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**EASTERN SUB STATION
PROJECT MANUAL
&
SPECIFICATIONS**

Bid Documents

**GHURA
CBDG PROJECT**

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SECTION 03100

CONCRETE FORMS AND ACCESSORIES

PART 1 - GENERAL

1.1 REFERENCES

The latest issues of the publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

- A. AMERICAN CONCRETE INSTITUTE (ACI)
 - ACI 301 Structural Concrete for Buildings
 - ACI 347R Formwork for Concrete
- B. AMERICAN HARDBOARD ASSOCIATION (AHA)
 - AHA A135.4 Basic Hardboard
- C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - C 39 Compressive Strength of Cylindrical Concrete Specimens
- D. CORPS OF ENGINEERS (COE)
 - COE CRD-C-572 Polyvinylchloride Waterstop
- E. U.S. DEPARTMENT OF COMMERCE PRODUCT STANDARDS (PS)
 - PS-1 Construction and Industrial Plywood

1.2 SUBMITTALS: Submit the following in accordance with Section 01330, "Submittal Procedures."

- A. SD-02 Manufacturer's Catalog Data
 - 1. Waterstops

PART 2 - PRODUCTS

2.1 MATERIALS FOR FORMS

Provide wood, plywood, or steel. Use plywood or steel forms where a smooth form finish is required. Lumber shall be square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Plywood: PS-1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining. Steel form surfaces shall not contain irregularities, dents, or sags.

2.2 FORM TIES AND ACCESSORIES

The use of wire alone is prohibited. Form ties and accessories shall not reduce the effective cover of the reinforcement.

- A. Polyvinylchloride Waterstops: COE CRD-C-572.

PART 3 - EXECUTION

3.1 FORMS

ACI 301. Provide forms, shoring, and scaffolding for concrete placement. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 20 mm unless otherwise indicated. Provide formwork with clean-out openings to permit inspection and removal of debris. Forms submerged in water shall be watertight.

- A. Coating: Before concrete placement, coat the contact surfaces of forms with a non-staining mineral oil, non-staining form coating compound, or two coats of nitrocellulose lacquer. Do not use mineral oil on forms for surfaces to which adhesive, paint, or other finish material is to be applied.
- B. Removal of Forms and Supports: After placing concrete, forms shall remain in place for the time periods specified in ACI 347R. Prevent concrete damage during form removal.
 - 1. Special Requirements for Reduced Time Period: Forms may be removed earlier than specified if ASTM C 39 test results of field-cured samples from a representative portion of the structure indicate that the concrete has reached a minimum of 85 percent of the design strength.
- C. Re-shoring: Re-shore concrete elements where forms are removed prior to the specified time period. Do not permit elements to deflect or accept loads during form stripping or re-shoring. Forms on columns, walls, or other load-bearing members may be stripped after 2 days if loads are not applied to the members. After forms are removed, slabs and beams over 3000 mm in span and cantilevers over 1200 mm shall be re-shored for the remainder of the specified time period in accordance with paragraph entitled "Removal of Forms." Perform re-shoring operations to prevent subjecting concrete members to overloads, eccentric loading, or reverse bending. Re-shoring elements shall have the same load-carrying capabilities as original shoring and shall be spaced similar to original shoring. Firmly secure and brace re-shoring elements to provide solid bearing and support.

3.2 WATERSTOP SPLICES

Fusion weld in the field.

3.3 FORMED SURFACES

- A. Tolerances: ACI 347R and as indicated.
- B. As-Cast Form: Provide form facing material producing a smooth, hard, uniform texture on the concrete. Arrange facing material in an orderly and symmetrical manner and keep seams to a practical minimum. Support forms as necessary to meet required tolerances. Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used.

END OF SECTION 03100

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 REFERENCES

The latest issues of the publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 82	Steel Wire, Plain, for Concrete Reinforcement
A 185	Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
A 496	Steel Wire, Deformed, for Concrete Reinforcement
A 497	Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
A 615/A 615M	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

A. SD-04 Drawings

1. Reinforcing steel: ACI 315. Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars.
2. Reproductions of contract drawings are unacceptable.

1.3 DELIVERY, STORAGE, AND HANDLING

Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Bars: ACI 301 unless otherwise specified. ASTM A 615/A 615M 617M with the bars Grade 60.
- B. Mechanical Reinforcing Bar Connectors: ACI 301. Provide 125 percent minimum yield strength of the reinforcement bar.

- C. Welded Wire Fabric: ASTM A 185 or ASTM A 497. Provide flat sheets of welded wire fabric for slabs and toppings.
- D. Wire: ASTM A 82 or ASTM A 496.
- E. Reinforcing Bar Supports: Provide bar ties and supports of coated or non-corrodible material.

PART 3 - EXECUTION

3.1 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

ACI 301. Provide bars, wire fabric, wire ties, supports, and other devices necessary to install and secure reinforcement. Reinforcement shall not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.

- A. Reinforcement Supports: Place reinforcement and secure with galvanized or non-corrodible chairs, spacers, or metal hangers. For supporting reinforcement on the ground, use concrete or other non-corrodible material, having a compressive strength equal to or greater than the concrete being placed.
- B. Splicing: As indicated. For splices not indicated ACI 301. Do not splice at points of maximum stress. Overlap welded wire fabric the spacing of the cross wires, plus 50 mm.
- C. Future Bonding: Plug exposed, threaded, mechanical reinforcement bar connectors with a greased bolt. Bolt threads shall match the connector. Countersink the connector in the concrete. Calk the depression after the bolt is installed.
- D. Cover: ACI 301 for minimum coverage, unless otherwise indicated.

END OF SECTION 03200

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS

The latest issues of the publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. U.S. Army Corps of Engineers (COE) Waterways Experiment Station Publications:

CRD-C-621 Handbook for Concrete and Cement, Specification for Non-shrink Grout

B. U.S. Department of Commerce Product Standard (PS):

PS 1 Construction and Industrial Plywood

C. American Concrete Institute (ACI) Publications:

211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete

301 Specifications for Structural Concrete for Buildings

302.1R Guide for Concrete Floor and Slab Construction

304 Recommended Practice for Measuring, Mixing Transporting, and Placing Concrete

305R Hot Weather Concreting

315 Details and Detailing of Concrete Reinforcing

318 Building Code Requirements for Reinforced Concrete

347 Recommended Practice for Concrete Formwork

D. American Society for Testing and Materials (ASTM) Publications:

A82 Steel Wire, Plain for Concrete Reinforcement, Specification for

A185 Steel Welded Wire Fabric Plain, for Concrete Reinforcement, Specification for

A496 Steel Wire, Deformed, for Concrete Reinforcement Cement, Specification for

A497 Steel Welded Wire Fabric Deformed for Concrete Reinforcement, Specification for

A615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, Specifications for

A616	Rail-Steel Deformed and Plain Bars for Concrete Reinforcement, Specifications for
A617	Axle-Steel Deformed and Plain Bars for Concrete Reinforcement, Specifications for
A706	Low-Alloy Steel Deformed Bars for Concrete Reinforcement, Specification for
C31	Practice for Making and Curing Concrete Test Specimens in the Field
C33	Concrete Aggregates, Specifications for
C39	Compressive Strength of Cylindrical Concrete Specimens, Test Methods for
C42	Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C94	Specification for Ready-Mixed Concrete
C136	Sieve Analysis of Fine and Coarse Aggregates, Test Method for
C143	Slump of Hydraulic Cement Concrete, Test for
C150	Portland Cement, Specification for
C171	Sheet Materials for Curing Concrete, Specification for
C172	Sampling Freshly Mixed Concrete, Practice for
C173	Air Content of Freshly Mixed Concrete by the Volumetric Method, Test Method for
C231	Air Content of Freshly Mixed Concrete by the Pressure Method, Test Method for
C309	Liquid Membrane-Forming Compounds for Curing Concrete, Specification for
C494	Chemical Admixtures for Concrete, Specification for
C881	Epoxy-Resin-Base Bonding Systems for Concrete, Specification for
C920	Elastomeric Joint Sealants, Specification for
D1190	Concrete Joint Sealer, Hot-Poured Elastic Type, Specification for
D1751	Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types), Specification for
D1752	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction, Specification for

E. American Welding Society (AWS) Publication:

D1.4 Structural Welding Code-Reinforcing Steel

1.2 DESCRIPTION OF WORK

The work includes the provision of cast-in-place concrete. In the ACI publications referred to herein, the advisor provisions shall be considered to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears; reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer," shall be interpreted to mean the Engineer.

1.3 QUALITY CONTROL

The Quality Control provisions of Division 1, Section 01400 apply to this section. All approvals, except those required for field installations, field applications and field tests, shall be before construction is started and before delivery of materials or equipment to the project site.

1.4 SUBMITTALS

A. Shop Drawings: Reproductions of contract drawings are unacceptable.

1. Shop Drawings for Reinforcing Steel: ACI 315. Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions and details of bar reinforcing, construction joints, accessories, and concrete covering. Do not scale dimensions from structural or detail drawings to determine lengths of reinforcing rods.
2. Subcontractor Mix Design: Thirty (30) days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Furnish a complete list of materials including type; brand; source and amount of cement. Obtain approval before concrete placement. Obtain acknowledgment of receipt prior to concrete placement. Submit additional data regarding concrete aggregates if the source of aggregate changes.

B. Certificates of Compliance: Before delivery of materials, certified test reports are required for the following:

1. Aggregates
2. Reinforcement
3. Cement
4. Admixtures

C. Catalog Data:

1. Materials for Curing Concrete
2. Joint Sealant
3. Joint Filler
4. Epoxy Grout

1.5 DELIVERY

Do not deliver concrete until vapor barrier, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement.

1.6 STORAGE

ACI 301 for job site storage of concrete aggregates. Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Provide for accurate identification after bundles are broken and tags removed.

PART 2 - PRODUCTS

2.1 CONCRETE

A. Subcontractor-Furnished Mix Design: Concrete shall be designed in accordance with ACI 211.1 and ACI 301. Concrete shall have a 28-day compressive strength of 4,000 psi unless specified otherwise and have a maximum aggregate size of 3/4".

1. Slump Requirements:

Element	Slump, Inches	
	Minimum	Maximum
Walls, columns, and grade beams	2	4
Floors, exterior slabs, and other building Construction	1	3

2.2 CONCRETE MATERIALS

- A. Cement: Cement shall be Type I or II, conforming to ASTM C150 or approved equal.
- B. Water: Water for mixing and curing including free moisture and water in the aggregates, shall be fresh, clean and potable.
- C. Water Cement Ratio: Shall not exceed 0.50 for concrete with specified compressive strength of 4000 psi or more.
- D. Aggregates: In general, aggregates shall be free from deleterious coatings, roots, bark, and other extraneous material. All aggregates shall conform to ASTM C33 and shall be thoroughly and uniformly washed before use.

Coarse aggregate shall be made from sound, clean coralline limestone in accordance with ASTM C136, conforming to the following gradation requirements:

Size of Coarse Aggregates (Inches)	Percent by Weight Passing
------------------------------------	---------------------------

	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16
1	100	90-100	---	25-60	---	0-10	0-5	--
3/4		100	90-100	---	20-55	0-10	0-5	--
1/2			100	90-100	40-70	0-15	0-5	--
3/8				100	85-100	0-30	0-10	--

Fine aggregate shall be manufactured from clean coralline limestone in accordance with ASTM C136, conforming to the following grading requirements.

Sieve	Percent Passing
3/8 inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

E. Proportioning, Measuring and Mixing:

1. Proportioning of Materials: Proportioning of materials shall be accomplished by weighing. Volumetric proportioning may be used subject to approval of the Engineer. The Subcontractor shall furnish the necessary equipment and shall establish accurate procedures, subject to the approval of the Engineer for determining the quantities of free moisture in the aggregates. Allowable tolerances for measuring cement and water shall be 1 percent, and for aggregates 2 percent.
2. Mixing: All concrete shall be machine mixed. In emergencies, the mixing may be done by hand if so authorized by the Engineer. Mixing shall begin within 30 minutes after the cement has been added to the aggregates.

F. Ready-Mixed Concrete: Ready-mixed concrete shall conform to ASTM C94 as modified herein. Ready-mixed concrete is defined in this specification as concrete produced regularly by a commercial establishment and delivered to the purchaser in the plastic state. Cement, aggregates and water shall conform to all applicable requirements of this specification.

G. Skim Coat Cement Finish: Cement based polymer modified, quick setting concrete finishing material; dry powder blend of Portland cement and acrylic additives designed specifically for application to concrete surfaces for Class A finish. Fine finish texture. BONDEDE PRO-FINISH or LA HABRA ACRYLIC FINISH.

2.3 ADMIXTURES

- A. Accelerating: ASTM C494, Type C.
- B. Retarding: ASTM C494, Type B, D, or G.

- C. Water Reducing: ASTM C494, Type A, E, or F.

2.4 MATERIALS FOR FORMS

Provide wood, plywood, or steel. Use plywood or steel forms where a smooth form finish is required. Lumber shall be square edged or tongue-and-groove board, free of raised grain, knotholes, or other surface defects. Plywood: PS1, B-B concrete form panels or better. Steel form surfaces shall not contain irregularities, dents, or sags.

2.5 REINFORCEMENT

- A. Reinforcing Bars: ACI 301, unless otherwise specified. ASTM A615, Grade 60.
- B. Welded Wire Fabric: ASTM A497 or ASTM A185, 6 by 6, W1.4 by W1.4, unless otherwise indicated.
- C. Mechanical reinforcing Bar Connectors: ACI 301. Provide 125 percent minimum yield strength of the reinforcement bar.
- D. Wire: ASTM A82 or ASTM A496.

2.6 MATERIALS FOR CURING CONCRETE

- A. Impervious Sheeting: ASTM C171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.
- B. Liquid Membrane-Forming Compound: ASTM C309, white-pigmented, Type 2, Class B, free of paraffin or petroleum.

2.7 EXPANSION/CONTRACTION JOINT FILLER

ASTM D1751 or ASTM D1752, 1/2 inch thick, unless otherwise indicated.

2.8 EPOXY GROUT

(For joints between old and new concrete and where called on the drawings) Three-component units composed of 100% solids ASTM-C881 epoxy resin system. Provide material type, grade, and class to suit project requirements.

PART 3 - EXECUTION

3.1 FORMS

ACI 301. Provide forms, shoring, and scaffolding for concrete placement unless indicated or specified otherwise. Concrete for footings may be placed in excavations without forms upon inspection and approval by the Engineer. Excavation width shall be a minimum of 4 inches greater than indicated. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch unless otherwise indicated. Provide forms with clean-out openings to permit inspection and removal of debris. Forms submerged in water shall be watertight.

- A. Coating: Before concrete placement, coat the contact surfaces of forms with a non-staining mineral oil, non-staining form coating compound, or two coats of nitrocellulose lacquer. Do not use mineral on forms for surfaces to which adhesive, paint, or other finish material is to be applied.

- B. Removal of Forms: Prevent concrete damage during form removal. After placing concrete, forms shall remain in place for a minimum time period equal to the curing period. Forms may be removed earlier than specified if ASTM C39 test results of field-cured samples from a representative portion of the structure indicate that the concrete has reached 85 percent (minimum) of the design strength.

3.2 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

ACI 301. Provide bars, wire fabric, wire ties, supports and other devices necessary to install and secure reinforcement. Reinforcement shall not contain rust, scale, oil, grease, clay, and foreign substances that would reduce the bond. Rusting of reinforcement is a basis for rejection if the effective cross sectional area or the nominal weight per foot of the reinforcement has been reduced to less than specified in paragraph entitled "Reinforcing Bars." Remove loose rust prior to placing steel. Tack welding is prohibited.

- A. Tolerances: Place reinforcement and secure with galvanized or non-corrodible chairs, spaces, or metal hangers. Use concrete or other non-corrodible material for supporting reinforcement on the ground.
- B. Splicing: AWS D1.4, except as otherwise indicated or specified. Splices shall be approved prior to use. Do not splice at points of maximum stress. Overlap welded wire fabric the spacing of the cross wires, plus 2 inches.
- C. Future Bonding: Plug exposed, threaded, mechanical reinforcement bar connectors with a greased bolt. Bolt threads shall match the connector. Countersink the connector in the concrete. Caulk the depression after the bolt is installed.
- D. Cover: ACI 301 for minimum coverage, unless otherwise indicated.
- E. Setting Miscellaneous Material: Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removal material to prevent the entry of concrete.
- F. Construction Joints: Locate joints to least impair strength. Continue reinforcement across joints unless otherwise indicated.
- G. Expansion joints and Contraction Joints: For slabs on grade, provide as shown on the drawings or as otherwise specified herein. Provide contraction joints, either formed or saw cut or cut with a jointing tool, to the indicated depth after the surface has been finished. Sawed joints shall be completed within 4 to 12 hours after concrete placement. Protect joints from intrusion of foreign matter.
- H. Form Ties and Accessories: The use of wire alone is prohibited. Form ties and accessories shall not reduce the effective cover of the reinforcement.

3.3 MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE

ASTM C94, ACI 301, ACI 302.1R, and ACI 304, except as modified herein. ASTM C94. Provide mandatory batch ticket information for each load of ready mix concrete.

- A. Measuring: Make moisture, weight, and air determinations at intervals as specified in paragraph entitled "Sampling and Testing." Allowable tolerances for measuring cement

and water shall be 1 percent; for aggregates, 2 percent; and for admixtures, 3 percent.

- B. **Mixing:** ASTM C94. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of the mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 85 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 85 degrees F. Additional water may be added, provided that both the specified maximum slump and water-cement ratio are not exceeded. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch.
- C. **Transporting:** Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete, which has segregated in transporting, and dispose of as directed.
- D. **Placing:** Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt, construction debris and water from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other. Position grade stakes on 10-foot centers maximum in each direction when pouring interior slabs and on 20-foot centers maximum for exterior slabs.
 - 1. **Vibration:** ACI 301. Furnish a spare vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4 inches in depth with high frequency, internal, mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading, and settling with a heavy leveling straight edge. Operate vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 impulses per minute when submerged. Do not use vibrators to transport the concrete in the forms. Insert and withdraw vibrators approximately 18 inches apart. Penetrate the previously placed lift with the vibrator when more than one lift is required. Place concrete in 18-inch maximum vertical lifts. External vibrators shall be used on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete.
 - 2. **Application of Epoxy Bonding Compound:** Apply a thin coat of compound to dry, clean surfaces. Scrub compound into the surface with a stiff-bristle brush. Place concrete while compound is stringy. Do not permit compound to harden prior to concrete placement. Follow manufacturer's instructions regarding safety and health precautions when working with epoxy-resins.
- E. **Hot Weather:** ACI 305R. Provide and maintain required concrete temperature using Figure 2.1.5 in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing.

Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling

(where worksite is remote to water source) to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets.

For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.4 FINISH OF FORMED SURFACES

- A. CF-1 Rough Formed Finish: For formed concrete surfaces not exposed-to-view in the finished work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/8" in height rubbed down or chipped off.
- B. CF-2 Smooth Form Finish: For exterior formed concrete surfaces exposed-to-view other than roofs. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed. For all walls to be painted with (EAHE).
- C. CF-3 Skim Coat Finish: For all interior formed surfaces exposed-to-view, provide skim coat finish. Apply over all contiguous surfaces.
- D. Related Uniform Surfaces: At top of walls, horizontal offsets, and similar uniformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.5 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

ACI 302.1R, unless otherwise specified.

- A. Finishing: Place, consolidate and immediately strike off concrete to obtain proper contour, grade, and elevation before bleed water appears. Permit the concrete to attain a set sufficient for floating and sufficient to support the weight of the finisher and equipment. If bleed water is present prior to floating the surface, drag the excess water off or remove by absorption by porous materials. Do not use dry cement to absorb bleed water.
 - 1. Floated: Provide for machinery pads and other exterior slabs where not otherwise specified. Float the surface by hand with a wood or magnesium float, or use a power-driven float. Floating of any one area shall be the minimum necessary to produce an even finish, level within 1/4 inch in 10 feet for exterior work.
 - 2. Steel Troweled: First, provide a floated finish. When slab has attained a proper set, hand- or machine-trowel to a smooth, hard, dense finish. Finished surfaces shall be free of troweled marks, uniform in texture, and have true plane, flat within 0.01 foot (approximately 1/8 inch) in 10 feet. Hand-finish portions of the slab not accessible to power finishing equipment (e.g., edges, corners) to match the remainder of the slab. Power trowel once and finally hand trowel where a finished floor covering (e.g., tile, carpet) is specified. Power trowel twice and finally hand trowel for exposed concrete floors.

3.

3.6 CURING AND PROTECTION

ACI 301 unless otherwise specified. Begin curing immediately following form removal. Protect concrete from injurious action by sun, rain, flowing water, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, or on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period.

- A. Moist Curing: Provide for the removal of water without erosion or damage to the structure.
1. Ponding or Immersion: Continually immerse the concrete throughout the curing period. Water shall not be more than 20 degrees F less than the temperature of the concrete.
 2. Fog Spraying or Sprinkling: Provide uniform and continuous application of water throughout the curing period.
 3. Pervious Sheeting: Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Sheeting shall be at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously set throughout the curing period.
 4. Impervious Sheeting: Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns, walls and other vertical structural elements from the top down with impervious sheeting, overlap and continuously tape sheeting joints, and introduce sufficient water to soak the entire surface prior to completely enclosing.
- B. Liquid Membrane-Forming Compound Curing: Seal or cover joint openings prior to application of curing compound. Prevent curing compound from entering the joint. Provide and maintain compound on the concrete surface throughout the curing period. Do not use this method of curing where the use of Figure 2.1.5 in ACI 305R indicates that hot weather conditions will cause an evaporation rate exceeding 0.2 pound of water per square foot per hour.
1. Applications: Unless the manufacturer recommends otherwise, apply compound immediately after the surface loses its water sheen and has a dull appearance, and before joints are sawed. Mechanically agitate curing compound thoroughly during use. Use approved power-spraying equipment to uniformly apply two coats of compound in a continuous operation. The total coverage for the two coats shall be 200 square feet maximum per gallon of undiluted compound unless otherwise recommended by the manufacturer's written instructions. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel. Immediately apply an additional coat of compound to areas where

the film is defective.

- C. Protection of Treated Surfaces: Prohibit foot and vehicular traffic and other sources of abrasion for not less than 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair any damage.
- D. Curing Periods and Minimum Temperatures: After placing concrete, maintain air temperature adjacent to the concrete at 50 degrees F minimum for the specified period, or 70 degrees minimum for a period of 3 days after placing and, and 40 degrees F minimum for the remainder of the specified time period.

3.7 SAMPLING AND TESTING

- A. Sampling: ASTM C172. Collect samples of fresh concrete to perform tests specified. ASTM C31 for making test specimens.
- B. Testing:
 - 1. Slump Tests: ASTM C143. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) of every 10 cubic yards (maximum) of concrete.
 - 2. Compressive Strength Tests: ASTM C39. Make five test cylinders for each set of tests in accordance with ASTM C31. Test two cylinders at 7 days, two cylinders at 28 days, and hold one cylinder in reserve. Provide concrete cylinders for compressive tests not less than once a day, nor less than once for each 150 cubic yards of concrete, nor less than once for each 5,000 square feet of surface area for slabs and walls. Double the cylinder collection frequency and number of batches sampled when pumping concrete. If the average strength of the 28-day test cylinders is less than the compressive strength and a maximum of one single cylinder is less than f'_c is minus 300 psi, take three ASTM C42 core samples and test. If the average strength of the 28-day test cylinders is less than f'_c and two or more cylinders are less than f'_c minus 300 psi, take six core samples and test. Concrete represented by core tests shall be considered structurally adequate if the average of three cores is equal to at least 85 percent of f'_c and if no single core is less than 75 percent of f'_c . Locations represented by erratic core strengths shall be retested. Remove concrete not meeting strength criteria and provide new, acceptable concrete. Repair core holes with non-shrink grout. Match color and finish of adjacent concrete.

END OF SECTION 03300

SECTION 03301

MISCELLANEOUS CONCRETE STRUCTURES

PART 1 - GENERAL

- 1.1 QUALITY CONTROL: The Quality Control of Division 1, apply to this section.
- 1.2 GENERAL REQUIREMENTS: The construction requirements of this section apply to concrete sidewalks, driveways, and concrete-paved drainage swales, with reinforcement, conforming to the lines and grades shown on the plans.
- A. Earthwork: Unless otherwise specified in this section or on the plans, the earthwork requirements of Section 02200, entitled "Earthwork", shall also apply to this section.
- B. Concrete Construction: Unless otherwise specified in this section, or on the plans, the concrete construction requirements of Section 03300, entitled "Cast-in-Place Concrete", shall also apply to this section.

PART 2 - PRODUCTS

- 2.1 General: Products mentioned in Section 03300, Cast-in-Place Concrete shall also apply to this section.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. Concrete Walkways: This work shall consist of the construction of concrete walkways, sidewalks, or concrete slabs in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans or established by the Contracting Officer.
1. Excavation: Excavation shall be made to the required depth and to a width that will permit the installation and bracing of the forms. The foundation shall be shaped and compacted to an even surface conforming to the section shown on the plan. All soft and yielding material shall be removed and replaced with acceptable material, which shall be thoroughly compacted to the degree indicated on the plans.
 2. Forms: Forms shall be of wood or metal and shall extend for the full depth of the concrete. All forms shall be straight, free from warp and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal.
 3. Placing Concrete: The foundation shall be thoroughly moistened immediately prior to the placing of the concrete. The proportioning, mixing and placing of the concrete shall be in accordance with the requirements of Section 03300, entitled "Cast-in-Place Concrete".
 4. Finishing: The surface shall be finished with a wooden float. No plastering of the surface will be permitted. All outside edges of the slab and all joints shall be edged with a 1/4 inch radius edging tool.
 5. Joints: Expansion joints shall be of the dimensions specified, and shall be filled with the type of pre-molded expansion joint filler. The sidewalk shall be divided into sections by dummy joints formed by a jointing tool or other acceptable means as

directed. These dummy joints shall extend into the concrete for at least 1/3 of the depth and shall be approximately 1/8 inch wide.

6. Construction joints shall be formed around all appurtenances such as manholes, utility poles, etc., extending into and through the installed in these joints. Expansion joint filler of the thickness indicated shall be installed between concrete sidewalks and any fixed structure such as a building or bridge. This expansion joint material shall extend for the full depth of the sidewalk.
7. Curing: Concrete shall be cured for at least 72 hours. Curing shall be by means of moist burlap or mats or by other approved methods.
8. Base Course Material: Base Course Material for sidewalks and driveways shall conform to the requirements for base course in Section 02203, entitled "Base Course".

B. Concrete Curbing: This work shall consist of the construction of curb, gutter or combination curb and gutter in accord with these specifications and in reasonably close conformity with the lines and grades shown on the plans or established by the Architect.

1. Excavation: Excavation shall be made to the required depth, and based upon which the curb is to be set shall be compacted to an even surface. All soft and unsuitable material shall be removed and replaced with suitable material which shall be thoroughly compacted to the degree indicated on the plans.
2. Forms: Forms shall be of wood, metal, or other suitable material and shall extend for the full depth of the concrete. All forms shall be straight, free from warp and of sufficient strength to resist the pressure of the concrete without displacement. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal. All forms shall be cleaned and coated with an approved form release agent before concrete is placed. Divider plates shall be of metal.
3. Mixing and Placing: Concrete shall be proportioned, mixed and placed in accordance with the requirements of Section 03300, entitled "Cast-In-Place Concrete". Consolidation of concrete placed in the forms shall be by vibration or other acceptable methods. Forms shall be left in place for 24 hours or until the concrete has set sufficiently so that they can be removed without injury to the curbing. The concrete shall be struck off to the cross-section specified, after which it shall be finished smooth and even by means of a wood float.

For the purpose of matching adjacent concrete finishes or for other reasons, the Architect may permit other methods of finishing. No plastering will be permitted.

4. Sections: Curbing shall be constructed in sections having a uniform length as shown on the plans unless otherwise directed by the Engineer. Sections shall be separated by open joints 1/8 inch wide except at expansion joints. Where the curb is constructed adjacent to concrete pavement, the construction or open joints in the curb shall match the contraction joints in the pavement.
5. Expansion Joints: Expansion joints shall be formed at the intervals shown on the plans using a pre-formed expansion joint filler having a thickness of 1/2 inch. When the curb is constructed adjacent to or on concrete pavement, expansion joints shall be located opposite or at expansion joints in the pavement.
6. Curing: Immediately upon completion of the finishing, the curbing shall be moistened and kept moist for three (3) days, or the curbing shall be cured by the use of membrane forming material. The method and details of curing shall be subject to the

approval of the Architect.

7. Backfilling: After the concrete has set sufficiently, the spaces in from and back of the curb shall be refilled to the required elevation with suitable material, which shall be thoroughly tamped, in layers of not more than eight inches thick.
- C. Drainage Swales: This work shall consist of paving ditches or other similar waterways with concrete constructed on a prepared bed in reasonably close conformity with these specifications and with the lines, grades and dimensions shown on the plans or established by the Architect.
1. Excavation: Excavation shall be made to the required depth, and the base upon which the curb is to be set shall be compacted to an even surface. All soft and unsuitable material shall be removed and replaced with suitable which shall be thoroughly compacted to the degree indicated on the plans.
 2. Forms: Forms shall be of wood, metal, or other suitable material and shall extend for the full depth of the concrete. All forms shall be straight, free from warp and of sufficient strength to resist the pressure of the concrete without displacement. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal. All forms shall be cleaned and coated with an approved form release agent before concrete is placed.
 3. Mixing and Placing: Concrete shall be proportioned, mixed and placed in accordance with the requirements of Section 03300, entitled "Cast-in-Place Concrete". Consolidation of concrete placed in the forms shall be by vibration other acceptable methods. Forms shall be left in place for 24 hours or until the concrete has set sufficiently so that they can be removed without injury to the structure. The concrete shall be struck off to the cross-section specified, after which it shall be finished smooth and even.
 4. Sections: Swales shall be constructed in sections as shown on the plans unless otherwise ordered.
 5. Curing: Immediately upon completion of the finishing, the structure shall be moistened and kept moist for three days. The method and details of curing shall be subject to the approval of the Architect.
 6. Backfilling: After the concrete has set sufficiently, the spaces shall be refilled to the required elevation with suitable material, which shall be thoroughly tamped, in layers of not more than eight (8) inches thick.
 7. Base Course Material: Base course material for concrete curbing shall conform to the requirements Section 02203, entitled "Base Course".

END OF SECTION

SECTION 03350
CONCRETE FINISHES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Finishes for cast-in-place concrete.
- B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.
- C. Related Sections:
 - 1. Section 03300 – Cast-in-Place Concrete: Substrate for finishing.
 - 2. Section 07190 - Water Repellents (Sealer): Substrate waterproof sealer.
 - 3. Section 09900 – Painting: Finishing.

1.2 DESCRIPTION OF WORK

- A. The extent of the concrete finishes work is indicated on the Drawings and Schedules and as specified herein, and includes providing materials and applying to in-place concrete surfaces.
- B. Materials and work specified herein, are in addition to the work under Division 3 – CONCRETE, and are required to achieve the specified finishes.

1.3 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. Applicable provisions.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 1155 - Test Method for Determining FF Floor Flatness and FL Floor Level Numbers.
- C. Americans with Disabilities Act Accessibility Guidelines (ADAAG):
 - 1. Accessibility Guidelines for Buildings and Facilities.
 - 2. Accessibility Guidelines for Building Elements Designed for Children's Use.

1.4 SUBMITTALS

- A. Section 01330 – Submittal Procedures: Procedures for submittals.
 - 1. Product Data: Manufacturer's technical information and application instructions

for the materials required.

2. Shop Drawings (if requested): Layout drawings and details for proper installation of the work.
3. Mock-Up: Construct a Mock-Up of 4"x 4" minimum size, not as part of work, to be reviewed for quality of workmanship and finish. Prior to beginning the Mock-Up, secure the Owner representative's general approval of the application technique to be used.
4. Assurance Control Submittals:
 - a. Documentation of experience indicating compliance with the specified qualifications requirements.

1.5 COORDINATION

- A. Concrete Characteristics. Without changing the design intent, it is required that the concrete characteristics, such as moisture content, pH levels, finish texture, and any materials used in conjunction with the concrete work meet the requirements of other work to be applied to and into it and whose performance, in part or whole, depends upon the concrete work provided. Verify and coordinate requirements with other Installers providing such work prior to the construction of each structure affecting such Installers.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 2. Applicator Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements. Transport, handle, store, and protect the products.
- B. Deliver products to the Project Site in the manufacturer's original, new and unopened packages or containers with seals and labels intact, dry and undamaged, bearing the product name, and precautionary labels.
- C. Store materials not in actual use, in tightly enclosed containers. Maintain containers used in the storage of materials, in a clean condition, free of foreign materials and residue.
- D. Store materials in a well-ventilated area, and in compliance with the manufacturer's published instructions.
- E. Store and handle materials to prevent deterioration and damage due to moisture, temperature changes, contaminants, and other causes.

PART 2 PRODUCTS

2.1 FORM MATERIALS

- A. In addition to materials required to achieve the finishes specified herein, comply with Division 3 - CONCRETE Sections.
- B. Form Coatings: Form coatings shall not bond with, stain, or adversely affect concrete surfaces, and shall not impair subsequent treatment of concrete surfaces.

2.2 CONCRETE MATERIALS

- A. In addition to materials required to achieve the finishes specified herein, comply with Division 3 - CONCRETE Sections.
- B. Skim Coat Cement Finish: (CF-3) Cement based polymer modified, quick setting concrete finishing material—dry powder blend of Portland Cement and acrylic additives designed specifically for application to concrete surfaces for a Class A finish. Fine finish texture. LAHABRA ACRYLIC FINISH, PRO-FINISH by Bonded Materials Co., or approved equal.
- C. Hardening —Sealing Agent for polished finish (CF-9)
 - 1. Advanced Floor Products—Retro-Plate 99
 - 2. Eloco: Ironshine HG

2.3 RELATED MATERIALS

- A. Salt: Coarse salt, 100% passing 30 sieve and 5% remaining on 20 sieve. Morton Softener Salt, Somat Water Softener Salt, North American Salt or approved product by another company.
- B. Curing Materials: Comply with Division 3. - CONCRETE Sections.

2.4 MIXES

- A. Comply with Division 3 - Concrete Sections.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that surfaces, substrates and conditions are as required, and ready to receive the work.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 FINISH OF FORMED SURFACES

- A. (CF-1) Rough Formed Finish: Formed concrete surfaces not exposed-to-view in the finished work or by other construction, unless otherwise indicated. Concrete surfaces having texture imparted by the form facing material used, with tile holes and defective areas repaired and patched, and fins and other projections, exceeding 1/4 in height, rubbed down or chipped off.

- D. (CF-2) Smooth Form Finish: Formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to the concrete, or a covering material applied directly to the concrete, such as waterproofing, dampproofing, veneer plaster, paint, wall covering or other similar materials. As-cast concrete surfaces resulting from selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and ground smooth.
- C. (CF-3) Skim Coat Finish: Formed surfaces exposed-to-view, provided with a skim coat finish, smooth or textured as indicated or selected by owner's representative. Apply over all contiguous surfaces.
- D. Related Un-formed Surfaces: Tops of walls, horizontal offsets, and similar un-formed surfaces adjacent to formed surfaces. Strike-off smooth and finish with a texture matching the adjacent formed surfaces. Continue final surface treatment of the formed surfaces uniformly across adjacent un-formed surfaces, unless otherwise indicated.

3.3 MONOLITHIC SLAB FINISHES

- A. Floor Flatness Standard: ASTM E1155, with F-number requirements as specified herein.
- B. (CF-4) Float Finish:
 - 1. Location: Apply on surfaces to receive a trowel finish, and as otherwise indicated.
 - 2. Installation: After screeding, consolidating, and leveling concrete slabs, do not work the surface until ready for floating.
 - 3. Begin floating when surface water has disappeared or when the concrete has stiffened sufficiently to permit operation of power driven floats, or both. Consolidate surface with power driven floats or by hand floating if the area is small or inaccessible to power units. Check and level the surface plane and uniformly slope surfaces to drains. Immediately after leveling, refloat the surface to a uniform, smooth, granular texture.
- C. (CF-5) Trowel Finish:
 - 1. Location: Apply to the following surfaces, and as otherwise indicated.
 - a. In general, apply to all exposed-to-view surfaces with no tile or stone finishes scheduled to be applied.
 - b. Surfaces to receive water repellent sealer.
 - c. Surfaces to receive carpet.
 - d. Surfaces to receive resilient flooring.
 - e. Surfaces to receive paint coatings.
 - 2. Installation: After floating, begin first finish operation using a power driven trowel. Begin final troweling when surfaces produce a ringing sound as trowel is moved over the surface. Consolidate concrete surfaces by final hand troweling, free of trowel marks, uniform in texture and appearance, and with the surfaces leveled. Grind smooth surface defects that will telegraph through an applied floor finish.

D. (CF-□) Trowel with Fine Broom Finish:

1. Location: Apply to the following surfaces, and as otherwise indicated.
 - a. Vehicular traffic surfaces which are not ramps.
 - b. Pedestrian (foot trafficked) concrete surfaces, such as walkways, ramps, and stairs.
 - c. Surfaces to receive mortarbed or thinset tile or stone.
2. Installation: Apply trowel finish as specified herein, then immediately follow by slightly scarifying the surface to a 1/4" maximum profile with a fiber bristle broom or brush.
3. Profile, Texture, and Pattern:
 - a. Vehicular and Pedestrian Traffic Surfaces: Verify profile, texture, and pattern with the Owner's representative, and provide in accordance with directions. Apply perpendicular to the direction of traffic, or as otherwise instructed.
 - b. Tile Stone and Waterproofed Surfaces: Verify scarifying profile with the Installer of the final exposed finish.

E. (CF-7) Scored (Rib) Finish:

1. Location: Apply to vehicular and pedestrian ramps, and as otherwise indicated.
2. Installation: Apply trowel finish as specified herein, then immediately follow with a scoring machine or tool leaving raked ribs perpendicular to the vehicular traffic direction, nominal 1/4" x 1/4" profile, at 2" o.c., or such other pattern and profile, as approved.

F. (CF-□) Salt Finish:

1. Location: As indicated.
2. Installation: Distribute at the rate of not less than 5 lb / 100 sf, or as otherwise approved by the Owner's representative, or as determined by an approved Mock-Up. Washout salt when concrete has set.

G. Water Repellent Sealer Finish:

1. Location: Apply to the following surfaces, and as otherwise indicated.
 - a. In general, apply to all surfaces in which concrete is scheduled to be exposed to view and not scheduled to receive a tile, stone, carpet, or resilient floor finish.
 - b. Pedestrian (foot trafficked) concrete surfaces, such as walkways and stairs.
3. Installation: Apply sealer hardener after complete curing and drying of concrete surfaces. Apply proprietary materials in strict accordance with the manufacturer's printed instructions.

H. (CF-9) Polished Finish:

1. Apply to floors where indicated.
2. Performance Criteria:
 - a. Abrasion Resistance: ASTM C779
 - b. Impact Strength: ASTM C105
 - c. Ultra Violet Light and Water Spray: ASTM G23
4. Sealing, Hardening and Polishing of Concrete Surface
 - a. Concrete must be in place a minimum of 45 days or as directed by the manufacturer before application can begin.
 - b. Only a certified applicator shall apply sealer and hardener. Applicable procedures must be followed as recommended by the product manufacturer and as required to match approved test sample.
 - c. Achieve water repellency, hardening, dust proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen.
 - d. The Sealing, Hardening and Polishing procedures shall be in strict accordance with the manufacturer's Standard Installation Methods for the product.
 - e. Upon completion of concrete finish application, clean areas to be striped to remove any debris and residue,
 - f. Provide Lust value test results.

3.4 CONCRETE SURFACE REPAIRS

A. Non-Structural Defects: Repair the following types of defects.

1. Exposed-to-view Surfaces.
2. Cracks: Repair and fill all cracks, which affect durability of the concrete.
3. Voids: Repair all spalls, air bubbles, honeycomb, rock pockets, bug holes, tile holes, and other voids larger than a pinhole (1/8").
4. Projections: Remove fins and other projections from surfaces.
5. Color & Texture Irregularities: Remove stains and other discolorations.
6. High Areas on Slabs: Correct surfaces by grinding after the concrete has cured at least fourteen (14) days.
7. Low Areas on Slabs: Correct surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when approved by the Owner's

representative.

- Concealed Surfaces: Repair defects that affect durability of the concrete. If defects cannot be repaired, remove and replace with new concrete. Where waterproofing materials are indicated, remove projections and defects necessary for proper waterproofing of the surfaces in conformance with instructions of the waterproofing manufacturer.
- 9. Non-Structural Repairs: Utilize polymer-reinforced mortar patching materials in strict accordance with the material manufacturer's written instructions. Provide appropriate aggregate sizes for the depth of the area to be repaired. Finish smooth to blend with adjacent surfaces.
- 10. Structural Repairs: Perform structural repairs with prior approval of the Owner's representative for method and procedure, using epoxy adhesive and mortar.
- E. Color □Texture Repair: Even out the color □texture appearance of all exposed-to-view formed surfaces with a wash finish where not required to be opaque painted or where irregularities can telegraph through the final finish.

3.5 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- B. Upon completion of the finishing work, clean all surfaces free of foreign matter.
- C. Clean surfaces with acid solutions only when permitted by the Owner's representative. Protect metal surfaces and cast iron from the effects of acid cleaning. Flush surfaces with clean water before and after cleaning.
- D. Leave finished installations clean and free of cracks, chips, and otherwise defective work.

3.□ PROTECTION

- A. Protect finish work with Kraft paper or other heavy covering to prevent staining, damage and wear.
- B. Immediately before final inspection, remove the protective coverings and rinse with clean, potable water.

END OF SECTION

SECTION 04200

UNIT MASONRY

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 82	Steel Wire, Plain, for Concrete Reinforcement
ASTM A 153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 167	Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM B 370	Copper Sheet and Strip for Building Construction
ASTM C 90	Load-Bearing Concrete Masonry Units
ASTM C 91	Masonry Cement
ASTM C144	Aggregate for Masonry Mortar
ASTM C 150	Portland Cement
ASTM C 207	Hydrated Lime for Masonry Purposes
ASTM C 270	Mortar for Unit Masonry
ASTM C 476	Grout for Masonry

1.2 SUBMITTALS

Submit the following in accordance with Section 01300, "Submittals."

1.2.1 Manufacturer's Catalog Data

- a. Masonry accessories
- b. Reinforcement
- c. Flashing

Submit for each type.

1.2.2 Drawings

- a. Reinforcing steel
- b. Drawing Requirements

Indicate splicing, laps, shapes, dimensions, and details of reinforcing steel and accessories. Include details of anchors, adjustable wall ties, positioning devices, bond beams, and lintels. Do not scale drawings to determine lengths of bars.

1.2.3 Design Data

- a. Pre-mixed mortar

1.2.4 Instructions

- a. Masonry cement

When masonry cement is used, submit the manufacturer's printed instructions on proportions of water and aggregates and on mixing to obtain the type of mortar required.

1.2.5 Samples

- a. Masonry units

Submit two sets of each type masonry units, showing full range of color, texture, finish, and dimensions.

1.3 QUALITY ASSURANCE

1.3.1 Appearance

Do not change source or supply of materials after work has started if the appearance of the finished work would be affected.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver cementitious materials to the site in unbroken containers, plainly marked and labeled with manufacturers' names and brands. Store cementitious materials in dry, weather-tight sheds or enclosures. Handle so as to prevent entry of foreign materials and damage by water or dampness. Store masonry units off the ground and handle with care to avoid chipping and breakage. Protect materials from damage and, except for sand, keep dry until used. Cover sand to prevent intrusion of water and foreign materials and to prevent drying. Do not use materials containing frost or ice. Store Type II, concrete masonry units at the site before using for a minimum of 28 days for air cured units, 10 days for atmospheric steam or water cured units, and 3 days for units cured with steam at a pressure of 120 to 150 psi and at a temperature of 350 to 365 degrees F for at least 5 hours.

1.5 SCHEDULING

Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching.

PART 2 PRODUCTS

2.1 MASONRY UNITS

2.1.1 Concrete Masonry Units

Units of modular dimensions and air, water, or steam cured. Surfaces of units which are to be plastered shall be sufficiently rough to provide bond; elsewhere, exposed surfaces of units shall be

smooth and of uniform texture. Exterior concrete masonry units shall have water-repellent admixture added during manufacture.

a. Hollow Load-Bearing Units

ASTM C 90, Type I or II, made with or normal weight aggregate. Provide load-bearing units for exterior walls, foundation walls, load-bearing walls, and shear walls.

b. Special Shapes

Provide special shapes such as closures, header units, and jamb units as necessary to complete the work. Special shapes shall conform to the requirements for the units with which they are used.

2.1.2 Pre-cast Concrete Lintels

Same materials and surface texture as adjacent masonry units, with a 28-day compressive strength of not less than 3000 psi. Provide reinforcing as indicated. Provide lintels of sizes indicated, with at least 8 inches of bearing at each end.

2.2 MORTAR

2.2.1 Portland Cement

ASTM C 150, Type I, II, or III.

2.2.2 Hydrated Lime

ASTM C 207, Type S.

2.2.3 Masonry Cement

ASTM C 91, except that for masonry cement provided for mortar for exterior walls, the air content of the mortar specimen shall be not more than 16 percent by volume in lieu of 22 percent. Containers shall bear complete instructions for proportioning and mixing to obtain the required types of mortar.

2.2.4 Sand

ASTM C 144.

2.2.5 Water

Clean, potable, and free from substances which could adversely affect the mortar.

2.2.6 Mortar Types

ASTM C 270, Type S for masonry work; except where higher compressive strength is indicated on structural drawings. Air content shall not be less than 11 percent.

2.2.7 Pre-Mixed Mortar

ASTM C 270, Type S, compressive strength of 1800 psi in 28 days. Air content shall not be less than 11 percent. Admixtures may be provided in mortar to retard curing and provide up to 36 hours of workability, as long as the admixture does not adversely affect bonding or compressive strength.

2.3 MASONRY ACCESSORIES

2.3.1 Horizontal Joint Reinforcement

Fabricate from cold drawn steel wire, ASTM A 82. Wire shall be hot-dipped galvanized after fabrication in accordance with ASTM A 153 Class B-2, 1.5 oz. of zinc per square foot. Reinforcement shall be truss type with two or more longitudinal wires welded to a continuous diagonal cross wire, or ladder type with perpendicular cross wires not more than 16 inches o.c. Provide flat sections 10 feet long, and pre-formed corners and tees approximately 30 inches long. Overall width shall be approximately 2-inches less than nominal thickness of wall.

a. Single-Wythe

For single-wythe walls and partitions, provide two 9-gage (0.1483-inch) longitudinal wires and 9-gage cross wires.

2.3.2 Fastenings

Build in bolts, metal wall plugs, and other metal fastenings furnished under other sections for securing furring and other items.

2.3.3 Reinforcing Bars

ASTM A 615

2.3.4 Through-Wall Flashing

Provide one of the following types

a. Coated-Copper Flashing

7-ounce, electrolytic copper sheet, uniformly coated on both sides with acid-proof, alkali-proof, elastic bituminous compound. Factory apply coating to a weight of not less than 6 ounces per square foot (approximately 3 ounces per square foot on each side).

b. Copper or Stainless Steel Flashing

Copper, ASTM B 370, minimum 16-ounce weight; stainless steel, ASTM A 167, Type 301, 302, 304, or 316, 0.010-inch thick, No. 2D finish. Provide with factory-fabricated deformations that mechanically bond flashing against horizontal movement in all directions. Deformations shall consist of dimples, diagonal corrugations, or a combination of dimples and transverse corrugations.

c. Reinforced Membrane Flashing

Polyester film core with a reinforcing fiberglass scrim bonded to one side. The membrane shall be impervious to moisture, flexible, and not affected by caustic alkalis. The material, after being exposed for not less than 1/2 hour to a temperature of 32 degrees F, shall show no cracking when, at that temperature, it is bent 180 degrees over a 1/16-inch diameter mandrel and then bent at the same point over the same size mandrel in the opposite direction 360 degrees.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Protection

a. Stains

Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces with fiber brushes and wooden paddles. Protect base of walls from splash stains by covering adjacent ground with sand, sawdust, or polyethylene.

b. Load

Do not apply uniform loads for at least 12 hours or concentrated loads for at least 72 hours after masonry is constructed.

c. Provide temporary bracing as required.

d. Polyester Embossed Film

Provide protective boards for polyester film during job installation.

3.1.2 Surface Preparation

Surfaces on which masonry is to be placed shall be smooth, clean, and free of foreign substances when mortar is applied.

3.2 WORKMANSHIP

Carry masonry up level and plumb. Furnish and use story poles or gage rods throughout the work. Changes in coursing or bonding after the work is started will not be permitted. Do not carry one section of the walls up in advance of the others. Step back unfinished work for joining with new work. Tothing will not be permitted. Check heights of masonry at each floor and at sills and heads of openings to maintain the level of the walls. Build in door and window frames, louvered openings, anchors, pipes, ducts, and conduits as the masonry work progresses. Fill spaces around metal door frames solidly with mortar. Handle masonry units with care to avoid chipping, cracking, and spalling of faces and edges. Drilling, cutting, fitting, and patching to accommodate the work of others shall be performed by masonry mechanics. Cut masonry with masonry saws for exposed work. Structural steelwork, bolts, anchors, inserts, plugs, ties, lintels, and miscellaneous metalwork specified elsewhere shall be placed in position as the work progresses. Provide chases of approved dimensions for pipes and other purposes where indicated and where necessary. Cover tops of exposed walls and partitions not being worked on with a waterproof membrane secured in place and extended down at least 2 feet on both sides. Inspect scaffolding regularly to ensure that it is amply strong, well braced, and securely tied in position. Do not overload scaffolding.

3.3 MORTAR MIXING

Measure mortar materials in 1 cu. ft. containers to maintain control and accuracy of proportions. Do not measure materials with shovels. Mix mortar in a mechanical batch mixer for not less than 3 nor more than 5 minutes after all ingredients are in so as to produce a uniform mixture. Add water gradually as required to produce a workable consistency. Do not load mixer beyond its rated capacity. Keep mortar boxes, pans, and mixer drums clean and free of debris and dried mortar. Re-temper mortar which has stiffened because of evaporation by adding water and mixing to obtain a workable consistency. Do not use or re-temper mortar which has not been placed in final position within 2 1/2 hours after the initial mixing. Do not use antifreeze compounds, salts, or other substances to lower the freezing point of mortar.

a. Mortar

Mix mortar in accordance with ASTM C 270 to obtain type mortar required. When masonry cement is provided, conform to masonry cement manufacturer's printed mixing instructions.

During mixing, add water-repellent admixture in quantity recommended by the admixture manufacturer to mortar which will be used in exterior concrete masonry unit walls.

b. Grout

ASTM C 476. Provide fine grout in grout spaces less than 2 inches in any horizontal dimension or in which clearance between reinforcing and masonry is less than $\frac{3}{4}$ inch. Provide coarse grout in grout spaces 2 inches or greater in all horizontal dimensions provided the clearance between reinforcing and masonry is not less than $\frac{3}{4}$ inch.

3.4 MORTAR JOINTS

Uniform thickness of 3/8-inch unless otherwise indicated. Tool exposed joints slightly concave with a round or other suitable jointer when the mortar is thumbprint hard. For horizontal joints, jointers shall be at least 12 inches long for brickwork and 16 inches long for concrete masonry. Jointers shall be slightly larger than the width of the joint so that complete contact is made along the edges of the units, compressing and sealing the surface of the joint. Strike flush joints that will not be exposed. Tool vertical joints first. Brush joints to remove all loose and excess mortar. Horizontal joints shall be level; vertical joints shall be plumb and in alignment from top to bottom of wall within a tolerance of plus or minus 1/2 inch in 40 feet.

3.5 TOLERANCES

Masonry work shall be within the following limits:

a. Face of Concrete Masonry Unit

1/16 inch from face of adjacent unit.

b. Variation From True Plane

1/4 inch in 10 feet and 1/2 inch maximum in 20 feet or more.

c. Variation From Plumb

1/4 inch in each story, non-cumulative and 1/2 inch maximum in two stories or more.

d. Variation From Level

1/8 inch in 3 feet, 1/4 inch in 10 feet, and 1/2 inch maximum.

e. Variation in Wall Thickness

Plus or minus 1/4 inch.

3.6 CONCRETE MASONRY UNIT WORK

Lay the first course in a full bed of mortar for the full width of the unit. Lay succeeding courses in running bond unless otherwise indicated. Form bed-joints by applying mortar to entire top surfaces of inner and outer face shells. Form head joints by applying mortar for a width of about 1 inch to ends of adjoining units. Mortar shall be of such thickness that it will be forced out of the joints as the units are placed in position. Where anchors, bolts, and ties occur within the cells of the units, place metal lath in the joint at the bottom of such cells and fill cells with mortar or grout as work progresses. Provide concrete brick for bonding walls, working out the coursing, topping out walls under sloping slabs, distributing concentrated loads, backing brick headers, and elsewhere as required. Do not dampen concrete masonry units before or during laying.

3.6.1 Special Concrete Masonry Unit Work

Where exposed concrete masonry unit walls and partitions are indicated, provide special concrete masonry unit work. Select units for uniformity of size, texture, true plane, and undamaged edges and ends of exposed surfaces. Place units plumb, parallel, and with properly tooled joints of maximum 3/8-inch thickness. Keep exposed surfaces clean and free from blemishes or defects.

3.6.2 Reinforced Concrete Masonry Unit Walls

Where vertical reinforcement occurs, fill cores solid with grout. Lay units in such a manner as to preserve the unobstructed vertical continuity of cores to be filled. Embed the adjacent webs in mortar to prevent leakage of grout. Remove mortar fins protruding from joints before placing grout. Minimum clear dimensions of vertical cores shall be 2 by 3 inches. Position reinforcing accurately as indicated before placing grout. As masonry work progresses, secure vertical reinforcing in place at vertical intervals not to exceed 160 bar diameters. Use puddling rod or vibrator to consolidate the grout. Minimum clear distance between masonry and vertical reinforcement shall be not less than 1/2 inch. Unless indicated or specified otherwise, form splices by lapping bars not less than 40 bar diameters and wire tying them together.

3.7 BONDING AND ANCHORING

Unless indicated otherwise, extend partitions from the floor to the bottom of the construction above. Structurally bond or anchor walls and partitions to each other and to concrete walls, beams, and columns. Securely anchor non-load-bearing partitions and interior walls to the construction above as indicated. Completely embed anchors in mortar joints.

3.7.1 Corners of Load-Bearing Walls

Provide a true masonry bond in each course, except where indicated or specified otherwise.

3.7.2 Intersections of Load-Bearing Walls

Provide a true masonry bond in each course, or anchor with rigid steel anchors not more than 2 feet apart vertically, unless otherwise indicated.

3.7.3 Masonry Walls Facing or Abutting Concrete Members

Anchor masonry to concrete with dovetail or wire-type anchors inserted in slots or inserts built into concrete. Locate anchors not more than 18 inches o.c. vertically and not more than 24 inches o.c. horizontally.

3.8 THROUGH-WALL FLASHING

Provide as indicated. Unless indicated otherwise, extend flashing from a point 1 inch outside of exterior face of walls. Bend down exterior edge to form a drip. Flashing shall be terminated 1 inch back from interior face of walls and turned back on itself not less than 1 inch. Secure flashing as indicated. Provide flashing in lengths as long as practicable. Lap ends not less than 1½ inches for interlocking type and 4 inches for other types. Seal laps as necessary to ensure watertight construction. Provide dams at ends of flashing where masonry abuts concrete and where flashing ends within the masonry.

3.9 HORIZONTAL JOINT REINFORCEMENT

Provide reinforcement where indicated in walls and partitions of concrete masonry units. Reinforcement shall be continuous except at control joints and expansion joints. Reinforcement above

and below openings shall extend not less than 24 inches beyond each side of openings. Provide reinforcement in the longest available lengths, utilizing the minimum number of splices. Overlap ends not less than 6 inches. Provide welded L-shaped assemblies and welded T-shaped assemblies to match straight reinforcement, at corners and intersections of walls and partitions. Provide mortar cover for wire of at least 5/8 inch for exterior face of wall, 1/2 inch for interior face of wall.

3.10 CONCRETE MASONRY UNIT LINTELS AND BOND BEAMS

Provide special units, fill cells solidly with grout or concrete, and provide not less than two No. 5 reinforcing bars, unless indicated otherwise. Reinforcing shall overlap a minimum of 40 bar diameters at splices. Terminate bond beams and reinforcing on each side of expansion joints. Concrete masonry units provided for lintels and bond beams shall have exposed surfaces of the same material and texture as the adjoining masonry units. Lintels shall be straight and true and shall have at least 8 inches of bearing at each end. Allow lintels to set at least 6 days before shoring is removed. During mixing, add water-repellent admixture in quantity recommended by the admixture manufacturer to concrete and grout which will be used to fill lintels and bond beams in exterior walls.

3.11 CONTROL JOINTS

Provide where indicated in concrete masonry-unit walls. Provide sawed type or built-in type as required. Joints shall occur directly opposite each other on both faces of the wall and shall be filled with sealant as specified in Section 07920, "Sealants," or as indicated.

3.12 EXPANSION JOINTS

Fill joints with a permanently flexible pre-formed filler material and a sealant as specified in Section 07920, "Sealants."

3.13 GROUT PLACEMENT

Place grout from the interior side of walls, unless approved otherwise. Protect sills, ledges, offsets, and other surfaces from grout droppings. Remove grout from such surfaces immediately. Grout shall be well mixed to prevent segregation and shall be sufficiently fluid to flow into joints and around reinforcing without leaving voids. Place grout by pumping or pouring from buckets equipped with spouts in lifts not exceeding 5 feet. Keep pours at 1 1/2 inches below top of masonry units in top course, except at finish course. Float bricks into grout to a position not less than 1 inch nor more than 2 inches from surrounding masonry units. Puddle or agitate grout thoroughly to eliminate voids. Remove masonry displaced by grouting operation and re-lay in alignment with fresh mortar.

3.14 FORMS AND SHORING

Construct to the shape, lines, and dimensions of members indicated. Prevent deflections which may result in cracking or other damage to supported masonry. Do not remove until members have cured.

3.15 CLEANING

3.15.1 Protection

During cleaning operations, protect work which may be damaged, stained, or discolored.

3.15.2 Pointing

Upon completion of masonry work and before cleaning, cut out defective mortar joints and tuck point joints and all holes solidly with pre-hydrated mortar.

3.15.3 Cleaning

Clean exposed masonry surfaces with clear water and stiff fiber brushes and rinse with clear water. Where stains, mortar, or other soil remain, continue scrubbing with warm water and detergent. Immediately after cleaning each area, rinse thoroughly with clear water. Restore damaged, stained, and discolored work to original condition or provide new work.

END OF SECTION 04200

SECTION 05500
METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rough hardware.
2. Miscellaneous framing and supports.
3. Loose bearing and leveling plates.
4. Counters and equipment supports.
5. Miscellaneous steel trim.
- Shelf and relieving angles.
7. Steel ladders.
- Aluminum ladders.
9. Pipe bollards.
10. Metal bar gratings.
11. Cast-in-place stair nosings and thresholds.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for attachments.
2. Section 04230 - Reinforced Unit Masonry: Substrate for attachments.
3. Section 05520 - Steel Handrails and Railings: Inserts and anchorage for.
4. Section 05□00 - Ornamental Metal Work: Inserts and anchorage for.
5. Section 07724 - Roof Hatch: Safety ladder post.
- Section 09900 - Painting: Metal finishes.
7. Products Furnished But Not Installed Under this Section: Inserts and anchors preset in masonry and concrete for anchorage of metal work.

1.2 DESCRIPTION OF WORK

A. The extent of metal fabrications is indicated on the Drawings, schedules and as specified

herein, and includes providing, fabricating and installing items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not structural steel or other metal systems specified elsewhere herein.

- B. All light iron and miscellaneous metal work not specified under another Section, but required for the work shall be provided under this Section whether or not specifically referred to herein.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- B. American Institute of Steel Construction (AISC):
 - 1. Specification for Structural Steel for Buildings.
- C. American National Standards Institute (ANSI):
 - 1. ANSI B18.5 - Round Head Bolts (Inch Series).
 - 2. ANSI B18.1 - Wood Screws (Inch Series).
- D. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- E. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 27 / A 27M - Specification for Steel Castings, Carbon, for General Application.
 - 2. ASTM A 47 / A 47M - Specification for Ferritic Malleable Iron Castings.
 - 3. ASTM A 48 / A 48M - Specification for Gray Iron Castings.
 - 4. ASTM A 36 / A 36M - Specification for Carbon Structural Steel.
 - 5. ASTM A 53 / A 53M - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 6. ASTM A 123 / A 123M - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 7. ASTM A 134 - Specification for Pipe, Steel, Electric-Fusion (Arc)-Welded (Sizes NPS 1 and Over).
 - 8. ASTM A 153 / A 153M - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 9. ASTM A 167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - 10. ASTM A 178 - Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip.
 - 11. ASTM A 276 - Specification for Stainless Steel Bars and Shapes.

12. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, 100,000 PSI Tensile Strength.
 13. ASTM A 500 / A 500M - Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
 14. ASTM A 501 - Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 15. ASTM A 568 / A 568M - Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
 16. ASTM A 569 / A 569M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 17. ASTM A 780 - Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 18. ASTM C 1107 / C 1107M - Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 19. ASTM E 330 - Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 20. ASTM E 935 - Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
 21. ASTM E 936 - Practice for Roof System Assemblies Employing Steel Deck, Preformed Roof Insulation, and Bituminous Built-Up Roofing.
- F. American Welding Society (AWS):
1. AWS D1.1 / D1.1M - Structural Welding Code - Steel.
- G. Americans with Disabilities Act Accessibility Guidelines (ADAAG):
1. Accessibility Guidelines for Buildings and Facilities.
- H. International Code Council:
1. International Building Code (IBC), 2009.
- I. National Association of Architectural Metal Manufacturers (NAAMM):
1. Metal Finishes Manual for Architectural and Metal Products.
 2. MBG 531 - Metal Bar Grating Manual.
 3. MBG 532 - Heavy Duty Metal Bar Grating Manual.
 4. MBG 533 - Welding Specification for Fabrication of Steel, Aluminum and Stainless Steel Bar Grating.
- SSPC: The Society for Protective Coatings (formerly Structural Steel Painting Council):
1. SSPC Painting Manual.

2. SSPC PA 1 - Specification Procedure for Shop, Field and Maintenance Painting of Steel.
3. Paint 20 - Specification of Zinc-Rich Coating Type 1 - Inorganic and Type II - Organic.
4. SSPC SP 2 - Requirements for Hand Tool Cleaning of Steel Surfaces.
5. SSPC SP 3 - Requirements for Power Tool Cleaning of Steel Surfaces.
- SSPC SP □ - Standard for Commercial Blast Cleaning of Steel Surfaces.
7. SSPC SP 7 - Standard for Brush-Off Blast Cleaning of Steel Surfaces.
- □IS 3 - Guide and Reference Photographs for Steel Surfaces Prepared by Power and Hand-Tool Cleaning.

1.4 DEFINITIONS

- A. Custom Metal Fabrications: Metal fabrications custom built for a specific Project purpose.
- B. Pre-Manufactured Metal Fabrications: Metal fabrications which are factory-fabricated for a specific architectural purpose. These products may require modification to meet the Project requirements, but their primary manufactured purpose is not altered.
- C. Non-Structural Metal Fabrications: Metal work which has not been designed by the Project Structural Engineer, and which is not part of the Structural Engineer's documents.

1.5 SYSTEM PERFORMANCE

- A. Structural Performance: Provide assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.

1.□ SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
 1. Product Data: Manufacturer's specifications, anchor details and installation instructions for pre-manufactured products. Submit data indicating materials used in miscellaneous metal fabrications, including paint products and grout.
 2. Shop Drawings:
 - a. Drawings for fabrication and erection of miscellaneous metal fabrications□ including plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installations by others.
 - b. Where materials or fabrications are required to comply with requirements for design loadings, include structural computations, materials properties and other information for structural analysis. Prepare under the seal of a professional structural engineer for products requiring structural engineering to meet the Performance Requirements.
 - c. Include profiles, si□es, connection attachments, reinforcing, anchorage, si□e and type of fasteners and accessories, erection drawings, elevations,

welded connections using standard AWS welding symbols with net weld lengths.

- d. Take field measurements prior to the preparation of Shop Drawings and prefabrication when possible. Allow for trimming and fitting where taking of field measurements before fabrication might delay construction.

3. Samples:

- a. Submit representative samples of materials and finished products as requested by the Architect.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Fabricator: Company specializing in fabricating the products specified with a minimum of five (5) years documented experience.
2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Performance Requirements:

1. Provide the capacity to withstand the following loading requirements for exterior units:
 - a. Design, fabricate and install to resist combined positive and negative windloading in accordance with IBC 2009, Section 1609 with a V of 170, q_s of 74.0 psf, exposure B and D and importance factor I of 1.0 or 1.25 or 1.5 as applicable per ASCE 7.
2. Provide assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.
 - a. Treads and Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 pounds per square foot, or a concentrated load of 300 pounds so located as to produce maximum stress conditions.

- C. Take field measurements prior to the preparation of Shop Drawings and fabrication, where possible. Do not delay the construction. Allow for trimming and fitting when the taking of field measurements before fabrication might delay the work.

- D. Pre-assemble items in the shop to the greatest extent possible, to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and a coordinated installation.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store and protect the products.

- B. Protect materials from corrosion, deformation and other damage during delivery, storage and handling.

- C. Deliver product to the Project Site in the fabricator's original, unopened packages, containers or bundles.

- D. Store and protect the materials with a weatherproof covering □ ventilate to avoid condensation.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness for fabrication of miscellaneous metal work which will be exposed to view.
- B. Steel Plates, Angles, and Other Structural Shapes: ASTM A 3 □ A 3M.
- C. Steel Pipe: ASTM A 53 □ A 53M. Type and grade (if applicable), as selected by the fabricator and as required for the design loading. Black finish, unless galvanizing is indicated. Standard weight (Schedule 40), unless otherwise indicated.
- D. Galvanized Steel Pipe and Tube: ASTM A 53 □ A 53M.
- E. Steel Tubing: Cold-formed, ASTM A 500 □ A 500M or hot-rolled, ASTM A 501.
- F. Sheet Steel, Galvanized: ASTM A 123 □ A 123M.
- G. Sheet and Strip Steel, Hot-Rolled: ASTM A 5 □ A 5M.
- H. Structural Steel Sheet: Hot-rolled, ASTM A 134 or cold-rolled ASTM E 93 □, Class 1 □ of grade required for the design loading.
- I. Galvanized Structural Steel Sheet: ASTM A □53 □ A □53M, of grade required for the design loading. Coating designation as indicated, or if not indicated, G90.
- Stainless Steel: AISI Type 304 for fumed and welded products. ASTM A 27 □ for base shapes and forging □ ASTM A 1 □7 or A 17 □ as best suited for plates, sheets and strip. Satin finish typical.
- K. Gray Iron Castings: ASTM A 4 □, Class 30.
- L. Malleable Iron Castings: ASTM A 47, grade as selected by the fabricator.
- M. Steel Bar Grating: ASTM A 3 □ A 3M or NAAMM MBG 531.
- N. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as the supported fabrications.
- O. Concrete Inserts. Threaded or wedge type □ galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims, as required, hot-dip galvanized, ASTM A 153.
- P. Non-Shrink, Non-Metallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107 (formerly CE CRD-C □21). POR-ROK Anchoring Cement by Minwax Co. division of Eastman Kodak Co., or approved equal. Comply with the manufacturer's printed instructions.
- Welding Materials: AWS D1.1 □ D1.1M. Type required for the materials being welded.

R. Anchors:

1. Threaded Type, Concrete Inserts: Galvanized malleable iron or cast steel capable of receiving 3/4" diameter machine bolts.
2. Slotted Type, Concrete Inserts: Welded box type, fabricated with a minimum 1/4" thick galvanized pressed steel plate with slots to receive 3/4" diameter square head bolts, and knockout cover.
3. Expansion Shield, Masonry Anchorage: FS FF-2-325.
4. Toggle Bolts: FS FF-B-501, type, class and style as required.

S. Fasteners:

1. Provide zinc-coated fasteners for exterior use or where built into exterior walls, Select fasteners for the type, grade and class required.
2. Bolts, Nuts and Washers at Interior Locations: ASTM A 307, Grade A, regular hexagon head.
3. Bolts, Nuts and Washers at Exterior Locations: ASTM A 307, galvanized per ASTM A 153.
4. Bolts, Round Head: ANSI B1.5.
5. Lag Bolts: Square head type, FS FF-B-501.
6. Plain Washers: Round, carbon steel, FS FF-W-92.
7. Lock Washers: Helical spring type, carbon steel, FS FF-W-04.
8. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
9. Toggle Bolts: Tumble-wing type, FS FF-B-501, type, class and style as required.
10. Machine Screws: Cadmium plated steel, FS FF-S-92.
11. Wood Screws: Flat head carbon steel, FS FF-S-111.

T. Primers:

1. Primer for Field Painting: Provide one of the following:
 - a. No. 99 Red Primer by Tnemec Co.
 - b. Ceko No. 15 Primox by Chessman-Elliot Company.
 - c. No. 7-C-19 by Rowe Products, Inc.
2. Touch-Up Primer for Galvanized Surfaces: High zinc dust content paint for re-galvanizing welds in galvanized steel, complying with SSPC-Paint-20 and ASTM A 700.
3. Section 01000 - Product Requirements: Product options and substitutions: Substitutions: Permitted.

U. Concrete Fill:

1. Concrete Materials and Properties: Comply with the requirements of Division 3 Sections for normal weight, ready-mix concrete with minimum 28-day compressive strength of 4,000 psi, 440 pounds cement per cubic yard, minimum, and a W/C ratio of 0.45, maximum, unless higher strength is indicated.
2. Non-Slip Aggregate Finish: Factory-graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate—rust-proof and non-glaing—unaffected by moisture and cleaning materials.

2.2 ROUGH HARDWARE

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Sections of Division 5.
- B. Fabricate items to the sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections—elsewhere, furnish steel washers.

2.3 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for the applications indicated, or which are not a part of the structural steel framework, as required to complete the work.
- B. Fabricate miscellaneous units to the sizes, shapes, and profiles indicated or, if not indicated, of the required dimensions to receive adjacent other construction retained by framing and supports. Except as otherwise indicated, fabricate from structural steel shapes, plates, and steel bars, of welded construction using mitered joints for field connections. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 1. Equip units with integrally welded anchors for casting into concrete or building into masonry.
 2. Furnish inserts if units must be installed after concrete has been placed.
 3. Except as otherwise indicated, space anchors and inserts 12" o.c., and provide the minimum number of anchor units in the form of steel straps 1-1/4" wide x 12" long.

2.4 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on concrete or masonry construction, made flat, free from warp and twist, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting, as required. Galvanize after fabrication.

2.5 MISCELLANEOUS STEEL TRIM

- A. Provide shapes and sizes indicated for the profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for the coordination of assembly and installation with other work.

- B. Hot-dip galvanized miscellaneous framing and supports in exterior locations and where indicated.

2.6 SHELF AND RELIEVING ANGLES

- A. Provide structural steel shelf and relieving angles of the sizes indicated for attachment to concrete framing. Provide slotted holes to receive 3/4" bolts, spaced not more than 12" from the ends and at not more than 24" o.c., unless otherwise indicated.
- B. Hot-dip galvanized shelf angles to be installed on exterior concrete framing.
- C. Furnish wedge-type concrete inserts, complete with fasteners, for attachment of shelf and angles to cast-in-place concrete.

2.7 STEEL LADDERS

- A. Comply with OSHA, and the requirements of other agencies having jurisdiction.
- B. Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as indicated.
- C. Wall Ladders: All steps/rungs shall be non-slip serrated treads or by coating of the rungs with aluminum oxide granules set in epoxy resin adhesive, or by using a manufactured rung filled with aluminum oxide grout. Hot-dip galvanized all ladders, brackets, and fasteners. Adhesive-applied coating strips are not acceptable.
 - 1. Siderails: Continuous steel flat bars, with eased edges, 1/2" @ x 2-1/2" apart.
 - 2. Bar Rungs: Round steel bars, 3/4" diameter, spaced 12" o.c., unless otherwise noted.
 - 3. Fit rungs at the centerline of side rails, plug weld and grind smooth on the outer rail faces.
 - 4. Support ladders at the top and bottom, and at intermediate points spaced not more than 5'0" o.c. by means of welded or bolted steel brackets.
 - 5. Size brackets to support the design dead and live loads required, and to hold the centerline of the ladder rungs clear of the wall surface by not less than 7"
- D. Provide safety post in accordance with Section 07724 - Roof Hatch.

2.8 ALUMINUM LADDERS

- A. Wall Ladders: Aluminum, all welded standard duty channel or tube shape rails/rungs 24" wide, spaced at 12" o.c., deep serrated aluminum, carry 1,000 pounds load without deformation or failure aluminum pipe handrails not less than 1-1/2" in diameter with end caps mill finish standard wall mounting brackets.. OSHA ANSI A14.3 compliant. Model 500 as manufactured by O'Keeffe's Inc. or approved equal.
- B. Ship Ladder: Aluminum, all welded standard duty channel or tube shape rails/rungs 24" wide, spaced at 12" o.c., deep serrated aluminum, carry 1,000 pounds load without deformation or failure aluminum pipe handrails not less than 1-1/2" in diameter with end caps mill finish standard wall mounting brackets incline as shown on the Drawings. OSHA ANSI A14.3 compliant. Model 520 as manufactured by O'Keeffe's Inc. or approved equal.

2.9 PIPE BOLLARDS

- A. Fabricate pipe bollards from Schedule 40 galvanized steel pipe.
- B. Fabricate sleeves for bollard anchorage from galvanized steel pipe with 1/4" thick steel plate welded to the bottom of the sleeve.

2.10 METAL BAR GRATINGS

- A. Provide close mesh bar gratings using bars of the type, material, sizes, spacing and construction indicated, or if not indicated, to support the truck loadings indicated. Comply with the "Standard Specifications for Metal Bar Grating and Metal Bar Grating Treads" portion of the NAAMM, "Metal Bar Grating Manual".
- B. Material: Steel.
- C. Type Grating: Welded.
- D. Bearing Bars: Size and shape as required by the anticipated loading.
- E. Cross Bars: Rectangular. Provide true alignment and equal spacing of the cross bars by notching the bearing bars prior to welding. Do not notch the bearing bars at supports to maintain elevation.
- F. Traffic Surface: Plain.
- G. Edge Band openings in the grating which interrupt four or more bearing bars with bars of the same size and material as the bearing bars.
- H. Steel Finish: Hot-dip galvanized with a coating of not less than 1.5 oz per square foot of coated surface.

2.11 METAL STAIR NOSINGS

- A. Material: Cast aluminum with hatched aluminum abrasive surface, 1/4" nosing lip x 3/4" minimum depth, embedded one piece the full width of stair treads and landings.
- B. Manufacturers:
 1. DSA3 by American Safety Technologies.
 2. Style 3511 by American Safety Tread Co.
 3. Type 231 by Wooster Products Inc.
 4. Section 0100 - Product Requirements: Product options and substitutions: Substitutions: Permitted.

2.12 FABRICATION

- A. Fabricate steel items according to the approved Shop Drawings and to the applicable portions of AISC Specifications.
- B. Pre-assemble products in the shop to the greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assemble and installation.
- C. For fabrications exposed to view, use materials which are smooth and free of surface

blemishes including pitting, seam marks, roller marks, roller trade names and roughness. Remove blemishes by grinding or by welding and grinding prior to cleaning, treating and the application of surface finishes, including zinc coating.

- D. Workmanship: Use materials of the size and thickness indicated or, if not indicated, as required to produce the strength and durability in the finished products for the intended use. Work to the dimensions indicated or accepted on the Shop Drawings, using proven details of fabrication and support. Use the type of materials indicated or specified.
- E. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Fabricate items with joints tightly fitted and secured. Make exposed joints butt tight, flush and hairline. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to the smallest radius possible, without causing grain separation or otherwise impairing the work.
- F. Conceal welds where possible. Weld corners and seams continuously, complying with AWS and the Building Code. At exposed connections, grind the exposed welds smooth and flush to match and blend with the adjoining surfaces.
- G. Form exposed connections with hairline joints, flush and smooth using concealed fasteners wherever possible. Use exposed fasteners of the type indicated or, if not indicated, Phillips flat-head (countersunk) screws, or bolts.
- H. Exposed Mechanical Fastenings: Flush countersunk screws and bolts, unobtrusively located, except where specifically noted otherwise consistent with the design.
- I. Provide anchorage of the type indicated, coordinated with the supporting structure. Fabricate and space anchoring devices to provide adequate support for the intended use. Fabricate anchorage and related components of the same material and finish as the metal fabrication, unless indicated otherwise.
- J. Cut, reinforce, drill and tap miscellaneous metal work, as indicated, to receive the finish hardware and similar items.
- K. Fabricate joints which will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- L. Galvanizing: For items indicated to be galvanized, apply zinc-coating by the hot-dip process in compliance with the following requirements:
 - 1. ASTM A 153 or A 153M for galvanizing iron and steel hardware.
 - 2. ASTM A 123 or A 123M for galvanizing both fabricated and un-fabricated iron and steel products made of un-coated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299" thick and heavier.
 - 3. ASTM A 123 or A 123M for galvanizing assembled steel products.

2.13 FINISHES, GENERAL

- A. Comply with NAAMM, Metal Finishes Manual for Architectural and Metal Products, for recommendations relative to the application and designation of finishes.
- B. Finish metal fabrications after assembly.

2.14 SHOP PAINTING AND PROTECTIVE COATING

- A. Conform to SSPC-PA 1, including preparation for painting.
- B. Apply shop primer to un-coated surfaces of metal fabrications, except those with a galvanized finish or to be embedded in concrete, masonry, or sprayed-on fireproofing, unless otherwise indicated. Comply with the requirements of SSPC-PA 1, ΔPaint Application Standards, Guides and Specifications No. 1□ for shop painting.
- C. Preparation for Shop Priming: Prepare un-coated ferrous metal surfaces to comply with the minimum requirements indicated below for SSPC surface preparation specifications and the environmental exposure conditions of the installed metal fabrications:
 - 1. Interiors (SSPC □one 1A): SSPC-□IS 3.
 - 2. Exteriors (SSPC □one 1B): SSPC-SP □
- D. Shop primer for Ferrous Metal: Fast-curing, lead-free, abrasion-resistant, rust-inhibitive primer selected for compatibility with the substrates and with the types of alkyd-type paint systems indicated, and for compatibility to provide a sound foundation for field-applied topcoats, despite prolonged exposure□complying with the performance requirements of FS TT-P-□□, Types I, II and III.
- E. Hot-Dip galvanizing and □nc coatings applied on products fabricated from rolled, pressed, and forged steel shapes, plates, bars and strips shall comply with ASTM A 123 □A 123M. Galvanized surfaces, for which a shop coat of paint is specified, shall be chemically treated to provide a bond for the paint. Except for bolts and nuts, all galvanizing shall be done after fabrication.
- F. Clean surfaces of rust, scale, grease and foreign matter in accordance with SSPC-SP 1 Solvent Cleaning, prior to finishing. Prepare surfaces for painting in accordance with SSPC-SP 2, SSPC-□IS 3 or SSPC-SP 7.
- G. Do not prime surfaces that will be in direct contact with concrete, or where field welding is required.
- H. Prime paint items scheduled, with one coat.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: □erification of existing conditions before starting the work.
- B. □erification of Conditions: □erify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for the installation of anchorages, such as concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors to be embedded in concrete or masonry.

- B. Coordinate the delivery of such items to the Project Site.

3.3 INSTALLATION

- A. **Fastening to In-Place Construction:** Provide anchorage devices and fasteners, where necessary, for securing miscellaneous metal fabrications to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors, as required.
- B. **Cutting, Fitting, and Placement:** Perform cutting, drilling, and fitting required for the installation of miscellaneous metal fabrications. Set fabrications accurately in location, alignment, and elevation with edges and surfaces level, plumb, true, and free of rack, measured from established lines and levels.
- C. **Setting Loose Plates:** Clean concrete or masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to the surfaces. Clean the bottom surface of bearing plates.
- D. **Set loose leveling and bearing plates on wedges, or other adjustable devices.** After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove the wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic, non-shrink grout in exposed locations, unless otherwise indicated. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
- E. **Provide temporary bracing or anchors in the formwork for items to be built into concrete, masonry or similar construction.**
- F. **Fit exposed connections accurately together to form hairline joints.** Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- G. **Bollards:**
 - 1. Anchor bollards in concrete by means of pipe sleeves preset and anchored into a concrete footing. After bollards have been inserted into sleeves, fill the annular space between the bollard and the sleeve solid with non-shrink, non-metallic grout, mixed and placed to comply with the grout manufacturer's directions.
 - 2. Fill bollards with concrete and round off the top.
- H. **Metal Bar Gratings:**
 - 1. Comply with the recommendations of NAAMM, [Metal Bar Gratings Manual](#), for the installation of gratings, including installation clearances and standard anchoring details.
 - 2. Secure removable units to supporting members with the type and size clips and fasteners indicated, or if not indicated, as recommended by the grating manufacturer for the type of installation conditions shown.
 - 3. Secure non-removable units to supporting members by welding where both materials are the same, otherwise fasten by bolting, as indicated.

- I. Field Welding: Comply with the AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of the welds made and methods used in correcting welding work, and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion-resistance of the base metal.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and the contour of the welded surface matches the adjacent surfaces.
- Touch-Up For Galvanized Surfaces: Clean the welds, bolted connections and abraded areas, and apply two (2) coats of galvanizing repair paint in compliance with SSPC Paint 20 and ASTM A 733.
- K. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting □ comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.
 - 1. Apply by brush or spray and provide a minimum dry film thickness of 2.0 mils.

3.4. ISOLATION REQUIREMENTS

- A. Dissimilar Metals:
 - 1. Where metal surfaces are in contact with, or fastened to dissimilar metals except stainless steel, zinc or zinc coating, the metal shall be protected from the dissimilar metal.
 - 2. Where drainage from a dissimilar metal passes over the metal, paint the dissimilar metal with a non-lead pigmented paint.
- B. Cementitious Materials: Paint metal where in contact with mortar, concrete, masonry or other cementitious material, with an alkali-resistant coating such as heavy-bodied bituminous paint or epoxy paint.
- C. Wood Contact: Isolate metal from cedar, redwood, oak and acid-treated lumber by means of unbroken 1/8-mil polyethylene construction sheet or a heavy coating of metal-protective paint.
- D. Surfaces in contact with sealants after installation need not be coated with any type of protective material.

3.5 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect fabrications and installations for alignment, attachment to the structure, and secure and rigid installation.

3.6 ADJUSTING AND CLEANING

- A. Section 01700 - Execution Requirements: Adjusting the installed work.

END OF SECTION

SECTION 05520

STEEL HANDRAILS AND GUARDS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel handrails and guards.
 - 2. Stainless guardrails.
- B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.
- C. Related Sections:
 - 1. Section 03300 - Cast-In-Place Concrete: Substrate for anchoring handrails and guards.
 - 2. Section 04230 - Reinforced Unit Masonry: Substrate for anchoring handrails and guards.
 - 3. Section 05500 - Metal Fabrications: Inserts and anchors for handrails and guards.
 - 4. Section 09900 - Painting: Finishing of handrails and guards.
- D. Products Furnished By But Not Installed Under this Section: Inserts and anchors preset in concrete and masonry for anchorage.

1.2 DESCRIPTION OF WORK

- A. The extent of handrails and guards work is indicated on the Drawings and as specified herein, and includes providing, fabricating and installing miscellaneous steel handrails and guards not included in other Sections of these Specifications.
- B. Handrails and guards shall comply with the applicable Building Code, ADAAG, and other Codes and standards which apply to this work of this Section.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- B. American Institute of Steel Construction (AISC):
 - 1. Specification for Structural Steel for Buildings.
- C. American National Standards Institute (ANSI):
 - 1. ANSI B1□5 - Round Head Bolts (Inch Series).

2. ANSI B18.1 - Wood Screws (Inch Series).
- D. American Society for Testing and Materials (ASTM):
1. ASTM A 36/A 36M - Specification for Carbon Structural Steel.
 2. ASTM A 53/A 53M - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 3. ASTM A 123/A 123M - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 4. ASTM A 133 - Specification for Pipe, Steel, Electric-Fusion (ARC)-Welded (Sizes NPS 1 and Over).
 5. ASTM A 153/A 153M - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 6. ASTM A 167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 7. ASTM A 173 - Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet and Strip.
 8. ASTM A 273 - Specification for Stainless Steel Bars and Shapes.
 9. ASTM A 500/A 500M - Specification for Cold-formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 10. ASTM A 501 - Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 11. ASTM A 568/A 568M - Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
 12. ASTM A 780 - Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 13. ASTM C 1107 - Specification for Dry, Hydraulic-Cement Grout (Nonshrink).
- E. American Welding Society (AWS):
1. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- F. Americans with Disabilities Act Accessibility Guidelines (ADAAG):
1. Accessibility Guidelines for Buildings and Facilities.
- G. International Code Council:
1. International Building Code (IBC), 2009.
- H. SSPC: The Society for Protective Coatings (formerly Structural Steel Painting Council):
1. SSPC Painting Manual.
 2. SSPC-PA 1- Shop, Field, and Maintenance Painting of Steel.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
1. Product Data: Submit manufacturer's product specifications and installation instructions for the products and processes used in handrails and guards, including grouting and finishing.
 2. Shop Drawings: Submit for fabrication and erection of handrails and guards, including plans, elevations and details of fittings, connections, joining methods, sizes and shapes, anchorage, and relationship to other work. Provide templates for anchors and bolts installation by others.
 3. Samples: Submit for each type of metal finish indicated. Prepare samples on metal of the same gage and alloy to be used in the work. Include 12" long samples of stainless steel railing members including handrails, top rails, posts, and rail coverings, if any. Include samples of fittings and brackets.
 4. Assurance Control Submittals:
 - a. Manufacturer's certificate that the product meet or exceed the specified requirements.
 - b. Calculations indicating that the system and anchorage satisfies the performance requirements.
 - c. Documentation of experience indicating compliance with the specified qualifications requirements.

1.5 QUALITY ASSURANCE

- A. Qualifications:
1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.
- B. Performance Requirements: Handrails and guards shall be designed, fabricated and installed to meet the structural loading conditions below, unless otherwise indicated:
1. Handrails and guards shall be designed to resist a load of 50 pounds per linear foot applied in any direction at the top and to transfer the load through the supports to the structure.
 2. Handrails and guards shall be able to resist a single concentrated load of 200 pounds, applied in any direction, at any point along the top, and to transfer the load through the supports to the structure. This load need not be assumed to act concurrently with the loads specified above.
 3. Intermediate rails (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot, including openings and space between rails. Reactions due to this loading are not required to be superimposed with those of the above loads.

- C. Engineering of each handrail and guard assembly is the responsibility of the manufacturer of the assembly.
- D. Shop Assembly: Preassemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only, as necessary, for shipping and handling limitations. Clearly mark the units for reassembly and coordinated installation.

1. DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store and protect the products.
- B. Protect the materials from corrosion, deformation and other damage during delivery, storage and handling.
- C. Deliver products to the Project Site in the fabricator's original, unopened packages, containers or bundles.
- D. Store and protect the materials with a weatherproof covering and ventilate to avoid condensation.

PART 2 PRODUCTS

2.1 MATERIALS

- A. General: Comply with the standards indicated for shapes and types of metals indicated, or required for the handrail and guards components. For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Steel:
 - 1. Steel Plates, Shapes and Bars: ASTM A 36.
 - 2. Steel Tubing: Cold-formed, ASTM A 500 or hot-rolled, ASTM A 501.
 - 3. Structural Steel Sheet: Hot-rolled and cold-rolled ASTM A 568 or A 569M, Class 1 of the grade required for the design loading.
 - 4. Steel Pipe: ASTM A 53 type and grade as selected by the manufacturer, and as required for the design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40).
 - 5. Stainless Steel: AISC, Type 304 for fumed and welded products; ASTM A 276 for base shapes and forging; ASTM A 167 or A 177, as best suited for plates, sheets and strip. Satin finish typical.
 - Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as the supported rails.
- C. Non-Shrink, Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous, complying with ASTM C 1107 (formerly CE CRD-C-21). Provide grout specifically recommended by the manufacturer for interior and exterior applications of the type specified in this Section.
- D. Welding Electrodes and Filler Metal: Provide the type and alloy of filler metal and

electrodes recommended by the producer of the metal to be welded, and as required for color match, strength and compatibility in fabricated items.

- E. Fasteners: Use fasteners of the same basic metal as the fastened metal. Do not use metals which are corrosive or incompatible with the materials joined.
- F. Provide concealed fasteners for the interconnection of handrail and guard components, and for their attachment to other work.
 - 1. Provide Phillips flat-head machine screws for exposed fasteners.
- G. Anchors and Inserts: Provide anchors of the proper type, size, and material for the type of loading and installation condition shown, as recommended by the manufacturer, unless otherwise indicated. Use stainless steel anchors and inserts. Use lead expansion shield devices for drilled-in anchors. Furnish inserts required to be set into concrete and masonry work.

2.2 FABRICATION

- A. General: Fabricate handrails and guards to the design, dimensions and details shown.
 - 1. Provide handrail and guard members in the sizes, profiles and wall thickness indicated, with supporting posts and brackets of the size and spacing shown, but not less than required to support the design loads indicated.
 - 2. The gripping portion of handrails with a circular cross section shall be as shown on the Drawings, but shall have an outside diameter of at least 1-1/4" but not greater than 2".
 - 3. Handrails shall return to a wall, guard or the walking surface or shall be continuous to the handrail of an adjacent stair flight or ramp run.
 - 4. Handrails shall extend horizontally at least 12" beyond the top riser and continue to slope for the depth of one tread beyond the bottom riser.
 - 5. At ramps where the handrails are not continuous between runs, handrails shall extend horizontally above landings 12" minimum beyond the top and bottom of ramp runs.
 - 6. Handrail extensions shall be in the same direction of stair flights at stairways and ramp runs at ramps.
 - 7. Comply with ADAAG for additional extension requirements.
- B. Steel Fabrication: Form exposed connections with hairline joints, flush and smooth. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind welds smooth and flush to match and blend with the adjoining surfaces.
 - 1. Join steel handrail and guard members by butt-welding or welding with internal connectors, at the fabricator's option. At tee and cross intersections, provide coped joints.
 - 2. At bends, join pipes by means of prefabricated elbow fittings or flush radius bends, of the radiuses indicated. Form bends by the use of prefabricated elbow fittings and radius bends, or by bending the pipe at the fabricator's option. Form simple and compound curves by bending pipe in fits to produce a uniform curvature. Maintain the cylindrical cross section of the pipe throughout the entire bend without

buckling, twisting or otherwise deforming exposed surfaces of the pipe.

3. Close exposed ends of pipes by welding 3/4" thick steel plate in place, or by the use of prefabricated fittings.
4. Provide wall returns at the ends of wall-mounted handrails.
- A. Brackets, Flanges, Fittings and Anchors: Provide the manufacturer's standard brackets, flanges, end closures, miscellaneous fittings and anchors for the connection of handrail and guard members to other work. Furnish inserts and other anchorage devices for connecting handrails and guards to concrete and masonry. Fabricate and space anchorage devices, as indicated, and as required to provide adequate support. Coordinate anchorage devices with the supporting structure.
- C. Toe Boards: Where indicated, provide toe boards at guards around openings and the edge of open-sided floors and platforms. Fabricate to the dimensions and details indicated, or if not indicated, use a 4" high x 1" plate welded to, and centered between, each guard post.
- G. Weeps: For exterior exposed units, fabricate joints which will be exposed to weather, to exclude water, or provide weep holes where water may accumulate.

2.3 FINISHES

- A. Steel Finish: Paint finish per Section 09900 - Painting for galvanized and plain steel. Apply shop primer to the surfaces of metal fabrications, except those which are galvanized, or as indicated to be embedded in concrete or masonry, and in compliance with the requirements of SSPC-PA 1 for shop painting. Apply an extra coat at exposed welds.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section -01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry. Coordinate the delivery of such items to the Project Site.
- B. Field Measurements: Take field measurements prior to the preparation of Shop Drawings and fabrication, where possible. Do not delay job progress. Allow for adjustments during installation where the taking of field measurements before fabrication might delay the work.

3.3 INSTALLATION

- A. Fit exposed connections accurately together to form tight, hairline joints.

- B. Perform cutting, drilling and fitting required for the installation of handrails and guards. Set work accurately in location, alignment and elevation, plumb, level, true to line and free of rack, measured from established lines and levels. Do not weld, cut or abrade surfaces of handrail and guard components which have been coated or finished after fabrication, and are intended for field connection by mechanical means without further cutting or fitting.
- C. Corrosion Protection: Paint metal surfaces where in contact with mortar, concrete or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint or epoxy paint.
- D. Adjust handrails and guards prior to anchoring to ensure matching alignment at abutting joints. Space posts at the interval indicated, or if not indicated, as required by the design loadings.
- E. Plumb posts in each direction. Secure posts and railing ends as follows:
1. Anchor posts in concrete by means of sleeves pre-set and anchored into concrete. After posts have been inserted into sleeves, fill the space between the posts and sleeves solid with non-shrink, non-metallic grout, mixed and placed to comply with the grout manufacturer's instructions.
 2. Leave anchorage joint exposed—wipe off excess grout and leave 1/4" build-up sloped away from the posts. For installations exposed on the exterior or to the flow of water, seal the grout to comply with the grout manufacturer's directions.
 3. Anchor posts to metal surfaces with the manufacturer's standard fittings designed for the purpose.
- F. Anchoring Guard Ends:
1. Anchor guards into concrete or masonry with the manufacturer's standard fittings designed for the purpose.
 2. Anchor guards to metal surfaces with the manufacturer's standard fittings using concealed fasteners.
- H. Attachment of Handrails and Guards to Walls:
1. Secure handrails and guards to walls with the manufacturer's standard wall brackets and end fittings. Provide brackets with 1-1/2" clearance between the wall and the inside face of handrails. Locate brackets as indicated or, if not indicated, at spacings required by the design loading.
 2. Secure wall brackets and wall return fitting as follows:
 - a. Use the type of bracket with flanges tapped for concealed anchorage to threaded hanger bolts.
 - b. For concrete and solid masonry anchorage, use drilled-in expansion shields and concealed hanger bolts.
 - c. For hollow masonry anchorage, use toggle bolts with square heads.
 - d. For stud partitions anchorage, use lag bolts fastened to treated wood blocking between studs. Coordinate with the stud spacing for the accurate location of blocking members.

3.4. ISOLATION REQUIREMENTS

- A. Dissimilar Metals: Where metal surfaces are in contact with, or fastened to dissimilar metals except stainless steel, zinc or zinc coating, the metal shall be protected from the dissimilar metal. Where drainage from a dissimilar metal passes over the metal, paint the dissimilar metal with a non-lead pigmented paint.
- B. Cementitious Materials: Paint metal where in contact with mortar, concrete, masonry or other cementitious material, with an alkali-resistant coating such as heavy-bodied bituminous paint or epoxy paint.
- C. Wood Contact: Isolate metal from cedar, redwood, oak and acid-treated lumber by means of unbroken 1/8-mil polyethylene construction sheet or a heavy coating of metal-protective paint.
- D. Surfaces in contact with sealants after installation need not be coated with any type of protective material.

3.5 CONSTRUCTION

- A. Site Tolerances:
 - 1. Maximum Variation from Plumb: 1/4"
 - 2. Maximum Offset From True Alignment: 1/4"
 - 3. Maximum Out-of-Position: 1/4"

3.6 ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting the installed work.
- B. Remove protective covering at completion of the Project, or when directed by the Owner's representative.
- C. Restore finishes damaged during installation and construction so no evidence of the corrective work is noticeable.
- D. Return items which cannot be refinished in the field to the shop, make the required alterations and refinish the entire unit, or provide a new unit.

3.7 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect installations for accurate location, alignment, elevation, plumb, level, true and free of rack.

3.8 PROTECTION

- A. Protect finishes of handrails and guards from damage during construction by use of temporary protective coverings, approved by guard manufacturer.

END OF SECTION

SECTION 05720

ALUMINUM HANDRAILS AND GUARDS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Aluminum handrails.
 - 2. Aluminum guardrails.
- B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.
- C. Related Sections:
 - 1. Section 03300 - Cast-in-Place Concrete: Substrate for attachment of handrails and guards.
 - 2. Section 04230 - Concrete Unit Masonry: Substrate for attachment of handrails and guards.
- D. Products Furnished By But Not Installed Under this Section: Inserts and anchors preset in concrete and masonry for anchorage.

1.2 DESCRIPTION OF WORK

- A. The extent of handrails and guards work is indicated on the Drawings and as specified herein, and includes providing, fabricating and installing miscellaneous aluminum handrails and guards not included in other Sections of these Specifications.
- B. Handrails and guards shall comply with the Building Code, ADAAG, and other Codes and standards which apply to this work of this Section.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- B. The Aluminum Association, Inc. (AA):
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM B 210 - B 210M - Specification for Aluminum-Alloy Sand Castings.
 - 2. ASTM B 209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 3. ASTM B 221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
 - 4. ASTM B 429 - B 429M - Specification for Aluminum-Alloy Extruded Structural Pipe

and Tube.

5. ASTM C 1107 - Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

D. Americans with Disabilities Act Accessibility Guidelines (ADAAG):

1. Accessibility Guidelines for Buildings and Facilities.

E. International Code Council:

1. International Building Code (IBC), 2009.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer's product specifications, anchor details and installation instructions for the products and processes used, including finishing and grouting.
2. Shop Drawings: For the fabrication and installation of handrails and guards, including plans, elevations and details of fittings, connections, joining methods, sizes and shapes, anchorage and relationship to other work. Provide templates for anchor and bolt installations by others.
3. Samples: For each type of metal finish indicated. Prepare samples on metal of the same gage and alloy to be used in the work. Where normal color and texture variations are to be expected, provide range samples showing the limits of such variations.
 - a. Long samples of distinctly different railing members, including handrails, top rails, posts, and rail coverings, if any.
 - b. Include samples of fittings and brackets.
4. Assurance Control Submittals:
 - a. Fabricator's certificate that the products meet or exceed the specified requirements.
 - b. Calculations indicating that the system and anchorage satisfies the performance requirements.
 - c. Documentation of experience indicating compliance with the specified qualifications requirements.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in fabricating the products specified with a minimum of five (5) years documented experience.
2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Performance Requirements: Handrails and guards shall be designed, fabricated and

installed to meet the structural loading conditions below, unless otherwise indicated:

1. Handrails and guards shall be designed to resist a load of 50 pounds per linear foot applied in any direction at the top and to transfer the load through the supports to the structure.
 2. Handrails and guards shall be able to resist a single concentrated load of 200 pounds, applied in any direction, at any point along the top, and to transfer the load through the supports to the structure. This load need not be assumed to act concurrently with the loads specified above.
 3. Intermediate rails (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot, including openings and space between rails. Reactions due to this loading are not required to be superimposed with those of the above loads.
- C. Engineering: Engineering of each assembly is the responsibility of the manufacturer of the assembly.
- D. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store and protect the products.
- B. Protect finished aluminum surfaces with a strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
- C. Pack, box, ship, unload, store and protect the products in a manner to avoid abuse, damage and defacement.
- D. Deliver products to the Project Site in the manufacturer's original, unopened protective packaging.
- E. Store inside, protected from weather.
- F. Store to provide for water drainage and air circulation.

1.7 MAINTENANCE

- A. Section 0170 - Closeout Submittals: Procedures for closeout submittals.
- B. Provide the Owner with two (2) gallons, minimum, of touch-up paint to match the finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 1. Newman Brothers, Inc.
 2. Poma Construction Corp.

- B. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

- A. Metals: Comply with the standards indicated for shapes and types of metals indicated or required for handrail and railing components.
- B. Aluminum: Alloy and Temper: Provide alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties of the alloy and temper, designated below for each aluminum form required.
1. Extruded Bar and Shape: ASTM B 221, 6063-T6
 2. Extruded Pipe and Tube: ASTM B 429 B 429M, 6063-T6
 1. Plate and Sheet: ASTM B 209, 6061-T6
 2. Castings: ASTM B 208 B 208M, 356-T6
- C. Non-Shrink, Non-Metallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107 (formerly CE CRD-C21). Provide grout specifically recommended by the manufacturer for interior and exterior applications of the type specified in this Section, POR-ROK Anchoring Cement by Minwax Co. division of Eastman Kodak Co., or approved equal.
- D. Welding Electrodes and Filler Metal: Provide the type and alloy of filler metal and electrodes recommended by the producer of the metal to be welded, and as required for color match, strength and compatibility in the fabricated items.
- E. Fasteners: Use fasteners of the same basic metal as the fastened metal, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.
1. Provide concealed fasteners for the interconnection of handrail and railing components, and for their attachment to other work, except where otherwise indicated.
 2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
- F. Anchors and Inserts: Provide anchors of the proper type, size, and material for the type of loading and installation condition shown, as recommended by manufacturer, unless otherwise indicated. Use stainless steel anchors and inserts. Use lead expansion bolt devices for drilled-in anchors. Furnish inserts, as required, to be set into concrete and masonry work.

2.3 FABRICATION

- A. General:
1. Fabricate handrails and guards to the design, dimensions and details shown. Provide handrail and guard members in the sizes and profiles indicated, with supporting posts and brackets of the size and spacing shown, but not less than required to support the design loads indicated.
 2. The gripping portion of handrails with a circular cross section shall be as shown on the Drawings, but shall have an outside diameter of at least 1-1/4" but not greater

than 2"

3. Handrails shall return to a wall, guard or the walking surface or shall be continuous to the handrail of an adjacent stair flight or ramp run.
 4. Handrails shall extend horizontally at least 12" beyond the top riser and continue to slope for the depth of one tread beyond the bottom riser.
 5. At ramps where the handrails are not continuous between runs, handrails shall extend horizontally above landings 12" minimum beyond the top and bottom of ramp runs.
 - Handrail extensions shall be in the same direction of stair flights at stairways and ramp runs at ramps.
 7. Comply with ADAAG for additional extension requirements.
- B. Non-welded Connections: Fabricate for the interconnection of members by means of the manufacturer's standard concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline mitered joints.
1. Fabricate splice joints for field connection using epoxy structural adhesive where this represents the manufacturer's standard splicing method.
- C. Welded Connections: Fabricate for the interconnection of members by concealed internal welds to eliminate surface grinding, using the manufacturer's standard system of sleeve and socket fittings.
- D. Radius Bends: Form to a uniform radius with smooth finished surfaces free from buckles and twists.
- E. Provide wall returns at the ends of wall-mounted handrails.
- F. Close exposed ends of handrail and railing members by use of the manufacturer's standard prefabricated end fittings.
- G. Brackets, Flanges, Fittings and Anchors: Provide the manufacturer's standard brackets, flanges, end closures, miscellaneous fittings and anchors for the connection of members to other work. Furnish inserts and other anchorage devices for connecting to concrete and masonry. Fabricate and space anchorage devices, as indicated and as required to provide adequate support. Coordinate anchorage devices with the supporting structure.
- H. Toe Boards: Where indicated, provide toe boards at guards around openings and the edge of open-sided floors and platforms. Fabricate to the dimensions and details indicated, or if not indicated, use a 4" high x 1" plate welded to, and centered between, each guard post.
- I. Weeps: For exterior exposed units, fabricate joints which will be exposed to weather so as to exclude water, or provide weep holes where water may accumulate.

2.4 ALUMINUM FINISH

- A. Siliconized powder coating: Kynar or approved equal.
- B. Anodized.
- C. Powder coat.

- D. Color as selected from manufacturer's standards.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for the installation of anchorages, such as sleeves, concrete inserts, anchor bolts and miscellaneous items having integral anchors to be embedded in concrete or masonry. Coordinate the delivery of such items to the Project Site.
- B. Field Measurements: Take field measurements prior to the preparation of Shop Drawings and fabrication, where possible. Do not delay job progress. Allow for adjustments during installation where the taking of field measurements before fabrication might delay the work.

3.3 INSTALLATION

- A. Fit exposed connections accurately together to form tight, hairline joints.
- B. Perform cutting, drilling and fitting required for the installation. Set work accurately in location, alignment and elevation, plumb, level, true to line and free of rack, measured from established lines and levels. Do not weld, cut or abrade surfaces of components which have been coated or finished after fabrication, and are intended for field connection by mechanical means without further cutting or fitting.
- C. Corrosion Protection: Coat concealed surfaces of aluminum, which will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of epoxy paint.
- D. Adjust prior to anchoring to ensure matching alignment at abutting joints. Space posts at the intervals indicated, or if not indicated, as required by the design loads.
- E. Anchoring Posts:
 - 1. Anchor posts by means of sleeves preset and anchored into concrete. After posts have been inserted into the sleeves, fill the space between the posts and sleeves solid with non-shrink, non-metallic grout, mixed and placed to comply with the grout manufacturer's directions.
 - 2. Leave anchorage joints exposed. Wipe off excess grout and leave 1/4" build-up, sloped away from the post. For installations exposed on the exterior, or to the flow of water, seal the grout in compliance with the grout manufacturer's instructions.
 - 3. Anchor posts to metal surfaces with the manufacturer's standard fittings designed

for the purpose, unless otherwise indicated.

F. Railing Connections:

1. Permanently connect components together using the manufacturer's standard mechanical or adhesive joining method and fittings, unless otherwise indicated. Use wood blocks and padding to prevent damage to members and fittings. Seal recessed holes of exposed locking screws using plastic filler, colored to match the finish of the handrails and guards.

G. Anchoring Handrails and Guards Ends:

1. Anchor ends into concrete and masonry with the manufacturer's standard fittings designed for the purpose, unless otherwise indicated.
2. Anchor ends to metal surfaces with the manufacturer's standard fittings using concealed fasteners, unless otherwise indicated.

H. Attachment of Handrails and Guards to Walls:

1. Secure to walls with the manufacturer's standard wall brackets and end fittings to maintain 1-1/2" clearance between walls and the rail.
2. For anchorage to concrete and solid masonry, use drilled-in expansion shields and concealed hanger bolts, unless otherwise indicated.
3. For hollow masonry anchorage, use toggle bolts with square heads, unless otherwise indicated.
4. For anchorage to stud partitions use lag bolts fastened to treated wood blocking between the studs. Coordinate with the spacing of studs for accurate location of the blocking.

3.4 ISOLATION REQUIREMENTS

- A. Dissimilar Metals: Where aluminum surfaces are in contact with, or fastened to dissimilar metals except stainless steel, zinc or zinc coating, the aluminum shall be protected from the dissimilar metal. Where aluminum contacts another metal, paint the dissimilar metal with epoxy paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.
- B. Cementitious Materials: Paint aluminum where in contact with mortar, concrete, masonry or other cementitious material, with an alkali-resistant coating such as heavy-bodied bituminous paint or epoxy paint.
- C. Wood Contact: Isolate aluminum from cedar, redwood, oak and acid-treated lumber by means of unbroken 1/8-mil polyethylene construction sheet or a heavy coating of metal-protective paint.
- D. Surfaces in contact with sealants after installation need not be coated with any type of protective material.

3.5 CONSTRUCTION

A. Site Tolerances:

1. Maximum variation from Plumb: 1/4"

2. Maximum Offset From True Alignment: 1/4"
3. Maximum Out-of-Position: 1/4"

3. ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting the installed work.
- B. Protect finishes of guards and handrails from damage during construction by use of temporary protective coverings approved by the railing manufacturer.
- C. Remove protective covering at project completion.
- D. Restore finishes damaged during installation and construction so no evidence of the corrective work remains.
- E. Return items which cannot be refinished in the field to the shop, make the necessary alterations, and refinish the entire unit, or provide a new unit, as required.

3.7 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect the installations for correct location, alignment and elevation, plumb, level, true to line, free of rack and secure attachment and anchorage.

3. PROTECTION

- A. Protect the finishes of the handrails and guards from damage during construction by the use of temporary protective coverings approved by the manufacturer.

END OF SECTION

SECTION 0□100
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing lumber and construction.
2. Miscellaneous wood blocking, supports and rough-in.
3. Plywood.
4. Moisture Barriers.
5. Anchors and connectors.
- Preservative and fire-resistive treatment.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03100 - Concrete Formwork: Cast-in inserts and attachment substrate.
2. Section - 03300 - Cast-In-Place Concrete: Substrate for attachment.
3. Section - 04230 - Reinforced Unit Masonry: Substrate for attachment.
4. Section 0□200 - Finish Carpentry: Finish work to be anchored.
5. Section 0□400 - Architectural Woodwork: Finish work to be secured.
- Section 09110 - Non-Load Bearing Steel Framing: Substrate for attachment.

D. Work furnished under other Sections but installed in whole, or in part under this Section:

1. Section 05500 - Metal Fabrications.
2. Section 0□210 - Wood Doors.
3. Section 0□710 - Door Hardware.
4. Division 10 - Applicable Sections.

1.2 DESCRIPTION OF WORK

- A. The extent of the rough carpentry work is indicated on the Drawings and as specified herein, and includes providing and installing wood framing and construction, anchors and

connectors, miscellaneous blocking, supports and wood rough-in as required by the Project conditions.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- B. American Lumber Standards Committee (ALSC):
 - 1. Softwood Lumber Standards.
- C. American Plywood Association (APA):
 - 1. Grades and Standards.
- D. American Society of Civil Engineers (ASCE):
 - 1. ASCE □SEI 7 - Minimum Design Loads for Buildings and Other Facilities.
- E. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, □0,000 psi Tensile Strength.
 - 2. ASTM E □4 - Test Method for Surface Burning Characteristics of Building Materials.
- F. American Wood Preservers Association(AWPA):
 - 1. AWPA - C1 - All Timber Products - Preservative Treatment by Pressure Process.
 - 2. AWPA - C15 - Wood for Commercial-Residential Construction Preservative Treatment by Pressure Processes.
 - 3. AWPA - C20 - Structural Lumber - Fire-Retardant Treatment by Pressure Processes.
 - 4. AWPA - C27 - Plywood - Fire-Retardant Treatment by Pressure Processes.
 - 5. AWPA - P5 - Water Borne Preservatives.
- G. International Code Council:
 - 1. International Building Code (IBC):
- H. Underwriters□Laboratories, Inc. (UL):
 - 1. UL FR S - Fire-Rated Treated Wood with Flame Spread and Smoke Developed Ratings of 25 or less in accordance with ASTM E □4.
 - 2. UL 723 - Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Shop Drawings: Dimensioned plans, elevations, sections, large scale details, attachment devices, anchors and other components.
2. Assurance □Control Submittals:
 - a. Wood Treatment: Treatment manufacturer's instructions for the proper use of each type of treated material.
 - b. Certificates:
 - 1) Pressure Treatment and Termite Treatment: Certification from the treating plant identifying the chemicals and process used, net amount of preservative retained □ conformance with applicable standards.
 - 2) Water-borne Preservatives: Certification from the treating plant stating that the moisture content of treated materials was reduced to a maximum of fifteen percent (15 □) prior to shipment to the Project Site.
 - 3) Fire Retardant Treatment: Certification from the treating plant stating that the type of chemicals used and the fire performance characteristics achieved □ that the fire-retardant treatment materials comply with the governing code, ordinances and requirements of local authorities having □ jurisdiction □ that treatment will not bleed through finished surfaces.

1.5 □ QUALITY ASSURANCE

- A. Perform work in accordance with the following agencies:
 1. Lumber Grading Agency: Certified by ALSC.
 2. Plywood Grading Agency: Certified by APA.
- B. Regulatory Requirements: Conform to the applicable codes for fire-retardant treatment of wood surfaces for flame □ smoke ratings.
- C. Performance Requirements: For exterior uses, design, fabricate, reinforce, install and anchor to withstand the following windload requirements:
 1. Combined positive and negative windloading in accordance with IBC 2009, Section 1 □ 09 with a □ mph of 170, qs of 74.0, exposure □ B □ C □ D □, and importance factor of □ 1.0 □ 1.25 □ 1.5 □ as applicable per ASCE 7.
- D. Evidence of Grade:
 1. Stamp each piece of lumber and plywood with a grade mark and trademark of the Association having □ jurisdiction, or accompany each shipment with an official certificate of inspection. Stamp on concealed surfaces or surfaces scheduled for opaque paint finish.

1. □ DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store and protect the products.
 - 1. Inspect wood materials for conformance with the specified grades, species and treatment at the time of delivery to the Project Site.
 - 2. Reject and return unsatisfactory wood materials.
- B. Provide facilities for the handling and storage of materials to prevent damage to edges, ends and surfaces.
- C. Keep materials dry. Stack materials off the ground a minimum of 12" or, if on a concrete slab-on-grade, a minimum of 1-1/2" fully protected from the weather. Provide for air circulation within and around stacks, and under temporary coverings.
- D. For materials pressure treated with waterborne chemicals, place spacers between each bundle to provide for air circulation.

PART 2 PRODUCTS

2.1 FRAMING LUMBER

- A. General:
 - 1. Use Douglas Fir or Southern Pine where concealed Redwood where exposed.
 - 2. Pressure and termite treated.
 - 3. Sizes shown are nominal. Actual sizes shall conform to American Lumber Standard, PS 20-70.
 - 4. Dimensioned lumber shall be S4S to standard dimensions.
 - 5. Moisture content shall be fifteen percent (15%) or less, unless otherwise noted.
 - All lumber shall bear the grade mark of Western Wood Products Association (WWPA) standard grading rules, latest edition. Grades called out below are minimum. Use appearance grade where exposed to view.
- B. Non-Load Bearing, Blocking, Bridging and Miscellaneous Framing: Standard Grade, Table 1.
- C. Load-Bearing and Non-Load Bearing Studs (8" long or less), Related Plates and Sills: No. 2 Grade, Table 3.
- D. Load-Bearing Studs (over 8" long), Related Plates and Sills: Select No. 1 or better grade, Table 3. Knots, pitch pockets, checks, splits, or bark shall not be allowed at full length of board edges.
- E. Roof, Ceiling and Floor Joists, Purlins, Rafters, Posts: No. 1 Grade, Table 3.
- F. Load-Bearing Beams, Headers, Stair Stringers, Truss Members: Select Structural Grade, Table 3.
- G. Boards: Construction Grade.

2.2 NAILERS, BLOCKING, FURRING AND SLEEPERS

- A. Wood for nailers, blocking, furring and sleepers: Construction grade, finished 4 sides, 15 percent maximum moisture content. Pressure preservative treat items in contact with roofing, flashing, waterproofing, concrete, masonry or the ground.

2.3 PLYWOOD

- A. General: Grading Rules in accordance with American Plywood Association (APA), Plywood Specification & Grade Guide, 197th edition. All plywood with pressure and termite treatment shall bear appropriate grade trademark of the APA.
- B. Wall & Roof Sheathing: 3/4" C-D 4x24, INT-APA Grade, Group 1 exterior glue, unsanded, T&G all edges - full face, 4x9 panels.
- C. Roof & Floor Sheathing: 1-1/2" 2-4-1, C-D, INT-APA grade, Group 1 exterior glue, unsanded, T&G all edges - full face, 4x9 panels.
- D. Subfloor Over Concrete: 3/4" CD Ext Grade exterior glue, 4x9 panels.
- E. Plywood Backing Plates (for mounting electrical and telephone equipment): Fire-retardant treated panels with grade designation, APA C-D PLUGGED INT exterior glue, in thickness indicated, or if not indicated, not less than 2"

2.4 MOISTURE BARRIERS

- A. Install where shown on the Drawings or where required.
- B. Place under wood plates bearing directly on earth supported concrete slabs and at subfloors over concrete slabs.
- C. 15 pound asphalt saturated roofing felt, non-perforated.

2.5 ROUGH HARDWARE

- A. All necessary hardware for installation of the work specified herein, of the sizes and quantities required by Building Code or herein after specified. Hardware shall be hot-dip galvanized steel or approved type of non-ferrous metal.

2.6 FRAMING CONNECTORS AND ACCESSORIES

- A. Provide connectors and accessories where indicated or as required by conditions & inc-coated steel, Code approved, as manufactured by Simpson Company, Silver Metal Products, Inc., or as approved. If a specific type is not shown, use type recommended by the connector manufacturer for the conditions of installation. Secure with nails, screws, or bolts provided or recommended by the manufacturer.

2.7 CONSTRUCTION ADHESIVE

- A. Conform to APA performance specification AFG-01 and specific application recommendations of the manufacturer.
- B. Products as manufactured by Bostik, Inc., Henkel, Sovereign Specialty Chemicals, Inc. or approved equal.

2.0 FASTENERS

A. General: Hot-dip galvanized steel, typical.

1. Nails and Staples: Federal Spec FF-N-105B.
2. Bolts: Federal Spec FF-B-575.
3. Nuts: Federal Spec FF-N-33.
4. Lag Screws and Bolts: Federal Spec FF-B-51.
5. Toggle Bolts: Federal Spec FF-B-53.
6. Wood Screws: Federal Spec FF-S-111.
7. Expansion Shields: Federal Spec FF-S-325.

B. Fasteners:

1. Bolts, Nuts, Lag Screws, Wood Screws and Washers: ASTM A 307, medium carbon steel grade and type to suit the application, unless otherwise noted.
2. Expansion Shield Fasteners: For anchorage of non-structural items to solid concrete and masonry.
3. Powder or Pneumatically Activated Fasteners: For anchorage of non-structural items to steel.
4. Fasteners for Non-Structural Wood Members to Masonry: 1/4" diameter x 3-1/4" Phillips, flat head.

C. Provide necessary installation of the work required grades and quantities of fasteners noted herein or as required by Code.

D. Tools: Provide the manufacturers recommended power tool for installing each type of fastener.

2.9 WOOD TREATMENT

A. General:

1. Treatment material shall provide protection against termites and fungal decay and shall be approved for use as a wood preservative for its intended use by the U. S. Environmental Protection Agency.
2. For all lumber and plywood above the ground and in ground contact, comply with the applicable requirements of AWPA, Standards C2 for Lumber, C9 for Plywood and of the AWPB standards referenced below.
3. Treated material shall meet the interior Type A requirements in AWPA, Standard C-20 for lumber and C-27 for plywood.
4. Pressure treat above ground items with water-borne preservatives complying with AWPA LP-2.

5. After treatment, kiln dry to a maximum moisture content of fifteen percent (15%).
- Mark each treated item with AWPB Quality Mark Requirements.
7. Chemicals used to treat materials shall be free of halogens, sulfates, ammonium phosphate and formaldehyde.

B. Wood Requiring Treatment:

1. Lumber, Preservative Treated: All interior and exterior wood including nailers, blocking, stripping and similar items in conjunction with roofing, flashing and other construction—sills, blocking, furring, stripping, ledgers, supports and similar items in contact with concrete or masonry.
2. Lumber, Fire-Retardant Treated: Interior framing, blocking, furring, stripping, ledgers, supports, nailers, and miscellaneous exposed wood. Do not use fire-treated wood in contact with concrete or masonry.
3. Interior Plywood, Fire-Retardant Treated: Plywood backing for electrical and telephone equipment.

C. Preservative Pressure Treated Lumber:

1. Products:
 - a. Ammoniacal Copper Zinc Arsenate (ACZA).
 - b. Chromated Copper Arsenate (CCA).
 - c. Fluor Chrome Arsenate Phenol (FCAP).
 - d. Pentachlorophenol (Penta).
 2. Comply with EPA and OSHA requirements and regulation and in accordance with AWPB, P-9. Type C treatment shall not discolor the wood used for exposed finish.
 3. Incising is not permitted for appearance grade lumber or where materials are exposed to view.
 4. Impregnate lumber with a preservative treatment conforming to AWPB, Standard C1 and P5. Apply preservative in a closed cylinder by the pressure process in accordance with AWPB, Standard C15.
 5. Retention of dry salts:
 - a. Moderate service conditions (weather exposure): 0.25 pounds per cubic foot (oxide basis).
 - b. Severe conditions (constant contact with the ground or water): 0.40 pounds per cubic foot (oxide basis).
- Remove excess moisture where shrinkage is a serious fault and where treated lumber will be in contact with concrete, masonry or plaster, and where water-borne treated lumber is to be painted or stained.

7. Lumber to be painted or stained shall have knots and pitch streaks sealed the same as for untreated wood.
- Liberally brush freshly cut surfaces, bolt holes and machined areas with the same preservative, in accordance with AWPA, Standard M4.

D. Fire-Retardant Treatment:

1. Where fire-retardant lumber or plywood is specified, otherwise indicated or required by the Building Code, provide materials which comply with AWPA standards for pressure impregnation. Use fire-retardant chemicals which have a flame spread rating of not more than 25 when tested in accordance with UL Test 723 or ASTM E 119, and show no increase in flame spread and significant progressive combustion upon continuation of the test for an additional twenty (20) minutes.
2. Where treated items are exposed at the exterior or high humidities or are to have a transparent finish, provide appearance grade materials which show no change in fire hazard classification when subjected to standard rain test UL 790 or ASTM B 299.
3. Use fire-retardant treatment which will not bleed through or adversely affect the type of finish indicated and which does not require brush treatment of field made cuts to maintain the fire hazard classification.
4. Where transparent finish is indicated, use the type of treatment and species which permits milling of the lumber after treatment without altering the indicated fire hazard classification, as determined by fire testing.
5. Kiln dry treated items to a moisture content of fifteen percent (15%), maximum.
- Provide UL label on each piece of fire-retardant lumber and plywood.
7. Inspect each piece of treated lumber and plywood after drying. Discard damaged and defective pieces.
- Products:
 - a. Dricon by Arch Wood Protection.
 - b. Pyro-Guard by Hoover Treated Wood Products.
 - c. Section 01100 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.

1. Verify that spacing, direction and details of supports are correct to accommodate the installation of blocking, backing, stripping, furring and nailing strips.
 2. Verify that surfaces to receive work are rigid, secure, accurately sited and located and otherwise properly prepared.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 COORDINATION

- A. Fit carpentry work to other work. Scribe and cope as required for accurate fit.
- B. Coordinate the location of furring, nailers, blocking, grounds and similar supports to allow for the proper attachment of other work.

3.3 GENERAL

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. If field measurements differ slightly from Drawing dimensions, modify the work as required for accurate fit.
3. If measurements differ substantially, notify the Owner's representative prior to fabrication.

B. Workmanship:

1. Carefully layout, cut, fit and install rough carpentry items.
2. Use sufficient number of nails, spikes, screws and bolts to insure rigidity and permanence.
3. Drive nails perpendicular to the grain of wood in lieu of toenailing, where feasible.
4. Provide for installation and support of plumbing, air conditioning and ventilation work.
5. Install work true to lines, plumb and level, unless indicated or required otherwise.

C. Installation:

1. Install proprietary products in accordance with the manufacturer's directions.
2. Provide washers under nuts and heads when making bolted or lag screwed connections.
3. Except as otherwise specified herein, machine nail or staple with written approval only.
4. Install framing connectors where indicated—secure with fasteners recommended by the manufacturer.

- D. Protecting Other Work and Existing Facilities: Protect against damage and discoloration caused by the work of this Section.

3.4 PLATES

- A. Provide single plates at floors and bottoms of openings—double plates face nailed together at ceilings and heads of openings.
- B. Provide headers, as specified herein, over openings more than 2'-0" wide.
- C. Splice single plates—stagger ends of double plates at least 4'-0"—splice plates abutting corners. Locate plate splices directly over studs.
- D. Unless shown otherwise on the Drawings, anchor plates resting on concrete or masonry with 1/2" diameter bolts at 4'-0" o.c., maximum, or as required by windload.

3.5 JOISTS AND RAFTERS

- A. Set with crown side up—lap and spike together over bearings utilizing joist hangers proper for the application. Minimum bearings on wood or metal: 1-1/2" on masonry: 3"
- B. Spike studs to joists resting on ribbon boards, block ends between studs where joists and studs are not in contact.
- C. Double joists under partitions running parallel to the joists—space to provide clearance for pipes in partitions.
- D. Double headers and trimmers—spike beams with ledgers to the ends of joists.

3.6 BRIDGING

- A. Cross Bridging:
 - 1. Nominal 2"x 3" wood, or approved type metal.
 - 2. Provide at not more than 4 feet apart in joist spans. Do not anchor until dead loads are in place.
 - 3. Space cross bridging members 1/4" apart to avoid rubbing against each other.
- B. Solid Bridging:
 - 1. Provide nominal 2" solid bridging over bearings, full depth of the joists, unless noted otherwise.

3.7 PLYWOOD SUBFLOORING

- A. Apply face grain perpendicular to and continuous over joists or sleepers with end joints on bearings—stagger end joints.
- B. Leave 1/8" space at all edge and end joints—3/32" at T&G edges.
- C. Before panels are placed, apply a bead of construction adhesive to the joists and T&G joints with a caulking gun.

- D. Secure panels to joists with 16d deformed shank nails at 16" o.c. at edges and 10" o.c. at intermediate supports.
- E. Complete all nailing within the adhesive manufacturer's specified assembly time.
- F. Protect from moisture and other damage during construction.
- G. Place 15 pound asphalt roofing felt over concrete subfloors and concrete slabs with plywood, secured to the floor with 1-1/2" screws in expansion shields.

3. ROOF SHEATHING

- A. Apply face grain perpendicular to and continuous over supports with end joints on bearings; stagger end joints.
- B. Leave 1/8" space at all square edges; 1/32" at T & G joints.
- C. Secure 1-1/2" panels with 10d ring shank nails at 16" o.c. at edges and intermediate supports, unless noted otherwise.
- D. Protect from moisture and other damage until roofing is applied.

3.9 DOOR & WINDOW BUCKS, FRAMING BLOCKING

- A. Provide treated wood, cut to size at locations against concrete and masonry.
- B. Provide fire-retardant treated bucks and framing in fire-rated partitions.

3.10 SITE TREATMENT OF WOOD MATERIALS

- A. Apply preservative treatment in accordance with the manufacturer's published instructions.
- B. Brush apply two coats of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashings.
- C. Treat site-sawn cuts.
- D. Allow preservative to dry prior to erecting members.

3.11 CONSTRUCTION

- A. Site Tolerances: Framing Members: 1/4" from true position, maximum.

END OF SECTION

SECTION 0□200
FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior wood paneling.
 - 2. Wood door frames.
 - 3. Standing and running trim.
 - 4. Plastic laminate.
 - 5. Adjustable shelving.
- B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.
- C. Related Sections:
 - 1. Section 0□100 - Rough Carpentry: Blocking and backing plates for anchorage.
 - 2. Section 0□400 - Architectural Woodwork: Cabinetry.
 - 3. Section 0□710 - Door Hardware: Hardware for wood doors.
 - 4. Section 09110 - Non-Load Bearing Steel Framing: Substrate framing.
 - 5. Section 09900 - Painting: Finishes.

1.2 DESCRIPTION OF WORK

- A. The extent of finish carpentry work is indicated on the Drawings and as specified herein, and includes providing and installing all finish woodwork, wood trim for bases, wall rails, crown moldings, ceiling battens, wood door and window frames, jambs and moldings and wood veneer paneling as required to complete the Project.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- B. American National Standards Institute (ANSI):
 - 1. ANSI A135.4 - Basic Hardboard.
 - 2. ANSI A20□1 - Mat Formed Wood Particleboard.
- C. Architectural Woodwork Institute (AWI):

1. AWI AWQ S - Architectural Woodwork Quality Standards, 4th Edition, Version 2.0.
- D. American Society for Testing and Materials (ASTM):
1. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
- E. Americans with Disabilities Act Accessibility Guidelines (ADAAG):
1. Accessibility Guidelines for Buildings and Facilities.
 2. Accessibility Guidelines for Schools.
- F. National Electric Manufacturer's Association (NEMA):
1. NEMA LD3 - High Pressure Decorative Laminates.
- G. United States Department of Commerce Product Standard (PS):
1. PS 20 - American Softwood Lumber Standard.
- H. Western Wood Products Association (WWPA):
1. WWPA - Quality Standards.

1.4 DESIGN INTENT

- A. It is the design intent that similar woodwork throughout the Project match. Coordinate work between the separate installers providing similar woodwork to ensure that the design intent is achieved to the satisfaction of the Owner's representative.

1.5 SUBMITTALS

- A Section 01330 - Submittal Procedures: Procedures for submittals.
1. Product Data: Manufacturer's specifications and installation instructions for each item of factory-fabricated paneling, wood veneer, finish hardware, anchorage devices and finish coating products.
 2. Shop Drawings: Show the location of each item, dimensioned plans and elevations, large scale details, attachment, anchorage and related components.
 3. Samples: For each species and cut or pattern of finish carpentry. Label each sample according to species, grade, grain cut and finish type.
 - a. Treated Wood: 12" long sample of termite, preservative and fire-retardant treated wood items.
 - b. Interior standing and running trim: 24" long x full board or molding width, unfinished.
 - c. Factory-Finished Plywood Veneer and Wood Paneling: 24" long x panel width.
 - d. Worked (Shaped) Pieces, Unfinished: Profile size x 12" lengths. For work requiring eased edges, submit samples of each size of eased edge

required. Samples for each species, grade, and grain cut need not be submitted.

e. Finished Samples: Representative board samples of 3/4"x 1/2"x 11" size with transparent finishes of each type, color and texture required finished by the Paint applicator.

f. Hardware: One (1) complete unit of each type and finish required.

4. Wood Treatment Data: Chemical treatment manufacturer's instructions for handling, storage, installation and finishing treated materials.

a. Pressure Treatment and Termite Treatment: For each type specified, include certification by the treating plant stating the chemicals and process used, net amount of preservative retained and conformance with applicable standards.

b. Dip Treatment: For each type specified, include certification by the treating plant stating the chemical solutions used, submersion period and conformance with applicable standards.

c. Fire-Retardant Treatment: Include certification by the treating plant indicating the type of chemicals used and fire performance characteristics achieved.

5. Assurance Control Submittals:

a. Manufacturer's certification that the fabricated woodwork complies with the quality grades and other requirements indicated.

b. Documentation of experience indicating compliance with the specified qualifications requirements.

B. Section 01700 - Closeout Submittals: Procedures for closeout submittals.

1. Warranty: Submit a written Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.0 COORDINATION

A. Pre-Installation Meeting: Convene a Pre-Installation Meeting at the Project Site prior to the delivery of finish carpentry materials to the Site.

1. Require attendance of the Contractor, Architect, Owner's representative and representatives of the installer of architectural woodwork, other finishes, painting and related mechanical and electrical work.

2. Review coordination and environmental controls required for proper installation and ambient conditions in areas to receive the work.

3. Review preparation and installation procedures, and the coordination and scheduling required with related work.

B. Support Work:

1. For support work not indicated in the Contract Documents, coordinate requirements with other installers, in a timely manner.

2. Provide work as necessary to ensure that all work has proper framing and reinforcing supports to ensure secure and solid installations.

1.7 QUALITY ASSURANCE

- A. Perform the work in accordance with AWI, Premium quality where designated, Custom quality all others
- B. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
- C. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Section 01000 - Material and Equipment: Transport, handle, store and protect to prevent damage.
- B. Deliver products to the Project Site in the manufacturer's original, unopened packaging.
- C. Do not deliver products to the Project Site until wet work, grinding, painting and similar operations which could damage, soil or deteriorate the finish carpentry has been completed in the installation areas, and humidity has been stabilized.
- D. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting the requirements specified for the installation areas.
- E. Protect installed finish carpentry from damage and excessive relative humidity until final acceptance.

1.9 JOB CONDITIONS

- A. Fabricator of the finish carpentry shall determine the optimum moisture content and the required temperature and humidity conditions.
- B. The installer shall advise the Contractor of the temperature and humidity requirements for the finish carpentry installation areas. Do not store or install finish carpentry until the required temperature and relative humidity has been stabilized and will be maintained in the installation areas.
- C. Stabilize temperature and humidity in installation areas as necessary to maintain the moisture content of the installed finish carpentry within a 1.0% tolerance of optimum moisture content, from the date of installation throughout the remainder of the construction period.

PART 2 PRODUCTS

2.1 GENERAL

- A. Finish Carpentry Standards:
 1. Comply with AWI, Premium quality where designated, Custom quality grade for trim, jambs, frames and detailing.

2. Lumber shall be best grade for clear finishes.
 3. Moisture content of lumber shall be no more than 13%.
 4. Minimum lengths for trim and frames shall be:
 - a. One continuous piece for openings.
 - b. Joints no closer than 12 feet apart in running trim.
 5. Sizes and profiles as called for on the Drawings.
- B. Backpriming:
1. Back prime work immediately upon arrival of the units at the Project Site with a single coat of spar varnish or other acceptable sealer for fabricated units to be installed as an exterior component or where against portland cement plaster, gypsum plaster, or against exterior facing walls of concrete or masonry.
 2. Ensure that the sealer does not contaminate surfaces requiring a transparent finish.

2.2 MATERIALS

- A. Millwork:
1. Wood door and window frames, trim and plywood, ceiling frames and panels, and solid paneling shall be the species and cut designated in finish schedules, drawings and details—best clear Premium quality where designated, Custom quality grade, for transparent finish—sized and fabricated as detailed.
 2. Exterior wood fascia boards, screens, trellis frames shall be clear, all heart Redwood.
- B. Panels: Fiberboard or fiberboard core plywood, construction balanced.
- C. Plywood: For exterior use and interior use exposed to moisture shall be marine grade.
- D. Joists: Species, cut and matching as indicated or selected, grade 1, factory-finished.

2.3 WOOD TREATMENT

- A. Preservative Treatment: For all exterior and interior wood, comply with applicable requirements of AWWPA, Standards C2 (Lumber), C9 (Plywood), and of AWPB, Quality Marks Requirements.
- B. Preservative Treatment Types:
1. Ammoniacal Copper Zinc Arsenate (ACZA).
 2. Pentachlorophenol (Penta).
 3. Fluor Chrome Arsenate Phenol (FCAP).
- C. Pressure-treat above ground items with water-borne preservatives complying with AWPB LP-2.

- D. Dip-treat interior wood.
- E. Apply in accordance with OSHA and EPA requirements and regulations and in accordance with AWWA, P-9. Treatment shall not discolor finished wood exposed to view.
- F. Fire-Retardant Treatment:
 1. Where fire-retardant wood is specified or required, provide materials which comply with AWWA standards for pressure impregnation with fire-retardant chemicals, and which have a flame spread rating of not more than 25 when tested in accordance with UL Test 723 or ASTM E 84, and shows no increase in flame spread and significant progressive combustion upon continuation of the test for an additional twenty (20) minutes.
 2. Where treated items are exposed to the exterior or to high humidity or are to have a transparent stain or sealer finish, provide appearance grade materials which show no change in the fire-hazard classification when subjected to standard rain test in accordance with UL 790 or ASTM B 299.
 3. Use fire-retardant treatment which will not bleed through or adversely affect the type of finish indicated, and which does not require brush treatment of field made cuts to maintain the fire-hazard classification.
- G. Products Scheduled for Transparent Finish:
 1. Treatment color shall be compatible with products scheduled for a transparent finish. Provide samples of treatment with finish applied for review.
 2. Where a transparent finish is indicated, use the type of treatment and species which permits milling of the lumber after treatment without altering the indicated fire-hazard classification, as determined by fire testing.
- H. Incised Materials: Do not use incised materials where finished work will be exposed to view.

2.4 INTERIOR WOOD PANELING

- A. Veneer plywood for transparent finish, clear plain cut Mahogany, color and grain matched for consistency between panels and with the trim.
- B. Stain and transparent finish.

2.5 WOOD DOOR FRAMES

- A. Grade:
 1. Opaque Painted: AWI, Custom.
 2. Transparent: AWI, Premium.
- B. Wood: Same species as the wood door face veneer. Ease edges.

2.6 STANDING AND RUNNING TRIM

- A. Grade:

1. Opaque Painted: AWI, Custom.
 2. Transparent: AWI, Premium.
- B. Trim, boards and plywood for painted finish: Softwood suitable for the exposure and use.
 - C. Trim and boards for transparent finish: Wood species as selected.
 - D. Back Construction: Rout or groove the backs of flat trim members, kerf backs of other wide flat members, except for members with ends exposed in finish work.

2.7 PLASTIC LAMINATE

- A. Manufacturers: Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 1. Formica Corp.
 2. Nevamar Corp.
 3. Wilsonart International.
- B. High-Pressure Laminate: NEMA LD3, Grade 50, General Purpose, fire-rated, 0.04" thick.
- C. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.8 ADJUSTABLE SHELVING

- A. Shelving: Softwood plywood, PS 1, graded in accordance with AWI, veneer cover core sides, edges and ends with plastic laminate, cover medium density particle board with factory-applied finish, as selected. 3/4" thick x depth shown on the Drawings x maximum possible length.
- B. Standards: Heavy-duty, 2-slot adjustments, length as required. Knape & Vogt #7 or comparable product as approved. Color as selected.
- C. Brackets: Heavy-duty, for 2-slots, nylon cam lock lever, length as required. Knape & Vogt #1 or #7 or comparable product as approved. Color as selected.

2.9 RELATED MATERIALS

- A. Closet Rod: 1-1/2" diameter stainless steel round tubing with chrome-plated mounting end flanges, Knape & Vogt #10 or comparable product as approved. Provide support brackets when required by the manufacturer of the same material and finish.
- B. Anchorage Devices, General: Nails, screws, toggle bolts, expansion shields, and other devices, of type, size and finish required for each use to ensure strong connections. Where products are subject to moisture, provide hot-dipped galvanized products, otherwise electroplated zinc or cadmium anchorage devices are acceptable.

2.10 FABRICATION, GENERAL

- A. Field Measurements:
 1. Before proceeding with the fabrication of finish carpentry products, obtain field measurements and verify dimensions.

B. Wood Products:

1. Fabricate finish carpentry products to the dimensions, profiles and details indicated with the construction and materials complying with referenced standards of the specified AWI grades.
2. Where necessary for fitting at the Project Site, provide reasonable allowance for scribing, trimming and fitting. Pre-cut openings, where possible, to receive hardware, and mechanical and electrical work.
3. Ease edges of rectangular solid wood components to a 1/4" radius for members less than 1" nominal thickness and 1/8" radius for edges of members over 1" nominal thickness.
4. Conceal all anchorage devices except where decorative fasteners are approved.

2.11 OTHER

- A. General: Where the quality of workmanship may not be specifically indicated, comply with the applicable provisions of AWI as follows as applicable to the grade of material, construction and finish:
1. Scheduled for Opaque Painting: AWI, Custom Grade.
 2. Scheduled for Transparent Finish: AWI, Premium Grade.
- B. Finish: Exposed wood surfaces (except resawn surfaces) shall be sanded and free of tool marks and similar blemishes. Hand sand inside the building after installation until all defects have been entirely removed. Any material showing machinery, tool, sandpaper or other defacing marks will be re-fected.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required and ready to receive the work.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 FABRICATION

- A. Fabricate trim, moldings, bases and frames to the dimensions and profiles shown. Route and groove the backside of members to be applied to flat surfaces, except for members with ends exposed in the finished work.
- B. Condition wood materials to the average prevailing humidity conditions in the installation areas prior to installing.

- C. Backprime wood with scheduled finish material exposed on the exterior or, to high the moisture and high relative humidities on the interior.
- D. Comply with the requirements of Section 09900 for primers and their application.

3.3 INSTALLATION

- A. Discard items which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or are too small to fabricate work with a minimum number of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.
- B. Install work in accordance with AWI, AWIS, Section 1700 - Installation of Woodwork.
- C. Install the work plumb, level and straight without distortions. Shim as required using concealed shims. Install to a tolerance of 1/16" for plumb and level countertops and with 1/4" maximum offset in flush adjoining surfaces and 1/32" maximum offsets in revealed adjoining surfaces.
- D. Scribe and cut the work to fit adjoining work. Refinish cut surfaces or repair damaged finish at cuts. Provide a neat, tight joint where work specified in this Section adjoins other work.
- E. Anchor work items to nailers or blocking or directly to the substrate using concealed fasteners, to the extent possible.
- F. Install standing and running trim with the minimum number of joints possible, using full-length pieces (from maximum length lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners to produce tight fitting joints with full surface contact throughout the length of joints. Use scarf joints for end-to-end jointing.
- G. Secure finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nail as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersink and fill flush with the finished surface. Match the final finish where a transparent finish is indicated.
- H. Apply sealant at all joints between finish carpentry work and adjacent walls and flooring to prevent intrusion by vermin and moisture into concealed spaces.
- I. Install hardware in accordance with the manufacturer's published instructions.
- J. Install shelving units, standards and brackets at locations indicated on the Drawings.
- K. Finish: AWI quality standard. Leave finish carpentry in a paint-ready condition for final finishing by the painting applicator.

3.4 ADJUSTING AND TESTING

- A. Section 01700 - Execution Requirements: Adjusting and testing the installed work.
- B. Adjust installed work.
- C. Test the installed work for rigidity and ability to support loads.

- D. Adjust cabinetry for uniform appearance.
- E. Touch-up shop-applied finishes to restore damaged and soiled areas.
- F. Repair damaged and defective work wherever possible to eliminate defects functionally and visually where repairs cannot be made to the satisfaction of the Owner's representative, replace the finish cabinetry.
- G. Adjust moving or operating parts to function smoothly and correctly.

3.5 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect finish carpentry work for plumb, level, alignment and secure attachment.

3.6 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- B. Clean exposed and semi-exposed surfaces.

3.7 PROTECTION

- A. Installer shall advise the Contractor and painting applicator of procedures required to protect the finish carpentry during the remainder of the construction period to ensure that the work will be without damage and deterioration at the time of final acceptance, and will be comparable to the final finish scheduled for the work.
- B. Installer shall return to the Project prior to substantial completion, repair any damage to the work, and readjust the hardware.

END OF SECTION

SECTION 00400
ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood faced casework and trim.
2. Plastic laminate faced casework and shelving.
3. Plastic laminate countertops.
4. Solid polymer fabrications.
5. Marble and Granite countertops.
- Wood shelving.
7. Preparation for installation and connection of utilities.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 00100 - Rough Carpentry: Blocking and backing plates in walls for anchorage.
2. Section 00200 - Finish Carpentry: Adjustable shelving.
3. Section 0040 - Solid Polymer Fabrications: Countertops.
4. Section 09110 - Non-Load Bearing Steel Framing: Blocking and backing plates.
5. Section 09900 - Painting: Woodwork finishes.
- DIVISIONS 15 and 16: Service fittings and connections.

1.2 DESCRIPTION OF WORK

A. The extent of architectural woodwork is indicated on the Drawings and as specified herein, and includes providing, fabricating and installing all wood faced and plastic laminate faced architectural woodwork, trim and countertops, wood shelving, installations and utility connections.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

- B. American National Standards Institute (ANSI):
 - 1. ANSI A135.4 - Basic Hardboard.
 - 2. ANSI A201.1 - Mat Formed Wood Particleboard.
- C. Americans with Disabilities Act Accessibility Guidelines (ADAAG):
 - 1. Accessibility Guidelines for Building and Facilities.
 - 2. Accessibility Guidelines for Schools.
- D. Architectural Woodwork Institute (AWI):
 - 1. AWI AW151 - Architectural Woodwork Quality Standards, 11th Edition, Premium/Custom Grade, except as otherwise indicated.
- E. National Electric Manufacturer's Association (NEMA):
 - 1. NEMA LD3 - High Pressure Decorative Laminates.
- F. United States Department of Commerce Product Standard (PS):
 - 1. PS 1 - Construction and Industrial Plywood.
 - 2. PS 20 - American Softwood Lumber Standard.

1.4 DESIGN INTENT

- A. It is the design intent that similar woodwork throughout the Project match. Coordinate work between the separate installers providing similar woodwork to ensure that the design intent is achieved to the satisfaction of the Owner's representative.

1.5 DEFINITIONS

- A. Exposed Surfaces: The exposed portions of woodwork, including surfaces visible when doors and drawers are closed. Bottoms of woodwork more than 4" above the floor shall be considered as exposed. Visible members in open cases or behind glass doors also shall be considered as exposed. The front and both sides of all storage cabinets shall be considered as exposed, even when one or both side panels are against a wall or an adjacent cabinet.
- B. Semi-exposed Surfaces: Semi-exposed portions of woodwork includes members behind opaque doors, such as shelves, dividers, interior face of ends, wood back, drawer sides, backs and bottoms, and the inside face of doors. Tops of woodwork 4" or more above the floor shall be considered as semi-exposed.
- C. Unexposed Surfaces: Unexposed portions of woodwork includes sleepers, web frames, dust panels and other surfaces not usually visible after installation.

1.6 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Fabricator's specifications and installation instructions for each item of factory-fabricated woodwork, wood veneer counter tops, finish hardware and finish coating products.
 - a. Wood veneers and finishes.
 - b. Data for hardware and accessories indicating the material, type, function, attachment and finish.

2. Shop Drawings: Show the location of each item on dimensioned plans, sections, elevations, and large scale details. Indicate materials used, wood species, component profiles, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes. Submit for the following:
 - a. Cabinet work, base and overhead.
 - b. Counter work, base and overhead.
 - c. Shelving units.
 - d. Details.
 - e. Submit fabricators product information including Shop Drawings for fabricator's standard units.

3. Samples: For each species and cut or pattern of architectural woodwork:
 - a. General:
 - 1). Two 12" x 12" solid wood and plywood or hard board samples with factory-applied transparent or opaque finish for each finish system and color required.
 - 2). Two samples of each countertop material.
 - 3). One unit of each type and finish of cabinet hardware.
 - b. Initial Samples: Unless specific products are scheduled, submit 2" x 2" minimum, size samples of the complete range of colors, patterns, and finishes available for initial selection.
 - c. Final Samples:
 - 1). Color, Pattern and Finish Samples: Submit 4" x 4" final samples matching those initially selected.
 - 2). Fused Joint Sample: On project products that would least likely obscure joints, submit 4" x 10" samples showing fused joint work.

4. Assurance Control Submittals:
 - a. Fabricator's certificate that the products meet or exceed the specified requirements.

- b. Documentation of experience indicating compliance with the specified qualifications requirements.

B. Section 01700 - Closeout Submittals: Procedures for closeout submittals.

- 1. Warranty: Submit a written Warranty with forms completed in the name of the Owner and registered with the fabricator.

1.7 COORDINATION

A. Pre-Installation Meeting: Convene a Pre-Installation Meeting at the Project Site prior to the delivery of architectural woodwork materials to the Site.

- 1. Require attendance of the Contractor, Architect, Owner's representative, and representatives of the installer of finish carpentry, other finishes, painting and related mechanical and electrical work.
- 2. Review coordination and environmental controls required for proper installation, and ambient conditions in areas to receive the work.
- 3. Review preparation and installation procedures, and the coordination and scheduling required with related work.

B. Support Work:

- 1. For support work not indicated in the Contract Documents, coordinate the requirements with other installers, in a timely manner.
- 2. Provide work as necessary to ensure that all work has proper framing, backing and reinforcing supports to ensure secure and solid installations.

1.8 QUALITY ASSURANCE

A. Qualifications:

- 1. Fabricator: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
- 2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Quality Standards:

- 1. Woodwork shall comply with the requirements of AWI Architectural Woodwork Quality Standards Illustrated®, Eighth Edition, 200, except where more stringent requirements are specified herein.

C. Style: Fabricate, as indicated, utilizing the following:

- 1. Conventional Flush Construction with face frame.
- 2. Conventional Flush Construction without face frame.
- 3. Flush Overlay Construction.
- 4. Reveal Overlay Construction.

5. Wood faced casework - Premium Custom grade.
6. Countertop, casework and shelving - Premium Custom grade.
7. Wood shelving - Premium Custom grade.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store and protect the products.
- B. Package architectural woodwork in water-tight containers for transport to the Project Site to prevent damage, water damage, soiling and deterioration and for storage in a location other than inside the building, if necessary.
- C. Do not store woodwork on the Project Site for a long period of time. If, due to unforeseen circumstances, the woodwork must be stored in other than the installation areas, store only in areas meeting the requirements specified for the installation areas.
- D. Do not deliver woodwork until wet work, grinding, painting and similar operations which could damage, soil or deteriorate the woodwork has been completed in the installation areas, and humidity has been stabilized.
- E. Deliver products to the Project Site in the fabricator's original, new, unopened packaging, crates or containers.

1.10 JOB CONDITIONS

- A. The fabricator of woodwork shall determine the optimum moisture content and required temperature and humidity conditions.
- B. The installer shall advise the Contractor of the temperature and humidity requirements for the architectural woodwork installation areas. Do not install woodwork until the required temperature and relative humidity has been stabilized and will be maintained in the installation areas.
- C. Stabilize temperature and humidity in installation areas, as necessary, to maintain the moisture content of the installed woodwork within a 1.0% tolerance of optimum, from the date of installation throughout the remainder of the construction period.
- D. Unless instructed otherwise by the Installer, maintain the spaces to receive woodwork between 55°F and 65°F, with a relative humidity of 50% or less for 72 hours prior to, during and after installation until the date of Substantial Completion.

1.11 WARRANTY

- A. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
- B. Fabricator's Warranty: Provide fabricator's standard Warranty against defects in product materials and workmanship.

PART 2 PRODUCTS

2.1 WOOD FACED CASEWORK AND TRIM

- A. AWI, premium custom grade, natural finish.
- B. Trim and Solid Stock: Solid, kiln dried, premium custom grade, wood species as selected.
- C. Core Stock: 3/4" plywood or medium density melamine particleboard, veneer finish at exposed faces, melamine or matching veneer finish at semi-exposed faces, outside and inside drawers, cabinet backs, shelves, etc.
- D. Species and Cut: Lumber and veneer for transparent and opaque finish shall be as indicated herein or in the Finish Schedule, interior drawings and details, or as selected.
- E. Factory Finished: Casework shall be factory finished per AWI 1500, System 5, catalyzed polyurethane, satin medium rubbed effect, filled finish.
- F. Backpriming: Back prime the work with a single coat of spar varnish or other acceptable sealer for fabricated units to be installed as an exterior component or where against portland cement plaster, gypsum plaster or against an exterior facing wall of concrete or masonry. Ensure that the sealer does not contaminate surfaces requiring a transparent finish.

2.2 PLASTIC LAMINATE FACED CASEWORK AND SHELVING

- A. Core Stock: Material shall be 45 pound density hard board, industrial grade.
 - 1. Minimum core thickness shall be 3/4" except:
 - a. Hidden cabinet backs may be 1/4" thick hardboard.
 - b. Exposed backs and drawer bottoms may be 1/4" thick.
 - c. Drawer sides may be 1/2" thick.
 - d. Backs of free standing cabinets may be 1/2", 5/8" or 3/4" thick, as indicated or required.
 - e. Cabinet bases (toe spaces) may be solid kiln-dried wood, unfinished for finish applications by others.
 - f. Shelf thickness shall be 1" for any shelf over 3' long.
 - 2. Laminated Plastic. Where Plam is indicated for exterior cabinet finish, all visible exposed faces and edges shall be covered with laminated plastic, unless otherwise specified herein. Provide backer as necessary to balance plastic laminate installation at concealed locations.
 - a. Fabricators: Subject to compliance with the Project requirements, fabricators offering products which may be incorporated into the work include the following:
 - 1). Formica Corporation.
 - 2). Nevamar Corporation.
 - 3). Wilsonart International.

- b. High-Pressure Decorative Laminate: NEMA LD-3, GP-50, General Purpose:
 - 1). Nominal 0.050" thick for horizontal and high usage exposures.
 - 2). 0.02" thick for vertical and medium usage exposures.
 - 3). 0.020" thick, liner grade, for all semi-exposed faces inside drawers, doors, backs, shelves, etc.
 - 4). Color(s) as selected.
 - c. Section 01000 - Product Requirements: Product Options: Substitutions permitted.
3. Laminated Plastic Adhesive: Type recommended by the laminated plastic manufacturer bonded by machine application and pressure of not less than 100 pounds per square inch.
 4. Edge Treatment: Top edges of drawer sides and drawer backs edge of doors, fixed panels, visible frame parts and drawer face tops and edges shall be matching laminate faced or shall be resilient polyvinylchloride 0.024" thick, machine bonded with hot melt glue, factory edges trimmed, superfinished, buffed and polished.

2.3 PLASTIC LAMINATE COUNTERTOPS

A. Plastic Laminate Tops:

1. Core thickness of countertop substrate shall be 3/4" or 1" as indicated. Backsplash core shall be 3/4" or 1 1/2" in two-piece countertop applications.
2. Finish wear surfaces, including all edges, shall be 0.050" plastic velvet or satin finish, pattern or solid color, as selected from the manufacturer's standards.
3. Underside of decks and back side of backsplashes shall have 0.02" balance sheet bonded to the substrate whether or not the countertop is in Awet or Adry usage.
4. Backsplash to deck joints shall be shoulder rabbited, glued, mechanically fastened, and sealed during assembly with a silicone compound backsplash color shall be compatible with the deck color.
5. Transverse deck joints shall be spaced as far apart as material limitations allow, shall be deb sealed during installation with silicone compound, and shall be securely drawn together with concealed mechanical joint fasteners.
- Where noted on the Drawings, chemical-resistant countertop surfacing with solid-core edge banding shall be used when severe resistance to reagents is required.
7. Use acid-resistant plastic laminate at Science Laboratories, Art Rooms and adjacent Storage Room counters.

2.4 SOLID POLYMER FABRICATIONS

- A. Provide fabrications of cast solid polymer material composed of acrylic polymer with mineral fillers and pigments where indicated. Material shall not be coated or laminate to

substrates. Superficial damage to a depth of 1/4" shall be repairable by sanding or polishing. Products by:

1. Avonite Surfaces.
2. DuPont Corian.

B. Sill:

1. Width x Height: Fabricator's standards of sill best meeting the project requirements. Backsplash to be 4" in height, unless otherwise indicated.
2. Thickness:
 - a. Horizontal surfaces - 3/4" minimum.
 - b. Vertical surfaces - 1/2" minimum x backsplashes - 3/4"

C. Finish: Polished, unless otherwise indicated. Top, backsplash and fascia shall be one-piece. Color, edge detail and pattern shall be as selected from the fabricator's standards.

D. Color x Pattern: The basis of design is products by Avonite or approved comparable color x pattern.

E. Related Materials:

1. Panel Adhesive: Fabricator's standard specifically recommended for the Project application. Adhesives used at installations exposed to water or high humidity conditions to be water-resistant type.
2. Joint Adhesive: Fabricator's standard capable of fusing each joint and creating inconspicuous and non-porous joints.
3. Sealant: Fabricator's recommended mildew resistant, FDA x UL recognized silicone sealant, in colors custom matched to each component where sealant is required.
4. Mounting Hardware: Provide mounting hardware including sink x bowl clips, inserts and fasteners for the attachment of undermount sinks and lavatories.
5. Anchorage Devices: Fabricator's approved clips, inserts, and anchorage devices. Ferrous products to be hot-dipped galvanized. Do not use metal types not specifically approved by the fabricator for their products.

F. Fabrication:

1. Factory fabricate components to the greatest extent possible, to the sizes and shapes indicated, in accordance with the approved Shop Drawings. Where indicated, factory fabricate side and back splashes with 1/2" cove at intersections.
2. Form joints between components using the fabricator's standard acrylic joint adhesive. Joints shall be inconspicuous, non-porous, and reinforced with strips of solid polymer material in accordance with the fabricator's printed instructions.
3. Tolerances:

- a. Variation of component size: ± 1/8"
 - b. Location of openings: ± 1/8" from the required location.
4. Provide factory cutouts for plumbing and accessories as indicated. Reinforce heated or cooled cutouts in accordance with the Approved Shop Drawings and the fabricator's printed instructions.
 5. Cut an finish components edges with clean returns. Round edges of cutouts to 1/8" radius. Round corners of cutouts with 1/2" minimum radius. Use router to form all cutouts. Provide thick edges where indicated using strips of solid polymer material and fabricator's acrylic joint adhesive. All joints to be inconspicuous and non-porous. All exposed surfaces to have a uniform finish and gloss.
- Countertop Joint Layout: Provide a monolithic look to the greatest extent possible. Where joints in the work is required due to fabrication limitations or required for proper performance of the product, work with the Owner's representative to establish satisfactory joint locations.

2.5 MARBLE AND GRANITE COUNTERTOPS

- A. Thickness shall be 3/4" minimum.
- B. Edge detail shall be as selected.
- C. Top, backsplash and fascia shall be a color and pattern selected from the fabricator's standards. Location of joints shall be shown on shop drawings.

2.6 WOOD SHELVING

- A. Softwood plywood, PS 1, graded in accordance with AWI.
- B. Veneer cover core sides and ends with plastic laminate, color as selected.
- C. Cover medium density particleboard with factory-applied finish, as selected.
- D. Dimensions: 3/4" thick x depth shown on the Drawings x maximum possible length.

2.7 CABINET HARDWARE AND ACCESSORY MATERIALS

- A. General: Provide complete cabinet hardware and accessory materials associated with the architectural woodwork, except for units specified as "door hardware" in other Sections of these Specifications.
- B. Hardware References: Except as otherwise indicated, comply with ANSI A15.1-9 "American National Standard for Cabinet Hardware".
- C. Cabinet Door Hardware: Provide hinges and pulls of the types indicated, to accommodate each door size and style. Hinges concealed "European" style. Pulls - EPCO DP-41" x 3-1/2" wire pull or as indicated or approved.
 1. Each cabinet door up to 36" in height shall have one pair of hinges up to 48" in height, 1-1/2" pair hinges over 48" in height, two pair of hinges. Each cabinet shall be equipped with sound dampening cushions to minimize noise.

- D. Drawer Hardware: Provide slides and pulls of the types indicated, to accommodate each drawer size and style.
 - 1. Equip each drawer with side-mounted, full-extension, ball-bearing, nylon roller drawer slides with a load capacity of 75 pounds per pair—provide “stay-closed” feature for lift out removal.
- E. Locks: Provide standard pin-type or disc-type (five pins or discs) tumbler locks, keyed individually, except as otherwise indicated.
- F. Shelf Supports: Where shelving is indicated as “adjustable”, provide pin-type or slotted-type standards and brackets of a type required to support shelves with a uniform load of 40 pounds per square foot—recessed for premium construction, surface-mounted for custom and economy construction.

2. ACCESSORIES

- A. Adhesive: Type recommended by AWI to suit the application.
- B. Fasteners: Size and type to suit the application.
- C. Bolts, Nuts, Washers, Lags, Pins and Screws: Of the size and type to suit the application.
- D. Concealed Joint Fasteners: Threaded, hot-dipped galvanized steel.
- E. Sealant: Manufacturer’s recommended mildew resistant, FDA —UL recognized silicone sealant in colors custom matched to each component where sealant is required.
- F. Anchorage Devices: Fabricator’s project approved clips, inserts, and anchorage devices. Ferrous products to be hot-dipped galvanized. Do not use metal types not specifically approved by the fabricator for their products.

2.9 FABRICATION

- A. Field Measurements:
 - 1. Before proceeding with the fabrication of architectural woodwork products, obtain field measurements and verify dimensions.
- B. Wood Products:
 - 1. Fabricate architectural woodwork products to the dimensions, profiles and details indicated, with construction and materials complying with the referenced standards of the specified AWI grades. Where necessary for fitting at the Project Site, provide reasonable allowance for scribing, trimming and fitting. Pre-cut openings, where possible, to receive hardware and mechanical and electrical work.
 - 2. Conceal all anchorage devices, except where decorative fasteners are approved.
- C. Fire-Retardant Treatment:
 - 1. Where fire-retardant wood is specified or otherwise indicated, provide materials which comply with AWPA standards for pressure impregnation with fire-retardant chemicals, and which have a flame spread rating of not more than 25 when tested in accordance with UL 723 or ASTM E 84, and show no increase in flame spread

and significant progressive combustion upon continuation of the test for an additional twenty (20) minutes.

2. Where treated items are exposed to the exterior or to high humidity or are to have a transparent stain or sealer finish, provide appearance grade materials which show no change in the fire hazard classification when subjected to standard rain test per UL 790 or ASTM B 209.
3. Use fire-retardant treatment which will not bleed through or adversely affect the type of finish indicated, and which does not require brush treatment of field made end cuts to maintain the fire-hazard classification.

D. Products Scheduled for Transparent Finish:

1. Treatment color shall be compatible with products scheduled for a transparent finish. Provide samples of treatment with finish applied for review.
2. Where a transparent finish is indicated, use the type of treatment and species which permits milling of the lumber after treatment without altering the indicated fire-hazard classification, as determined by fire testing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required and ready to receive the work.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Condition woodwork to the average prevailing humidity conditions in the installation areas before installing.
- B. Install concrete inserts and similar anchoring devices to be built into substrates well in advance of the time the substrates are to be built.
- C. Prior to the installation of architectural woodwork, examine shop fabricated units for completion, and complete work as required, including back priming and removal of packing.

3.3 INSTALLATION

- A. Set and secure fixtures in place at the locations indicated on the Drawings.
- B. Cabinets and countertops shall be installed by factory-trained personnel, or by personnel experienced in installing the type of countertops and splashes required.

- C. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims.
- D. Scribe and cut work to fit adjoining work—refinish cut surfaces or repair damaged finishes at cuts in strict accordance with the fabricator’s instructions.
- E. Secure woodwork to anchorage devices or blocking built-in or directly attach to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nail as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersink and fill flush with the woodwork surface. Match the final finish where transparent finish is indicated.
- F. Casework: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated. Maintain the indicated veneer sequence matching of casework with transparent finish.
- G. Secure fixtures to the floor using appropriate angles and anchorages.
- H. Countertops: Anchor securely to base units and other supports as indicated, in strict accordance with the fabricator’s instructions.
- I. Wood Storage Shelving: Complete the assembly of units and install in the locations indicated, including hardware and accessories, as indicated.
- Finish: AWI quality standard. Leave woodwork in paint ready condition for final finishing by the painting applicator.
- K. Apply sealant at all joints between architectural woodwork and adjacent floor and walls.

3.4 CONSTRUCTION

- A. Interface with Other Work:
 - 1. Coordinate the installation sequence of fixtures with the trades providing utilities to the units.
- B. Tolerances:
 - 1. Fabrication: Variation of Components Size: □ 1/16" Location of Openings: □ 1/16" from the required location.
 - 2. Installation: 1/16" in □=0" for plumb and level, including countertops, and with 1/16" maximum, offset in flush adjoining surfaces □ 1/32" maximum offsets in revealed adjoining surfaces.
- C. Finishing:
 - 1. Repair damaged and defective woodwork wherever possible to eliminate defects functionally and visually. Where not possible to repair to the satisfaction of the Owner’s representative, replace the woodwork.
 - 2. Touch-up shop applied finishes to restore damaged and soiled areas.
 - 3. Adjust grain for a uniform appearance.

4. Complete the finishing work specified as work of this Section, to whatever extent not completed in the shop or prior to installation of the woodwork.

3.5 ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting the installed work.
- B. Lubricate and make final adjustment of moving and operating parts for smooth and correct operation.

3.6 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect woodwork installations for flush, plumb, level, alignment and secure attachment to substrates.

3.7 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning and protection of installed work.
- B. Clean casework, counters, shelves, hardware, fittings and fixtures.
- C. Clean woodwork on exposed and semi-exposed surfaces.

3.8 PROTECTION

- A. Installer shall advise the Contractor and paint applicator of the procedures required to protect the woodwork during the remainder of the construction to ensure that the work will be without damage and deterioration at the time of final acceptance.
- B. Installer shall return to the Project prior to substantial completion, repair any damage to the work and readjust the hardware.

END OF SECTION

SECTION 0050

SOLID POLYMER FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Countertops.
2. Work surfaces.
3. Vanities.
4. Window sills.
5. Preparation for installation and connection of utilities.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 00400 - Architectural Woodwork: Support for countertops, work surfaces and vanities.
2. Section 07900 - Joint Sealers: Sealants for Joints.
3. Section 09110 - Non-Load Bearing Steel Framing: Blocking and backing plates in walls.
4. Section 09250 - Gypsum Board: Adjacent wall substrate.
5. Section 12305 - Science Casework and Laboratory Equipment: Support for countertops.
6. Division 15 - Plumbing Fixtures.
7. Division 16 - Wiring Devices.

1.2 DESCRIPTION OF WORK

- A. The extent of Solid polymer fabrications work is indicated on the Drawings and as specified herein, and includes providing, fabricating and installing cast synthetic polymer fabrications, splashes, inlays, adhesive, sealant, mounting accessories and preparation for installation of plumbing fixtures, and mechanical and electrical services by other trades.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only. Comply with the

applicable standards of the following, as referenced herein.

B. American National Standards Institute (ANSI):

1. ANSI A124.3 - Plastic Lavatories.
2. ANSI A124.4 - Plastic Sinks.

C. American Society for Testing and Materials (ASTM):

1. ASTM C 501 - Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.
2. ASTM D 256 - Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
3. ASTM D 570 - Test Method for Water Absorption of Plastics.
4. ASTM D 338 - Test Method for Tensile Properties of Plastics.
5. ASTM D 698 - Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Fused Silica Dilatometer.
6. ASTM D 700 - Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.
7. ASTM D 790 - Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
8. ASTM D 2583 - Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
9. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
10. ASTM G 21 - Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
11. ASTM G 155 - Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.

D. Americans with Disabilities Act Accessibility Guidelines (ADAAG):

1. Accessibility Guidelines for Buildings and Facilities.
2. Accessibility Guidelines for Schools

E. National Electrical Manufacturers Association (NEMA):

1. NEMA LD3 - High Pressure Decorative Laminates.

F. National Fire Protection Association (NFPA):

1. NFPA 255 - Method of Test for Surface Burning Characteristics of Building Materials.

- G. Underwriters Laboratories, Inc. (UL):
 - 1. UL 723 - Test for Surface Burning Characteristics of Building Materials.
- H. U. S. Environmental Protection Agency (EPA):
 - 1. Method 24 - Determination of Volatile Matter Content.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
 - 1. Product Data: Manufacturer's current product literature for each product indicated.
 - 2. Shop Drawings: Show the location of each item, dimensioned plans, elevations, large scale details, construction joint locations, termination points, attachment devices and other components. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in Section 09110. Show locations and sizes of cutouts and hole for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items to be installed in the solid surface.
 - 3. Samples:
 - a. Initial Samples: Unless specific products are scheduled, submit 2"x 2" minimum, size samples of the manufacturer's complete range of colors, patterns, and glosses for initial selection.
 - a. Final Samples:
 - 1). Submit two (2) 4"x 4" final samples matching the color, pattern and gloss of those initially selected.
 - 2). Fused Joint Sample: Submit 4"x 10" samples showing fused joint work.
 - 3). One sample or each will be retained at the Project Site as the standard for the work.
 - 4. Assurance Control Submittals:
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - b. Manufacturer's Material Safety Data Sheets (MSDS).
 - c. Manufacturer's Fabricator's certification that the products supplied comply with applicable federal and local regulations controlling the use of volatile organic compounds (VOC).
 - d. Manufacturer's Instructions indicating procedures and conditions requiring special attention, and cautionary procedures required during fabrication.
 - e. Documentation of experience indicating compliance with the specified qualifications requirements.

- f. Signed copy of the Fabricator's certificate, acknowledging that he she has been trained and approved by the manufacturer.
- B. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
 - 1. Warranty: Provide a written special Warranty with forms completed in the name of the Owner and registered with the fabricator.
- C. Maintenance Data: Submit Manufacturer's care and maintenance data, including repair and cleaning instructions.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 - 2. Fabricator Installer: Certified by the manufacturer, and has successfully completed fabrications of the type required for this Project, and has been continuously engaged in this type of work for not less than five (5) years.
- B. Field Measurements: When possible, take field measurements prior to the preparation of Shop Drawings and fabrication to ensure proper fitting of the work, otherwise, indicate field measurements on the final Shop Drawings.
- C. Installation to be by the Fabricator of the products, for single source responsibility.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Section 01000 - Product Requirements: Transport, handle, store and protect the products.
- B. Package products in packages, crates or containers for transport to the Project Site to prevent damage, water damage, soiling and deterioration.
- C. Deliver sheets, fabricated items, materials and components to the Project Site in the fabricator's original, new, unopened, undamaged packages, crates or containers with identification labels intact.
- D. Do not deliver products until wet work, grinding, painting and similar operations have been completed in the installation areas.
- E. If, due to unforeseen circumstances, the fabrications must be stored in other than the installation areas, store only in areas meeting the requirements specified for the installation areas.

1.7 JOB CONDITIONS

- A. The Installer shall advise the Contractor of the temperature requirements for the installation areas.
- B. Do not install the fabrications until the required temperature has been stabilized and will be maintained in the installation areas.

1.8 WARRANTY

- A. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
- B. Special Warranty:
 - 1. Submit a written Warranty jointly signed by the solid polymer manufacturer and the fabricator certifying that the products and the installation is free of defective materials and workmanship, and will repair or replace any defective component or the fabrication, in whole or in part, as necessary to restore the product to its original intended state and integrity.
 - 2. Warranty Period: Ten (10) years from the date of Substantial Completion.

1.9 MAINTENANCE

- A. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
- B. Provide manufacturer's maintenance kit for finishes.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 - 1. Avonite Surfaces by Aristech Acrylics LLC..
 - 2. Corian by DuPont, Inc.
- B. Section 01000 - Product Requirements: Product Options: Substitutions: Not permitted.

2.2 MATERIALS

- A. General:
 - 1. Studio Collection by Avonite.
 - 2. D Series Corian by DuPont.
- B. Description:
 - 1. Non-porous, homogeneous material maintaining the same composition throughout, with a composition of polyester or acrylic polymer, aluminum trihydrate filler and pigment.
 - 2. Thickness: 3/4" unless shown otherwise specified.
 - 3. Colors and patterns, as selected, from the manufacturer's full line of standard colors and patterns
 - 4. Adhesive: Water-based adhesive as recommended by the polymer manufacturer for the substrate and conditions.
 - 5. Sealant: Mildew-resistant, FDA-compliant as recommended by the manufacturer color to match the solid surface material.

2.3 FABRICATION

A. General:

1. Factory fabricate by a solid polymer manufacturer's certified fabricator.
2. Comply with the details shown for profile and construction of fabrications. Where not otherwise shown, comply with the manufacturer's written instructions.
3. Provide separate countertops for installation on casework or other support systems, as indicated.
3. Measurements: Before proceeding with fabrications required to be fitted to other construction, obtain measurements and verify the dimensions and Shop Drawings details, as required for an accurate fit. Where measuring substrates before fabrication would delay the project, proceed with the fabrication and provide sufficient borders and edges to allow for subsequent scribing and trimming for an accurate fit.
4. Fabricate from single piece material, except where the required length exceeds the maximum length produced by the manufacturer. Locate joints at even intervals through the material, aligned with other adjacent joints, and as approved on the final Shop Drawings. Form joints using the manufacturer's recommended adhesives for a smooth even appearance with matching color for an inconspicuous appearance. Provide joints of an equal or greater strength than the material being jointed.
5. Pre-Cut Openings: Pre-cut openings in fabrications, wherever possible, to receive plumbing fixtures, electrical work and similar items. Locate the openings accurately, and use templates or roughing-in diagrams for the proper size and shape. Smooth edges of cutouts and, where located in countertops and similar exposures, seal the edges of cutouts with a water-resistant material.
 - Cutouts for sinks and lavatories shall be smooth and uniform without saw marks. The top and bottom of openings shall be finished smooth. Where edges are exposed, fabricate with 1/4" radius or 1/4" radius at cutouts, or as indicated.
7. Fabricate to accommodate plumbing fixtures, trim and drains.

A. Countertops and Work Surfaces:

1. Fabricate tops from 3/4" thick material with 1/2" thick x 1/4" high splashes and 2" skirts, unless otherwise indicated. Include 3/4" thick solid support braces with aluminum angle clips for interconnection of components.

C. Vanities:

1. Fabricate tops from 3/4" thick material with 1/2" thick x 1/4" high splashes and 4" skirt, unless otherwise indicated.

D. Window Sills:

1. Provide sizes and profiles as detailed. Where joints are required, locate at the center of openings or at the center line of window mullions.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's recommendations.
 - 2. Cure fabrications for 24 hours, minimum, before exposure to moisture or pressure.
 - 3. Install the work plumb, level, true and straight with no distortions. Shim as required, using concealed shims. Install to a tolerance of 1/4 in ±0 for plumb and level and with 1/32 maximum offsets in revealed adjoining surfaces.
 - 4. Scribe and cut work to fit adjoining work. Refinish cut surfaces and repair damaged finish at cuts.
- B. Anchorage:
 - 1. Anchor fabrications to anchors or blocking built-in or directly attached to substrates as detailed. Secure to grounds, stripping and blocking with concealed fasteners as required for a complete installation.
 - 2. Securely anchor countertops to base units and other support systems as indicated.
- C. Countertops, Work Surfaces and Joints:
 - 1. Anchor units to supports using concealed fasteners. Do not use continuous adhesive application. Field cut as required for plumbing fixtures and fittings. Plumbing fixtures, trim, drains, and connections are specified in Division 15. At recesses, install loose splashes with adhesive. Seal joints and perimeter with matching acrylic sealant as specified in Section 07900 - Joint Sealers, except at joints, use matching mildew-resistant silicone sealant as specified in Section 07900.
- D. Window Sills:
 - 1. Anchor window sills to substrate with non-staining adhesive as recommended by both stool and adhesive manufacturer. Cut and trim to fit with joints only at

approved locations. Make seamless joints. Fill joints between stools and other materials with acrylic sealant as specified in Section 07900.

3.3 ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting the installed work.
- B. Repair soiled, damaged and defective fabrications wherever possible to eliminate defects functionally and visually where not possible to repair properly, replace the fabrications.

3.4 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect installations for level, inconspicuous joints, tight fit to adjacent surfaces and secure attachment to substrates.

3.5 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- B. Clean exposed and semi-exposed surfaces.
- C. Remove adhesives, sealants and other stains.

3.6 PROTECTION

- A. The Fabricator/Installer shall advise the Contractor of the protection and maintained conditions necessary to ensure that the work will be without damage or deterioration at the time of final acceptance.

END OF SECTION

SECTION 07110
WATERPROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Below grade walls waterproofing.
2. Existing below grade walls affected by new construction waterproofing.
3. Planters waterproofing.
4. Concrete parking and traffic decks waterproofing.
5. Horizontal roof slabs supporting earth waterproofing.
- Split concrete slabs waterproofing.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for waterproofing.
2. Section 04230 - Reinforced Unit Masonry: Substrate for waterproofing.
3. Section 04400 - Natural Stone: Dampproofing under natural stone.
4. Section 07190 - Water Repellents (Sealer): Water repellents and slurry coat dampproofing.
5. Section 09300 - Tile: Dampproofing under ceramic and quarry tile flooring.

1.2 DESCRIPTION OF WORK

A. The extent of each type of waterproofing is indicated on the Drawings and as specified herein, and includes providing and installing all waterproofing materials. Similar work used as an exposed finish is excluded by definition and, if required, is specified as roofing, flooring, special coating or other appropriate category.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM C 442 - Test Method for Water Absorption.
2. ASTM D 545 - Test Method for Flash Point by Closed Cup Tester.

3. ASTM D 3900 - Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
 4. ASTM E 514 - Test Method for Water Penetration and Leakage Through Masonry.
- C. U. S. Environmental Protection Agency (EPA):
1. Method 24 - Determination of Volatile Matter Content.

1.4 SUBMITTALS

- A. Section 01330 - Submittals: Procedures for submittals.
1. Product Data: Submit manufacturer's specifications, recommendations for water repellents for each surface specified, performance data, surface preparation and application instructions, precautions for materials which can contaminate the system, limitations to coating, protection and cleaning instructions and VOC content. Include recommendations for sealing penetrations, cracks and control, construction and expansion joints. Submit color charts for products required to be integrally colored.
 2. Shop Drawings: Indicate details critical to water tightness of the membrane, including, but not necessarily limited to, membrane transitions terminations at perimeters, drains, sleeves and other penetrating elements.
 3. Samples: For each type of waterproofing system, submit a 12" x 11" board sample of each complete system. Where the membrane is a layered system, expose at least 1" of each succeeding layer. Top coats to be provided with Project required colors as selected.
 4. Assurance Control Submittals:
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - b. Manufacturer's Material Safety Data Sheets (MSDS).
 - c. Manufacturer's certification that the products supplied comply with applicable federal and local regulations controlling the use of volatile organic compounds (VOC).
 - d. Manufacturer's Instructions indicating procedures and conditions requiring special attention, and cautionary procedures required during application.
 - e. Documentation of experience indicating compliance with the specified qualifications requirements.
- C. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
1. Warranty: Submit a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5

QUALITY ASSURANCE

- A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience, and has a record of successful in-service performance.
 2. Applicator: Company experienced in applying the types of waterproofing required for this Project for not less than five (5) years, and is acceptable to the primary waterproofing materials manufacturer. Employees assigned to the Project shall have been trained by an approved waterproofing materials manufacturer.
- B. Mockup: Apply water repellent to a mockup, either partial or full coverage, as directed, before proceeding with the application. Comply with the application requirements contained herein.
- C. Regulatory Requirements: Comply with applicable rules and regulations of the pollution-control regulatory agency having jurisdiction regarding volatile organic compounds (VOC) and use of hydrocarbon solvents.
- D. General: Obtain the primary materials from a single manufacturer. Provide secondary materials only as recommended by the manufacturer of the primary materials.
- E. Manufacturer's Technical Representative:
1. The primary waterproofing materials manufacturer to make a Technical Representative available to monitor the on-going work to ensure proper application of the waterproofing system. The manufacturer must maintain the same Technical Representative for the duration of the Project.
 2. Pre-Application Review: Prior to the start of work and the purchase of any materials, the Manufacturer's Technical Representative, who is to certify each application, shall visit the Project Site, review existing conditions, and review the Contract Document for appropriateness of the requirements with the specified manufacturer's system including, but not necessarily limited to membrane requirements, substrate preparation, membrane terminations, reinforcements, flashing conditions, penetrations, including multiple penetration requirements, joints required and treatment and protection of the membrane.
 3. Certification: After the Manufacturer's Technical Representative's review, submit written certification of the appropriateness of the requirements, or submit other or additional specific recommendations, if any, to assure that the specified system is appropriate for the use intended and complete in scope to assure its intended performance. This should be coordinated with the Shop Drawing Submittal.
 4. Substrate Certification: Submit the Technical Representative's written certification of compliance that the prepared substrate is in conformance with requirements necessary for the system installation. Certification of the substrate is to be accomplished just prior to the start of application of the membrane system.
 5. Technical Representative's Field Review of Work:
 - a. Number of Site Visits: Submit the manufacturer's recommended minimum number of times the Technical Representative is to field review the work to ensure success of the installation. Indicate when such visits are to be made.
 - b. Field Reports: For each visit, the Technical Representative shall submit a detailed Field Report assessing each application. Field Reports to

indicate the date, time of day, length of each visit, weather condition during the visit, condition of the substrate at the time of application, application procedures, and other important aspects that affect success of the application. Submit Reports within seven (7) days after each Site visit.

- F. Performance Requirements: It is required that the waterproofing membrane be watertight, and not deteriorate in excess of the limits published by the membrane manufacturer.

1.0 COORDINATION

- A. Pre-Application Conference: Prior to start of the application of materials, meet at the Project Site with the Owner's representative, Architect, Contractor, Applicator and subcontractors whose work penetrates the surfaces to be waterproofed. Review the conditions, methods and procedures necessary for application of the work, including inspections of the areas of work, requirements of the Specifications and the manufacturer's literature—review submittals and schedules.
- B. Tolerances —Finish of Substrates: Coordinate with other trades providing substrates over which the waterproofing is scheduled for the required tolerances, conditions and finish of the substrates necessary to ensure successful application of the work of this Section. Coordinate in a timely manner so other trades can implement their requirements in accordance with the —Job Schedule. Submit documentation of the coordination, including the date of the coordination, with whom coordinated, and the requirements specified.
- C. Control —oints: Control —oints are indicated on the Drawings. Where additional or other configuration for control —oints is required in substrates other than what is currently required to ensure success of each membrane application, submit the requirements to the Owner's representative for review, and arrange with the substrate installer for installation of such control —oints.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Section 01—00 - Product Requirements. Transport, handle, store, and protect the products.
- B. Deliver products to the Project Site in the manufacturer's original, new and unopened packages or containers with seals and labels intact—dry and undamaged, bearing the product name, color, manufacturer's lot number, directions for use and precautionary labels.
- C. Store materials not in actual use, in tightly covered containers. Maintain containers used in the storage of materials, in a clean condition, free of foreign materials and residue.
- D. Store materials in a well ventilated area, and in compliance with the manufacturer's published instructions.
- E. Store and handle materials to prevent deterioration and damage due to moisture, temperature changes, contaminants, and other causes.
- F. Protect against fire hazards and spontaneous combustion.
- G. Keep storage areas neat and orderly. Remove waste daily.
- H. Take all precautions to ensure that workmen and the work areas are adequately protected from health hazards resulting from handling, mixing and application of the materials.

1.0 —OB CONDITIONS

- A. Proceed with the waterproofing work only after the substrate construction and penetrating work has been completed.
- B. Environmental Requirements: Do not apply products under any of the following conditions, except with the written recommendation of the manufacturer:
 - 1. Substrate surfaces cured less than thirty (30) days.
 - 2. Surfaces not dry for a minimum of 24 hours.
 - 3. Rain predicted within 24 hours.

1.9 WARRANTY

- A. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
- B. Special Warranty:
 - 1. Provide a joint and severable written Warranty signed by the waterproofing materials manufacturer, Contractor and the Applicator, agreeing to repair or replace defective materials and workmanship, defined to include leakage of water, ruptures caused by cracking substrate up to 1/4" abnormal aging or deterioration of materials, and other failures of membranes to perform as required within the warranty period. Warranty shall include responsibility for removal and replacement of other work which conceals the waterproofing membrane.
 - 2. During the warranty period, repairs and replacements required because of acts of God and other events beyond the Contractor's or Applicator's control, and which exceed the performance requirements, shall be completed by the Contractor or Applicator and paid for by the Owner at the prevailing rates.
 - 3. Warranty Period: Five (5) years from the date of Substantial Completion of the waterproofing work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 - 1. Urethane Polymers International (UPI).
 - 2. Carlisle Coatings and Waterproofing, Inc. (CCW).
- B. Section 01000 - Product Requirements: Product Options: Substitutions permitted.

2.2 SYSTEM

- A. The following specifications are based on Urethane Polymers International products to establish quality.
- B. Other acceptable manufacturer's systems shall be equivalent.

2.3 WATERPROOFING MATERIALS

- A. WP-1 (for vertical and horizontal surfaces below grade, masonry backer walls and inside planters): Single component, fluid-applied, modified elastomeric waterproof membrane, UPI System BG-7011-90 Mil by Urethane Polymers or approved equal 90 mils thickness for walls and vertical surfaces.
- B. WP-2 (for horizontal roof slabs supporting earth or paving and split slab construction): UPI System BG-7011-R-90 Mil or approved equal.
- C. WP-3 (for exposed concrete parking and vehicular traffic decks): Single component, moisture-curing, polyurethane elastomeric membrane UPI Uradek System 70-S for parking stalls Uradek System 70-H or approved equal for entrances, ramps and drives.
- D. Caulking Compound: Single component, polyurethane as recommended by the primary waterproofing materials manufacturer.
- E. Aggregate: As recommended by the manufacturer and approved by the Owner's representative.
- F. Other materials as recommended by the manufacturer of the prime materials.

2.4 PROTECTION DRAINAGE BOARD

- A. Composite structure of a molded, three-dimensional, high impact-resistant polymeric sheet with a filter fabric bonded to the open side. ACCW MiraDRAIN 000 as manufactured by Carlisle Coatings or approved equal.
 - 1. Attach panels to the substrate with an adhesive recommended by the manufacturer.

2.5 MISCELLANEOUS MATERIALS

- A. Parge Coat: Where the manufacturer requires a portland cement parge coat over rough or porous substrates, the Contractor shall provide such parge coat as required at no additional cost. Failure of the parge coat or the absence of a parge coat will be considered as failure of the membrane system to perform as the parge coat is a required condition for the membrane's success over substrates requiring a parge coat.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 - 1. Verify that joint sealants are installed and cured.
 - 2. Verify that surfaces to be coated are dry, clean, and free of efflorescence, oil, and other matter detrimental to application of the coating.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate surfaces of projections and substances detrimental to the work, acid etch smooth surfaces, fill all voids to comply with recommendations of the prime materials manufacturer. Stripe coat all cracks up to 1/8" wide, rout and patch cracks larger than 1/8"
- B. Moisture Content Testing: Just prior to application, test substrates with an electronic moisture meter. Do not proceed until the moisture content is within the manufacturer's acceptable tolerances.
- C. Protection of Other Work: Do not allow liquid or mastic compounds to enter and clog drains, sleeves or conductors. Prevent spillage and migration onto other surfaces of the work by masking or otherwise protecting the adjoining work.

3.3 INSTALLATION

- A. General: Comply with the manufacturer's instructions, except where more stringent requirements are shown or specified, and except where Project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
- B. Thickness Testing: Monitor mil thickness application by a monitoring method recommended by the Manufacturer's Technical Representative for each specific system.
- C. Reinforcement: Unless otherwise acceptable, or as otherwise recommended, in writing, by the Manufacturer's Technical Representative, reinforcement is to be provided as follows and in the manner indicated:
 - 1. Material: Manufacturer's recommended elastomeric sheet and/or polyester fabric fully encapsulated in the primary membrane coating of a thickness equal to the total thickness required for the primary membrane, unless otherwise recommended by the manufacturer, and has been reviewed and approved on submittals.
 - 2. Transitions: At transitions from vertical to horizontal, at inside and outside corners, and at other similar transitions that are not expansion/control joints, penetrations, or cracks, embed reinforcement of a width that extends 6", minimum, onto each surface on each side of the intersection.
 - 3. Expansion/Control Joints: Embed reinforcement of a width necessary to extend the material 6", minimum, on each side of the joint, plus additional materials, as necessary, to accommodate movement of the joint. Small joints are to be bridged over backer rods placed in the joints. Reinforcement is to be looped down into the joints with backer rod placed in the loop.
 - 4. Penetrations: 3" square reinforcement, but not less than necessary to extend out in all directions from the penetration a distance of 12", minimum, beyond the flange of each penetration.
 - a. Pipes, Conduits, and Similar Components: Construct a form fitting elastomeric boot 6", minimum, in height and with an integral elastomeric flange extending 6", minimum, onto the wall or deck. The boot shall be fully adhered to the penetrating element and fully encapsulated at the interface with the wall or deck. Apply 3" square reinforcement material over this, fully encapsulated in the primary membrane material.

- b. Cracks: Encapsulated reinforcement of a width necessary to extend the material 2" minimum, on each side of the crack.

3.4 APPLICATION

- A. WP-1: Prime coat the substrate surface at the rate of 250 - 300 sq. ft. /gallon. Apply with rollers, two or more coats of (30 dry mils) at the rate of 4.5 gallons /100 sq. ft. to produce 90 dry mils total thickness at vertical surfaces. Allow 1 hour curing time between coats.
 - 1. Attach Protection / Drainage Boards to all vertical and horizontal surfaces with adhesive per the manufacturer's recommendations. Set panels with the fabric toward the earth side. Lap fabric a minimum of 2". Install at below grade walls and retaining walls. Lap fabric at the top of the highest course and embed in waterproofing to ensure that loose material cannot enter and accumulate behind the protection / drainage board. Backfill against boards with approved material.
- B. WP-2: Apply a surface conditioner to concrete substrates in accordance with the manufacturer's instructions. Apply membrane in three (3) applications at a rate to provide a continuous monolithic coating of 30 dry mils, average thickness per coat, and 90 mils total thickness. Provide flashing in accordance with the manufacturer's standard details. Where protection board is required, embed into the membrane to ensure good bond. Place protection boards in a staggered pattern and butt boards tightly together.
- C. WP-3: Prime and apply a 30 mil thick coating to cover and overlap shrinkage cracks, integral flashings, caulked expansion joints and construction joints. Apply a 25 mil base coat, 25 mil intermediate coat, and two (2) 10 mil top coats to produce 70 mils total thickness, exclusive of aggregate. Broadcast aggregate in the first top coat.

3.5 MEMBRANE TESTING

- A. Water Test: Conduct water containment tests to ensure that the membranes are watertight.
- B. Horizontal Membranes: For installations where the primary membrane is horizontal, contain waterproofed areas in a manner to prevent 2" minimum, depth of water from escaping by damming any open perimeters and sealing the drains.
- C. Pan Membranes: For installations where the primary membrane forms a continuous container with the bottom and all vertical sides enclosed, such as planters, seal the drains and fill the container to within 1" of the top termination of the membrane.
- D. Method of Containment: Dams, seals, and other methods used to contain water should be capable of fully containing water for the period of time required. The method of containment should not damage the adjacent work.
- E. Period of Containment: 4 hours without loss of water, except for that by natural evaporation, and without evidence of failure in the membrane in any manner.
- F. Report: Submit a report of tests to the Owner's representative indicating the location of the test, date and time of the test, weather conditions and results.

3.6 PROTECTION

- A. Contractor's Operations: The Contractor to verify the kinds of operations that will be conducted around or over installed membranes. The Owner's representative will advise the Contractor of the measures that must be implemented to ensure that the membranes will be without damage at the time of Substantial Completion.

- B. Buried Installations: At the time of backfill fill, at the time of installation of irrigation and landscaping over buried membranes, and at any other time where the Contractor's operations may have an adverse effect on a buried membrane system, the Manufacturer's Technical Representative shall observe to ensure that the Contractor's operations are being conducted in a manner that will protect the membranes from damage.

3.7 FIELD QUALITY CONTROL

- A. Section 01450 - uality Control: Field inspection.
- B. Inspect installations for tight and waterproof oints and proper thickness of membrane applications.

3. CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- B. Clean all spills. Do not leave splatters or drips.
- C. Do not allow seepage of waterproofing through oints.

END OF SECTION

SECTION 07120

FLUID-APPLIED URETHANE ROOFING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Fluid-applied, elastomeric polyurethane membrane roofing system for new and existing, exposed concrete roof slabs.
 2. Walking surfaces over concrete roof slabs.
- B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.
- C. Related Sections:
1. Section 03300 - Cast-In-Place Concrete: Substrate for roofing materials.

1.2 DESCRIPTION OF WORK

- A. The extent of fluid-applied waterproofing over new and existing concrete roof slabs, including walking surfaces is indicated on the Drawings and as specified herein, and includes providing and applying all the required products.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
1. ASTM C 501 - Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.
 2. ASTM C 957 - Specification for High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane With Integral Wearing Surface.
 3. ASTM D 412 - Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
 4. ASTM D 24 - Test Methods for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 5. ASTM D 22 - Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 6. ASTM D 903 - Test Method for Peel or Stripping Strength of Adhesive Bonds.
 7. ASTM D 1004 - Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.

- ASTM D 2240 - Test Method for Rubber Property - Durometer Hardness.
- 9. ASTM E 911 - Test Methods for Water Vapor Transmission of Materials.
- C. National Roofing Contractors Association (NRCA):
 - 1. Roofing and Waterproofing Manual.
- D. Underwriters Laboratories Inc.:
 - 1. UL 790 - Test Method for Fire Test of Roof Coverings.
- E. U. S. Environmental Protection Agency (EPA):
 - 1. Method 24 - Determination of Volatile Matter Content.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
 - 1. Product Data: Provide data for primer, membrane roofing, flexible flashings, joint and crack sealants and temperature range for application of the waterproofing membrane.
 - 2. Shop Drawings: Sequence drawings and details for special conditions not covered by the manufacturer's standard details.
 - 3. Samples: Not less than 12x 12in size showing the applied thickness, texture and color.
 - 4. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
 - 5. Assurance Control Submittals:
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - b. Manufacturer's Material Safety Data Sheets (MSDS).
 - c. Manufacturer's certification that the products supplied comply with applicable federal and local regulations controlling the use of volatile organic compounds (VOC).
 - d. Manufacturer's instructions indicating procedures and conditions requiring special attention, and cautionary procedures required during application.
 - e. Documentation of experience indicating compliance with the specified qualifications requirements.
- B. Section 01710 - Closeout Submittals: Procedures for closeout submittals.
 - 1. Warranty: Submit a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 QUALITY ASSURANCE

- A. Qualifications:
1. Manufacturer: Company specializing in manufacturing aromatic and aliphatic urethane roofing systems materials with a minimum of five (5) years documented experience in high temperature, high U_v and high humidity environments.
 2. Authorized Applicator: Company specialized in, and has successfully completed applications of the same or similar type of materials for not less than five (5) years.
 - a. Applicator shall be specifically approved as a factory-authorized Applicator, in writing, by the roofing system manufacturer.
 - b. Submit the manufacturer's written approval and certification of the Applicator.
 - c. Applicator's equipment and training shall conform to the manufacturer's standards.
 - d. As applicable, assign work closely associated with waterproofing, including, but not limited to, waterproofing accessories, flashing in connection with waterproofing, expansion joints in membranes, and insulation and protection courses in membranes, to the waterproofing Applicator for undivided responsibility.
 - e. Applicator shall conform strictly to the manufacturer's Quality Assurance Program requirements.
- B. Source Quality Control: Obtain the primary waterproofing materials from a single manufacturer. Provide secondary materials only as recommended by the primary materials manufacturer.
- C. Manufacturer's Technical Representative:
1. The primary waterproofing materials manufacturer to make a Technical Representative available to monitor the on-going work to ensure proper application of the roofing system. The manufacturer must maintain the same Technical Representative for the duration of the Project.
 2. Pre-Application Review: Prior to the start of work and the purchase of any materials, the Manufacturer's Technical Representative, who is to certify each application, shall visit the Project Site, review existing conditions, and review the Contract Document for appropriateness of the requirements with the specified manufacturer's system including, but not necessarily limited to, the substrate and application conditions.
 3. Certification: After the Manufacturer's Technical Representative's review, submit written certification of the appropriateness of the requirements, or submit other or additional specific recommendations, if any, to assure that the specified system is appropriate for the use intended and complete in scope to ensure its intended performance. This should be coordinated with the Shop Drawing Submittal.
 4. Substrate Certification: Submit the Technical Representative's written certification of compliance that the prepared substrate is in conformance with requirements necessary for application of the system. Inspection and certification of the substrate is to be accomplished first prior to the start of application of the membrane system.

5. Technical Representative's Field Review of Work:
 - a. Number of Site Visits: Submit the manufacturer's recommended minimum number of times the Technical Representative is to field review the work to ensure success of the application. Indicate the stages of work when such visits are to be made.
 - b. Field Reports: For each visit, the Technical Representative shall submit a detailed Field Report assessing each application. Field Reports to indicate the date, time of day, length of each visit, weather conditions during the visit, condition of the substrate at the time of application, application procedures, and other important aspects that affect success of the application. Submit Reports within seven (7) days after each Site visit.
- D. Regulatory Requirements: Comply with the applicable rules and regulations of the EPA and the local pollution control regulatory agency having jurisdiction regarding volatile organic compounds (VOC) and the use of hydrocarbon solvents.
- E. Performance Requirements: It is required that the fluid-applied waterproofing membrane be watertight, and not deteriorate in excess of the limits published by the membrane manufacturer.
- F. Caution: Do not apply fluid-applied waterproofing membrane to on-grade slabs, split slabs with buried membrane or on slabs over unvented metal pans without prior approval of the roofing membrane manufacturer.

1.6 COORDINATION

- A. Pre-Application Conference: Prior to start of the application of materials, meet at the Project Site with the Owner's representative, Architect, Contractor, Applicator and subcontractors whose work penetrates the surfaces to be roofed. Review the conditions, methods and procedures necessary for application of the work, including inspection of the areas of work, requirements of the Specifications and the manufacturer's literature—review submittals and schedules.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store, and protect the products.
- B. Deliver products to the Project Site in the manufacturer's original, new and unopened packages and containers with seals and labels intact—dry and undamaged, bearing the product name, color, manufacturer's lot number, directions for use and precautionary labels.
- C. Store materials not in actual use, in tightly covered containers. Maintain containers used in the storage of materials, in a clean condition, free of foreign materials and residue.
- D. Store materials in a well ventilated area, and in compliance with the manufacturer's written instructions.
- E. Keep storage areas neat and orderly. Remove waste daily.
- F. Protect against fire hazards and spontaneous combustion.
- G. Take all precautions to ensure that workmen and the work areas are adequately protected from health hazards resulting from handling, mixing and application of the materials.

1.8 JOB CONDITIONS

- A. Proceed with the work only after the substrate construction and penetrating work has been completed.
- B. Proceed with the work only when existing and forecasted weather conditions will permit work to be performed in accordance with the manufacturer's recommendations. Do not apply products under the following conditions:
 - 1. Substrate surfaces have cured less than thirty (30) days.
 - 2. Rain is predicted within 24 hours.
 - 3. Surfaces have not been dry for a minimum of 24 hours.
- C. Provide adequate ventilation to prevent the accumulation of hazardous fumes during the application of solvent-based components in enclosed spaces□maintain ventilation until the coatings have thoroughly cured.
- D. Warn personnel against breathing vapors and contact of materials with the skin and eyes.
- E. Ensure that workmen wear the appropriate approved respiratory gear and protective clothing.
- F. Ensure that all gas flames and electrical apparatus are shut down during the coating application and curing.

1.9 SAFETY □COORDINATION

- A. All application, material handling and associated equipment shall conform to, and be operated in conformance with OSHA safety requirements.
- B. Manufacturer's Material Safety Data Sheets (MSDS) shall be read, understood and the instructions adhered to.
- C. A sufficient number of filled and operating fire extinguishers meeting current standards must be on the roof deck at all times during application of the roofing materials.

1.10 WARRANTY

- A. Section 017□0 - Closeout Submittals: Procedures for closeout submittals.
- B. Special Warranty:
 - 1. Provide a written □oint and severable Warranty signed by the roofing materials manufacturer, Contractor and Applicator, agreeing to repair or replace defective materials and workmanship, defined to include leakage of water, ruptures caused by cracking substrate up to 1□□□ abnormal aging or deterioration of materials, and other failures of the membrane to perform as required within the warranty period. Warranty shall include responsibility for removal and replacement of other work which conceals the membrane waterproofing.
 - 2. During the warranty period, repairs and replacements required because of acts of God and other events beyond the Contractor's □Applicator's control, and those which exceed the performance requirements, shall be completed by the Contractor □Applicator and paid for by the Owner at the prevailing rates.
 - 3. Warranty Period: Five (5) years from the date of Substantial Completion of the

roofing work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 - 1. Urethane Polymers International, Inc.
 - 2. Carlisle Coatings - Waterproofing.
- B. Section 0100 - Product Requirements: Product Options: Substitutions not permitted.

2.2 SYSTEM

- A. The following specifications are based on Urethane Polymers International, AM-C-Thane 455 - 0 Mil system to establish quality.
- B. Other acceptable manufacturer's systems shall be equivalent.

2.3 ELASTOMERIC ROOFING MATERIALS

- A. Primer: UI-7012 water-based, or UI-7112 solvent-based, Epoxy-Polyamide, low viscosity, two-component primer - sealer as recommended by the membrane manufacturer.
- B. Base Membrane: UI-7013 single-component, high-adhesion, moisture-cured, polyurethane membrane. Meet or exceed the following typical properties:

<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
Composition	Aromatic Urethane	
Weight Solids	100 ± 2%	
OC Content	Less than 200 gm	
Hardness, Shore A	5 ± 5	ASTM D 2240
Tensile Strength	900 ± 100 psi	ASTM D 412
Ultimate Elongation	50 ± 100%	ASTM D 412
Tear Resistance	150 ± 25 lbs/in.	ASTM D 1004
Weather Resistance	Slight checking 500 hours	ASTM D 22
Adhesion to Concrete	30 pli	ASTM D 903

- C. Elastomeric Membrane: UI-7013-HT, single component, high tensile strength, moisture-cured, liquid elastomeric polyurethane. Meet or exceed the following typical properties:

<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
Composition	Aromatic Urethane	
Weight Solids	101 ± 2%	
OC Content	Less than 250 gm	
Hardness, Shore A	0 ± 5	ASTM D 2240
Tensile Strength	2500 ± 250 psi	ASTM D 412
Ultimate Elongation	450 ± 50%	ASTM D 412
Tear Resistance	250 ± 50 lbs/in.	ASTM D 1004
Weather Resistance	Slight chalk 1,000 hrs.	ASTM D 22

Adhesion to Base Coat 30 pli ASTM D 903

- D. Top Coat: UI-701-HS, single-component, high tensile strength, abrasion-resistant, weather-resistant, aliphatic polyurethane. Meet or exceed the following typical performance properties:

<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
Composition	Aliphatic, Saturated Polyester Urethane	
Weight Solids	75 <input type="checkbox"/> 2 <input type="checkbox"/>	
<input type="checkbox"/> OC Content	Less than 250 gm <input type="checkbox"/>	
Hardness, Shore A	90 <input type="checkbox"/> 5	ASTM D 2240
Tensile Strength	3500 <input type="checkbox"/> 300 psi	ASTM D 412
Ultimate Elongation	250 <input type="checkbox"/> 50 <input type="checkbox"/>	ASTM D 412
Tear Resistance	300 <input type="checkbox"/> 50 lbs <input type="checkbox"/> in.	ASTM D 1004
Water Permeability	Less than 0.1 Perm	ASTM E 9 <input type="checkbox"/> <input type="checkbox"/> E 9 <input type="checkbox"/> M
Weather Resistance	No chalking <input type="checkbox"/> 2000 hrs.	ASTM D <input type="checkbox"/> 22
Abrasion Resistance	Negligible change, CS-17 wheels, 1000 cycles, 1,000 gm. load	ASTM C 501
Color	White, or as selected	

2.4 ACCESSORIES

- A. Flexible Flashing: 45-0 mils, thickness neoprene sheet or non-woven reinforcing fabric, or as recommended by the roofing materials manufacturer.
- B. Embedded Flashing Reinforcing: Non-woven fabric as recommended by the roofing materials manufacturer.
- C. oint and Crack Sealant: One- or two-component polyurethane compound, as recommended by the roofing membrane manufacturer.
- D. Caulking Compound: One- or two-component polyurethane compound as approved by the roofing membrane manufacturer.
- E. Aggregate: Rounded, non-angular, pre-blended 20 30 mesh, flint shot silica, ground glass, Monterey sand, or equivalent washed and kiln-dried aggregate free of foreign materials hard and stable to atmospheric conditions.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: erification of existing conditions before starting the work.
- B. erification of Conditions: erify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 - 1. Roofing Applicator, Manufacturer's Technical Representative and the Owner's Representative must ointly examine the substrates and conditions under which the roofing work is to be done.
 - 2. erify that substrate surfaces are durable, free of matter detrimental to adhesion

and application of the roofing materials.

3. Verify that substrate surfaces are smooth, free of honeycomb and pitting, and not detrimental to full contact bond of the waterproofing materials.
 4. Verify that items which penetrate surfaces to receive the roofing are installed and secured in-place.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 CONDITION OF CONCRETE SURFACES

- A. Concrete surfaces shall have a steel troweled finish, free of fins, ridges, voids and air entraining holes.
- B. Cured at least 28 days or until completely dry by the water curing method. Curing compounds or chemical curing agents shall not be used without prior approval of the roofing manufacturer.
- C. Surfaces shall be sloped for proper drainage.
- D. Saw-cut control joints and/or expansion joints shall have been properly installed at strategic locations throughout the field of the deck.
- E. Required crickets and drains shall be cast monolithic with the main roof deck.
- F. Concrete decks poured over precast AT's®, planks or slabs, shall have control joints placed directly over all corresponding joints and openings in the precast units.
- G. Coordinate with Section 03300 - Cast-In-Place Concrete.

3.3 PREPARATION

- A. Finish voids, rock pockets and excessively rough surfaces with epoxy grout or grind to match the unrepaired areas.
- B. Apply bond breaker per the manufacturer's recommendations, fill voids and seal joints with polyurethane sealant. Pay particular attention to construction joints.
- C. Clean, prime, install backing rod and caulk all expansion and contraction joints with elastomeric polyurethane sealant.
- D. Repair of concrete cracks and spalls:
 1. All cracks over 1/4" in width and all moving cracks less than 1/4" in width shall be routed out to 1/4" minimum, width and depth, and filled flush with polyurethane elastomeric sealant.
 2. Joints less than 1/2" in width and all caulked cracks shall be stripe-coated with a 30 mil preparatory coat of Base Membrane for a width of 3" on either side of the crack.
 3. Apply 45 to 60 mil thick neoprene flashing or non-woven reinforcing fabric over all cracks as recommended by the membrane manufacturer.
- E. Treatment of Roof Penetrations:

1. Caulk around and along the perimeters of duct and pipe penetrations with polyurethane elastomeric sealant.
 2. Apply a 3/4" cant of sealant around all pipes, drains and vertical junctions.
 3. Apply 30 mils of polyurethane membrane coating vertically, horizontally on surfaces around roof penetrations.
- F. Correct ponding water locations for smooth flow into roof drains—use epoxy topping where required to build up slopes.
- G. Clean concrete substrate of projections and substances detrimental to the work.
- H. Thoroughly clean and dry concrete surfaces free of laitance, surface contaminants and cleaning residue. Clean and prepare surfaces to receive roofing in accordance with the manufacturer's published instructions.
- I. Protect adjacent surfaces not scheduled to receive roofing. Mask off surfaces to effectively prevent spillage and overspray of liquid materials outside the membrane area.
- Protect landscaping, property, personnel and vehicles from over spray and drift.

3.4 FLASHING REINFORCEMENT

- A. Install all required metal and neoprene flashings and fabric flashing reinforcement—install all sealant cants.
- B. Deliver all metal shop primed, then field prime with Epoxy Primer prior to coating with the Base Membrane. Prime metal surfaces which exhibit adhesion difficulties first with a zinc chromate type of epoxy primer.
- C. Base Membrane is used as an adhesive for polyester reinforcing fabric. Reinforcing fabric shall be laid into wet Base Membrane with roller, brush or broad blade knife. Fabric shall be laid relaxed, smooth and wrinkle-free—over-coat with Base Membrane.
- D. Coat flashings and polyester reinforcing fabric with Base Coat and Top Coat with each application.

3.5 APPLICATION

- A. The roofing Applicator shall have the sole right of access to specific areas of the roof for the time required to complete the application and to effect adequate cure.
- B. Comply with the manufacturer's instructions, except where more stringent requirements are shown or specified, and except where the Project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
- C. Start application of the waterproofing membrane only in the presence and with the advice of the Manufacturer's Technical Representative.
- D. Stir and mix separately packaged components using a mixing paddle on a slow speed drill motor, in accordance with the manufacturer's instructions. Protect the components from sun and rain.
- E. Apply uniform coatings of waterproofing to substrates and surfaces indicated to receive membrane.

- F. Apply coatings by spray, squeegee or roller.
- G. Primer:
1. Apply Primer at the approximate rate of 250 sq. ft. per gallon. Allow primer to dry until tack-free. Within 1 hour of primer application, apply Base Coat. If the base coat cannot be applied within 1 hour then re-prime the surfaces.
- H. Base Membrane:
1. Apply Base Membrane in one uniform coat at the rate of 10 to 15 sq. ft. per gallon, minimum, or as needed to obtain a minimum dry film thickness of 20 mils. Allow 1 to 4 hours curing time before applying the next coat. Do not apply coating over joints greater than 12 in width.
- I. Elastomeric Membrane:
1. Apply in one uniform coat at the approximate rate of 10 to 15 sq. ft. per gallon, minimum, or as needed to obtain an average dry film thickness of 12 mils. Allow 1 hour curing time before applying the next coat.
 2. If the preceding layers of membrane become dirty or contaminated or lose their surface tack, wipe clean with xylene immediately before applying the next coating.
 3. Apply a second coat of Elastomeric Membrane in one uniform coat at the rate of 100 sq. ft. per gallon, or as needed to obtain an average dry film thickness of 12 mils.
 4. At locations shown on the Drawings, or if not shown, as directed, while the second coat is still fluid, uniformly broadcast aggregate onto the coating at the rate of 25 lbs. per 100 sq. ft.
 5. Allow 1 to 3 hours curing time before applying the next coat.
- J. Top Coat:
1. Apply one uniform coat at the rate of 100 sq. ft. per gallon, minimum, to obtain an average dry film thickness of 10 mils, and to completely encapsulate the aggregate.
 2. For walkway surfaces and around roof-mounted equipment, provide aggregate additive for a tough non-slip surface. Apply in colors and patterns as designated by the Architect.
- K. Spray coats over flashings embed with fabric when plastic flashings are spanning voids greater than 34 in.
- L. The application of membrane waterproofing materials shall be continued up onto vertical surfaces 12 in minimum, and over the tops of fascias and parapets. Apply extra thickness waterproofing material at corners, intersections, angles, cants, penetrations and over cracks.
- M. If waterproofing is applied on unscheduled surfaces, remove immediately by a method approved by the membrane manufacturer.
- N. The overall dry film thickness of the completed waterproofing system, exclusive of aggregate, shall average 10 mils.

O. Permit the membrane to cure under conditions which will not contaminate or deteriorate the waterproofing materials. Block off all traffic and protect the membrane from physical damage.

P. Remove protective coverings.

3.□ FIELD □UALITY CONTROL

A. Section 01450 - □uality Control: Field inspection and testing.

B. Inspect the fluid-applied roofing application.

C. Test for required dry film thickness.

3.7 PROTECTION

A. Section 01700 - Execution Requirements: Protection of the applied work.

B. Do not permit traffic on the membrane during the first 24 hours after application and no heavy traffic within four (4) days after the final coat has been applied, or until accepted by the Owner's representative.

C. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07190

WATER REPELLENTS (SEALER)

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Surface preparation and application of clear penetrating water repellent coating to the following exposed surfaces:
 - a. WR-1: Exterior and interior concrete walks and floors.
 - b. WR-2: Slurry coating for dampproofing vertical walls.
- B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.
- C. Related Sections:
1. Section 03300 - Cast-in-Place Concrete: Sealers and curing agents.
 2. Section 04400 - Natural Stone: Sealers and curing agents.
 3. Section 07900 - Joint Sealers: Joint fillers and sealers.
 4. Division 7 Sections - Roofing and Waterproofing.

1.2 DESCRIPTION OF WORK

- A. The extent of each type of waterproofing work is indicated on the Drawings and as specified herein, and includes providing and applying waterproofing on concrete surfaces. Similar work used as an exposed finish is excluded by definition and, if required, is specified as roofing, flooring, special coating or other appropriate category.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
1. ASTM C 42 - Test Method for Water Absorption.
 2. ASTM D 5 - Test Method for Flash Point by Closed Cup Tester.
 3. ASTM D 3900 - Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
 4. ASTM E 514 - Test Method for Water Penetration and Leakage Through Masonry.
- C. U. S. Environmental Protection Agency (EPA):

1. Method 24 - Determination of Volatile Matter Content.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer's specifications, recommendations for water repellents for each surface specified, surface preparation and application instructions, precautions for materials which can contaminate the system, limitations to coating, protection and cleaning instructions. Include recommendations for sealing penetrations, cracks and control, construction and expansion joints. Submit color charts for products required to be integrally colored.
2. Shop Drawings: Indicate details critical to water tightness of the membrane, including, but not necessarily limited to, membrane transitions terminations at perimeters, drains, sleeves and other penetrating elements.
3. Samples: 1x1 samples of each substrate indicated to receive water repellent with the specified repellent treatment applied to half of each sample.
4. Assurance/Control Submittals:
 - a. Manufacturer's certification that the materials specified are recommended by the manufacturer for the applications indicated.
 - b. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - b. Manufacturer's Material Safety Data Sheets (MSDS).
 - c. Manufacturer's certification that the products supplied comply with applicable federal and local regulations controlling the use of volatile organic compounds (VOC).
 - d. Manufacturer's Instructions indicating procedures and conditions requiring special attention, and cautionary procedures required during application.
 - e. Documentation of experience indicating compliance with the specified qualifications requirements.

B. Section 01700 - Closeout Submittals: Procedures for closeout submittals.

1. Warranty: Submit a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience, and has a record of successful in-service performance.
2. Applicator: Company experienced in applying the types of waterproofing required for this Project for not less than five (5) years, and is acceptable to the primary waterproofing materials manufacturer.

- B. Mockup: Apply water repellent to a mockup, either partial or full coverage, as directed, before proceeding with the application. Comply with the application requirements contained herein.
- C. Regulatory Requirements: Comply with applicable rules and regulations of the pollution-control regulatory agency having jurisdiction regarding volatile organic compounds (VOC) and use of hydrocarbon solvents.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store, and protect the products.
- B. Deliver products to the Project Site in the manufacturer's original, new and unopened packages or containers with seals and labels intact, dry and undamaged, bearing the product name, color, manufacturer's lot number, directions for use and precautionary labels.
- C. Store materials not in actual use, in tightly covered containers. Maintain containers used in the storage of materials, in a clean condition, free of foreign materials and residue.
- D. Store materials in a well ventilated area, and in compliance with the manufacturer's published instructions.
- E. Store and handle materials to prevent deterioration and damage due to moisture, temperature changes, contaminants, and other causes.
- F. Protect against fire hazards and spontaneous combustion.
- G. Keep storage areas neat and orderly. Remove waste daily.
- H. Take all precautions to ensure that workmen and the work areas are adequately protected from health hazards resulting from handling, mixing and application of the materials.

1.7 JOB CONDITIONS

- A. Environmental Requirements: Do not apply products under any of the following conditions, except with the written recommendation of the manufacturer:
 - 1. Substrate surfaces cured less than thirty (30) days.
 - 2. Surfaces not dry for a minimum of 24 hours.
 - 3. Rain predicted within 24 hours.
 - 4. Windy conditions such that the repellent might be blown onto vegetation or onto substrates not intended to be coated.

1.8 WARRANTY

- A. Section 0170 - Closeout Submittals: Procedures for closeout submittals.
- B. Special Warranty:
 - 1. Provide a joint and severable written Warranty signed by the water repellent materials manufacturer, Contractor and the Applicator, agreeing to repair or

replace defective materials and workmanship, defined to include leakage of water, ruptures caused by cracking substrate up to 1" abnormal aging or deterioration of materials, and other failures of membranes to perform as required within the warranty period. Warranty shall include responsibility for removal and replacement of other work which conceals the waterproofing membrane.

2. During the warranty period, repairs and replacements required because of acts of God and other events beyond the Contractor's or Applicator's control, and those which exceed the performance requirements, shall be completed by the Contractor or Applicator and paid for by the Owner at the prevailing rates.
3. Warranty Period: Five (5) years from the date of Substantial Completion of the water repellent work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 1. Tamms Industries.
 2. Hydro-Bond, Inc.
 3. Thoro System Products.
 4. Textured Coatings of America.
 5. Pecora Corp.
- B. Section 01000 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

- A. WR-1: Silane, clear penetrating water repellent. A monomeric compound containing approximately 40% alkylalkoxysilane with alcohol, ethanol, mineral spirits, water, or other proprietary solvent carrier.
 1. Baracade Silane 40 by Tamms Industries.
 2. Concrete and Masonry Sealer by Thoro Consumer Products.
 3. Hydro-Bond Silane 40 VOC by Hydro-Bond, Inc.
 4. Klere-Seal 940S VOC by Pecora Corp.
 5. Rainstopper RS1750W by Textured Coatings of America.
- B. WR-2: Crystalline, applied as a slurry coat.
 1. Dypex Concentrate by Dypex Chemical Corp. or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.
- B. Verification of Conditions: Verify that the field measurements, surfaces, substrates and conditions are as required, and ready to receive work.
 - 1. Verify that joint sealants are installed and cured.
 - 2. Verify that surfaces to be coated are dry, clean, and free of efflorescence, oil, and other matter detrimental to application of the coating.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate surfaces of substances that might interfere with penetration or performance of the water repellent. Remove loose particles and foreign matter. Remove oil and foreign substances with a cleaning agent which will not affect the coating.
- B. Scrub surfaces with water, rinse and let dry.
- C. Test for moisture content according to the manufacturer's instructions to ensure that the surfaces are sufficiently dry.
- D. Test the pH level according to the manufacturer's instructions to ensure chemical bond to the silicate minerals.
- E. Protect adjacent surfaces not scheduled to receive coating. Protect landscaping, property, and vehicles from over spray and drift. If applied on unscheduled surfaces, remove immediately, by an approved method.
- F. Prior to the start of application, properly seal joints and cracks in movement with an elastomeric joint sealant acceptable to the sealant manufacturer. Non-movement cracks greater than 1/4 in width must be filled with a suitable patching material.
- G. Do not apply water repellent until sealants in joints adjacent to surfaces to receive water repellent treatment have been installed and cured.
 - 1. Water repellent work may precede sealant application only if the sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.
 - 2. Prior to performing the water repellent work, including bulk purchase or delivery of products to the Project Site, prepare a small application in an unobtrusive location to demonstrate the final visual, physical and chemical effect of the planned application.

3.3 APPLICATION

- A. Prepare materials in accordance with the manufacturer's printed instructions for the Project conditions. Consult a manufacturer's technical representative if the printed recommendations are not applicable to the Project conditions.

- B. Apply coating in accordance with manufacturer's instructions, using the appropriate method and coverage rate.
- C. WR-1:
 - 1. Apply a heavy-saturation spray coating of the water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with the manufacturer's instructions and recommendations using airless spraying procedure unless otherwise indicated.
 - 2. Apply a second saturation spray coating, repeating the first application. Comply with the manufacturer's instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats.
 - 3. Remove protective coverings from adjacent surfaces.
- D. WR-2:
 - 1. Mix Type Concentrate in accordance with the manufacturer's instructions. Apply with a bristle-brush to a uniform thickness of 1/16".
 - 2. Apply a second coat after the first coat has reached initial set but is still green.
 - 3. Lightly re-water, as necessary, to counteract drying.
 - 4. Wet cure surfaces in accordance with the manufacturer's instructions. Do not thoroughly wet concrete surfaces with water to saturate the surfaces; remove excess water before application.

3.4 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect for complete and consistent coverage and waterproofing capability.

3.5 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- B. Clean all spills. Do not leave splatters or drips.

END OF SECTION

SECTION 07210
BUILDING INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Semi-rigid insulation at underside of roofs at interior spaces.
 2. Board insulation for split slabs and under decks.
 3. Batt insulation at exterior stud walls of air conditioned spaces and at interior stud walls for sound control.
 4. Semi-rigid board insulation at shafts and chases.
 5. Exposed wall and ceiling insulation at Mechanical Rooms.
- Spray-applied thermal and acoustical insulation for exposed ceilings.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for installation of insulation.
2. Section 09110 - Non-Load Bearing Steel Framing: Support for installation of insulation.

1.2 DESCRIPTION OF WORK

A. The extent of each type of building insulation is indicated on the Drawings and as specified herein, and includes providing and installing thermal, acoustical and spray-on insulation, and safing and smoke stops.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM C 510 - Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
2. ASTM C 120 - Specification for Mineral Fiber Block and Board Thermal Insulation.
3. ASTM C 155 - Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
4. ASTM D 5113 - Test Method for Determining Adhesion Attack of Rigid Cellular Foam.

5. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
- ASTM E 119 - Test Method for Fire Tests of Building Construction and Materials.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
 1. Product Data: Manufacturer's product specifications and installation instructions for each type of insulation and vapor barrier material required. Indicate product characteristics, performance criteria and limitations.
 2. Assurance □Control Submittals:
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - b. Documentation of experience indicating compliance with the specified qualifications requirements.

1.5 □QUALITY ASSURANCE

- A. □ualifications:
 1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.
 3. Use adequate number of skilled workmen, thoroughly trained and experienced in the necessary crafts and are completely familiar with the specified requirements and methods for proper performance of the work of this Section.
- B. Regulatory Requirements: Conform to the flame spread and smoke developed requirements of the local authority having □ jurisdiction.

1.□ DELI□ERY, STORAGE AND HANDLING

- A. Section 01□00 - Product Requirements: Transport, handle, store and protect the products.
- B. Deliver products to the Project Site in the manufacturer's original, unopened packages, containers or bundles, bearing brand name, identification of the manufacturer, and material identification.
- C. Store inside, under cover, and in a manner to keep dry.
- D. Protect from weather, direct sunlight, moisture, surface contamination, and damage from construction traffic and other causes.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 - 1. CertainTeed.
 - 2. Owens-Corning.
 - 3. Dow Chemical.
 - 4. Manville-Schuller International.
 - 5. International Cellulose Corporation.
- B. Section 01000 - Product Requirements: Product Options: Substitutions permitted.

2.2 THERMAL INSULATION

- A. Concealed Glass Fiber Insulation Boards: Unfaced glass fiber thermal insulation, semi-rigid boards, friction-fit, 48x 96x 2-1/2" thick, R-13 or as indicated, ASTM C 112, Type 1A and 1B. Maximum flame spread rating 25, maximum smoke developed 50 when tested in accordance with ASTM E 119. ΔType 703 by Owens-Corning or approved equal.
- B. Polystyrene Insulation Boards: High density extruded polystyrene foam insulation, 48x 96x 1-1/2" thick, R-5.0, square edge, 1/2x 1/4" drainage channels on bottom long edge, for installation over waterproofing membrane. Pla Deck STYROFOAM Brand PLAAMATE Insulation by Dow Chemical Co.
- C. Concealed Wall Batt Insulation: Unfaced glass fiber thermal insulation, friction-fit, 16" or 24" widths as required x 3-1/2" thick, ASTM C 115, Type I. R-11 when tested in accordance with ASTM C 510. Maximum flame spread 10, maximum smoke developed 10 when tested in accordance with ASTM E 119. ΔThermal Batt Insulation by Owens-Corning or approved equal.

2.3 ACOUSTICAL INSULATION

- A. Concealed Noise Barrier Batt Insulation: Unfaced glass fiber acoustical insulation, friction-fit, 16" or 24" widths as required x 3-1/2" thick, ASTM C 115, Type I. Maximum flame spread 10, maximum smoke developed 10 when tested in accordance with ASTM E 119. ΔSound Attenuation Batts by Owens-Corning or approved equal.
- B. Chase Wall Insulation: Unfaced glass fiber acoustical insulation, semi-rigid, friction-fit, 24" x 96" x 1-1/2" ASTM C 115, Type I. R-5.0 when tested in accordance with ASTM C 510. ASTM E 119 for 1-hour fire rated partitions. Maximum flame spread 20, maximum smoke developed 20 when tested in accordance with ASTM E 119 and UL 723. ΔShaftwall Insulation by Owens-Corning or approved equal.
- C. Exposed Generator Room Walls and Ceiling: FRK (foil) faced glass fiber thermal insulation, semi-rigid, 1-1/2" thick, ASTM C 112, Type 1A and 1B. Maximum flame spread 25, maximum smoke developed 50 when tested in accordance with ASTM E 119. ΔType 703 by Owens-Corning or approved equal.

2.4 SPRAY-ON INSULATION

- A. Exposed Thermal-Acoustical Spray-Applied Cellulose: Textured fibered cellulose with chemical binder and adhesives, mildew and mold treated, spray-applied, 3" thick, R-4.5 per

inch, NRC of 1.0, Class I. Class AA flame spread rating per ASTM E 84. FMRC Category I. AK-13 by International Cellulose Corp. or approved equal. Color as selected.

- B. Exposed Acoustical Spray Applied Cellulose: Textured fibered cellulose with chemical binder, mildew and mold treated, spray applied. NRC .90 at 1" thick, AK-13 by International Cellulose Corp. or approved equal. Color as selected.

2.5 OTHER MATERIALS

- A. Insulation Anchors: Impaling pin-type with 2" diameter flat anchor head and wire spindles, self-locking holding washers designed for adhesive application to the underside of roof decks. Adhesive as supplied or approved by the insulation manufacturer.
- B. Provide other materials, not specifically described but required for a complete and proper installation, as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that the areas, surfaces, substrates and conditions are as required, and ready to receive the work.
 - 1. Board Insulation:
 - a. Verify that the substrate and adjacent materials are dry and ready to receive the insulation and adhesive.
 - b. Verify that the insulation boards are dry, unbroken and free of damage.
 - 2. Batt Insulation:
 - a. Verify that the adjacent materials are dry and ready to receive the installation.
 - b. Verify that mechanical and electrical services within the walls have been installed, are properly placed, and has been tested.
 - 3. Spray-applied Insulation:
 - a. Verify that the substrate and adjacent surfaces are dry and ready to receive the insulation.
 - b. Verify that all equipment is operating properly.
- A. Remove or protect against projections in the construction framing which might damage or prevent the proper installation or application of materials.
- B. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install the work of this Section in strict accordance with the original design, requirements of government agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved. Anchor all components firmly into position.

3.3 INSTALLATION - ROOF INSULATION

- A. Apply with stick pins, adhesively secured to the underside of the roof. Provide a minimum of 6 pins per 4'x 8' board and 4 pins per 4'x 4' board, spaced per the manufacturer's instructions. Butt all edges and ends of insulation tightly.

3.4 INSTALLATION - SPLIT SLABS AND UNDER DECKS

- A. Set in an approved waterproof roof coating in accordance with the manufacturer's recommendations. Protect insulation from weathering, sunlight and traffic until the top deck has been placed.

3.5 INSTALLATION - WALL INSULATION

- A. Install batt insulation in accordance with the manufacturer's instructions, without gaps or voids.
- B. Wall Insulation: Friction fit for installation within metal framing. Carry around water and waste piping, electrical junction boxes, outlets, conduit and other elements to ensure a complete acoustical barrier.
- C. Trim insulation neatly to fit the spaces. Use batts free of damage. Fit insulation tight in the spaces and tight to the exterior side of mechanical and electrical services within the plane of the insulation.
- D. When faced, install the insulation with the factory-applied membrane facing the warm side of the building space. Lap ends and side flanges of the membrane. Attach insulation in place to the framing. Tape seal butt ends and lapped side flanges. Tape seal tears and cuts in the membrane.

3.6 INSTALLATION - MECHANICAL ROOM WALLS AND CEILINGS

- A. Install with impaling pins and bend prongs of pins inward so they are not a hazard. Tape joints. Stop insulation 4" from light fixtures and heat producing equipment.

3.7 INSTALLATION - SPRAY-APPLIED INSULATION

- A. Apply by authorized applicator utilizing authorized fiber machines and nozzles for control of the fiber to binder ratio. Prime or seal surfaces before applying as required by the insulation manufacturer. Apply the manufacturer's standard fire-retardant mildew-resistant overspray.

3.8 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect work for proper thickness, secure attachment to the substrate and in accordance with the manufacturer's instructions.

END OF SECTION

SECTION 07□20

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal base flashings and counter flashings.
 2. Penetration flashing.
 3. Built-in metal scuppers.
 4. Gutters.
 5. Downspouts.
- Miscellaneous sheet metal accessories.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for securing flashing.
2. Section 04230 - Reinforced Unit Masonry: Substrate for securing flashing.
3. Section 07410 - Preformed Metal Roofing: Substrate for securing flashing.

1.2 DESCRIPTION OF WORK

A. The extent of each type of flashing and sheet metal work is indicated on the Drawings and as specified herein, and includes providing and installing flashings, metal scuppers, gutters, downspouts and miscellaneous accessories.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Iron and Sheet Institute (AISI):

1. North American Specification for the Design of Cold-Formed Steel Structural Members.

C. American Society of Civil Engineers (ASCE):

1. ASCE □SEI 7 - Minimum Design Loads for Buildings and Other Structures.

D. American Society for Testing and Materials (ASTM):

1. ASTM A.167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 2. ASTM A 36 - Steel Sheet, Zinc-Coated (galvanized) by the Hot-Dip Process for Roofing and Siding.
 3. ASTM A 527 / A 527M - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality.
 4. ASTM A 593 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 5. ASTM A 792 / A 792M - Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process.
 6. ASTM B 32 - Specification for Solder Metal.
 7. ASTM B 209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 8. ASTM B 221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
 9. ASTM B 370 - Specification for Copper Sheet and Strip for Building Construction.
 10. ASTM B 404 - Specification for Paste Solder.
 11. ASTM C 920 - Specification for Elastomeric Joint Sealants.
- E. International Code Council:
1. International Building Code (IBC), 2009.
- F. Metal Building Manufacturer's Association (MBMA):
1. Metal Building Systems Manual.
- G. National Roofing Contractors Association (NRCA):
1. The NRCA Roofing and Waterproofing Manual.
- H. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
1. Architectural Sheet Metal Manual.
- I. Society for Protective Coatings (formerly Structural Steel Painting Council):
1. SSPC-Paint 12 - Cold-Applied Asphalt Mastic (Extra Thick Film).

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
1. Product Data: Manufacturer's product specifications, gauges and thickness, installation instructions and general recommendations for each specified sheet material and fabricated product.

2. Shop Drawings: Show layout, joining, profiles, and anchorage of fabricated work, including valley flashings, major counter flashings, trim fascia units, gutters, downspouts, scuppers and expansion joint systems layouts at 1/4" scale, details at 3/8" scale.
 3. Samples: Submit 12" square samples of the specified sheet materials that will be exposed as finished surfaces.
 4. Assurance Control Submittals:
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - b. Calculations indicating that the products and anchorage satisfies the performance requirements.
 - c. Documentation of experience indicating compliance with the specified qualifications requirements.
- B. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
1. Warranty: Submit a written limited Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 QUALITY ASSURANCE

- A. Qualifications:
1. Fabricator: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

1.6 DESIGN AND PERFORMANCE CRITERIA

- A. Thermal Movement:
1. The completed metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on the structure, anchors or fasteners, or reducing performance ability.
 2. The interface between panels and clips shall provide for a minimum of 3/8" of thermal movement in each direction along the longitudinal direction.
 3. The location of metal roofing rigid connectors shall be designed to meet the job conditions by the metal roof system manufacturer.
- B. Wind Load Requirements:
1. Provide the capacity to withstand the following loading requirements:
 - a. Design, fabricate and install to resist combined positive and negative windloading in accordance with IBC 2009, Section 1609 with a 140 mph or 170, q_s of 74.0 psf, exposure B, C, D and importance factor of 1.0 or 1.25 or 1.5 as applicable per ASCE 7.

1.7 FACTORY TESTS

- A. The manufacturer shall have conducted tests on previously manufactured sheets of the same type and finish as proposed for this project to assure conformance. Sheets shall have passed the following tests:
1. Salt Spray: Withstand a salt spray test for a minimum of 1,000 hours in accordance with ASTM B 117, including the scribe requirement in the test. Immediately upon removal of the panel from the test, the coating shall have receive a rating of 10 with no blistering, as determined by ASTM D 1554, Rating Schedule No. 1.
 2. Formability: When subjected to a 180 degree bend over a 1 inch diameter mandrel (3 inch diameter mandrel for coatings 4 mils or greater in thickness) in accordance with ASTM D 522, the exterior coating film shall show only slight microchecking of the exterior film, and no loss of adhesion.
 3. Accelerated Weathering: Withstand a weathering test of 2,000 hours, minimum, in accordance with ASTM G 152 or ASTM D 2535 without cracking, peeling, blistering, loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating that can be readily removed from the base metal with a penknife blade or similar instrument shall be considered as an indication of the loss of adhesion.
 4. Chalking Resistance: After a 2,000 hours weatherometer test, the exterior coating shall not chalk greater than No. 1 rating when measured in accordance with ASTM D 4214.
 5. Color Change: After a 2,000 hours weatherometer test, the exterior color change shall not exceed 2 NBS units when measured in accordance with ASTM D 2244.
 6. Abrasion Resistance for Color Coating: When subjected to the falling sand test in accordance with ASTM D 968, the coating system shall withstand a minimum of 100 liters of sand before appearance of the base metal.
 7. Humidity: When subjected to a humidity cabinet test in accordance with ASTM D 2247 for 1,000 hours, a scored panel shall show no signs of blistering, cracking, creepage, or corrosion.
 8. Fire Hazard: Factory-fabricated sheets shall be 30 to 70 at an angle of 90 degrees, when measured in accordance with ASTM D 523.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store, and protect the products.
- B. Protect components during fabrication, shipment, storage, handling, and erection from mechanical abuse, stains, discoloration and corrosion.
- C. Inspect materials upon delivery to the Project Site. Reject and remove physically damaged and marred materials.
- D. Store materials off the ground, providing for drainage under cover providing for air circulation protected from wind, foreign material contamination, mechanical damage, cement, lime and other corrosive substances.
- E. Prevent contact with materials which may cause discoloration or staining.

- F. Handle materials to prevent damage to surfaces, edges and ends of sheet metal items. Damaged materials shall be re-ected and removed from the Project Site.

1.9 MOB CONDITIONS

- A. Coordinate the work of this Section with interfacing and adjoining work for the proper sequencing of each installation.
- B. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements.
- C. Ensure the best possible weather resistance and durability of the work, and protection of materials and finishes.

1.10 WARRANTY

- A. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
- B. Limited Warranty:
 - 1. Manufacturer's Warranty against checking, cracking, peeling, chalking, fading and adhesion.
 - 2. Warranty Period:
 - a. Manufacturer's twenty (20) years Warranty covering refinishing of the finish coating from the date of Substantial Completion.
 - b. Installer's two (2) years Warranty covering the installation and watertightness from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 SHEET METAL FLASHING AND TRIM MATERIALS

- A. Stainless Steel: AISI Type 302 304, satin finish, 24 gauge, soft except where hard temper is required for forming or performance. ASTM 107.
- B. Aluminum Sheet: Prefinished aluminum alloy sheet, .032 thickness except as otherwise indicated, temper appropriate to the end use. ASTM B 209. Exposed aluminum shall have a baked-on, factory-applied color coating of polyvinylidene fluoride (PVF2) or other equivalent fluorocarbon coating per AMA 05.2, applied after the metal substrates have been cleaned and pretreated. Finish coating dry-film thickness shall be 1.0 - 1.3 mils. Color as selected.
- C. Zinc-Coated Steel: Commercial quality with 0.20 copper, ASTM A 53, except ASTM A 527 for lock-forming, G90 hot-dip galvanized, mill phosphated where indicated for painting, 24 gauge except as otherwise indicated.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of the work, matching or compatible with the product material being installed, non-corrosive, size and gauge as required for performance.

- B. Reglets: Metal or plastic units of the type and profile indicated, compatible with the flashings indicated, non-corrosive.
- C. Fasteners: Same metal as the flashing □sheet metal or stainless steel, as recommended by the sheet manufacturer. Match finish or exposed heads with the material being fastened.
- D. Solder: For use with steel□provide 50 - 50 tin □lead solder with rosin flux. ASTM B 32.
- E. Adhesives: Type recommended by the flashing sheet manufacturer for waterproof □ weather-resistant seaming and adhesive application of flashing sheet and substrate.
- F. Elastic Flashing Filler Rods: Closed-cell polyethylene or other soft closed-cell material recommended by the elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on the flashing sheet.
- G. Mastic Sealant: Polyisobutylene□non-hardening, non-skinning, non-drying, non-migrating sealant.
- H. Elastomeric Sealant: Generic type as recommended by the manufacturer of the metal or fabricator of the components being sealed.
- I. Gutter and Conductor-Head Guards: .032□aluminum or 20 gauge bron□e or non-magnetic stainless steel mesh, or fabricated units, with salvaged edges and non-corrosive fasteners. Select materials for compatibility with the gutters and downspouts.
- Unit Plumbing □ent: Integral stack pipe flashing with elastomeric base, for flat or pitched roof applications, si□e as required by the pipe si□e.
- K. Protective Backing Paint: Bituminous.

2.3 FABRICATED UNITS

- A. General Material Fabrication: Shop fabricate work to the greatest extent possible. Comply with the details shown, and with the applicable requirements of SMACNA "Architectural Sheet Metal Manual", and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work□sufficient to permanently prevent leakage, damage and deterioration of the work. Form work to fit the substrates. Comply with the material manufacturer's instructions and recommendations. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels as indicated, with exposed edges folded back to form hems.
- B. Flashings, Counter Flashings, Copings, Expansion □oints, Scuppers: Fabricate from 20 o□ □sq. ft. copper sheet unless otherwise indicated.
- C. Aluminum Gutter: .075□conforming to ASTM B 221 with baked-on, factory-applied color coating of polyvinylidene fluoride (P□F2) or other equivalent fluorocarbon coating per AMA □05.2, applied after the metal substrates have been cleaned and pretreated. Finish coating dry-film thickness shall be 1.0 - 1.3 mils. Color as selected.
- D. Downspouts: Fabricate from .032□aluminum□form in continuous lengths.
- E. Seams: Fabricate non-moving seams in sheet metal as flat-lock type. For metal other than aluminum, tin the edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer□rivet □oints for additional strength where required.
- F. Expansion Provisions: Where lapped or bayonet-type expansion provisions cannot be used, or would not be sufficiently water □weatherproof, form expansion □oints of intermeshing

hooked flanges, not less than 1" deep, filled with mastic sealant, concealed within the joints.

- G. Sealant joints: Where movable, non-expansion type joints are indicated or required for proper performance of the work, form the metal to provide for proper installation of elastomeric sealant in accordance with SMACNA standards.
- H. Separations: Provide for the separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with a bituminous coating or other permanent separation as recommended by the manufacturer or fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 - 1. Verify that roof openings, curbs, pipes, sleeves, ducts, and vents through the roof are solidly set, reglets in place, and nailing strips located.
 - 2. Verify that roofing termination and base flashings are in place, sealed, and secure.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting the installation.
- B. Install concrete inserts, reglets and similar anchoring devices to be built into substrates and walls prior to the time the flashing installation is to begin.
- C. Install surface-mounted reglets true to lines and levels. Apply sealant along the top of reglets.

3.3 INSTALLATION

- A. Comply with the manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual".
- B. Fit flashings, gutters, and downspouts tight in place, make corners square, surfaces true and straight in planes, and lines accurate to the profiles.
- C. Anchor units securely in place by the methods indicated, providing for thermal expansion of metal units.
- D. Secure work in place using concealed fasteners where possible.
- E. Set units true to line and level as indicated.
- F. Install work with laps, joints and seams to be permanently watertight and weatherproof.

- G. Install reglets to receive counter flashings in a manner and by the methods indicated. Where shown in concrete, furnish reglets to the concrete trade for installation as the work of Sections of Division 3. Where shown in masonry, furnish reglets to the masonry trade for installation as the work of Division 4 Sections.
- H. Install counterflashings in reglets, either by shape-in seal arrangement, or by wedging in place and filling the reglet with mastic or elastomeric sealant, as indicated, depending on the degree of sealant exposure.
- I. Expansion and Contraction: Provide expansion and contraction joints at not more than 30 foot intervals. Space joints evenly and as approved.
 - Install elastic flashings in accordance with the manufacturer's recommendations. Where required, provide for movement at joints by forming loops or bellows the full width of the flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from the flashings. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with the manufacturer's recommendations.
- K. Install continuous gutter guards on gutters. Provide hinged units to swing open for cleaning the gutters. Install beehive type strainer-guards at conductor heads, removable for cleaning downspouts.

3.4 ISOLATION REQUIREMENTS

- A. Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a course of paper slip sheet and a course of polyethylene underlayment.
- B. Concrete Contact: Coat the underside of sheet metal over horizontal concrete surfaces, with asphaltum cement.
- C. Dissimilar Metals: Insulate the juncture between dissimilar metals with a heavy coat of insulating film. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.
- D. Wood Contact: Isolate sheet metal from cedar, redwood, oak and acid-treated lumber by means of an unbroken mil polyethylene construction sheet, or a heavy coating of metal protective paint.

3.5 PROTECTION

- A. The Installer shall advise the Contractor of required procedures for surveillance and protection of the flashings and sheet metal work during the remainder of the construction, to ensure that the work will be without damage or deterioration, other than natural weathering, at the time of Substantial Completion.

3.6 ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting the installed work.
- B. Touch-up exposed fasteners using paint furnished by the metal manufacturer, and matching the exposed metal surface finish.
- C. Touch-up minor abrasions and scratches in surface finishes.
- D. Scratches, abrasions and minor surface defects to the finish may be repaired in accordance with the manufacturer's printed instructions. Replace items which cannot be repaired.

3.7 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspection the installations for proper support, alignment, watertight and weatherproof.

3.8 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- B. Remove excess sealants as approved by the metal manufacturer.
- C. Clean exposed metal surfaces to remove all substances which might cause corrosion or metal or deterioration of finishes.
- D. Leave the entire installation in a clean condition on the date of Substantial Completion.

END OF SECTION

SECTION 07□40
FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Firestop sealant and safing insulation for the following locations:
 - a. All pipes, ductwork, conduit and other penetrations through a fire-rated walls, floor assemblies and roof assemblies.
 - b. Head of wall firestopping at full-height, fire-rated partitions.
 - c. Closure of penetrations for acoustic purposes.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for firestopping.
2. Section 04230 - Reinforced Unit Masonry: Substrate for firestopping.
3. Section 07210 - Building Insulation: Wall and roof insulation.
4. Section 07900 - Joint Sealers: Non-firestopping joint sealers.
5. Section 09250 - Gypsum Board: Substrate for firestopping.

1.2 DESCRIPTION OF WORK

A. The extent of each type of firestopping is indicated on the Drawings and as specified herein, and includes providing and installing fire safing at penetrations thru fire-rated assemblies, roofs and head of wall firestopping at full-height, fire-rated partitions.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM C □12 - Specification for Mineral Fiber Block and Board Thermal Insulation.
2. ASTM E □4 - Test Method for Surface Burning Characteristics of Building Materials.
3. ASTM E 119 - Test Methods for Fire Tests of Building Construction and Materials.
4. ASTM E 13□ - Test Method for Behavior of Materials in a Vertical Tube Furnace at

750E C.

5. ASTM E 119 - Test Method for Fire Tests of Through-Penetration Fire Stops.
 - ASTM E 2307 - Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus.

C. Underwriters Laboratories, Inc. (UL):

1. UL 1479 - Tests of Through-Penetration Firestops.
2. UL 2079 - Tests for Fire Resistance of Building Joint Systems.

1.4 DEFINITIONS

- A. Firestopping: Sealing materials and assemblies installed in spaces between building materials to prevent movement of smoke, heat, gasses, and fire through wall openings.

1.5 SYSTEM DESCRIPTION

- A. Firestopping Materials: ASTM E 119, ASTM E 114, UL 1479 to achieve the fire rating indicated on the Drawings.

1.6 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures of submittals.

1. Product Data: Manufacturer's specifications for each joint firestop sealer, grout and safing insulation product required, including instructions for joint preparation and joint sealer application for insulation installation, product characteristics, performance, and limitations.
2. Assurance Control Submittals:
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements and are suitable for the intended use.
 - b. Certified Test Reports showing compliance with the specified performance values, including r-values (aged values for plastic insulations), densities, compression strengths, fire performance characteristics, perm rating, water absorption ratings and similar properties.
 - c. Product Test Reports for each type of joint firestop sealer evidencing compliance with requirements.
 - d. Documentation of experience indicating compliance with the specified qualifications requirements.

B. Section 01700 - Closeout Submittals: Procedures for closeout submittals.

1. Warranty: Provide a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 2. Installer: Company that has successfully completed at least three (3) sealer applications similar in type and size within the last three (3) years, and is approved by the manufacturer for this type of installation.
- B. Pre-Installation Meeting: Prior to beginning the installation of materials, meet at the Project Site with the Owner's representative, Contractor, Installer and subcontractors of the affected trades. Review conditions, methods and procedures necessary for proper installation of the work, including inspections of areas of work, requirements of the Specifications, and the manufacturer's literature—review submittals and the installation schedule.

1. DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store and protect the products.
- B. Deliver products to the Project Site in the manufacturer's original, unopened containers or packages with labels intact, identifying the manufacturer, product name and designation, expiration date for use, pot life, curing time, and mixing instructions for multi-component materials.
- C. Store and handle materials in compliance with the manufacturer's recommendations to prevent deterioration and damage due to moisture, high or low temperatures, contaminants or other causes.
- D. Protect insulations from physical damage from becoming wet or soiled.

1.9 JOB CONDITIONS

- A. Environmental Requirements:
 1. Maintain the manufacturer's recommended minimum temperature before, during, and for 3 days after installation of the materials.
 2. Keep products away from heat, open flame, sparks, and other sources of ignition until curing is complete.
 3. Install only when adequate ventilation is provided.
 4. Do not proceed with installation of firestop joint sealers when ambient and substrate conditions are outside the limits permitted by the manufacturer when substrates are wet due to rain, condensation, or other causes.
 5. Do not proceed with installation of firestop joint sealers until contaminants capable of interfering with adhesion has been removed from the joint substrates.

1.10 WARRANTY

- A. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
- B. Special Warranty:
 1. Contractor to warrant that the firestopping systems will provide a permanent installation.

2. Warranty Period: Life of the building.

PART 2 PRODUCTS

2.1 FIRE-RESISTANT JOINT SEALERS

- A. Firestop materials shall have been tested with and shall be in compliance with the minimum requirements of ASTM E 119, UL 1479, and UL 2079, as applicable. Products used shall be as listed below, as suitable for the intended application and as required to produce the fire rating shown on the Drawings and to conform to the Firestopping Schedule at the end of this Section.
- B. General: Provide manufacturer's standard fire-stopping sealants, with the necessary accessory materials, having fire resistance ratings indicated, as established by testing identical assemblies per ASTM E 119 by Underwriters Laboratories Inc. or other testing and inspecting agency acceptable to the authorities having jurisdiction.

2.2 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering firestopping materials which may be incorporated into the work include the following:
 1. Nelson Firestop Products.
 2. Hilti, Inc.
 3. The RectorSeal Corp.
 4. Specified Technologies, Inc. (STI).
 5. 3M Fire Protection Products.
 - Tremco Firestop Systems.
- B. Section 0100 - Product Requirements: Product Options: Substitutions not permitted.

2.3 MATERIALS

- A. Intumescent Latex or Acrylic Sealant: Single-component, intumescent, latex or acrylic formulation.
 1. LBS by Nelson Firestop.
 2. FS ONE or CP 100 by Hilti.
 3. Metacaulk 950 or 1000 by RectorSeal.
 4. SpecSeal SSS100 by STI.
 5. CP 25WB by 3M.
 - TREMstop WBM by Tremco.
- B. Intumescent Solvent-Release-Curing Sealant: Single component, intumescent, synthetic-polymer based, non-sag grade.

1. CP 25 NIS by 3M.
 2. TREMstop WBM by Tremco.
- C. Intumescent Wrap Strip: Single-component, elastomeric sheet with aluminum foil on one face.
1. WRS by Nelson Firestop.
 2. CP 45 Wrap Strip by Hilti.
 3. Metacaulk Wrap Strip by RectorSeal.
 4. SpecSeal SSWRED Wrapstrip by STI.
 5. FS-195 Wrap Strip by 3M.
 - TREMstop WS by Tremco.
- D. Intumescent Putty: Single-component, non-hardening, dielectric.
1. FSP by Nelson Firestop.
 2. CP 1 Putty Stick or CP 17 17L Putty Pad by Hilti.
 3. CP 45 Wrap Strip by Hilti.
 4. CP 5 Firestop Plug by Hilti.
 5. Metacaulk Fire Rated Putty by RectorSeal.
 - SpecSeal Putty by STI.
 7. Moldable Putty by 3M.
- E. Silicone Sealant: Single-component, moisture-curing, silicone-based elastomeric, non-sag grade.
1. CLK NIS by Nelson Firestop.
 2. CP 01S by Hilti.
 3. Metacaulk 35 by RectorSeal.
 4. SpecSeal PEN 300 by STI.
 5. 2000 Silicone by 3M.
 - FRYE SIL by Tremco.
- F. Silicone or Polyurethane Foam: Two-component, liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.
1. SpecSeal PEN 200 by STI.
 2. 2001 Silicone RT Foam by 3M.

3. CP □20 Fire Foam by Hilti.
- G. Intumescent Collar: Factory-fabricated, intumescent collar.
1. PCS by Nelson Firestop.
 2. CP □42 or CP □43 by Hilti.
 3. Metacaulk Pipe Collar by RectorSeal.
 4. SpecSeal SSC Collars by STI.
 5. Plastic Pipe Device by 3M.
- TREMstop D by Tremco.
- H. Intumescent Composite Sheet, Pillows and Mortar or Blocks: Products used to firestop large openings.
1. CPS by Nelson Firestop.
 2. FS □57 Fireblocks by Hilti.
 3. CP □37 Firestop Mortar by Hilti.
 4. CP □75T Firestop Board by Hilti.
 5. SpecSeal SSB Pillows and SpecSeal SSM Firestop Compound by STI.
- CS-195□ Composite Sheet by 3M.
7. TREMstop PS by Tremco.
- I. Sprayable Fire-Rated Mastic: Products used to firestop construction □oints.
1. CP □72 Speed Spray by Hilti.
 2. SpecSeal Elastomeric Spray by STI.
 3. Firedam Spray by 3M.
- Packing Material: Manufacturer's standard mastic, putty, ceramic fiber blanket, or mineral wool to be used as fill or backing material for firestopping.
1. FSB or Mineral Wool by Nelson Firestop.
 2. Mineral Wool by Hilti.
 3. Fire Safing or Backer Rod by RectorSeal.
 4. Mineral Wool by STI.
 5. FireMaster Mastic, FireMaster Putty, or FireMaster Bulk by 3M.
- Cerablanket by Tremco, Canada.
7. CP 777 Speed Plugs by Hilti (preformed mineral wool designed for top of wall

fluted metal deck packing material).

- K. Safing and Smoke Stop: Thermafiber Safing Insulation, 4" thick, 4 pcf high melt point, mineral wool, unfaced and thermafiber Smoke Stop System with Smoke Seal compound as required for the use and location.
- L. Accessory Materials for Fire-Stopping Sealants: Provide forming, joint fillers, packing and other accessory materials required for installation of fire-stopping sealants as applicable to the installation conditions indicated.

2.4 FIRE INSULATING MATERIALS

- A. General: Provide insulating materials which comply with the requirements indicated for materials, compliance with the referenced standards, and other characteristics.
- B. Semi-Refractory Fiber Board Safing Insulation: Semi-rigid boards designed for use as a firestop at openings between edge of slab and exterior wall panels at the top of rated walls as shown—produced by combining semi-refractory mineral fiber manufactured from slag with thermosetting resin binders to comply with ASTM C 112, passing ASTM E 136 for combustion characteristics—R-value of 4.0 at 75°F, melting point exceeding 2000 degrees F. Supports to be 2" gage galvanized steel.
 - 1. Manufacturer's of Semi-Refractory Fiber Insulation:
 - a. Johns Manville Corp.
 - b. 3M.
 - c. United States Gypsum Co.
- C. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, and conditions are as required, and ready to receive the work.
- C. With the Installer present, examine surfaces to receive joint sealers for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance.
- D. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean joints immediately before installing joint sealers to comply with recommendations of the joint sealer manufacturer and the following requirements:

1. Remove all foreign materials from joint substrates which could interfere with adhesion of the joint sealer, including dust, paint, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by the sealant manufacturer, old joint sealers, oil, grease, waterproofing, water repellents, water, and surface dirt.
- B. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with the joint sealer.
- C. Remove loose particles remaining from the cleaning operations by vacuuming or blowing out the joints with oil-free compressed air.
- D. Remove laitance and form release agents from concrete.
- E. Prime joint substrates where recommended by the joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of the joint sealer bond. Do not allow spillage or migration onto adjoining surfaces.
- F. Place hangers or damming devices in penetrations to hold firestopping materials in place, where necessary.

3.3 INSTALLATION

- A. General:
 1. Comply with the manufacturer's printed installation instructions applicable to the product and application required, except where more stringent requirements apply.
 2. Comply with the manufacturer's recommendations for protection during installation.
- B. Install firestopping at penetrations of fire-rated walls by sleeves, piping, ductwork, conduit and other items in accordance with the manufacturer's published instructions. Follow the manufacturer's chart for the appropriate material for use to achieve the required fire rating in the various locations.
- C. Install sealant, including forming, packing, and other accessory materials to fill openings around mechanical and electrical services penetrating walls and floors to provide fire-stops with the fire-resistance ratings indicated for wall and floor assemblies in which the penetrations occur. Comply with the installation requirements established by testing and inspecting agency.
- D. At full-height fire-rated walls or partitions: Protect all fire safing insulation by installing a 22 gage galvanized sheet metal closure at the top and bottom, for protection of the fire safing insulation. Tool exposed surfaces of mortar or sealants. Where plastic pipes penetrate floors, provide a galvanized steel sleeve around the pipes and fire stop sealant within the sleeve.
- E. At openings between exterior walls and floors or roofs, install fire safing insulation per the manufacturer's instructions.

3.4 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. The Owner's representative will inspect firestopping installations. Do not cover installations by other construction until the Owner's representative has completed an inspection.

3.5 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- B. Clean excessive fill material and sealants adjacent to openings and joints as the work progresses by methods and with cleaning materials approved by the manufacturers of the firestopping products and of products in which openings and joints occur.

3.6 PROTECTION

- A. Protect joint sealers and insulation from contact with contaminating substances and from damage resulting from construction operations or other causes so they are without damage at the time of Substantial Completion.
- B. If damage or deterioration does occur, cut out and remove the damaged or deteriorated joint sealers and make repairs indistinguishable from the original installations.

3.9 FIRESTOPPING SCHEDULE

- A. Provide firestopping complying with the UL assemblies specified below:

Penetration	Assembly	Nelson	Hilti	RectorSeal	STI	3M	Tremco
Metal Pipe	CMU Wall <input type="checkbox"/> Thick or Less	CA1224 or CA1203	CA1149 or CA1155 or	CA1114 or CA1115	CA1079 or CA1217	CA1001 or CA1009	CA1179 or CA1117
	Gypsum Board Partition	WL1013 or	WL1054 or	WL1021 or	WL1049 or	WL1003 or	WL1020 or
Non-Metallic Pipe	CMU Wall <input type="checkbox"/> Thick or Less	CA2011	CA2110 or	CA2021 or	CA2014 or	CA2005	CA2012 or
	Gypsum Board Partition	WL2071	WL2091 or	WL2015 or	WL2093 or	WL2002 or	WL2013 or
Cable Tray	CMU Wall <input type="checkbox"/> Thick or Less	CA4049 or	CA4035 or	CA4043	CA4020 or	CA4003 or	CA4007 or
	Gypsum Board Partition	WL4003	WL4011 or	N/A	WL4005 or	WL4004	WL3043 or
Insulated Metal Pipe	CMU Wall <input type="checkbox"/> Thick or Less	CA5001 or	CA5090 or	W5011 or	CA5021 or	CA5001 or	CA5052 or
	Gypsum Board Partition	WL5031	WL5021 or	WL5057	WL5014 or	WL5001	WL5034
Construction Gaps	CMU Wall to Metal Deck	N/A	HWD0091	TRC112 or 114	N/A	HWD0013	N/A
	Gypsum Board Partition to Metal	N/A	HWD0042 or	HWD0014	N/A	HWS0003	WHP110.01
Construction Gaps - Wall to Wall	CMU Wall to CMU Wall	N/A	WWD1011 or WWD1012 or	N/A	N/A	WWS1001	N/A

	Gypsum Board Partition to	N/A	N/A	N/A	N/A	WWS000 4	N/A
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END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sealants.
2. Backing.
3. Substrate preparation.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Sealant used in conjunction with concrete work.
2. Section 04230 - Reinforced Unit Masonry: Sealant used in conjunction with masonry work.
3. Section 05000 - Expansion Control : Sealant for waterproofing expansion joints.
4. Section 06400 - Architectural Woodwork: Sealant to prevent vermin and moisture penetration into concealed spaces.
5. Section 06550 - Solid Polymer Fabrications: Sealant to prevent vermin and moisture penetration into concealed spaces.
6. Section 07110 - Waterproofing: Sealant for waterproofing concrete work.
7. Section 07120 - Fluid-Applied Urethane Roofing: Sealant for waterproofing roofing applications.
8. Section 07125 - Fluid-Applied Elastomeric Roofing (Acrylic): Sealant for waterproofing roofing applications.
9. Section 07190 - Water Repellents (Sealer): Sealant for waterproofing concrete walks and floors.
10. Section 07250 - Fireproofing: Sealants used in fireproofing.
11. Section 07410 - Preformed Metal Roofing: Sealant for waterproofing metal roofing systems.
12. Section 07415 - Exterior Wall Panel System: Sealant for waterproofing metal wall systems.

13. Section 07□20 - Sheet Metal Flashing and Trim: Sealant for weatherproofing metal roofing and flashings.
14. Section 07724 - Roof Hatch: Sealant for waterproofing roof hatch installations.
15. Section 07□40 - Firestopping: Sealants for use in fire-rated assemblies.
- 1□ Section 0□100 - Hollow Metal Doors and Frames: Sealants for weatherproofing door and window frame perimeters and thresholds.
17. Section 0□310 - Access Doors and Panels: Sealant to close □oint where metal edge trim meets adjacent surfaces.
- 1□ Section 0□330 - Overhead Coiling Doors: Sealants for weatherproofing door frame perimeters and thresholds.
19. Section 0□400 - Entrances, Storefronts and Windows: Sealants for weatherproofing frame perimeters and thresholds.
20. Section 0□□00 - Glass and Gla□ing: Sealants and compound for glass and gla□ing installations.
21. Section 09250 - Gypsum Board: Sealant for back of control □oints and to close □oint where edge trim meets adjacent surfaces□acoustical sealants.
22. Section 09300 - Tile: Sealants for tile and threshold installations.
23. Section 09510 - Gypsum Board: Sealant to close □oint where edge trim meets vertical surfaces.
24. Section 10200 - Louvers and □ents: Sealants to close □oint where metal edge trim meets vertical surfaces.
25. Section 10500 - Metal Lockers: Sealant to close □oint where metal edge trim meets vertical surfaces.
- 2□ Section 10□10 - Toilet Accessories: Sealants to prevent moisture penetration into concealed areas.
27. Section 12305 - Science Casework and Laboratory Equipment: Sealant to prevent vermin and moisture penetration into concealed spaces.
- 2□ Section 14240 - Hydraulic Elevators: Sealant to prevent moisture penetration into concealed spaces.
29. Section 14245 - Traction Elevators: Sealant to prevent moisture penetration into concealed spaces.
30. Section 145□0 - Chutes: Sealant to prevent moisture penetration into concealed spaces.

1.2 DESCRIPTION OF WORK

- A. The extent of □oint sealers work is indicated on the Drawings and as specified herein, and includes providing and installing sealants, complete. The principal item of work is the

sealing of openings and joints indicated, specified, and as required to make the entire building weatherproof and watertight.

- B. This Section contains general specifications for sealants throughout the Project. The specific use for joint sealants is indicated in the Sealant Schedule at the end of this Section.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C 717 - Terminology of Building Seals and Sealants.
 - 2. ASTM C 834 - Specification for Latex Sealants.
 - 3. ASTM C 920 - Specification for Elastomeric Joint Sealants.
 - 4. ASTM C 1193 - Guide for Use of Joint Sealants.
 - 5. ASTM C 1299 - Guide for Use in Selection of Liquid-Applied Sealants.
 - ASTM D 105□ - Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

1.4 SUBMITTALS

- A. Section 01330 - Submittals: Procedures for submittals.
 - 1. Product Data: Manufacturer's specifications, recommendations, handling, installation and curing instructions for each type of sealant and associated miscellaneous material required. Include chemical characteristics, performance criteria, substrate preparation, limitations, color availability and VOC content.
 - 2. Samples: 2□long of each color required for each type of sealant exposed to view.
 - 3. Assurance □Control Submittals:
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - b. Manufacturer's Material Safety Data Sheets (MSDS).
 - c. Manufacturer's certification that the products supplied comply with applicable federal and local regulations controlling the use of volatile organic compounds (VOC).
 - d. Manufacturer's Instructions indicating procedures and conditions requiring special attention, and cautionary procedures required during application.
 - e. Documentation of experience indicating compliance with the specified qualifications requirements.
- B. Section 017□0 - Closeout Submittals: Procedures for closeout submittals.

1. Warranty: Provide a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store and protect the products.
- B. Deliver products to the Project Site in the manufacturer's original, new, unopened packages or containers, dry and undamaged with seals and labels intact, identifying the product and manufacturer, product designation, date of manufacture, lot number, shelf life, curing time, and mixing instructions, if applicable.
- C. Handle and store materials to prevent deterioration and damage due to moisture, temperature changes, contaminants and other causes.
- D. Store materials not in actual use out of the weather until ready for use. Maintain packages and containers in a clean condition, free of foreign materials and residue.
- E. Store materials in a ventilated area, and in compliance with the manufacturer's printed instructions.
- F. Keep storage areas neat and orderly.
- G. Protect against fire hazards and spontaneous combustion.
- H. Take all necessary precautions to ensure that workmen and the work areas are adequately protected from health hazards resulting from handling, mixing and installation of the materials.

1.7 JOB CONDITIONS

- A. Environmental Requirements: Install sealants only during the manufacturer's recommended temperature ranges and weather conditions for proper application and cure. Consult the manufacturer if a sealant cannot be applied under the recommended conditions.

1.8 WARRANTY

- A. Section 0170 - Closeout Submittals: Procedures for closeout submittals.
- B. Special Warranty:
 1. Submit a joint and severable written Warranty signed by the sealant manufacturer and the Installer certifying that the products and installation is free of defective materials and workmanship and agreeing to repair or replace sealants and accessories which fail because of loss of cohesion or adhesion, which do not

cure properly or are improperly installed.

2. Warranty Period: Three (3) years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

- A. General Performance Requirements: Select materials for compatibility with the joint surfaces to be encountered and other indicated exposures, and except as otherwise indicated, select modulus of elasticity and hardness or grade recommended by the manufacturer for each application indicated.
- B. Where exposed to foot traffic, select materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of the sealant system.
- C. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 1. Urethanes:
 - a. Two-Part Urethane: Self-Leveling, ASTM C 920, Type M, Grade P, Class 25.
 - 1) Chem-Calk 550 by Bostik.
 - 2) Sulkem 245 by Tremco (formerly Mameco International, Inc.)
 - 3) Sulkem 255 FM by Tremco.
 - 4) Urexpam NR-200 by Pecora Corporation.
 - 5) Sikaflex 2c SL by Sika Group.
 - b. Two-Part Urethane: Non-Sag, ASTM C 920, Type M, Grade NS, Class 25.
 - 1) Chem-Calk 500 by Bostik.
 - 2) Sonolastic NP 2 by Sonneborn Building Products
 - 3) Sulkem 227 by Tremco.
 - 4) Dynatrol II by Pecora.
 - 5) Sikaflex-2c NS E Mix by Sika.
 - c. One-Part Urethane: Self-Leveling, ASTM C 920, Type S, Grade P, Class 25.
 - 1) Sulkem 45 by Tremco.
 - 2) Sonolastic SL1 by Sonneborn.
 - 3) Urexpam NR-201 by Pecora.

- d. One-Part Urethane: Non-Sag, ASTM C 920, Type S, Grade NS, Class 25.
 - 1) Chem-Calk 900 by Bostik.
 - 2) Sonolastic NP 1 by Sonneborn.
 - 3) Sulkem 11 by Tremco.

2. Silicones:

- a. One-Part Silicones: ASTM C 920, Type S, Grade NS, Class 25. Vertical Surfaces Only.
 - 1) 795 Silicone Building Sealant Structural Glazing, Glazing and Weatherproofing Sealant by Dow Corning. (colors only)
 - 2) Construction 1200 Sealant by General Electric Company.
 - 3) 999-A Silicone Building and Glazing Sealant by Dow Corning.
 - 4) S4 Architectural Silicone by Pecora.
- b. One-Part Silicones: ASTM C 920, Type S, Grade NS, Class 25.
 - 1) 7 Mildew Resistant Silicone Sealant by Dow.
 - 2) Sanitary 1700 Silicone Sealant by General Electric.
 - 3) S9 Sanitary Mildew Resistant Silicone Sealant by Pecora.

3. Acrylics, Latex:

- a. One-Part Acrylic Latex, Non-Sag, ASTM C 834.
 - 1) Chem-Calk 100 by Bostik.
 - 2) LC-130 Liquid Nails Caulk Window and Door Acrylic Latex by Macco Adhesives.
 - 3) AC-20 Acrylic Latex Caulking, Non-Sag by Pecora.
 - 4) Sonolac Acrylic Latex Caulk by Sonneborn.

4. Acoustical Sealants:

- a. AC-20 FTR Fire and Temperature Rated Acoustical and Insulation Sealant by Pecora.
- b. Sheetrock Acoustical Sealant by United States Gypsum Co.

5. Butyls:

- a. One-Part Butyl, Non-Sag, FS TT-S-157.
 - 1) Chem-Calk 300 Butyl Rubber Caulk by Bostik.

2) BC-15 Butyl Rubber Caulk by Pecora.

□ Preformed Compressible □ Non-Compressible Fillers:

a. Backer Rod - Closed cell polyethylene foam:

1) Chem-Rod □Closed by Bostik.

2) Expand-O-Foam by Williams Products.

3) HBR Backer Rod by Nomaco, Inc.

4) Sonofoam Closed-Cell Backer Rod by Sonneborn.

b. Backer Rod - Open cell polyurethane foam:

1) Denver Foam by Backer Rod Manufacturing.

2) Foam Pack II by Nomaco.

c. Neoprene compression seals:

1) WA and WE Series by Watson Bowman Acme.

d. Butyl Rod: Kirkhill Rubber Co.

7. Paving Sealants:

a. Two-Part Urethane: Self-Leveling, ASTM C 920, Type M, Grade P, Class 25.

1). □ulkem 202 by Tremco. (□et Fuel Resistant) (FS SS-S-200E, Type H only).

2). NR-300 Urexpan by Pecora (FS SS-S-200E).

b. One-Part Urethane: Self-Leveling, ASTM C 920, Type S, Grade P, Class 25.

1). SONOMETRIC 1 Sealant by Sonneborn (FS SS-S-200E).

2). □ulkem 45 by Tremco.

D. Section 01□00 - Product Requirements: Product Options: Substitutions permitted.

2.2 MISCELLANEOUS MATERIALS

A. □oint Cleaner: Provide the type of □oint cleaning compound recommended by the sealant manufacturer for the □oint surfaces to be cleaned.

B. □oint Primer □Sealer: Type of □oint primer □sealer recommended by the sealant manufacturer for the □oint surfaces to be primed or sealed.

C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by the sealant manufacturer, to be applied to the sealant contact surfaces where bond to the substrate or □oint filler must be avoided for proper performance of the sealant. Provide self-adhesive tape where applicable.

- D. Sealant Backer Rod: Compressible rod stock of polyethylene foam, polyethylene backed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorbable material as recommended by the sealant manufacturer for compatibility with the sealant.
- E. Masking tape and similar accessories as necessary to protect adjacent surfaces from damage.

2.3 COLORS

- A. Generally use sealant colors to match the color of the material in which the joint is located. Select from the manufacturer's standard colors.
- B. Where a joint occurs between two materials of differing colors and the Contractor cannot determine which material to match, contact the Owner's representative for a decision.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 - 1. Verify that joint widths are in conformance with the sealant manufacturer's allowable limits.
 - 2. Verify that contaminants capable of interfering with adhesion have been cleaned from joints.
 - 3. Verify that joints has been properly prepared.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 JOINT PREPARATION

- A. Prepare and size joints in accordance with the manufacturer's instructions.
- B. Clean joint surfaces immediately before installation of sealant. Remove dust, dirt, laitance, unsecured coatings, mortar, moisture and other substances which could interfere with bond of sealant or caulking compounds using a solvent or abrasion as recommended by the manufacturer. Remove loose materials and foreign matter which could impair adhesion of the sealant.
- C. Etch concrete and masonry joint surfaces as recommended by the sealant manufacturer.
- D. Roughen vitreous and glazed joint surfaces as recommended by the sealant manufacturer.
- E. Prime or seal joint surfaces where indicated, and where recommended by the sealant manufacturer.

- F. Verify that the sealant is suitable for the substrate.
- G. Verify that joint backing and release tapes are compatible with the sealant.
- H. Verify that the sealant is paintable if a paint finish is indicated.

3.3 INSTALLATION

- A. Install in accordance with the manufacturer's printed instructions, except where more stringent requirements are shown or specified, and except where the manufacturer's technical representative directs otherwise. Perform the work in accordance with ASTM C 1193 for latex base sealants.
- B. Prime or seal joint surfaces where recommended by the sealant manufacturer. Do not allow the primer or sealer to spill or migrate onto adjoining surfaces.
- A. Set joint filler units at the proper depth or position to coordinate with other work, including the installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between the ends of joint filler units.
- B. Install sealant backer rods, except where shown to be omitted or recommended to be omitted by the sealant manufacturer for the application indicated.
- C. Install pre-formed compressible and non-compressible fillers in accordance with the manufacturer's published instructions.
- D. Install bond breaker tape where indicated and where required by the manufacturer's recommendations to ensure that elastomeric sealants will perform properly.
- E. Employ only proven installation techniques which will ensure that the sealants are deposited in uniform, continuous ribbons without gaps or air pockets, foreign embedded matter, ridges and sags, with complete wetting of joint bond surfaces equally on both sides.
- F. Except as otherwise indicated, fill sealant rabbet to a slight concave surface, slightly below the adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill the joint to form a slight cove so the joint will not trap moisture and foreign matter.
- G. Dry tool joints. Do not use soap, water or solvent to tool the joints.
- H. Seal joints before adjacent surfaces are waterproofed or painted.
- I. Install sealants to the depths shown or, if not shown, as recommended by the sealant manufacturer, but within the following general limitations, measured at the center (thin) section of the bead:
 1. For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasions and indentation exposures, fill the joints to a depth equal to 75% of the joint width, but not less than 3/16" deep or more than 1/2" deep.
 2. For normal moving joints sealed with elastomeric sealants not subject to traffic, fill joints to a depth equal to 50% of the joint width, but not less than 1/4" deep or more than 2" deep.

3. For joints sealed with non-elastomeric sealants, fill the joints to a depth in the range of 75% to 125% of the joint width.
- L. Epoxy Floor Joint Sealant: Install sealant at floor construction and control joints in accordance with the manufacturer's published instructions.

3.4 SPILLAGE

- A. Protect materials surrounding the work of this Section from damage and disfigurement. Do not allow sealants to overflow or spill onto adjacent surfaces, or to migrate into the voids of adjoining surfaces.
- B. Recess exposed edges of exposed joint fillers slightly behind the adjoining surfaces, unless otherwise shown, so the compressed units will not protrude from the joints.
- C. Bond ends of joint fillers together with an adhesive or weld by other means recommended by the manufacturer to ensure a continuous watertight and airtight installation.

3.5 CURING

- A. Cure sealants in compliance with the manufacturer's published instructions.

3.6 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect sealant work for proper installation, depth and adhesion.

3.7 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- B. Remove excess and spillage of sealants promptly as the work progresses using the materials and methods recommended by the sealant and substrate manufacturers.
- C. Clean adjoining surfaces to eliminate evidence of spillage without damage to the adjoining surfaces and finishes.

3.8 SEALANT SCHEDULE

- A. Exterior joints:
 1. Perimeters of exterior openings where frames and other penetrations meet the exterior face of the building—precast concrete, concrete, concrete masonry, polymer reinforced concrete:
 - a. Sealant No. 2.1, C.1.b
 2. Expansion and control joints in exterior surfaces of cast-in-place concrete walls and precast architectural wall panels:
 - a. Sealant No. 2.1, C.1.b
 - b. Sealant No. 2.1, C.1.d

- c. Material No. 2.1, C.1.a
 - 3. Expansion and control joints in exterior surfaces of unit masonry walls, polymer reinforced concrete and metal panels:
 - a. Sealant No. 2.1, C.1.b
 - 4. Coping joints, coping-to-facade joints, cornice and wash, and horizontal surface joints not subject to foot or vehicular traffic:
 - a. Sealant No. 2.1, C.1.b
 - b. Sealant No. 2.1, C.1.d
 - 5. Exterior joints in horizontal wearing and non-wearing surfaces:
 - a. Sealant No. 2.1, C.1.a
 - b. Sealant No. 2.1, C.1.c
 - c. Material No. 2.1, C.1.a
 - Paving joints and curb:
 - a. Sealant No. 2.1, C.1.d
 - b. Sealant No. 2.1, C.2.a
 - 7. Setting bed for thresholds and saddles:
 - a. Sealant No. 2.1, C.1.c
 - Painted metal lap and flashing joints:
 - a. Sealant No. 2.1, C.2.a
- B. Interior joints:
 - 1. Seal the interior perimeters of exterior openings.
 - 2. Expansion and control joints on the interior of exterior cast-in-place concrete walls.
 - 3. Expansion and control joints on the interior of exterior precast, architectural wall panels.
 - 4. Expansion and control joints on the interior of exterior surfaces of unit masonry walls.
 - 5. Perimeters of interior aluminum and hollow metal frames.
 - Interior masonry vertical control joints and intersecting unit masonry walls□ masonry-to-masonry, masonry-to-concrete.
 - 7. For all of the above interior joints:

- a. Sealant No. 2.1, C.1.b
 - b. Sealant No. 2.1, C.1.d
 - c. Sealant No. 2.1, C.1.a (for pre-finished materials only).
- Exposed interior control joints in drywall and concealed joints:
- a. Sealant No. 2.1, C.3.a
 - b. Sealant No. 2.1, C.4
 - c. Sealant No. 2.1, C.4.c
 - d. Sealant No. 2.1, C.□a
9. Joints at the top of non-load-bearing unit masonry walls at the underside of cast-in-place concrete:
- a. Sealant No. 2.1, C.1.b
 - b. Sealant No. 2.1, C.1.d
10. Perimeters of architectural woodwork: overhead cabinets, base cabinets, vanities, countertops, shelving, etc.:
- a. Sealant No 2.1, C.2.b
11. Perimeters of suspended acoustical ceilings where edge trim meets vertical surfaces:
- a. Sealant No. 2.1, C.2.b
12. Perimeters of toilet and bath fixtures: mirrors, sinks, urinals, tubs, vanities, waterclosets, accessories, etc.:
- a. Sealant No. 2.1, C.2.b
13. Interior expansion and control joints in floor surfaces exposed to foot traffic:
- a. Sealant No. 2.1, C.1.a
 - b. Sealant No. 2.1, C.1.c
 - c. Material No. 2.1, C.□a
14. Interior saw-cut contraction joints in exposed concrete floors exposed to forklift traffic:
- a. Sealant No. 2.1 C.7
15. Interior non-moving joints, including control, contraction, and construction joints in interior floor slabs exposed to heavy duty traffic:
- a. Sealant No. 2.1, C.7
- 1□ Painted metal lap joints:

a. Sealant No. 2.1, C.2

C. Glass and Glazing:

1. Structural Glazing.

a. Sealant 2.1, C.2.a

2. General Purpose Glazing.

a. Sealant 2.1, C.2.b

3. End Damming.

a. Sealant 2.1, C.5

END OF SECTION

SECTION 01100

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Steel doors.
 2. Steel door frames.
 3. Steel window frames.
 4. Door vision panels.
 5. Louvers.
 - Accessories.
- B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.
- C. Related Sections:
1. Section 03300 - Cast-In-Place Concrete: Substrate for anchorage.
 2. Section 04230 - Reinforced Unit Masonry: Substrate for anchorage.
 3. Section 01210 - Wood Doors: Doors installed in steel frames.
 4. Section 01710 - Door Hardware: Hardware coordination.
 5. Section 01400 - Glass and Glazing: Glass installed in vision panels in doors and steel window frames.
 - Section 09900 - Painting: Field painting and finishing of frames and doors.

1.2 DESCRIPTION OF WORK

- A. The extent of standard steel doors and frames work is indicated on the Drawings and Schedule and as specified herein, and includes providing and installing exterior entrance and storefront assemblies, designed and fabricated to comply with the requirements for system performance characteristics below, as demonstrated by testing of the manufacturer's corresponding stock systems in compliance with the test methods designated.
- B. Door hardware is specified in Section 01710.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced.

Publications are referred to in the text by basic designation only.

B. American Society of Civil Engineers (ASCE):

1. ASCE □SEI 7 - Minimum Design Loads for Buildings and Other Structures.

C. American Society for Testing and Materials (ASTM):

1. ASTM A 153 □A 153M - Specification for □inc Coating (Hot-Dip) on Iron and Steel Hardware.
2. ASTM A 5□□ □A 5□□M - Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
3. ASTM A □53 □A □53M - Specification for Steel Sheet, □inc-Coated (Galvani□ed) or □inc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
4. ASTM A 100□ □A 100□M - Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
5. ASTM A 1011 □A 1011M - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- ASTM D 2201 - Practice for Preparation of □inc-Coated and □inc-Alloy-Coated Steel Panels for Testing Paint and Related Coating Products.
7. ASTM E 90 - Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- ASTM E 330 - Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
9. ASTM E 413 - Classification for Rating Sound Insulation.

D. Americans with Disabilities Guidelines (ADAAG):

1. Accessibility Guidelines for Buildings and Facilities.

E. Door Hardware Institute (DHI):

1. DHI - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder□ Hardware.

F. International Code Council:

1. International Building Code (IBC), 2009.

G. Steel Door Institute (SDI):

1. SDI-100 - Standard Steel Doors and Frames.
2. SDI-105 - Recommended Erection Instructions for Steel Frames.

H. National Fire Protection Association (NFPA):

1. Standard No. 10 - Standard for Fire Doors and Other Opening Protectives.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Identify door and frame materials, gauges, configurations, location of cutouts, hardware reinforcement, fire-rating and finish.
2. Shop Drawings: Include elevations of each door type, details of each frame type, conditions at openings, details of construction, location and installation requirements of reinforcements and finish hardware, and details of joints and connections. Show anchorages and accessory items. Indicate door elevations, internal reinforcement, closure method, sidelights, and cutouts for louvers and vision panels.
3. Schedule: Provide for doors and frames using the same reference numbers for details and openings as those used on the Drawings.
4. Samples: Full range of color samples for selection. Two (2) 2x2 minimum, of each color and texture selected from factory-finished doors and frames.
5. Assurance Control Submittals:
 - a. Certificates:
 - 1) Manufacturer's Certificate that the products meet or exceed the specified requirements.
 - 2) Manufacturer's certification that hot-dip galvanizing for doors and frames comply with the requirements.
 - 3) Manufacturer's certification that oversized fire-rated frame and door assemblies have been constructed with materials and methods equivalent to the requirements for labeled construction.
 - b. Calculations indicating that exterior doors, frames and anchorages satisfy the performance requirements.
 - c. Documentation of experience indicating compliance with the specified qualifications requirements.

B. Section 01700 - Closeout Submittals: procedures for closeout submittals.

1. Warranty: Submit a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
2. Installer: Company experienced in performing work of this Section with a minimum of five (5) years documented experience.

3. Provide frames and doors complying with Steel Door Institute, SDI-100 Recommended Specifications: Standard Steel Doors and Frames and as specified herein.

B. Performance Requirements:

1. Provide the capacity to withstand the following loading requirements for exterior units:
 - a. Design and install to resist combined positive and negative windloading in accordance with IBC 2009, Section 1609 with a v of 170, q_s of 74.0 psf, exposure B and importance factor $I = 1.25$ as applicable per ASCE 7.
2. Fire-Rated Assemblies: Provide fire-rated doors investigated and tested as fire door assemblies, complete with type of hardware to be used. Identify each fire door with recognized testing laboratory labels indicating the applicable fire-rating. Construct and install assemblies to comply with NFPA, Standard No. 80, and as herein specified.

1.6 DELIVERY, STORAGE AND PROTECTION

- A. Section 01600 - Product Requirements: Transport, handle, store, and protect the products.
- B. Deliver hollow metal work cartoned or crated for protection during transit and storage.
- C. Provide additional sealed plastic wrapping for factory-finished doors.
- D. Deliver products to the Project Site in the manufacturer's original, unopened packages, dry and undamaged with seals and labels intact.
- E. Inspect products for damage. Minor damages may be repaired provided the finish items are equal, in all respects, to new work, and acceptable to the Owner's representative; otherwise remove and replace the damaged items.
- F. Store under cover in dry, weathertight conditions. Place units on 4" high wood sills or store otherwise in a manner to prevent rust and damage. Provide 1" space between stacked doors to allow for air circulation. Avoid the use of non-ventilated plastic or canvas shelters. If the cardboard wrapper becomes wet, remove the carton immediately.
- G. Break seals to permit ventilation.

1.7 WARRANTY

- A. Section 01700 - Closeout Submittals: Procedures for closeout.
- B. Special Warranty:
 1. Provide a written Warranty, signed by the door manufacturer, and the door installer agreeing to repair or replace doors that do not meet the requirements, or that fail in materials or workmanship.
 2. Warranty Period: Two (2) years from the date of Substantial Completion.

PART 2 PRODUCTS

HOLLOW METAL
DOORS AND FRAMES

0100-4

CENTRAL POLICE PRECINCT

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering items which may be incorporated in the work include the following:
 - 1. Amweld Building Products.
 - 2. Ceco Door Products.
 - 3. Republic Doors and Frames.
 - 4. Steelcraft.
 - 5. Curries.
- B. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 1011 or A 1011M and ASTM A 500 or A 500M.
- B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 1008 or A 1008M and ASTM A 500 or A 500M.
- C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 593 or A 593M, ASTM D 2201, G90 zinc coating, mill phosphated.
- D. Supports and Anchors: Fabricate of not less than 1/4 gage galvanized sheet steel.
- E. Inserts, Bolts and Fasteners: Manufacturer's standard units, hot-dip galvanized complying with ASTM A 153 or A 153M, Class C or D, as applicable.

2.3 FABRICATION

- A. Fabricate units rigid, neat in appearance, and free from defects, warp, twist and buckle. Fit and assemble units in the manufacturer's plant. Fabricate KD or welded. Clearly identify work that cannot be permanently factory-assembled before shipment to assure proper assembly at the Project Site.
- B. Weld the exposed surface of joints continuously grind, dress, and make joints smooth, flush and invisible. When prime painted, the use of metallic filler to conceal manufacturing defects is not acceptable.
- C. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units from only cold-rolled steel.
- D. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and molding from either cold-rolled or hot-rolled steel (fabricator's option) galvanized.
- E. Fabricate doors, panels and frames from galvanized sheet steel. Close top and bottom edges of doors as an integral part of the door construction or by the addition of inverted steel channels.
- F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips head for exposed screws and bolts galvanized.

G. Sound-Rated (Acoustical) Assemblies:

1. Where shown or scheduled, provide frame and door assemblies which have been fabricated as sound-reducing type, tested in accordance with ASTM E 90 and classified in accordance with ASTM E 413.
2. Unless otherwise indicated, the minimum sound rating for acoustical assemblies shall be STC 33.

H. Door Hardware Preparation:

1. Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by the hardware supplier. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.
2. For concealed overhead door closers, provide space, cutouts, reinforcing and provisions for fastening in the top rail of doors or heads of frames, as applicable.
3. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at the Project site.
4. Locate finish hardware as shown on final Shop Drawings or, if not shown, in accordance with Recommended Locations for Builder's Hardware, published by the Door and Hardware Institute and ADA Accessibility Guidelines.

I. Prepare frame for silencers. Provide three single rubber silencers for single doors □ two single silencers on the frame head at double doors without mullions.

- Equip frames with one welded-in floor anchor in each jamb. Furnish a minimum of three (3) steel jamb anchors and two (2) head anchors for field insertion at a maximum of 24" o.c. Anchors shall be of the proper type for particular construction involved (i.e., masonry, concrete, metal framing, etc).

K. Factory install louvers and vision panels in prepared openings.

L. Shop Painting:

1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
2. Clean, treat and paint exposed surfaces of steel doors, louvers and frames including galvanized surfaces.
3. Apply one shop coat of rust-inhibitive enamel or primer paint, either air-dried or baked-on, of even consistency, and suitable as a base for the specified finish paint.

2.4 STANDARD STEEL FRAMES

A. Provide galvanized steel frames for doors, transoms, sidelights, borrowed lights, windows and other openings of the types and styles shown on the Drawings.

B. Exterior Frames including sidelights, if required:

1. Cold-rolled steel—factory mitered corners and full-welded construction—2—face, —amb dept as required or as shown on the Drawings—galvani—ed to ASTM D 2201.
 2. 14 gage for exterior frames and other frames wider than 4—
 3. 1—gage for all other frames.
- C. Interior Frames:
1. Cold-rolled steel—2—face, —amb depth as required or as shown on the Drawings.
 2. 1—gage.
 3. Fire-rated frames per NFPA, Standard No. —0.
- D. Silencers: Except on weatherstripped frames, drill stops to receive three (3) silencers on the strike —amb of single-swing frames and two (2) silencers on the heads of double-swing frames. Install plastic plugs to keep holes clear during construction.
- E. Plaster Guards: Provide 2—gage, steel plaster guards or mortar boxes welded to the frames at the back of door hardware cutouts where mortar or other materials might obstruct hardware operation.
- F. Anchors: Equip frames with one welded-in floor anchor in each —amb. Furnish a minimum of three (3) steel —amb anchors and two (2) head anchors for field insertion at a maximum of 24—o.c.. Anchors shall be of the proper type for the particular construction involved, i.e., concrete, masonry, metal framing, etc. Conceal fastenings unless indicated otherwise.

2.5 STANDARD STEEL DOORS

- A. Exterior Doors: Extra Heavy-Duty, Grade III per SDI-100, 1-3—thick, types and styles as indicated on the Drawings—top edge closed flush—14 gage cold-rolled steel, galvani—ed to ASTM D 2201—insulated core.
- B. Interior Doors: Standard-duty, Grade I per SDI-100, 1-3—thick, types and styles as indicated on the Drawings—top edge closed flush—1—gage cold-rolled steel. Fire-rated UL labeled where indicated or required by the Building Code.
- C. Fire-Rated Doors: Per NFPA, Standard No. —0.
- D. —ision Panels: Laminated glass in metal frames as required by the fire-rating. Install removable steel stops on the room side of the doors.
- E. Louvers:
 1. Exterior: Weatherproof, stationary, where shown on the Drawings. Construct of A—@ shaped, 1—gage, hot-dip galvani—ed steel blades. Space blades not more than 1-1—o.c.. Provide removable 1—stainless steel wire mesh screen at the interior face of doors, in formed metal frame with removable clips. Provide insect screens at lovers in exterior doors.
 2. For fire-rated openings, provide tightly fitted, spring-loaded, automatic closing louvers with operable blades equipped with a fusible link—arranged so metal overlaps metal at every —int.
 3. Provide louvers complying with UL or NFPA standards only, and factory-applied in doors.

4. Interior (Non-fire-rated): Roll-formed, 20 gage, galvanized steel, inverted AY@ blades sight-proof prime painted for field applied finish paint as indicated on the Drawings.

2. CORE CONSTRUCTION

- A. Provide one of the following types of core construction (Contractor's option):
 1. Kraft Honeycomb: Phenolic treated.
 2. Polyurethane: Foamed-in-place or laminated. 20 psi strength, 1.0 pcf density, 12 maximum voids in any direction. Strength of bond between the core and the steel face sheets shall exceed strength of core so delamination will not occur during operating conditions.
 3. Polystyrene: Rigid core of polystyrene foam board, 1500 psf compressive strength, 1.0 psi shear strength. Strength of the bond between the core and the steel face sheets shall exceed strength of core so that delamination will not occur under operating conditions.
 4. Vertical Steel Stiffeners: 22 gage vertical steel stiffeners, spaced 12 apart and spot welded to the face sheets at 12 on center. Insulate the spaces between stiffeners with loose fill insulation the full height of the door.

2.7 PROTECTIVE COATINGS

- A. Bituminous Coating: Apply fibered asphalt emulsion at grout filled frames.
- B. Primer: Exposed surfaces shall be cleaned, treated with Bonderite chemical and given one baked-on shop coat of grey synthetic primer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
- C. Report in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install standard steel doors, frames and accessories in accordance with the final Shop Drawings, the manufacturer's published instructions, as herein specified, and at the locations shown on the Drawings.
- B. Door Installations:
 1. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.

2. Install fire-rated doors with the clearances specified in NFPA, Standard No. 80.
- C. Frame Installations:
1. Comply with the provisions of SDI-105 "Recommended Erection Instructions for Steel Frames", unless indicated otherwise.
 2. Except for frames located at in-place concrete or masonry and at drywall installations, place frames prior to construction of the enclosing walls. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After the wall construction is completed, remove temporary braces and spreaders leaving the surfaces smooth and undamaged.
 3. At in-place concrete construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.
 4. In masonry construction, locate wall anchors at the hinge and strike levels. Building-in of anchors and grouting of frames is specified in Division 4 and as shown on the Drawings.
 5. In steel framed partitions, install wall anchors at the hinge and strike levels. In open steel stud partitions, place studs in wall anchor notches and wire tie. In closed steel stud partitions, attach wall anchors to studs with tapping screws.
- Install fire-rated frames with clearances specified in NFPA, Standard No. 80.
- D. Field Finish: Field paint door, frames, louvers and vision panel frames as specified in Section 09900 - Painting.

3.3 CONSTRUCTION

- A. Interface with Other Work:
1. Coordinate frame installations for size, location, and the particular construction involved.
 2. Coordinate with the door opening construction, door frames, door hardware, door louver and vision panel glazing installation.
- B. Site Tolerances:
1. Maximum Diagonal Distortion: 1/1000 measured with straight edge from corner to corner.

3.4 ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting the installed work.
- B. Immediately after installation, sand smooth any rusted or damaged areas of the prime coat and touch-up with a compatible air-drying primer.
- C. Check and readjust operating door hardware items. Leave steel doors and frames undamaged and in complete and proper operating condition.
- D. Adjust hardware for smooth and balanced door and window movement.

3.5 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect metal door, frame and window installations, alignment, attachment to structure, and operation.

3.6 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning installed Work.
- B. Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.
- C. Wipe down all doors and frames before final acceptance inspection.

END OF SECTION

SECTION 0□210

WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Flush solid core wood doors with wood veneer.
2. Flush solid core wood doors with plastic laminate face.
3. Flush hollow core wood doors with veneer face.
4. Paneled wood doors with solid wood stiles, rails and panels.
5. Furnishing and installation of louvers in wood doors.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 0□200 - Finish Carpentry: Wood door frames.
2. Section 0□710 - Door Hardware: Hardware coordination for wood doors.
3. Section 0□□00 - Glass and Glazing: Glass installed in wood doors.
4. Section 09900 - Painting: Field painting of wood doors.

1.2 DESCRIPTION OF WORK

A. The extent of the wood doors work is indicated on the Drawings and Schedules and as specified herein, and includes providing and installing standard hollow core and solid core wood doors, panel doors and louvers.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society of Civil Engineers (ASCE):

1. ASCE □SEI 7 - Minimum Design Loads for Buildings and Other Structures.

C. Americans with Disabilities Act Accessibility Guidelines (ADAAG):

1. Accessibility Guidelines for Buildings and Facilities.

D. National Electrical Manufacturers Association (NEMA):

1. NEMA LD-3 - High Pressure Decorative Laminates.
- E. Architectural Woodwork Institute (AWI):
1. Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program.
 2. AWI 1300 - Architectural Flush Doors.
- F. International Code Council:
1. International Building Code (IBC), 2009.
- G. National Wood Window and Door Association (NWWDA):
1. I.S.-1. AIndustry Standard for Wood Flush Doors@.
- H. National Woodwork Manufacturers Association (NWMA).
1. ACare and Finishing of Wood Doors@.
- I. Woodwork Institute (WI):
1. AManual of Millwork@ - Designations for wood door grades and core construction.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
1. Product Data: Door manufacturer's product data, specifications and installation instructions for each type of door. Include details of core and edge construction, and louvers, if any, and similar components.
 2. Shop Drawings: Indicate locations and size of each door, elevation of each kind, details of construction, locations and extent of hardware blocking, swings, and other pertinent information. Indicate cutouts for vision panels and louvers, if any.
 2. Samples: For review and approval of color and texture only. Compliance with other requirements is the exclusive responsibility of the Contractor. Submit the following:
 - a. 12x 10representative finished veneer sheet for each available flitch to be used for face veneer of transparent finished doors.
 - b. 3x 10solid wood strips of species to be used for exposed edges, trim and other solid wood components.
 3. Assurance Control Submittals:
 - c. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - d. Documentation of experience indicating compliance with the specified qualifications requirements.
- B. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
1. Special Warranty: Submit written special Warranty forms completed in the name

of the Owner and registered with the manufacturer.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

B. Obtain doors from a single manufacturer to ensure uniformity in quality of appearance and construction, unless approved otherwise.

C. Mark each door with NWWDA, Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of ANSI NWWDA I.S.-1. For manufacturer's not participating in the NWWDA Hallmark Program, a certification of compliance may be substituted for marking of the individual doors.

D. Perform Work in accordance with AWI 1300 for Custom Grade doors.

F. Performance Requirements:

1. Fabricate and install to withstand the following loading requirements for exterior units:
 - a. Combined positive and negative windloading in accordance with IBC 2009, Section 1609 with a v of 170, q_s of 74.0 psf, exposure B and C and importance factor of 1.0 to 1.5 as applicable per ASCE 7.

1.5 DELIVERY, STORAGE AND HANDLING

A. Section 0100 - Product Requirements: Transport, handle, store and protect doors from damage, soiling and deterioration.

B. Ship doors individually wrapped.

C. Deliver products to the Project Site in the manufacturer's original, unopened packaging, dry and undamaged with seals and labels intact.

D. Comply with the "On-Site Care" recommendations of NWMA pamphlet "Care and Finishing of Wood Doors" and with the manufacturer's instructions.

E. Store under cover in dry, weathertight conditions.

1.6 COORDINATION

A. Design Intent: It is the intent of the design that similar woodwork throughout the Project match. Coordinate work between the separate installers providing similar woodwork to ensure that the design intent is achieved to the satisfaction of the Owner's representative.

B. Pre-Construction Meetings: Prior to the purchase and fabrication of materials and prior to installation of the scheduled work, conduct meetings with the various related woodwork installers to coordinate efforts to achieve the design intent. Participants to include the Contractor, finish carpentry installer, architectural woodwork installer, painting applicator and the Owner's representative.

1.7 JOB CONDITIONS

- A. Condition doors to the average prevailing humidity in the installation areas prior to installation.

1.0 WARRANTY

- A. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
- B. Special Warranty:
 - 1. Provide a written Warranty, signed by the door manufacturer agreeing to repair or replace doors that do not meet the requirements, or that fail due to delamination of veneer, warping beyond the specified installation tolerances, defective materials or telegraphing of the core construction.
 - 2. Warranty Period:
 - a. Exterior Doors: Two (2) years from the date of Substantial Completion.
 - b. Interior Doors: Life of the installation.
 - c. Stile and Rail Doors: Fabricator's special warranty for two (2) years against defects in materials and workmanship including, but not limited to, defects against warpage and wracking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 - 1. Cal-wood Door Div., Timberland Industries.
 - 2. Eggers Industries, Architectural Door Div.
 - 3. Mohawk Flush Doors, Inc.
 - 4. Weyerhaeuser Co.
 - 5. SUN-DOR-CO.
- B. Section 01000 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

- A. Solid Core Wood Doors (interior doors): AWI 1300.
 - 1. Type: Institutional, flush, solid core wood, AWI, premium custom grade.
 - 2. Thickness: As indicated on the Drawings.
 - 3. Core: Mat-formed wood particleboard with closed grain hardwood stiles, commercial Standard CS 2300, Type 1, Density AC@, Class 1. Minimum 30 pounds per cubic foot density. Mineral core with UL label for fire-rated doors.

4. Face Finish: Veneer shall be premium grade sliced hardwood for doors with a transparent finish or custom grade, medium density overlay for doors scheduled for paint finish or conform to commercial standard CS35 or minimum, 1/8" thick. Wood species as selected. Plastic laminate where indicated.
 5. Stiles and Rails: One piece hardwood stiles and top and bottom rails with wood species to match the face veneer. Where door closers are specified, the top rail width shall be doubled.
 - a. The bottom rail of a transom panel shall run the full width of the panel.
- Plastic Laminate: High pressure laminate. Color and texture as selected.
- B. Hollow Core Wood Doors:**
1. Type: Institutional, flush hollow core, AWI, or premium or custom grade.
 2. Thickness: As indicated on the Drawings.
 3. Core: Expanded corrugated core with wood lock blocks.
 4. Face Finish: Veneer shall be premium grade, plain sliced hardwood for doors with a transparent finish or custom grade, medium density overlay for doors scheduled for paint finish. Wood species as selected.
 5. Plastic Laminate: High pressure laminate. Color and texture as selected.
- C. Panel Doors:**
1. Type: Custom fabricated, solid wood construction. AWI, or premium or custom grade.
 2. Stiles, Rails and Panels: Fabricated from clear, kiln dried solid lumber core with sliced veneer faces and edges as scheduled and solid trim pieces as required. Wood species as scheduled or selected. Vertical stiles shall be of the same species and color as the face veneer.
- D. Louvered or Half-Louvered Doors:** Minimum 1-3/4" thick or conform to NWWDA, I.S.-1
- E. Louvers:**
1. Wood: Door manufacturer's standard solid wood louvers of the same species as the door face veneer, unless indicated otherwise and of the size, type and profile shown. Factory install in prepared openings.
- F. Transom and Side Panels:** Where transom or side panels are shown in the same framing system as wood doors, provide panels which match the quality and appearance of the associated wood doors, unless otherwise indicated. Fabricate matching panels with the same construction, exposed surfaces and finish as specified for the associated doors.
- G. Adhesive:** Type 1, waterproof bond.

2.3 FABRICATION

- A. Fabricate non-fire-rated doors in accordance with AWI 1300.
- B. Furnish and install lock blocks at lock edge, and at the top of doors for closer hardware reinforcement.

- C. Bond edge banding to the core.
- D. Factory machine doors for door hardware in accordance with the hardware requirements and dimensions. Do not machine for surface hardware.
- E. Factory install louvers in prepared openings.
- F. Factory fit doors for the frame opening dimensions identified on the approved Shop Drawings.
- G. Doors may be provided pre-fitting, set in frames and ready for installation in rough openings.
- H. Before delivery of doors to the Project Site, shop-prime all wood surfaces per Section 09900 - Painting.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
- C. Installer must examine door frames and verify that the frames are the correct type and have been installed as required for the proper hanging of corresponding doors.
- D. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Condition doors to average prevailing humidity in the installation areas prior to hanging.
- B. Install wood doors in accordance with the manufacturer's instructions and as shown.
- C. Install non-fire-rated doors in accordance with AWI Quality Standards requirements.
- D. Job Fit Doors: Align doors to the frames for proper fit and uniform clearance at each edge and machine for hardware. Seal cut surfaces after fitting and machining.
 - 1. Bevel non-fire rated doors 1/4" in 2" at lock and hinge edges.
- E. Machine cut doors for the hardware. Install the door hardware specified in Section 08710.
- F. Clearance: For non-fire rated doors provide a clearance of 1/8" at jambs and heads, 1/4" at meeting stiles for pairs of doors, and 3/16" from the bottom of the door to the top of decorative floor finish or covering. Where thresholds are shown or scheduled, provide 1/4" clearance from the bottom of the door to the top of the threshold.
- G. Tolerance: Conform to AWI 1300 for requirements for maximum diagonal warp.

- H. Install door louvers plumb and level.
- I. Job Site Finished Doors: For requirements for finishing wood doors, louvers and vision panel frames see Section 09900 - Painting.

3.3 ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting and cleaning the installed work.
- B. Rehang or replace doors which do not swing or operate smoothly.

3.4 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect door installations for alignment, hardware installations and door operation.

3.5 PROTECTION

- A. Section 01700 - Execution Requirements: Protecting the installed work.
- B. Implement procedures for the protection of installed wood doors from damage and deterioration until final acceptance.
- C. Refinish or replace doors damaged during installation as directed by the Owner's representative.

END OF SECTION

SECTION 0310

ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access door and frame units.
2. Wall- and ceiling-mounted locations.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for anchorage.
2. Section 04230 - Reinforced Unit Masonry: Substrate for anchorage.
3. Section 09110 - Non-Load Bearing Steel Framing: Wall and ceiling framing for attachment of units.
4. Section 09250 - Gypsum Board: Adjacent wall and ceiling finish material.
5. Section 09900 - Painting: Field painting of door and frame units.

1.2 DESCRIPTION OF WORK

A. The extent of access door work is indicated on the Architectural, Mechanical, Plumbing and Electrical Drawings and as specified herein, and includes providing and installing access doors where access to mechanical, plumbing and electrical items is required, whether or not the access doors are shown on the Drawings.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM A 153/A 153M - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. ASTM A 568/A 568M - Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
3. ASTM A 569/A 569M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

4. ASTM A 1008 / A 1008M - Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 5. ASTM A 1011 / A 1011M - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 - ASTM D 2201 - Practice for Preparation of □inc-Coated and □inc-Alloy-Coated Steel Panels for Testing Paint and Related Coating Products.
- C. National Fire Protection Association (NFPA):
1. Standard No. □0 - Standard for Fire Doors and Other Opening Protectives.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
1. Product Data: Manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions and directions for installation of anchorage devices.
 2. Shop Drawings: Indicate the location, si□e, type, finish, hardware, and details of ad□ining work for all access door units.
 3. Schedule: Indicate all doors by type, si□e, rating and location keyed to the Drawings.
 3. Assurance □Control Submittals:
 - a. Manufacturer's certificate that products meet or exceed the specified requirements.
 - b. Documentation of experience indicating compliance with the specified qualifications requirements.
- B. Section 017□0 - Closeout Submittals: Procedures for closeout submittals.
1. Pro□ect Record Documents: Accurately record the location of all access units.
 2. Warranty: Submit a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 □UALITY ASSURANCE

- A. □ualifications:
1. Manufacturer: Company speciali□ing in manufacturing the products specified with a minimum of five (5) years documented experience.
- B. Fire-Resistance Ratings: In all Corridor walls, rated partitions and ceilings, provide access door assemblies with panel door, frame, hinge, and latch from a manufacturer listed in Underwriter's Laboratories, Inc. □AClassified Building Materials Index□ for 90 minutes rating.

1. Provide UL label on each fire-rated access door.
- C. Size Variation: The selected manufacturer's standard units may vary in size slightly from the sizes indicated herein. Secure the Owner representative's approval for sizes that differ from the units specified.
- D. Coordination: Furnish inserts and anchoring devices which must be built into other work for the installation of access doors. Coordinate delivery with other trades to avoid delaying the work.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store, and protect the products.
- B. Deliver products to the Project Site in the manufacturer's original, unopened packaging, dry and undamaged with seals and labels intact.
- C. Handle and store to prevent damage to frames, panels and operating mechanisms.

1.7 WARRANTY

- A. Section 0170 - Closeout Submittals: Procedures for closeout.
- B. Special Warranty:
 1. Provide a written Warranty, signed by the manufacturer, and the Installer agreeing to repair or replace doors and panels that do not meet the requirements, or that fail in materials or workmanship.
 2. Warranty Period: Two (2) years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 1. L. Industries, Inc.
 2. Karp Associates, Inc.
 3. Larsen's Manufacturing Co.
 4. Milcor (Gibraltar Building Products).
- B. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.2 ACCESS DOORS

- A. General: Manufacturer's standard fully-welded steel construction. Provide units with means for anchoring properly to the adjacent construction.
- B. Non-Fire-Rated Units:

1. Doors:
 - a. Flush Units: 14 gage, minimum.
 - b. Recessed Units: 16 gage, minimum.
 2. Hinges: Stainless steel, piano or pin type, concealed and continuous, 175 degrees opening, constant force closure, spring type.
 3. Operation: Flush screw driver slot for quarter turn cam latch with welded steel access sleeves at recessed panel doors.
- C. Fire-Rated Units: As required for the fire-rating, but not less than the following:
1. Doors: Steel-faced, insulated core panel, 20 gage minimum.
 2. Hinges: Stainless steel, piano or pin type, concealed and continuous, 175 degrees opening, constant force closure with spring or other self-closing mechanism.
 3. Operation: Flush screw driver slot for quarter turn cam latch.
- D. Unit Construction Types:
1. Non-Fire-Rated:
 - a. Flush: Flush door with bead to give the unit a frameless appearance.
 - b. Recessed: Recessed door to allow installation of acoustical tile, gypsum board or similar finish into the recess to provide a concealed appearance. Units for plaster or mortarbed to have integral expanded metal lath.
 - c. Universal: Flush door with exposed frame, Exposed flange of frame not to exceed 1 1/2 in width.
 2. Fire-Rated: Flush insulated door with exposed frame. Exposed flange of frame not to exceed 1 1/2 in width, unless approved otherwise.

2.3 FABRICATION

- A. General: Fabricate each access door assembly as an integral unit, complete, with all necessary parts, and ready for installation.
- B. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction. Fill and grind welds smooth and flush with adjacent surfaces. Fabricate units square. Furnish attachment devices and fasteners of the type required to secure the units to the adjacent substrate. All doors in fire-rated assemblies shall have been tested and have a Class B, 1-1/2 hour fire-rating label attached.
- C. Frames and Flanges:
 1. Fabricate frames from 16 gage steel, minimum, with exposed flanges approximately 1 1/2 in width around the perimeter of the frame for units to be installed in the following construction types, except as noted:
 - a. Exposed concrete.
 - b. Exposed masonry.

- c. Gypsum board.
 - d. Plaster.
 - e. Ceramic tile.
 - f. Wood paneling, flush type with wood inlay to match the adjacent panel.
2. For installation in masonry construction, fabricate frames with adjustable metal masonry anchors.
 3. For installation in plaster finish, fabricate frames with galvanized expanded metal lath, and exposed casing bead welded to the perimeter of the frame.
- D. Access doors and frames for installation in concrete, masonry, plaster and ceramic tile shall be flush, stainless steel 304 satin finish: Model DSC-214M by Karp Associates or approved equal.
 - E. Access doors for installation in gypsum board shall be concealed frame, recessed finish as selected: Model KDW by Karp Associates or approved equal.
 - F. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets. Install in a hole cut thru the finish material.
 - G. Finish: Phosphate treated and shop painted with the manufacturer's standard rust inhibitive primer.

2.4 ACCESSORIES

- A. Anchorage Devices:
 1. Devices of the type required to secure units to the abutting structure.

2.5 SCHEDULE

- A. General: Where not otherwise indicated, provide access doors in accordance with the following:
 1. Size: As required to comfortably achieve the purpose for which access is required.
 2. Types:
 - a. Flush: In non-public areas that are not restrooms, conference rooms or offices.
 - b. Recessed: In all public areas, restrooms, conference rooms and offices.
 - c. Universal: In exposed concrete and masonry surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 - 1. Verify that rough openings for the units are correctly located and properly sized.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install units in accordance with the manufacturer's published instructions, where indicated on Drawings, and where required for access.
- B. Coordinate with mechanical, plumbing and electrical trades and other work requiring access.
- C. Position units to provide convenient access to concealed work requiring access.
- D. Set frames in position accurately and securely attached to supports with face panels plumb and level in relation to the adjacent finish surfaces.
- E. Field paint surfaces exposed to view. See Section 09900 - Painting.
- F. Built-in anchors and grouting of frames in concrete and masonry is included in Sections of Divisions 3 and 4.

3.3 PROTECTION

- A. Institute and maintain protective measures and take other precautions necessary to ensure that all assemblies will be without damage and deterioration at the time of final acceptance.

3.4 ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting the installed work.
- B. Adjust hardware and panels after installation for proper operation.
- C. Remove and replace panels and frames that are warped, bowed, twisted or otherwise damaged.

3.5 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect installed units for location, alignment, plumb, level, attachment to framing, and operation.

3.6 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- B. Clean the units before final acceptance inspection.

END OF SECTION

SECTION 0□400

ENTRANCES, STOREFRONTS, DOORS AND WINDOWS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum exterior and interior entrances.
2. Aluminum storefronts.
3. Aluminum sidelites.
4. Aluminum flush doors.
5. Aluminum sliding doors.
- Tempered glass doors.
7. Aluminum windows, fixed and operable.
- Glass and gla□ing in-fill and vision panels.
9. Door hardware.
10. Window hardware.
11. Perimeter sealants.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for anchorage.
2. Section 04230 - Reinforced Unit Masonry: Substrate for anchorage.
3. Section 07900 - □oint Sealers: Sealants for a weatherproof installation.
4. Section 0□710 - Door Hardware: Hardware not specified in this Section.
5. Section 0□□00 - Glass and Gla□ing: Gla□ing for entrances, storefronts, sidelites, doors and windows including those specified herein to be factory-gla□ed.
- Section 09110 - Non-Load Bearing Steel Framing: Non-structural framing for ad□acent wall and ceiling finishes.
7. Section 09250 - Gypsum Board: Ad□acent wall and ceiling finish material.
- Section 09900 - Painting: Field painting of components.

1.2 DESCRIPTION OF WORK

- A. The extent of the work of this Section is indicated on the Drawings and Schedules and as specified herein, and includes providing and installing aluminum exterior and interior doors, entrances, storefronts, sidelites, flush doors, tempered glass doors, sliding doors and operable and fixed windows□ tubular aluminum sections, shop-fabricated, factory-finished□glass and gla□ing in-fill□related flashings□anchorage and attachment devices□hardware□sealants.
- B. Provide complete operating door assemblies including door curtains, guides, hardware, operators, motors, and installation accessories. Coordinate with other hardware requirements in Section 0□700.
- C. The systems are standard units to the shapes indicated, combined with extruded sections to create the profiles indicated.
- D. Provide assemblies that have been designed and fabricated to comply with requirements of the system performance characteristics below, as demonstrated by testing the manufacturer's corresponding stock systems in accordance with the test methods designated.
- E. Preparation of openings, structural support, access panels, finish and trim for openings, construction of storage pockets and painting shall be furnished and installed under other Sections herein.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- B. Aluminum Association (AA):
1. AA DAF45 - Designation System for Aluminum Finishes.
- C. American Architectural Manufacturers Association (AAMA):
1. AAMA 101 - Specification for Windows, Doors and Skylights.
 2. AAMA 501.1 - Methods of Test for Exterior Walls.
 3. AAMA □05.2 - Specification for High Performance Organic Coating on Architectural Extrusions and Panels.
 4. AAMA □07.1 - Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
 5. AAMA □0□.1 - Specification and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum.
 - . AAMA □11 - Specification for Anodi□ed Architectural Aluminum.
 7. AAMA 701.2 - Specifications for Pile Weatherstripping and Replaceable Fenestration Weatherseals.
 - . AAMA 1503.1 - Test Method for Condensation Resistance of Windows.

9. Manual 10 - Care and Handling of Architectural Aluminum From Shop to Site.
 10. SFM-1-7 - Aluminum Storefront and Entrance Manual- AAMA Technical Reference Manual - Volume III.
- D. American National Standards Institute (ANSI):
1. ANSI A 117.1 - Safety Standards for the Handicapped.
 2. A154 - Door Controls - Closers.
 3. ANSI A 155 - Standard for Auxiliary Locks and Associated Products.
 4. ANSI 97.1 - Safety Glazing Materials Used in Buildings - Methods of Test.
- E. American Society of Civil Engineers (ASCE):
1. ASCE SEI 7 - Minimum Design Loads for Buildings and Other Structures.
- F. American Society for Testing and Materials (ASTM):
1. ASTM A 36/A 36M - Specification for Carbon Structural Steel.
 2. ASTM B 209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 3. ASTM B 221 - Specification for Aluminum and Aluminum-Alloy Extended Bars, Rods, Wire, Profiles, and Tubes.
 4. ASTM B 302/B 302M - Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
 5. ASTM E 283 - Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Difference Across the Specimen.
 6. ASTM E 330 - Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 7. ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Skylight, Doors, and Curtain Walls by Uniform Static Pressure Difference.
 8. ASTM E 547 - Test Method for Water Penetration of Exterior Window, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
 9. ASTM E 1996 - Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
 10. ASTM F 562 - Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.
 11. ASTM F 142 - Test Methods for Measuring the Forced Entry Resistance of Sliding Door Assemblies, Excluding Glazing Impact.
- G. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

- H. American Welding Society (AWS):
 - 1. AWS A5.10 □A5.10M - Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods.
 - 2. AWS D1.1 □D1.1M - Structural Welding Code - Steel.
- I. Code of Federal Regulations:
 - 1. 1□CFR 1201 - Safety Standards for Architectural Gla□ing Materials.
- Glass Association of North America:
 - 1. Gla□ing Manual.
- K. International Code Council:
 - 1. International Building Code (IBC), 2009.
- L. International Organization for Standards (ISO):
 - 1. ISO 9001 - □uality Management Systems.
- M. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. Metal Finishes Manual for Architectural and Metal Products.
- N. SSPC: Society for Protective Coatings (formerly Structural Steel Painting Council):
 - 1. Paint 12 - Cold-Applied Asphalt Mastic (Extra Thick Film).

1.4 PERFORMANCE TESTING

- A. General:
 - 1. Perform tests on complete assembly mock-ups. Comply with the requirements indicated below. Perform tests prior to the start of fabrication.
 - 2. Where the manufacturer's standard system complies with the requirements, and has been tested in accordance with the specified tests, provide certification by the manufacturer showing compliance with such tests.
- B. Air Infiltration: Air infiltration rate shall not exceed 0.15 cfm □sq. ft. and 0.37 cfm □ft. of crack length when tested at a static air pressure differential of □24 psf when tested per ASTM E 2□3.
- C. Static Water Resistance: Specimen shall be sub□ected to a static pressure of 10.0 psf with a water spray application rate of 5 gph □sq. ft. for a duration of 15 minutes. No uncontrolled leakage is allowed. Tested per ASTM E 331.
- D. Seismic Performance at Design Displacement:
 - 1. For buildings 4-stories and higher.
 - 2. The middle row of the anchors shall be shifted parallel to the plane of the wall for a

distance of 0.75" in one direction, held for 10 seconds, then back to center, then the other direction 0.75" held for 10 seconds, then back to center. Visual observations shall be made at 1/4" displacements in both directions.

3. The test shall be repeated two additional times with no failure or gross permanent distortion of the anchors, frames or glass. Glazing gaskets may not disengage and weather seals shall not fail.
- E. Cyclic Water Resistance: Sliding doors shall be subjected to four (4) test cycles, with each cycle consisting of a static pressure of 12.0 psf with a water spray application of 5 gph /ft for a duration of 5 minutes each, and a 1 minute duration with pressure released but water application continuously applied. No uncontrolled leakage is allowed. Tested per ASTM E 547.
- F. Forced Entry Resistance: ASTM F 502 or ASTM F 142, performance level 10.
- G. Uniform Load: No deflection in excess of L /175 of the span of any framing member at a structural test load equal to 1.5 times the specified design windload no glass breakage or permanent set in the framing members in excess of 0.2" of their clear spans with a static air design load of 20 psf applied in the positive and negative directions in accordance with ASTM E 330.
- H. Component Structural Tests: Perform operating, hardware, sash rail rigidity and other tests called for by AAMA A1100 Voluntary Guide Specification for Aluminum Architectural Windows

1.5 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
 1. Product Data: Manufacturer's technical product data, specifications, standard details, and installation recommendations for the components required. Provide component dimensions describe components within the assembly, anchorage and fasteners, glass and glazing in-fill, hardware, and internal drainage details.
 2. Shop Drawings: Drawings for fabrication and installation of the required systems indicate the system dimensions, framed opening requirements, tolerances, and affected related work include plans, elevations, detailed sections of typical composite members, hardware mounting heights, reinforcement, and expansion and contraction joint locations. Show anchors, hardware and other components not included in the manufacturer's Product Data include glazing details.
 3. Samples:
 - a. Aluminum Extrusions: Two (2) samples of each required aluminum finish on 12" long sections of the extrusion shapes required for the system.
 - b. The Architect reserves the right to require additional samples which show fabrication techniques, workmanship of component parts, design of the hardware and other exposed auxiliary items.
 - c. Glazing: Submit samples per Section 01000 - Glass and Glazing.
 4. Assurance Control Submittals:
 - a. Manufacturer's certification or test reports certifying that the products have been tested and comply with the performance testing requirements.

- b. Calculations indicating that the system and anchorages meet the Performance Requirements and the Building Code indicate anchor spacing. Indicate the number and placement of weld-in anchors and supplemental steel l̄amb and frame reinforcing, as necessary.
- c. Certification that the door system meets the performance design criteria in accordance with the following:
 - i. ANSI A 151.10.
 - ii. NFPA 101.
 - iii. UL 325.
 - iv. IBC - 2009.
- d. Documentation of experience indicating compliance with the specified qualifications requirements.
- f. Manufacturer's Operation and Maintenance Data..

B. Section 01710 - Closeout Submittals: Procedures for closeout submittals.

- 1. Manufacturer's Operation and Maintenance Manual.
- 2. Warranty: Submit a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.1 COORDINATION

A. Pre-Installation Meeting: Convene a Pre-Installation Meeting at the Project Site prior to beginning the work of this Section.

- 1. Require attendance of the Contractor, Owner's representative, Architect, and representative of the Installer.
- 2. Review the coordination required for proper installation.
- 3. Review preparation and installation procedures, and the coordination and scheduling required with other related work.

B. Check Shop drawings for other work to confirm that adequate provisions are made for locating and installing doors in compliance with the requirements.

1.7 QUALITY ASSURANCE

A. Qualifications:

- 1. Manufacturer:
 - a. Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 - b. Company capable of providing field service representation during installation, approving an acceptable installer, and approving the

installation.

2. Installer:
 - a. Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.
 - b. Company with supervisory staff trained and approved by the door manufacturer and with the trained supervisory personnel observing and directing the work.
 - c. Company capable of providing field service after installation.

B. Performance Requirements:

1. Provide assemblies capable of withstanding the wind loads and thermal movements based on testing of the manufacturer's standard units in assemblies similar to those indicated for this Project.
2. Provide the capacity to withstand the following wind loading requirements:
 - a. Design, fabricate and install to resist combined positive and negative windloading in accordance with ASCE 7, Chapter 6 with a V of 170, qs of 74.0 psf, exposure C and Importance Factor of 1.0.
3. Thermal Movement:
 - a. Provide for thermal movement resulting from the following maximum change in ambient and surface temperatures to prevent buckling, opening of joints, over stressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of the materials due to both solar heat gain and nighttime heat loss.
 - i. Ambient temperature range: 120°F.
 - ii. Materials surface: 100°F.

C. Furnish complete units produced by a single manufacturer, including hardware, accessories, tracks, mountings, and installation components.

D. Unless otherwise acceptable to the Architect, furnish all units and assemblies for the entire Project by one manufacturer.

E. Design Criteria: The Drawings are based on Kawneer's standard aluminum entrance, storefront, sidelite, sliding door and operable and fixed window systems. Other manufacturer's standard system of similar and equivalent nature may be acceptable when the difference does not materially detract from the design concept or required performance, as judged solely the Architect. The plans, elevations and details show the spacing of members as well as profiles and similar dimensional requirements, and the entrance, storefront, sidelights, and door and windows work.

1. DELIVERY, STORAGE AND HANDLING

A. Section 0100 - Product Requirements: Transport, handle, store, and protect the products.

- B. Protect finished aluminum surfaces with a strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
- C. Pack, box, ship, unload, store and protect products in a manner to avoid breakage, abuse, damage and defacement.
- D. Deliver products to the Project Site in the manufacturer's original, unopened protective packaging.
- E. Store inside, protected from weather.
- F. Stack vertically on edge to provide for water drainage and air circulation.
- G. Break seals to permit ventilation.

1.9 WARRANTY

- A. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
- B. Special Warranty:
 - 1. Provide a joint and severable written Warranty signed by the manufacturer, Contractor and Installer, certifying that the products and installation is free of defective materials and workmanship, and agreeing to repair or replace any defective component, or the system, in whole or in part, as necessary, to restore the product to its original intended state and integrity. Warranty shall include responsibility for removal and replacement of other work which may conceal door parts.
 - 2. Warranty Period: Two (2) years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 - 1. Kawneer Company, Inc. components are referenced within this Section to establish the level of quality required.
 - 2. Alternate Manufacturers: Subject to compliance with the Project requirements, alternate manufacturers offering the specified items which may be incorporated in the work include the following:
 - a. Bradham Aluminum Corp.
 - b. Century Manufacturing.
 - c. United States Aluminum.
 - d. Oldcastle Glass Engineered Products.
- B. Section 01000 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS AND ACCESSORIES

- A. Aluminum Members: Alloy and temper as recommended by the manufacturer for strength, corrosion resistance, and application of the required finish—ASTM B 221 for extrusions, ASTM B 209 for sheets and plates.
- B. Steel Sections: ASTM A 36/A 36M—shaped to suit the mullion sections.
- C. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125" thick, reinforce the interior with aluminum or non-magnetic stainless steel to receive the screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.
- D. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible, otherwise, non-magnetic stainless steel. Steel reinforcing shapes to be stainless steel or hot-dip galvanized steel complying with ASTM A 123/A 123M.
- E. Concealed Flashings: Dead-soft stainless steel, 24-gauge minimum, or extruded aluminum, 0.024" minimum, of an alloy and type selected by the manufacturer for compatibility with other components.
- F. Anchors: Drill-in expansion bolts or weld-in type with in-place steel anchors welded to steel plates anchoring the frame.
- G. Fasteners:
 - 1. Aluminum, non-magnetic stainless steel, or other materials warranted by the manufacturer to be non-corrosive, and compatible with aluminum components.
 - 2. Do not use exposed fasteners for the attachment of hardware, except where unavoidable and where clearly noted on submittal shop drawings.
 - 3. Provide Phillips flat-head machine screws for exposed fasteners. Finish shall match the finish of the adjoining metal.
- H. Glass and Glazing Materials: Provide glass and glazing materials which comply with the requirement of Section 07000 - Glass and Glazing, including for doors and windows specified to be factory-glazed.
- I. Weatherstripping: Provide compression-type weatherstripping at the perimeter of each operating sash—manufacturer's standard replaceable stripping of either molded neoprene gaskets complying with ASTM D 2000, or molded PVC gaskets complying with ASTM D 2277, or molded neoprene gaskets complying with ASTM C 509, Grade 4.
- J. Sealant and Backing Materials: Unless otherwise indicated for sealants required within fabricated window units, provide a type recommended by the product manufacturer for the joint size and movement, to remain permanently elastic, non-shrinking and non-migrating. Comply with Section 07900 - Joint Sealers, for installation of sealants and backing materials.

2.3 FABRICATION

- A. Siles and Profiles: The siles for units, including profile requirements, shall be as indicated and as required to meet the Performance Requirements. Any variable dimensions are indicated, together with maximum and minimum dimensions required to achieve the design requirements and coordination with other work.

- B. Field Measurement: Wherever possible take field measurements prior to the preparation of Shop Drawings and fabrication to ensure proper fitting of the work. Proceed with fabrication and coordination, as necessary, when the taking of field measurements might delay the work.
- C. Prefabrication: To the greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to the Project Site. Disassemble components only as necessary for shipping and installation.
 - 1. Pre-glass door and window units to the greatest extent possible, in coordination with the installation and hardware requirements.
 - 2. Do not drill and tap for surface-mounted hardware items until the time of installation at the Project Site.
 - 3. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work in a manner to prevent damage to exposed finish surfaces. For hardware, perform these operations prior to the application of finishes.
 - 4. Fabricate framing for glazing from the inside, except for large plates of glass which may be glazed from the outside.
- D. Glazing: Provide for the following edge clearances:

Single Glazed

Nominal edge cover (bite)	5/16"
Minimum nominal edge clearance	1/8"
Minimum face clearance	1/8"

- 1. Glass must be edge blocked to prevent contact with the metal framing.
- E. Reinforcing: Install reinforcing, as necessary, to meet the Performance Requirements.
- F. Welding: Comply with AWS recommendation to avoid discoloration—grind exposed welds smooth and restore mechanical finish.
- G. Continuity: Maintain accurate relationship of planes and angles, with hairline fit at contacting members.
- H. Fasteners: Conceal fasteners wherever possible.
- I. Weatherstripping: For exterior doors and windows, provide compression weatherstripping against fixed stops, at other edges provide sliding weatherstripping retained in adjustable strip mortised into door edges.
- Structural Silicon Sealant: As recommended by the manufacturer.

2.4 ALUMINUM ENTRANCES

- A. Doors: Standard Aluminum Entrance, Series 350 Medium Stile—500 Wide Stile—swing door by Kawneer. Size as indicated on the Drawings.
 - 1. Vertical Stile: 3-1/2" x 5", single piece.
 - 2. Top Rail: 3-1/2" x 5", single piece.

3. Bottom Rail: 1-1/2" single piece.
- B. Door Hardware:
1. Section 01310 - Project Management and Coordination: Verification of hardware components specified in Section 0710 - Door Hardware.
 2. Door Hinges: Door manufacturer's standard butt hinges, US32D finish.
 3. Offset Pivots: Where indicated provide top, intermediate and bottom offset pivots assemblies complying with ANSI A 15.4, Grade 1 requirements cast aluminum-alloy, baked epoxy finish to match the door finish door manufacturer's standard.
 4. Concealed Overhead Closers: Single-acting manual, with built-in door stop, 105" hold open door manufacturer's standard. ADAAG compliant.
 - a. Force for pushing or pulling open interior doors shall not exceed 5-pounds.
 - b. For push button operated openers see 0710.
 5. Push Pulls and Panic Hardware: Standard to the door manufacturer, directly mounted on the glass.
 - a. CP-II Push and CO-9 Pull by Kawneer. Finish to match door. Use where an exit device and door exterior trim is not specified.
 6. Deadlocks: Three-point locks, located in the bottom rail.
 7. Door Locking Devices (where noted in Section 0710): Adams Rite MS190 deadbolt latch, double cylinder operation. Finish: 2.
 8. Exit Devices: Concealed vertical rods with crash bar doggable exterior mortise trim. Clear 17 finish for exterior exit doors.
 - a. Latch shall release when subject to a 15-pound force.
 9. Three-point Lock: 4015 foot bolt and 4005 head bolt by Adams Rite.
 10. Flush Bolt: Top and bottom flush surface-mounted in the nose of the door stile.
 11. Automatic Door Bottoms: 3/4" mortise type Pemko 420 A.L.
 12. Floor-Mounted Holder: Rubber cushioned stop with door-mounted holder door manufacturer's standard.
 13. Weatherstripping (Exterior doors only): As selected from the manufacturer's standards.
 - a. Head and Lamb: Replaceable wool, polypropylene, or nylon wool pile with aluminum strip backing, recessed in the frame AAMA 701.2.
 - b. Sill: Semi-rigid polymeric material on aluminum anodized to match the door EPDM sweep strip 3-5" by Kawneer.

14. Thresholds: Weatherproof, 4" or 5" as detailed, mill-finished aluminum, standard for offset pivots cut as required for carpet or tile adaptation as detailed. ADAAG compliant.
15. Other Hardware: As described in the door manufacturer's literature, as specified or as required.
1. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.5 ALUMINUM STOREFRONTS

- A. Provide a system combined with extruded aluminum sections, to the profiles indicated designed to meet the Performance Requirements.
- B. Storefront Framing System: Trifab Versa Glass 451 451T by Kawneer, 2" x dimension shown, extruded aluminum minimum wall thickness of 0.040" flush gasketed.
- C. Column Covers: 0.040" aluminum by Kawneer. Finish to match the storefront system.
- D. Receptor Channel: Model No. 450-03 and 45-025 by Kawneer finish to match the storefront system.
- E. Provide aluminum entrances fabricated to comply with the elevations and details shown on the Drawings.

2.6 ALUMINUM FLUSH DOORS

- A. Doors: Kawneer Standard Flushline Series.
 1. Face Sheets: 0.042" embossed aluminum.
 2. Core: 3 lb. cu. ft. density, foamed-in-place polyurethane, 1" thick tempered hardboard backing at each face, bonded to the core.
 3. Reinforcement: Internally for the installation of hardware.
 4. Trim: Beveled edge aluminum extrusion around the entire door perimeter and the perimeter of glass and louver openings to receive the skin and hardboard.
 5. Weatherstripping: Woodpile around the entire door perimeter.
1. Vision lites and Louvers: As indicated on the Drawings.
- B. Hardware:
 1. See Section 0710 - Door Hardware.
 2. Supplemental Flush Door Storm Hardware: Provide intermediate barrel bolts at 30" o.c. to latch doors greater than 7'0" in height, and at the center of door heads and sills to secure doors greater than 42" in width.
- C. Frames: Trifab VG (Versa Glass) 450 by Kawneer.

2.7 TEMPERED GLASS DOORS

- A. Glass doors and framing system factory-glassed with 1/2" thick tempered glass, minimum, or as required to meet the Performance Requirements.
- B. Glass: Brite Blue glass by Oldcastle Glass Co.
- C. Hardware: As provided by the door manufacturer.
 - 1. Push/Pulls: Manufacturer's standard, as selected.

2. ALUMINUM WINDOWS AND SLIDING DOORS

- A. General: The drawings and following paragraphs define the operating arrangement for the types of sash (ventilators) required in the window units, and specify the minimum provisions for each type. The Drawings indicate which panels of each window unit are operable sash and which are fixed. Where two or more types of operating sash are included in the same window unit, the operation of each is indicated, and the unit is considered a Combination Window

Provide the following:

- 1. High rise sill with subsill sill pan at each sliding door and window.
 - 2. Swing limiters set at 4" at all operating sashes.
 - 3. Insect screens with maximum opening at the lock side of the operating sashes unless indicated otherwise.
- B. Fixed Window Units: All joints of frames shall be butt type construction, neatly secured at each corner with integral screw ports 3-1/4" main frame depth, 0.07" nominal wall thickness. Commercial line 7225 Non-Thermal, HC90 by Kawneer.
 - C. Casement Window Units: Out-swinging, interior glassed. 7225 Non-Thermal, HC90 by Kawneer.
 - D. Projecting Window Units: Out-swinging, top-hinged, unless otherwise noted, 2-1/4" frame depth horizontal pivoting with extruded 3" degree aluminum pivots concealed limit stop and removable key handle lock at each vent interior glassed. 7225 Non-Thermal, HC90 by Kawneer.
 - E. Horizontal Sliding Window Units: Commercial high performance quality, stainless steel roller assemblies, locks and keepers, two-piece compensating head detail 4" frame depth with interior insect screens interior glassed. Series 7330 by Kawneer.
 - F. Vertical Sliding Units: Commercial high performance quality, stainless steel roller assemblies, two factory-installed sash balances for each operating sash, locks and keepers, two-piece compensating head detail 4" frame depth with interior insect screen interior glassed. Series 7330 by Kawneer.
 - G. Sliding Aluminum and Glass Doors: Two-piece compensating channel subheads and jamb heavy-duty interlocks and horizontal muntins, factory-glassed. HPS High Performance Sliding 1000/1000/120" by Kawneer.
 - H. Hardware:
 - 1. Locking handles, cases, keepers, catches and fasteners shall be of a corrosion-resistant material compatible with aluminum.

2. Hardware shall meet AAMA tests and be suitable for its intended use.

2.9 GLASS AND GLAZING MATERIALS

- A. Glazing: As specified in Section 05000 - Glass and Glazing.
- B. Double wet glaze with Dow 995, or approved equal.

2.10 SEALANT

- A. Sealant and Backing Materials:
 1. Perimeter Sealant: Type as specified in Section 07900 - Joint Sealers.
 2. Sealant Used Within the System (Not for Glazing): Type as specified in Section 07900 - Joint Sealers.

2.11 HARDWARE

- A. General: Provide the manufacturer's standard heavy-duty hardware units, as indicated, scheduled, or as required for the operation of each door and window, as recommended by the manufacturer for the service required. Finish to match the frame unless otherwise indicated.

2.12 FINISHES

- A. Exposed Aluminum Surfaces:
 1. Clear anodized or as selected from the manufacturer's standard finishes.
 2. Polyvinylidene fluoride, (Kynar) or equal as selected from manufacturer's standard colors.
- B. Maintain same color range on doors, frames and other components. Do not mix light and dark shades within an assembly.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 1. Verify that related work performed under other Sections has been completed, and is in accordance with approved Shop Drawings.
 2. Verify that openings are dimensionally within allowable tolerances, plumb, level, clean and provide for proper anchoring.
- C. Report in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions

have been corrected.

3.2 INSTALLATION

- A. Install doors and windows, complete, with all necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports in accordance with approved Shop Drawings, manufacturer's instructions, to meet the Performance Requirements, and as specified herein.
- B. Attach to the structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Anchor and weld securely in place—provide alignment attachments and shims to permanently fasten systems and units to the building structure. Anchorages shall be concealed.
- D. Comply with AWS recommendation to avoid discoloration—grind exposed welds smooth and restore the mechanical finish.
- E. Align assemblies and units plumb, level and true to line, without warp or rack of framing members, doors, windows and panels. Maintain assembly dimensional tolerances—align with adjacent work.
- F. Install sill flashings with turned up edges and ends—seal to adjacent work to form a water tight dam.
- G. Install compensating channels at door and window heads where indicated.
- H. Ensure water drainage away from glazing.
- I. Coordinate the attachment and seal of perimeter air and vapor barrier materials.
- Provide thermal isolation where components penetrate or disrupt the building insulation. Pack fibrous insulation in shim spaces at the perimeter of assemblies and units to maintain continuity of the thermal barrier.
- K. Install hardware using templates provided, and in accordance with the installation requirements in Section 0710 - Door Hardware.
- L. Drill and tap frames, doors and windows and apply surface-mounted hardware items in compliance with the hardware manufacturer's instructions and templates. Use concealed fasteners wherever possible.
- M. Set sill members, thresholds and other members in a bed of sealant, as indicated, or with joint fillers or gaskets, as indicated, to provide a weathertight installation. Coordinate the installation with wall flashings and other components of the work. Comply with the requirements of Section 07900 - Joint Sealers.
- N. Apply sealants to provide a watertight installation at all joints and intersections and at all opening perimeters. Install perimeter sealants and backing materials in accordance with the installation requirements of Section 07900 - Joint Sealers.
- O. Set thresholds in a bed of mastic, and secure.
- P. Refer to Section 0800 - Glass and Glazing for the installation of glass and other panels shown to be glazed into doors, windows and framing, and not pre-glazed by the

manufacturer.

- . Separate aluminum and other corrodible metal surfaces from sources of corrosion and electrolytic action at points of contact with other metals. Isolation Requirements:
 1. Dissimilar Metals: Where aluminum surfaces are in contact with, or fastened to dissimilar metals except stainless steel, zinc or zinc coating, protect aluminum from the dissimilar metal. Where aluminum contacts another metal, paint the dissimilar metal with epoxy paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.
 2. Cementitious Materials: Paint aluminum where in contact with mortar, concrete or other cementitious material, with an alkali-resistant coating such as heavy-bodied bituminous paint or epoxy paint.
 3. Wood Contact: Isolate aluminum from cedar, redwood, oak and acid-treated lumber by means of unbroken 1/8-mil polyethylene construction sheet or a heavy coating of metal-protective paint.
 4. Surfaces in contact with sealants after installation shall not be coated with any type of protective material.

3.3 ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting installed work.
- B. Adjust operating hardware to function properly, without binding, and to prevent tight fit at contact points and weatherstripping.
- C. Doors operation shall meet ADAAG requirements for opening force.
- D. Repair damaged finishes to match the original finish.

3.4 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field testing and inspection.
- B. Inspect installations for alignment, level, plumb, secure attachment to the structure, and smooth and proper operation.
- C. On-Site Tests:
 1. If the units do not appear to meet air or water infiltration requirements, the Owner, may require on-site tests shall be conducted for both air and water infiltration, with the door manufacturer's representative present. The Owner's representative will select the unit(s) to be tested. If such unit(s) fail to meet the specified air and water requirements, the reason for failure shall be jointly determined.
 2. Tests shall be conducted in accordance with AAMA 101-10.
 3. The responsible Contractor shall correct tested units that do not meet the specified requirements, and all units with similar deficiencies, at no additional cost to the Owner.
 4. The cost for all successful tests, both original and retest shall be paid by the Owner. All unsuccessful tests, both original and retest, shall be paid for by the

responsible Contractor.

5. The testing shall be done by an AAMA-accredited testing agency, selected by the Owner's representative and the manufacturer, and shall be employed by the responsible Contractor.

3.5 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- B. Remove protective material from pre-finished aluminum surfaces.
- C. Promptly after the installation of glass and sealants, clean the completed system, inside and out, exercise care to avoid damage to coatings and finishes.
- D. Remove excess glazing and joint sealants, dirt, and other substances from aluminum surfaces by a method acceptable to the sealant manufacturer.
- E. Wash down exposed surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean and dry.

3.6 PROTECTION

- A. Implement and maintain protective measures, and take other precautions necessary to ensure that all assemblies will be without damage and deterioration at the time of Substantial and Final Completion.

END OF SECTION

SECTION 0550
STORM PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removable storm panels.
2. Accordion shutters.
3. Hinged aluminum shutters.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for supporting storm protection.
2. Section 04230 - Reinforced Unit Masonry: Substrate for supporting storm protection.

1.2 DESCRIPTION OF WORK

- A. The extent of storm protection work is indicated on the Drawings and Schedules and as specified herein, and includes providing and installing products applied to exterior doors, windows, storefronts and open areas in buildings.
- B. Take field measurements prior to the preparation of Shop Drawings and fabrication of the protection units.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society of Civil Engineers (ASCE):

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

C. American Society for Testing and Materials (ASTM):

1. ASTM B 633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
2. ASTM B 733 - Specification for Electrodeposited Coatings of Cadmium.
3. ASTM E 330 - Test Method for Structural Performance of Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

4. ASTM E 199 - Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

D. International Code Council:

1. International Building Code (IBC), 2009.

1.4 SYSTEM PERFORMANCE

- A. Provide storm protection units with materials and assemblies to conform to the Building Code, Wind Load requirements for storm panels or shutters for external application, except where more stringent requirements are indicated.
- B. Performance Requirements:
1. Provide the capacity to withstand the following loading requirements:
 - a. Design and install to resist combined positive and negative windloading in accordance with IBC 2009, Section 1609 with a V mph of 170, qs of 74.0 psf, exposure B, C, D, and importance factor of 1.0, 1.25, 1.5, as applicable per ASCE 7.
 2. Heights above ground level are indicated on or can be calculated from the Drawings.

1.5 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
1. Product Data: Manufacturer's product literature and specifications describing the storm protection products, including color selections and finishes.
 2. Shop Drawings: Show elevations of units, full size profiles of frame and track members, thickness of metal sizes, types, materials, finishes, and location of fasteners, type, material and location of operating hardware, mullion details, and details of installation, including connection and relationship to other work.
 - a. Include a schedule showing the location of units for each size and type.
 3. Samples: Submit two (2) each pieces of the assemblies, and the required finish on 1/2" long sections of typical frame members, plus a 12" x 12" sample of the panel itself.
 4. Test Reports: Submit certified laboratory test reports evidencing that storm panels of the type indicated comply with the performance requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
1. Seaview Shutters Inc., Miami, FL. (represented by AMS, Guam).

2. Willard Shutter Company, Inc., Miami, FL (represented by KB Enterprises, Guam).

B. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

A. Provide alloys complying with ANSI AAMA 1002.10 and as recommended by the aluminum producer for the forming and fabricating process used by the manufacturer and for the type of finish required.

B. Other Materials: Where metals other than aluminum are standard with the manufacturer for concealed reinforcing, concrete inserts, fasteners and hardware, use stainless steel or other non-corrosive materials which are compatible with aluminum. Electroplate steel, if used for reinforcing members, with zinc or cadmium coating complying, respectively, with ASTM B 33 or B 70. For exposed fasteners match the color and finish of the metal material being fastened.

C. Non-Metalic Spacers: Provide the manufacturer's standard vinyl, rubber or high density polyurethane spacers, not less than 1/4" thick, to separate storm shutters from contact with metal prime windows.

2.3 REMOVABLE STORM PANELS

A. Headers and Sills: Slip-in type, and made of extruded aluminum alloy 6063-T5.

B. Structural Panels: Roll-formed from aluminum alloy 3003-H14 of a thickness to withstand the positive and negative forces applied on the spans required, but not less than 0.05". Panels shall be designed to allow nesting for storage with T&G edges for interlocking of erected panels at 12" o.c..

C. Clips and Wing Nuts: Stainless steel, standard with the manufacturer.

D. Reinforcing Tubes and Frames, Door Angel Frames and Stops: Sizes and shapes, and fabricated as detailed, extruded aluminum alloy 6063-T5.

E. Aluminum Mill Finish: For panels, angles, tubes, embedded items, and removable base and head members.

F. Anodized Finish: Match the finish of the adjacent windows for base and head members which are to remain permanently in-place.

2.4 ACCORDION SHUTTERS

A. Headers and Sills: 0.125" thick extruded aluminum alloy 6063-T5.

B. Shutters: Extruded aluminum blades of extruded aluminum alloy 6063-T5 with stainless steel carriage, nylon rollers and nylon guides, top and bottom locking rods with stainless steel thumb screws. Provide end closure pieces securely attached to the wall.

C. Finish: All aluminum materials to be finish color as selected by the Architect from the manufacturer's standards.

2.5 HINGED ALUMINUM SHUTTERS

A. Provide hinged aluminum shutters as indicated and detailed on the Drawings. Aluminum panel doors shall be custom fabricated for exterior use.

- B. Provide two (2) recessed flush bolts at the top and two (2) flush bolts at the bottom for each panel, with dust proof floor strikes. Track shall be standard to the manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with the manufacturer's instructions for the installation of storm shutters.
- B. Set storm units plumb, level and without distortion, securely fastened to, and aligned with the prime windows.
- C. Fasten to allow for expansion and contraction without damage to the window members or pullout of fasteners. Fasten members required to be in a fixed position, as detailed. For those that are required to be removable, verify the connectors and inserts, and fabricate accordingly.
- D. Position storm panels main frame so it does not contact the prime window frame, or install a non-metallic spacer between the prime window and the storm shutter and frame.
- E. Provide weepholes in sill tracks. Size the holes to effectively permit the drainage of rain water collecting between closed storm shutters and the windows they protect.
- F. Isolation Requirements:
 - 1. Wood Contact: Isolate sheet metal from cedar, redwood, oak and acid-treated lumber by means of unbroken 1/8-mil polyethylene construction sheet or a heavy coating of metal-protective paint.
 - 2. Dissimilar Metals: Insulate the juncture between dissimilar metals with a heavy coating of insulating film.
 - 3. Concrete Contact: Coat the underside of sheet metal over horizontal concrete surfaces with an asphaltum cement.

3.3 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect for plumb, level and secure attachment to substrates, where applicable.

3.4 ADJUSTING AND CLEANING

- A. Section 01700 - Execution Requirements: Adjusting and Cleaning the installed work.
- B. Adjust inserts, and hardware to provide a tight fit at contact points, for smooth operation, and for a weathertight closure.
- C. Clean surfaces promptly after installation, exercising care to avoid damage to the finish of new and existing surfaces.

END OF SECTION

SECTION 0710

DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Finish Hardware items required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same Section as the doors and windows.
2. Hinges.
3. Locks, latches and bolts.
4. Push Pull units.
5. Exit devices. (Panic Hardware).
- Closers.
7. Stops, holders and bumpers.
- Thresholds.
9. Weatherstripping.
10. Miscellaneous hardware.

B. Related Documents: The Contract Documents, as defined in Section 01110 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:

1. Section 07100 - Rough Carpentry: Rough hardware.
2. Section 07100 - Rough Carpentry: Installation of finish hardware.
3. Section 07400 - Architectural Woodwork: Cabinet hardware.
4. Section 07100 - Hollow Metal Doors and Frames: Hardware for metal doors.
5. Section 07210 - Wood Doors: Hardware for wood doors.
- Section 07420 - Aluminum Doors and Windows: Door and window hardware.
7. Section 12305 - Science Casework and Laboratory Equipment: Cabinet hardware.

1.2 DESCRIPTION OF WORK

A. The extent of the finish hardware work is indicated on the Drawings and as specified herein, and includes furnishing and installing all finish hardware, trim, attachments and

fastenings specified complete and proper. Under this Section include all hardware that is not specified in other Sections, whether or not such hardware is herein scheduled.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- B. American National Standards Institute (ANSI)
 - 1. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
 - 1. ANSI A15□1 - National Standard for Butts and Hinges.
 - 2. ANSI A15□2 - National Standard for Locks and Lock Trim.
 - 3. ANSI A15□3 - National Standard for Exit Devices.
 - 5. ANSI A15□4 - National Standard for Closers.
 - ANSI A15□5 - Standard for Auxiliary Locks and Associated Products.
 - 7. ANSI A15□□ - National Standard for Architectural Door Trim.
 - ANSI A15□13 - National Standard for Mortise Locks □ Latches.
 - 9. ANSI A15□1□ - Standard for Auxiliary Hardware.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 2□3 - Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
- D. Americans with Disabilities Act Accessibility Guidelines (ADAAG):
 - 1. Accessibility Guidelines for Buildings and Facilities.
- E. Door Hardware Institute (DHI):
 - 1. Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
- F. National Fire Protection Association (NFPA):
 - 1. NFPA □0 - Standard for Fire Doors and Other Opening Protectives.
 - 2. NFPA 101 - Life Safety Code.
 - 3. NFPA 252 - Standard Methods for Fire Tests of Door Assemblies.
- G. Underwriters Laboratories (UL):
 - 1. UL 10B - Standard for Safety Fire Tests for Door Assemblies.
 - 2. UL 305 - Panic Hardware.

1.4 HARDWARE FOR FIRE DOORS AND EXIT DOORS

- A. Provide all hardware necessary to meet the requirements of NFPA No. 80 for fire doors and NFPA No. 101 for exit doors, as well as other requirements specified, even if such hardware is not specifically mentioned in the "Hardware Schedule". Such hardware shall bear a UL label.

1.5 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
 - 1. Product Data: Manufacturer's technical product data for each item of hardware. Include information necessary to show compliance with requirements, instructions for installation, and maintenance of operating parts and finishes.
 - 2. Hardware List: Prepare and submit three (3) copies of a Hardware List for review. One (1) copy will be returned. The List shall identify each hardware item by manufacturer, manufacturer's catalog number, and the exact location in the work. Indicate applicable scheduled door data, including the door numbers shown on the Drawings, the number of doors, hand of operation with an explanation of how the hand is determined, and indicate the active leaf where a pair of doors are required. Indicate hardware finishes.
 - a. Fastening Data: Indicate and clearly highlight "exposed on surface of hardware" fasteners, and through fastenings which would be exposed on the opposite door face when other than Phillips flat-head devices are proposed.
 - b. The Hardware List shall be in a suitable form to facilitate ready review by the Owner's representative. Acceptance of the List will not relieve the Hardware Supplier from the responsibility for furnishing the work complete.
 - 3. Catalog Cuts: Submit three (3) catalog cuts of every item to be furnished. One (1) copy will be returned. Show all finishes, sizes, catalog numbers and pictures, include information necessary to show compliance with the requirements, instructions for installation, and maintenance of operating parts and finishes. Explain all abbreviations fully.
 - 4. Mounting Locations: Submit mounting locations data for each type of hardware required.
 - 5. Hardware Schedule: Submit a Hardware Schedule as indicated below. Coordinate hardware with the doors, frames and related work to ensure proper size, thickness, backset, hand, function and finish.
 - a. Final Hardware Schedule Content: Based on the finish hardware indicated, organize a Hardware Schedule into "Hardware Sets" indicating a complete designation of every item required for each door. Provide the following information:
 - 1). Type, style, function, size and finish of each hardware item.
 - 2). Name and manufacturer of each item.
 - 3). Fastenings and other pertinent information.
 - 4). Location of the hardware set cross-referenced to the Drawings, both on the Floor Plans and Door Schedule.

- 5). Explanation of all abbreviations, symbols, codes, etc. contained in the Hardware Schedule.
 -). Mounting locations for hardware.
 - 7). Door and frame sizes and materials.
 -). Keying and master keying information.
- b. Submittal Sequence: Submit the Hardware Schedule at the earliest possible date, particularly where acceptance of the Schedule must precede the fabrication of other work (e.g., aluminum frames) critical to maintaining the Project Construction Schedule. Include with the Schedule, product data, samples, Shop Drawings of other work affected by the finish hardware, and other information essential for a coordinated review of the Schedule. Acceptance of the Hardware List does not relieve the Hardware Supplier from the responsibility of furnishing the Job complete for its intended purpose.
- Keying Schedule: Submit with the final Hardware Schedule. Door designations to be the same as those on the Drawings.
7. Samples: Prior to submittal of the Final Hardware Schedule, and prior to ordering of the finish hardware, submit one (1) sample of each type of exposed hardware, as selected, with the required finish, including fasteners, and tagged with a full description for coordination with the Hardware Schedule.
- a. Samples will be returned to the supplier. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of the operation, be used in the work, within limitations of the keying coordination requirements.
- B. Maintenance Related Items: Provide one (1) set of adjusting tools, two (2) sets of Maintenance Manuals, including lubrication requirements, parts list, manufacturers contact for ordering replacement parts and basic installation instructions for locksets, door closers, floor hinges and panic devices to the Owner's representative. Provide four (4) blanks for each key type.
1. QUALITY ASSURANCE
- A. Perform work in accordance with the following requirements:
- 1. ANSI A117.1
 - 2. NFPA 00.
 - 3. NFPA 101.
 - 4. NFPA 252.
 - 5. UL 10B.
 - UL 305.
 - 7. ADAAG.

- B. Regulatory Requirements:
 - 1. Conform to the Building Code for requirements applicable to fire-rated doors and frames.
 - 2. Conform to ADAAG for operation, mounting heights, and location of accessories.
- C. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
- D. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.
- E. Supplier: A recognized architectural finish hardware supplier, who has been furnishing hardware to similar projects for a period of not less than five (5) years, and who employs an experienced architectural hardware consultant (AHC) for the preparation of Hardware Schedules, and consultation about project hardware requirements.
- F. Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Section 01000 - Product Requirements: Transport, handle, store and protect the products.
- B. Supplier to deliver the appropriate hardware, at the proper time and to the proper location (shop or Project Site) for installation.
- C. Deliver products to the Project Site in the manufacturer's original, unopened packages, dry and undamaged, bearing the manufacturer's name and identification of the hardware item.
- D. Retain the manufacturer's original packaging. Ensure that the products are complete, including basic installation instructions. Label each product separately to be readily identifiable with the products indicated in the Hardware Schedule.
- E. Supplier to identify sets with the appropriate hardware set number.
- F. Contractor to catalogue the delivered hardware and store in a secure lockable enclosure, i.e. room, storage cabinet, etc. Store off the ground and on shelving. Set up procedures for limited access to the locked storage.
- G. Store products in their original protective packaging to prevent soiling, wetting and physical damage to materials, finishes and operating mechanisms.
- H. Handle to prevent damage to finish surfaces.
- I. Maintain protective covers on all units until installation has been completed. Remove coverings during final clean-up.

PART 2 PRODUCTS

2.1 HARDWARE, GENERAL

- A. Comply with ANSI B89.1-1998 Series standards applicable to the type and grade of hardware required.

- B. Hardware Characteristics: Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware are indicated in the Hardware Schedule at the end of this Section.
- C. Complete Assemblies: Scheduled hardware indicates the primary types and quality of hardware required and is not necessarily descriptive of all the components required. Provide standard accessory components, as necessary, to complete the assembly for a fully functional unit when installed. Provide finishes matching the primary unit where accessory components are exposed-to-view.
- D. Anchorage Devices: Furnish with each hardware type required.
 - 1. Types: Wood and machine screws and other appropriate anchorage devices applicable to the type of substrate the item is to be fastened to. Do not provide exposed through-bolts or nuts unless clearly noted on the Hardware Schedule submittal, and approved by the Architect.
 - 2. Head Style: Phillips flat-head devices.
 - 3. Finish: Match the finish of the primary fastened hardware.
- E. Finish of Hardware: The finish of hardware shall be as stated herein below. Special care shall be taken to coordinate the finish of the various manufacturers to insure a uniform acceptable finish throughout. The finish of all hardware shall match the finish of the locksets, unless otherwise specified.
- F. Hardware manufacturers are listed, within each item Article below, for each hardware item to establish a standard of quality, and minimum functional requirements.

2.2 HINGES

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:
 - 1. Hager.
 - 2. McKinney.
 - 3. Stanley.
 - 4. Henry Soss.
- B. Material:
 - 1. Door Butts: Hinges shall be full mortise, template type, unless half mortise hinges are required stainless steel. Hinges shall have non-rising loose pins, ball or oilite bearings, and flat button tips with matching plugs, except where otherwise specified. Provide hinges with stainless steel pins steel pins steel hinges non-removable pins (NRP) for exterior and public interior exposures, non-rising for non-security exposure.
 - 2. Where necessary to keep the door leaf clear of walls, casings, frames or reveals in the door opening, furnish wide throw hinges of an approved type shall be furnished. For out-swinging doors, hinges shall have a set screw in the barrel to prevent removal of the pin when the door is closed. All doors over 7 feet tall shall have one extra hinge for each additional two (2) feet of height, or fraction thereof.

3. Ball Bearing Type: Swaged, inner leaf beveled, square corners.
4. ANSI 15□1, Grade 1.

2.3 LOCKS, LATCHES AND BOLTS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. Yale.
2. Arrow.
3. Schlage.
4. Best.
5. Sargent.

B. Materials:

1. Lock Uniformity: Except where otherwise specified, all locksets, latchsets, padlocks, cylinders and component parts, as specified hereinunder, shall be by one manufacturer. All internal parts of locksets, latchsets, padlocks and cylinders shall be brass or stainless steel to resist corrosion, and shall be marine function for exterior doors□US 32D finish.
2. Lockset Style: All hardware shall have lever handles with rose.
3. Locksets: ANSI A15□2, Series 4000 Grade 1, with removable cores.
4. Mortise Locks and Latches: ANSI □BHMA A15□13, Series 1000, Operational Grade 1, Security Grade 2□equip with □-pin tumbler□ 2-3□backset□keyed alike, or as approved. Levers and roses shall have screwless shanks, and no exposed fasteners.
5. Bored Locks and Latches: ANSI □BHMA A15□2, Series 4000, Grade 1. Locks for exterior doors shall have threaded roses or concealed machine screws.
- Latch Sets: Provide release by turning lever, closing door, or turning emergency release key through a hole in the outside knob.
7. Cores: All lockset shall have removable cores to facilitate easy replacement.
 - a. To maintain the established existing master key system, all cylinder, locksets and padlocks shall be furnished with keyways to match the keyway of record.
 - b. Furnish with construction cores for use during construction and until Substantial Completion, or until a portion of the work has been accepted by the Owner and the Owner’s representative has directed the cores to be change out.
- Hospital Latches: Push □pull latchsets similar and equal to Glynn-□ohnson HL□□□ □ throw, 2-3□backset, to 1□1 cutout. Cover approximately 2-1□2□ covers and handles of stainless steel, BHMA 630 finish, engraved “PUSH” and “PULL” on handles, push handle pointing up, pull handle pointing down.

9. Combination Locks: Heavy-duty, mechanical combination locksets with five pushbuttons, standard sized knobs, 3/4" deadlocking latch, 2-3/4" backset. Lock shall be operated by pressing two or more of the buttons in unison or individually in the proper sequence. The inside knob shall always operate the latch. Provide a keyed cylinder on the interior to permit setting the combination.
10. Strikes: ANSI Strikes, 1-1/4" x 4-7/8" All lock strikes shall have a curved lip of sufficient length to protect the trim and jamb, and shall be furnished with wrought box strikes with extended lip for latch bolts, except open strike plates may be used in wood frames. Provide dustproof strikes for foot bolts.
11. Door Bolts: ANSI BHMA 15-1" Provide dustproof strikes for bottom bolts, except for doors having metal thresholds. Automatic latching flush bolts: ANSI BHMA A15-3, Type 25.
12. Door Hardware: Hand of lock shall be as shown on the Drawings. If the door hand is changed during construction, the Contractor shall make the necessary changes in the hardware at no additional cost to the Owner.
13. Lever Handles: All latch and locksets shall have lever handles with a rose. Lever handles for exit devices shall meet the test requirements of ANSI BHMA A15-13 for mortise locks. Provide knurled or abrasive-coated lever handles for doors accessible to blind persons, and those which lead to dangerous areas.
14. Cipher Locks: Exterior Grade and Weather Resistant Stand Alone ANSI BHMA Grade 1 pushbutton keypad with at least 500 unique PIN codes, programming master code, passage mode low battery indicator and 9-volt battery power backup keypad lockout feature key override and freewheeling outside lever in locked position.

C. Keying, General:

1. All locksets, padlocks and cylinders shall be keyed, master keyed and grand master keyed at the factory where records shall be established and maintained, as directed.
 - a. All master keys and grand master keys shall be identified with a registry number, not stamped with "Master" or the letter "M".
 - b. Individual room keys shall not be stamped with a key cut, but with a plain identification number only.
2. Maintain a security system to ensure that keys used during construction will not open doors after occupancy.
3. Provide three (3) keys for each lockset.
4. A Keying Schedule will be provided after the initial Hardware Schedule submittal. Keyed alike and master keying will be finalized at that time.
5. Furnish exterior door lock sets with removable ICC core cylinders and cylinder guards.
- Restrict the distribution of construction keys. Maintain a record of all persons who receive keys and provide a copy of the record to the Owner's representative upon request.

7. When directed by the Owner's representative, remove the construction cores, install permanent cores, and return the construction cores to the manufacturer.

2.4 PUSH □ PULL UNITS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. H. B. Ives.
2. Quality Hardware Manufacturing Co., Inc.
3. Trimco.
4. Rockwood.

B. Materials: ANSI A15□□ for 0.050 inch thickness.

2.5 EXIT DEVICES (PANIC HARDWARE)

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. Corbin Russwin.
2. Yale.
3. Lion Duprin.
4. Adams Rite.
5. Monarch.
- Sargent.

B. Materials:

1. Exit Devices: ANSI □BHMA A15□3, Grade 1. Provide adjustable strikes for rim type and vertical rod devices. Provide open back strikes for pairs of doors with mortise and vertical rod devices.
2. Exit Locks With Alarm: ANSI □BHMA A15□5, Type E0431 (with full-width horizontal actuating bar) for single doors: Type E0431 (with actuating bar) or E0471 (with actuating bar and top and bottom bolts, both leaves active) for pairs of doors, unless otherwise specified. Provide terminals for connection to a remote indicating panel. Provide outside control key. Coordinate with the electrical subcontractor.
3. All exposed metal shall match the hardware.
4. Size and mount the units as indicated or, if not indicated, to comply with the manufacturer's recommendations for the exposure condition. Reinforce the substrate as recommended.
5. ANSI A15□3 Exit Device and Trim, Grade 1, surface-mounted vertical rod device with dust-proof strike at the head and threshold.

2.0 CLOSERS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. LCN.
2. Norton.
3. Sargent.
4. Corbin Russwin.
5. Rixon-Firemark.
- Yale.
7. Dorma.

B. Materials and features:

1. ANSI A15.4, Grade 1.
2. ANSI A117.1.
3. Non-Slidable Adjustable 1-5.
4. 10 degree door opening.
5. Heavy-duty parallel arm.
- Standard cover.
7. Exposed metal to match the hardware.
- Mounting: Hinge face mounting. Do not mount closers on the exterior side of doors.
9. Size and mount units as indicated or, if not indicated, comply with the manufacturer's recommendations for the exposure condition. Reinforce the substrate as recommended.
10. Provide drop brackets, mortise shoes, and long arms, as required.
11. Closers attached to mineral core or particle filled doors shall be installed with sex bolts.
12. Closers to be installed to allow the door to swing as shown on the Drawings.
13. All closers shall be ADAAG type, adjustable for spring setting, latch and sweep speed, and backcheck.

2.7 STOPS, HOLDERS AND BUMPERS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. H. B. Ives.
2. Quality Hardware Manufacturing Co., Inc.
3. Trimco.
4. Dor-O-Matic.
5. Glenn-Johnson.

B. Materials:

1. Door Stop Mounting: Utilize the appropriate anchor method for the substrate encountered (plastic anchor, drywall anchor, expansion shield).
2. Provide resilient grey rubber bumpers.
3. Adjust the height of floor stops to suit the undercut of the adjacent door, and for out-swinging exterior doors.

2. THRESHOLDS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. Pemko.
2. National Guard.
3. Reese.
4. Wooster.
5. Tero.

B. Thresholds by type:

1. Type as scheduled or indicated, or where not shown provide a manufacturer's standard aluminum threshold, with standard cast or extruded non-slip profile. For out-swinging exterior doors use vinyl or silicone rubber inserts in the face of the stop. 2005 profile by Pemko, or as approved non-slip.
 2. Thresholds shall be one-piece, continuous the full width of the doorway.
 3. Where not indicated, the dept of the flat portion of the threshold to be not less than the door frame depth.
 4. End Returns: Mitered and returns where ends would otherwise be exposed of material finish to match the primary threshold unit.
 5. Height: As indicated, except do not exceed 1 1/2 in height where handicapped access is required. Comply with ADAAG.
- Method of fastening: Provide the manufacturer's special concealed fastener system for installation for single units.

7. Sealant: For thresholds, single component, urethane complying with Section 07900 - Joint Sealers.

2.9 WEATHERSTRIPPING

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:
 1. Pemko.
 2. Reese.
 3. Ferro.
- B. Continuous Adhesive-Applied Lamb Head Weatherstripping: Continuous at Lambs and head. Air leakage of weatherstripped doors shall not exceed 0.5 CFM of air per square foot or door when tested in accordance with ASTM E 283. Pemko PK357BL, or approved equal.

2.10 LIGHT PROOFING AND SOUNDPROOFING

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:
 1. National Guard.
 2. Pemko.
 3. Ferro.
- B. A set shall include adjustable door stops at the head and Lambs of doors, and an automatic door bottom of extruded aluminum, anodized finish, surface-applied, with vinyl fin seals between the plunger and housing. Door stops shall have a solid neoprene tube, silicone rubber, or closed-cell sponge gasket. Door bottoms shall have an adjustable operating rod and silicone rubber or closed-cell sponge neoprene gasket. Door stops shall be mitered at the corners.

2.11 MISCELLANEOUS HARDWARE

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:
- B. Products:
 1. Smoke Seals: Fire-tested, continuous at Lambs and head PK 55 by Pemko, or approved equal, color as selected.
 2. Bottom Sweep: 307 by Pemko, or approved equal, color as selected.
 3. Overlap Astragal: 1 gauge minimum, but not less than required for the tested assembly provided for 357 by Pemko, or approved equal, color as selected.
 4. Split Astragal for doors: 1 gauge minimum, but not less than required for the tested assembly provided for 309 by Pemko, or approved equal, color as selected.
 5. Door Rain Drips: Extruded aluminum, not less than 0.0625 thick, approximately

1-1/2" high x 5" projection, as selected. Align the bottom with the bottom edge of the door.

- Overhead Rain Drip: Extruded aluminum, not less than 0.0625" thick, approximately 1-1/2" high x 2-1/2" projection, with length equal to the overall door frame width. Align the bottom with the door frame rabbet by Pemko, or approved equal, color as selected.

2.12 SUBSTITUTIONS

- A. Section 01000 - Product Requirements: Product Options: Substitutions permitted.

2.13 FABRICATION

- A. Finish and Base Material Designations: Number indicate BHMA Code or nearest traditional U.S. commercial finish.
- B. Where base material and quality of the finish are not otherwise indicated, provide at least commercially recognized marine quality as specified in the applicable Federal Specifications.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 - 1. Verify that doors and frames are ready to receive the work, and that dimensions are as instructed by the manufacturer.
- C. Report in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until unsatisfactory the conditions have been corrected.

3.2 INSTALLATION

- A. Where not specified under other Sections to be performed by the manufacturer or supplier, machine, fit and drill wood and metal doors, and frames.
- B. Prepare doors of the various types to receive hardware, using templates and instructions provided with the hardware items for on-site work.
- C. Install each hardware item in compliance with the manufacturer's instructions and recommendations.
- D. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate the hardware removal, storage and reinstallation, or the application of surface protection with the finishing work specified in Section 09900 - Painting. Do not install or reinstall surface-mounted items until the finishes have been completed on the substrates.

- E. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units not factory-prepared for anchorage fasteners, flush with the fastened surface. Space fasteners and anchors in accordance with industry standards.
- G. Set thresholds for exterior doors in a full bed of sealant to ensure waterproof integrity.

3.3 ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting the installed work.
- B. Adjust and check each operating item of hardware and each door to ensure proper operation and function of every unit. Replace units which cannot be adjusted to operate freely and smoothly for their intended application.
- C. Adjust door control devices to compensate for the final operation of cooling and ventilating equipment.
- D. Door operation shall meet ADAAG requirements for opening force.
- E. Adjust operating hardware to provide a tight fit at contact points and weatherstripping, for smooth operation and weathertight closure.
- F. Lubricate moving components and hardware.
- G. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make a final check and adjustment of all hardware items.

3.4 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect hardware installations for proper locations, heights, level, plumb, square, attachment to the substrate and opening force.

3.5 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- B. Clean adjacent surfaces soiled by the hardware installation.
- C. Clean operating items as necessary to restore proper function and finish of the hardware and doors.

3.6 TRAINING

- A. Instruct the Owner's personnel in the proper adjustment and maintenance of hardware items and finishes during final adjustment of the hardware.

3.7 HARDWARE SCHEDULE

A. Door Material Types:

AL	Aluminum	OHC	Overhead Coiling
FLDG	Folding Grille	SCWD	Solid Core Wood
GATE	Chain Link Gate	SLGL	Sliding Glass
HCWD	Hollow Core Wood	WD	Wood
HM	Hollow Metal		

HW-1 Exterior AL Double Exit Door

Hinges	3 pairs	By Manufacturer	
Exit Device	2 ea	By Door Manufacturer	
	1 ea	F110 Lever	
	1 ea	Dummy Trim	
Closer	2 ea	Surface mount interior	Alum
Flush Bolts	1 set	Top and Bottom	US32D
Weatherstripping	continuous	By Door Manufacturer	
Threshold	continuous	As indicated	Alum
Astragal			Alum
Rain Drip			Alum
Provide ADA Door Operator			

HW-2 Exterior AL Door

Hinges	1-1 1/2 pairs	By Manufacturer	
Lockset	1	F110 Lever	US2 1/2 D
		Provide Cipher Lock where scheduled.	
Closer	1 ea	Surface mount interior	Alum
Weatherstripping	continuous	By Door Manufacturer	
Threshold	continuous	As indicated	Alum
Astragal			Alum
Rain Drip			Alum

HW-3 Security Gates and Roll-up door

Heavy Duty Hinges, 4 pairs each except roll-up door.
 Heavy Duty Padlock, 2 each
 Locking Bottom Bolt (for swinging gate)

HW-4 Interior SCWD and HM Doors, Fire Rated where scheduled

Hinges	1-1 1/2 pairs	A5112, 4-1 1/2 x 4-1 1/2	US32D
Lockset	1	F 1 1/2	US2 1/2 D
		F 1 1/2 at secure interview rooms	
		Provide Cipher Lock where scheduled.	
Closer	1 ea	Surface Mount	Alum
Door Stop	1 ea	Floor	US32D
Door Gasketing	continuous		Roy 154
Closer	1 ea	Surface mount interior	Alum

HW-5 Interior SCWD HM Restroom Doors (w/ent) Fire Rated where scheduled

Hinges	1-1 1/2 pairs	By Manufacturer	
Lockset	1	F7	US20D
		F7 at secure areas	
Closer	1 ea	Surface mount	Alum
Kick Plate	1 ea	10" x width	US32D
Door Stop	1 ea	Floor or wall	US32D
Door Gasketing	continuous		Roy 154

HW- Interior SCWD Doors (Storage, Closets)

Hinges	1-1 1/2 pairs	A5112, 4-1 1/2 x 4-1 1/2	US32D
Exit Device	1 ea	By Door Manufacturer	
	1 ea	F4 Lever	US20D
Closer	1 ea	Surface Mount	Alum
Door Stop	1 ea	Floor	US32D
Door Gasketing	continuous		Roy 154
Closer	1 ea	Surface mount interior	Alum

END OF SECTION

SECTION 0100
GLASS AND GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glazing for entrances and storefronts.
2. Glazing for curtain walls.
3. Glazing for sliding doors.
4. Glazing for window units.
5. Interior partitions relites.
 - Fire-rated glazing.
7. Low-E glazing.
 - Glass blocks.
9. Glazing sealant installation.
10. Bulletproof glass.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 01011 - Sustainable Design and Construction Procedures
2. Section 01200 - Finish Carpentry: Wood frames for interior glazing.
3. Section 07900 - Joint Sealers: Sealants for waterproofing glazing installations.
4. Section 01100 - Hollow Metal Doors and Frames: Glazing in metal doors and sidelites.
5. Section 01210 - Wood Doors: Glazing in wood doors, transoms and sidelites.
 - Section 01330 - Overhead Doors: Glazing in sectional doors.
7. Section 01400 - Entrances, Storefronts and Windows: Glazing installations.
 - Section 01420 - Aluminum Doors and Windows: Glazing in doors and windows.
9. Mirrors are specified in Section 10010 - Toilet Accessories.

1.2 DESCRIPTION OF WORK

- A. The extent of glass and glazing work is indicated on the Drawings and Schedules and as specified herein, and includes providing and installing glazing for exterior and interior doors and windows, safety glass, interior relites, glass blocks, sealants and miscellaneous glazing materials.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- B. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7 - Minimum Design Loads for Buildings and other Structures.
- C. American National Standards Institute (ANSI):
 - 1. ANSI 97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.
- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM C 920 - Specification for Elastomeric Joint Sealants.
 - 2. ASTM C 1034 - Specification for Flat Glass.
 - 3. ASTM C 1044 - Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
 - 4. ASTM E 1996 - Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
 - 5. ASTM F 1233 - Test Method for Security Glazing Materials and Systems.
- E. Flat Glass Marketing Association (FGMA):
 - 1. FGMA - Glazing Manual and Glazing Sealing Systems Manual.
- F. National Fire Protection Agency (NFPA):
 - 1. NFPA 257 - Standard on Fire Tests for Window and Glass Block Assemblies.
- G. International Code Council:
 - 1. International Building Code (IBC), 2009:
- H. U. S. Consumer Product Safety Commission, CPSC 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.

1.4 CONSTRUCTION

- A. Interface with Other Work: Coordinate glazing with the installation of exterior aluminum entrances, storefronts, curtain walls, doors and windows as specified in Section 05410 hollow metal doors and windows specified in Section 05100 wood doors and windows specified in Section 05210.

1.5 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
1. Product Data:
 - a. Submit two (2) copies of the manufacturer's catalogs, including specifications and installation instructions for all glass products to be used and for glazing sealant and compound, gasket and miscellaneous materials required.
 - b. Glass: For each type of glass provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
 - c. Glazing compound: Provide chemical, functional, and environmental characteristics, limitations and special application requirements.
 - d. Manufacturer's engineering design to meet the performance requirements.
 2. Calculations indicating glazing satisfaction of performance requirements
 3. LEED Requirement: Actual light transmission level calculation to achieved LEED credit required for this project.
 - a. Complete the LEED Materials Submittal Form as provided in Section 01340 - Submittals - LEED Submittals, for procedures in this section.
 - b. Complete the LEED VOC Submittal Form as provided in Section 01340 - Submittals - LEED Submittals, for products in this section.
 4. Samples:
 - a. Glass: Two (2) samples 12x 12in size for each type of glazing, illustrating tinting, and finish of the glazing material. Label each sample indicating kind, quality and manufacturer as follows:
 - 1) Tinted float glass.
 - 2) Laminated glass.
 - 3) Tempered glass.
 - 4) Low-e glass.
 - 5) Patterned glass.
 - b. Glass Blocks: Two (2) full size units.
 - c. Glazing Sealants: Three (3) copies of the manufacturer's standard color selection.
 5. Assurance Control Submittals:
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements.

- b. Calculations indicating that the materials satisfy the performance requirements.
 - c. Documentation of experience indicating compliance with the specified qualifications requirements.
 - B. Section 01700 - Closeout Submittals: Procedures for closeout submittals.
 - 1. Warranty: Submit a written Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.0 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 - 2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.
- B. Performance Requirements:
 - 1. Provide the capacity to withstand the following loading requirements for exterior units:
 - a. Design and install to resist combined positive and negative windloading in accordance with IBC 2009, Section 1609 with a v of 170, q_s of 74.0 psf, exposure B and importance factor $I = 1.0$ as applicable per ASCE 7. Site for areas of discontinuity and worst case scenario to be experienced by the building.
 - b. Height of windows and door units above the ground level are indicated on the Drawings or can be calculated from the Drawings.
- C. Identification: Provide labels where safety glazing is required. Each unit of tempered glass shall be permanently identified by the manufacturer. The identification shall be etched or ceramic fired on the glass and shall be visible after the glazing has been installed. Label per NFPA 70.
- D. Grading and Labeling: Grade and label each light stating the quality and grade of the glass and the manufacturer's name and brand designation. Leave labels intact until removal is directed by the Owner's representative. Label each individual glazing unit for fire-rated doors and windows in accordance with NFPA 70-1-7.4. Listing marks shall be visible after installation.
- E. Perform the work in accordance with the FGMA, Glazing Manual.
- F. All exterior glazing shall be wet sealed glazing gaskets and permitted only for interior work.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Section 01000 - Product Requirements: Transport, handle, store, and protect the products.
- B. Comply with the manufacturer's instructions for shipping, handling, storing and protecting

glass and glazing products.

- C. Deliver products to the Project Site in the manufacturer's original, unopened packaging or crates.
- D. Exercise exceptional care to prevent edge damage to the glass, rainbowing, discoloration and damage to and deterioration of coatings, if any, on the glass.

1.8. MOB CONDITIONS

- A. Pre-installation: Meet with the Glazier and other trades affected by the glass installation prior to beginning installation. Do not perform work under adverse weather or ob conditions. Install liquid sealants only when the temperature is within the lower or middle one third of the temperature range recommended by the manufacturer.

1.9 WARRANTY

- A. Section 01710 - Closeout Submittals: Procedures for closeout submittals.
- B. Special Warranty:
 - 1. Provide a manufacturer's written Warranty against cracking, breakage, staining, rainbowing, discoloration and for replacement.
 - 2. Warranty Period: Two (2) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 - 1. Falconer Glass Industries, Inc.
 - 2. Guardian Industries.
 - 3. PPG Industries.
 - 4. Libby-Owens-Ford.
 - 5. Pilkington.
 - iracon, Inc.
 - 7. Oldcastle Glass.
 - National Glass Blocks.
- B. Section 01100 - Product Requirements: Product Options: Substitutions permitted.

2.2 GLAZING MATERIALS

- A. Standards:
 - 4. Prime Glass: FS DD-G-451, ASTM C 1031

5. Safety Glass: CPSC 16 CFR 1201.
 1. Heat-Treated Glass: FS DD-G-1403, ASTM C 1041.

- B. Float Plate Glass: Type 1, quality q3, thickness as required to meet the performance requirements, but not less than 3/16" clear unless otherwise indicated. Curved or straight as indicated.

- C. Laminated Safety and Security Glass: Standard two-ply laminated glass with minimum 0.001" Saflex interlayer. Thickness as required to meet the Performance Requirements or security criteria for the location, height and use or as indicated, but not less than 3/16". Where glazing is double pane, the laminate shall be installed as the exterior lite. Tint color as selected.
 1. Impact Loads: Comply with South Florida Building Code, Section 2315 and 3513.

- D. Tempered Glass: Heat treated to strengthen the glass in bending to not less than 4.5 times the annealed strength, edges seamed, thickness as required to meet the performance requirements (3/16" thick, minimum). Exposed edges in the finished work shall be polished. Tint color as selected.
 1. Where indicated as "Free of Tong Marks", provide tempered glass produced by manufacturer's special process which eliminates tong marks.

- E. Tempered Low-E: Hard coating on surface 4. Tint color as selected from manufacturer's standards.

- F. Polished Wired Glass or Patterned Wire Glass: Type II, minimum 1/4-inch thick, Class 1, Form 1, quality q11, clear and polished both faces. Pattern as selected.
 1. Fire Rating: Provide glass listed and labeled by UL "fire resistance" complete with steel channel stops.

- G. Interior Fire Rated: Fire glass-mullion glazing system with pyrostop safety rated glass.

- H. Patterned Glass: Tempered glass with screen-printed, ceramic frit fused pattern.
 1. PPG DecoTherm.
 2. Miracon, Miraspan.
 3. Approved equal.

- I. Bullet-proof Glass: meet or exceed UL Level III (9mm full metal jacket with lead core, 0.357 magnum jacketed lead soft point, 0.44 magnum lead semi wadcutter).
 1. Transaction Window:
 - a. Non-ricochet type intended to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration.
 - b. Stainless Steel dip tray with single or multiple transaction positions.
 - c. Natural voice configuration.

2.3 GLASS BLOCKS

- A. Glass Blocks: 4"x 4"x 4" thick or as indicated, partially evacuated hollow units. Style, pattern and color as selected from the manufacturer's standards.

2.4 GLAZING SEALANT

- A. Silicone: Single component, elastomeric, chemical curing capable of water immersion without loss of properties non-bleeding, non-staining, non-sag cured Shore A hardness of 15 - 25. Color black.

2.5 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers and Sealers: Type recommended by the glazing sealant or gasket manufacturer.
- B. Setting Blocks: Neoprene or EPDM, 70 to 90 Shore A durometer hardness compatible with the glazing sealant used.
- C. Spacers: Neoprene or EPDM, 40 to 50 Shore A durometer hardness self adhesive on one side compatible with the glazing sealant used.
- D. Filler Rods: Closed cell or waterproof jacketed foam rod of polyethylene, butyl, neoprene, polyurethane, or vinyl compatible with the glazing sealant used.

2.6 GLASS BLOCK GLAZING ACCESSORIES

- A. Panel reinforcement: Two (2) parallel 9 gage wires either at 1-5" or 2" on center with electrically welded cross wires at regular intervals, galvanized after welding.
- B. Expansion Strips: Fibrous glass or polyethylene foam, 3/8" thick.
- C. Panel Anchors: 20 gage perforated steel strips, 24" long x 1-3/4" wide, galvanized after perforating.
- D. Sealant: Sealant No. 1 or No. 3 per Section 07900.
- E. Backer Rods: Polyethylene foam, neoprene or equal as approved by the sealant manufacturer.
- F. Mortar Materials: Type S in accordance with ASTM C 270 with integral type water-repellant added to the mortar mix.
- G. Portland Cement: Type 1 in accordance with ASTM C 150.
- H. Lime: Type S in accordance with ASTM C 207.
- I. Sand: Clean, white quartzite type, essentially free of iron compounds for thin joints in accordance with ASTM C 144.
- J. Integral Type Water-repellant: Stearate as recommended by the glass block manufacturer.

PART 3 - EXECUTION

3.1 STANDARDS AND PERFORMANCE

- A. Watertight and airtight installation of each glass product is required, except as otherwise

shown. Each installation must withstand normal temperature changes, wind loading, and impact loading (for operating sash and doors), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials, and other defects in the work.

- B. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.
- C. Glazing channel dimensions, as indicated and specified, are intended to provide for the necessary bite on the glass, minimum edge clearances, and adequate sealant thickness with reasonable tolerances. Adjust as required by the job conditions at the time of installation. Do not reduce the manufacturer's recommended minimum edge bite on the glass.
- D. Comply with the combined recommendations and technical reports by manufacturers of the glass and glazing products used in each glazing channel, and with recommendations of the Flat Glass Marketing Association, "Glazing Manual", except where more stringent requirements are indicated.
- E. Inspect each piece of glass just prior to installation, and discard any which have observable edge damage or face imperfections.
- F. Provide safety glass for all glazed panels within 4' of a door and where glazed panels are less than 4' above any floor or any walking surface and elsewhere where required by the Building Code, performance data or as indicated.
- G. Clean glazing channels and other framing members to receive glass just prior to glazing. Remove coatings which are not firmly bonded to the substrate. Remove lacquer from metal surfaces where elastomeric sealants are used.
- H. Apply primer or sealant to joint surfaces where recommended by the sealant manufacturer.

3.2 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 - 1. Verify that openings for glazing are correctly sized and within tolerance.
 - 2. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement and that weeps are clear and ready to receive the glazing.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

- C. Prime surfaces scheduled to receive sealant.

3.4 GLAZING INSTALLATION

- A. Place setting blocks of the proper size in sill rabbet—locate at 1/4th the glass width from each corner—set blocks in a thin course of heel and toe compound, if any.
- B. Install spacers of the proper size and spacing inside and out for glass sizes larger than 50 united inches, except where gaskets or pre-shimmed tape is used. Provide 1/8" minimum bite of spacers on the glass and use a thickness slightly less than the final compressed thickness of the tape.
- C. Set each unit of glass in each series in uniformity with other pieces in pattern, draw, bow, and other visually perceptible characteristics.
- D. Provide for the following edge clearances (bite):

Single glazed

Nominal edge cover (bite)	5/16"
Minimum nominal edge clearance	3/16"
Minimum face clearance	3/16"

- E. Glass must be edge blocked to prevent contact with metal framing.
- F. Provide glazing sealant as required for the particular glazing application. Coordinate with other Sections herein for material compatibility. Glazing gaskets are permitted only for interior locations.
- G. Prevent exudation of the sealant or compound by forming voids or installing filler rods in channels at the heel of limbs and heads, except as otherwise indicate and depending on the light size, thickness and type of glass, and in compliance with the manufacturer's recommendations.
- H. Provide filler rod where sealants are used in the following locations:
 1. Head and limb channels.
 2. Tinted glass over 75 united inches in size.
 3. Clear glass over 125 united inches in size.
- I. Do not leave voids in sill channels except as specifically indicated or recommended by the glazing manufacturer. Force sealant into the channel to eliminate voids and to ensure complete "wetting" or bond of the sealant to the glass and channel surfaces.
- J. Do not allow the sealant to close the weeps of aluminum framing.
- K. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from the glass.
- L. Clean and trim excess glazing materials from glass and stops or frames promptly after installation—eliminate stains and discolorations.
- M. Install pressurized tape and gaskets to protrude slightly out of the channel to eliminate dirt

and moisture pockets.

3.5 GLASS BLOCK INSTALLATION

- A. Verify that channels, chases and panel anchors have been provided at heads and sills for panel support within openings.
- B. Cover the sill area with a heavy coat of asphalt emulsion. Allow the emulsion to dry before placing mortar. Adhere expansion strips to sills and head. Make certain that expansion strips extend to the sill. Maintain a uniform joint width of 1/4" plus or minus 1/16". All mortar joints must be full and not furrowed. Steel tools should not be used to tap blocks into position.
- C. Install reinforcing at 12" o.c. horizontally and in joints immediately above and below all openings within panels. Run the reinforcing continuously from edge to edge of panels. Lap reinforcing not less than 12" where necessary to use more than one length. Do not bridge expansion joints with reinforcing. Install reinforcing as follows:
 - 1. Place lower half of mortar in bed joint. Do not furrow. Press panel reinforcing into place. Cover panel reinforcing with upper half of mortar bed and trowel smooth. Do not furrow.
 - 2. Strike joints smooth while mortar is still plastic and before final set. Rake out all spaces requiring sealant to a depth equal to the width of the spaces. Remove surplus mortar from the faces of glass blocks and wipe dry. Tool joints smooth and concave before mortar takes final set.
 - 3. After final mortar set, install packing tightly between glass block panel and head construction. Apply sealant evenly in the head and sill recesses in accordance with the manufacturer's instructions.

3.6 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect the preparation for and installation of glazing.

3.7 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- B. Remove non-permanent labels after glazing has been completed and clean glass surfaces.
- C. Wash and polish glass on both surfaces not more than four (4) days prior the date scheduled for inspections intended to establish the date of Substantial Completion for each area of the Project. Wash with a solution of mild detergent in warm water applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean and dry.

3.8 PROTECTION

- A. Section 01700 - Execution Requirements: Protection of the installed work.
- B. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from the glass. Do not apply markers directly to the glass surface.

- C. Remove and replace glass which has been broken, chipped, cracked, abraded or damaged in other ways during the construction period, including by natural causes, accidents and vandalism.

END OF SECTION

SECTION 09110

NON-LOAD-BEARING STEEL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior non-load-bearing steel partition framing.
2. Metal furring.
3. Interior suspended steel ceiling framing.
4. Blocking and backing plates.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 05500 - Metal Fabrications: Backing plates.
2. Section 08100 - Rough Carpentry: Wood blocking.
3. Section 07210 - Building Insulation: Wall insulation.
4. Section 07900 - Joint Sealers: Sealants.
5. Section 09250 - Gypsum Board: Wall finish.

1.2 DESCRIPTION OF WORK

A. The extent of non-load-bearing steel framing work is indicated on the Drawings and as specified herein, and includes providing and installing interior partition framing, suspended ceiling framing, furring and metal blocking and backing plates in walls and ceilings.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM A 41 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
2. ASTM C 445 - Specification for Non-Structural Steel Framing Members.
3. ASTM C 754 - Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

4. ASTM C 40 - Standard Specification for Application and Finishing of Gypsum Board.
5. ASTM C 954 - Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033-inch (0.84 mm) to 0.112- inch (2.84 mm) in Thickness.
- ASTM D 220 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
7. ASTM D 2201 - Standard Practice for Preparation of Zinc-Coated and Zinc-Alloy-Coated Steel Panels for Testing Paint and Related Coating Products.
- ASTM E 4 - Standard Test Method for Surface Burning Characteristics of Building Materials.
9. ASTM E 90 - Standard Test Method for Laboratory Measurements of Airborne Sound Transmission Loss of Building Partitions and Elements.
10. ASTM E 413 - Classification for Rating Sound Insulation.
11. ASTM E 119 - Standard Test Method for Fire Tests of Building Construction and Materials.

C. Gypsum Association

1. GA-000 - Fire Resistance Design Manual.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data:

- a. Framing Members: Standard materials and finish, product criteria, sizes and lengths, load charts and limitations.
- b. Fasteners and Anchorage Devices: Standard materials and finish, sizes and load charts.

2. Shop Drawings:

- a. Indicate prefabricated work, component details, framing layout, framed openings, anchorage to the structure, type and location of fasteners and accessories or items required of other related work.
- b. Indicate the method of securing studs and framing to tracks, splicing, suspension, blocking □backing plates for support of items specified in other Sections and reinforcement of framing connections.
- c. Indicate details associated with fireproofing and acoustical seals.
- d. Indicate location of blocking and backing plates required for installation of other work.

3. Samples:

- a. If requested, two (2) long sections of each shape required.
- 4. Assurance Control Submittals:
 - a. Documentation of experience indicating compliance with the specified qualifications requirements.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 - 2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store and protect the products.
- B. Protect metal framing materials from corrosion, deformation and other damage during delivery, storage and handling.
- C. Deliver products to the Project Site in the manufacturer's original, unopened packages, containers or bundles bearing the brand name and identification of the manufacturer.
- D. Store and protect the metal framing with a weatherproof covering ventilate to avoid condensation.
- E. Store, handle and install to prevent bending.

1.7 JOB CONDITIONS

- A. Maintain environmental conditions (temperature, humidity and ventilation) within the limits recommended by the manufacturer. Do not install products under environmental conditions outside the manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 - 1. Unimast Incorporated.
 - 2. Dale Industries.
 - 3. National Gypsum Company (Gold Bond Building Products).
 - 4. Clark Steel Framing Systems.
- B. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

- A. Unimast Incorporated framing component designations are used within this Section to establish quality and to identify the framing types.
- B. Interior Non-Load-Bearing Partition Framing: ASTM C 345 and D 2201 galvanized sheet steel, channel shaped, punched for utility access, depth as indicated on the Drawings, gages as indicated below, unless indicated otherwise on the Drawings.
1. 212ST20 - 2-1/2" Studs - Unbraced Length 13 Feet or Less: Minimum 20 gage
Minimum 18 gage where greater than 13 feet.
 2. 35ST22 - 3-5/8" Studs - Unbraced Length 10 Feet or Less: Minimum 22 gage
Minimum 20 gage where greater than 10 feet.
 3. 40ST22 - 4" Studs - Unbraced Length 25 Feet or Less: Minimum 22 gage:
Minimum 20 gage where greater than 25 feet.
 4. Bridging - Same depth and gage as the studs.
- C. Partition Floor Tracks and Runners: ASTM C 345 and D 2201 galvanized sheet steel, channel shaped, solid web, same depth and gage as the studs.
1. 22 Gage Studs: CR22 x stud size.
 2. 20 Gage Studs: CR20 x stud size.
- D. Slip-Type Top Tracks: Provide one of the following:
1. Deflection Track: Steel sheet top runner, manufactured to prevent the cracking of finishes applied to interior partition framing resulting from deflection of the structure above in thickness not less than the studs and in a width to accommodate the depth of the studs.
 2. Double Runner System: ASTM C 345 runner inside runner with 2" deep flanges, in thickness not less than that indicated for the studs and fastened to the studs outer runner sized to friction fit inside the inside runner.
 3. Single Long-Leg Runner System: ASTM C 345 runner with 2" deep flanges, in thickness not less than that indicated for the studs, installed with studs friction fit into the runner and with bridging located within 12" of the top of the studs.
- E. Partition Framing Fasteners: Corrosion-resistant, self-drilling, self-tapping steel screws.
1. 22 Gage Framing: ASTM C 1002 3/8" Type S, pan head.
 2. 20 Gage and Heavier Framing: ASTM C 954 5/8" Types S-12, low-profile head.
- F. Partition Floor Track Anchorage Device: Low velocity, powder-actuated drive pins minimum 0.140" shank diameter x 1-1/2" shank length with 7/8" diameter washer.
1. D 451 System using D-DNI Pins with R23 washers by Hilti.
 2. Ramset Red Head System using 4700SD Pins by ITW Ramset Redhead.
- G. Wall Furring: ASTM C 345 and D 2201 galvanized sheet steel.

1. Studs: ST22 - 2-1/2" deep, 22 gage.
 2. Studs: ST20 - 3-5" deep, 20 gage.
 3. Hat-Shaped Channels: 7" deep x 1-1/2" wide, 25 gage.
 4. A@ Furring Channels: 1-1/2" deep, 25 gage.
 5. Clip Angles: 2"x 2"x 1/4" less than stud width, 1" gage.
- H. Wall Furring to Concrete or Masonry Fasteners: Hex head sleeve anchors minimum 1/4" diameter x minimum 1-1" embedment.
1. Slv Anch H 5/16" x 2-1/2" by Hilti.
 2. Dynabolt HN-1413 by ITW Ramset Redhead.
- I. Furring Channel to Masonry or Concrete Fasteners: Low velocity, powder-actuated drive pins of size to suit the application.
- J. Suspended Interior Ceiling and Soffit Framing:
1. Wire Hangers: ASTM A 41 A 41M, Class 1 zinc coating, soft temper, 0.125" diameter.
 2. Flat Hangers: Galvanized steel sheet, 1" x 3" x length required.
 3. Stud Hangers: ASTM C 45 cold rolled, galvanized sheet steel, channel shaped, cross braced, minimum 20 gage.
 4. Carrying Channels: ASTM C 45 cold rolled, galvanized sheet steel, channel shaped, minimum 20 gage.
 5. Furring Channels: ASTM C 45 galvanized, hat-shaped, 7" deep x 1-1/2" wide, 25 gage.
- K. Tie Wire: ASTM A 41 A 41M, Class 1 zinc coating, soft temper, 0.025" diameter.
- K. Flat Straps and Backing Plates: ASTM D 2201 galvanized sheet steel, 22 gage, minimum.
- L. Isolation Strips at Exterior Walls and Suspended Concrete Floors: ASTM D 2200 asphalt-saturated organic felt, Type I (No. 15 asphalt felt), non-perforated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 1. Verify that building framing components are ready to receive the work.

2. Verify that rough-in utilities are in-place and properly located where required.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION - PARTITION FRAMING

- A. Install framing and fasteners in accordance with the manufacturer's published instructions and ASTM C 754.
- B. Install tracks (runners) at floors, ceilings, and structural walls and columns where steel framing abuts.
 1. Install asphalt felt between tracks (runners) and wall (floor) where framing is installed directly against exterior walls and floor slabs.
- C. Metal Stud Spacing: 16" on center, maximum.
- D. Align stud web openings horizontally (install horizontal bridging at 5' o.c., maximum).
- E. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate below suspended ceilings.
- F. Install studs so flanges point in the same direction.
- G. Splice studs with an (inter) nested lap, minimum (fasten each stud flange with a minimum of two (2) screws).
- H. Construct corners using a minimum of three (3) studs.
- I. Install double studs at wall openings and door (l) amb, maximum 2' from each side and at the top of openings.
 - (j) Extend vertical (l) amb studs through suspended ceilings and attach to the underside of the structure above.
- K. Frame other openings, in the same manner as for doors.
- L. Place studs 2' minimum, from abutting walls.
- M. Install intermediate studs above and below openings to match the wall stud spacing.
- N. Fasten studs adjacent to door frames, partition intersections and corners to the top and bottom runner flanges in double-stud fashion.
 1. Securely fasten studs to (l) amb and head anchor clips of doors and borrowed light frames.
 2. Place a cut-to-length section of runner horizontally with the web-flange bent at each end (fasten with a minimum of two (2) fasteners per flange).
 3. Position a cut-to-length stud (extending to the top runner) at vertical panel (j) oints over door and window headers.
- O. Allow for deflection of roof or floor slabs.

1. Leave 1/2" gap between the top end of studs and the top track.

P. Framing Fastening: Fasten framing in accordance with the manufacturer's published instructions and the schedule below, unless indicated otherwise on the Drawings.

	<u>Connection</u>	<u>Fasteners</u>
flange	Floor and Top Track to Concrete	1 pin at 32" on center
	Partition Stud to Floor Track	1 screw each side, each
slab	Partition Stud to Top Track	1 screw each side, each flange in slotted hole to allow
		deflection
end	Plates and Straps to Studs	2 screws
	Stud Web to Stud Web	2 screws
	Runner to Header	1 screw at 16" on center, maximum 16" from each

Q. Install framing, blocking and backing plates between studs for the attachment of work by other trades.

R. Install batt insulation in walls and ceilings, where indicated on the Drawings and as specified in Section 07210 - Building Insulation.

3.3 INSTALLATION - FURRING

A. Furring Channels:

1. Vertically spaced at 16" on center, maximum 16" attach to concrete and masonry surfaces with hammer set or powder-driven fasteners, staggered 24" o.c. on opposite flanges.

2. Nest channels 1/2" at splices and anchor with two (2) fasteners in each flange.

B. Wall Furring:

1. Secure top and bottom runners to the structure in a manner to permit minor slab deflection.

2. Space metal furring at 16" on center, maximum.

3.4 INSTALLATION - CEILING AND SOFFIT FRAMING

A. Suspend ceiling hangers directly from the building structure.

1. Install hangers plumb and free from contact with other objects within the ceiling plenum.

2. Where other construction within the ceiling plenum interferes with the typical hanger spacing, install supplemental suspension members and hangers in the form of trapezoids or equivalent devices. Size supplemental suspension members and hangers to support the imposed ceiling loads.

3. Secure wire hangers by looping and wire-tying, either directly to the structure or to inserts.

4. Do not suspend framing from ducts, pipes or conduits.
 5. Keep hangers and braces 2" clear of ducts, pipes and conduits.
- B. Install framing per ASTM C 754.
1. Install framing components in the sizes and spacing indicated on the Drawings, but not less than that required by the referenced standards.
- C. Wire-tie furring channels to support the framing.
- D. Attach perimeter wall track or angle where the suspension system meets vertical surfaces. Mechanically join the main beam and cross-furring members to each other and fit furring into the wall track.
- E. Install compression struts and sway bracing system with tie wires as indicated on the Drawings, and as required by the Building Code.
1. Provide hanger wires splayed 45 degrees within 3" of the intersection between main runners and cross runners, and at each light fixture.
 2. Provide compression struts and splayed hanger wire sway bracing as follows:
 - a. Within 4 feet of walls.
 - b. At 12 feet on centers, maximum.
- F. Install steel framing components for suspended ceilings so members for attachment of finish panels are level to within 1/8" in 12 feet measured lengthwise and transversely.
- G. When the ceiling system provides lateral support for permanent or relocatable partitions, the connection, ceiling system and lateral force bracing shall be sized and installed to support the reaction force of the partitions.

3.5 INSTALLATION - BLOCKING AND BRIDGING

- A. Screw attach wood blocking or metal backing plates between studs for the support of surface-mounted items for:
1. Plumbing fixtures.
 2. Wall cabinets.
 3. Toilet accessories.
 4. Hardware.
 5. Architectural woodwork.
 6. Grab bars.
 7. Writing or Bulletin boards.
 8. Fire extinguishers and fire extinguisher cabinets.
 9. Other items requiring backing for attachment.

- B. Provide bridging between opposite sides of plumbing cavity walls at a maximum of 3' o.c., vertically.

3. CONSTRUCTION

A. Interface with Other Work:

1. Coordinate the erection of studs at openings and with door and window frames.
2. Coordinate the installation of anchors, supports and blocking for mechanical, electrical and building accessory items installed within the framing.

B. Site Tolerances:

1. Maximum Variation From True Position: 1/8" in 10 ft.
2. Maximum Variation From Plumb: 1/8" in 10 ft.

3.7 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- B. Inspect metal framing erection, placement, spacing, seismic joints, expansion joints, fasteners and connections.

END OF SECTION

SECTION 09250

GYPSUM BOARD

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gypsum board.
2. Cement board.
3. Gypsum sheathing.
4. Accessories.
5. Joint treatment.
- Finishing.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 06100 - Rough Carpentry: Wood framing and blocking for attachment of gypsum board.
2. Section 07210 - Building Insulation: Sound attenuation blankets.
3. Section 07900 - Joint Sealers: Acoustical sealants.
4. Section 09110 - Non-Load Bearing Steel Framing: Metal framing for attachment of gypsum board.
5. Section 09200 - Lath and Plaster: Finish for gypsum sheathing.
- Section 09300 - Tile: Ceramic wall finish on gypsum board.
7. Section 09900 - Painting: Field paint finish on gypsum board.

1.2 DESCRIPTION OF WORK

A. The extent of gypsum board work is indicated on the Drawings and Schedules and as specified herein, and includes providing and installing gypsum board for all applications, cement fiber board, gypsum sheathing, galvanized and PVC trim, accessories and the finishing of installations exposed to view.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

- B. American Society for Testing and Materials (ASTM):
1. ASTM C 475 - Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 2. ASTM C 330 - Specification for Water-Resistant Gypsum Backing Board.
 3. ASTM C 340 - Specification for the Application and Finishing of Gypsum Board.
 4. ASTM C 954 - Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 inches (0.84 mm) to 0.112 inches (2.84 mm) in Thickness.
 5. ASTM C 919 - Practice for Use of Sealants in Acoustical Applications.
 - ASTM C 1002 - Specification for Steel Self-Piercing Topping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 7. ASTM C 1200 - Specification for Application of Gypsum Sheathing.
 - ASTM C 1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets.
 9. ASTM C 1398 - Specification for Gypsum Board.
 10. ASTM D 3078 - Specification for Rigid Poly (Vinyl Chloride) (PVC) Interior-Profile Extrusions.
 11. ASTM E 119 - Test Methods for Fire Tests of Building Construction and Materials.
- C. Gypsum Association (GA):
1. GA-201 - Gypsum Board for Walls and Ceilings.
 2. GA-214 - Recommended Specification for Levels of Gypsum Board Finish.
 3. GA-218 - Recommended Specifications for the Application and Finishing of Gypsum Board.
 4. GA-200 - Fire Resistance Design Manual.
- D. International Code Council:
1. International Building Code (IBC), 2009.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
1. Product Data: Manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data required to show compliance with these specifications.
 12. Assurance □Control Submittals:

- a. Manufacturer's certificate that the products meet or exceed the specified requirements.
- b. Documentation of experience indicating compliance with the specified qualifications requirements.
- c. Test Reports from recognized testing laboratories, upon request.

1.5 QUALITY ASSURANCE

A. Qualifications:

- 1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
- 2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Fire-Resistance Ratings: Where gypsum drywall systems with fire-resistance ratings are indicated, provide materials and installations which are identical to those of applicable assemblies tested per ASTM E 119 by a fire testing laboratory acceptable to the authorities having jurisdiction.

- 1. Provide fire-resistance rated assemblies identical to those indicated by reference to GA File No. S in GA "Fire Resistance Design Manual" or to design designations in U.L. "Fire Resistance Directory" or in listing of other testing and agencies acceptable to the authorities having jurisdiction.

C. Single-Source Responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturer's recommended by the prime manufacturer of the gypsum board.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 0100 - Product Requirements: Transport, handle, store and protect the products.

- B. Deliver products to the Project Site in the manufacturer's original, unopened, undamaged packages, containers, or bundles bearing the brand name with identification labels intact.
- B. Store materials inside and under cover, keep dry, protect from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.
- D. Neatly stack gypsum boards flat to prevent sagging.
- E. Handle to prevent damage to edges, ends and surfaces.
- F. Protect corner beads and trim from being bent and damaged.

1.7 JOB CONDITIONS

A. Environmental Requirements, General: Comply with requirements of the referenced gypsum board application standards and recommendations of the gypsum board manufacturer for environmental conditions before, during and after installation.

B. Ventilation: Ventilate building spaces as required to remove water in excess of that required for the drying of joint treatment materials immediately after application. Prevent drafts during hot,

dry weather to avoid excessively rapid drying.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
1. United States Gypsum Co.
 2. National Gypsum Company (Gold Bond Building Products).
 3. Georgia-Pacific.
 4. Domtar Gypsum.
- B. Section 01000 - Product Requirements: Product Options: Substitutions permitted.

2.2 GYPSUM BOARD MATERIALS

- A. General:
1. Provide boards where called for on the Drawings in lengths to minimize the number of end-to-end butt joints.
 2. United States Gypsum (Sheetrock) designations are used in this Section to identify gypsum board and accessory types, unless otherwise noted.
- B. Standard Gypsum Board: ASTM C 139 natural finish, paper faces, 1/2" at ceilings and over wall furring, 5/8" thick at walls unless noted otherwise, 48" width, maximum practical length to meet conditions ends square cut, tapered edges.
1. Provide where gypsum board is called for unless otherwise indicated.
- C. Fire-Resistant Gypsum Wallboard: Type X, ASTM C 139 paper faces, 2" at ceiling, or 5/8" thick at walls, 48" width, maximum practical length to meet conditions ends square cut, edges tapered providing at least 1-hour fire-retardant rating when tested in accordance with ASTM E 119.
1. Provide where a fire-resistance rating is required.
- D. Water-Resistant Gypsum Backing Board: ASTM C 130 2" at ceiling and over wall furring, and 5/8" thick at walls, 48" width, maximum practical length to meet conditions ends square cut edges tapered ends and edges straight and solid. Board consisting of a non-combustible water-resistant gypsum core, surfaced on face and back with green treated water-repellent paper bonded to the core. Suitable for receiving paint or wallpaper and in compliance with IBC.
1. Provide at ceilings and walls in showers, toilets and other wet areas not scheduled for tile finish.
- E. Impact Penetration-Resistant Gypsum Board: Type X, ASTM C 139, 5/8" thick, 48" width, maximum practical length to meet the conditions, ends square cut edges tapered gypsum core with additives to enhance fire resistance 1-hr fire-retardant rating when tested in accordance with ASTM E 119 surfaced with paper on the front, back and long

edges 0.30 GE Lexan film bonded to the back side to enhance impact penetration resistance without penetration.

1. Provide at Corridor walls where indicated and other locations subject to high abuse.
- F. Tile Backing Board: 5/8" thick inorganic fiberglass mat with moisture-resistant gypsum core, paperless, heat-cured acrylic coating, DensShield Tile Backer by Georgia-Pacific, or approved equal.
1. Provide at shower and toilet room walls scheduled to receive ceramic tile finish.
- G. Cement Board: High density, glass fiber reinforced, 1/2" thick x 2' or 4' width, Durock Cement Board as manufactured by United States Gypsum or approved equal.
1. Provide at shower and toilet room walls scheduled to receive ceramic tile finish, and at ceilings and walls exposed to the weather.
- H. Gypsum Sheathing: ASTM C 130, 5/8" thick x 4' width x maximum practical length to meet conditions, ends square cut, edges tapered, ends and edges straight and solid. Weather and sag resistant for exterior applications, water repellent paper faces suitable for painting or plastering.
1. Provide at ceilings and walls exposed to the weather.
- I. Solid Shaftliner: 1" thick x 23-7/8" or 47-3/4" width, Type I core, ASTM C 139, moisture-resistant paper faces.
1. Provide at fire-rated shaft and chase walls, as indicated.

2.3 FASTENERS

- A. Metal Framing: ASTM C 1002, Type S, Phillips-head recess, bugle head, corrosion-resistant, self-drilling, self-tapping, fine thread steel screws.
1. One Layer 1/2" board: 1" long.
 2. One Layer 5/8" board: 1-1/8" long.

2.4 TRIM ACCESSORIES

- A. General: Install vinyl plastic accessories at exterior work and work in high humidity and non-air-conditioned spaces. Use galvanized accessories at interior air conditioned, normally humidity areas.
- B. Plastic Accessories: High-Impact PVC plastic, ASTM D 377, including corner beads, stop beads, casing beads, trim beads, baseboard and ceiling beads, as manufactured by Plastic Components, Inc. or approved equal.
- C. Galvanized Accessories:
1. Edge Trim: Galvanized steel casing.
 - a. AL shape for tight abutment at edges, Sheetrock Brand, No. 200-B.
 - b. A shape at other locations, Sheetrock Brand, No. 200-A.

2. Corner Beads: Galvanized steel corner beads, Sheetrock Brand, Dur-A-Bead Metal Corner Bead.
 3. Control Joint: Roll-formed joint Sheetrock Brand, joint Control joint.
- D. Pre-finished Corners: Pre-finished inside corner reinforcement as manufactured by ULTRAFLEX or approved equal.

2.5 JOINT TREATMENT MATERIALS

- A. General: Type recommended by the gypsum board manufacturer for the application, except as otherwise indicated ASTM C 475.
- B. Reinforcing Tape: Cross-fibered paper with high tensile strength, roughened surface, accurate center crease Sheetrock Brand, Heavy Drywall joint Tape.
- C. Joint Compound:
1. Single Grade: Multi-purpose grade for the entire application.
 2. Two Grades:
 - a. Interior and Exterior Work: Use chemically-setting, powder compound type for bedding and filling Sheetrock Brand, Durabond joint Compound or Easy Sand Lightweight Setting Type joint Compound.
 - b. Topping: Use ready-mixed, lightweight, vinyl formulation or vinyl powder Sheetrock Brand, Lite Taping joint Compound.
- D. Water-Resistant joint Compound: Special water-resistant type for treatment of joints, fastener heads and cut edges of water-resistant backing boards.

2. MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials of the type and grade recommended by the gypsum board manufacturer.
- B. Adhesives: Commercial adhesives ASTM C 557.
1. Laminating: Special adhesive or joint compound specifically recommended by the gypsum board manufacturer for laminating gypsum boards.
 2. Water-Resistant: Type I, organic adhesive for ceramic tile ANSI A13.1.
- C. Blocking and backing Plates: Provided by the trade responsible for Section 09110 located by the appropriate trade or as indicated below.
1. Casework and Other Trades: 14 gage galvanized steel, minimum 3/8" wide x length required.
 2. Plumbing: Size as required for the relevant wall-hung fixture.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates, blocking and backing plates and conditions are as required, and ready to receive the work.
- C. Report, in writing, prevailing conditions that will adversely affect the satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PRE-INSTALLATION MEETING

- A. Prior to commencing work, meet on-site with the Owner's representative and all concerned trades to review the work required by this Section.

3.3 GENERAL REQUIREMENTS

- A. Install in accordance with reference standards, manufacturer's instructions, product technical bulletins, product catalog and product carton instructions and as required to comply with seismic requirements.
- B. Install supplementary framing, blocking and bracing at terminations in gypsum board assemblies to support fixtures, equipment, heavy trim, grab bars, toilet accessories, cabinetry, furnishings and similar construction.
- C. Install metal framing and gypsum board to enclose all pipes, ducts, conduit, etc. which would otherwise be exposed in finished areas, regardless of whether or not furring is shown or indicated on the Drawings.
- D. Enclosures to receive recessed light fixtures in fire-rated ceilings shall conform to U.L. requirements for materials and assemblies. Provide U.L. Design No. P251 enclosures over all types of recessed lights.
- E. Defects which appear in the work due to faulty workmanship and/or materials, shall be repaired and refinished with materials and in a manner to meet the requirements of this Section.

3.4 GYPSUM BOARD INSTALLATION REQUIREMENTS

- A. Application and Finishing Standards: Install in accordance with manufacturer's published instructions, GA-201, GA-21 and ASTM C 440.
- B. Install sound attenuation blankets as indicated, prior to the application of gypsum boards unless the blankets can be readily installed after the boards have been installed.
- C. Locate exposed end-to-end butt joints as far as possible from the center of walls and ceilings, and stagger not less than 1'-0" in alternate courses.
- D. Install ceiling boards in the direction and in a manner that will minimize the number of end-to-end butt joints and avoid end joints in the central area of each ceilings. Stagger end joints at least 1'-0"
- E. Install wall/partition boards vertically to avoid end-to-end butt joints to the extent possible. Use boards of maximum practical lengths where applicable stagger end joints. Cut and saw all openings do not core and punch. Apply edge bead to all exposed edges and outside corners.

- F. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/8" open space between boards. Do not force boards into place.
- G. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so both tapered edge joints abut, tapered edges against tapered edges and mill-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends.
- H. Stagger vertical joint over different studs on opposite sides of partitions.
- I. Attach gypsum boards to supplementary framing and blocking provided for additional support at openings and cutouts.
- Isolate perimeter of non-load bearing gypsum board partitions at structural abutments. Provide 1/4" to 1/2" space and trim edges with A-1 type, semifinished, edge trim. Seal joints with acoustical sealant.
- K. Form control joints and expansion joints with space between edges of boards prepared to receive trim accessories.
- L. Space fasteners in boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

3.5 GYPSUM BOARD INSTALLATION METHODS

- A. Single Layer Applications:
 - 1. Install single layer gypsum board in the most economical direction, with edges and ends attached to firm bearing surfaces—panel ends aligning and parallel with framing members.
 - 2. Apply gypsum board on walls and partitions vertically unless indicated otherwise, and provide sheet lengths that will minimize the number of end-to-end butt joints.
 - 3. Apply gypsum board on furring with no end joints. Locate edge joints over furring members.
 - 4. Apply gypsum board on ceilings prior to application on walls and partitions, to the greatest extent possible.
 - 5. Treat cut edges, holes, fastener heads and joints, including those at angle intersections in water-resistant gypsum board, cement board and gypsum sheathing at exterior ceilings and soffits with the specified joint compound. Treat prior to installation.
 - Do not align panel joints with edges of openings.
- B. Wall Tile Base: Where gypsum board is the base for thin-set ceramic tile and similar rigid applied wall finishes, install paperless tile backing boards.
- C. Showers, tubs and similar wet areas: Install paperless tile backing boards. Apply with uncut long edges at the bottom of the work, and space 1/4" above fixture lips. Seal ends, cut edges and penetrations of each piece with water-resistant adhesive or, where recommended by the backing board manufacturer, with water-resistant joint compound.

- D. Double Layer Applications: Install gypsum backing board as the base layer and exposed gypsum board for the face layer.
1. Apply base layer on ceilings prior to application of the base layer on walls □ partitions□apply face layers in the same sequence. Offset joints between layers at least 10□ Apply base layers at right angles to supports unless indicated otherwise.
 2. Apply base layer and face layer on walls □partitions vertically□horizontally□with joints of the base layer over supports and face layer joints offset at least 10□with base layer joints.
 3. Apply base layer on furring members vertically□horizontally□and the face layer either vertically□ horizontally□with vertical joints offset at least one furring member. Locate edge joints of the base layer over furring members.
- E. Single Layer Fastening Methods: Secure boards to supports as follows:
1. Install fasteners from the center of the panel field toward the ends and edges. Install fasteners 3□□from ends and edges of panels, and as follows:
 - a. Ceiling: 12□on center, perimeter and field.
 - b. Walls: 12□o.c. in the field of walls and □□o.c. at vertical joints.
- F. Double Layer Fastening Methods: Apply base layer of gypsum board and face layer to the base layer as follows:
1. Fasten both the base layer and face layer to supports separately with screws.
- G. One-Hour Fire-Rated Chase Walls: Install framing studs, shaftliner and face layers in strict accordance with the manufacturer's instructions and the Building Code
- H. Sound-Rated Walls: Where work is indicated, including double layer work and work on resilient furring, seal the work at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions.
1. Comply with the manufacturer's recommendations for location of beads, and close off sound-flanking paths around and through the work, including sealing of partitions above acoustical ceilings. Provide sound insulation at ceilings where walls do not extend to the slab above.
- I. Acoustical Sealant Application: Comply with the details indicated or if not indicated, comply with applicable published recommendations of the AGypsum Construction Handbook by the United States Gypsum Company.
- Inspection of Acoustical Partitions: Gypsum board partitions with a STC rating of 52 or higher shall not be closed and finished until inspected and approved by the Owner's representative.
- K. Shower Room Ceilings: Install paperless gypsum board in accordance with the manufacturer's instructions. Reinforce all joints with glass mesh tape and coat the entire surface with a recommended compound to provide a smooth, even finish over the entire surface.

3. □ GYPSUM BOARD TRIM INSTALLATION

- A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as used to fasten the gypsum boards to supports. Otherwise, fasten flanges by nailing or stapling in accordance with the manufacturer's instructions and recommendations.
- B. Install plastic corner beads at external corners. Use the longest practical lengths. Place edge trim where panels abut dissimilar materials.
- C. Install plastic edge trim wherever the edge of gypsum board would otherwise be exposed or semi-exposed. Provide the type with face flanges to receive joint compound except where semi-finishing type is indicated. Install AL@ trim where work is tightly abutted to other work and install special kerf-type where other work is kerfed to receive the long leg of AL@ trim. Install A@ trim where the edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).
- D. Install semi-finishing trim where indicated, and where exterior gypsum board edges are not covered by applied moldings or indicated to receive trim with face flanges covered with joint compound.
- E. Install plastic edge trim or pre-finished internal corners where indicated on wall panels at junctures with ceilings.
- F. Install control joints where indicated.

3.7 GYPSUM SHEATHING INSTALLATION

- A. Install gypsum sheathing in accordance with the manufacturer's instructions, GA-201, GA-21 and GA-00.
 - 1. Install single layer gypsum sheathing horizontally, with edges butted tight, tongue up with attachment to firm bearing.
- B. Provide construction control joints at a maximum of 30 feet o.c., at inside corners and at all intersections.
 - 1. Install sheathing with 1/4" space between the edge of the sheathing and adjacent walls, beams, columns, and fascia construction.
- C. Install screws at 12" o.c., maximum, to secure sheathing to the supporting substrate.
- D. Protect all exposed gypsum cores at perimeter edges and penetrations by covering the core with trim.
- E. Place edge trim where sheathing abuts dissimilar materials. Use longest practical lengths.

3. JOINT TREATMENT

- A. Reinforce interior and exterior corners at ceiling and wall surfaces.
- B. Apply 2" wide coated glass fiber tape at cement backer board corner joints.
- C. Install control joints the full height of partitions consistent with the lines of building spaces, with 1/4" gap between panels. Apply sealant at the back of the joint and a control joint accessory at the face.
- D. Apply 3" wide initial coating of joint compound, press tape firmly into the compound, wipe off excess compound. Apply a second coat of joint compound with tools of sufficient

width to extend beyond the joint center approximately 4". Draw the joint compound down to a smooth even plane.

- E. Sand after the second and third applications of joint compound. Do not raise the nap of the paper when sanding.
- F. Feather coats onto adjoining surfaces with a maximum camber of 1/32" in 12".
- G. After drying or setting, sand or sponge joints, edges, and corners, eliminating high spots and excessive compound to produce a smooth finish surface.
- H. Prepare surfaces to receive subsequent finishes to a height of 1/4" above the finished ceiling.

3.9 GYPSUM BOARD FINISHING

- A. General:
 - 1. Refer to Sections on painting, coatings and interior design documents for decorative finishes to be applied to gypsum board work. Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare the work for decoration.
 - 2. Prefill open joints and rounded or beveled edges, if any—use the type of compound recommended by the manufacturer.
 - 3. Apply joint tape at joints between gypsum boards except where a trim accessory is indicated. Apply joint compound in three (3) coats (not including prefill of openings in the base)—sand between the last two coats and after the last coat.
- B. Skim Coat: Wherever gypsum board is to receive eggshell, semigloss or gloss paint finish, apply a thin skim coat of joint compound over the entire gypsum board surface, after the three-coat joint and fastener treatment has been completed and is dry.
- C. Base for Acoustical Tile: Where gypsum board is indicated as the base for adhesively-applied acoustical tile, install tape and two (2) coats compound treatment, without sanding.
- D. Paperless Tile Backing Board or Cement Board Base for Ceramic Tile:
 - 1. Comply with recommendations of the backing board manufacturer for the treatment of joints behind ceramic tile.
 - 2. In areas to be tiled, treat fastener heads with water-resistant joint compound. Fill tapered edges in gypsum panels with water-resistant joint compound, embed joint tape firmly and wipe off excess compound—follow immediately with a second coat of water-resistant joint compound over the taping coat—do not crown the joint. Fold and embed tape in all interior corners to form true angles.
 - 3. In areas not to be tiled, treat fastener heads and embed tape as indicated above using water-resistant joint compound but finish with two (2) coats of the joint compound used for regular gypsum board work.

3.10 GYPSUM BOARD FINISH LEVELS

- A. Apply finish in accordance with the manufacturer's published instructions and GA-214

Finish Levels.

1. Level 1: All joints and interior angles shall have tape embedded in joint compound. Surfaces shall be free of excess joint compound. Tool marks and ridges are acceptable.
 - a. Application: In plenum areas above ceilings, in attics, in mechanical rooms, in areas where the assembly is generally concealed and in other areas not normally exposed to view. Accessories not required unless shown or required by the rating. Where a fire-resistance rating is required for the gypsum board assembly, the details of construction shall be in accordance with reports of the fire tests of assemblies that have met the fire-rating requirement.
2. Level 2: Embed tape and apply a separate first coat of joint compound to the tape, fasteners and trim flanges.
 - a. Application: Where panels are the substrate for tile.
3. Level 3: Embed tape and apply separate first and fill coats of joint compound to the tape, fasteners and trim flanges.
 - a. Application: At surfaces scheduled to receive medium- or heavy-textured finishes or heavy wall coverings before painting.
4. Level 4: Embed tape and apply separate first, fill and finish coats of joint compound to the tape, fasteners and trim flanges.
 - a. Application: At panel surfaces in mechanical and electrical spaces not exposed to public view.
5. Level 5: Embed tape in joint compound at all joints and interior angles and apply three (3) separate coats of joint compound over all joints, angles, fastener heads and accessories. A thin skim coat of joint compound or a material manufactured especially for this purpose shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges. Prepared surfaces shall be coated with a primer / sealer prior to the application of finish paint. Refer to Specification Section 09900 - Painting.
 - a. Application: For use where gloss, semi-gloss, enamel and non-textured flat paints are specified, or where severe lighting conditions occur. Generally in all public areas exposed to view, except where noted otherwise, to provide a uniform surface and minimize the possibility of joints telegraphing and fasteners showing.

3.11 CONSTRUCTION

A. Interface with Other Work:

1. Coordinate the installation of firestopping materials specified in Section 07840 at penetrations through fire-resistive rated gypsum board walls, partitions and ceilings.
2. Coordinate the installation of joint sealers specified in Section 07900 at penetrations of non-fire-resistive rated walls, partitions and ceilings.

3.12 PROTECTION

- A. Protect other work and finishes from damage by the gypsum board work.
- . Provide protection and maintain conditions which will ensure that the gypsum board work will be without damage and deterioration at the time of Substantial Completion.

3.13 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- . Inspect the installed work for alignment, attachment to the structure, backing plates and openings for installations by other trades.

3.14 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- . Clean and remove all debris from the Project Site.
- C. Leave the entire Project clean.

END OF SECTION

SECTION 09300

TILE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Floor tile and base tile.
2. Quarry floor and base tile.
3. Ceramic wall tile, shapes and trim units.
4. Porcelain floor tile.
5. Stair tile.
6. Marble threshold.
7. Mortar and grout.
8. Sealer.
9. Metal edge strips.
10. Waterproofing membrane.
11. Tile feature strips and patterns set in paving.

12. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for application.
2. Section 04230 - Reinforced Unit Masonry: Substrate for application.
3. Section 09250 - Gypsum Board: Substrate for application.
4. Section 07900 - Joint Sealers: Sealant at tile penetrations and dissimilar materials.

1.2 DESCRIPTION OF WORK

- A. The extent of the tile work is indicated on the Drawings and Schedules and as specified herein, and includes providing and installing floor, base and wall units made from clay and other ceramic materials, marble thresholds, waterproofing membrane under tile, metal edge strips, mortar and grout, sealing of expansion and other joints, and feature strips, patterns and accent tiles.

- . Definition: The term "tile" includes ceramic surfacing units and trim made from clay or other ceramic materials.
- C. Joint sealants are specified in Section 07900 - Joint Sealers.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

□. American National Standards Institute (ANSI):

1. ANSI A108.4 - Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive.
2. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
3. ANSI A108.10 - Installation of Grout in Tilework.
4. ANSI A118.1 - Specifications for Dry-Set Portland Cement Mortar.
5. ANSI A118.4 - Specifications for Latex-Portland Cement Mortar.
- . ANSI A118.□ - Specifications for Standard Cement Grouts for Tile Installation.
7. ANSI A13□.1 - Organic Adhesives for Latex Portland Cement Mortar.
8. ANSI A137.1 - Specification for Ceramic Tile.

C. American Society for Testing and Materials (ASTM):

1. ASTM C 373 - Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products.
2. ASTM C 482 - Test Method for Bond Strength of Ceramic Tile to Portland Cement Plaster.
3. ASTM C 485 - Test Method for Measuring Warpage of Ceramic Tile.
4. ASTM C 499 - Test Method for Facial Dimensions and Thickness of Flat, Rectangular Ceramic Wall and Floor Tile.
5. ASTM C 501 - Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.
- . ASTM C 502 - Test Method for Wedging of Flat, Rectangular Ceramic Wall and Floor Tile.
7. ASTM C □48 - Test Method for Breaking Strength of Ceramic Tile.
8. ASTM C □50 - Test Method for Resistance of Ceramic Tile to Chemical Substances.
9. ASTM C 1028 - Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Tester

□ethod.

□. Americans with □isabilities Act Accessibility Guidelines (A□AAG):

1. Accessibility Guidelines for □uildings and Facilities.

E. Tile Council of America, Inc. (TCA):

1. □andbook for Ceramic Tile Installation.

1.4 SU□□ITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product □ata: □anufacturer's technical information and installation instructions for the materials re□uired.

2. Shop □rawings: Layout drawings and details for proper installation of the work.

3. Samples:

a. Initial Selection:

1) □anufacturer's color charts of actual tiles or sections of tile showing the full range of colors, textures and patterns available for each type of tile indicated.

2) Grout and accessories re□uiring color selection.

b. Final Selection:

1) Full size samples of each type of tile and each color and texture selected.

2) Full size samples of each type of trim, accessory, and for each color.

3) □arble thresholds, □□long.

4) Stair tread and nosing, full size.

5) □etal edge strip, □□long.

4. □ock up:

a. Waterproof membrane.

b. 30 SF of tile for pattern and joint width conformation.

c. Expansion and control joints and metal edge strip installations.

5. Assurance / Control Submittals:

a. □anufacturer's certificate that the products meet or exceed the specified re□uirements.

- b. Documentation of experience indicating compliance with the specified qualifications requirements.
- . Section 01780 - Closeout Submittals: Procedures for closeout submittals.
 - 1. Extra Products: Provide extra products as specified herein below.

1.5 COORDINATION

- A. Pre-Installation Meeting: Convene a Pre-Installation Meeting at the Project Site prior to beginning the work of this Section.
 - 1. Require attendance of the Contractor, Owner's representative, Architect, and all impacted trades.
 - 2. Review coordination and environmental controls required for proper installation and ambient conditions in the areas to receive tile work.
 - 3. Review preparation and installation procedures, and the coordination and scheduling required with the related work.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 - 2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.
- . Provide materials from a single source for each type and color of tile, grout, setting material and accessory.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Section 01000 - Product Requirements: Transport, handle, store, and protect the products.
- . Deliver tile and setting material to the Project Site in the manufacturer's original, unopened cartons, bearing the name of the manufacturer, the certification mark of the Tile Council of America, and ready for use.
- C. Store materials under cover in a manner to prevent damage and contamination.
- . Prevent damage and contamination of materials by water, foreign matter and other causes.

1.8 WORK CONDITIONS

- A. Environmental Requirements:
 - 1. Maintain adequate lighting for the installation of tile work. Lighting level shall be equal to permanent lighting level designed for areas receiving the tile work.
 - 2. Maintain sufficient ventilation in areas where the work of this Section is being performed to allow the ceramic tile to properly set.

3. Maintain environmental conditions and protect the work during and after installation to comply with the referenced standards and the manufacturer's printed recommendations.

1.9 MAINTENANCE

- A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
- B. Extra Products: Upon completion of the installation, deliver to the Owner's representative, replacement materials from the same production run as the installed materials of 2% of the total amount of each size, style and color.

PART 2 PRODUCTS

2.1 GENERAL

- A. ANSI Standard For Ceramic Tile: Comply with ANSI A137.1 for the types and grades of tile indicated.
- B. ANSI Standard For Tile Installation Materials: Comply with the ANSI Standard referenced with the installation products and materials indicated.
- C. Colors, Texture and Patterns: For tile and other products requiring the selection of colors, surface textures and other appearance characteristics, provide products to match the characteristics indicated or, if not otherwise indicated, as selected from the manufacturer's standards.
- D. Mounting:
 1. Where factory-mounted tile is required, provide back or edge mounted tile assemblies as standard with the manufacturer, unless another mounting method is indicated.
 2. Where tile is indicated for installation in pools, fountains or at exterior or in wet areas, do not use back or edge mounted tile assemblies unless the tile manufacturer specifies that such type of mounting is suitable for that kind of use and has been successfully used on other projects.
- E. Trim Units: Provide tile trim units to match the characteristics of the adjoining flat tile and to comply with the following requirements:
 1. Size: As indicated, coordinate with the sizes and coursing of the adjoining flat tiles, where applicable.
 2. Shapes: As follows, selected from the manufacturer's standard shapes:
 - a. Base for Portland Cement Mortar Installations: Cove.
 - b. Base for Thinset Mortar Installations: Cove.
 - c. Wainscot Cap for Thinset Mortar Installations: Surface bullnose.
 - d. External Corners for Thinset Installations: Surface bullnose.
 - e. Internal Corners: Internal cove with cap angle designed to member with

the stretcher shapes.

f. Stair tread with nosing.

F. Coefficient of Friction (COF): AIAAG recommends a 0.4 or higher coefficient or higher in dry conditions to meet AIAAG requirements. Typically the COF is indicated in a wet and a dry number under those conditions for the average of the test results. In a situation where there is a potential for water, the tile should meet the COF of 0.4 or higher under wet conditions. AIAAG recommendation for COF on a ramped surface is 0.8. Static coefficient of friction tests are performed according to ASTM C 1028.

2.2 MANUFACTURERS

A. Subject to compliance with the Project requirements, manufacturer's offering products which may be incorporated into the work include the following:

1. Tile:

- a. American Olean.
- b. Cal-Tile Corp.
- c. Crossville Inc.

2. Mortar and Grout:

- a. Hydroment by Kostik.
- b. LATICRETE.
- c. APEI, Corp.

3. Latex-Portland Cement Mortar and Grout:

- a. ProSpec (formerly Consal).
- b. Hydroment by Kostik.
- c. LATICRETE.
- d. Summitville Tiles, Inc.

□. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.3 TILE, GENERAL

A. Tile: ANSI A137.1.

1. Stain Resistance, CTI Stain Test: Unstainable.
2. Surface Water Absorption, ASTM C 373: 0.5% max.
3. Abrasive Wear, ASTM C 501: 100.
4. Breaking Strength, ASTM C 48: 250 lbs.

5. Bond Strength, ASTM C 482: 50 psi.
6. Facial Dimension (range), ASTM C 499: 1.5" max.
7. Range of Thickness, ASTM C 499: 0.04" max.
8. Warpage (diagonal), ASTM C 485: ≤ 0.75 " max.
9. Wedging, ASTM C 502: 1" max.
10. Chemical Resistance, ASTM C 550: Unaffected.
11. Coefficient of Friction, ASTM C 1028:
 - a. Dry ≥ 0.7 .
 - b. Wet ≥ 0.4 .
12. Scratch Hardness, Mohs Scale: ≥ 8 .

2.4 QUARRY TILE

- A. Gal-Tile, Quarry tile, 4" x 8" or size and shape as selected.
- B. Color as selected.

2.5 CERAMIC TILE

- A. American Olean, 2" x 2" ceramic mosaic floor tile.
- B. American Olean, 4" x 4" ceramic glazed wall tile.
- C. Color as selected. Accent tile shall be a contrasting color to the field tile color.

2.6 PORCELAIN TILE.

- A. 20" x 20" or size and shape as selected, glazed floor tile by Gal-Tile.
- B. 12" x 12" or as indicated unglazed floor tile at the exterior by Gal-Tile.
- C. Color as selected.
 1. Accent tiles shall be a contrasting color to the field tile color.

2.7 MARBLE TERAZZO

- A. Alabama Marble Tile Co., Inc.
- B. Gal-Tile.
- C. Thornton Tile and Marble, Inc.
- D. Size, shape and color as shown, or as selected.
- E. Section 01000 - Product Requirements: Product Options: Substitutions permitted.

2.8 WATERPROOF MEMBRANE

- A. Liquid Applied Membrane: Thin, load-bearing, flexible waterproofing system, self-curing liquid rubber polymer, cold-applied with integral reinforcing fabric to form a seamless membrane.
- B. LATICRETE 9235 Waterproofing Membrane by LATICRETE or approved equal.

2.9 MISCELLANEOUS MATERIALS

- A. Metal Edge Strip: Brass or stainless steel, as selected 1/8" wide at the top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated. Style to be as indicated, or appropriate to the use as manufactured by Schluter Systems, or approved equal. Style to be as appropriate for the use intended
- B. Wall Access Panel: Schluter-REDA by Schluter Systems or approved equal.
- C. Adhesives: Water-resistant organic ANSI A13.1.
- D. Water: Clean and potable.
- E. Reinforcing Mesh: 2" x 2" 1" gauge, galvanized, welded wire.
- F. Tile / Grout Sealer: Non-flammable, water-soluble, penetrating methyl siliconate clear solution, stain-resistant, matte sealer.
- G. Tile, Grout and Masonry Cleaner: As approved by the tile, grout and sealer manufacturers.

2.10 MORTAR AND GROUT MIX

- A. Mix and proportion mortar and grout materials in strict accordance with the manufacturer's instructions.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates slope to drains and conditions are as required, and ready to receive the work.
 - 1. Examine areas to be covered for surface contamination which requires correction before work begins.
- C. Report in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Do not use sealers or curing compounds on concrete slabs to be covered with tile. Slabs shall be covered and wet cured for a minimum of seven (7) days. Surfaces to receive tile

installed by the thin set method shall have a wood float finish, be true to within 1/8" in 10 feet, and pitched to drains where required.

- . Areas requiring fill, patching or leveling shall be prepared by the General Contractor. □o not use gypsum or asphalt leveling compounds.
- C. Seal substrate surface cracks with filler.
- . Clean substrate surfaces to remove dust, dirt, mortar, etc.
- E. Surfaces to be covered shall be left clean, free of dust, plaster, sealer or curing compounds and form oil. Any such contamination shall be removed by the responsible trade.
- F. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.
- G. Protect surrounding work from damage or disfiguration.
- . □acuum clean existing substrate and damp clean.
- I. Wet down or wash and remove excess water from dry or dusty concrete or masonry surfaces just prior to the application of pavers.

3.3 INSTALLATION

- A. Installation □ethods: Install ceramic tile in accordance with the TCA, A□andbook for Ceramic Tile Installation@, ANSI A108.4, and ANSI A108.5.
- . Waterproof □embrane: Install waterproof membrane for all elevated slab floors exposed to water or wind blown rain. For example, install at elevated slabs where Showers, □aths, □itchens, washing and other wet activities occur□and at terraces and roofs over interior spaces.
 - 1. Contractor shall obtain architect or owner's representative approval of membrane prior to proceeding with the work.
- C. Installation by Thick □ed □ethod:
 - 1. Spread mortar to approximately one-half the desired bed thickness, then place reinforcing mesh. Lap mesh 3" minimum, and place additional mortar over the mesh to bring the bed to the desired thickness. Rod and compact mortar with a steel trowel. The setting bed shall be, minimum, 1-1/2" thick.
 - a. Note: The setting bed may be reduced to a nominal 1" thickness and the reinforcing omitted when bonding directly to concrete slabs or a load-bearing membrane.
 - 2. □efore placing tile on a green or wet screed bed, apply a slurry of bond coat to the mortar bed using a flat trowel.
 - 3. Tile shall be placed in the wet slurry coat before the surface dries, or apply a slurry bond coat applied to the back of each tile just prior to placing the tile on the bed.
 - 4. □efore the mortar takes initial set, place and beat each tile into place with a wooden block or rubber mallet to embed it and to even the surface.

5. □ maintain uniform joint widths.
 - The surface shall be pitched to drains, where indicated, or as required.
 7. On hardened screed or mortar bed, tiles may be installed by the thin set method if proper tolerances are provided.
- . Installation by Thin Set □ethod:
1. Apply mortar with a notched trowel using a scraping motion to work the material into good contact with the substrate to be covered. A trowel having notches approximately 1/4□x 3/8□is recommended for pavers. Apply only as much mortar as can be covered within 30 minutes, or while the surface is still tacky.
 2. Trowel a small □quantity of mortar onto the back of each piece of tile. Set the tile in place and tap with a small beating block to ensure 100□ full bedding and a true surface.
 3. Align tile to provide uniform joints and then allow to set until firm.
 4. Clean excess mortar from the surface of tiles with a wet cloth or sponge while the mortar is still fresh.
- E. □ortar:
1. □achine □ixing: □ortar mixer shall be the rotating blade type. Place mixing li□uid in the mixer, start the machine and add sand, then cement. □ix only long enough to wet out the batch. Stop the mixer and dump the mortar promptly. □o not overmix.
 2. □and □ixing: Pre-mix the dry ingredients (sand and cement). Place mixing li□uid in a clean container or mixing box, add the dry materials and mix. Adjust the amount of li□uid or dry materials to obtain the proper consistency.
- F. □oints: 1/8□width for tiles less than 12□□3/1 □□for tiles to 25□□1/4□for □uarry tile.
- G. Expansion and Control □oints:
1. Existing joints in concrete subfloors must be carried through the tile and shall conform to the architectural details.
 2. Expansion joints shall be installed where tile abuts restraining surfaces, such as perimeter walls, curbs, columns, corners, etc.
 3. Interior installations shall have expansion joints spaced a maximum of 30 feet o.c. in both directions. Exterior areas shall have expansion joints spaced a maximum of 15□in both directions. Expansion joints shall be raked out or cut through the setting bed to the supporting slab or structure below.
- . Edge Strips: Install at transitions to other flooring materials, for control joints, or as indicated.
- I. Grouting and Pointing □oints:
1. □oints shall be grouted or pointed with Latex-Portland Cement Grout or Epoxy Grout.

2. Joints shall be packed full and free of voids and pits. Tool or rake as specified.
 3. Excess mortar shall be cleaned from the surface of tiles with water and a damp sponge as the work progresses, while the mortar is fresh and before it hardens.
- Q. Provide a slope in tile setting material as required to slope surfaces at floor transitions and floor drains.
 - Q. Lay tile to the pattern indicated. Do not interrupt the tile pattern through wall openings.
 - L. Cut and fit tile to penetrations through the tile leaving a sealant joint space. Form corners and bases neatly. Align floor, base, and wall joints.
 - Q. Place tile joints uniform in width, subject to variance in the tolerance allowed in the tile size. Make joints watertight, without voids, cracks, excess mortar or excess grout.
 - N. Sound the tile after setting. Replace hollow sounding units.
 - O. Expansion, Contraction, Control Joints and Separation: Install tile and a pair of metal edge strips in accordance with the applicable TCA Handbook methods. Keep joints free of adhesive, mortar, and grout seal. Refer to Section 07900 - Joint Sealers.
 - P. Allow tile to set for a minimum of 48 hours prior to grouting.
 - Q. Grout tile joints in accordance with ANSI A108.10.
 - R. Caulk plumbing penetrations thru floor tiles and plumbing and electrical penetrations thru wall tiles.
 - S. Apply sealant to the junction of tile and dissimilar materials and at the junction of dissimilar planes as specified in Section 07900 - Joint Sealers. Apply in strict accordance with the manufacturer's instructions.
 - T. Install metal edge strips at transitions to other flooring materials, and where tile edges are exposed. Lock solidly into the setting bed.

3.4 INSTALLATION SCHEDULE

- A. Paver Tiles: Install by thick (mortar) bed method. Place waterproof membrane under exterior pavers with occupiable space below. Apply sealer per manufacturer's instructions.
- Q. Quarry Tiles: Install by thin set on hardened thick bed method at Freezer floors thick bed method at Kitchens thin set at Bars. Place waterproof membrane at Dishwashing, garbage areas and exterior spaces over structural slabs and other wet areas.
- C. Ceramic Tiles: Install by thin set or thick (mortar) bed method. Place waterproofing membrane at Baths, Shower Rooms, areas on structural slabs subject to wind blown water and other wet areas.

3.5 TOLERANCE

- A. Maintain an even and flat plane with variation not to exceed 1/8" in 8 feet. Adjacent tile shall be flush with no protruding or recessed tile edges. The tiles shall be cut neatly and fit to built-in work, penetrations, corners, changes in elevations and other variations.

3.0 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
 - . Inspect installations for joint widths, alignment, edge treatments, sound bonding to the substrates.

3.7 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
 - . Upon the completion of placement and grouting, clean all ceramic tile surfaces free of foreign matter.
 - C. Remove excess mortar and grout from floor, base, and wall surfaces without damaging the surfaces.
 - . Clean unglazed tiles with acid solutions only when permitted by the tile and grout manufacturer's printed instructions, but not sooner than fourteen (14) days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from the effects of acid cleaning. Flush surfaces with clean water before and after cleaning.
 - E. Clean tile only with cleaning materials recommended by tile and grout manufacturers.
 - F. Remove hardened grout film or haze using Laticrete TC-500, Grout and Masonry Cleaner.
 - 1. Saturate grout joints with water, then dampen the surface with the cleaner.
 - 2. Allow to soak 15 - 30 minutes and then use a power scrubbing machine with a coarse texture nylon pad to remove the grout film.
 - G. Clean unglazed pavers by sprinkling fine sand (30 - 60 mesh) over the surface before scrubbing.
 - 1. Caution: Do not use sand on soft glazed tiles.
 - . Do not use acid type cleaners on colored grout joints.
 - I. Leave finished installations clean and free of cracked, chipped, broken, un-bonded and otherwise defective work.

3.8 PROTECTION

- A. When recommended by the tile manufacturer, apply a protective coat of neutral protective cleaner to the completed floor and wall tiles.
 - . Protect installed tile work with kraft paper or other heavy covering to prevent staining, damage and wear.
 - C. Prohibit foot and wheel traffic from tiled floors for at least seven (7) days after grouting has been completed.
 - . Immediately before final inspection, remove the protective coverings and rinse the neutral cleaner from the tile surfaces.

- E. Before final inspection, remove protective coverings and rinse neutral cleaner from the tile surfaces.

END OF SECTION

SECTION 09510
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Suspended metal grid ceiling system.
2. Perimeter trim.
3. Acoustical ceiling panels, suspended.
4. Acoustical ceiling panels, adhered to substrate.

- B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 07900 - Joint Sealers: Caulking of joints between perimeter trim and vertical surfaces.
2. Section 15850 - Air Outlets and Inlets: Air diffusion devices in the ceiling system.
3. Section 15510 - Interior Luminaires: Light fixtures attached to the ceiling system.

1.2 DESCRIPTION OF WORK

- A. The extent of acoustical ceilings work is indicated on the Drawings and as specified herein, and includes providing and installing suspended metal ceiling grid, perimeter trim, acoustical panels, hanger devices, sealants and accessories for complete adhered and suspended ceiling systems.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

- B. American Society for Testing and Materials (ASTM):

1. ASTM A 41 - Specification for Zinc-Coated (Galvanized Carbon Steel Wire.
2. ASTM C 35 - Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
3. ASTM C 35 - Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
4. ASTM 1779 - Specification for Adhesive for Acoustical Materials.

5. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM E 400 - Test Method for Analysis of Ores, Minerals, and Rocks by the Fire Assay Preconcentration Optical Emission Spectroscopy.
7. ASTM E 413 - Classification for Rating Sound Insulation.
8. ASTM E 580 - Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint.
9. ASTM E 795 - Practices for Mounting Test Specimens During Sound Absorption Tests.
10. ASTM E 1244 - Classification for Acoustical Ceiling Products.

C. International Building Code (IBC):

1. Applicable edition in the Project jurisdiction.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer's product specifications and installation instructions for each suspension system and type of seismic brace, and each acoustical ceiling material required; certified laboratory test reports and other data as necessary to show compliance with these Specifications.
2. Shop Drawings: Four (4) sets of accurate layout drawings based on actual field measurements. Indicate all mechanical and electrical items, access panels and other items to be installed in the finished ceiling including seismic bracing locations.
3. Samples:
 - a. Two 24x24 square samples of each acoustical unit required, showing the full range of exposed pattern, texture and color to be expected in the finished work.
 - b. Two 12' long samples of each exposed runner.
 - c. Two 12' long samples of each edge molding.
4. Assurance / Control Submittals.
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - b. Documentation of experience indicating compliance with the specified qualifications requirements.
5. Maintenance Information: Manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods which may be detrimental to finishes and acoustical performance.

6. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

1. Warranty: Submit a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 COORDINATION

- A. Coordinate layout and installation of the suspension system components and acoustical ceilings with other work supported by or penetrating through the ceilings, including light fixtures, HVAC equipment, fire-suppression system components, and partition systems, if any.
 - . Furnish layouts for inserts, clips and other supports required to be installed by other trades for support of acoustical ceilings.
 1. Furnish concrete inserts, steel deck hanger clips and similar devices to other trades for installation well in advance of the time needed for the coordination of other work.
- C. Interface with Other Work:
 1. Schedule the installation of acoustical units after all interior wet work has been completed.
 2. Install after all major above ceiling work has been completed.
 3. Coordinate the location of hangers with other work.
 4. Do not install acoustical units until after the building has been enclosed, dust generating activities have ceased, overhead work is complete, tested and approved and the air conditioning system is operational.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience acceptable to the manufacturer as shown by a current written statement from the suspension system manufacturer.
- C. Fire Performance Characteristics: Provide acoustical ceiling components identical to those tested for the following fire performance characteristics, according to the ASTM test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify the acoustical ceiling components with appropriate marking by the testing and inspecting agency.
 1. Surface charring characteristics: Tested per ASTM E 84.
 - a. Flame Spread: 25 or less.
 - b. Smoke developed: 50 or less.
 - . Fire Resistance Ratings: As indicated by reference to the design designation in UL Fire Resistance Directory or AF Approval Guide for floor, roof or beam assemblies in which

acoustical ceilings function as a fire protective membrane, tested per ASTM E 119.

- E. Fire-Rated Ceilings: Provide protection materials for lighting fixtures and air ducts to comply with the requirements indicated for a rated assembly conform to UL requirements for materials and assemblies. Provide UL Design No. P 251 enclosures over all types of recessed lights.
- F. Limitations: The ceiling and suspension system shall be installed with vertical and lateral seismic bracing as required by the building code. Ceilings shall not support materials or other building components. Ductwork, grilles, light fixtures, plumbing and like work shall have their own support system and shall not use the ceiling system or ceiling suspension wires for support.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store and protect the products.
 - B. Deliver products to the Project Site in the manufacturer's original, unopened containers, dry and undamaged, with the brand name and type clearly marked.
 - C. Store under cover in dry, weathertight conditions.
 - D. Protect against damage from moisture, direct sunlight, surface contamination and other causes.
 - E. Handle acoustical ceiling units carefully to prevent chipping of edges and damage to the units in any way.

1.8 INSTALLATION CONDITIONS

- A. Do not install acoustical ceiling units until the space has been enclosed and weatherproof, wet work in the space is completed and nominally dry, work above the ceiling is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.
- B. Maintain a uniform temperature range of 60°F - 85°F and relative humidity of no more than 70%, continuously, prior to, during and after installation.

1.9 WARRANTY

- A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
 - B. Special Warranty:
 1. Provide a written Warranty jointly signed by the manufacturer and the installer certifying that the products and the installation is free of defective materials and workmanship and will repair or replace any defective component or the system, in whole or in part, as necessary to restore the product to its original intended state and integrity.
 2. Warranty Period: Ten (10) years from the date of Substantial Completion, subject to conditions.

1.10 MAINTENANCE

- A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

- . Extra Materials: Provide not less than 5□ of each type, size and color of acoustical ceiling panels, from the same manufacturer as the materials installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Suspension System: Subject to compliance with the Project requirements, manufacturers offering specified items which may be incorporated into the work include the following:
 1. Armstrong Building Products (Armstrong World Industries, Inc.).
 2. Chicago Metallic Corp.
 3. USG Interiors, Inc. (USG Corp.).
- . Acoustical Panels: Subject to compliance with the Project requirements, manufacturers offering the specified items which may be incorporated into the work include the following:
 1. Armstrong World Industries, Inc.
 2. USG Interiors.
 3. Celotex Building Products Division (CertainTeed).
- C. Section 01□00 - Product Requirements: Product Options: Substitutions permitted.

2.2 METAL CEILING GRID SUSPENSION SYSTEMS, GENERAL

- A. Standard for Metal Suspension Systems: Intermediate duty, hot-dipped galvanized steel suspension grid of the type and finish indicated□ comply with applicable requirements of ASTM C □35.
- . Edge Moldings and Trim: Metal or extruded plastic of the types and profiles indicated, or if not indicated, provide manufacturer's standard molding for edges and penetrations of the ceiling which fits with the type of edge detail and suspension system indicated.
 1. For lay-in panels with reveal edge details, provide a stepped edge molding which forms a reveal of the same depth and width as that formed between the edge of panels and flanges at exposed suspension members.
 2. For circular penetrations of the ceiling, provide edge moldings fabricated to the diameter required to fit the penetration exactly.
- C. Finishes and Colors: Provide manufacturer's standard finish for the type of system indicated, unless otherwise required. For exposed suspension members and accessories with painted finish, provide the color indicated or, if not otherwise indicated, as selected from the manufacturer's full range of standard colors.
 1. High Humidity Finish: Comply with ASTM C □35 requirements for "Coating Classification for Severe Environment Performance".
- . Attachment Devices: Size for five (5) times the design load indicated in ASTM C □35, Table 1, Direct Hung.
 1. Concrete Inserts: Inserts formed from hot-dipped galvanized sheet steel and

designed for attachment to concrete and for embedment in concrete, with holes or loops for attachment of hanger wires.

2. Surface Devices: Standard, hot-dipped galvanized, angle hangers, shot stud attached to concrete ceilings.
- E. Hanger Wire: Galvanized carbon steel wire, ASTM A 41, soft temper, prestretched, Class 1 coating, sized for three (3) times the hanger design load indicated in ASTM C 35, Table 1, direct hung not less than 12 gage for vertical hangers and lateral sway bracing.
- F. Stiffener Traces: Manufacturer's standard vertical struts or attachment to hanger wires to hold the suspension system in place during seismic events.
- G. Hold-Down Clips for Non-Fire-Rated Ceilings: For exterior ceilings and for interior ceilings with lay-in panels weighing less than one pound per square foot, provide hold-down clips spaced at 24" o.c. on all cross tees.

2.3 EXPOSED METAL CEILING GRID SYSTEM

- A. Intermediate duty, hot-dipped galvanized steel, exposed AT@15/1" wide one-hour fire rated plug-in positive-lock connections, locking tee ends, main tees punched with cross tee and hanger wire holes, stabilizer bars, clips and splices, baked on paint finish ASTM C 35. Color white, unless selected otherwise.
 1. Model:
 - a. Prelude L 15/1" Exposed Tee System by Armstrong.
 - b. 1200 Seismic System by Chicago Metallic Corp.
 - c. Donn Rand / L System by USG.
 2. Moldings: Angle Shadow molding with exposed flange to match the grid system. Color to match the grid.
 3. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.4 CONCEALED METAL CEILING GRID SYSTEM

- A. Intermediate duty, hot-dipped galvanized steel, concealed, 15/1" wide, one-hour fire rated plug-in positive lock connections, locking tee ends ASTM C 35.
 1. Model:
 - a. Prelude Concealed Tee System by Armstrong.
 - b. Donn Rand L, Concealed Ceiling Suspension System by USG.
 2. Moldings: Angle Shadow
 3. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.5 ACOUSTICAL CEILING UNITS, GENERAL

- A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of the configuration indicated which are prepared for the mounting method designated and which comply with the requirements of ASTM E 400, including those indicated by reference to

type, form, pattern, grade, noise reduction coefficient (NRC), ceiling attenuation class (CAC), light reflectance (LR), edge detail, and joint detail, if any.

1. Mounting method for measuring NRC: No. 7 (mechanically mounted on special metal support), ASTM E 400 mounting per ASTM E 795.

B. Sound Attenuation Performance:

1. Provide acoustical ceiling units with ratings for ceiling attenuation class (CAC) values of the range indicated as determined in accordance with ASTM E 413.
2. Provide acoustical ceiling units with ratings for ceiling sound attenuation class (STC) of the range indicated as determined according to ASTM A 1-11 Ceiling Sound Transmission Test by Two-Room method with ceilings continuous at partitions and supported by a metal suspension system of a type appropriate for ceiling units of the configuration indicated (concealed for tile, exposed for panels).

C. Colors, Textures, and Patterns: Provide products to match the appearance characteristics indicated or, if not otherwise indicated, as selected from the manufacturer's standard colors, surface textures, and patterns available for acoustical ceiling units and exposed metal suspension system members of the quality designated.

2. ACOUSTICAL CEILING UNITS

A. General: The following product type numbers in parenthesis are those used on the drawings.

- B. (ACT-1): Mineral fiber, fire-resistant, Class A: flame spread 25 or less per ASTM E 1204, R-1.0, weight 1.0 lbs / sf, factory-applied vinyl latex paint finish, medium texture, non-directional, NRC .50-.60, CAC 30 - 40, LR 0.80, angled tegular edge, 24" x 24" x 5/8" Color as selected.

1. Cortega, 81" by Armstrong.
2. Sandrift by USG.
3. Natural Fissured by Celotex.
4. Section 01000 - Product Requirements: Product Options: Substitutions permitted.

- C. (ACT-2): Mineral fiber, fire-resistant, Class A: flame spread 25 or less per ASTM E 1204, R-1.0, weight 0.9 lbs / sf, factory-applied vinyl latex paint finish, medium texture, non-directional, NRC .45-.55, CAC 30 - 40, LR 0.80, beveled edge, for concealed spline installations, 12" x 12" x 5/8" Color as selected.

1. Cortega, 745 by Armstrong.
2. Section 01000 - Product Requirements: Product Options: Substitutions permitted.

- D. (ACT-3): Ceramic and mineral fabric composite, fire resistant, Class A: flame spread 25 or less per ASTM E 1204, R-1.4, weight 1.40 lbs / sf, scrubbable factory-applied vinyl plastic paint, sag resistant, fine fissured, perforated, NRC .50-.60, CAC 35 - 39, LR 0.80, square edge, lay-in, 24" x 24" x 5/8" Color white.

1. Ceramaguard 007 by Armstrong.
2. Section 01000 - Product Requirements: Product Options: Substitutions permitted.

2.7 MISCELLANEOUS MATERIALS

- A. Tile Adhesive: Type recommended by the tile manufacturer, bearing UL label of Class 0 - 25 flame spread, comply with ASTM E 1779.
- B. Tile Fasteners: Cadmium plated, type recommended by the tile manufacturer, length for not less than 1/2" penetration of substrate.
- C. Acoustical Sealant: Resilient, non-staining, non-shrinking, non-hardening, non-skinning, non-drying, non-sag sealant intended for interior sealing of concealed construction joints.
 - 1. Tremco Acoustical sealant by Tremco Global Sealants.
 - 2. USG Acoustical Sealant by United States Gypsum Co.
 - 3. Chem-Calk 100 by Kostik.
 - 4. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

PART 3 EXECUTION

3.1 EXECUTION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
 - B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 - 1. Verify that the layout of hangers will not interfere with other work.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Layout:
 - 1. Locate the system on room axes according to the Reflected Ceiling Plan, as indicated on the drawings, or establish layout to balance the border tile widths at opposite edges of each ceiling. Avoid the use of less than 1/2" width units at borders.
 - 2. Where the acoustical ceiling continues thru a wall opening, continue the established pattern without interruption. One row of panels may be cut to less than full size, if necessary, to establish the pattern in the adjoining room.
- B. Substrate Testing: Before installing adhesively applied tile on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that the moisture level is below the tile manufacturer's recommended limits.
- C. Prior to installation, store acoustical units for 24 hours, minimum, at the same temperature and relative humidity as the space where the materials are to be installed.

3.3 INSTALLATION - GENERAL

- A. Install materials in accordance with the manufacturer's printed instructions, ASTM C 35 and ASTM C 33, in compliance with governing regulations, fire-resistance rating requirements as indicated, and industry standards applicable to the work.

3.4 INSTALLATION - CEILING SUSPENSION SYSTEM

A. General:

1. Install the suspension system with hangers supported only from the building structural members. Locate hangers not less than 12" from each end and spaced at 48" o.c. along each carrying channel or direct-hung runner, unless otherwise indicated.
2. Install metal hanger tabs and clips attached to the structure above where required for the attachment of suspension wires.
3. Secure wire hangers by looping and wire-tying, either directly to the structure or to inserts, eye-screws, or other devices which are secure, appropriate for the substrate, and which will not deteriorate or fail with age or temperature change.
4. Install hangers plumb and free from contact with insulation, ductwork and other objects within the ceiling plenum which are not part of the supporting structure or ceiling suspension system. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing. Where carrying members are spliced, avoid visible displacement of the face plane of adjacent members.
5. Install edge molding of the type indicated, at the perimeter of acoustical ceiling areas, at the intersection of the ceiling and vertical surfaces and at locations where necessary to conceal the edges of acoustical units. Use the longest practical lengths. Provide edge molding at junctions with other interruptions. Secure at 12" o.c., maximum.
- Screw-attach moldings to the substrate at intervals not over 12" o.c. and not more than 3" from ends. Level with the ceiling suspension system. Join corners accurately and connect securely.
7. Rivet cross tees to the edge molding at 48" o.c., typical.
8. In areas larger than 144 sq. ft., rivet the cross tees on two adjacent walls per ASTM E 580.
9. Do not support components on the main runners or cross runners if the weight causes the total dead load to exceed the allowable limits. Do not eccentrically load the system or produce rotation of runners.
10. Install the system level, in a uniform plane, and free of twists, warp, dents, scratches, stains and other defects. Variation from Flat and Level Surface: 1/8" in 12 feet.
11. Caulk between the edge molding and adjacent vertical surfaces.

□ Vertical Support System:

1. Suspension wires shall be 12 gage, minimum, galvanized, attached to main runners at 4'0" o.c., maximum, spacing in both directions.
2. Each wire shall be anchored to the structure above with a device capable of supporting 75 pounds, minimum.
3. Wires supporting fixtures shall be capable of supporting four (4) times the fixture weight.
4. Suspension wires shall not hang more than 1/4" out of plumb, unless counter sloping wires are provided.
5. Wires shall not be attached to or bend around interfering work such as piping, conduits or ductwork. Trapeze or equivalent devices shall be used where obstructions interfere with direct suspension. Trapeze shall be suspended back-to-back, 1-1/2" cold formed channels, minimum, for spans up to 12 feet.

C. Horizontal Support System:

1. Lateral support systems for ceilings shall be shown in detail on the Shop Drawings.
2. Adequacy of the system shall be demonstrated by calculations, and / or test results, including adequacy of main runner intersection connections. Tests shall show a capacity of twice the calculated load to provide a safety factor.
3. Provisions shall be made for possible differential movement between ceilings and side walls. The terminal ends of each main and each cross runner shall be wire supported. Wall trim angles shall not provide the primary support for runners.
4. Lateral support of ceilings shall not be provided by the angle trim, and runners shall not be riveted to the wall trim.

D. Lateral Force Bracing: Provide cross-bracing for ceilings greater than 144 sq. ft. in area.

1. Where substantiating calculations are not provided, horizontal restraints shall be provided by four No. 12 gage wires secured to a main runner within 2' of a cross runner intersection and splayed 90 degrees from each other at an angle not exceeding 45 degrees from the plane of the ceiling. A strut fastened to the main runner shall extend up to and be fastened to a structural member supporting the roof or floor above. The strut shall be adequate to resist the vertical force induced by the bracing wires. These horizontal restraint points shall be placed 12 feet o.c. in both directions with the first point within 4 feet of each wall. Attachment of the restraint wires to the structure shall be adequate for the load imposed.

3.5 INSTALLATION - ACOUSTICAL PANELS

- A. Arrange acoustical units and orient directionally patterned units, if any, in the manner shown on the Drawings. If not indicated, install units with the pattern running in one direction only, as approved by the Owner's representative.
- D. Fit the acoustical units in place free of damaged edges, dents, scratches, stains and other defects. Install level and in a uniform plane.
- C. Hold Down Clips: For fire-rated and security areas, install clips spaced at 2'0" o.c. on all cross tees. Do not install clips at panels for access and at one panel in each corner of a room.

- . Mark access panels with a black adhesive dot.

3.□ INSTALLATION - ACOUSTICAL PANELS APPLIED TO SUBSTRATE

- A. Install acoustical panels in accordance with the panel manufacturer's recommendations.
- . Apply adhesive in accordance with the adhesive manufacturer's printed directions, unless directed otherwise.
- C. Spread only enough adhesive to permit the installation of acoustical panels before initial set.
- D. Scribe panels to walls, columns, junction boxes, and other appurtenances as necessary to produce tight joints.

3.7 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- . Inspect the ceiling grid suspension system installation, connections to the structure, edge moldings and acoustical panel placement.

3.8 ACUSTING

- A. Section 01700 - Execution Requirements: Adjusting the installed work.
- . Adjust the grid for alignment and level.
- C. Adjust the acoustical panels for proper fit within the grid.

3.9 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- . Clean exposed surfaces of the ceiling grid, perimeter trim, and acoustical panels.
- C. Comply with the manufacturer's instructions for cleaning and touch-up of minor finish damage.
- . Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09050
RESILIENT FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl composition tile.
2. Sheet vinyl flooring.
3. Resilient edge strip.
4. Rubber base.
5. Accessories.

- B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for resilient flooring.
2. Section 09250 - Gypsum Board: Substrate for rubber base.
3. Section 09080 - Carpet: Floor finish for rubber base.

1.2 DESCRIPTION OF WORK

- A. The extent of resilient flooring work is indicated on the Drawings and Schedule and as specified herein, and includes providing and installing adhesively applied vinyl composition tile, sheet vinyl flooring, resilient edge strips, rubber base and resilient accessories.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

- B. American Society for Testing and Materials (ASTM):

1. ASTM E 648 - Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
2. ASTM E 842 - Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
3. ASTM F 1066 - Specification for Vinyl Composition Floor Tile.
4. ASTM F 1303 - Specification for Sheet Vinyl Floor Covering with Backing.
5. ASTM F 1841 - Specification for Resilient Wall Base.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
1. Product Data: Technical data and installation instructions for each type of resilient flooring and accessory.
 - a. Two boxes - 2x2 samples of each type, color and pattern in the specified group of the manufacturer selected for each type of resilient flooring required.
 - b. 12x 12 samples of sheet flooring.
 - c. Samples of available colors for resilient edge strip.
 - d. One chain of available colors for rubber base selection.
 3. Final Samples: Submit for final selection.
 - a. 2 - full-size samples of vinyl tile.
 - b. 2 - 12x 12 samples of sheet flooring.
 - c. 2 - long sections of resilient edge strip.
 - d. 2 - long sections of rubber base.
 4. Assurance / Control Submittals:
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - b. Documentation of experience indicating compliance with the specified qualifications requirements.
 5. Maintenance Instructions: Submit two (2) copies of the manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

1.5 QUALITY ASSURANCE

- A. Qualifications:
1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.
- B. Regulatory Requirements:
1. Critical Radiant Flux in Accordance with ASTM E 48: More than 0.45 watts per square centimeter.
 2. Specific Optical Smoke Density in Accordance with ASTM E 22: Less than 450.
- C. Where possible, provide each type of resilient flooring and accessories as the products of a single manufacturer, including recommended primers, adhesives, and sealants.

1.0 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store and protect the products.
 - B. Deliver products to the Project Site in the manufacturer's original, unopened cartons and containers, each bearing the name of the product and manufacturer, project identification, and shipping and handling instructions.
 - C. Store the materials in a dry space, protected from the weather, with ambient temperatures maintained between 50 degrees and 90 degrees F.
 - D. Store on a flat surface.

1.7 JOINT CONDITIONS

- A. Environmental Requirements:
 - 1. Do not install flooring over concrete slabs until the slabs have been cured and are sufficiently dry to achieve bond with the adhesive, as determined by the manufacturer's recommended bond and moisture tests.
 - 2. Store materials in the area of installation for at least 48 hours prior to beginning installation.
 - 3. Maintain the ambient temperature required by the adhesive manufacturer, not less than 72 degrees F, for three days prior to, during, and for 48 hours after installation.
 - 4. Install flooring and accessories only after other finishing operations, including painting, have been completed.
 - 5. Provide adequate temporary ventilation during installation.

1.8 MAINTENANCE

- A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
 - B. Extra Materials: At completion of the installation deliver to the Project Site extra materials from the same manufactured lot as the materials installed in the following quantities:
 - 1. Not less than 2% of each type, size and color of flooring.
 - 2. Not less than 2% of each type and color of base.
 - 3. Submittal of extra accent tiles is not necessary.
 - C. Maintenance Data: Submit two (2) copies of manufacturer's recommended maintenance practices for each type of flooring and accessory required, recommended maintenance materials and suggested schedule for cleaning.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering the specified items which may be incorporated into the work include the following:
 - 1. Tile:

- a. Armstrong Floor Products (Armstrong World Industries, Inc.).
 - b. Azrock.
 - c. Tarkett.
2. Sheet Vinyl:
- a. Armstrong Floor Products (Armstrong World Industries, Inc.).
 - b. Azrock.
 - c. Tarkett.
3. Resilient Edge Strip:
- a. Armstrong Floor Products.
 - b. Roppe.
 - c. Roppe.
 - d. Burke Mercer.
4. Rubber Base:
- a. Armstrong Floor Products.
 - b. Roppe.
 - c. Burke Mercer.

□. Colors, patterns and sizes shall be selected from the manufacturer's standards.

C. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

- A. Vinyl Composition Tile: 12" x 12" x 1/8" gauge composition tile resistant to alkali, grease and oils and able to withstand static loads of 125 psi ASTM F 1066 marbleized design as follows:
- 1. (VCT-1):
 - a. Standard Excelon, Imperial Texture by Armstrong.
 - b. Cortina Colors □ Classics by Azrock.
 - c. Standard, Expressions by Tarkett.
 - 2. (VCT - 2):
 - a. Standard Excelon, Imperial Texture by Armstrong.
 - b. Cortina Colors □ Classics by Azrock.
 - c. Standard, Expressions by Tarkett.
 - 3. Color: As selected. Accent tile (VCT-2) shall be a color contrasting with the field tile color.

- . Sheet Vinyl Flooring (S-1): Randomly placed, high-contrast colors to create a terrazzo-like pattern. AST F 1303 Class A backing, Grade 1, Type II, flexible fiberglass 4 feet wide nominal 0.080 overall gage, 0.050 nominal wear layer modified static load limit 500 psi as follows:
 1. Connection Corlon by Armstrong.
 2. Section 0100 - Product Requirements: Product Options: Substitutions permitted.
- C. Resilient Edge Strip: Homogeneous vinyl, tapered or bullnose edge, 1/8 thick x not less than 1 wide x length required or roll length. Color as selected.
- . Rubber Base (R-1): Type TP, 4 high, 1/8 thick, topset standard covered toe at resilient flooring, toeless at carpet matching end stops and preformed corner units roll length AST F 181. Color as selected.

2.3 ACCESSORIES

- A Subfloor Filler: Latex underlayment mixed with undiluted latex liquid, furnished by or as recommended by the resilient flooring manufacturer as follows:
 1. Levelayer I by Dayton Superior Corporation.
 2. No. 345 by W.W. Henry Company.
 3. Section 0100 - Product Requirements: Product Options: Substitutions permitted.
- . Concrete Slab Primer: Non-staining type as recommended by the resilient flooring manufacturer.
- C. Adhesive: As recommended by the resilient flooring manufacturer for the specific material and substrate conditions clear color.

PART 3 EXECUTION

3.1 EXECUTION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
 - . Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 - C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.
 - . Start of the flooring installation shall indicate acceptance of the subfloor conditions and full responsibility for the completed work.

3.2 PREPARATION

- A. Prepare the substrate for product installation in accordance with the manufacturer's published instructions.

- . Remove existing floor finishes and prepare substrate as recommended by the resilient flooring manufacturer.
- C. Remove curing compounds not compatible with the adhesive. Avoid organic solvents.
- . Remove ridges, bumps and other irregularities in the substrate.
- E. Fill cracks, joints, holes and depressions with a subfloor filler and leveler recommended by the flooring manufacturer to achieve a smooth, flat, hard surface, with no more than 1/8" variation from plane within 10 feet in any direction.
- F. Prohibit traffic until the filler has cured.
- G. □room clean and vacuum surfaces to be covered by resilient flooring □inspect the subfloor.
- . Perform bond and moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured, dried and are ready to receive the flooring Utilize a bond test recommended by the flooring manufacturer. Ensure that moisture content of the concrete substrate does not exceed 3% as measured by the Calcium Carbide □ygrometer Procedure or 5% by normal Protimeter.
- I. If bond test is negative, surface the existing floor with latex underlayment as recommended by the manufacturer.
- . Apply concrete slab primer, if recommended by the flooring manufacturer, prior to the application of adhesive. Apply in compliance with the manufacturer's instructions.

3.3 INSTALLATION - GENERAL

- A. Install resilient flooring using the methods indicated, and in strict compliance with the manufacturer's recommendations.
- . □aintain subfloor reference marks, penetrations, and openings that are in place or plainly marked for future cutting by repeating on the finished flooring. Use chalk or other non-permanent marking device.
- C. Cut flooring to and fit around all permanent fixtures, built-in furniture, cabinets, pipes, and outlets. Cut edges, and fit and scribe to walls and partitions after the field flooring has been installed.
- . Extend flooring into toe spaces, door rabbets, closets and similar openings.
- E. Tightly cement flooring to the subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.
- F. Install flooring on covers for telephone and electrical ducts, and other such items that occur within finished floor areas □maintain overall continuity of colors and patterns with pieces of flooring installed in the covers. Tightly cement edges to the perimeter of the floor around the covers and to the covers.
- G. □and roll flooring at the perimeters of each covered area to ensure proper adhesion.

3.4 INSTALLATION - □IN □L CO □ POSITION TILE FLOORING

- A. Install the resilient tile flooring in accordance with the manufacturer's published instructions.

- . Prime concrete slabs in contact with the ground with cut-back type primer as recommended by the flooring manufacturer. Work the primer with a non-absorptive base completely into the surface. Primer shall be thoroughly dry before applying adhesive.
- C. Apply adhesive in accordance with the adhesive manufacturer's printed directions, unless specified or directed otherwise. Apply only cut-back adhesive to primed concrete surfaces.
- . Spread only enough adhesive to permit the installation of floor materials before initial set.
- E. Open only the number of floor tile cartons for the quantity of material required to cover each area. Mix tile pieces to ensure that noticeable shade variations do not occur within any one area.
- F. Install tile flooring in a checker board pattern, or as indicated. Start in the center of the room or area and work from the center towards the edges. Vary edge width as necessary to maintain full-size tiles in the field, but no edge tile shall be less than 1/2 the field tile size, except where irregular shaped rooms or conditions make it impossible. Keep tile lines and joints square, symmetrical, tight, and even. Keep each floor in a true, level plane, except where indicated as sloped.
- G. Locate accent tiles where shown, or if not shown locate per Architect's instructions.
- . Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances accurately for tight joints.
- I. Where flooring continues through a wall opening, continue the established pattern without interruption. One row of tiles may be cut to less than full size, if necessary, to establish the pattern in the adjoining room.
- . Where an adjacent floor finish is dissimilar, terminate the resilient flooring at the centerline of openings or centerline of doors in the closed position.
- . Press installed flooring with a 150 pound resilient flooring roller to attain full adhesion.

3.5 INSTALLATION - SHEET VINYL FLOORING

- A. Layout sheet flooring for as few seams as possible with economical use of materials.
- . Match edges for color, pattern and shading at seams in compliance with the manufacturer's recommendations.
- C. Prepare seams in the sheet flooring in accordance with the manufacturer's instructions for the most inconspicuous appearance. Seal continuously with fluid applied sealant or adhesive as standard with the manufacturer.
- . Adhere sheet flooring to the substrate using a method approved by the flooring manufacturer for the type of sheet flooring and substrate conditions.
- E. Use conventional perimeter bonding adhesive procedures where recommended by the flooring manufacturer. Use special perimeter bonding adhesive for unfilled vinyl sheet with vinyl backing.

3.6 INSTALLATION - RESILIENT EDGE STRIP

- A. Install edge strips at unprotected and exposed edges where resilient flooring terminates and where flooring terminates at points higher than the contiguous finished flooring, except at doorways where thresholds are located.

- . Place resilient edge strips tightly butted to the resilient flooring. Secure with adhesive to the flooring and substrate.

3.7 INSTALLATION - RUBBER BASE

- A. Install rubber base in accordance with the manufacturer's published instructions.
- . Apply rubber base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install the base in lengths as long as practicable.
 - . Maintain a minimum measurement of 18" between joints. Install true to line, level and with tight vertical joints. Scribe and fit accurately to and around permanent fixtures, equipment and bases.
- C. Use preformed units at external corners and exposed ends. Miter or cope inside corners.
- . Install on solid backing and firmly adhere to walls, floor surfaces and permanent fixtures, except carpet throughout the length of each piece, with continuous contact at horizontal and vertical surfaces.
- E. On masonry surfaces, or other similar irregular surfaces, fill voids along the top edge of wall base with the manufacturer's recommended adhesive filler material.
- F. Roll the installation per the manufacturer's instructions.

3.8 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- . Inspect the resilient flooring and base installation, pattern, layout and attachment to the substrate.

3.9 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- . Remove excess adhesive and other surface blemishes from the floor finish, base and wall surfaces without damage and use neutral type cleaners recommended by the flooring manufacturer.
- C. Just prior to final inspection, thoroughly clean the flooring, edge trims and base.
- . Apply polish and buff. Use the type of polish, number of coats, and buffing procedures in compliance with the flooring manufacturer's instructions.

3.10 PROTECTION

- A. Protect installed flooring with heavy kraft paper or other covering until final acceptance inspection.

END OF SECTION

SECTION 09900

PAINTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior and exterior paint systems.
2. Schedule of Items to be painted.
3. Painting Treatments Schedule.

- . Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

1.2 DESCRIPTION OF WORK

- A. The extent of the work of this Section is indicated on the Drawings and Schedules and as specified herein, complete, and includes cleaning and preparation of all interior and exterior surfaces to be painted or finished, and finishing of all interior and exterior surfaces, unless hereinafter excluded.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

- . American Society for Testing and Materials (ASTM):

1. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.

1.4 GENERAL

- A. The term "Paint" as used herein, means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as primer, intermediate coat or finish coat.

- . The following categories of work are included under other Sections of these Specifications:

1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various Sections of structural steel, metal fabrications, hollow metal doors and frames, and similar items.
2. Unless otherwise specified, shop priming of fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other Sections.

1.5 SUBSTITUTIONS

A. Section 01300 - Submittal Procedure: Procedures for submittals.

1. Product Data: Submit for each type of paint specified.
 - a. Manufacturer's technical information including paint analysis, and application instructions for each material proposed for use.
 - b. Painting Schedule listing the surfaces to be painted with cross reference to the specific painting and finishing system, and application. Identify each paint material by manufacturer's catalog number and general classification.
2. Samples:
 - a. Prior to beginning the painting work, the Architect will furnish color chips for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples of color and texture only for the Architect's review. Provide a listing of materials and application for each coat of each finish sample.
 - b. Provide two (2) samples of each color and material on 8"x 12" hardboard, with texture to simulate actual conditions. Re-submit samples as requested by the Architect until acceptable color, sheen, and texture is achieved.
 - c. Provide two (2) 8"x 12" samples of natural and stained wood finish on actual wood surfaces. Label and identify each as to location and application.
 - d. Provide two (2) 8" x 12" samples of masonry for each type of finish and color on concrete masonry, showing the filler, prime coat and finish coats.
3. Mock-Up: On actual wall surfaces and other interior and exterior building components, duplicate the paint finish of the prepared samples. Provide full-coat finish samples on at least 80 sq. ft. of surface, as directed, until the required color, sheen and texture is obtained simulate the final lighting conditions for review of the work in-place.
4. Assurance / Control Submittals:
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - b. Documentation of experience indicating compliance with the specified qualifications requirements.
 - c. Manufacturer's Material Safety Data Sheets (MSDS) for each paint type specified.

1. COORDINATION

- A. Pre-Application Meeting: Convene a Pre-Application Meeting at the Project Site prior to beginning the painting work.
1. Require attendance of the Contractor, Owner's representative, Architect,

representatives of the paint subcontractor and other finish products, and the mechanical and electrical trades.

2. Review coordination and environmental controls required for the proper application and ambient conditions in the areas to receive paint.
3. Review preparation and installation procedures, and the coordination and scheduling required with the painting work.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
2. Applicator: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Regulatory Requirements:

1. Surface Burning Characteristics in Accordance with ASTM E 84 for Class I or A finish:
 - a. Flame Spread (Non-Combustible Surfaces): Less than 25.
 - b. Smoke Density (Non-Combustible Surfaces): Less than 450.
2. Provide paint and coating materials that conform to Federal, and local Government restrictions for volatile organic compounds (VOC) content.

C. Codes and Standards: The work and materials shall conform to regulations of the Fire Department, safety color coding in conformance with OSHA and all other regulatory ordinances having jurisdiction. Conform to the most stringent requirements of the authorities having jurisdiction.

D. Single Source Responsibility: Provide primers and other undercoat paint products by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only within the recommended limits.

E. Coordination of Work: Review other Section of these Specifications in which prime paints are to be provided to ensure compatibility of the total coating system for various substrates. Upon the request of other trades, furnish information or characteristic of the finish materials provided for use, to ensure that compatible prime coats are use.

1.8 DELIVERY, STORAGE AND HANDLING

A. Section 01000 - Product Requirements: Transport, handle, store, and protect the products.

B. Deliver products to the Project Site in the manufacturer's original, new and unopened packages and containers bearing the following information:

1. Manufacturer's name.
2. Name or title of the material.

3. □ manufacturer's lot number and date of manufacture.
 4. Contents by volume for major pigment and vehicle constituents.
 5. Color name and number.
 - Thinning or reducing instructions.
 7. Application instructions including surface preparation and coverage.
 8. □ drying time.
 9. Cleanup re□uirements.
- C. Store products, not in actual use, in tightly covered containers, off the ground and under cover. □aintain containers used in the storage of paint, in a clean condition, free of foreign materials and residue.
- . Store paint materials at a maximum ambient temperature of 90° F, in a ventilated area, and in compliance with the manufacturer's published instructions.
- E. □eep storage areas neat and orderly. Remove oily rags and waste daily.
- F. Protect against fire hazards and spontaneous combustion.
- G. Take all precautions to ensure that workmen and the work areas are adequately protected from health hazards that might result from handling, mixing and application of paints.

1.9 □ □ CON□ITIONS

- A. Environmental Re□uirements:
1. □o not apply paint during rain, fog or mist when the relative humidity exceeds 85% , or to damp or wet surfaces, unless otherwise permitted by the paint manufacturer's printed instructions.
 2. Apply paint finishes only when the moisture content of the surfaces to be coated is within the manufacturer's acceptable range for the type of finish to be applied.
 3. Painting may be continued during inclement weather if the areas and surfaces to be painted are enclosed and within the humidity limits specified, and allowed by the paint manufacturer's printed instructions.
 4. □o not apply paint in areas where dust is being generated.
 5. In areas being painted provide a lighting level of, at least 80 foot-candles, measured at mid-height of the surface being painted.

1.10 □ AINTENANCE

- A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
- . Extra □aterials:
1. Upon completion of the work, provide replacement materials from the same

production run as the materials applied. Provide 2^{1/2} of each, but not less than one (1) quart, nor more than ten (10) gallons of each type, color and sheen.

2. Label each container with the color, type and texture, in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:

1. Frazee Paint & Wallcovering.
2. Benjamin Moore & Co.
3. Sherwin-Williams Co.
4. Olympic Stains.
5. Watco Co.
6. VAR by United Gilsonite Laboratories.
7. ASCO.
8. Thoro Systems Products.
9. PPG Amercoat (formerly Ameron Protective Coatings).
10. Textured Coatings of America, Inc. (TEC-COTE).
11. Rain Products Company.

6. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

- A. Material Quality:

1. Manufacturer's best quality grade of the various types of coatings, and suitable for the intended purpose, as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.

- a. Proprietary names used to designate colors or materials are not intended to imply that the products of the named manufacturers are required to the exclusion of equivalent products by other manufacturers.

6. Color Pigments:

1. Pure, non-fading, applicable types to suit the substrates and service indicated. Manufacturer shall confirm that exterior applied pigments will not fade when exposed to UV light.

2. All exterior colors and interior deep tone colors shall be ground-in at the factory. Shop mixing is not permitted.
 3. Colors to be as selected by the Architect, and subject to modification on the Project Site at the Architect's discretion.
 4. Lead content in pigment, if any, is limited to not more than 0.01%, based on the total non-volatile (dry film) of paint by weight. This limitation extends to interior surfaces and those exterior surfaces, such as stairs, decks, porches, railings, windows, and doors which are readily accessible to children.
- C. Paint:
1. Ready-mixed, pigments fully-ground, maintaining a soft paste consistency, capable of readily and uniformly dispersing to a complete homogeneous mixture.
 2. Provide good flowing and brushing properties, and capable of drying or curing free of streaks and sags.
- . Primers and Undercoaters: Produced by the same manufacturer as the intermediate and finish coats.
- E. Paint Accessory Materials: Linseed oil, shellac, turpentine and other materials not specifically indicated herein, but required to achieve the finishes specified to be of high quality, and by an approved manufacturer.

2.3 PAINT SYSTEMS

- A. (EAE) Exterior Acrylic Emulsion: A 100% acrylic latex, water-thinned coating with extra mildewcide, flat finish, 203 Duratec and 200 Epotilt acrylic-epoxy sealer by Frazee, or Loxon acrylic primer with A-100, 100% exterior acrylic latex by Sherwin-Williams.
- . (EAHE) Exterior Acrylic High Build Emulsion: A high-build, heavy-bodied, water-based, acrylic emulsion with 7% solids conforming to Federal Spec TTTC 00555, paragraph 4.4.7. Thorocoat by Thoro Systems Products, smooth finish. Finish with two (2) coats of Thoroglaze or other sealer recommended by the manufacturer. Primer to be as recommended by the manufacturer for the Project conditions.
- C. (TC) Textured Coating: Tex-Cote L-70 primer and top coat system by Textured Coatings of America. Texture as selected by the Architect.
- . (AFE) Interior Acrylic Flat Emulsion Copolymer: 100% acrylic latex, water thinned, washable, velvet flat finish, 002 Majestic by Frazee.
- E. (AEE) Interior Acrylic Eggshell Enamel: 100% acrylic, water thinned, semi-gloss enamel, 022 Lo-Glo by Frazee.
- F. (LOAE) No VOC Interior Acrylic Paint: Envirokote Interior Low Odor, flat, eggshell or semi-gloss as noted, with Envirokote primer by Frazee.
- G. (ARE) Alkyd Resin Enamel for Interior and Exterior Metal: 28 Aro-plate II SG, semi-gloss with 01 metal primer by Frazee.
- . (AREW) Alkyd Resin Enamel for Exterior Wood: 372 wood undercoat with two coats of 352 Classic House and Trim Gloss Enamel, semi-gloss by Frazee.

- I. (EPC) Epoxy Paint for Cementitious Materials: Polyamide epoxy coating system, two-component coating self-priming, semi-gloss, Amerlock 400 by PPG Americoat.
- . (EP□) Epoxy Paint for Metal: 5□1 acrylic metal primer with Aro-Gard 542 finish coats, two-component coating, semi-gloss by Frazee. Prepare metal with □ASCO Prep and Primer.
- . (RIP) Rust Inhibitive Primer: Alkyd mineral spirit thinned, satin finish primer□□□□1 metal prime, rust preventive alkyd primer by Frazee.
- L. (□F) □lock Filler: Acrylic block filler□□2□2 acrylic block filler by Frazee.
- . (PS) Primer Sealer: P□A vinyl acrylic resin, water-thinned, flat finish primer, □0□1 Aqua Seal interior P□A Sealer by Frazee.
- N. (PSU) Polyurethane: Clear finish exterior polyurethane varnish, Satin□□AR □203.
- O. (WS) Wood Stain: Olympic semi-transparent wood stain or □AR transparent interior stain as selected by the Architect.
- P. (CWF) Clear Wood Finish: Oil alkyd resin, satin or hand rub finish, □eft Clear Wood Finish.
- . (□O) Wood Sealer: Watco □anish Oil finish, exterior formula where exposed to wind blown water.
- R. (CS) Concrete Stain: Lithochrome stain in water solution by Scofield Co.
- S. (TEC) Cementitious Sealer: Elasto-grip FC, waterborne modified polyamine epoxy by Tnemec.
- T. (TEC) Concrete Coating: Enviro-crete 15□, modified waterborne acrylate by Tnemec.
- U. (GRC) Graffiti Resistant Coating: Water repellent, clear, deep-penetrating, non-film forming, non yellowing, heavy duty chemical water repellent solution. □andiGuard non-sacrificial graffiti coating system.

PART 3 EXECUTION

3.1 EXECUTION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
 - . Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory and timely execution of the work of this Section. State, in writing, any anticipated problems with using the specified coating systems on substrates primed by others. Do not proceed with the work until the unsatisfactory conditions have been corrected in a manner acceptable to the Applicator.
- . Starting the painting work will be construed as the Applicator's acceptance of the surfaces

and condition within any particular area.

3.2 SURFACE PREPARATION

- A. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.
- Perform preparation and cleaning procedures in accordance with the paint manufacturer's published instructions, and as herein specified, for each substrate condition.
 - 1. Provide barrier coats over incompatible primers, or remove and reprime as necessary.
 - 2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be field painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of the painting of each space or area, reinstall all removed items.
 - 3. Clean surfaces to be painted before applying paint or surface treatment. Remove any oil or grease prior to mechanical cleaning.
 - 4. Program cleaning and painting so contaminants from the cleaning process do not fall onto wet, newly painted surfaces.
- C. Ferrous Metals: Clean ferrous surfaces not galvanized or shop-coated, of oil, grease, dirt, loose mill scale, and other foreign substances by solvent or mechanical cleaning.
 - 1. Touch-up shop-applied prime coats where damaged or bare, when required by other Sections of these Specifications. Clean and touch-up with the same type of shop primer.
- Galvanized Surfaces: Remove oil and other surface contaminants with a non-petroleum based solvent. Apply a coat of etching primer if required by the paint manufacturer.
- E. Cementitious Materials: Prepare cementitious surfaces of concrete, concrete blocks, cement plaster and cement-asbestos board to be painted by removing efflorescence, chalk, dust, dirt, grease and oils, and by roughening as required to remove glaze. Wash concrete surfaces scheduled to be painted with a commercial solution of muriatic acid, or other etching cleaner. Flush with clean water to neutralize the acid, and allow to dry before painting.
 - 1. Determine the alkalinity and moisture content of surfaces to be painted by performing the appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, correct the condition before starting the application of paint.
 - 2. Do not paint over surfaces where the moisture content exceeds that permitted in the manufacturer's printed instructions.
 - 3. Clean floor surfaces, scheduled to be painted, with a commercial solution of muriatic acid, or other etching cleaner. Flush the floor with clean water to neutralize the acid, and allow to dry before painting.
- F. Wood: Clean wood surfaces to be painted of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as necessary. Sandpaper smooth, finished

surfaces exposed to view, and remove dust. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before application of the prime coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sandpaper smooth when dry.

1. Prime, stain, or seal wood required to be field painted, immediately upon delivery to the Project Site. Prime ends, edges, faces, undersides, and backsides of such wood, including cabinets, counters, cases and paneling.
2. When a transparent finish is required, use spar varnish for backpriming.
3. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on the backside.
4. Seal tops, bottoms, and cut-outs of unprimed wood doors with a heavy coat of varnish or equivalent sealer immediately upon delivery to the Job Site.

G. Gypsum board: Fill minor defects with filler compound. Spot prime defects after repair.

3.3 MATERIALS PREPARATION

- A. Mix and prepare painting materials in accordance with the manufacturer's printed instructions.
- B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into the material. Remove the film and, if necessary, strain the material before using.

3.4 APPLICATION

- A. General:
 1. Apply paint products in accordance with the manufacturer's written directions using applicators and techniques best suited for the substrate, type of material being applied, and texture required.
 2. Paint finishes are scheduled. Provide prime coats compatible with the finish paints to be used.
 3. Apply additional coats, when the undercoats, stains, or other conditions show through the final coat, until the paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment and furniture with prime coat only before final installation of the item.
 5. Paint the back sides of access panels, and removable or hinged covers to match the exposed surfaces.
- B. Finish exterior doors on tops, bottoms and side edges the same as the exterior

faces.

7. Paint tops, edges, and bottoms of wood and hollow metal doors: .
 8. Sand lightly between each succeeding enamel and varnish coat.
 9. Omit the first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.
 10. Apply each coat slightly darker than the preceding coat, unless otherwise approved by the Owner's representative. Sand surfaces lightly between coats, as necessary to achieve the specified finish.
 11. Do not apply finishes on surfaces that are not dry.
 12. The number of coats and the film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured, as recommended by the paint manufacturer.
 13. Paint the interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
 14. Apply block filler to concrete masonry units at the rate necessary to provide complete coverage with pores filled.
- Scheduling Painting: Apply first coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until the paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- C. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spread rate to provide a total dry film thickness or, if not indicated, as recommended by the coating manufacturer.
- Prime Coats: Apply a prime coat of material required to be painted or finished and has not been prime coated by others.
1. Re-coat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in the first coat, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- E. Stipple Enamel Finish: Roll and re-distribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.
- F. Pigmented (Opaque) Finishes: Completely cover surfaces to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness and other surface imperfections are not acceptable.
- G. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of an even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush

marks, orange peel, nail holes, and other imperfections.

1. Provide a satin finish for final coats, unless otherwise indicated.
- . Surfaces To Be Painted: Except where natural finish of material is specifically noted as a surface to not be painted, paint exposed surfaces whether or not colors are designated. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials, or areas. If color or finish is not designated, the Architect will select from the manufacturer's standard colors or finishes.
- I. Equipment in Finished Rooms: Unless otherwise authorized, paint wall grilles and diffusers, door louvers, panel board fronts and other equipment having a factory-finish, occurring in rooms other than storage, mechanical and custodial.
- . Do not paint over any code-required labels, such as Underwriter's Laboratories and Factory Mutual, or any other equipment identification, performance rating name, door label or nomenclature plates.
- . Paint exposed interior and exterior plumbing, heating and electrical equipment, apparatus, conduits, pipes and fittings, supports and hangers and all other unfinished surfaces of the mechanical and electrical work.
1. Work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primer or factory-painted metal surfaces of equipment installed under the mechanical and electrical work, except as otherwise indicated.
- L. Mechanical and Electrical Work: Painting of mechanical and electrical work includes those items exposed in mechanical equipment rooms, in occupied spaces, and equipment on roofs.
1. Exposed Mechanical: Items to be painted include, but are not limited to, the following:
 - a. Factory pre-painted diffusers at public spaces.
 - b. Ductwork insulation.
 - c. Piping, pipe hangers and supports.
 - d. Sprinkler covers and piping.
 - e. Heat exchangers.
 - f. Motors, mechanical equipment and supports.
 - g. Tanks.
 - h. Accessory items.
 2. Exposed Electrical: Items to be painted include, but are not limited to the following:
 - a. Panel boards in public spaces.
 - b. Speaker grilles.

- c. Conduit and fittings.
 - d. Switchgear.
 - e. Rooftop equipment.
- . Roof Flashings: Paint all exposed roof flashings that are not stainless steel or factory-finished.
 - N. Completed Work: Match the approved samples for color, sheen, texture and coverage. Remove, re-finish or re-paint work not in conformance with the specified requirements.
 - O. The following categories of work are not included as part of field-applied painting work.
 1. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
 2. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of prefinished aluminum, anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials do not require finish painting.
 3. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkage, sinkage, sensing devices, motor and fan shafts will not require finish painting.

3.5 MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Replace identification markings on mechanical and electrical equipment, if painted over or spattered.
- . Paint conduit and electrical equipment occurring in finished areas where exposed to public view, color and texture to match the adjacent surfaces.
- C. Paint front, back and all edges of plywood backboards for electrical equipment before installing, and mounting the equipment.

3.6 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- . The Owner reserves the right to invoke the following material testing procedures at any time, and any number of times during the field painting work:
 1. Engage the services of an independent testing laboratory to sample the paint being used. Samples of materials delivered to the Project Site will be taken, identified and sealed, and certified in the presence of the Contractor.
 2. A testing laboratory will perform appropriate tests for any or all of the following characteristics: abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, re-coating, skinning, color retention, alkali resistance and quantitative materials analysis.
 3. If the test results show that the material being used does not comply with the

specified requirements, the Contractor may be directed to stop the painting work, remove the non-complying paint, pay for the testing, re-paint surfaces where the rejected paint has been applied, and remove the rejected paint from the previously painted surfaces if, upon re-painting with the specified paint, the two coatings are not compatible.

- . Inspect painting and coating applications for the scheduled materials, color, sheen, texture, thickness, and coverage.

3.7 CLEANING

A. Section 01700 - Execution Requirements: Cleaning the installed work.

- . As work proceeds, and upon completion, promptly remove paint where spilled, splashed, and spattered.
- C. During progress of the work keep the premises free from any unnecessary accumulation of tools, equipment, surplus materials, and debris.
- . Remove from the site discarded paint materials, rubbish, cans and rags at the end of each work day.
- E. Collect waste, cleaning cloths, and materials which may constitute a fire hazard, place in closed metal containers, and remove from the site daily.
- F. Upon completion of the work leave the premises neat and clean. Clean metal door and window frames, glass, and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, taking care to not scratch or otherwise damage finished surfaces.

3.8 PROTECTION

- A. Protect the work of other trades, whether to be painted or not, against damage by the painting and finishing work.
- . Place "Wet Paint" signs as required as a warning of newly painted surfaces.
- C. Remove temporary protective wrappings provided by other trades for the protection of their work, after completion of the painting operations.
- . Upon completion of the work of other trades, touch-up and restore all damaged and defaced painted surfaces.
- E. Correct any damage by cleaning, repairing or replacing and re-painting, as acceptable to the Owner's representative.
- F. Repair any damage resulting from inadequate and unsuitable protection.

3.9 SCHEDULE OF ITEMS TO BE PAINTED

- A. Refer to the Drawings and Painting and Finishing Schedule at the end of this Section for designated finishes. Paint finish shall be provided for, but not limited to, the following items:
 1. Interior: All interior surfaces as scheduled on the Drawings including, but not limited to:

- a. Wood and hollow metal doors and frames.
- b. Metal opening frames and trim.
- c. Gypsum board.
- d. Exposed concrete and plaster.
- e. Steel rails and guards.
- f. Exposed mechanical ductwork , hangers and supports, if the exposed structure is shown on the drawings to be painted.
- g. Exposed piping, hangers and supports, if scheduled on the drawings to be painted.
- h. Exposed conduit, hangers and supports, if scheduled on the drawings to be painted.
- i. Exposed structure including decking, joists, girders, beams, bridging, and miscellaneous metal fabrications, if scheduled on the drawings to be painted.
- j. Exposed structural columns.
- k. Metal stair stringers and handrails.
- l. Exposed wood trim.

2. Exterior: All exterior surfaces including, but not limited to:

- a. Wood and hollow metal doors and frames.
- b. Metal opening frames and trim.
- c. Metal flashings, if exposed from ground level, and downspouts, other than stainless steel.
- d. Pipe bollards.
- e. Steel rails and guards.
- f. Roof hatches.
- g. Concrete and plaster walls, soffits, fascia, ceilings, beams and columns.
- h. Structural steel decking, joists, beams and columns.

Do not paint the following Items:

- 1. Aluminum, brass, bronze, stainless steel and chrome-plated steel.
- 2. Pre-finished items, such as cabinetry, toilet compartments, acoustical ceiling materials, and mechanical and electrical equipment.
- 3. UL, F, and other Code required labels.

4. Equipment identification, performance ratings, and name plates.
5. Finish hardware.

□ Toilet accessories.

3.10 PAINTING TREATMENTS SCHEDULE

General: The paint abbreviations below refer to those noted above in PART 2, MATERIALS.

NO.	LOCATION	MATERIALS
1	Exterior and Interior Metal including factory prefinished items scheduled for field finish	<u>Shop Coat:</u> As specified in other Sections <u>Prime Coat:</u> (RIP) <u>Finish:</u> Two coats (ARE□)
2	Exterior Plaster, Concrete and Masonry where noted for paint including: Fascia, Soffits, Walls of Buildings, Exposed Concrete Beams, Exposed Concrete Retaining Walls	<u>Prime Coat:</u> Manufacturer's Representative <u>Finish:</u> Two coats (EAE)
3	Exterior Plaster and Concrete where noted for Textured Coating (other than Special Coating per Section 09800) including: Fascia, Soffits, Walls of Building, exposed Concrete Beams, exposed Concrete Retaining Walls	<u>Prime Coat:</u> As recommended by manufacturer <u>Finish:</u> (EA□E) system or <u>Prime Coat:</u> □L-70 primer <u>Finish:</u> (TC)
4	Exterior Wood	<u>Wood Stain:</u> Two coats (WS) or <u>Prime</u> and Two coats (AREW)
5	Interior Smooth Concrete and Gypsum Board, where scheduled	<u>Prime Coat:</u> (PS) <u>Finish:</u> Two coats (AEE) or (AFE)
□	Interior Masonry, where scheduled	<u>Prime Coat:</u> (□F) <u>Finish:</u> Two coats (AEE) or (AFE)
7	Interior Wood for opaque finish including Wood Doors	<u>Prime Coat:</u> Manufacturer recommended primer <u>Finish:</u> Two coats (AEE) or (AFE)

- | | | |
|----|---|--|
| 8 | Interior hardwood, natural finish, including doors, door and Window Frames and Relights, Panels and all Trim, Wood-Faced Casework | <u>Finish:</u> Two coats (FO) or two coats (WS) with sanding sealers
<u>Sealer:</u> Two coats (PSU)
or
<u>Finish:</u> Three coats (CWF) |
| 9 | Interior Concrete, Masonry and Gypsum board, where noted for epoxy. | <u>Prime Coat:</u> As recommended by manufacturer
<u>Finish:</u> Two coats (EPC) |
| 10 | Maintenance coating for interior smooth Concrete, Masonry, Gypsum board and Wood | <u>Prime Coat:</u> As recommended by manufacturer
<u>Finish:</u> (LOAE) Coats as required for coverage |
| 11 | Interior metal including factory pre-finished items scheduled for painting | <u>Prime Coat:</u> (RIP) except where pre-finished
<u>Finish:</u> Two coats (ARE) |
| 12 | Interior metal where noted for epoxy | <u>Prep Coat:</u> ASCO Prep and Primer
<u>Prime Coat:</u> Aro-Gard 501 primer
<u>Finish:</u> Two coats (EP) |
| 13 | Graffiti Resistant Coating over specified paint system. | <u>Finish:</u> Three coats (GRC) |
| 14 | Stained concrete or plaster: (CS) per manufacturer's recommendation. | |
| 15 | Sealed concrete or plaster: | <u>Finish:</u> Three coats (TEC) or per manufacturer's recommendation |

END OF SECTION

SECTION 1015

PHENOLIC TOILET PARTITIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid polymer toilet partitions.
2. Solid polymer urinal screens.
3. Solid polymer dressing compartments.
4. Institutional hardware.

- B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for attachment.
2. Section 04230 - Reinforced Unit Masonry: Substrate for attachment.
3. Section 05100 - Rough Carpentry: Backing plates within walls for partition attachment.
4. Section 09110 - Non-Load Bearing Steel Framing: Framing and plates within walls for partition attachment.
5. Section 10810 - Toilet Accessories: Coordinate compartment installation with subsequent accessories installation.

1.2 DESCRIPTION OF WORK

- A. The extent of the phenolic toilet partitions work is indicated on the drawings and as specified herein, and includes providing and installing floor-mounted / overhead braced toilet compartments, urinal screens, dressing compartments, hardware and accessories necessary for a complete and functional system.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
1. ASTM A 167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- C. Americans with Disabilities Act Accessibility Guidelines (ADAAG):

1. Accessibility Guidelines for Buildings and Facilities.
2. Accessibility Guidelines for Schools.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings and accessories.
2. Shop Drawings: Fabrication and erection drawings of toilet partitions, urinal screens, and dressing compartments assemblies not fully described in the manufacturer's product drawings, templates, and instructions for anchorage devices built into other work; partitions layout plan, elevations, dimensions, door swings, details of floor and wall supports and connections.
3. Samples: Not less than 2x 3 of the actual solid polymer material, for selection of finishes, colors and patterns.
4. Assurance / Control Submittals:
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - b. Documentation of experience indicating compliance with the specified qualifications requirements.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

1. Warranty: Provide written limited Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 COORDINATION

- A. Coordinate plumbing rough-in locations with Division 15 Installer to ensure proper location and fitting of the work.
- B. Furnish inserts and anchorages which must be built into other work for the installation of toilet partitions, screens and related work. Coordinate deliver with other work to avoid delay.
- C. Coordinate with the installation of toilet accessories, as scheduled.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

- . Take field measurements prior to the preparation of Shop □rawings and fabrication, where possible, to ensure proper fitting of the work. Allow for adjustments within the specified tolerances whenever taking field measurements before fabrication might delay the work.
- C. Conform to A□AAG for access and operation of compartment doors and hardware by the handicapped.

1.7 □ELI□ER□, STORAGE AN□ □AN□LING

- A. Section 01□00 - Product Re□uirements: Transport, handle, store, and protect the products.
 - . Protect partitions, screens, hardware, accessories and other items during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
 - C. □o not deliver products until wet work, grinding and similar operations which could damage, soil or deteriorate the materials has been completed in the installation areas.
 - . If the partitions and screens must be stored in other than the installation areas, store only in areas meeting the same re□uirements as specified for the installation areas.

1.8 WARRANT□

- A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
 - . Limited Warranty:
 1. Submit manufacturer's Limited Warranty against breakage and corrosion, and agreeing to replace products which are defective in materials or workmanship.
 2. Warranty Period: Fifteen (15) years from the date of Substantial Completion.

PART 2 PRO□UCTS

2.1 □ANUFACTURERS

- A. Subject to compliance with the Project re□uirements, manufacturers offering products which may be incorporated into the work include the following:
 1. □obrick Washroom E□uipment, Inc.
 2. Accurate Partitions Corp.
 3. Sanymetal (Crane Plumbing Co.).
 4. Santana Products, Inc.
 - . Section 01□00 - Product Re□uirements: Product Options: Substitutions permitted.

2.2 □ATERIALS

- A. Panels, □oors, Pilasters and Screens:

1. Solid plastic, fabricated from high density Polyethylene (HDPE) containing a minimum of 50% recycled material manufactured under high pressure forming a single component section.
 2. Water-resistant, graffiti-resistant, non-absorbent.
 3. 1/2" thick, unless otherwise indicated.
 4. Self-lubricating surface that resists marking by pens, pencils and other writing instruments.
 5. All panels, doors, pilasters and screens to be shipped from the manufacturer with a special protective plastic covering.
- Characteristics:
 - a. Equal component compression molded high density Polyethylene (HDPE) of solid virgin resin materials in colors that extend throughout the material.
 - b. Panels, doors, pilasters and screens shall have recycled material (HDPE) as the core material.
 - c. Use material that has been selected for surface flatness and smoothness. Exposed surfaces that exhibit seam marks, roller marks, discoloration, telegraphing of core, or other imperfections on the finished units are not acceptable.
 - Pilaster Shoes: Type 302 / 304 stainless steel, 3/4" high minimum, and 18 gage, No. 4 satin finish, ASTM A 193.
 - C. Stirrup brackets: manufacturer's heavy-duty design for attaching panels to walls and pilasters, stainless steel, anodized aluminum or chromium-plated non-ferrous cast alloy, to match the hardware finish.
 - Style: Floor-mounted / Overhead-traced, 1080 duraLine Series by Kobrick.
 - E. Provide colors and patterns as selected from the manufacturer's full line of standard colors and patterns.

2.3 PARTITIONS AND SCREENS

- A. Shall be solid plastic with Type 304 stainless steel hardware throughout. All hardware shall be concealed on the inside of compartments.
- Style: Floor-mounted, duraLine Series 1083 by Kobrick.

2.4 DRESSING COMPARTMENTS

- A. Floor-mounted / Overhead-traced, solid phenolic partitions. Panels, doors, and pilasters to be 1/2" thick Type 304, 18-8 stainless steel hardware, satin finish. duraLine Series 1080 by Kobrick.
- Wall-mounted, 1/2" thick solid phenolic benches with stainless steel supports, satin finish. Series 1080 by Kobrick.

2.5 HARDWARE AND ACCESSORIES

- A. Manufacturer's heavy-duty operating hardware and accessories stainless steel Institutional Series.
1. Hinges shall be integral hinge system. Pilasters to be machined to accept door and hinge mechanisms. The hinge mechanism to consists of a 2 piece 1/2" diameter nylon pin with ACam Action® and a 3/16" stainless steel pin inserted into the lower portion of the pilaster and door. A one piece 1/2" diameter, 4" long nylon pin to be inserted into the top portion of the pilaster and door. Door closures to be factory set to accommodate all conditions and to allow for positive opening and closing action, free of impediment.
 2. Door Pull and Wall Stop: Type 304 cast stainless steel.
 3. Door latch housing fabricated from heavy aluminum extrusion (6061-T5 alloy) with clear anodized finish, surface-mounted and thru-bolted to the door with one-way sex bolts. Slide bolt and button shall be heavy aluminum.
 4. Door strike and keeper fabricated from heavy aluminum extrusion (6061-T5 alloy) with clear anodized finish, wrap around flange, surface-mounted and thru-bolted to the pilaster with one-way sex bolts. Strike shall be 12" in length.
 5. Coat Hooks: Combination coat hook and bumper fabricated from Type 304 stainless steel.
- Finish: Stainless steel, No. 4 satin.
- Overhead Tracing: Continuous extruded heavy-duty mill finish 18 gauge stainless steel brackets.
- C. Anchorage and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, chromium-plate steel, or brass finished to match the hardware theft-resistant heads and nuts. Use stainless steel concealed anchors.
1. Steel Plate Reinforcement: Carbon steel, prepared for fasteners 1/8" thick.
- Add one (1) additional coat hook on the inside of handicapped accessible stalls and stalls with out-swinging doors.

2. FABRICATION

- A. General:
1. Comply with the details shown for profile, layout and construction of compartments, screens and other items. Where not otherwise shown, comply with the manufacturer's written instructions.
 2. Furnish standard panels, doors, pilasters and screens fabricated from the partition system specified, unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware and accessories, as shown.
 3. Pre-Cut Openings: Fabricate with pre-cut openings, wherever possible, to receive hardware and accessories. Locate openings accurately and use templates or roughing-in diagrams for the proper size and shape. Smooth the edges of cutouts and seal edges of cutouts with a water-resistant material. Provide radiused machined edges and bottom burn strip.

4. Fabricate from single piece material, except where the required length exceeds the maximum length fabricated by the manufacturer. Locate joints at even intervals through the material, aligned with other adjacent joints, and as approved on the final Shop Drawings. Form joints using the manufacturer's recommended adhesive for a smooth even appearance of matching color and inconspicuous appearance. Provide joints of equal or greater strength than the material being joined.
 - . Floor-mounted / Overhead-traced Partitions: Partitions, Doors and Pilasters: Flush type, manufacturer's standard. Stainless steel bracing assembly, manufacturer's standard, anchored to each pilaster and to the wall. Furnish 3/8"galvanized steel leveling devices to permit structural connection to the floor. Furnish a shoe at each pilaster to conceal the anchorages.
 - C. Doors: Unless otherwise indicated, furnish 24"wide in-swinging doors for standard toilet stalls and 32"wide (clear opening width) out-swinging doors for stalls equipped for use by the handicapped.
 - . Floor-mounted Urinal Screens: Panels and pilasters of the same construction and finish as the partitions. Furnish 3/8"galvanized steel leveling devices, welded to 11 gauge steel core. Furnish a shoe at each pilaster to conceal the anchorages.

2.7 FINISHES

- A. Panels, Doors, Pilasters and Screens: Single color as selected from the manufacturer's standard colors. Submit for selection as required above.
 - . Overhead Tracing: Mill finish.
 - C. Stainless Steel: No. 4 bright directional polish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
 - . Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work, including spacing of plumbing fixtures, and location of built-in framing and backing plates.
 - C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with the manufacturer's recommended procedures and installation sequence.
 - . Install partitions plumb, level, straight, square, secure and rigid in accordance with the manufacturer's published instructions, and as shown on the Drawings.
 - C. Floor-mounted / Overhead-traced Partitions:

1. Set pilasters with anchorages having not less than 2" penetration into structural floors, unless otherwise recommended by the partition manufacturer.
 2. Secure pilasters to the floor with the anchorage devices provided.
 3. Level, plumb and tighten the installation with the anchorage devices furnished.
 4. Secure overhead braces to pilasters with not less than two (2) fasteners per face.
 5. Hang doors and adjust so tops of doors are parallel with the overhead brace when the doors are in the closed position.
- . Floor-mounted Urinal Screens:
1. Set pilasters with anchorages having not less than 2" penetration into structural floors, unless otherwise recommended by the partition manufacturer.
 2. Set units in accordance with the manufacturer's instructions for secure support, and to resist lateral impact.
 3. Anchor panels to walls with two (2) panel brackets and to vertical upright pilasters anchored to the floor.
 4. Attach units with heavy-duty concealed anchoring devices, as recommended by the manufacturer, and to suit the wall construction.
 5. Secure panels to built-in devices using concealed fasteners.
- . Level, plumb and tighten the installation with the anchorage devices furnished.
- E. Secure panels to walls with not less than two (2) stirrup brackets attached near the top and bottom of the panels. Locate wall brackets so holes for wall anchorages occur in masonry or tile joints, where occurs. Secure panels to pilasters with not less than two (2) stirrup brackets located to align with the stirrup brackets at the wall. Secure panels in position with the manufacturer's recommended anchoring devices.
- F. Attach panels and pilasters to brackets with through sleeve, tamper-proof bolts and nuts.
- G. Locate head rail joints at the center line of pilasters.
- . Provide adjustment for floor variations with screw jacks through steel saddles integral with the pilaster.
- I. Conceal floor fastenings with stainless steel shoes.
- . Provide clearance of not more than 1/2" between pilasters and panels, and not more than 1" between panels and walls.
- . Align the hardware to provide uniform clearance at vertical edges of doors, not exceeding 3/16"
- L. Install door bumper coat hooks on partitions or walls.
- . Provide hardware at handicapped accessible compartments in compliance with ANSI A117.1.

- N. Install one (1) additional wall-mounted bumper at handicapped accessible stall doors and out-swinging doors.

3.3 CONSTRUCTION

A. Interface With Other Work:

- 1. Coordinate the placement of support framing and backing plates in walls.

Site Tolerances:

- 1. Maximum Variation from True Position: 1/4"
- 2. Maximum Variation From Plumb: 1/8"

3.4 ADJUSTING

A. Section 01700 - Execution Requirements: Adjusting the installed work.

- Adjust and lubricate hardware for proper operation after installation.
- C. Adjust hardware for uniform clearance at the vertical edge of doors.
- Adjust adjacent components for consistency of line and plane.
- E. In-Swinging Doors: Adjust hinges to locate doors approximately 30 degrees from the closed position when unlatched.
- F. Out-Swinging Doors (and entrance swing doors): Adjust hinges to gently return doors to the fully closed position.
- G. Restore damaged and soiled areas per the manufacturer's recommendations.
- Repair damaged and defective components, where possible, to eliminate defects functionally and visually. Where not possible to repair to the satisfaction of the Owner's representative, replace the damaged units.

3.5 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection.

- Inspect installations for plumb, level, alignment, square, secure and rigid.

3.6 CLEANING

A. Section 01700 - Execution Requirements: Cleaning the installed work.

- Remove protective masking.
- C. Clean exposed and semi-exposed surfaces using materials and by methods recommended by the partitions manufacturer.
- Clean hardware, fittings and accessories.

3.7 PROTECTION

- A. Provide protection, as necessary, to prevent damage during the remainder of the construction to ensure that the work will be without damage and deterioration at the time of final acceptance.

END OF SECTION

SECTION 10200
LOUVERS AND VENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed aluminum wall louvers.
2. Bird screens.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for attachment of units.
2. Section 04230 - Reinforced Unit Masonry: Substrate for attachment of units.
3. Section 07900 - Joint Sealers: Perimeter sealant at louver and vent frames.

1.2 DESCRIPTION OF WORK

A. The extent of the louvers and vents work is indicated on the Drawings and as specified herein, and includes providing and installing louvers and vents with bird screens, anchor devices, flashings and sealants necessary for complete and weather-tight installations.

B. The work of this Section does not include providing and installing louvers for doors specified in Sections 08100 and 08210.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society of Civil Engineers (ASCE):

1. ASCE / SEI 7 - Minimum Design Loads for Buildings and Other Structures.

C. American Society for Testing and Materials (ASTM):

1. ASTM A 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
2. ASTM E 330 - Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
3. ASTM E 199 - Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

- . International Code Council:
 1. International Building Code (IBC), 2009.

1.4 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Procedures for submittals.
 1. Product Data: Provide data describing the design characteristics, maximum recommended air velocity, design free area, materials and finishes.
 2. Shop Drawings: Indicate louver layout plan and elevations, openings and clearance dimensions, tolerances, head, jamb and sill details, blade configuration, screens, blankout areas, and frames.
 4. Samples: When requested, submit 11 x 11 square of each required finish. Prepare samples on metal of the same gage and alloy as that to be used in the work. Where color variations are to be expected, submit two (2) or more samples showing the limits of such variations.
 5. Assurance / Control Submittals:
 - a. Manufacturer's certificate that the Products meet or exceed the specified requirements.
 - b. Calculations indicating that the products and anchorages satisfy the performance requirements.
 - c. Documentation of experience indicating compliance with the specified qualifications requirements.

1.5 COORDINATION

- A. Verify size, locations and placement of louver units prior to fabrication, wherever possible.
- . Coordinate with the mechanical subcontractor for size and location of required louvers and vents.
- C. Where size or location of louvers or vents differ with the drawings, notify the Owner's representative.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
- . Performance Requirements:
 1. Provide capacity to withstand the following loading requirements for exterior units:
 - a. Design and install to resist combined positive and negative windloading in accordance with IBC 2009, Section 1609 with a Vmph of 170, Cs of 74.0 psf, exposure B and importance factor of 1.0 to 1.25 to 1.5 as applicable per ASCE 7.

- b. Height of louver units above ground level are indicated on or can be calculated from the drawings.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Section 0100 - Product Requirements: Transport, handle, store and protect the products.
- B. Protect finished aluminum surfaces with a strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
- C. Deliver product to the Project Site in the manufacturer's original, unopened protective packaging.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 - 1. The Airlite Co.
 - 2. Airline Products, Nystrom Building Products.
 - 3. Construction Specialties, C/S Louvers.
- B. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

- A. Aluminum: ASTM 221, extruded shapes.
- B. Bird Screen: 1/4x 1/4 mesh, aluminum, set in aluminum frame.

2.3 ACCESSORIES

- A. Fasteners and Anchors: Stainless steel.
- B. Flashings: Of the same material as the louver frame.
- C. Sealants: As specified in Section 07900 - Joint Sealers.

2.4 FABRICATION

- A. Louver Panel Thickness: Deep face measurements as shown on the drawings.
- B. Louver Blade Design: Weatherproof, minimum material thickness of 0.081" integral and lateral rain water stops positioned on the blades.
- C. Louver Frame: Channel shape, mechanically fastened corner joints, minimum material thickness of 0.081"
- D. Head and Sill Flashings: Extruded to the required shapes, single length, in one piece per location.

- E. Screens: Install screen mesh in shaped frames, reinforce corner construction, shop install to the louvers with non-ferrous fasteners.

2.5 FINIS

- A. Exposed Aluminum Surfaces: Clear anodized or as selected from the manufacturer's standard finishes.
 - . Maintain same color range within each unit. □o not mix light and dark shades within an assembly.

PART 3 EXECUTION

3.1 EXECUTION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
 - . Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 - C. Report in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. □o not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install louver assemblies in accordance with the manufacturer's published instructions.
 - . Install louvers level, plumb, free of rack and securely attached to the structure.
 - C. Install flashings and align louver assemblies to ensure that moisture sheds from the flashings, and to the exterior.
 - . Secure louvers in opening framing with concealed fasteners as required to meet the Performance Requirements.
 - E. Install perimeter sealant in accordance with Section 07900 - Joint Sealers.

3.3 ISOLATION REQUIREMENTS

- A. Dissimilar Metals: Where aluminum surfaces are in contact with, or fastened to dissimilar metals except stainless steel, zinc or zinc coating, the aluminum shall be protected from the dissimilar metal. Where aluminum contacts another metal, paint the dissimilar metal with epoxy paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.
 - . Cementitious Materials: Paint aluminum where in contact with mortar, concrete, masonry or other cementitious material, with an alkali-resistant coating such as heavy-bodied bituminous paint or epoxy paint.
 - C. Wood Contact: Isolate aluminum from cedar, redwood, oak and acid-treated lumber by means of unbroken 1/8-mil polyethylene construction sheet or a heavy coating of metal-protective paint.
 - . Surfaces in contact with sealants after installation need not be coated with any type of

protective material.

3.4 PROTECTION

- A. Protect the finish from damage during construction by the use of temporary protective coverings approved by the manufacturer.

3.5 ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting the installed work.
 - Remove protective covering at project completion or when directed by the Owner's representative.
- C. Restore finishes damaged during installation and construction so no evidence of the corrective work remains.
 - Return items which cannot be refinished in the field to the shop, make the necessary alterations, and refinish the entire unit, or provide a new unit.

3.6 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
 - Inspect the installations for correct location, alignment and elevation, plumb, level, true to line, free of rack and secure attachment and anchorage.

3.7 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning installed work.
 - Immediately prior to final inspection, remove protective wrappings.
 - C. Wipe down all louver blades and frames before final acceptance.

END OF SECTION

SECTION 1043

SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Accessible signage.
2. Directional signage.
3. Tactile exit signs.
4. Elevator signs.
5. Exit enclosure signs.
6. Instructional signage.
7. Room identification signage.
8. Occupant load signs.
9. Fire fighting equipment signs.
10. Fire wall signs.
11. Floor and roof design load signs.
12. Medication plaque.
13. Exterior signage.

6. Related documents: The Contract documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for attachment.
2. Section 04230 - Reinforced Unit Masonry: Substrate for attachment.
3. Section 09250 - Gypsum Board: Substrate for attachment.
4. Sections of DIVISION 16 - Electrical: Requirements for lighted signs.

1.2 DESCRIPTION OF WORK

- A. The extent of signage work is indicated on the drawings and as specified herein, and includes providing and installing all interior and exterior signage, and all attachment accessories.

- . Signage mounting height shall comply with A□AAG.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

- . Americans with Disabilities Act Accessibility Guidelines (A□AAG):

1. Accessibility Guidelines for Buildings and Facilities.
2. Accessibility Guidelines for Schools.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer's product data and mounting details.
2. Shop Drawings:
 - a. Indicate sign styles, lettering font, foreground and background colors, locations, and overall dimensions of each sign.
 - b. Provide installation details.
3. Samples: Two (2) signs, full size, illustrating the type, style, letter font, colors and method of attachment, when requested.
4. Assurance / Control Submittals:
 - a. Manufacturer's certificate that the products meet or exceed the specified requirements.
 - b. Installation templates, attachment devices, and procedures for the care of finished surfaces.
 - c. Documentation of experience indicating compliance with the specified qualifications requirements.

- . Section 01780 - Closeout Submittals: Procedures for closeout submittal.

A. Warranty: Provide a written standard Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01000 - Product Requirements: Transport, handle, store, and protect the products.

- . Deliver products to the Project Site in the manufacturer's original, unopened protective packaging bearing the manufacturer's name, contents, brand name, and applicable standards.
- C. Handle to prevent damage to surfaces and edges.
- . Store in the manufacturer's original packaging, off the ground and under protective covers.

1.7 WARRANT

- A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
- . Manufacturer's standard for materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with project requirements, manufacturer's offering products which may be incorporated into the work include the following:
 1. Mohawk Sign Systems, Inc.
 2. APCO Graphics Inc.
 3. ASI-Modulex.
 4. West Sign Systems, Inc.
- . Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.2 SIGNAGE

- A. Mohawk Sign Systems, Series 200A, is used as the standard for design and quality.
 1. Construction: Signs shall be of one-piece construction. Added-on and / or engraved characters are not acceptable. Text shall be accompanied by Grade 2 braille.
 2. Design and Location: Comply with ICC A117.1 requirements for visual characters and include the International Symbol of Accessibility.
 3. Tactile characters / symbols: Raised 1/32" from the sign plate face.
 4. Font: Times Roman Extra Black, upper and lower case.
 5. Pictographs: AGA Symbol Signs repro art developed for the U.S. Department of Transportation to be used whenever possible.

2.2.1 ACCESSIBLE SIGNAGE

- A. Accessible Signage: Post signage, including the International Symbol of Accessibility at the following locations:
 1. Accessible entrances when not all entrances are accessible.

2. Accessible dressing, fitting and locker rooms where not all such rooms are accessible.
 3. Accessible areas of refuge.
 4. Exterior areas for assisted rescue.
 5. Other locations required by the Building Code.
- . Directional Signage: Signage, including the International Symbol of Accessibility, indicating the route to the nearest like accessible element at the following locations:
1. Inaccessible building entrances.
 2. Inaccessible public toilets and bathing facilities.
 3. Elevators not serving an accessible route.
 4. At each toilet and bathing room indicating the location of the nearest family or assisted-use toilet or bathing room, where provided.
 5. At exits and exit stairways serving a required accessible space, but not providing an approved accessible means of egress.
- C. Tactile Exit Signs: Provide "EXIT" sign complying with ICC A117.1 adjacent to each door to exit discharge, exit passageway, exit ramp, exit stairway, area of refuge and exterior area for assisted rescue. Text shall read as follows:
- a. At doors providing access to an area of refuge from an adjacent floor area - "AREA OF REFUGE".
 - b. At doors providing access to an exterior area for assisted rescue - "EXTERIOR AREA FOR ASSISTED RESCUE".
- . Elevator Signs: Provide an approved pictorial sign of standard design adjacent to each elevator call station on all floors to read - "IN FIRE EMERGENCY, DO NOT USE ELEVATOR. USE EXIT STAIRS".
- E. Exit Enclosure Signs: Provide at each floor landing in exit enclosures connecting more than three (3) stories. Designate the floor level, terminus of the top and bottom of the enclosure and identification of the stair or ramp. Signage shall state the story of, and direction to, the exit discharge and availability of roof access from the enclosure for the fire department. Comply with the following:
1. Size shall be a minimum 8" x 8"
 2. Letters designating the identification of the stair enclosure shall be a minimum of 2" in height.
 3. All other lettering and numbers shall be a minimum of 1" in height.
 4. Characters and background shall have a non-glare finish. Characters shall contrast in color with their background, with either light characters on a dark background or dark characters on a light background.
 5. Locate 5 feet above the floor landing in a position readily visible when the doors are in the open and closed positions.

- Floor level identification signs in tactile characters complying with ICC A117.1 shall be located at each floor level landing, adjacent to the door leading from the enclosure into the corridor.
- F. Instructional Signage: In areas of refuge and exterior areas for assisted rescue, instructions on the use of the area under emergency conditions shall be posted. Instructions shall include all of the following:
1. Persons able to use the exit stairway do so as soon as possible, unless they are assisting others.
 2. Information on planned availability of assistance in the use of stairs or supervised operation of elevators and how to summons such assistance.
 3. □irections for use of the two-way communications system, where provided.

2.2.2 ROO□ SIGNS

- A Room Identification Signs: Provide wall-mounted signs at each door opening and where indicated on the □rawings.
1. Type A Signs: Size 4_A x □□(typical) at Room entrances indicating room number and name, including braille.
 2. Type P Signs: Size 8□ x 8□ at Toilet Room doors, including the international symbols for □oys / □en, Girls / Women, including braille.
 3. Type □ Signs: Size 2□ x 4□(typical) at secondary spaces, indicating room name only.
 4. Type C Signs: Size 10□ x 10□(typical) directional signs, including braille.
- Occupant Load Signs: Provide an approved legible permanent sign indicating the occupant load for all assembly occupancies. Post in a conspicuous place, near the main exit or exit access doorway from the room or space.
- C. Floor and Roof □esign Load Signs: Where live loads for floors or roofs, or portion thereof, have been designed to exceed 50 psf, post such design load signs in a conspicuous place in that part of each story or roof in which they apply.

2.2.3 FIRE SIGNS

- A Fire Fighting E□uipment Signs: Cabinets containing fire fighting e□uipment such as standpipes, fire hoses, fire extinguishers or fire department valves shall be identified in an approved manner by a permanently attached sign with letters not less than 2□ high in a color that contrasts with the background color, and indicating the e□uipment contained therein.
- Fire Wall Signs: Post effective and permanent signs or stenciling along fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions and any other walls re□uired to have protected openings and penetrations. Such identification shall:
1. □e located in accessible concealed floor, floor-ceiling and attic spaces.
 2. □e repeated at intervals not exceeding 30 feet horizontally along the wall or partition.

3. Include lettering not less than 1/2" in height to read - "FIRE ANCHOR / OR SOURCE OF HAZARD - PROTECT ALL OPENINGS" or other similar wording.

2.3 EXTERIOR SIGNAGE

- A. Subject to compliance with project requirements, manufacturer's offering products which may be incorporated into the work include the following:
 1. Gemini, Inc.
 2. Metal Arts.
 3. Metallic Arts.
- B. Section 01000 - Product Requirements: Product Options: Substitutions permitted.
- C. Metal Signage:
 1. Size: 8" x 12" x 15" x 3" height, stroke, depth, and average width per manufacturer's standard for the size and letter style selected.
 2. Material: Cast aluminum.
 3. Finish: Satin or baked enamel or Anodized color as selected.
 4. Letter Style: As selected.
 5. Mounting: Projected Spacer Mount with aluminum tube spacers.
 6. Lettering / Name: To be provided.
 7. Location: Mount in location shown or as directed.
- D. Manufacturer to provide layout template.

2.4 ENGRAVING PLaque

- A. Metal Plaque:
 1. Size: 1" x 20" x 18" x 18"
 2. Material: Bronze.
 3. Letter Style: Times and Times Bold, engraved copy and logo, color filled, satin finish, straight edge borders.
 4. Mounting: Concealed.
 5. Locations: Mount in locations, as directed.
- B. Owner to provide sample of graphics, Contractor to prepare the artwork.

2.5 FASTENERS AND OTHER MATERIALS

- A. Provide non-corrosive fasteners, hangers, and mounting devices compatible with the sign material and finish. Concealed or of the same color and finish as the components they

secure where exposed to view.

- . Other materials, not specifically described but required for a complete and proper installation shall be as selected, and subject to approval.
- C. Sign face surfaces shall not be deformed, distorted or discolored by the attachment of fasteners.

PART 3 EXECUTION

3.1 EXECUTION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
 - . Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 - 1. Examine walls, doors, ceilings and other areas scheduled to receive signs for conditions that would affect quality and execution of the work. Notify the Owner's representative if a sign will be obscured from view at any location.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install signage in accordance with the manufacturer's published instructions, and with AIAAG.
- . Install sign units and components at the locations shown or scheduled, securely mounted with concealed, theft-resistant fasteners.
- C. Install level, plumb, and at the proper height. Cooperate with other trades for the attachment of sign units to finish surfaces.
- . Installations shall withstand normal wear and tear.
- E. Exterior installations shall withstand environmental actions of wind and rain, and normal wear and tear.

3.3 CONSTRUCTION

- A. Interface with Other Work:
 - 1. Furnish full-size spacing templates for individually bundled letters and numbers for coordination with the work of other trades.
 - 2. Furnish wiring diagrams for illuminated signs for coordination with the electrical trade for service to lighted units.

3.4 ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting installed work.
 - . Adjust signage, as necessary, for proper mounting height, plumb, level and secure

attachment.

3.5 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection.

- . Inspect signage locations, attachments, and messages to verify that the installations conforms to the drawings or information provided.

3.6 CLEANING

A. Section 01700 - Execution Requirements: Cleaning the installed work.

- . Remove protective materials from surfaces.

C. Wipe clean before final acceptance inspection.

END OF SECTION

SECTION 10520

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SU□□AR□

A. Section Includes:

1. Fire extinguishers.
2. □ounting brackets.
3. Fire hose cabinets.
4. □ounting brackets.

- . Related □ocuments: The Contract □ocuments, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional re□uirements and information necessary to complete the work of this Section may be found in other □ocuments.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for attachment.
2. Section 04230 - Reinforced Unit □asonry: Substrate for attachment.
3. Section 09110 - Non-Load □earing Steel Framing: Wall framing for attachment of extinguishers and cabinets .
4. Section 09250 - Gypsum □oard: Adjacent wall finish.

1.2 □ESCRPTION OF WOR□

- A. The extent of the fire protection work is indicated on the □rawings and as specified herein, and includes providing and installing fire extinguisher cabinets, fire extinguishers, fire hose cabinets with hoses, and all mounting brackets, devices and accessories.
- . Fire protection shall comply with the □uilding Code, and regulations of the governing authorities having jurisdiction.

1.3 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.
- . National Fire Protection Association (NFPA):
1. NFPA 10 - Portable Fire Extinguishers.
- C. Underwriters Laboratories, Inc. (UL):

1. UL 299 - Dry Chemical Fire Extinguishers.

□. Americans with Disabilities Act Accessibility Guidelines (ADAAG):

1. Accessibility Guidelines for Buildings and Facilities.

2. Accessibility Guidelines for Schools.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer's specifications, data and list of items.

a. Extinguishers: Type, operational features, color.

b. Extinguisher: Type, materials, construction, features, finish, color and attachment method.

c. Fire Hose Cabinets: Type, materials, construction, features, finish, color and attachment method.

2. Shop Drawings: Show fabrication and installation details including anchorage and interface with adjacent materials.

3. Assurance / Control Submittals:

a. Documentation of experience indicating compliance with the specified qualifications requirements.

1.5 COORDINATION

A. Coordinate support and opening requirements with other trades.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

□. Regulatory Requirements: Conform to NFPA 10 and the local governing authorities having jurisdiction for extinguisher locations and mounting heights.

C. Obtain products from one fire protection specialty manufacturer.

□. Portable fire extinguishers to be UL-listed and bear a UL Listing mark® for the type, rating and classification of extinguisher indicated.

1.7 DELIVERY, STORAGE AND HANDLING

A. Section - 0100 - Product Requirements: Transport, handle, store and protect the products.

- B. Deliver products to the Project Site in the manufacturer's original, unopened protective packaging.
- C. Store to prevent damage to materials, finishes and operating mechanisms.

PART 2 PRODUCTS

2.1 GENERAL

- A. Provide extinguisher and holder only where "AFE" is shown on the drawings. Provide cabinet and extinguisher where "FEC" is shown. Provide hose cabinet where "FC" is shown.

2.2 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
 1. UL Industries, Inc.
 2. Larsen's Manufacturing Company.
 3. Potter Roemer - Fire Protection Equipment.
- B. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.3 MATERIALS

- A. (FE-1) Fire Extinguisher (at light hazard areas): Multipurpose dry chemical, UL 299 UL-rated 4-A:0:C 10 lb. nominal capacity cylinder with pressure gage and hose. Finish as selected.
 1. UL Industries: Cosmic Series.
 2. Larsen's: P Series.
 3. Potter Roemer: 3002-3020.
- B. (FE-2) Fire Extinguisher (at kitchens and mechanical rooms): Surface-mounted Halotron 15-1/2 lbs. nominal capacity cylinder with pressure gage, nozzle and wall mounting bracket. Finish as selected.
 1. UL Industries: Mercury Series.
 2. Larsen's: T Series.
 3. Potter Roemer: 3101-3115.
- C. (FE-3) Fire Extinguisher (at Parking Garages): Surface-mounted regular dry chemical 20 lbs. nominal capacity cylinder with pressure gage, hose and wall mounting bracket. Finish as selected.
 1. UL Industries: Galaxy Series.

2. Larsen: C Series.
 3. Potter Roemer: 3302-3320.
- . Mounting Bracket: Device necessary for holding extinguishers and hoses in place. Designed to prevent the accidental dislodging of extinguisher. Size as required for the type and capacity of extinguisher specified. Screw attached to the wall. Fire extinguisher manufacturer's recommended standard type. Enameled steel finish.
- E. Identification Sign. As approved by Fire Department.
- F. Fire Extinguisher and Fire Hose Cabinets:
1. General: Manufacturer's standard fully welded construction with exposed to view (including inside the cabinet) welds ground smooth and blended with the adjacent surfaces. Jitter and weld perimeter door frames.
 2. Door Lock: Self contained keyed cylinder lock assembly with internal cabinet trip lever. Key cabinets alike and provide ten (10) keys.
 3. Pulls: 5/16" diameter x 4" c.c. x 1-1/8" projection wire (rod) aluminum pull.
 4. Door Hinge: Continuous piano type.
 5. Decal: Instruction decal on face of door.
- . Finishes: Exposed-to-view exterior and interior surfaces of cabinets and doors, interior tub, and door pull. Finish shall be manufacturer's standard:
- a. Unaked enamel coating. □
 - b. Polyester coating. □
 - c. Stainless steel. □
 - d. Anodized aluminum. □
7. Identification: Copy to read "Fire Extinguisher" or "Fire Hose", or such other copy necessary to indicate the primary fire device therein each unit. Letter style to be selected from manufacturer's standards.
- G. (FEC-1) Fire Extinguisher and Cabinet: Fully-recessed, 3/8" flat trim, horizontal duo panel style with 1/8" Solargray glass with block letters. Tub: 9" x 24" x 4" or as approved. AAG compliant.
1. L. Industries: 1525.
 2. Larsen: AL-C 2409-R.
 3. Potter Roemer: 7340.
- . (FEC-2) Fire Extinguisher and Cabinet: Semi-recessed, 1-1/4" square edge trim formed aluminum frame and door with rolled edges. 1/8" thick clear acrylic bubble door with block letters. Tub: 9" x 24" x 4" or as approved. AAG compliant.
1. L. Industries: Clear U Series, Model No. 1527.

2. Larsen: AL-C 2409-R.
 4. Potter Roemer: Loma Series, Model No. 7342.
- I. (FEC-3) Fire Extinguisher and Cabinet: Surface-mounted, door / frame, clear acrylic bubble door with block letters. Tub: 11-1/2"W x 2-1/2" x 4" or as approved. AAG compliant.
1. L. Industries: S Series.
 2. Larsen: AL-C 2409-S.
 3. Potter Roemer: 7344.
- (F) Fire Hose Cabinet: Semi-recessed, formed aluminum frame and door, solid door panel 1-1/4" square edge 2-1/2" rolled edge Cabinet size 38" x 2" x 8" or as approved. Include fire hose and fire department valve. AAG accessible.
1. L. Industries: 42427
 2. Larsen: AL-C238-R
 3. Potter Roemer: 1000 Series
- Fire Hose Rack Assembly: For one man operation. 1-1/2" F-approved hose and valve with single jacket lined hose. UL-rated industrial fog nozzle, pin rack and cast brass coupling, angle valve with escutcheon and nipple. Rated 100 GPM at 5 psi at nozzle. Hose length as selected.
1. L. Industries: 3000 Series.
 2. Guardian Fire Equipment, Inc.: 3000 Series.
 3. Potter Roemer: 2500 Series.

PART 3 EXECUTION

3.1 EVALUATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
- Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 1. Verify that rough openings for cabinets are correctly sized and located.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install brackets, cabinets and extinguishers in accordance with the manufacturer's published instructions.
- Coordinate anchorage, support and opening requirements with other installers.

- C. Install in locations and at the mounting heights indicated and as required by applicable regulations of the governing authorities having jurisdiction.
- Securely fasten mounting brackets and fire equipment cabinets to the structure mount square, level and plumb.
- E. Mount brackets so the height of the top of extinguishers is in compliance with AIAAG or not more than 0 above the finished floor.
- F. Install identification signage approved by Fire Department where not part of equipment.
- G. Do not install defective or damaged units that can not be restored or repaired to the satisfaction of the Owner's representative.
- Turn over lock keys to the Owner's representative.

3.3 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
- Inspect brackets installations for secure attachment and for plumb.
- C. Inspect cabinet installations for secure attachment and for plumb, level, square and flush.

3.4 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- Touch-up abraded paint coatings with matching paint.
- C. Clean units of dirt, stains, and mars without damage to the finishes.

END OF SECTION

SECTION 10810
TOILET ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Toilet accessories.
2. Attachment hardware.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 05100 - Rough Carpentry: Placement of backing and blocking for attachment of accessories.
2. Section 09110 - Non-Load Bearing Steel Framing: Placement of backing plate reinforcement for attachment of accessories.
3. Section 10150 - Phenolic Toilet Partitions: Substrate for mounting toilet accessories.
4. Section 10105 - Plastic Laminate Toilet Partitions: Substrate for mounting toilet accessories.

1.2 DESCRIPTION OF WORK

A. The extent of toilet accessories work is indicated on the Drawings and as specified herein, and includes providing and installing the various accessory types, locks, keys and miscellaneous attachment hardware.

B. Mounting heights for toilet accessories shall comply with ADAAG, as applicable.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM A 123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A 167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
3. ASTM A 36 - Specification for Steel, Carbon, Cold-Rolled, Commercial Quality.

C. Americans with Disabilities Act Accessibility Guidelines (ADAAG):

1. Accessibility Guidelines for Buildings and Facilities.
2. Accessibility Guidelines for Schools.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer's catalog and data for each accessory describing size, finish, details of function and attachment method.
2. Samples: Submit one (1) sample of each item and model specified, if requested.
3. Manufacturer's recommended maintenance and operating instructions, parts manual and keys for each item and lock.
4. Assurance / Control Submittals:
 - a. Manufacturer's certificate that products meet or exceed the specified requirements.
 - b. Documentation of experience indicating compliance with the specified qualifications requirements.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

1. Deliver accessories Schedule, keys and Parts Manual for Owner's permanent records. Provide two (2) sets of the following items of manufacturer's literature:
 - a. Technical data sheets for each accessory item.
 - b. Service and Parts Manuals.
 - c. Name of a local representative to be contacted in the event of need for field service or consultation.
2. Warranty: Submit a manufacturer's special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Regulatory Requirements: Comply with Americans with Disabilities Act Accessibility Guidelines (ADAAG). Verify mounting heights and clearances prior to installation.

C. All accessories alike shall be the product of a single manufacturer.

- . Keyed (tumbler lock) accessories shall be keyed alike except for coin receiving boxes on vending equipment.

1.6 ELIQUER, STORAGE AND ANCHLING

- A. Section 0100 - Product Requirements: Transport, handle, store and protect products.
- . Deliver products to the Project Site in the manufacturer's original, unopened protective packaging, labeled bearing the manufacturer's name and the type of accessory.
- C. Store materials in their original protective packaging to prevent soiling, wetting and physical damage.
- . Handle to prevent damage to finish surfaces.
- E. Maintain protective covers on all units until installation has been completed. Remove coverings during final clean-up.

1.7 WARRANT

- A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
- . Special Warranty:
 - 1. Provide a written Warranty signed by the manufacturer certifying that the products are free of defective materials and workmanship and agreeing to replace or repair any defective item, in whole or in part, as necessary to restore the product to its original intended state and integrity.
 - 2. Warranty Period:
 - a. Stainless Mirror Frames: Fifteen (15) years against corrosion.
 - b. Plate Glass Mirrors: Fifteen (15) years against silver spoilage.
 - c. Tempered Glass Mirrors: Five (5) years against silver spoilage.
 - d. Laminated Glass: Five (5) years against silver spoilage.
 - e. Hand Dryers: Ten (10) years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering the specified items which may be incorporated into the work include the following:
 - 1. American Specialties, Inc.
 - 2. Kobrick Washroom Equipment, Inc.
 - 3. Bradley Corp.
 - 4. GOO Corporation

5. San Ramon Oceans Corporation

TC Corporation

Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

A. Sheet Steel: ASTM A 36

Galvanized Sheet Steel: ASTM A 36, ASTM A 123 to 1.25 ounces per square foot.

C. Stainless Steel Sheet: ASTM A 167, Type 304.

Expansion Shields: Fiber, lead or rubber as recommended by the accessory manufacturer for the component and substrate.

E. Fasteners, Screws and Bolts: Hot-dip galvanized, tamper-proof. The finish of exposed fasteners shall match the finish of the item secured.

2.3 MANUFACTURE UNITS

A. TA-1 Liquid Soap Dispenser:

1. Model Numbers:

a. American Specialties: 9343.

b. Kobrick: K-2112.

c. Bradley: B542.

2. Description: Surface-mounted, horizontal tank-type dispenser for all-purpose liquid soap. 22 gage, Type 304 satin finish stainless steel container drawn one-piece seamless body mounting bracket attached to back plate for attachment to wall plate concealed, vandal-resistant mounting. Unbreakable, clear acrylic refill indicator window lockable hinged stainless steel lid for top filling special key. Capacity: minimum, 40 ounces. Molded plastic push button and spout. Corrosion resistant to most soaps and detergents. AAG compliant.

TA-1A Touch Free Foam Soap Dispenser

1. Model Number:

a. Goob TF 532.02

b. TC 450017

2. Description: Surface mounted foaming hand soap dispenser. Refillable. Battery operated automatic touch free dispenser, with skylight window. AAG compliant. 1200 mL refills.

3. Refills: Provide two (2) additional refill packets for each soap dispenser

TA-2 Mirror with Stainless Steel Frame:

1. Model Numbers:

- f. American Specialties: 0000.
 - g. Kobrick: K-290 Series.
 - h. Bradley: 780 Series.
2. Description: 1/4" polished, tempered glass mirror. One-piece, roll-formed, 18 gage, Type 304 satin finish stainless steel angle frame—mitered corners welded, ground and polished. Concealed hanging bracket locked into top and bottom of frame with tamper-proof set screws. One piece water-resistant back attached to frame with theft-resistant locking device. Manufacturer's standard size, as indicated.
- C. TA-3 Stainless Steel Mirror:
- 1. Model Numbers:
 - a. American Specialties: 0000.
 - b. Kobrick: K-290 Series.
 - c. Bradley: 780 Series.
 - 2. Description: Same as TA-2 except with Type 304 polished stainless steel mirror.
- D. TA-4 Combination Paper Towel Dispenser and Waste Receptacle:
- 1. Model Numbers:
 - a. American Specialties: 0409.
 - b. Kobrick: K-3944.
 - c. Bradley: 234.
 - 2. Description: Recessed, 22 gage, Type 304 satin finish stainless steel, all-welded cabinet. 22 gage, satin finish stainless steel, drawn and beveled one-piece seamless flange. 22 gage, Type 304 satin finish stainless steel dispenser door secured to cabinet with full-length stainless steel piano hinge—semi-concealed tumbler lock. 22 gage, Type 304 satin finish stainless steel dispenser—rounded towel tray with hemmed opening. Capacity: 100 C-fold or 800 multi-fold paper towels. 22 gage, Type 304 satin finish stainless steel waste receptacle—all edges hemmed—secured to cabinet with tumbler lock. Capacity: 12 gallons. Interior hooks for optional vinyl liner. A—AAG compliant.
- E. TA-5 Paper Towel Dispenser:
- 1. Model Numbers:
 - a. American Specialties: 0215.
 - b. Kobrick: K-2021.
 - c. Bradley: 252.

2. Description: Surface-mounted, 22 gage, Type 304 satin finish stainless steel, all-welded cabinet. Hemmed opening towel tray. 22 gage, Type 304 satin finish stainless steel door, secured to cabinet with full-length stainless steel piano hinge and tumbler lock. Capacity: 200 C-fold or 275 multi-fold paper towels. AAG compliant.

TA-5A Automatic Paper Towel Dispenser

1. Model Numbers:
 - a. San Amar Oceans Tear-N-Try
 - b. Timvery P-02
2. Description: Touchless towel dispensing system with automatic portion control to dispense, adjustable sheet length setting. Battery operated, dispenser automatically operates with user's motion. For rolls 8" wide x 8 1/2" diameter and 4" diameter stub roll with lock.
3. Refills: Provide six (6) refill rolls for each towel dispenser.

F. TA-6 Waste Receptacle:

1. Model Numbers:
 - a. American Specialties: 0828.
 - b. Dobrick: D-279.
 - c. Bradley: 357
2. Description: Surface-mounted 22 gage, Type 304 satin finish stainless steel. Top and bottom edges hemmed. Minimum 1.5 gallons capacity. Looks for re-useable vinyl liner.

G. TA-7 Electric Hand Dryer:

1. Model Numbers:
 - a. American Specialties: 0195.
 - b. Dobrick: D-7507.
 - c. Bradley: 2899-28.
2. Description: One piece cast-iron housing, high gloss porcelain enamel finish acid-resistant automatic sensor. 4" projection, maximum. AAG compliant.

H. TA-8 Touchless Paper Towel Dispenser:

1. Model Numbers:
 - a. Bradley: 2490.
 - b. Taintex, Inc: enotion.

2. Description: Surface-mounted, automatic touchless paper towel dispenser. Battery operated high impact translucent plastic door roll towels key-activated spring lock.
- I. TA-9 Sanitary Napkin / Tampon Dispenser:
1. Model Numbers:
 - a. American Specialties: 0408.
 - a. Kobrick: 3500 Series.
 - b. Bradley: 4017 Series.
 2. Description: Semi-recessed, 18 or 22 gage, Type 304 satin finish stainless steel cabinet. 18 gage, Type 304 satin finish stainless steel door attached to cabinet with full-length stainless steel piano hinge held closed with two (2) tumbler locks keyed alike with manufacturer's other accessories. 22 gage stainless steel internal coin box secured by separate lock keyed differently from door locks. Coin mechanism convertible, replaceable in the field without removing cabinet factory installed coin operation denomination to be determined. Body and door of welded construction with burr-free edges no exposed fasteners or welded seams. Provide collar, as necessary, for semi-recessed mounting. Capacity: 30 napkins and 27 tampons, minimum. AAG compliant.
- TA-10 Partition-mounted, Dual Access Sanitary Napkin / Tampon Disposal:
1. Model Numbers:
 - a. American Specialties: 0472 (for two compartments) / 0473 (for single end compartment).
 - b. Bradley: 4721-15 (for two compartments) / 4722-15 (for single end compartment).
 2. Description: Partition-mounted dual napkin disposal serves two compartments. 22 gage, Type 304 satin finish stainless steel flanges one-piece seamless construction, 1 wide with 1/4 return, adjustable for partitions thickness. 22 gage, Type 304 satin finish stainless steel cabinet. All welded construction with one flange welded to cabinet. 22 gage, Type 304 satin finish stainless steel, self-closing push flap door on each side heavy-duty, full-length, spring loaded, stainless steel piano hinges doors operate independently. 22 gage, Type 304 stainless steel waste container with tumbler locks keyed alike with manufacturer's other accessories hemmed finger grip, removable from one side only. Capacity: 1.5 gallons. Body and doors welded construction burr-free beveled edges. International graphic waste symbol affixed to doors. AAG compliant.
- End compartment unit similar but recess-mounted in side wall.
- TA-11 Toilet Seat Cover Dispenser:
1. Model Numbers:
 - a. American Specialties: 0477S.
 - b. Kobrick: K-221.
 - c. Bradley: 583.

2. Description: Surface-mounted 22 gage, Type 304 satin finish stainless steel all welded construction. Capacity 250 single or half-fold seat covers.
- L. TA-12 Multi-Roll Tissue Dispenser:
1. Model Numbers:
 - a. American Specialties: 9030.
 - b. Kobrick: K-2888.
 - c. Bradley: 5402.
 2. Description: Surface-mounted 22 gage, Type 304 satin finish stainless steel cabinet. All welded construction. 18 gage drawn, one-piece, Type 304 satin finish stainless steel door, pivot hinge and tumbler lock. 18 gage stainless steel dispensing mechanism, inner housing and cam. Heavy-duty, one-piece, theft-resistant, molded ABS spindles. Holds 2 standard core 5-1/4" diameter tissue rolls. Reserve roll automatically drops in-place when bottom roll is depleted.
- M. TA-13 Toilet Grab Bar:
1. Model Numbers:
 - a. American Specialties: 3100 Series, Type - 5
 - b. Kobrick: K-5837.
 - c. Bradley: 832 Series.
 2. Description: Heavy-duty, 1-1/4" diameter, horizontal, 1-1/2" wall clearance. 18 gage, Type 304 satin finish stainless steel. Concealed screw attached mounting and anchorage. 3" flange 11 gage, Type 304 satin finish stainless steel. Minimum 900 pounds supporting capacity. Length as indicated, ADA compliant.
- N. TA-14 Robe Hooks:
1. Model Numbers:
 - a. American Specialties: 7345.
 - b. Kobrick: K-727.
 - c. Bradley: 9124.
 2. Description: Double robe hook, Type 304 satin finish stainless steel. Concealed mounting. 4" wide bar with end hooks. Projects 1-5/8" minimum, from wall.
- O. TA-15 Shower Curtain Rod / Hooks / Curtain:
1. Model Numbers:
 - a. American Specialties: 1214 / 1200-SU / 1200-

- b. Kobrick: K-107 / 204-1 / 204-3.
 - c. Bradley: 953 / 953K / 9537.
 - 2. Description: Heavy-duty, 20 gage, 1" diameter, Type 304 satin finish stainless steel rod screw anchored attachment length as required. Stainless steel hooks for 1" rod. 8 gage, flame-resistant, anti-bacterial vinyl fabric shower curtain, length as required color white.
- P. TA-1 Soap Dish:
 - 1. Model Numbers:
 - a. American Specialties: 7404.
 - b. Kobrick: K-4380.
 - 2. Description: Recessed, heavy-duty, one-piece construction, drawn and seamless. 22 gage, Type 304 satin finish stainless steel.
- Q. TA-17 Shower / Tub Grab Bar:
 - 1. Model Numbers:
 - a. American Specialties: Series 3100, Type-02.
 - b. Kobrick: K-580 Series.
 - c. Bradley: 832 Series.
 - 2. Description: 1-1/4" diameter, diagonal, 1-1/2" wall clearance. 18 gage, Type 304 satin finish stainless steel. Peened grip. Concealed screw attached mounting and anchorage. 3" flange 11 gage, Type 304 satin finish stainless steel. Minimum 900 pounds supporting capacity. Length as indicated. AAG compliant.
- R. TA-18 Shower Seat:
 - 1. Model Numbers:
 - a. American Specialties: 820K
 - b. Kobrick: K-5181.
 - c. Bradley: 95K9.
 - 2. Description: Reversible, folding seat. Type 304 satin finish stainless steel frame, legs, flanges and bracket. 1/2" thick solid phenolic slatted seat self-locking mechanism. Color as selected. AAG compliant.
 - 3. Provide one at each accessible Shower.
- S. TA-19 Corner Shower Seat:
 - 1. Model Numbers:
 - a. American Specialties: 0010.

- b. Bradley: 954.
 - 2. Description: Folding, corner-mounted Type 304 satin finish stainless steel seat, support brackets and retainer clip. Secured to one wall with full length stainless steel piano hinge and other wall by bracket. Retainer clips to hold seat upright. Channel formed edges. Size: 15x 15
- T. TA-20 Top Holder:
 - 1. Model Numbers:
 - a. American Specialties: 1315.
 - b. Kobrick: K-224.
 - 2. Description: 18 gage, Type 304 satin finish stainless steel. 8 deep shelf with return. 3 long. 4 rubber mop holders, 3 rag hooks rod below shelf.

2.4 MANUFACTURE UNITS FOR APARTMENT BATHROOMS (ATA)

- A. ATA-1 Medicine Cabinet, Recessed:
 - 1. Model Number:
 - a. American Specialties: 0952.
 - b. Kobrick: K-398.
 - c. Bradley: 175.
 - 2. Description: Recessed, satin finish stainless steel cabinet. Swing door with 1/4 plate glass mirror. 20 gage cabinet and mirror frame. 3 stainless steel adjustable shelves. Full-length heavy-duty stainless steel piano hinge, magnetic catch. Approximately 1W x 2 x 3-5/8.
 - 3. One each Bathroom.
- B. ATA-2 Towel Bar:
 - 1. Model Number:
 - a. American Specialties: 730.
 - b. Kobrick: K-73.
 - c. Bradley: 9055.
 - 2. Description: 3/4 square, heavy-gage, Type 304 bright polished stainless steel tubing. 22 gage, Type 304 stainless steel flanges and support arms. 1 gage, concealed stainless steel mounting brackets. All welded construction. Secured with stainless steel locking set-screws. 1 gage, Type 304 stainless steel wall plates. 3-1/4 projection, minimum length as shown.
 - 3. One each Bathroom.
- C. ATA-3 Toilet Tissue Holder:

1. Model Number:
 - a. American Specialties: 7305.
 - b. Kobrick: K-85.
 - c. Bradley: 5085.
 2. Description: Surface-mounted, bright polished stainless steel, standard size tissue holder. Chrome-plated plastic spindle.
 3. One each watercloset.
- D. ATA-4 Toilet Grab Bar:
1. Model Number:
 - a. American Specialties: 3100 Series, Type 5
 - b. Kobrick: K-5837.
 - c. Bradley: 832 Series.
 2. Description: See TA-13.
 3. One each watercloset.
- E. ATA-5 Shower / Tub Grab Bar:
1. Model Number:
 - a. American Specialties: 3100 Series, Type-02.
 - b. Kobrick: K-580 Series.
 - c. Bradley: 832 Series.
 2. Description: See TA-17.
 3. One each Shower / Bathtub.
- F. ATA-6 Shower Curtain Rod / Hooks / Curtain:
1. Model Number:
 - a. American Specialties: 1214 / 1200-SU / 1200-.
 - b. Kobrick: K-107 / 204-1 / 204-3.
 - c. Bradley: 953 / 953 / 9537.
 2. Description: See TA-15.
 3. One each Shower / Bathtub.
- G. ATA-7 Towel Pin:

1. Model Number:
 - a. American Specialties: 7301.
 - b. Kobrick: K-77.
 - c. Bradley: 9315.
 2. Description: 10 gage, Type 304 stainless steel cap welded to support arm. 22 gage, Type 304 stainless steel flange and support arm. 10 gage concealed stainless steel mounting bracket. All welded construction. Secured with stainless steel set-screws. 10 gage, Type 304 stainless steel wall plate. 3-3/8" minimum projection. Bright polished finish. AAG compliant.
 3. One each Bathroom.
- ATA-8 Shower Seat:
1. Model Number:
 - a. American Specialties: 8205-R / L.
 - b. Kobrick: K-517 / 518.
 2. Description: 1-1/2" thick, foam padded, fold-down seat. White / off-white water-resistant naugahyde cover on enclosed 1/2" thick marine grade plywood base. Stainless steel frame and mounting brackets self-locking mechanism. Right or left hand to suit conditions. AAG compliant.
 3. One each Shower.
- ATA-9 Soap Dish, Recessed:
1. Model Number:
 - a. American Specialties: 0398.
 - b. Kobrick: K-4390.
 - c. Bradley: 940.
 2. Description: Recessed, heavy-duty, stainless steel dish with bar. 19 gage, Type 304 stainless steel. Drawn and beveled, one-piece, seamless construction. 22 gage, Type 304 stainless steel retaining clip. 3/16" thick, Type 304 stainless steel bar. Matte polished finish.
 3. One each Shower / Bathtub.

2.5 FABRICATION

- A. Weld and grind smooth joints of fabricated components.
- B. Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches and dents.
- C. Fabricate grab bars of tubing, free of visible joints, return to wall with end attachment flanges.

- D. Shop assemble components and package complete with fittings and anchors.
- E. Provide steel anchor plates, adapters and anchor components necessary for secure installation.
- F. Back paint components where in contact with building finishes to prevent electrolysis.

PART 3 EXECUTION

3.1 QUALIFICATION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
 - D. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.
 1. Verify that wall openings for recessed accessories are correctly located and of proper dimensions.
 2. Verify that attachment blocking and backing plates are in place, plumb and level, and in the correct location for attachment of accessories.
 4. Check areas to receive surface-mounted accessories for conditions that would affect quality and execution of the work.
 5. Verify spacing of plumbing fixtures and toilet partitions that affect installation of accessories.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Deliver inserts and rough-in frames to the Project Site for scheduled installation.
- D. Provide and use templates and rough-in measurements as required.

3.3 INSTALLATION

- A. Install fixtures, accessories, and items in accordance with the manufacturer's instructions, AIAAG and as indicated on the drawings.
- D. Install at the locations and heights indicated or as required, plumb and level, securely and rigidly anchored to the substrate.
- C. Install manufacturer's recommended anchor system for all grab bars.
- D. Conceal evidence of drilling, cutting and fitting on adjacent finishes.
- E. Fit flanges of accessories snug to wall surfaces. Provide caulking in gaps between 90 degrees return flanges and finish wall surface after accessories are installed.

3.4 ADJUSTING

- A. Section 01700 - Execution Requirements: Adjusting the installed work.

- . Adjust accessories for proper operation.
- C. □erify that mechanisms function smoothly.

3.5 FIEL□ □UALIT□ CONTROL

- A. Section 01450 - □uality Control: Field inspection.
- . Inspect accessories to ensure secure attachment to the substrates, proper locations and mounting heights in compliance with A□AAG.

3.□ CLEANING

- A. Section 01700 - Execution Re□uirements: Cleaning the installed work.
- . Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces prior to final inspection.

EN□ OF SECTION

SECTION 12484
FLOOR MATS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Reversible floor mats.
2. Recessed mat frames.
3. Accessories.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03302 - Cast-in-Place Concrete: Floor substitute.
2. Section 08400 - Entrances, Storefronts and Windows: Entrance doors.
3. Section 09300 - Tile: Floor finish.
4. Section 0950 - Resilient Flooring: Floor finish.

1.2 DESCRIPTION OF WORK

A. The extent of the floor mats and frames work is as indicated on the Drawings and specified herein, and includes providing and installing reversible mats, recessed stainless steel frames and accessories necessary for proper installation.

B. Mat and frame installations shall comply with the Building Code and AIAAG.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM D 117 - Practice for Operating Salt Spray (Fog) Apparatus.
2. ASTM D 2047 - Test Method for Static Coefficient of Friction of Polish - Coated Flooring Surfaces as Measured by the James Machine.
3. ASTM E 848 - Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

C. Americans with Disabilities Act Accessibility Guidelines (AIAAG):

1. Accessibility Guidelines for Buildings and Schools.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer's published descriptive literature, complete specifications, installation instructions, method of installation, and substrate preparation.
2. Shop Drawings: Show layout, profiles and product components, include details, direction of traffic, spline locations, anchorage, accessories, finish colors, patterns and textures.
3. Samples: For each type and color of exposed mat, frame and accessory required, two (2) - 12"x 12" samples of the mat material and frame.
4. Assurance / Control Submittals:
 - a. Certified test reports showing compliance with the specified performance characteristics and physical properties.
 - b. Documentation of experience indicating compliance with the specified qualifications requirements.
5. Maintenance Data: Manufacturer's printed instructions for cleaning and maintaining the mats.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

1. Special Warranty: Submit a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing Products specified with a minimum of five (5) years documented experience.
2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Flammability: Minimum 0.45 watts / sq. m. in accordance with ASTM E 648, Class 1.

C. Slip Resistance: Minimum 0.40 for assembled routes in accordance with ASTM D 2047.

D. Single Source Responsibility: Obtain all floor grids and frames from a single manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01000 - Product Requirements: Transport, handle store and protect Products.

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

- C. Deliver materials to the Job Site ready for use and fabricated in sections and assemblies as large as practical.
- D. Protect finished aluminum surfaces with strippable coating. Do not use adhesive paper or sprayed coating which bond when exposed to sunlight or weather.
- E. Deliver materials to the Project Site in the manufacturer's original, unopened packages, containers or bundles bearing the brand name and identification of manufacturer.
- F. Storage and protection: Store mats and metal frames under weatherproof covering, in a dry and protected location until ready for installation. Ventilate to avoid condensation.

1.7 COORDINATION

- A. Coordinate the frame installation with the concrete construction to ensure that the recess and frame anchorage are accurately located, and the base is level and flat. Refer frame installation until the building enclosure is complete and interior finish work is in progress.

1.8 WARRANTY

- A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
 - D. Special Warranty:
 1. Provide a written Warranty that the products are free of defective materials and workmanship, and will repair or replace any defective component or the system, in whole or part, as necessary to restore the product to its original intended state and integrity.
 2. Warranty Period: Five (5) years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with Project requirements, manufacturers offering products which may be incorporated into the work include the following:

1. ATS, Inc.

- D. Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

- A. ATS, Inc. component designations are used within this Section to identify mat and frame types.

1. Recessed Foot Grid: Nuway Tuftguard by ats, Inc.

2. Frame: Aluminum, Deep Frame®, 1-1/4" mat and frame depth.

3. ats: Alternating aluminum and unbuffered rubber strips with PVC spacers to allow for the passage of water and debris reversible.

- D. Fabrication:

1. Fabricate mats to the greatest extent possible, in single units for each installation, but do not exceed the manufacturer's maximum size recommendation for units to be removed for cleaning and reversal. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Size as shown on drawings.
2. Provide frames in single lengths. When frame dimensions exceed the maximum lengths available, use the least number of pieces possible, with hairline joints equally spaced, and spliced with straight connection pins.
3. Iterate corners and join with corner gusset and plates for hairline joints.
4. Coat the surfaces of frames to be installed in contact with cementitious material, with a zinc chromate primer.

PART 3 EXECUTION

3.1 EXECUTION

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.
 - . Verification of Conditions: Verify that field measurements, surfaces, substrates, and conditions are as required, and ready to receive the work.
- C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Manufacturer shall provide assistance and guidance, and provide a template for irregular shaped grid assemblies to ensure proper installation.

3.3 INSTALLATION

- A. Strictly comply with the manufacturer's installation instructions and recommendations.
 - . Set the mat height as recommended by the manufacturer for the most effective cleaning action.
 - C. Coordinate the top of mat surfaces with the bottom of doors that swing across to provide ample clearance between the door bottom and top of the mat.
 - . Coordinate the installation with adjacent work to avoid a tripping hazard.
 1. The installation shall comply with AIAAG.

3.4 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field inspection.
 - . Inspect the installation and relationship to adjacent floor finishes to ensure avoidance of trip hazards.

3.5 CLEANING

- A. Section 01700 - Execution Requirements: Cleaning the installed work.
- . Refer to the manufacturer's Cleaning and Maintenance Instructions.

3.□ PROTECTION

- A. After completing the frame installation and concrete work, provide a temporary filler of plywood or fiberboard in the recess, and cover the frames with plywood protective flooring. Install mats for Substantial Completion of the Project.
- . Maintain the temporary protection until construction traffic has ended and the Project is near Substantial Completion.

EN□ OF SECTION

SECTION 12492

LINOS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Horizontal metal slat louver blinds.
2. Mounting system.
3. Operating hardware.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for attachment.
2. Section 04230 - Reinforced Unit Masonry: Substrate for attachment.
3. Section 09110 - Non-Load Bearing Steel Framing: Structure for attachment.
4. Section 09250 - Gypsum Board: Adjacent wall finish.

1.2 DESCRIPTION OF WORK

A. The extent of the horizontal metal blinds work is indicated on the Drawings and as specified herein, and includes providing and installing slat louver blinds, mounting systems and operating hardware and devices.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Data indicating the physical and dimensional characteristics and operating features.
2. Shop Drawings: Indicate opening sizes, quantities of each size, location of each size, tolerances required, method of attachment, clearances and operation.
3. Samples: Two each, 12" long illustrating slat material, finish and color.
4. Assurance / Control Submittals:
 - a. Manufacturer's certificate that products meet or exceed the specified requirements.
 - b. Documentation of experience indicating compliance with the specified qualifications requirements.

- c. manufacturer's Installation Instructions: Indicate special procedures and any perimeter conditions requiring special attention.
 - Section 01780 - Closeout Submittals: Procedures for closeout submittals.
 - 1. Operation and maintenance data: manufacturer's recommendations for maintenance and cleaning.
 - 2. Warranty: Submit a manufacturer's special Warranty with forms completed in the name of the Owner and registered with the manufacturer.
- 1.4 QUALITY ASSURANCE
- A. Qualifications:
 - 1. manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.
 - 2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.
- 1.5 DELIVERY, STORAGE AND HANDLING
- A. Section 01000 - Product Requirements: Transport, handle, store and protect the products.
 - Deliver products to the Project Site in the manufacturer's original, unopened protective packaging.
 - C. Store blinds to prevent damage to the materials, finishes and operating mechanisms.
 - Handle to prevent damage to the slats and operating mechanisms.
- 1.6 EXISTING CONDITIONS
- A. Existing Conditions: Take field measurements of the openings to determine the exact size required for each opening.
- 1.7 WARRANTY
- A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.
 - Special Warranty:
 - 1. Provide a written Warranty, signed by the blinds manufacturer agreeing to repair or replace blinds that do not meet the requirement, or that fail in materials or workmanship.
 - 2. Warranty Period: Lifetime.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:
1. Springs Window Fashions (Ali).
 2. Hunter Douglas Contract.
 3. Levolor.
- . Section 0100 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

- A. Model / Color:
1. Springs Window Fashions: The Ali Classics Mini blinds, 1" Aatte White® color or as approved.
 2. Hunter Douglas: 1" Mini Aluminum blinds, Model C80, ALinen Flirt® color or as approved.
 3. Levolor: Mark I DustGuard, 1" blind, Model AR1, Cover® color or as approved.
- . Blinds: Horizontal slat louvers, hung from a full-width headrail with full-width bottom rail □ manual control for raising and lowering by a cord with full-range locking □ open and closed point locking □ blade angle adjustable by a control wand.
- C. Metal Slats: Spring-tempered, pre-finished aluminum, radiused slat corners with manufacturing burrs removed.
1. Width: 1"
 2. Thickness: 0.008" minimum.
- . Slat Support: Braided polyester yarn, ladder configuration.
- E. Headrail: Pre-finished, formed steel box with end caps □ internally fitted with hardware, pulleys and bearings for operation □ same depth as the width of the slats.
1. Color: Same as the slats.
- F. Bottom Rail: Pre-finished, formed steel with top side shaped to match the slat curvature □ end caps.
1. Color: Same as the slats.
- G. Lift Cord: Braided polyester, continuous loop.
1. Free end looped through a wall-mounted, spring tensioned pulley.
 2. Color: White.
- . Control Wand: Extruded solid transparent plastic, ribbed or hexagonal shape.
1. Non-removable type.

2. Length of window opening height less 3"

3. Color: Clear.

I. Headrail Attachment: Wall brackets.

□ Accessory Hardware: Type recommended by the blind manufacturer.

2.3 FABRICATION

A. Fabricate blinds to cover the window frames completely.

□ At openings requiring multiple blind units, provide separate blind assemblies with a 1" space between assemblies located at window mullion centers.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

□ Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.

1. Verify that structural blocking and supports, if required, are in place and correctly located.

C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install blinds in accordance with the manufacturer's published instructions, at each window and where shown on the drawings.

□ Secure in place with concealed fasteners.

3.3 CONSTRUCTION

A. Interface with other Work: Coordinate the work of this Section with the window installation and placement of concealed blocking to support the blinds.

□ Site Tolerances:

1. Maximum Variation of Gap at Window Opening Perimeter: 1/4"

2. Maximum Offset From Level: 1/8"

3.4 ADJUSTING

A. Section 01700 - Execution Requirements: Adjusting the installed work.

- . Adjusting blinds to hang level and plumb.
- C. Adjust operating hardware for smooth operation.

3.5 FIELD QUALITY CONTROL

- A. Section 01450 - Quality Control: Field testing and inspection.
- . Inspect the installation, attachment and operation of the blinds.

3.6 CLEANING

- A. Section 01700 - Execution Requirements: Requirements for adjusting and cleaning.
- . Clean blinds surfaces prior to the Final Acceptance inspection.

END OF SECTION

SECTION 15000

MECHANICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 APPLICATION

- A. This section applies to all Sections of Division 15.

1.2 LAWS, REGULATIONS AND CODES

- A. All work shall be in accordance with government laws, ordinances, rules, regulations, and orders.
- B. The Following Shall Govern Where Applicable: The International Building Code, the International Plumbing Code, the Uniform Mechanical Code, Applicable National Fire Protection Association Standards, OSHA Rules and Regulations, and all other codes and standards referenced in these specifications. Where requirements differ in these codes and standards, the more stringent shall apply.

1.3 TRADE NAMES

- A. Mentioning of a trade name indicates that the manufacturer is acceptable to the Engineer. However, certain specified construction and details may not be regularly included in the manufacturer's catalogued product. The Mechanical Contractor shall provide the material or equipment complete as specified.

1.4 AVAILABILITY OF EQUIPMENT AND MATERIALS

- A. Specified equipment and materials may not be available locally and must be ordered off-island. This does not give Contractor the option to substitute non-complying materials or equipment that is locally available.

1.5 DEFINITIONS

- A. "As directed" shall mean that the Mechanical Contractor shall seek instructions of the Architect.
- B. "As indicated" shall mean as shown on plans.
- C. "As necessary" shall mean that the item shall be provided if necessary to have all systems complete, tested, and ready for operation.
- D. "Furnish" shall mean that the Mechanical Contractor shall furnish item indicated, installation will be done under another work.
- E. "Mechanical Contractor" shall mean the Plumbing Contractor, the Air Conditioning Contractor, or the Fire Protection System Contractor.
- F. "Provide" shall mean the Mechanical Contractor shall furnish and install item indicated.

- G. "Or approved equal" used after a trade name shall mean that the trade name mentioned will be used as a basis of comparison and that all makes of similar item will be considered, provided that, in the opinion of the Architect, substituted item has equal or better quality than the trade name mentioned.
- H. "Or approved equivalent as manufactured by" shall mean that only products of manufacturers mentioned in the paragraph are acceptable to the Architect.

1.6 SUBMITTALS

- A. Submit six sets of shop drawings, manufacturer's data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and have them approved before procurement, fabrication, or delivery of the items to the job site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable industry, and technical society publication references, and other information necessary to establish contract compliance of each item the Contractor proposes to furnish.

1. Shop Drawings: Drawings shall be a minimum of 8.5 inches by 11 inches in size, except as specified otherwise. Drawings shall include floor plans, sectional views, wiring diagrams, and installation details of equipment; and equipment spaces identifying and indicating proposed location, layout and arrangement of items of equipment, control panels, accessories, piping, ductwork, and other items that must be shown to assure a coordinated installation. Wiring diagrams shall identify circuit terminals, and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. If equipment is disapproved, drawings shall be revised to show acceptable equipment and be resubmitted.
2. Manufacturer's Data: Submittals for each manufactured item shall be manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts.
3. Standards Compliance: When materials or equipment must conform to the standards of organizations such as the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), and Underwriters Laboratories (UL), proof of such conformance shall be submitted to the Architect for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual sections.
4. Certificates of Conformance or Compliance: Submit certification from the manufacturer attesting that materials and equipment to be furnished for this project comply with the requirements of this specification and of the reference publications. Pre-printed certification will not be acceptable; certifications shall be in the original. The certification shall not contain statements that could be interpreted to imply that the product does not meet all requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; "equal or exceed the service and performance of the specified material". The certification shall simply state that the product conforms to

the requirements specified.

- B. Each submittal shall bear Contractor's Certification that the material, equipment, and other items in the submittal are in compliance with Contract Drawings and Specifications can be installed in allocated spaces.
- C. Each submittal for equipment requiring electrical power supply shall also bear Contractor's Certification that the power requirements of the equipment in the submittal are consistent with the power supply shown on electrical drawings.
- D. Any submittal without Contractor's Certification will be returned without review.
- E. Coordination: Plumbing and Fire Protection Drawings shall be coordinated with air conditioning and ventilation drawings, offset piping around ducts, and offset ducts around structural members.

1.7 OPERATION AND MAINTENANCE MANUAL

- A. For each equipment, furnish an operation and maintenance manual. Furnish three copies of the manual bound in hardback binders or an approved equivalent. Furnish one complete manual prior to the time that equipment tests are performed, and furnish the remaining manuals before the contract is completed. Inscribe the following identification on the cover: the words OPERATION AND MAINTENANCE MANUAL, the name and location of the equipment or the building and the name of the Contractor. The manual shall include the names, addresses, and telephone numbers of each subcontractor installing equipment, and of the local representatives for each item of equipment. The manual shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include: wiring and control diagrams with data to explain detailed operation and control of each item of equipment; a control sequence describing start-up, operation and shut-down; description of the function of each principal item of equipment; the procedure for starting; the procedure for operation; shut-down instructions; installation instructions; maintenance instructions; lubrication schedule including type, grade, temperature range, and frequency; safety precautions, diagrams, and illustrations; test procedures; performance data; and parts list. The parts lists for equipment shall indicate the sources of supply, recommended spare parts, and the service organization which is reasonably convenient to the project site. The manual shall be complete in all respects for equipment, controls, accessories, and associated appurtenances provided.

1.8 DELIVERY AND STORAGE

- A. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation. Damaged or defective items shall be replaced.

1.9 CATALOGED PRODUCTS

- A. Materials and equipment shall be cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest design that complies with the specification requirements. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use at least two years prior to bid opening. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the items

need not be the products of the same manufacturer. Each item of equipment shall have the manufacturer's name, address, model number, and serial number on the nameplate securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.10 SAFETY REQUIREMENTS

- A. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of a type as specified herein.

1.11 MANUFACTURER'S RECOMMENDATIONS

- A. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Architect prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.12 WORK INCLUDED IN OTHER SECTIONS

- A. The following are included in the General Contract Work and all pertinent information required shall be provided by the Mechanical Contractor.

1. Concrete Pads or Runners for Equipment: Pads and runners shall be at least 6" above the floor, roof, or grade level and pads shall clear equipment base by at least 4" all around unless indicated otherwise.
2. Toilet and Bathroom Accessories: Toilet and bathroom accessories such as paper holders, towel dispensers, and the like are specified under another section and will be provided under the General Contract Work.
3. Utilities: Cold water service line and building sewer main will be provided up to within 5 feet of the building line or as indicated. Final connection to these utilities shall be done by the Mechanical Contractor.
4. The following are included under Electrical Work
 - a. Power Wiring: All power wiring, including final hook-up to all mechanical equipment will be provided under the Electrical Work. Where control devices are required on power wiring such as a high temperature limit control for an exhaust fan, the control devices shall be installed by the Mechanical Contractor but shall be wired by the Electrical Contractor.

Division 16, ELECTRICAL WORK, is based on electrical ratings of equipment indicated on the mechanical drawings. Any deviation by the Mechanical Work which requires a change in the Electrical Work shall be paid for by the Mechanical Contractor.

1.13 WORK TO BE DONE IN ACCORDANCE WITH OTHER SECTIONS

- A. All electrical work and control wiring, included under Mechanical Work, shall be in

accordance with Division 16, ELECTRICAL WORK.

1.14 AS-BUILT DRAWINGS

- A. The Contractor shall maintain at the site one copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders, and other modifications, in good order and marked to record all changes made during construction. These shall be made available to the Architect.

- B. At the conclusion of the work, the Mechanical Contractor will be furnished by the Architect, at the Mechanical Contractor's expense, a set of reproducible made from original contract plans. The Mechanical Contractor shall then incorporate all changes made, as recorded, the set of reproducible in a clear, legible and reproducible manner. All underground stub-outs shall be dimensionally located from the building structure. As a condition for acceptance of work, "as-built" reproducible shall be signed by Mechanical Contractor attesting that all changes have been incorporated, dated and delivered to the Architect.

- C. As-built drawings required for:
 - SECTION 15300 - FIRE PROTECTION SYSTEM
 - SECTION 15400 - INTERIOR PLUMBING SYSTEM
 - SECTION 15500 - AIR CONDITIONING AND VENTILATION SYSTEMS

END OF SECTION 15000

SECTION 15300

FIRE PROTECTION SYSTEMS

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. This section provides for an automatic sprinkler system, standpipe systems and portable fire extinguishers.
- B. Provide fire protection systems with drain valves, inspectors test valves and sway braces. There shall be enough drain valves at strategic locations to enable draining all the water from the systems.
- C. Provide fire protection during construction.

1.2 QUALITY ASSURANCE

- A. Installation of automatic sprinkler system, standpipe system, and portable fire extinguishers shall be in accordance with the 2009 International Building Code, 2009 International Fire Code and applicable NFPA Standards.
- B. All equipment and system components shall bear UL or FM label or marking.
- C. Specialist Firm: A Company specializing in the installation of sprinklers and other fire protection systems with at least five (5) years experience, such as Grinnell Fire Protection Systems Company or Pacific Fire Protection, Inc.
- D. Installation of the Sprinkler Systems shall be done by a Specialist Firm. If experienced in the installation of sprinklers and other fire protection systems for at least five (5) years the Mechanical Contractor may install the fire protection systems under the supervision of the specialist firm.

1.3 SUBMITTALS

- A. Installation Shop Drawings:
 - 1. Within 35 calendar days after award of Contract, submit sprinkler head layout.
 - 2. Within 30 calendar days after approval of sprinkler head layout, submit sprinkler and other fire protection systems layout. Include hydraulic calculations based on installation shop drawing layout and recent fire flow test conducted by the contractor.
- B. Product Data: Within 35 calendar days after award of Contract, submit:
 - 1. Catalog cuts and other data required to demonstrate compliance with the specified requirements for the following:

Alarm Check Valve
Fire Department Connections

Check Valve
Gate Valve
Floor Control Valve
Monitor Switch
Sprinkler Heads
Sprinkler Cabinet
Fire Pump, Jockey Pump and Controller Package (DEDUCTIVE BID ITEM
FP-1)
Fire Extinguisher Cabinets
Portable Fire Extinguishers
Hose Gate Valves
Roof Manifolds

PART 2 - MATERIALS

2.1 PIPING

- A. Underground piping shall be Class 150 cast iron pipe conforming to ANSI 21.51 (AWWA C151). Fitting shall be cast iron conforming to ANSI A21.10 (AWWA C110), mechanical coupling.
- B. Aboveground sprinkler piping shall be Schedule 40 black steel pipe with black cast iron screwed fittings for pipe sizes up to 2". Pipes and fittings bigger than 2" shall be roll-grooved black steel, schedule 10 for pipe sizes up to 5", 0.134" for 6" pipes and 0.188 for 8" and 10" pipes.
- C. All piping shall be rated for a minimum of 175 psig working pressure. Maximum system pressure shall not exceed 300 psig.

2.2 ALARM CHECK VALVE

- A. Divided seat ring type alarm check valve with external bypass and retarding chamber. Basic trimmings shall include nipples, fittings, devices for external by-pass, alarm test by-pass, gauge and drain connections, and mounting supports for retarding chamber and drip funnel. Standard alarm trimmings shall be provided for use with, and including a water motor alarm and a pressure switch. Alarm check valve shall be "Grinnell" model A with Model A-3 retarding chamber or approved equal.

2.3 FIRE DEPARTMENT CONNECTION

- A. For sprinkler system double clapper flush wall connection type, straight body connection, 4" x 2-1/2" x 2-1/2" with plugs and chains, exposed parts with polished brass finish, threads to conform to those used by local fire department, with "Auto-Spkr" lettering, "Potter-Roemer" No. 229 or approved equal.

2.4 CHECK VALVE

- A. Swing check type, with iron body, bronze mounted, renewable seat and disc, bolted cap, asbestos gaskets. Steel bolts, 175 lbs. water working pressure, flanged ends with drip connection.

2.5 GATE VALVES

- A. Iron body with bronze trim, solid wedge, outside screw and yoke, rising stem, flanged ends, 175 lbs. water working pressure.
- 2.6 MONITOR SWITCH
- A. Single pole double throw switch with a roller type switch actuator and a spring loaded plunger mounted in a housing, design to make an electrical contact when O.S. & Y. Control gate valve at sprinkler main riser is closed, "Grinnell" Model F640 or approved equal.
- 2.7 SPRINKLER HEADS
- A. 1/2" N.P.T. pipe connection 1/2" nominal orifice size, intermediate degree rating, "Grinnell" Duraspeed Sprinkler with SSP-1 or SSP-3 deflector or approved equal. At areas with ceiling, sprinkler heads shall be pendent type, chrome finish with Figure 410 chrome ceiling plate. At areas without ceiling, sprinkler heads shall be upright, plain brass, with Model F774 sprinkler guard finish painted to match brass color of sprinkler head. Side wall sprinkler heads shall be standard horizontal side wall type brass finish with matching escutcheon plate enamel finish to match adjacent surface. At detention cell areas, sprinkler heads shall be institutional type side wall. Sprinkler and deflector to be of bronze construction, with 1/2" NPT thread. Levered fusible solder link shall consist of an approved black-painted beryllium-nickel link assembly. Fusible link shall be designed to release a suspended load that exceeds 50 lbs. (22.7 kg) when dropped from a 1-inch (25.4 mm) height. Water seal shall consist of a Teflon-coated Bellville spring washer and bronze diffuser sub-assembly containing no plastic parts. Institutional escutcheons shall be of zinc or aluminum construction with zinc ring plate and tamper resistant screws. Sprinkler K-factor shall be nominal 5.6 (81.0). Sprinkler temperature rating shall be Ordinary 165 °F (74 °C). Standard cover finish: Bright chrome plated. Quick response institutional sprinklers shall be Reliable Model XL Institutional Horizontal Sidewall, Standard Coverage (SIN R1334) or equal. Glass bulb type temperature rated for specific area hazard.
- 2.8 SPRINKLER CABINET
- A. Fabricated from sheet steel and finished painted with red enamel, to be provided complete with 12 spare sprinkler heads (6 plain brass and 6 chrome plated) and two sprinkler wrenches.
- 2.9 HOSE GATE VALVES
- A. 2-1/2", polished brass finished, hose threads to match local fire department equipment.
- 2.10 ROOF MANIFOLDS
- A. Cast brass with female N.P.T. inlet and male N.P.T. outlet, two ways, 4" x 2-1/2", back inlet.
- 2.11 FIRE EXTINGUISHER CABINET
- A. 22 gauge steel box, one piece 22 gauge tubular steel door, one piece 20 gauge steel frame with continuous hinge, white baked enamel finish, with break glass door. Provide each fire extinguisher cabinet with one dry chemical type, portable fire extinguisher, 10 lbs., 4A-60 BC rating, "Potter-Roemer" No. 3010 or approved equal.
- B. See plans for type of fire extinguisher cabinet and provide the following as required:

1. Recessed type - "Potter-Roemer" Figure No. 1704 or approved equal.
2. Semi-Recessed type - "Potter-Roemer" Figure No. 1724 or approved equal.
3. Surface-Mounted type - "Potter Roemer" Figure No. 1754 or approved equal.

2.12 PACKAGED FIRE PUMP, JOCKEY PUMP, CONTROLS AND ACCESSORIES (DEDUCTIVE BID ITEM FP1.0)

A. FIRE PUMP

1. Type: Centrifugal, direct connected, horizontal.
2. Casing: Cast iron, split case, rated for greater of 150 psig or 1.25 times actual working discharge pressure, as verified by hydraulic calculations, renewable bronze wearing rings, flanged suction and discharge.
3. Impeller: Bronze, fully enclosed, keyed to shaft.
4. Shaft: High grade alloy steel with copper, bronze, or stainless steel shaft sleeves.
5. Bearings: Grease lubricated ball bearings.
6. Drive: Flexible coupling with coupling guard
7. Seals: Packing gland with minimum four rings graphite asbestos packing.
8. Base plate: High grade heat-treated cast iron or reinforced heavy steel with integral drain rim, and grout base.

B. Accessories

1. Check valve in discharge pipe.
2. OS&Y gate or butterfly valves on system side of check valve and on supply side of pump.
3. Fire pump bypass fitted with OS&Y gate or butterfly valves and check valve.
4. Pressure gages, suction and discharge.
5. Circulation relief valve.
6. Umbrella cock, automatic air release.
7. Splash shield between pump and motor.
8. Flow metering system for closed loop testing.

C. Drive

1. Motor: Squirrel cage type; drip proof.

2. Controller: NFPA 20 transfer switch type with auto-transformer reduced voltage, starter, in NEMA 4 enclosure, including the following:
 - a. Two circuit breakers of 30,000 amperes interrupting capacity (one for emergency start).
 - b. Magnetic starter capable of being energized by pressure switch or manually.
 - c. Alarm circuit for power failure.

D. Controls

1. Controller: Hands-off automatic switch, fire water pressure switch to operate pump drive, fire water pressure switches for alarms.
2. Local alarm with indicating lights for low fire water pressure and high fire water pressure.
3. Contacts for remote circuits to indicate pump operational status and alarm status.

E. Acceptable Manufacturers

1. "Aurora" Pumps.
2. "Peerless" Pumps.
3. "Worthington" Pumps.
4. "Fairbanks Morse".
5. ITT

F. Jockey Pump

G. Electrically operated pressure booster pump to maintain pressure.

H. Provide shut-off valves, check valve, and relief valves.

I. Acceptable Manufacturers

1. Aurora Pumps.
2. Peerless Pumps.
3. Worthington Pumps.
4. Fairbanks Morse.
5. ITT

PART 3 - EXECUTION

3.1 PIPING

- A. Install buried shut-off valves in valve box. Provide post indicator.
- B. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- C. Locate outside alarm gong on building wall as indicated.
- D. Place pipe runs to minimize obstructions to other work.
- E. Place piping in concealed spaces above finished ceilings.

3.2 MONITOR SWITCH

- A. Shall be installed on the unthreaded section of the O.S. & Y control gate valve at the sprinkler main, to make an electrical contact when the valve is closed. Wiring to Alarm system will be done by electrical contractor.

3.3 PRESSURE SWITCH

- A. Pressure switch on alarm check valve shall be arranged to make an electrical contact when sprinkler system is activated. Wiring to alarm system will be done by electrical contractor.

3.4 SPRINKLER CABINET

- A. Shall be installed near sprinkler main riser as directed.

3.5 INSPECTOR TEST PIPE

- A. Arrange to discharge outside the building or as indicated. Test valve shall be installed in a wall box with access panel, permanent identification.

3.6 FIRE PUMP

- A. Pipe drain from pump bases, pump stuffing boxes, and pump casings to floor sinks or drains.
- B. SIGNS
 - 1. Properly lettered approved metal signs conforming UBC Standard 9-1 shall be attached to each valve in the sprinkler system.
- C. ACCEPTANCE REQUIREMENTS
 - 1. Perform all acceptance requirements in accordance with the referenced standards.
 - a. Flushing of Piping: Underground mains and lead-in connections to system

risers shall be completely flushed before connection is made to the sprinkler piping. Before connecting sprinkler system to the water main, the sprinkler system shall be sterilized. Sterilization shall be in accordance with Guam EPA requirements.

- b. Hydrostatic Test: All interior piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psig and shall maintain that pressure without loss for two (2) hours.
 - c. Dry System Air Test: An air pressure leakage test at 40 psig shall be conducted for 24 hours. Correct all leakage that will result in a pressure loss in excess of 1-1/2 psi.
 - d. System Operational Tests: Contractor shall request the Fire Department to witness all system operational tests.
2. Complete, sign, and submit all required Contractor's Material and Test Certificates.
 3. Provide all literature and instructions provided by the manufacturers describing proper operation and maintenance of any equipment and devices installed. Provide three (3) publications titled NFPA 13A, Recommended Practice for Inspection, Testing and Maintenance of Sprinkler System.

END OF SECTION 15300

SECTION 15400

INTERIOR PLUMBING SYSTEM

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Work included: The plumbing system for this Work includes all hot and cold water distribution systems, soil, waste and vent system, plumbing fixtures and trim and all other plumbing items indicated on the Drawings or described in these Specifications, plus all other plumbing items needed for a complete and proper installations. The work also includes plumbing and final connections to other equipment furnished under other sections, including indirect waste lines from fixtures to waste receptors.
- B. Related work described elsewhere: Perform all trenching and backfilling associated with the plumbing installation in strict accordance with the provisions of "Earthwork" Section.

1.2 QUALITY ASSURANCE

- A. Use sufficient journeyman plumbers and competent supervisors in execution of this portion of the Work to ensure proper and adequate installation throughout. In the acceptance or rejection of installed plumbing, no allowance will be made for lack of skill on the part of workmen.

1.3 SUBMITTALS

- A. General: Comply with the provisions of Section 15000.
- B. Product Data: Within 35 calendar days after award of Contract, submit:
 - 1. Catalog cuts and other data required to demonstrate compliance with the specified requirements shall be provided for the following:
 - a. Plumbing Fixtures & Trims
 - b. Pumps
 - c. Drains
 - d. Cleanouts
 - e. Hose Bibb
 - f. Valves
 - g. Insulation
 - i. Booster pumps & Water Tank (DEDUCTIVE BID ITEM P1.1)
- C. Operation and Maintenance Manual: Upon completion of this portion of the Work, and as a condition of its acceptance, compile and submit manuals as required under Section 15000 of these Specifications.

1.4 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 PIPE

A. Soil, Waste Vent AND Storm Drain Piping

1. Underground building drainage shall be Polyvinyl Chloride (PVC) pipes and fittings conforming to ASTM D 2665; ASTM F 891; ASTM F 1488 with solvent weld joints conforming to ASTM D 2235.
2. Building sewer shall be Polyvinyl Chloride (PVC) pipes and fittings conforming to ASTM D 2665; ASTM F 891; ASTM F 1488 with solvent weld joints conforming to ASTM D 2235.
3. Soil, waste, and storm drainage piping aboveground shall be PVC or ABS plastic pipes and fittings with solvent welded joints, per ASTM D 2665 or ASTM D 1785
4. Vent shall be Polyvinyl Chloride (PVC) pipes and fittings conforming to ASTM D 3034 and ASTM D 2949 with solvent weld joints conforming to ASTM D 2235.

B. Domestic Water Piping

1. All domestic hot and cold water piping shall be hard-drawn copper tube conforming to ASTM B88 with wrought copper fittings.
2. Below-grade and below-slab copper piping shall be type "K" with brazed joints; all other copper piping shall be type "L" with joints made up of 95-5 tin-antimony solder.

2.2 PIPE WRAPPING

- A. Wrap all water piping buried in the ground, with "Scotchrap". Wrap all straight runs with 0.020-inch thick tape, spirally applied in half-lap layers. Pre-wrap all joints, valves, and similar irregular surfaces using 0.020-inch thick tape.

2.3 VALVES

- A. Gate valves shall be bronze, solid wedge, inside screw, traveling stem, screw-in-bonnet, 200 lbs. W.O.G., solder ends, "Milwaukee" Figure No. 1153 or approved equal.
- B. Check valves shall be bronze, swing check type, renewable disc, and wrench grip removable caps, soldered ends, 200 lbs. W.O.G., "Milwaukee" Figure No. 508 or approved equal.
- C. Ball valves shall be bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder ends.

2.4 PIPE SLEEVES AND ESCUTCHEONS

- A. All pipe sleeves and escutcheons shall be steel pipe and shall have ample clearance for pipe and covering, and shall have chrome plated wall and floor escutcheons over the pipe in

finished areas.

2.4 HANGERS AND SUPPORTS

A. Hangers and supports shall equal or exceed the quality of the following:

	<u>Item</u>	<u>Manufacturer and Number</u>
1.	Pipe ring hanger	Grinnell Fig. 97cp, plastic coated for plastic pipes
2.	Clevis Type Hanger	Grinnell Fig. 260, galvanized, for cast iron or steel pipe

B. Hanger rods shall be galvanized and shall conform to the following:

	<u>Pipe Size</u>	<u>Rod Diameter</u>
1.	1/2 inch to 2 inch	3/8 inch
2.	2-1/2 inch to 3-1/2 inch	1/2 inch
3.	4 inch to 5 inch	5/8 inch

2.5 WATER HAMMER ARRESTERS

A. Provide permanently sealed, all stainless steel water hammer arresters properly sized in accordance with Fixture Unit requirement, equaling or exceeding the quality of J.R. Smith Hydrotols.

2.6 CLEANOUTS

A. General: Provide cleanouts equaling or exceeding the quality of the following:

1.	Floor cleanouts	J. R. Smith number 4023.
2.	Yard cleanouts	J. R. Smith number 4283 with round frame and cover.
3.	Wall cleanouts	"Tee" fittings with J. R. Smith number 4531 or 4551, and chrome plated access cover.

B. Finishes: All exposed parts of floor cleanouts shall be scoriated nickel bronze. All grade cleanouts shall have rough scoriated bronze covers.

2.7 ISOLATION

A. Isolate all dissimilar metals with dielectric unions.

2.8 DRAINS

A. The following are products of "J.R. Smith". Equivalent items as manufactured by "Josam", "Wade" or "Zurn" are acceptable:

1. Floor and shower drains shall be Figure 2010-A, with 5 inch diameter strainer, cast

iron body, flashing collar, nickel bronze adjustable strainer head, and caulked outlet.

2. Scupper drains shall be Figure 1530, galvanized cast iron body, flashing device and secured grate, threaded outlet.
3. Roof drains shall be Fig. No. 1010 with galvanized cast iron body, low profile rough bronze dome, and flashing clamp, caulked outlet.
4. Overflow drains shall be Fig. No. 1080 with galvanized cast iron body, rough bronze dome, cast iron collar, flashing clamp, caulked outlet.
5. Deck drains shall be Fig. No. 1410 with galvanized cast iron body, polished bronze top, flashing clamp with seepage openings, and caulked outlet.

2.9 PLUMBING FIXTURE

A. The following fixtures are products of "Sloan" unless indicated otherwise. Equivalent fixtures as manufactured by "American Standard", "Eljer", or "Kohler" are acceptable.

1. Water Closet – WC-1: (Flush Valve, Floor-Mounted, Elongated Bowl, 1.28 gpf, for Handicapped)
 - a. Fixture: Sloan complete HET system with exposed manual Royal closet flushometer and vitreous china water closet. Elongated bowl, floor mounted, 1-1/2" top spud inlet, vitreous china, high efficiency toilet (1.28 gpf), white, "Sloan" WETS 2020.1001-1.28 with "Olsonite" No. 95 open front seat less cover and No. 481310-100 bolt caps.
 - b. Flush Valve: PERMEX synthetic rubber diaphragm with dual filtered fixed bypass, ADA compliant metal oscillating non-hold open handle non-hold-open handle with triple seal handle packing, , fixed metering bypass and no external volume adjustment to ensure water conservation.
2. Water Closet - WC-1: (Flush Valve, Floor-Mounted, Elongated Bowl, 1.28 gpf)
 - a. Fixture: Sloan complete HET system with exposed manual Royal closet flushometer and vitreous china water closet. Elongated bowl, floor mounted, 1-1/2" top spud inlet, vitreous china, high efficiency toilet (1.28 gpf), white, "Sloan" WETS 2000.1001-1.28 with "Olsonite" No. 95 open front seat less cover and No. 481310-100 bolt caps.
 - b. Flush Valve: PERMEX synthetic rubber diaphragm with dual filtered fixed bypass, non-hold-open handle, fixed metering bypass and no external volume adjustment to ensure water conservation.
- 2.a Penitentiary Combination Water Closet with lavatory (**ALTERNATE BID ITEM**)

Product of "Acorn" or equal, Penal-Ware 18" wide Lav-Toilet Comby - Front Access (specify model number and options), arranged to be installed on finished wall through access panels. Fixture shall have factory installed Air-Control lavatory valve and a hydraulic flush valve. Provide Air-Control pneumatically operated pushbutton valve. Valve and bubbler conform with lead free requirements for NSF61, Section 9 and

CHSC 116875. Fixture shall be fabricated from type 304 stainless steel. Construction shall be seamless welded and exposed surfaces shall have a satin finish. Access panels shall be secured with tamper-resistant screws. Countertop shall have an air-circulating, self-draining soap dish. Toilet shall be concealed blowout jet type with an elongated bowl, a self-draining flushing rim, and an integral contoured seat. Toilet shall meet ASME A112.19.3 and CSA B45.4 requirements and will flush with a minimum of 25 PSI flow pressure when used in conjunction with a minimum of 1.28 GPF. Toilet trap shall have a minimum 3-1/2" seal that shall pass a 2-1/8" diameter ball and be fully enclosed. Cabinet interior is sound-deadened with fire-resistant material. Fixture shall withstand loadings of 5,000 pounds without permanent damage. Fixture shall be furnished with necessary fasteners for proper installation.

3. Urinal – UR:

- a. Fixture: Sloan complete HEU system with exposed manual Royal urinal Flushometer and vitreous china urinal, "Sloan" WEUS 1000.1001-0.13, wall hung, washdown flushing action, 3/4" I.P.S. top spud inlet, integral flushing rim.
- b. Flush Valve: PERMEX synthetic rubber diaphragm with dual-filtered fixed bypass, ADA compliant metal oscillating non-hold-open handle with triple seal handle packing, fixed metering bypass and no external volume adjustment to ensure water conservation.

4. Lavatory – LAV (Countertop):

- a. Fixture: 20" x 17", vitreous china, countertop, front overflow, faucet ledge, self-rimming, 16" x 10" x 5-5/8" deep bowl, "Aqualyn" No. 0475.020.
- b. Faucet: Two-handle widespread lavatory faucet with conventional spout, "Amarilis/Heritage" Model No. 4801.000.002 with wrist-blade handles Kit No. 372V, cast brass valve bodies with reinforced flexible hose connections, 1/2" male inlet shanks with brass coupling nuts and shank nuts, 1/4 turn washerless ceramic valve cartridges reversible for use with round or lever handles, aerator with 2.5 gpm flow restrictor.
- c. Trap: Catalog No. 4401-014 "P" cast brass trap with tubing drain to wall, 1-1/4" inlet and outlet, ground swivel joint, cleanout plug and escutcheon, chrome finish.
- d. Supply: Catalog No. 2303.154 with flexible tube riser, escutcheon, wheel handle, and chrome finish.

5. Lavatory - LAV (Handicapped):

- a. Fixture: 20-1/2" x 18"-1/4", vitreous china, wall-hung, front overflow, self-draining deck area with contoured back and side splash shields, faucet ledge, 15" x 10" x 6-3/4" deep D-shaped bowl, white, with wall-hanger, "Lucerne" No. 0356.421. Top of front rim mounted 34" from finished floor.
- b. Faucet: Single control lavatory faucet Cebaron Model No. 2081.101X all brass body with metal handle, hot limit safety stop, reinforced flexible hose

connections, brass shank nuts and coupling nuts, washerless ceramic disc valve cartridge reversible for use with round or lever handles, 6-3/4" spout, pop-up drain, with 1-1/4" tailpiece, polished brass finished.

- c. Trap: Catalog No. 4401-014 "P" cast brass trap with tubing drain to wall, 1-1/4" inlet and outlet, ground swivel joint, cleanout plug and escutcheon, chrome finish.
- d. Supply: Catalog No. 2303.154 with flexible tube riser, escutcheon, wheel handle, and chrome finish.
- e. Under-Sink Protective Enclosure: "Truebro" Lav Shield or approved equal.

6. Kitchen Sink

- a. Fixture: "Just" Model No. DL-2233-A-GR, 33" x 22" x 8" deep, double bowl sink, type 304 18 gauge stainless steel, sound deadened, self-rimming.
- b. Faucet: "Just" Model No. J-902, deck mounted single lever washerless mixing faucet with escutcheon and hose spray, 8" spout with aerator, spray head mounted on escutcheon, chrome plated cast brass.
- c. Supplies: 1/2" angle valves with flexible risers and wall flanges.
- d. Trap: 1-1/2" chrome plated cast brass with wall flange.
- e. Food Waste Disposer: "Thermador" Model No. 6T722 Royal Deluxe, 1/2" Hp, 115 V, 1 phase, 60 Hz., 1725 Rpm motor, 1-1/2" brass tubing drain.

7. Shower Valve and Fitting

- a. Ceramix Model 2000.501 Pressure Balance Shower with ceramic disc valve, hot limit safety stop, check stops, direct sweat inlets, polished chrome finish.
- b. Adjustable spray brass shower head with 2.5 gpm flow restrictor.

8. Electric Water Cooler

- a. Unit shall be U.L. listed, air-cooled dual height water cooler complying with ARI Standard 1010-84. Capacity shall be 8.0 gph at 90 degrees F, ambient temperature, 80 and 50 degrees F, entering and leaving water temperatures respectively.
- b. Receptors, backplate and grille shall be heavy gauge stainless steel with No. 4 satin finish. Bubblers shall be one piece polished chrome-plated, with anti-squirt angle stream. Valves shall be chrome-plated brass with self-closing lever handle valves.
- c. Mounting frame manufactured of heavy gauge galvanized steel with predrilled mounting holes.
- d. Push actuation mechanism shall be self-closing, polished chrome plated push buttons, with automatic stream height regulator.

- e. Refrigeration system shall be hermetic using refrigerant 134a. Compressor shall have an automatic reset overload protection. Air cooled condenser shall be non-ferrous construction. Cooling unit shall be tube type with continuous coil of seamless copper tubing, complete with moisture and vermin proof insulation. Thermostat shall have an adjustable range of 45 to 55 degrees F. Motor shall be 430 watts, 115 volts, single phase, and 60 hertz.
- f. Electric water cooler shall be "Haws" Model HWCD8-2 or approved equal.

2.10 ELECTRIC WATER HEATER

- A. Storage tank shall be .064 inch marine grade 316L stainless steel fully MG welded acid washed passivized and shall require anode rod or preventive maintenance. Water storage tank shall be capable to withstand water temperatures up to 212 F(100 C) without degradation. The storage tank shall be designed to operate in a horizontal orientation, test pressure shall be 300 psi operating pressure shall not exceed 150 psi. Units shall be U.L.listed.

2.11 HOSE BIBBS

- A. Hose bibbs shall be "Chicago Faucet Co." No. 998 3/4" key operated sill faucet with cast brass body, 3/4" hose connection, vacuum breaker, flanged inlet, and square head shut-off cocks.

2.12 HOT WATER PIPE INSULATION

- A. Hot water pipe insulation shall be 1-1/2 lb. density 1" thick fiberglass pipe insulation with all service jacket vinyl scrim-butt-joint strips. Insulation shall be products of "Owens-Corning", "Johns-Manville", or "PPG Industries".

2.13. OTHER MATERIALS

- A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the Architect.

2.14 WASHER BOX

- A. Fabricated of 18 gauge stainless steel, recessed in wall, complete with 1/2" hose bibbs, and 2" drains. "Guy Gray" Model No. B-200 or equal, 9" x 10-3/4". Provide hose bibbs with vacuum breakers.

2.15 TANK, PUMPS AND PRESSURE BOOSTER SYSTEM (DEDUCTIVE BID ITEM P1.1)

- A. See plans for capacities, manufacturer, and model number of Tank, Pumps and Booster systems.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.
- B. Install all piping promptly, capping or plugging all open ends.
- C. Install all piping generally level and plumb, free from traps, and in a manner to conserve for other work.
- D. Provide uniform pitch of at least 1/4 inch per foot for all horizontal waste and soil piping within the building.
- E. Pitch all vents for proper drainage. Install vent piping with each bend 45 degrees minimum from the horizontal wherever structural conditions will permit.
- F. Conceal all piping unless otherwise shown on the Drawings.
- G. Inspect each piece of pipe, couplings, fittings, and equipment for defects and obstructions. Promptly remove all defective material from the site.
- H. Maintain fixtures to the following heights above finished floor (unless otherwise indicated on architectural drawings):

Lavatory:

- 1. Standard 31 inches to top of basin rim
- 2. Accessible (ADA) 34 inches to top of basin rim

- I. Maintain utilities connections to the following heights above finished floor (unless otherwise indicated on architectural drawings):

	<u>Hot Water</u>	<u>Cold Water</u>	<u>Waste</u>
1. Lavatory	20-3/4"	20-3/4"	19-1/2"
2. Kitchen Sink	20-3/4"	20-3/4"	19-1/2"
3. Water Closet:			
a. Flush Tank Floor Mounted Regular	----	26-1/2"	----
4. Shower	32"	32"	----

3.2 FIXTURE ROUGH-IN SCHEDULE

- A. Rough-in fixture piping connections in accordance with following table of minimum sizes for particular fixtures:

		<u>Hot Water</u>	<u>Cold Water</u>	<u>Waste</u>	<u>Vent</u>
1.	Lavatory	1/2"	1/2"	1-1/2"	1-1/4"
2.	Service Sink	1/2"	1/2"	2"	1-1/2"
3.	Kitchen Sinks	1/2"	1/2"	1-1/2"	1-1/4"
4.	Water Closet	--	1"	4"	2"

3.3 JOINTS AND CONNECTIONS

- A. Preparation: Properly ream all cut pipes. Cut all threads straight and true, apply best quality teflon tape to male pipe threads, but not to inside the fittings. Use graphite on all cleanout plugs.

3.4 HANGERS AND SUPPORTS

- A. Spacing: Do not exceed the following spacing, on centers:

	<u>Type of pipe</u>	<u>Spacing</u>
1.	PVC	Five feet
2.	Copper or steel, 1-1/2 inch and smaller	Six feet
3.	Copper or steel, two inches and larger	Ten feet

- B. Supporting: Use a separate hanger for each branch. Support vertical risers at the floor with extension pipe clamps approved by the Architect.
- C. Secure all branch take-off to fixture immediately before fixture faucet inlet connections, conceal support or clamp in wall.

3.5 EQUIPMENT

- A. Install all equipment in accordance with manufacturer's published instructions and recommendations.

3.6 CLOSING IN UNINSPECTED WORK

- A. Do not cover up or enclose work until it has been properly and completely inspected and approved. Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and, after it has been completely inspected and approved, make all repairs and replacements with such materials and workmanship as are necessary to the approval of the Architect, and at no additional cost to the Owner.

3.7 TESTING

- A. General: Furnish all test pumps, gages, equipment, and personnel required, and test as necessary to demonstrate the integrity of the finished installation to the approval of all

pertinent authorities and the Architect.

- B. Soil, Waste and Vent Piping: Unless otherwise directed, plug all openings and fill with water to a height not less than 10 feet above horizontal pipes. Allow to stand one hour or longer as required. Redo leaking joints as directed and then re-test.
- C. Water Lines: Test and make tight at 150 psi water gage. Retain for four hours; repair all leaking joints and then re-test.

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to connecting to existing piping, flush clean and disinfect new piping.
- B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 50 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual disinfectant equals that of incoming water or not more than 0.5 mg/l nor less than 0.2 mg/l.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C601.
- I. Bacteriological Analysis of Water: After the completion of disinfection procedure, including the final flushing as described heretofore, the Contractor shall obtain water samples from this system for bacteriological analysis. Requirements for satisfactory disinfection of water supply are that bacteriological analysis indicates that water samples are negative for coliform organisms and that total plate count is less than 100 bacteria per cubic centimeter. Submit certified laboratory analysis to Division of Environmental Quality (DEQ) for evaluation.
- J. Final Approval: If bacteriological analysis does not satisfy above requirements, then disinfection procedure shall be repeated until these requirements are met.
- K. Discharging Used Water: Water used in the disinfection process must be disposed of to a ponding basin, percolation trench, holding tank, water truck tank or to any other location and method acceptable to CNMI's Division of Environmental Quality (DEQ).
- L. Certification: Deliver a "Certificate of Completion of Disinfection" to the Architect.

3.9 LEAD ANALYSIS

- A. Lead concentration of water in the new water line must be analyzed and submit test results to Division of Environmental Quality (DEQ).

END OF SECTION 15400

SECTION 15500

AIR CONDITIONING AND VENTILATION SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Work Included: Air conditioning and ventilation required for this Work is indicated on the Drawings and includes, but is not necessarily limited to:
1. Air conditioning and ventilation equipment.
 2. Ductwork and accessories.
 3. Diffusers, Grilles, and Registers.
 4. Refrigerant Piping and Accessories.
 5. Condensate Drain Piping.
 6. Insulation.
 7. Controls.
 8. All other items required for a complete and operating air conditioning and ventilation systems.
- B. Related Work Described Elsewhere: Power wiring, Section 16400.

1.2 QUALITY ASSURANCE

- A. Qualifications of Installers
1. For the actual fabrication, installation, and testing of work under this Section, uses only thoroughly trained and experienced workmen completely familiar with the items required and the manufacturer's current recommended methods of installation.
 2. In acceptance or rejection of installed work, the Architect will make no allowance for lack of skill on the part of workmen.
- B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations contained in the Standards listed below, latest edition, as published by the Sheet Metal and Air Conditioning Contractor's National Association.
1. HVAC Metal Duct Standards.
 2. HVAC Systems Testing, Adjusting, and Balancing.

1.3 SUBMITTALS

- A. General: Comply with the provisions of Section 15000.
- B. Product Data: Within 35 calendar days after award of the Contract, submit:
 - 1. Following items proposed to be furnished and installed under this section.
 - a. All air conditioning and ventilating equipment
 - b. Diffusers, Grilles and Registers
 - c. Insulation
 - 2. Shop Drawing showing all details of the proposed installation, and the interface of ducts, piping and equipment with all other items.
 - 3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.
- C. Record Documents: During progress of the Work, maintain an accurate record of all changes made in the air conditioning and ventilating systems from the layout and materials shown on the approved submittals.
- D. Manual: Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Owner and the Architect each three copies of the operations and maintenance Manual. Include in each copy of the Manual a copy of the Record Documents.
- E. Control Wiring Diagrams: Submit for approval along with shop drawings.

1.4 PRODUCTS HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. General: All equipment shall be the capacity and types shown on the Equipment Schedule in the Drawings, and shall be the listed manufacturer and model number or shall be an equal approved in advance by the Architect. Use only air conditioning equipment that has local representatives.
- B. Single Source: For ease of maintenance and parts replacement, to the maximum extent possible use equipment of a single manufacturer.
- C. The Architect reserves the right to reject any materials list which contains equipment from various manufacturers if suitable materials can be secured from fewer manufacturers, and

to require source of materials to be unified to the maximum extent possible.

D. Package Cooling Units

1. Unit shall be air-cooled, completely factory assembled, consisting of compressor and condenser section, blower section, cooling coil section, filter section, operating and safety controls, all enclosed in a weatherproof baked-enamel finished steel housing.
2. Compressor and condenser section shall be complete with upblast discharge condenser fan and motor assemblies condenser coils, galvanized condenser fan guards, hermetic spring mounted compressors with crankcase heaters and starters. Condenser fans shall be propeller type, direct driven, up-blast discharge type. Condenser coils shall be copper tube aluminum fin with factory coating for coil corrosion protection.
3. Blower section shall be complete with a centrifugal forward-curved fan belt driven motor through an adjustable pitch pulley by an electric motor.
4. Cooling coil shall have direct expansion, copper tubes with aluminum fins cooling coil. An insulated galvanized drain pan shall be provided under the entire cooling coil section with a refrigerant metering device.
5. Safety controls shall include high pressure cutout, low pressure cutout, compressor and fan motors overload devices, and anti-cycling device.
6. Filters shall be of 1" thick throwaway type.
7. Unit shall be completely pipe and wired. Refrigerant piping shall be on non-ferrous construction with suction lines insulated with foam plastic insulation. Wiring shall be in accordance with the National Electrical Code and shall be complete requiring only a single power source.
8. Unit shall have easily removable service panels for access to filters, blower motor, compressors, condenser fans, cooling coil and controls. Rubber isolation pads to isolate unit from concrete runners shall be provided.
9. Packaged Cooling Unit shall be "Carrier" or approved equal as manufactured by "Lennox", "McQuay", "Trane", or "York".
10. Accessories shall include a space thermostat with night set-back and on-off switch.
11. Each package cooling unit with 3-phase power supply shall be provided with a 3-phase power monitor to protect the unit from damage due to power supply-irregularities. The 3-phase power monitor shall turn off the unit whenever any or all of the following conditions occur:
 - a. Low voltage on any or all phases.
 - b. Loss of any phase.
 - c. Unbalanced voltage between phases.

- d. Phase being reversed from A-B-C sequence.
3-phase monitor shall have automatic reset, to be mounted adjacent to electrical panels for condensing unit.

E. Ceiling Exhaust Fans

1. Housing shall be of reinforced phosphatized steel construction and interior surfaces shall be finished in a dark color.
2. Grille shall be with plastic with three-dimensional grid and shall have smooth, symmetrical finished appearance. Grille screws shall be concealed from view. Grids shall have a minimum of 80% free area.
3. Interior surfaces of housings shall be lined with acoustical insulation material, permanently secured in place and this material shall not be visible when grille is in position.
4. Wheels shall be of true centrifugal, rigidly constructed, forward curved design and shall be statically and dynamically balanced.
5. Motors shall be shaded pole type with sleeve bearings. Motors shall be supported by one-piece, die-formed steel suspension brackets in combination with rubber isolation dampers, with no metal-to-metal contact.
6. Terminal box shall be mounted in the housing receptacle, plug and cord inside the cabinet. All motors shall be suitable grounded. Motor and fan assembly shall be removable from installed ceiling ventilator.
7. Duct flanges shall be preassembled to housings. Backdraft dampers shall be of integral design and shall have aluminum damper door with steel pin. Damper shall have foam rubber seal to eliminate chatter.
8. Wall caps shall be fabricated of stainless steel, and shall have integral bird screen.
9. Ceiling exhaust fans shall be "Twin-City" or approved equal.

F. In-Line Fans

1. Belt-driven, centrifugal type, exhaust fan with baked-enamel finish steel housing.
2. Fans shall be forward curve type, mounted on rubber vibration isolator.
3. Cover shall be insulated, easily removable.
4. In-line fan shall be "Pennbarry", Twin-City" or approved equal.

G. Wall Exhaust Fan

1. Propellers shall be of fixed pitch design and constructed with fabricated aluminum blades fastened to a steel hub. The propeller assembly shall be statically and dynamically balanced in accordance with ANSI/AMCA 204-96, "Balance Quality and Vibration Levels for Fans" to Fan Application Category BV-3, Balance Quality Grade G6.3. All motors shall be permanent split capacitor (PSC) single phase or three

phase induction, permanently lubricated, heavy duty, ball bearing type, with thermal overload protection, closely matched to the fan load and provided at the voltage, phase, hertz, and enclosure as specified on the fan schedule. Motors for use with variable speed control shall be closely matched to the fan load and provide good speed controllability without any objectionable noise. Fans shall be provided with wall collar, backdraft damper, damper guard screen, weather hood with screen, variable speed controller and disconnect switch where required. Capacity shall be as indicated.

2.2 DUCTWORK

- A. Air conditioning and ventilation ducts, other than hood exhaust ducts shall be fabricated from prime grade galvanized steel sheets.
- B. High velocity flexible round ducts shall be vinyl coated spring steel wire helix, tightly woven fiberglass impregnated and vinyl coated inner liner, 1-1/4" thick fiber glass insulation, and metalized Mylar/neoprene laminate fiberglass scrim reinforced outer jacket. High velocity flexible round ducts shall be UL listed as Class I duct, "Thermaflex" Type M-KH or approved equal as manufactured by "Wiremold". All flexible ducts from high velocity ducts to variable air control boxes and air terminals are high velocity flexible ducts.

2.3 DUCTWORK ACCESSORIES

- A. Volume dampers shall be factory fabricated of galvanized steel, at least 2 gauges heavier than duct where dampers are installed, single-bladed for duct depths up to 10", opposed blade type for ducts with depths more than 10" complete with indicating locking quadrants. Volume dampers for installation above plaster ceilings shall have remote damper operators mounted on plaster ceilings.
- B. Round fire dampers shall be U.L. listed, with 16 gauge steel frame, steel curtain, curtain stay and 160 degrees F. fusible link, "Tuttle and Bailey" Model F or approved equal as manufactured by "Air Balance", "Prefco", "Phillips-Aire", or "American Warming and Ventilating, Inc."
- C. Rectangular fire dampers shall be U.L. listed with 18 gauge steel frame, steel curtain, 160 degrees F., fusible link and positive lock in closed position. Steel frame shall have baked enamel finish. Fire dampers shall be "Tuttle and Bailey" Models F1 and F2 or approved equal as manufactured by "Air Balance", "Prefco", or "Phillips-Aire", or "American Warming and Ventilating, Inc."
- D. Air extractors shall be factory fabricated of galvanized steel with a series of radius vanes attached to a pivoting frame and bracket, gang-operated with all vanes synchronized to move as unit. Adjustable in any position from open (45 degree) to closed through a rotary operator accessible from the outside of duct.
- E. Turning vanes shall be factory fabricated of galvanized steel, with double-walled blades rolled from a single sheet of metal, assembled over precision-formed tenons on the side pieces. Turning vanes shall be screwed or riveted into the duct elbow.

2.4 AIR INLETS AND OUTLETS

- A. The following items are products of "Tuttle and Bailey" similar and equal units as manufactured by "Carnes", "J and J", or "Waterloo" are acceptable. For VAV diffuser product of "Thermafuser" or equal. All air outlets shall be factory finish painted to match adjacent surface color. Contractor shall submit manufacturers color chart for color selection by the Architect.
1. Variable Volume Supply Ceiling Diffuser (Thermally Powered VAV Diffusers)
Thermally powered VAV diffusers shall be a complete VAV terminal and thermostat self-contained in a nominal 24" x 24"/600 mm square diffuser. They shall be thermally powered with one room thermostat/actuator and one changeover thermostat/actuator. External wiring or pneumatics shall not be allowed. The VAV diffusers shall have a thumbwheel and temperature scale to adjust the cooling set point. The adjustment shall be right above the hinged appearance panel and shall not require tools. Each set point shall be separately adjustable between 23 degrees C and 26 degrees C. The initial set point shall be factory set at 23 degrees C. In the cooling mode the VAV diffusers shall open on a rise in room temperature. Nothing shall extend above the inlet of the diffuser. All VAV diffusers shall have a dial and scale to adjust minimum flow between 2.4 lps and 50% of maximum flow without tools. Minimum flow shall be factory set at 10%. A fixed maximum flow stop shall be factory set for the full open air flow of the specified inlet size. All VAV diffusers shall have a lever which will open the damper for balancing without tools. The balancing lever shall be accessible from the outside of the diffuser without folding down the appearance panel or removing any part of the diffuser. All VAV diffusers shall warrant that the diffuser shall be free from defects in materials and workmanship for a period of ten years from date of shipment.
 2. Return, outside air and exhaust registers shall be Series A110 aluminum registers with A45 frame, 1 1/4" margin, horizontal bars set at 40 degrees, and opposed blade volume dampers.
 3. Return and transfer grilles shall be as specified for return registers except without volume dampers.
 4. Return grilles with filters shall be Series A110FB with bars set at 40 degrees, complete with 1" thick throwaway filters and filter retaining clips.
 5. Linear return grilles shall be Imperialine Series 4000, extruded aluminum construction, with 30 degree core deflection, margin style A and No. 3 frame for tile ceiling installation.

2.4A AIR OUTLETS (DEDUCTIVE BID ITEM M1.1a)

- A. The following items are products of "Tuttle and Bailey" similar and equal units as manufactured by "Carnes", "J and J", or "Waterloo" are acceptable. All air outlets shall be factory-finish painted to match adjacent surface color. Contractor shall submit manufacturers color chart for color selection by the Architect.
1. Linear diffusers shall be AIR TRAC, extruded aluminum construction capable field adjustable horizontal or vertical. Number of slots and width of slots as indicated,

margin style W, control line pattern controller. Supply diffusers shall be provided complete with supply plenums.

2. Supply air registers shall be Series A-647 extruded aluminum registers with removable core, double deflection, vertical outer bars, A45 frame, opposed-blade dampers, and type VLR vectrol air extractors.
3. Square ceiling diffusers with round necks shall be Type AMASR, aluminum construction, baked white enamel finish, with opposed blade volume damper.
4. Half-round ceiling diffusers shall be Type PH, fixed pattern, flush face, aluminum construction with removable core, PH-7 damper, and PH-6 Grid.

2.5 OUTSIDE AIR INTAKE LOUVERS

- A. Outside air intake louvers shall be all aluminum with PVC coated galvanized wire screen, 1/2" screen mesh.
- B. Blades shall be "S" shaped, spaced at 2", installed at 20o.
- C. Duct collars shall be provided for outside air duct connection.
- D. Outside air intake louvers shall be "Carnes" Model L 40 or approved equal.

2.6 INSULATION, ADHESIVES, TAPES, SEALERS

- A. All insulation, adhesives, tapes and sealers shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with ASTM E84.
- B. External Air Conditioning Duct Insulation shall be 1-1/2" thick faced fiberglass duct wrap, Type FRK25, Series ED-100 as manufactured by "Owens-Corning" or approved equal as manufactured by "Johns-Manville" or "Certain Teed".
- C. Insulation for equipment, valves, fittings, and flanges shall be premolded precut foamglass insulation, of the same thickness as used on adjacent piping. Jacketing shall be as specified for piping above.
- D. Adhesives, sealers and tapes, for use in the application of insulation shall be as recommended by the insulation manufacturer, products of "Minnesota Mining and Manufacturing Co.", "Benjamin Foster", or "United Sheet Metal Company".

2.7 OPERATING AND TEMPERATURE CONTROLS

- A. Fan Coil Units: Operating and temperature controls specified to be provided with fan-coil units.
- B. Air Conditioning Systems for (Time Clock Integral to A/C Unit).
 1. Package cooling units have individual 7-day time clocks and thermostats with night setback. Provide thermostats with perforated plastic covers.
- C. Room Temperature Control

1. Program Package Cooling Unit thermostats to maintain designed room temperature of $75 \pm 2^{\circ}$ F.

D. Ventilation System

1. Ceiling exhaust fan at restrooms, janitor's room and water softener room shall be operated by the light switch, see electrical drawings.
2. In-line fan shall be operated by manual switch, to turn on during office hours and turn off during unoccupied hours.
3. Exhaust fan EF at generator room shall operate thru thermostat, to turn on at 90° F, off at 80° F room temperature.

2.8 OTHER MATERIALS

- A. All other materials not specifically described but required for a complete and proper installation, shall be as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that the work of this Section may be completed in strict accordance with all pertinent codes and regulations, the approved Shop Drawings, and the manufacturers' recommendations.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Architect.
2. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 INSTALLATION OF EQUIPMENT

- A. Locations: Install all equipment in the locations shown on the approved Shop Drawings, except where specifically otherwise approved on the job by the Architect.
- B. Install in accordance with manufacturer's published instructions.
- C. Secure to concrete runners with properly sized stainless steel anchor bolts. Number of anchor bolts shall at least equal the number of anchor holes provided with the packaged cooling units.
- D. Interferences: Avoid interference with structure, and with work of other trades, preserving

adequate headroom and clearing all doors and passageways to the approval of the Architect.

- E. Inspection: Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

3.3 PIPING SYSTEMS

- A. All drain piping shall be pitched, preferably at 1/4" per foot, 1/8" per foot minimum in the direction of flow, adequate cleanouts shall be provided in changes of direction to facilitate rodding.

3.4 DUCTWORK

- A. Provide bracing for all ducts in accordance with SMACNA Seismic Restraint Manual.
- B. Low pressure galvanized steel air conditioning ducts shall be fabricated and erected in accordance with the SMACNA HVAC Metal Duct Standards. Beading and crossbreaking are both acceptable. Longitudinal seams shall either be the Pittsburgh lock or Acme locked grooved seam. Button punch snap lock may be used with 1/2" pocket depth for gauge 26 material, 1/2" or 5/8" for gauge 24 and 5/8" for heavier material. Round elbows with standard elbows may be used in lieu of rectangular vaned elbow.
- C. Fire dampers shall be provided on all ducts passing through fire-rated walls and partitions and as indicated. All fire dampers shall have gasketed 6" x 6" access panels on the fusible link side of the dampers. Installation shall be in accordance with SMACNA Fire damper guide.
- D. All square elbows in all ductwork shall be provided with double thickness turning vanes. All branch take-offs shall be provided with adjustable air extractors.
- E. All inlet and outlet connections to equipment shall be provided with neoprene-coated flexible duct connections.
- F. All joints in toilet exhaust ductwork shall be taped with adhesive polyethylene cloth tape.
- G. Duct dimensions shown are net inside dimensions.
- H. All hood exhaust ducts shall be fabricated and erected in accordance with NFPA 96 and the Uniform Mechanical Code, with liquidtight continuous external weld. Provide access openings for cleaning and inspection at each change in direction.
- I. Leakage Test - High Pressure Ducts
 1. Testing apparatus shall include a portable rotary blower, an orifice assembly with straightening vanes and orifice plate mounted in a straight tube with properly located pressure taps, and U-tube manometers.
 2. Test for audible leaks as follows
 - a. Close off and seal all openings in the duct section to be tested. Connect the test apparatus to the duct by means of section of flexible duct.

- b. Start the blower with its control damper closed (some small blowers popularly used for testing ducts may damage the duct because they can develop pressures up to 25 inches. W.G.).
 - c. Gradually open the inlet damper until the duct pressure reaches 2-inches W.G. in excess of design duct operating pressure. Determine test pressure by using a U-tube manometer. Note that the pressure is indicated by the difference in level between the two legs of the manometer and not by the distance from zero to the reading on one leg only.
 - d. Survey all joints for audible leaks. Mark each leak and repair after shutting down blower. Do not apply a retest until sealants have set.
3. After all audible leaks have been sealed; the remaining leakage should be measured with the orifice section of the test apparatus as follows
- a. Start blower and open dampers until pressure in duct reaches 25% in excess of designed duct operating pressure.
 - b. Read the pressure differential across the orifice using the manometer. The leakage rate in cfm is read directly from the calibration curve of the orifice plate. If there is no leakage, the pressure differential will be zero.
 - c. If all audible leaks have been corrected, it is unlikely that the measured leakage will exceed one (1) percent of capacity. If it does, the leaks must be located by more careful listening or by feeling along the joint.
 - d. It should be noted that even though a system may pass the measured leakage test, a concentration of leakage at one point may result in a noisy leak which, of course, must be corrected.
- J. Installation of fabric ductwork: Install chosen suspension system in accordance with the requirements of the manufacturer. Instructions for installation shall be provided by the manufacturer with product.

3.5 INSULATION

- A. All air conditioning ducts shall be provided with external duct insulation applied per insulation Manufacturer's Published Instructions.
- B. Air conditioning ducts outdoors shall be additionally insulated with 1" thick spray on urethane insulation, after duct erection.
- C. Condensate Lines, and lines shall be insulated. Piping shall not be insulated at joints until tested, approved, and painted. Self-sealing adhesive strips shall be pressed in place only with nylon tools to be provided for that specific purpose.

3.6 INSTALLATION OF REGISTERS AND DIFFUSERS

- A. Install and connect all registers and diffusers, in the locations shown on the approved Shop Drawings, securely anchoring each item in place and sealing with rubber gaskets to prevent leakage.

3.7 INSTALLATION OF AIR TERMINALS

- A. Install air terminals in accordance with manufacturer's published installation instruction.

3.8 EQUIPMENT IDENTIFICATION

- A. Equipment labels: All equipment furnished and installed under this Section shall be provided with the manufacturer's metal identification labels securely attached to each individual piece of equipment, and showing complete and comprehensive performance characteristics, size, model number, and serial number.

3.9 AIR SIDE BALANCING AND TESTING REQUIREMENTS

A. Constant Volume Systems

- 1. Set all supply and return volume dampers, air outlets, air extractors, and distribution grids to full open position. Set all controls for full cooling operating. Adjust outside air volume dampers for proper cfm.
2. Drill all probe holes for static pressure readings, pitot tube traverse readings, and temperature readings. Check motor electric current supply and rated running amperage of fan motor. Check fan and motor speeds. Set fan rpm to deliver not more than 10% over design cfm.
3. Make first complete air distribution run throughout entire system, recording first run statistics. Make second complete air distribution run throughout entire system for check on proper proportion of air.
4. Using pitot traverse, set all dampers to deliver proper amount of air to all areas, set branch line dampers to deliver proper amount of air to air outlets in each zone. Read cfm at each outlet and adjust to meet requirements.

3.10 TEST REPORTS

- A. Completed test report forms and data sheets be submitted in triplicate after testing and balancing is completed. Report form and data sheets shall be as follows:

- 1. Air Outlet Test Report - Similar to the following:

OUTLET TEST REPORT

Project _____ Sheet ____ of
System _____ Zone #
Job # _____ Date

Outlet Location Outlet Outlet Factor Req. Field Test 1 Final
Number Type Size FPM CFM FPM CFM FPM CFM

-
-
2. Package Air Conditioning Unit Test Report - Similar to the following:

PCU TEST REPORT

Project _____ Sheet _____ of _____
System _____ Floor # _____ Zone # _____
Job # _____ Date _____

Remarks _____

Item Specified Field Test 1 Field Test 2 Field Test 3

Outside air cfm _____
Total air cfm _____
% outside air _____
Discharge duct sq. ft. _____
Discharge duct fpm _____
Return duct sq. ft. _____
Return duct fpm _____
Return air cfm _____
Manufacturer _____
Fan size _____
Arrangement _____
Fan blade _____
Fan sheeve _____
Motor sheeve _____
No. rows coil _____
Filters _____
Rpm _____
Hp _____
Bhp _____
Volts _____
Phase _____
Cycle _____
Full-load amps _____
No-load amps _____
Heaters: rated amps _____
Suction sp _____
Discharge sp _____
Total sp _____
Ent. DB temperature _____
Ent. WB temperature _____
Lvg. DB temperature _____
Lvg. WB temperature _____
Outside air temperature _____

Remarks: _____

3. Exhaust Fan Data Sheets - indicating all data on fan nameplate, current characteristics to fan motor, suction and discharge static pressures, total fan cfm,

and cfm through each exhaust registers.

4. All other readings required to be recorded under balancing and test requirements.

3.11 CLOSING-IN OF UNINSPECTED WORK

- A. General: Do not allow or cause any of the work of this Section to be covered up or enclosed until it has been inspected, tested, and approved by the Architect and by all other authorities having jurisdiction.
- B. Uncovering: Should any of the work of this Section be covered up or enclosed before it has been completely inspected, tested, and approved, do all things necessary to uncover all such work. After the work has been completely inspected, tested, and approved, provide all materials and labor necessary and make all repairs necessary to restore the work to its original and proper condition at no additional cost to the Owner.

3.12 COOPERATION WITH OTHER TRADES

- A. Do all things necessary to cooperate with other trades in order that all systems in the Work may be installed in the best arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum of access to each system.

3.13 TESTING

- A. General: Provide all necessary personnel, equipment, and services and perform all tests necessary to demonstrate the integrity of the completed installation to the approval of the Architect and all other authorities having jurisdiction. Make all adjustments necessary to balance the completed system in accordance with the data shown on the Drawings.
- B. Architect's Right to Retesting
 1. Should the Contractor refuse or neglect to make any tests necessary to demonstration of the integrity of the completed system, the Architect may retain the services of an outside consultant to make all such tests and their resulting adjustments and balance.
 2. The costs for such test shall be deducted from amounts owing to the Contractor and shall not be borne by the Owner.
- C. Air Balancing: Perform in accordance with SMACNA HVAC Systems Testing, Adjusting, and Balancing Manual.

3.14 INSTRUCTING

- A. Upon completion of all required testing and balancing, and at a date set by the Architect to coincide with the Owner's acceptance of the completed Work, furnish all necessary personnel and thoroughly indoctrinate and instruct the Owner's maintenance and operation personnel in all aspects of operation and maintenance of the installed systems. Demonstrate the contents of the Operation and Maintenance Manual and ensure that the Owner's personnel are thoroughly familiar with all aspects of operation and maintenance of the installed systems.

END OF SECTION

SECTION 15550

STANDBY GENERATOR FUEL OIL AND EXHAUST SYSTEMS (DEDUCTIVE BID ITEM M2.1a)

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section includes the standby generator fuel oil, engine exhaust and radiator exhaust systems.
- B. Provide one tankful of fuel immediately before turning over system to owner.

1.2 RELATED WORK

- A. Generator will be provided under another section. Exhaust muffler and flexible connection for engine exhaust will be furnished with the generator.

PART 2 - GENERAL

2.1 ENGINE EXHAUST SYSTEM

- A. Piping: Engine exhaust piping shall be Schedule 40 black steel pipe with butt-welding fittings. Turns shall be made with long radius elbow.
- B. Accessories: Exhaust muffler and flexible connection will be furnished with the generator, to be installed under this section.
- C. Insulation: Engine exhaust piping inside the building and exhaust muffler shall be insulated with "Owens-Corning" Kaylo 10 pipe insulation, 1-1/2" thick, applied in accordance with insulation manufacturer's written instructions and recommendations.

2.2 RADIATOR EXHAUST SYSTEM

- A. Exhaust Duct: 20 gauge galvanized steel sheets, all welded construction. Welded joints to be grounded smooth and provided with cold galvanizing compound.
- B. Flexible Duct Connection: Factory-fabricated neoprene-coated flexible duct.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install engine exhaust and radiator piping system in accordance with the generator manufacturer's published instruction and recommendations. Provide all vents required by engine manufacturer.

- B. Request for all required inspection from Guam Environmental Protection Agency and complete all application and registration forms. Pay for all fees required.
- C. Fabricate and erect radiator exhaust duct in accordance with SMACNA Metal Duct Standards. Provide flexible duct connector between radiators and exhaust duct.

--END OF SECTION --

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

- 1.1 RELATED DOCUMENTS: This Section supplements all sections of Division 16, and shall apply to all phases of work specified, shown on the drawings, and required to provide all electrical systems complete and operable for the project. The work required under the Division is not limited to the work shown on the electrical drawings. Refer to site, architectural, structural and mechanical drawings, coordinate all such work to attain fully operational systems throughout the project. The intent of this specification is to provide a complete and operating electrical system in accordance with all Contract Documents.
- 1.2 WORK INCLUDED: Provide all labor, materials, services and skilled supervision necessary for the construction, erection, installation, connection, testing, and adjustment of all circuits and electrical equipment required by the Contract Documents, complete in all respects and ready for use.
- 1.3 SUPERVISION OF WORK
- A. Electrical work shall be under the full supervision of a professional electrical engineer or a master electrician registered to practice in the Territory of Guam. Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit a certification from the Professional Engineer or master electrician stating that the work will be done under his full supervision. At the conclusion of the work, prior to final inspection, submit certification that the work was done in accordance with electrical construction documents and the installation complies with the latest edition of the National Electrical Code.
 - B. Fire alarm system manufacturer's Technical Representative shall supervise, approve and certify installation and testing of Fire Alarm System devices and wiring.
- 1.4 COORDINATION OF WORK
- A. Plan all work so that it proceeds with a minimum of interference with other trades. Coordinate all openings required for equipment and conduit required for work of other trades. Provide all special frames, sleeves and anchor bolts as required. Coordinate electrical work with the mechanical installation.
 - B. Work lines and established heights shall be in accordance with architectural drawings. Verify all dimensions shown and establish all elevations and detailed dimensions not shown.
 - C. Lay out and coordinate all work well in advance to avoid conflicts or interference with other work in progress so that in the event of interference, the electrical layout may be altered to suit the conditions, prior to the installation of any work, and without additional cost to the Owner. Conflicts arising from lack of coordination shall be the contractor's responsibility.
 - D. Maintain all code required clearance around electrical equipment. Unless specifically noted otherwise, establish the exact location of electrical equipment based on the actual dimensions of equipment furnished.
- 1.5 COOPERATION WITH OTHER TRADES
- A. Cooperate and coordinate all work of Division 16 with that of other trades; afford reasonable opportunity for the execution of their work. Properly connect and coordinate this work with

the work of other trades at such time and in such a manner as not to delay or interfere with their work.

- B. Examine the drawings and specifications for the general and mechanical work and the work of other trades. Coordinate this work accordingly.
- C. Promptly report to the Contracting Officer any delay or difficulties encountered in the installation of this work which might prevent prompt and proper installation, or make it unsuitable to connect with or receive the work of others. Failure to report shall constitute an acceptance of the work of other trades as being fit and proper for the execution of this work.

1.6 CODES, PERMITS AND FEES

- A. Perform work in accordance with the National Electrical Code, applicable building ordinances, and other applicable codes, hereinafter referred to as the "Code". Where the Contract Documents exceed minimum requirements, the most stringent shall apply unless variance is approved.
- B. Comply with all requirements for permits, licenses, fees, and codes. Obtain all required permits, licenses, inspections, and pay all fees required to perform the work described in the Contract Documents.
- C. Comply with all requirements of the applicable utility authorities serving the project. Make all arrangements with the utility authorities for proper coordination of the work.

1.7 MATERIALS AND EQUIPMENT FURNISHED BY OTHERS: The electrical work includes the installation or connection of certain materials and equipment furnished by others. Verify installation details. Foundations for apparatus and equipment will be furnished by others unless otherwise noted or detailed.

1.8 CONTRACT DRAWINGS: The Contract Drawings are shown in part diagrammatic, and intend to convey the scope of work, indicating the intended general arrangement of equipment, conduit and outlets. Follow the drawings in laying out the work and verify spaces for the installation of materials and equipment based on actual dimensions of equipment furnished. Wherever a question exists regarding the intended location of outlets or equipment, circuiting, etc., obtain instructions from the Contracting Officer before proceeding with the work.

1.9 EQUIPMENT OR FIXTURES: Equipment or fixtures shall be connected to provide circuit continuity in accordance with applicable codes whether or not each piece of conductor, conduit, or protective device is shown between such items of equipment or fixtures, and the point of circuit origin.

1.10 NEW EQUIPMENT AND MATERIAL:

- A. Unless otherwise specified, equipment and materials of the same type of classification, and used for the same purpose shall be products of the same manufacturer. Use only new and unweathered material.
- B. Furnish products listed and classified by Underwriter's Laboratories, Inc.

1.11 APPLICABLE DOCUMENTS: Design, manufacture, testing and method of installation of all apparatus and materials furnished under Division 16 of the specifications shall conform to the latest publications or standard rules of the following:

Institute of Electrical and Electronic Engineers
(Formerly American Institute of Electrical Engineers) - IEEE
National Electrical Manufacturers' Association - NEMA

Underwriters' Laboratories, Inc. - UL
 National Fire Protection Association - NFPA
 American Society for Testing and Materials - ASTM
 American National Standards Institute - ANSI
 National Electrical Code - NEC
 National Electrical Safety Code - NESC
 Uniform Fire Code - UFC
 International Building Code - IBC
 Insulated Power Cable Engineers Association – IPCEA
 Americans with Disabilities Act Guidelines - ADAG
 American Institute of Steel Construction - AISC
 Department of Public Works Standards, Government of Guam - DPW
 Guam Fire Department Standards, Government of Guam - GFD
 Guam Power Authority Standards, Government of Guam - GPA
 GTA Standards - GTA
 Guam Environmental Protection Agency - GEPA

1.1 EXECUTION OF THE WORK

- A. Install equipment and materials in neat and workmanlike manner and align, level and adjust for proper operation. Install equipment so that all parts are easily accessible for inspection, operation, maintenance, and repair.
- B. Where damage, marring or disfigurement has occurred, replace or refinish the damaged surfaces as directed, and to the satisfaction of the Contracting Officer.
- C. Provide the design, fabrication, and erection of all supplementary structural framing required for attachment of hangers or other devices supporting electrical equipment. Submit design shop drawing to the Contracting Officer for approval.
- D. Outlet Location:
 - 1. Position of outlets: Center all outlets with regard to panelling, furring and trim. Symmetrically arrange outlets in the room. Satisfactorily correct outlets improperly located or installed. Repair or replace damaged finishes. Set outlets plumb and extend to the finished surface of the wall, ceiling or floor without projecting beyond same.
 - Install all receptacles, switches, and outlets shown on the wood trim, cases or office fixtures symmetrically, and where necessary, set the long dimension of the plate horizontal, or ganged in tandem.

1.1 SPECIAL CONSIDERATION

- A. Cutting, Patching and Piercing: Obtain written permission from the Contracting Officer before cutting or piercing structural members.
 - 1. Use craftsmen skilled in their respective trades for cutting, fitting, repairing, patching of plaster and finishing of materials including carpentry work, metal work or concrete work required for by Division 16. Do not weaken walls, partitions or floor by cutting. Holes required to be cut in floors must be drilled or cored without breaking or spalling around the holes. Do all necessary patching and/or refinishing as instructed by the Contracting Officer.
 - Sleeves through floors and walls to be galvanized rigid steel flush with walls, ceiling or finished floors to accommodate the raceway.

- Use care in piercing waterproofing. After the part piercing waterproofing has been set in place, seal opening and make absolutely watertight.
 - Provide baked white enamel painted spring-clipped escutcheon plates where exposed pipe passes through walls, floors, or ceilings. Cover sleeves and entire opening made for the pipe with escutcheon plates. Field applied paint finish shall match color of surrounding finish. Seal all conduit openings through floor slabs, masonry walls, and continuous partitions to make air and watertight. Tightly caulk space between conduit and abutting materials with fiberglass insulation and nonflammable sealant.
- B. Seal equipment or components exposed to the weather and make watertight and insect-proof. Protect equipment outlets and conduit openings with temporary plugs or caps at all times that work is not in progress.
- C. Equipment Access: Locate starters, switches, receptacles, and pull boxes to allow easy Equipment Identification: Identify each piece of equipment including disconnect switches and motor starters, with plastic laminate nameplates, black face with white core letters, having proper and complete identification. Clearly identify on the equipment served, and spell out the full name of the equipment, such as □Air Handling Unit AHU-1□and □Hot Water Cir. Pump P-1□ Do not use abbreviated plan references such as □AHU-1□or □P-1□
- D. Equipment Access: Locate starters, switches, receptacles, and pull boxes to allow easy access for operation, repair and maintenance, and if concealed, provide access doors.
- E. Equipment Bases: Provide equipment bases on all floor-mounted equipment furnished under this Contract.
- F. Protection of apparatus, materials and equipment: Take all necessary precautions to properly protect all apparatus, fixtures, appliances, material, equipment and installations from damage of any kind. The Contracting Officer may reject any particular piece or pieces of material, apparatus, or equipment which has scratches, dents or otherwise damaged.
- G. Operation and Maintenance Manuals: During the time of the Contract and before final acceptance of the electrical installation, submit to the Contracting Officer three copies of all descriptive literature, maintenance recommendations from the equipment manufacturer, data of initial operation, wiring diagrams and parts list of each item of electrical equipment installed under the Contract□submit all manufacturer's guarantees and warranties. Submittal shall include: switchboards, motor control centers, generators, and fire alarm system.
 - 1. Refer to Division 1 for additional requirements.
- H. Painting Preparation: Prepare all exposed fittings, boxes, supports and panelboards for painting□remove traces of oil, grease and dirt. Employ all necessary precautionary methods to prevent scratching or defacing of all electrical apparatus and devices.
- I. Painting: Exposed conduit, boxes installed after room has been painted, shall be painted to match room finish by this contractor.
 - 1. Corrosion Control: All corrosive metal surfaces, conduits□fittings, pipelines and structures shall be provided with corrosion inhibiting primer before installation. Appropriate surface preparation shall be made before application of primer.
 - Rust Prevention: Provide hot dip galvani□ed finish for all ferrous materials. In addition, outdoor installations shall be field painted with two coats of enamel paint.

- . Tests: Provide all tests as outlined hereinafter, and other tests necessary to establish the adequacy, quality, safety, completed status, and suitable operation of each system. Tests shall be conducted in the presence of the Contracting Officer.
 - 1. Ground Rod Test: Immediately after installation, test driven grounds with direct-reading single-test megger, utilizing the AC fall-of-potential method and two reference electrodes. Orient the ground to be tested and two reference electrodes in a straight line spaced 10 feet apart. Drive the reference electrodes 6 feet deep. Disconnect the ground rod to be tested from other ground system at the time of testing. Ground resistance for the electrical service shall be 25 ohms or less. Ground resistance for communication system shall meet manufacturer's minimum requirements. Submit the results, date of test, and soil conditions, to the Contracting Officer in writing, immediately after testing.
 - . System voltage at each panelboard measure voltage between phases□phase to neutral□phase to ground□and neutral to ground. Measurements shall be conducted during unloaded condition and repeated during loaded condition. Adjust system volume to within 1% of nominal voltage.
 - . Insulation resistance of conductors.
- L. Seismic Consideration: Installation shall meet Seismic 1 requirements.
- M. Windload Consideration: Installation exposed to outdoors shall be designed to withstand 170 MPH wind speed IBC 2009 Exposure C and ASCE7-05.

1.1 □ QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Division.
- B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the work of this Division in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

1.1 □ PROTECTIVE DEVICES COORDINATION STUDIES

Contractor shall provide the services of a qualified relay coordination engineer to perform a complete relay coordination study of the entire electrical distribution system. The studies shall include a complete single-line diagram of the power system covered by this specification, time-current characteristic curves, current transformer ratios, and relay device numbers and settings□fully coordinated composite time-current characteristic curves including recommended ratings and settings of all protective devices in tabulated form. Provide associated calculations to demonstrate that the power system protection will be selectively coordinated by the use of devices or equipment supplied. These studies shall be certified by a registered Professional Electrical Engineer. Final copy of the report shall be incorporated in the electrical O□M Manual. Perform testing and calibration of power relays by a certified relay technician.

1.16 ELECTRICAL SERVICE

- A. Electrical service to the building is as indicated on the drawings.

- B. Make all necessary arrangements with the serving utilities, and pay all costs and fees, assessed to the project by the serving utilities. All work shall be in accordance with serving utilities standards and subject to their approval. Coordinate the installation of service entrance equipment with GPA prior to start of construction.
 - C. Application for power service must be submitted to GPA eight months before service connection to allow for timely delivery of transformers.
- 1.17 PRODUCT HANDLING: Comply with pertinent provisions of Division 1.
- 1.18 WARRANTY: Provide one year warranty on all labor and materials.
- 1.19 AS-BUILT DRAWINGS
- A. The Contractor shall maintain at the site one copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders, and other modifications, in good order and marked to record all changes made during construction. These shall be made available to the Contracting Officer.
 - B. At the conclusion of the work, the Contractor will be furnished by the Contracting Officer, at the Contractor's expense, a set of reproducible made from original contract plans. The Contractor shall then incorporate all changes made, as recorded, into the set of reproducible in a clear, legible and reproducible manner. All feeders, main alarm and communication lines, service entrance, and stub-outs shall be dimensionally located within the building structure. As a condition for acceptance of work, "as-built" reproducible shall be signed by Contractor attesting that all changes have been incorporated, dated and delivered to the Contracting Officer.
- 1.20 SPARE PARTS AND MAINTENANCE PRODUCTS
- A. Provide spare parts, maintenance, and extra Products in quantities specified in individual specification sections.
 - B. Deliver to Project site and place in location as directed—obtain receipt prior to final payment.

END OF SECTION

SECTION 16□08

DIESEL ENGINE-GENERATOR SET

PART 1 GENERAL

- 1.1 RELATED WORK SPECIFIED IN OTHER SECTIONS: Section 16050 "Basic Electrical Materials and Methods," applies to this section except as specified otherwise.
- 1.2 DESCRIPTION: Provide diesel diesel electric generating unit with accessories, auxiliary equipment, and associated work as specified.
- 1.3 QUALITY ASSURANCE: Provisions of Division 1 apply.
- A. Operating Experience Requirements: Engines installed shall meet all of the operating experience requirements listed below:
1. Only electric generation service is considered as equivalent experience. Engines driving pumps or compressors, or those in marine propulsion or railroad service, are not acceptable.
 2. Only experience on the same engine model is acceptable. Engine model is considered to be a given series or class of identical bore and stroke and of the same type of engine, such as in-line or Vee. In-line and Vee engines with identical bore and stroke are considered as two separate models of engines.
 3. Only experience at the identical rotative speed as that which is offered is acceptable.
 4. Only experience at the identical or higher brake mean effective pressure as that which is offered is acceptable.
 5. Only experience with fuel oil is acceptable.
- 1.4 SUBMITTALS
- A. Furnish certificate(s) within 30 days after award certifying that not less than two engines of identical number of cylinders and cylinder size, identical rotative speed, and identical or higher BMEP, and of the same basic configuration (in-line or Vee) as the engine to be furnished, shall have driven generators which have satisfactory operated not less than 3-years. Certificate(s) shall include:
1. A list of at least two engine installations meeting the experience requirements set forth in paragraph entitled "Operating Experience Requirements".
 2. Owner and location of each such installation.
 3. Date of initial operation of each such installation.
 4. Number of KW hours produced at each installation.
 5. Horsepower rating, KW rating, and rotative speed of each unit.
 6. Design characteristics of each unit, such as bore and stroke, number of cylinders, and configuration (in-line or Vee).

- B. Manufacturer's Data:
1. Diesel engine driven electric generator set.
 2. Valves.
 3. Fuel oil day tank (specified under Division 15).
 4. Fuel line strainers.
 5. Engine muffler.
- C. Shop Drawings and Calculations: Submit for diesel generating unit and auxiliary equipment, including the following:
1. Certified outline, general arrangement (setting plan), and anchor bolt details. Drawings shall show the total weight and center of gravity of the assembled equipment on the mounting skid.
 2. General arrangement drawings showing location of all auxiliary equipment in relation to the diesel generating unit.
 3. Piping schematics for fuel oil, lubricating oil, jacket water, and cooling water integral with diesel engine.
 4. Battery sizes and cranking time calculations.
 5. Critical speed calculations.
 6. Drawings for the transfer switch, including certified outline, electrical ratings, general arrangement, and detail drawings.
- Electrical elements, schematics and wiring diagrams, including details of the safety shutdown systems and main generator circuit breaker trip system.
- D. Certified Test Reports:
1. Diesel engine shop tests.
 2. Generator shop test.
 3. Diesel engine driven electric generator set shop tests.
 4. Automatic transfer switch.
 5. Radio-interference suppression.
- E. Manuals: Provide two sets of operation and maintenance manuals for equipment. Identification symbols for all replaceable parts and assemblies shall be included. Information in manuals shall be comprehensive and specific.
- F. Safety Requirements: Comply with ANSI B15.1.

- G. Approved Manufacturers: Manufacturer shall have local on-island distributor with spare parts and repair services available.
 - 1. Generator Set:
 - a. Caterpillar
 - b. Onan
 - c. Kohler

PART 2 PRODUCTS

2.1 MATERIALS

- A. Standard Commercial Product: Generator set shall, as a minimum, be in accordance with the requirements of this specification and shall be the manufacturer's standard commercial product with any added features needed to comply with the requirements. Additional or better features which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product shall be included in the generator set being furnished. Standard commercial product is a product which has been or will be sold on the commercial market through advertisements or manufacturer's catalogs, or brochures, and represents the latest production model(s).
- B. Materials and Equipments: Furnish new materials of high quality which will give long life and reliable operation. Equipment shall not have been in prior service except as required by factory test. Workmanship shall be of highest quality in every detail.

2.2 DIESEL-ELECTRIC GENERATOR SET AND AUXILIARY EQUIPMENT: Each generator set shall consist of a diesel engine connected to an alternating current generator with brushless excitation system mounted on a steel subbase and provided with all necessary accessories, auxiliaries, and control equipment resulting in a complete self-contained unit capable of operation. Set shall be arranged for automatic unattended starting. Generator set must be capable of providing full rated power within 10 seconds after failure of normal power. Generator set shall be "tropicalized".

- A. Equipment Rating and Capability: Diesel-electric generating set shall have a standby rating indicated at 0.8 power factor. Gross KW rating of each diesel generating set shall be not more than the figure obtained by multiplying the delivered shaft horsepower rating of the engine by 0.46 and by the overall efficiency of the generator at the corresponding load. Overall efficiency of the generator shall allow for power required to operate the exciter. Rated net capacity of each generating set is defined as gross electrical power output of generator minus total electrical power requirements of electric motor driven engine accessories normally constituting part of "engine assembly," as defined in DEMA publication "Standard Practices for Stationary Diesel and Gas Engines." All auxiliary equipment furnished shall be designed for continuous duty at 110 percent of rated net capacity of generating set.
- B. Critical Speeds: Each complete diesel-electric generating set shall be free of critical speeds of either a major or minor order that will endanger satisfactory operation of the set. Satisfactory operation will be considered endangered if torsional vibration stresses exceed 5,000 psi within 10 percent above or below rated engine speed.

2.3 DESIGN AND CONSTRUCTION: Rotating or reciprocating parts, or other parts that may present a hazard to operating personnel shall be isolated or shielded to minimize danger. Design characteristics shall limit operating temperatures at critical points of maximum wear at full-load operating conditions.

2.4 DIESEL ENGINE AND ACCESSORIES

- A. Engine shall be 4-cycle, naturally aspirated, turbocharged, turbocharged-intercooled, vertical in-line or vertical "V" type. Design and construct engine so as to eliminate undue heating, vibration, and wear. Engine shall be capable of burning diesel fuel oil conforming to Fed. Spec. W-F-00 (Grade DF-2). Limiting characteristics of engine shall be as follows:
1. Maximum engine speed, 1,000 rpm:
 2. Maximum piston speed, 1,050 fpm:
- B. Base rating of each engine on plant site elevation of 1,000 feet above mean sea level and an atmospheric temperature of 104 degrees F. Offer engine only at speeds and ratings not higher than those for which they have been designed, which fulfill requirements specified in paragraph entitled "Operating Experience Requirements."
- C. General Construction: Engine shall be constructed adequately to withstand sudden changes from no load to rated load, and to preserve alignment of integral components under all conditions of operation. Engine shall be neat in appearance and shall permit easy access to various parts for maintenance purposes. The crankshaft shall incorporate drilled passages for pressure lubrication of bearings, and the journals shall be hardened or chromium plated to provide a hard shock-resistant surface with ductile core. Crankshaft and connecting rod bearings shall be the replaceable precision sleeve type. Cylinders shall be provided with replaceable liners. The piston rings shall be constructed of a heat-resisting alloy steel or chromium plated cast iron. Camshafts shall be gear or chain driven, and shall have higher wear resistance at cams and journals. Timing marks shall be clearly indicated on the crankshaft and gears. Valves shall operate in removable stem guides and seat inserts. The fly-wheel shall be balanced, and shall be capable of being rotated 50 percent above the maximum rated engine rotative speed without danger of breaking or exploding. Flywheel housings shall be provided with a drain hole at the lowest point. Means for turning the crankshaft manually shall be provided.
- D. Assembly: Completely factory assembles each engine. Mount turbocharger, intercooler if provided and all piping integral with the engine on the engine.
- E. Engine Speed Governing System: Governing system shall be electronic type suitable for controlling the speed of the generator set within the requirements specified herein without intermediate adjustment and shall maintain the specified stability without hunting or cycling.
1. Speed (Frequency) Governing System: Set shall have an engine speed (frequency) governing system conforming to IEEE 126, Section II. Engine speed governing system shall be adjusted to meet the performance requirements of IEEE 126, Section II, when tested in accordance with ASME PTC26.
- F. Overspeed Shutdown Device: The overspeed shutdown device shall be entirely independent of the engine speed governing system and shall consist of solid-state overspeed device positive engaged so that engine speed shall not exceed 110 percent of synchronous speed, and shall react to shut-off the engine's air or fuel supply and trip the set output circuit breaker. The overspeed device shall require manual resetting after emergency tripping.
- G. Engine Fuel System: The engine shall be provided with all necessary equipment, including piping, fittings, valves, fuel coolers, filters, strainers, day tank, and appurtenances. A mechanical fuel injection system shall be employed. Injection pump shall be driven in a positive manner from cam or drive shaft. Injection pump and injection valves shall be of type

not requiring adjustment in service and shall be capable of quick replacement in a few minutes by ordinary mechanics without special diesel experience. A pump for priming the fuel system shall be provided to facilitate easy starting. Internal parts forming the high-pressure portion of the fuel system shall have wear-resistant surfaces where relative movement between surfaces exists. The fuel system shall include the following fuel related equipment supplied and factory installed by the engine-generator set manufacturer. A sub-base fuel storage tank with capacity of minimum 24 hours continuous operation at 100% capacity. It shall have the structural integrity to support the engine generator set along with the associated vibrations and shall be designed to meet Seismic Zone 4 requirements. Minimum features shall include double walled all welded construction, fuel gauge, low fuel alarm, line check valve, fuel leak indicator and fittings for fuel supply fill and vent.

- H. Engine Lubricating Oil System: Provide with a full pressure lubricating system arranged to distribute oil to all moving parts of the engine and to cool the pistons. System shall include an engine-driven positive displacement pump, pressure regulating valves, oil filter, oil pressure indicator, crankcase ventilator for four-cycle engines, and the necessary piping and fittings. The pump shall have ample capacity to circulate the lubricating oil required for engine lubrication, and to cool the pistons. All necessary stop, check, pressure relief, and pressure control valves shall be provided.
1. Lubricating Oil Filters: Shall be the full-flow type (throw-away-type) and shall be capable of filtering the full rate of oil flow of the oil pump at maximum engine speed. Means shall be provided to insure delivery of lubricating oil to vital wearing surfaces regardless of the condition of the filter. Additionally, the filter must provide a means of automatically bypassing filter if it should become flow-restricting.
 2. Lubricating Oil Coolers: Provide to maintain the lubricating oil within the temperature limits recommended by the manufacturer. Oil cooler shall utilize the engine jacket cooling water from the radiator as the cooling medium. Temperature rise of the jacket water across the lubricating oil cooler shall be limited so that the temperature of the water leaving the lubricating oil cooler will be not higher than the optimum temperature as recommended by the engine manufacturer for jacket water to the engine. Cooler shall be either the shell and tube single or multipass design, or shall be built in as an integral part of the engine cooling radiator. The core shall be constructed of copper base alloys. The cooler shall be designed for jacket water to pass through the tubes. The temperature of the oil to the engine shall be maintained at a reasonably constant value. Thermostats used in the oil cooler shall be of the nonadjustable type and factory set at the temperature as recommended by the manufacturer. Where temperature of the oil in the cooler is regulated by controlling the jacket water temperature, the system design shall assure proper oil temperature under operating conditions.
- I. Engine Cooling System: The radiator fan shall direct the air flow from the engine outward through the radiator, with horizontal air discharge. The fan shall be driven directly from the engine crankshaft or through V-belt drive. The radiator shall have sufficient capacity to dissipate not less than the total British Thermal Units per hour reflected by the engine to the cooling system at 110 percent rated load in 104 degrees F ambient, and against a static restriction of 0.5 inches of water as may be imposed by louvers, ductwork, etc. Cooling section shall have a tube and fin type core which shall consist of copper or copper base alloy tubes with nonferrous fins. The radiator shall be protected by a strong grille or metal bar guard on the exterior, and the fan shielded with a metal canopy. Filler caps shall be designed for pressure relief prior to removal. A thermostatic control valve shall be installed in the jacket water system of the engine to maintain the water system temperature of the engine. The thermostatic valve shall be the standard modulating type utilizing self-contained thermostats. The valve shall be capable of passing the water flow as determined by the

manufacturer without excessive pressure drop across the valve. The valve shall be provided with one or more interchangeable thermostatic elements. The elements shall be nonadjustable type and the operating temperature shall be set at the temperature recommended by the engine manufacturer. The valve shall be designed so that in event of the thermostatic element failure, water will be able to flow through the engine. Radiator core shall be treated with anti corrosion coating.

- Engine Exhaust System: Provide a complete exhaust system, including exhaust flexible connection and residential type silencer.

- K. Engine Air Induction System: The air induction system shall be equipped with heavy-duty dry type air cleaners of adequate capacity to effectively remove the dirt and abrasives from the combustion air to the engine. When the engine air intake noise level is above the audible mechanical noise level of the engine, a combination filter-silencer or a separate silencer shall be provided. For two-stroke engines, an air intake shutoff shall be provided which shall be operated by the engine overspeed shutdown device.
 - 1. Scavenging air blowers for two-stroke cycle engines shall be built integrally with and driven directly from the engine.
 - 2. Turbocharger shall be a combination centrifugal blower driven by an exhaust gas turbine, with the air blower directly connected to the intake air manifold. Systems that require cooling of the intake air below ambient air temperature ahead of the turbocharger or scavenger air blower will not be acceptable. They may be lubricated from the engine pressure lubrication system or as recommended by the manufacturer. All necessary supports and connections shall be provided.
 - 3. Intercooler: Tubular heat exchangers will be accepted only if available jacket water can be used as the cooling medium. Supplementary water cooling equipment is not acceptable. When intercooling is included, provide and install on the engine all necessary intercooling equipment, including valves, controls, and integral piping.

- L. Cranking System: NEMA ICS 1 and NEMA ICS 2. An electric cranking system shall be furnished, capable of rotating the engine at a speed sufficient for rapid starting in an ambient temperature of 60 degrees F. The system shall be arranged to permit starting of the engine automatically upon signal from the automatic transfer switch.
 - 1. Cranking: The electric cranking system shall utilize direct current (DC) electrical circuit, with the negative polarity grounded, energized by storage batteries. The cranking motor shall be of the heavy-duty type with adequate capacity to crank the engine continuously to start the engine in an ambient temperature of 60 degrees F. The drive mechanism for engaging the starting motor with the engine flywheel shall be designed to inherently engage and release without binding. When the engine starts, a "stop cranking" switch, which is engine speed actuated, shall cause disengagement of the starting gearing and the shutdown of the starting motor. Starting shall be automatic. Automatic cranking panel shall crank the engine for 15 seconds cranking and 15 seconds off for three consecutive cycle before locking out the starting circuitry, sounding an alarm and illuminating an "overcrank" indicating light which shall remain lighted until it is manually reset.
 - 2. Storage Battery: The engine cranking battery shall be S.A.E. Type "D", diesel engine starting type and of sufficient size and capacity in a fully charged condition to start the engine-generator six consecutive times. Batteries shall comply with Fed. Spec. W-B-133.

3. Battery Charger: The battery charger shall be enclosed, wall-mounted, automatic, dual rate, solid-state, constant voltage type having AC voltage compensation, DC voltage regulation, and current limiting. The charger shall employ transistor-controlled magnetic amplifier circuits to provide continuous taper charging. Charger shall have two ranges, float and equalize, with 0-24 hour equalizer time, DC cranking relay, silicon diode full-wave rectifiers, automatic surge suppressors, DC ammeter, DC voltmeter, and fused inputs and outputs. Charger shall have a continuous rated output of not less than 10 amps. Battery charger shall conform to UL 1236.
- M. Safety Shutdown Controls and Alarms: Control shall be provided that will function to immediately shut off delivery of fuel to the engine cylinders, when actuated by a condition of low lubricating oil pressure, high water temperature, overspeed, or low water level. The values at which the controls for low lubricating oil pressure and high water temperature are actuated shall be as recommended by the manufacturer, and the overspeed governor shall be set to actuate at the value specified herein. The low lubricating oil pressure shutdown control shall be provided with a means to make it inoperative during the period of low oil pressure when the engine is started. Each shutdown shall initiate its individual light and sound an alarm within the cranking panel, and shall require manual reset to release each indicating light. Normal startup and shutdown shall not actuate the manual reset indicator system.

2.5 GENERATORS AND EXCITATION SYSTEMS

- A. Generators: The generators for each unit shall be rated as indicated, 60 Hz, 0.8 power factor alternating-current type with revolving field. The speed of the generator shall be that of the engine. The generator shall be capable of carrying continuously an 0.8 power factor load equal to the gross kilowatt rating of the diesel generating unit at normal voltage and with a temperature rise of not more than 130 degrees C as measured by resistance based on 40 degrees C ambient temperature. Enclosures shall be the general-purpose open type with ventilating openings covered with removable screens having a mesh not larger than 1/2 inch. The generator shall conform to ANSI C50.10, and to NEMA MG-1. The generator shall have Class H insulation. The stator winding shall be arranged for "wye" connection with both line and neutral leads of each of the three-phase windings brought out of the bottom of the generator frame, and the neutral grounded. The generator and flywheel shall have sufficient flywheel effect to meet the requirements of regulation and operation as specified. The rotor shall have continuous or interconnected amortisseur windings. The generator rotor shall be mounted on an extended shaft which shall be coupled rigidly to the engine crankshaft. Impellers shall be mounted on the rotor for cooling the generator. The rotor shall be capable of safe operation at a speed 25 percent in excess of its rated synchronous speed. The generator armature, field, and ground leads shall have clamp-or crimp-type lugs or connectors for electrical connections. Terminal markings shall conform to NEMA MG-1.
1. Generator Space Heater: Provide 120 ac volt heaters. Heater capacity shall be as recommended by the generator manufacturer to aid in keeping the generator insulation dry.
- B. Excitation and Voltage Regulation System: The excitation system shall be the integral brushless-type consisting of a rotating AC exciter and rectifier diode assembly together with a static-type voltage regulating system and including surge protection and the required accessories. The system shall serve as an individual excitation and regulation system for the generator specified herein, and there is no requirement for parallel operation with other exciters. The excitation system shall have a continuous current rating of not less than the generator excitation current required when the generator operates at 105 percent rated voltage under the condition of continuous rating requiring maximum field current. The

voltage rating of the system shall be as required to match the generator field requirements. The excitation system response ratio shall be not less than 0.5 and the ceiling voltage shall be not less than 120 percent of rated voltage.

1. Exciter: The exciter shall be a rotating AC generator having a rotating armature on the rotor spider and a stationary field on the stator frame. The exciter insulation shall be Class B and the temperature rise shall not exceed 40 degrees C when measured by resistance based on a 40 degree C ambient temperature.
2. Rectifiers: Shall be full-wave silicon diode type, with each diode protected by individual fuses. The rectifiers shall be mounted on the rotating part of the exciter to convert AC exciter output to DC for the main generator excitation. Connections shall be provided between the exciter, rectifiers, and generator field without use of brushes or slip rings.
3. Voltage Regulator: The voltage regulator shall be completely solid-state type for control of generator voltage by control of the exciter field. The regulator shall be suitable for mounting in the generator switchgear. The regulator shall control the generator exciter field as required to maintain a constant and stable generator output voltage within plus or minus 1% of one percent of nominal for all steady-state loads from no load to full load, including a 5 percent variation in frequency and the effects of field heating. The regulator shall be designed for single-phase voltage sensing. Electromagnetic interference suppression shall be an integral part of the regulator. Thermal protection for power semiconductors, inherent overvoltage protection, and fuse protection shall be provided internally in the regulator. No electrolytic capacitors, vacuum tubes, or electromechanical relays shall be used in the voltage regulator. The regulator shall have provisions for switching to manual control to allow the generator voltage to be controlled either manually or automatically. The following regulator components shall be mounted on the front of the generator switchgear:
 - a. Voltage adjusting rheostat.
 - b. Manual voltage control with adjusting rheostat and manual automatic-off transfer switch.
4. Engine-Generator Instruments and Controls: NEMA ICS 1, 2, 3, 4, and 6.
5. Engine Instruments: Include the following as minimum components:
 - a. Lubricating Oil Pressure Gauge: Shall be electronic, utilizing a Bourdon tube for confining the pressure medium. The Bourdon tube shall be seamless and made of phosphor bronze. Gauge shall be accurate to within 2 percent of full scale reading. Gauge subject to rapid pressure surges shall be properly suppressed.
 - b. Coolant Temperature Indicators: Shall be electronic. Capillary tubing shall be covered with a protective casing throughout its entire length and reinforced with an additional casing at the connection to the bulb or socket. The temperature indicator shall be accurate to within 2 percent of full scale reading.
 - c. Running Time Meter: Totalize engine running time to 9999.9 hours total.

- d. Oil Temperature Gauge: Shall be indicating dial type. Indicator shall be accurate to within 2% of full scale reading.
 - e. Fuel Pressure Gauge: Shall be indicating dial type, utilizing a Bourdon tube. Gauge shall be accurate to within 2% of full scale reading.
6. Generator Controls and Instruments: NEMA ICS 1, 2, 3, and 4 and shall include the components listed below: Instruments shall comply with ANSI C37.1.
- a. Voltmeter and Ammeter: Semiflush mounted electronic type.
 - b. Frequency Meter: Analog or Electronic type.
 - c. Control Switches: Voltage and ampere ratings suitable for the intended use. Contacts shall be rated in accordance with NEMA Standards ICS 2-125.
 - d. Generator Output Circuit Breaker: Shall comply with Fed. Spec. W-C-375. Molded case type, trip-free, and shall be mounted to allow operation from outside the control panel. Frame size shall be adequate for generator amperage when operating at standby rating, and an adjustable trip shall be provided. Lugs shall be provided for electrical connections.
 - e. Voltage adjustment rheostat.
 - f. Panel lights and control switch.
 - g. Alarm indicating panel.
- 2.6 GENERATOR CIRCUIT BREAKER: UL 489, molded case, adjustable thermal magnetic trip type circuit breaker. The circuit breaker continuous current rating shall be adequate for the power rating of the engine-generator set and the circuit breaker shall be rated to withstand the short circuit current provided by the generator set. Provide circuit breaker in a NEMA ICS 6, Type 1 enclosure mounted on the engine-generator set.
- 2.7 BASE ASSEMBLY AND ENCLOSURE: NEMA ICS 6.
- A. Engine-Generator: Shall be mounted on a fabricated steel skid base suitable for supporting, transporting, and skidding engine and generator without damage to equipment or alignment.
 - B. Vibration Isolators: Shall be provided to isolate the engine-generator set from the building floor. At least four isolators, as recommended by the isolator manufacturer, are required. The isolators shall be manufactured by a firm specializing in this product, and the unit shall be specifically listed for this application and have a maximum deflection of one inch. Isolators shall be suitable for outdoor application and shall be corrosion resistant.
- 2.8 TREATMENT AND PAINTING: All parts, including engine subject to high temperature, shall be treated and painted in accordance with manufacturer's standards. The generator and all associated electrical equipment shall be thoroughly cleaned and treated prior to painting. Color shall be manufacturer's standard.

PART 3 EXECUTION

- 3.1 INSTALLATION: Installation shall conform to the requirements of NFPA 70. Muffler and fuel connections shall be made under the Mechanical sections of this contract.

- 3.2 DIESEL ENGINE-GENERATOR: Install diesel generating unit as indicated. Provide vibration isolators to isolate vibrations from the diesel generating unit to the foundation.
- 3.3 TESTING: Perform the following tests on the generator set system provided. The Contracting Officer shall be given 5 working days' notice prior to each test. The Contractor shall provide all test equipment, load bank, fuel, lubricants, and personnel and submit written copies of all test results.
- A. Factory Tests: The engine-generator shall be subject to the manufacturer's standard run-in and conditioning tests. Following the run-in tests, test the engine-generator set at rated speed and voltage for 4 hours of continuous operation with 2 hours each at 50 and 100 percent of rated load, consecutively, 0.8 power factor. Determine generator frequency, phase current, and voltage and record at 15-minute intervals. Run tests on the voltage regulator to determine the variation in terminal voltage under conditions of constant load, and under conditions of abrupt load changes to determine the maximum voltage change during the surging period and the time required as specified in paragraph entitled "Voltage Regulator".
1. Speed Governing Test: Engine speed governing system shall be tested in accordance with ASME PTC26.
- B. Field Tests and Inspections: The Contractor shall perform all field tests and trial operations, and conduct all field inspections (except final field inspection). The Contractor shall provide all labor, equipment, load bank, and incidentals required for the tests. The Government Representative(s) will witness all field tests and trial operations, and conduct final field inspections. The Contractor shall give the Contracting Officer ample notice of the dates and times scheduled for tests, trial operations, and inspections which require the presence of the Owner Representative(s). All deficiencies found shall be rectified and work affected by such deficiencies shall be completely retested at the Contractor's expense. A qualified factory representative shall assist the Contractor with the field checkout, startup, and test. Field tests shall include the following:
1. Demonstrate proper operation of all systems.
 2. Simulate power failure and demonstrate complete automatic start, load, unload, by-pass, and stop sequence.
 3. Conduct 6-hour load run utilizing Contractor-furnished portable load banks as follows:
 - a. 1/2 load--2 hours
 - b. Full load--4 hours
- C. Failure to Meet Requirements: In the event any of the equipment fails to meet specified performance or fails to operate satisfactorily, the Owner shall have the right to operate the equipment until the defects have been corrected. Any equipment proved to be faulty or inadequate for the service specified will be rejected, but the Owner shall have the right to operate the rejected equipment until such time as new equipment is provided by the Contractor to replace the equipment rejected.
- D. Instruction of Operators: After equipment is ready to be placed in service, the Contractor shall provide the services of the manufacturer's technical representative to fully instruct the Owner's designated plant operators in operation and maintenance of the equipment.

- E. Cleaning: Clean work under provisions of Division 1. Clean engine and generator surfaces. Replace oil and fuel filters.
- F. Operating Permit: Obtain EPA operating permit.

END OF SECTION

SECTION 16301

INTERIOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. General conditions and special provisions preceding these specifications shall govern this section.
- B. Specifications and drawings complement each other and what is specified, scheduled or mentioned by one shall be binding as if called for by both. Specifications and drawings are intended to specify nature, quantity and quality of work. Report any error, conflicts or omissions to the Owner's Representative (hereafter referred to as Contracting Officer) at least one week before submission of bids for interpretation or clarification. If errors or omissions are not reported, provide necessary work at no costs to Owner to complete intent of specifications and drawings.

1.2 SCOPE OF WORK

- A. In general, provide complete conduit riser and underground raceways for electrical system.
- B. Provide all material, labor, tools and equipment to construct all items as indicated on the drawings and as specified herein including but not limited to the following:
 - 1. Complete underground raceway system including conduits, service risers, handholes and concrete pads that will be used by the Guam Power Authority, (hereafter referred to as GPA).
 - 2. Complete underground raceway system including conduits, handholes and pedestals that will be used by the telephone company (hereafter referred to as GTA).
 - 3. Complete underground raceway system including conduits, handholes and pedestals that will be used by the Cable TV company (hereafter referred to as CTV).
 - 4. Complete underground raceway system including conduits and risers for street lighting.
 - 5. Coordinate work and arrange for periodic and specified inspections of work by the GPA, GTA, CTV and Contracting Officer. Request for inspection shall be submitted 2 days in advance.
 - 6. Pass test mandrel through all ducts and conduits and make corrections as directed by inspectors or Contracting Officer.
 - Provide 10 lb. test nylon pull cord in all ducts and conduits, except provide 200 pound test line in all 4" ducts.
 - Immediately report and pay for damages to existing equipment.
- C. Obtain and pay for electrical permits, arrange for periodic inspection by local authorities and deliver certificate of final inspection to Contracting Officer.

1.3 SPECIAL CONDITIONS

- A. Contractor shall make detailed arrangements for work by utility agencies pertaining to this Contract. Payment to utility agencies for their work shall be by the Contractor. Request shall be submitted at least 14 days in advance for proper coordination.
- B. Riser conduit work on utility pole shall be in accordance with utility agency standards.
- C. Application for power service must be submitted eight months before service connection to allow for delivery of transformers.

1.4 WORK BY OTHERS

- A. Connection of street light circuit to secondary source shall be by GPA.
- B. Electric, telephone and cable TV utility and equipment by respective utility agencies.
- C. Contractor shall schedule their work to allow the utility agencies sufficient time to complete their respective utility work within the time frame allowed under this contract.

1.5 WORKMANSHIP AND REGULATIONS

- A. Work shall comply with ordinances of the Government of Guam, Department of Public Works, National Electrical Code, National Electrical Safety Code and applicable specifications and requirements of GPA, GTA, and CTV.
- B. Inspection, skill, and competency of workmanship shall be subject to the approval of the inspectors of GPA, GTA, CTV and Contracting Officer. All concrete pouring, handhole fabrications, riser conduit erection, and duct laying shall be performed in the presence of the respective utility agencies and company's inspector. Notification shall be given 24 hours in advance.

1.6 DRAWINGS

- A. Before installing, verify all dimensions, conditions and sizes of equipment at job site.
- B. During bidding and construction, Contractor shall coordinate his work with utilities and other trades to avoid omissions and overlapping responsibilities.

PART 2 PRODUCTS

2.1 GENERAL: Materials shall be new and those items listed by the Underwriters Laboratories shall bear "UL" labels of approval.

2.2 CONDUIT

- A. Underground conduits shall be PVC, Schedule 40.
- B. Rigid Metal Conduits: Rigid aluminum, round bore electrical conduits, and used with threaded fitting. Manufacture and install in accordance with NEC Article 346. Use only where exposed.
- C. Conduit and Duct Accessories: Couplings, spacers, plugs and accessories shall be as recommended by the manufacturer of conduits and ducts.

- D. End Bells: End bells matching conduit or duct shall be provided at each entry into handhole or transformer.
- 2.3 GROUND RODS: Ground rods shall be 3/4" x 10' copperweld.
- 2.4 HARDWARE: Steel hardware for handholes shall be hot-dipped galvanized after fabrication.
- 2.5 STRUCTURAL REINFORCING BARS: Intermediate grade steel, deformed, and meeting ASTM Specifications A-15.
- 2.6 WIRE MESH: Welded steel wire fabric for reinforcing concrete, galvanized conforming to ASTM Specification A-15.
2. CONCRETE: Ready mixed type with compressive strengths as shown on drawing. Concrete material and aggregates shall be No. 3 fine.
2. BACKFILL MATERIAL
- A. Selected Backfill: Sand, earth or earth and gravel mixture. If earth and gravel mixture, rock size shall be 1-inch or smaller and shall not contain more than 50% rock particles by volume. This fill shall be used over concrete encased ducts and over buried ducts after sand cushion has been placed, in accordance with drawings.
 - B. Sand Cushion: Manufactured sand or beach sand. This fill shall be used all around direct buried conduits as shown on the drawings.
2. WIRES AND CABLES
- A. Ground Wire: Ground wire shall be 1/2-1/4 bare copper unless otherwise indicated.
 - B. Wires: 600 volts, No. 12 AWG minimum, copper conductor. Size No. 12 to 10 solid and larger stranded. National Electrical Code insulation: THW, RHW, THWN. Manufacture and install according to NEC Articles 300 and 310.
- 2.10 STREET LIGHTING SYSTEMS
- A. Street lighting standard shall consist of tapered aluminum shaft with anchor base welded to lower end, complete with anchor bolts, mast arm fittings, concrete foundations, wiring, and connection. Lighting standard shall withstand 100 MPH wind speed IBC 200 Exposure C and ASCE 05.
 - B. Mounting Height:
 - 1. All mounting heights are nominal and indicate distance from top of curb to center of luminaire support at point of luminaire attachment.
 - 2. See drawings for mounting height.
 - C. Anchor Base: One piece cast aluminum alloy anchor bolt or stud on inside of shaft immediately above bottom weld joining shaft to anchor bolt.
 - D. Shaft: Fabricated from minimum .135" thick 5056-H34 aluminum alloy sheet with only one longitudinal, electrically welded joint no intermediate horizontal joints or welds only one

length of aluminum shaft shall be used, formed into continuously tapered shaft, having taper of approximately $\frac{1}{4}$ " x 4-3 $\frac{1}{4}$ ".

- E. Mast Arm: Shall be made from 2" NPS Schedule 40, 6061-T6 aluminum alloy pipe.
- F. Foundation: Construction from 3000 psi (compressive strength in 28 days after pouring) concrete, reinforced with 6" x 6" x 10 gauge x 10 gauge galvanized steel wire mesh folded into cylinder, and shaped as shown on drawings. Provide with each foundation 4-1" x 40" galvanized steel anchor bolts. Supplier of street lighting standard shall furnish the Contractor with templates for anchor bolts spacing.
- G. Accessories and Hardware: Accessories and hardware such as nuts, washers and shims to be hot dip galvanized.
- H. Fused Connector: Fused connector shall be rubber body, water tight, two section (line side receptacle - load side plug), metallic fuse holder with wire terminal, and lead-in wires. Lead-in wires shall be soldered to terminals. Line side lead-in wire shall be two feet of #12 RHW and load side lead-in wire shall be two feet of #12 THW. Lead-in wires shall be connected to line and load wires by solderless connectors. Fuse shall be midget type 10 ampere cartridge fuse. ESNA style 64 or approved equal.
- I. Street Lighting Cables: Cables for underground runs shall be 18-#10 AWG copper, RHW insulated.

PART 3 EXECUTION

3.1 TRENCH EXCAVATIONS

- A. Dimensions and locations of trenches for handholes, pads, conduits and ductlines shall be as shown on the drawings. Trench width and depth shall be sufficient to accommodate proper installation of conduit banks.
- B. Where a trench is excavated on slope, sides are to be vertical, and depth measured at lowest side. All measurements are to be based on final grade.
- C. All trench bottoms are to be flat and smooth.
- D. Trenches shall be widened at concrete transformer pad sites to permit proper entry of conduits.
- E. Trenches shall be approved by utility inspector before any ducts are placed.
- F. All excavations for handholes and pullboxes in excess of the depths required shall be filled with concrete or crushed rock.
- G. Sheathing and bracing as required shall be provided to support sides of excavations from cave-ins.
- H. Provide drainage and pumps to keep trenches dry.
- I. Saw cut all edges of existing sidewalks and pavement before trenching.

3.2 BACKFILL

- A. Concrete encasement or sand cushion backfilling shall be done after duct, pullbox and conduit installations have been approved by GPA, GTA, and CTV.
- B. Sand cushion around direct buried conduit shall be 4" thick.
- C. Selected backfill shall be used over concrete encased ducts only and sand cushioned ducts.
- D. Backfilling shall be to finished grades shown on accompanying drawings and matching existing conditions.
- E. Backfill material shall be completely free of wood or other debris.
- F. At road crossings, selected backfill shall be 4" thickness and remainder may be normal road base course.
- G. Sand cushion around conduits shall be installed under supervision of utility agencies' inspectors.
- H. Backfill material shall be placed in maximum of 12" layers in loose thickness before compacting. Backfill shall be thoroughly compacted with hand or mechanical tampers, and in no case tamping shall be accomplished by using the wheels or tracts of a vehicle.

3.3 GPA TRANSFORMER PADS AND LOTS

- A. Slope of lots for concrete pads shall not exceed one-inch rise in one foot run.
- B. Grade sufficiently around lots to prevent future filling of lots.
- C. Concrete pad shall be level. The pad elevation shall be 2" above the highest sidewalk grade.

3.4 INSTALLATION OF CONDUIT AND DUCT BANKS

- A. Trench bottom shall be clean, smooth, well graded and approved by utility agency inspectors.
- B. Saw, cut, ream and taper ducts and conduits with manufacturer approved tool.
- C. Coupling shall be tight to prevent entry of dirt or concrete into ducts and conduits.
- D. Provide plastic spacers to maintain proper separation between ducts.
- E. Conduits and duct run change of direction shall not exceed 4 degrees per length of conduit or duct. Radii and turns shall be made with appropriate duct short lengths.
- F. Ducts shall be clean and free from debris and rubbish.
- G. Concrete encasement shall be 3" all around duct bank.
- H. When pouring concrete prevent heavy masses of concrete from falling directly on ducts. If unavoidable, protect ducts with plank.
- I. Direct flow of concrete down sides of duct bank to bottom, to center, and then to rise up in middle thus filling all open spaces uniformly.
- To insure against voids, work a long, flat splicing bar or spatula liberally and carefully up and down the vertical rows of ducts.

- K. Cure for a minimum 48 hours before permitting traffic and backfilling.
- L. During construction provide temporary conduit plugs at the end of conduit banks to prevent entry of dirt, rubbish, debris or concrete at end of each day's work.
- M. Pass smooth bullet-shaped wooden test mandrel through the entire length of each duct or conduit to test for freedom of burrs and obstructions.
- N. Install 10 lbs. nylon pull cord in each conduit after testing, except install 200 pound line in 4" ducts.
- O. Apply thin coat of sealing compound on ducts and conduits at couplings and bells.
- P. Couplings and bells shall be tight to prevent entry of dirt or concrete into ducts and conduits.

3.5 CONCRETE WORK

- A. Concrete, ready mixed according to ASTM C-1154-4
- B. Convey concrete from mixer to forms rapidly to prevent segregation. Free drop shall be limited to 5' unless authorized by inspector.
- C. Placing:
 1. Clean and remove all debris from inside forms and trenches before placing concrete.
 2. Place concrete only on clean damp surfaces, but free from water.
 3. Place concrete in forms in horizontal layers not exceeding 12" thickness.
 4. Place concrete to avoid segregation of materials and displacement of ducts, inserts and reinforcing.
- D. Forming:
 1. Forms shall be of good sound lumber with sufficient strength, and conforming to shapes and dimensions indicated on drawings.
 2. Forms shall be treated with non-staining form oil immediately before each use.
- E. Patching: Patch all voids, pour joints and holes before concrete is thoroughly dry. Use mortar of same proportions as original concrete.
- F. Curing: Curing of concrete shall be accomplished by impervious membrane method with liquid membrane compound. Apply two or more coats of total one (1) gallon for one hundred and fifty (150) square feet of concrete surface.
- G. Reinforcing Steel:
 1. Clean reinforcing of mill or rust scale and form to dimensions indicated.
 2. Install reinforcing in proper locations and secure in place to prevent movement during concrete placing or vibrating.

- H. Finishing:
1. Handhole floors shall have integral cement topping with smooth metal trowelled finish.
 2. Removable concrete covers for handholes shall be finished to match the adjacent sidewalk.
- 3.6 STRUCTURAL STEEL AND MISCELLANEOUS METAL WORK: Structural steel work including bolts, nuts, anchors, pulling-in irons, etc. shall be galvanized by hot-dipped process after fabrication into largest practical sections.
3. □ UNDERGROUND UTILITIES: Underground utilities indicated on plans, are approximate in location. It is not the intention of plans to imply that all existing utilities are drawn and located. It shall be the responsibility of Contractor to coordinate locations of existing utilities prior to doing any excavation work.
3. □ CLEANING AND REPAIRING
- A. During the progress of work, all rubbish, waste, lumber, displaced materials, etc. shall be removed as soon as possible and upon completion of the work, Contractor shall remove from Owner's property and from all public and private property, at his own expense, all temporary structures, rubbish and waste material resulting from his operations.
 - B. The Contractor shall restore all removed or damaged pavement, gutters, curbs, sidewalks, sign posts, trees and landscape to as near their original conditions or better.
3. □ SOIL TREATMENT
- A. All electrical backfill shall be treated with toxicant. Toxicant shall be registered with the Environmental Protection Agency (EPA) for use as specified herein. The toxicant shall be chlorpyrifos phosphorothiate, 1.0 □ concentration by weight. Diluent shall not include other pesticide residues or rinsates.
 - B. Application:
 1. Licenses and Certification Requirements: The Contractor shall be licensed by the applicable agency responsible for enforcing the Federal Insecticide, Fungicide, and Rodenticide Act as amended (FIFRA), in the category required for performance of this contract. Pesticide applications shall be made by a certified applicator.
 2. Application: Toxicant shall be applied by spraying after conduits have been covered by one foot of soil but prior to compaction. Application shall be at rate of 1.5 gallons per 10 square feet.

END OF SECTION

SECTION 16402

INTERIOR WIRING SYSTEMS

PART 1 GENERAL

- 1.1 RELATED REQUIREMENTS: Section 16050, "Basic Electrical Materials and Methods," applies to this section with additions and modifications specified herein.
- 1.2 SUBMITTALS
- A. Shop Drawings - Submit for the following:
 - Panelboards
 - B. Manufacturer's Data:
 - Receptacles
 - Circuit breakers
 - Switches
 - Conduit and fittings (each type)
 - Surface metal raceway
 - Ground rods
 - Device plates
 - Insulated conductors
 - Outlet and Junction boxes
 - C. Test Reports: Submit test results for approval in report form.
 - 1. 600-volt wiring test.
 - 2. Grounding system test.
- 1.3 QUALITY ASSURANCE: In each standard referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears. Interpret references in these standards to "authority having jurisdiction," or words of similar meaning to mean Contracting Officer.

PART 2 PRODUCTS

- 2.1 MATERIALS AND EQUIPMENT: Materials, equipment and devices shall, as a minimum, meet the requirements of UL, where UL standards are established for those items, and the requirements of NFPA 70.
- 2.2 CONDUIT AND FITTINGS
- A. Rigid Steel Conduit (Galvanized): ANSI C10.1, UL 6.
 - B. Rigid Aluminum Conduit: ANSI C10.5, UL 6.
 - C. Rigid Nonmetallic Conduit: PVC Type EPC-40, in accordance with NEMA TC2 fiberglass conduit in accordance with NEMA TC14.

- D. Electrical Metallic Tubing (EMT): UL 854, ANSI C80.3.
 - E. Plastic-Coated Rigid Steel and IMC Conduit: NEMA RN1, Type 40 (40 mils thick).
 - F. Flexible Metal Conduit: UL 1.
 - 1. Liquid-Tight Flexible Metal Conduit (Steel): UL 360.
 - G. Fittings for Metal Conduit, EMT and Flexible Metal Conduit: UL 514B. Ferrous fittings shall be cadmium- or zinc-coated in accordance with UL 514B.
 - 1. Fittings for Rigid Metal Conduit and IMC: Threaded type. Split couplings unacceptable.
 - 2. Fittings for EMT: Compression-type.
 - 3. Fittings for use in Hazardous Locations: UL 66.
 - H. Fittings for Rigid Nonmetallic Conduit: NEMA TC3.
- 2.3 SURFACE METAL RACEWAY AND FITTINGS: UL 5, two-piece painted-steel, totally-enclosed, snap-cover type. Provide multiple-outlet type raceway with grounding-type receptacle where indicated. Receptacles shall be as specified herein and shall be spaced as indicated.
- 2.4 OUTLET BOXES AND COVERS: UL 514A, cadmium- or zinc-coated, if of ferrous metal. UL 514C, if nonmetallic.
- A. Floor Outlet Boxes: Boxes shall be adjustable and concrete-tight. Each outlet shall consist of a nonmetallic or cast-metal body with threaded openings or sheet-steel body with knockouts for conduits, adjustable ring, brass flange ring, and cover plate with 1-inch or threaded plug. Telephone outlets shall consist of a flush brass housing with one-inch bushed side opening. Telephone outlets shall have provisions to accommodate a 10-wire telephone terminal block. Receptacle outlets shall consist of flush brass housing with a duplex-type receptacle, as specified herein. Gaskets shall be used where necessary to ensure watertight installation.
- 2.5 CABINETS, JUNCTION BOXES AND PULL BOXES (WITH VOLUME GREATER THAN 100 CUBIC INCHES): UL 50, hot-dip zinc-coated, if of sheet steel.
- 2.6 WIRES AND CABLES: Wires and cables shall meet the applicable requirements of NFPA 70 and UL for the type of insulation, jacket, and conductor specified or indicated. Wires and cables manufactured more than 12 months prior to date of delivery to the site shall not be used.
- A. Conductors: No. 10 AWG and smaller shall be solid. No. 8 AWG and larger shall be stranded. Conductors shall be copper, unless indicated otherwise.
 - 1. Minimum Conductor Sizes: Minimum size for branch circuits shall be No. 12 AWG for Class 1 remote-control and signal circuits, No. 14 AWG and for Class 2 Low-energy, remote-control and signal circuits, No. 16 AWG.
 - B. Color Coding: Provide for all service, feeder, branch, control, and signaling circuit conductors. Color shall be green for grounding conductors, and white for neutrals, except where neutrals of more than one system are installed in same raceway or box, the other

neutral shall be white with a colored (not green) stripe. The color of the ungrounded conductors in different voltage systems shall be as follows:

1. 120/208 volt, 3-phase:
 - Phase A - black
 - Phase B - red
 - Phase C - blue

- C. Insulation: Unless specified or indicated otherwise or required by NFPA 70, all power and lighting wires shall be 600-volt, Type THW, THWN, EHHW, or RHW, except that grounding wire may be Type TW. Remote-control and signal circuits shall be Type TW, THW or TF. Conductors shall conform to UL 83. Where lighting fixtures require 90 degree C conductors, provide only conductors with 90 degree C insulation or better.
- D. Bonding Conductors: ASTM B 1, solid bare copper wire for sizes No. 10 AWG and smaller diameter. ASTM B 1, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2. SPLICES AND TERMINATION COMPONENTS: UL 486A for wire connectors, and UL 510 for insulating tapes. Connectors for wires No. 10 AWG and smaller diameter wires shall be insulated, pressure-type in accordance with UL 486A or UL 486C (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2. DEVICE PLATES: Provide UL listed, one-piece device plates for outlets and fittings to suit the devices installed. Plates on finished walls shall be urea or phenolic, minimum 0.10-inch wall thickness. Plates shall be the same color as the receptacle or toggle switch with which they are mounted. Screws shall be machine type with countersunk heads in a color to match the finish of the plate. The use of sectional type device plates will not be permitted. Plates installed in wet locations shall be gasketed and UL listed for "wet locations".

2.9 SWITCHES

- A. Toggle Switches: Fed. Spec. W-S-896, totally enclosed with bodies of thermosetting plastic and a mounting strap. Handles shall be ivory. Wiring terminals shall be of the screw type, side wired. Switches shall be rated quiet-type AC only, 120/277 volts, with the current rating and number of poles indicated.
- B. Disconnect Switches: NEMA KS1. Switches serving as motor-disconnect means shall be horsepower rated. Provide heavy duty type switches where indicated, where switches are rated higher than 240 volts, and for double throw switches. Fused switches shall utilize Class R fuseholders and fuses, unless indicated otherwise. Provide switches in NEMA enclosure as indicated, per NEMA ICS 6.

2.10 RECEPTACLES: UL 498 and NEMA WDI, heavy-duty, specification grade grounding type. Ratings and configurations shall be as indicated. Wiring terminals shall be of the screw type, side wired. Connect grounding pole to the mounting strap. Bodies shall be ivory thermosetting plastic supported on a metal mounting strap.

- A. Switched Duplex Receptacles: Provide separate terminals for each ungrounded pole. The top receptacles shall be switched when installed.
- B. Weatherproof Receptacles: Provide in a cast metal box with a gasketed, weatherproof, cast-metal cover plate and a gasketed cap over each receptacle opening. Receptacle shall be UL approved for use in "wet locations". All outdoor-location receptacles shall be GFCI and

weather-resistant rated. Device cover shall be weatherproof rated, "in-use" type. Receptacles to be installed at dwelling units shall be tamper-resistant rated.

- C. Ground Fault Circuit Interrupter (GFCI) Receptacles: UL 94, duplex type for mounting in a standard outlet box. The device shall be capable of detecting a current leak of 6 milliamperes or greater and tripping per requirements of UL 94 for Class A GFCI devices.
 - D. Special Purpose Receptacles: Receptacles serving special purpose. Provide in ratings indicated. Furnish one matching plug with each receptacle.
- 2.11 PANELBOARDS: UL 67 and UL 80. Panelboards for use as service disconnecting means shall additionally conform to UL 869. Panelboards shall be circuit breaker equipped bolt on type. Design shall be such that any individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as a means of obtaining clearances as required by UL. Where "space only" (PFB) is indicated, make provisions for the future installation of a breaker sized as indicated. All panelboard locks shall be keyed same. Directories shall be typed to indicate load served by each circuit and mounted in a holder behind transparent protective covering.
- A. Panelboard Buses: Provide panelboard with copper bus. Support bus bars on bases independent of the circuit breakers. Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or tapping. Provide an isolated neutral bus in each panel for connection of circuit neutral conductors. Provide a separate ground bus identified as equipment grounding bus per UL 67 for connecting grounding connectors bond to steel cabinet.
 - B. Circuit Breakers: Fed. Spec. W-C-7 thermal magnetic type with interrupting capacity as indicated. Series rated circuit breakers are unacceptable. Breaker terminals shall be UL listed as suitable for the type of conductor provided. Plug-in circuit breakers unacceptable.
 - 1. Multipole Breakers: Provide common-trip type with a single operating handle. Breaker design shall be such that an overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B and C, respectively.
 - 2. Circuit Breaker with GFCI: UL 94 and NFPA 70. Provide with "push-to-test" button, visible indication of tripped condition, and ability to detect and trip on current imbalance of 6 milliamperes or greater per requirements of UL 94 for Class A GFCI devices.
- 2.12 ENCLOSED CIRCUIT BREAKERS: UL 489. Individual molded case circuit breakers with voltage and continuous current ratings, number of poles, overload trip setting, and short circuit interrupting rating as indicated. Enclosure type as indicated. Provide solid neutral.
- 2.1 TELEPHONE SYSTEM: Provide a system of telephone wire supporting structures, including conduits with pull wires, terminal boxes, outlet and junction boxes and other accessories for telephone outlets, telephone cabinets.
- A. Outlet Boxes for Telephone System: Standard type, as specified herein. Mount flush in finished wall at height indicated. Outlet boxes for wall-mounted telephones shall be 2 inches by 4 inches mounted at height as indicated. Outlet boxes for handicapped station shall be mounted at height 48 inches above finished floor.
 - B. Cover Plates: Blank cover with 1/8-inch hole, modular telephone type of the finish specified for receptacles and switch cover plates.

- C. Conduit Sizing: Unless otherwise indicated, conduit for single outlets shall be a minimum of 1/4 inch and for multiple outlets a minimum of 1 inch. Size conduits for telephone risers to telephone cabinets, junction boxes, distribution centers, and telephone service as indicated.
 - D. Backboards: Interior grade plywood, 1/4 inch thick.
 - E. Terminal Cabinets: Construct of cold-rolled sheet steel. Match trim, hardware, doors and finishes to lighting panelboards.
 - F. Receptacles for Telephone Service: Provide receptacles, 120 volts, single phase, 60 Hz, adjacent to telephone backboards, served from panelboard circuit as indicated.
- 2.14 GROUNDING AND BONDING EQUIPMENT: UL 467. Ground rods shall be copper-encased steel, with minimum diameter of 1/4 inch and minimum length of 10 feet.
- 2.15 CONTACTOR: NEMA ICS 2, electrically operated, mechanically held contactor rated as indicated. Provide in NEMA 1 enclosure conforming to NEMA ICS 6. Contactor shall have silver alloy double-break contacts and coil clearing contactor with hand-off automatic selector switch.
- 2.16 NAMEPLATES: Fed. Spec. L-P-87. Provide as specified in Section 16000, "Basic Electrical Materials and Methods."
- 2.17 SOURCE QUALITY CONTROL: Test opening around electrical penetrations through fire resistive-rated walls, partitions, floor or ceiling for fire resistive integrity in accordance with ASTM E 814.

PART 0 EXECUTION

- 01 INSTALLATION: Electrical installations shall conform to requirements of NFPA 70 and to requirements specified herein.
- A. Underground Service: Underground service conductors and associated conduit shall be continuous from service entrance equipment to outdoor power system connection.
 - B. Service Entrance Identification: Service entrance disconnect devices, switches, or enclosures shall be labeled or identified as such.
 - 1. Labels: Wherever work results in service entrance disconnect devices in more than one enclosure, as permitted by NFPA 70, each enclosure, new and existing, shall be labeled as one of several enclosures containing service entrance disconnect devices. Label, at minimum, shall indicate number of service disconnect devices housed by enclosure and shall indicate total number of enclosures that contain service disconnect devices. Provide laminated plastic labels. Use lettering of at least 0.2 inch in height, and engrave on black-on-white matte finish. Service entrance disconnect devices in more than one enclosure shall be provided only as permitted by NFPA 70.
 - C. Wiring Methods: Provide insulated conductors installed in conduit, except where specifically indicated or specified otherwise, or required by NFPA 70 to be installed otherwise. Provide insulated, green equipment grounding conductor in all feeder and branch circuits, including lighting circuits. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated, green conductor for grounding conductors installed in conduit

or raceways. Minimum conduit size shall be 1/2 inch in diameter for low voltage lighting and power circuits. Vertical distribution in multiple story buildings shall be made with metal conduit in fire-rated shafts. Metal conduit shall extend through shafts for minimum distance of 6 inches. Conduit which penetrates fire walls, fire partitions, or floors shall be metallic on both sides of fire walls, fire partitions, or floors for minimum distance of 6 inches.

1. Aluminum Conduit: Use in exposed installation and in unairconditioned spaces.
 - a. Do not install underground or encase in concrete.
 - b. Do not use brass or bronze fittings.
2. Electrical Metallic Tubing: Use in dry partitions and above drop ceiling.
 - a. Do not use in feeder circuits.
 - b. Do not install underground.
 - c. Do not encase in concrete.
 - d. Do not use in areas where subject to severe physical damage including, but not limited to, mechanical equipment rooms and electrical equipment rooms.
 - e. Do not use in hazardous areas.
 - f. Do not use in outdoor work.
- Nonmetallic Conduit:
 - a. Underground Conduit: PVC, Type EPC-40 or fiberglass.
 - b. Conduit Embedded in Concrete: PVC, Type EPC-40.
 - c. Restrictions applicable to PVC Schedule 40 and PVC Schedule 80:
 - Do not use in areas subject to severe physical damage including, but not limited to, mechanical equipment rooms, electrical equipment rooms, etc.
 - Do not use in hazardous areas.
 - Do not use in penetrating fire-rated walls or partitions, fire rated floors, etc.
- D. Conduit Installation: Unless indicated otherwise, conceal conduit within finished walls, ceilings, and floors. Keep conduit minimum 6 inches away from parallel runs of flues and steam or hot-water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.
 1. Where conduits rise through floor slabs, the curved portion of bends shall not be visible above the finish slab.

2. **Conduit Support:** Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood□by toggle bolts on hollow masonry units□by concrete inserts or expansion bolts on concrete or brick□by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. The load applied to fasteners shall not exceed one-fourth of the proof test load. Fasteners attached to concrete ceiling shall be vibration resistant and shock resistant. Holes cut to a depth of more than 1-1/2 inches in reinforced concrete beams or to a depth of more than □4-inch in concrete □oints shall not cut the main reinforcing bars. Fill unused holes. In partitions of light steel construction, use sheet-metal screws. In suspended-ceiling construction, run conduit above the ceiling. Spring steel fasteners may be used for lighting branch circuit conduit supports in suspended ceiling in dry locations. Where conduit crosses building expansion □oints provide a suitable watertight expansion/deflection fitting that maintains the conduit electrical continuity by bonding □umpers or other means.
 - Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with a hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of all obstructions.
4. Install pull wires in empty conduit in which wire is to be installed by others. The pull wire shall be plastic having minimum 200-pound tensile strength. Leave a minimum 12 inches of slack at each end of the pull wire.
 - Telephone and Television System Conduits: Install in accordance with the specified requirements for conduit and with the additional requirement that no length of run shall exceed 1□0 feet for trade sizes 2 inches and smaller and shall not contain more than two 90-degree bends or the equivalent. Provide pull or □unction boxes where necessary to comply with these requirements. Inside radii of bends in conduits one-inch trade size and larger shall be minimum five times the nominal diameter. Terminate conduit at bottom edge of backboard.
6. **Conduit Installed in Concrete Floor Slabs:** Locate so as not to adversely affect the structural strength of the slabs. Install conduit within the middle one-third of the concrete slab. Do not stack conduits. Space conduit horizontally minimum three diameters except at cabinet locations. Curved portions of bends shall not be visible above the finish slab. Increase slab thickness as necessary to provide a minimum one-inch cover over conduit. Where embedded conduits cross expansion □oints, provide suitable watertight expansion/deflection fittings and bonding □umpers. Conduit larger than one-inch trade size shall be parallel with or at right angles to the main reinforcement□when at right angles to the reinforcement, the conduit shall be close to one of the supports of the slab.
7. Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box□otherwise, use minimum single locknut and bushing. Locknuts shall have sharp edges for digging into the wall of metal enclosures. Install bushings on the ends of conduits and provide insulating type where required by NFPA 70.
8. **Stub-Ups:** Provide conduits stubbed up through concrete floor for connection to free-standing equipment with an ad□stable top or coupling threaded inside for plugs,

set flush with the finished floor. Extend conductors to equipment in rigid steel conduit, except that flexible metal conduit may be used 6 inches above the floor. Where no equipment connections are made, install screwdriver-operated threaded flush plugs in conduit end.

9. Flexible Connections: Provide flexible connections of short length, 6 feet maximum, for recessed and semi-recessed lighting fixtures for equipment subject to vibration, noise transmission, or movement and for all motors. Provide liquid-tight flexible conduit in wet locations. Provide separate ground conductor across flexible connections.

E. Boxes, Outlets and Supports: Provide boxes in the wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be of the cast-metal hub type when located in wet locations, when surface mounted on outside of exterior surfaces, when installed exposed up to 7 feet above interior floors and walkways, or when installed in hazardous areas. Boxes in other locations shall be sheet steel, except that aluminum boxes may be used with aluminum conduit and nonmetallic boxes may be used with nonmetallic conduit system. Each box shall have the volume required by NFPA 70 for the number of conductors enclosed in the box. Boxes for mounting lighting fixtures shall be minimum 4 inches square or octagonal, except that smaller boxes may be installed as required by fixture configurations, as approved. Boxes for use in masonry-block or tile walls shall be square-cornered tile-type, or standard boxes having square-cornered tile-type covers. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by the fixture terminal operating temperature fixtures shall be readily removable for access to the boxes unless ceiling access panels are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of the ceiling supports or make adequate provisions for distributing the load over the ceiling support members. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units and with machine screws or welded studs on steel. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type fastener maximum 24 inches from the box. When penetrating reinforced-concrete members, avoid cutting any reinforcing steel.

1. Boxes for use with raceway systems shall be minimum 1-1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting-fixture outlets shall be minimum 4 inches square, except that 4 inch by 2 inch boxes may be used where only one raceway enters the outlet. Telephone outlets shall be a minimum of 4 inches square by 1-1/2 inches deep.
 2. Pull Boxes: Construct of at least the minimum size required by NFPA 70 of code-gage aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified herein. Furnish boxes with screw-fastened covers. Where several feeders pass through a common pull box, tag the feeders to indicate clearly the electrical characteristics, circuit number, and panel designation.
- Extension Rings: Used only on existing boxes in concealed conduit systems where wall is furred out for new finish.

F. Mounting Heights: Mount panelboards, circuit breakers, and disconnecting switches so the height of the operating handle at its highest position maximum 72 inches above the floor.

Mount lighting switches receptacles and other devices as indicated. Measure mounting heights of wiring devices and outlets to the center of device or outlet.

- G. Conductor Identification: Provide conductor identification within each enclosure where a tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, color coding shall be by factory-applied color-impregnated insulation. For conductors No. 4 AWG and larger diameter, color coding shall be by plastic-coated self-sticking markers, colored nylon cable ties and plates, or heat-shrink type sleeves. Identify control circuit terminations.
- H. Splices: Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with an insulated pressure type connector. Make splices in conductors No. 8 AWG and larger diameter with a solderless connector and cover with an insulation material equivalent to the conductor insulation.
- I. Covers and Device Plates: Install with edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings are not permitted. Plates shall be installed with an alignment tolerance of 1/16 inch. The use of sectional type device plates are not permitted. Plates installed in wet locations shall be gasketed.
- Electrical Penetrations: penings around electrical penetrations through fire resistance rated walls, partitions, floors, or ceilings shall be sealed to maintain fire resistive integrity as tested per ASTM E 814.
- K. Grounding and Bonding: In accordance with NFPA 70. Ground all exposed non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, and neutral conductor of wiring systems. Make ground connection at the main service equipment and extend grounding conductor to the point of entrance of the metallic water service. Make connection to the water pipe by a suitable ground clamp or lug connection to a plugged tee. If flanged pipes are encountered, make connection with the lug bolted to the street side of the flanged connection. Supplement the metallic water service grounding system with an additional made electrode in compliance with NFPA 70. Make ground connection to driven ground rods on the exterior of the building. Where ground fault protection is employed, ensure that the connection of ground and neutral does not interfere with the correct operation of the fault protection. Bond building foundation rebars to ground.
 - 1. Grounding Conductor: Provide an insulated, green equipment grounding conductor in all feeder and branch circuits including lighting circuits. Grounding conductor shall be separated from the electrical system neutral conductor. Provide insulated, green conductor for grounding conductors installed in conduit or raceways.
 - 2. Resistance: The maximum resistance to ground of the grounding system shall not exceed 2 Ω ohms under normally dry conditions. Where the resistance obtained exceed 2 Ω ohms provide additional ground rods to achieve the resistance level. Spacing of ground rods shall not exceed 10 feet apart.
 - Telephone and Television Service: Provide a main service equipment ground consisting of a separate No. 6 AWG ground wire in conduit between the equipment backboard and a readily accessible grounding connection. The equipment end of the ground wire shall consist of a coiled length at least twice as long as the terminal cabinet or backboard height.

- L. Motor Load: When motor size provided differs from the size indicated or specified, make adjustments to the wiring, disconnect devices, and branch circuit protection to accommodate the equipment actually provided.
- 2.2 FIELD QUALITY CONTROL: Furnish test equipment and personnel and submit written copies of test results to the Contracting Officer. Give five working days notice prior to each test.
- A. Devices Subject to Manual Operation: Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.
 - B. Test on 600-Volt Wiring: Test all 600-volt wiring to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on all wiring No. 6 AWG and larger diameter using an instrument which applies a voltage of approximately 500 volts to provide a direct reading of resistance—minimum resistance shall be 20,000 ohms.
 - C. Grounding System Test: Test the grounding system to ensure continuity and resistance to ground is not excessive. Test each ground rod for resistance to ground before making any connections to the rod—tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to the Contracting Officer and indicate the location of the rods as well as the resistance and soil conditions at the time the measurements were made.

END OF SECTION

SECTION 1610

LIGHTING SYSTEM

PART 1 GENERAL

- 1.1 GENERAL REQUIREMENTS: Section 1600, "Basic Electrical Materials and Methods", applies to this Section, with the additions and modifications specified herein.
- 1.2 DESCRIPTION OF WORK: The work includes providing lighting fixtures, photocell switches, dimmer switches, time switches, contactors, and battery-powered units and systems for interior use, including lighting fixtures and accessories mounted on the exterior surfaces of buildings. Materials not normally furnished by manufacturers of these devices are specified in Section 16402, Interior Wiring Systems.
- 1.3 SUBMITTALS: Data, shop drawings and reports shall employ the terminology, classifications and methods prescribed by the IES Lighting Handbook, as applicable, for the lighting system specified.
 - A. Manufacturer's Data:
 - 1. Lighting Fixtures, including Lamps and Ballasts
 - 2. Lighting Contactors
 - Photocell Switch
 - 4. Timer Switch
 - Emergency Lighting Equipment
 - 6. Light Pole
 - B. Shop Drawings:
 - 1. Lighting fixture assemblies.
 - 2. Emergency lighting systems.
 - Light Pole Assembly and Foundation.

PART 2 PRODUCTS

- 2.1 FLUORESCENT LIGHTING FIXTURES: UL 1070, except lighting fixtures for damp and wet locations shall conform to UL 107.
- A. Fluorescent Lamps: Provide the number, type and wattage indicated. Provide lamp conforming to ANSI C78.
- B. Fluorescent Ballasts: UL 900, ANSI C82.1 and shall be labeled Certified Ballast Manufacturers (CBM) certified by Electrical Testing Laboratories (ETL)
 - 1. Electronic Ballasts: Provide energy-saving fluorescent ballasts of the CBM certified full light output type. The ballasts shall have an average input wattage of 112 or less

when operating four F0□2T8 lamps, 62 or less when operating two F0□2T8 lamps, □6 or less when operating one F0□2T8 lamp, tested in accordance with ANSI C82.2 methods. Ballast shall have a frequency of operation of 20 Khz or greater, and operate without visible flicker. Total Harmonic Distortion shall be less than 20□. Ballast shall meet all applicable ANSI and IEEE standards regarding transient protection. Ballast shall be designed for parallel lamp connection, meaning, if one or more lamps fail, the companion lamps remain fully lit. Ballast shall maintain constant light output over operating range of □10□ of the input voltage. Ballast factor shall be 0.88 or higher. Nominal power factor shall be 0.9□ or higher. Lamp current crest factor shall be below 1.7. Manufacturer shall provide warranty that ballast will be free from defects in material and workmanship for a period of □years from the date of manufacture. Warranty shall cover labor and material to replace the defective ballast. □nly new ballasts manufactured not earlier than 6 months at time of installation will be accepted. Use single ballast for two or three lamps light fixtures.

b. Acceptable Manufacturers for Fluorescent Electronic Ballast:

EBT □Electronic Ballast Technology□
Motorola
Magnetek
□almont

C. □pen-Tube Fluorescent Fixtures: Provide with spring-loaded telescoping sockets or lamp retainers □two per lamp□

2.2 HIGH-INTENSIT□-DISCHARGE □HID□LIGHTING FI□TURES: UL 1□72.

A. HID Lamps: Provide the number, type and wattage indicated.

B. HID Ballasts: UL 1029 and ANSI C82.4 and shall be constant wattage autotransformer □CWA□ or regulator, high power factor type, unless otherwise indicated. Ballasts shall be designed to operate on the voltage system to which they are connected. Single-lamp ballasts shall have a minimum starting temperature of minus □0 degrees C. Ballasts shall be designed for installation in a normal ambient temperature of 40 degrees C. Ballasts shall be constructed so that open circuit operation will not reduce the average life. High Pressure Sodium □HPS□ ballasts shall have a solid-state igniter/starter with an average life in the pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 degrees C. Average life is defined as the time after which □0 percent will have failed and □0 percent will have survived under normal conditions.

2.□ RECESS AND FLUSH-M□UNTED FI□TURES: Provide type that can be relamped from the bottom. Trim for the exposed surface of flush-mounted fixtures shall be as shown on sketches or as indicated.

2.4 SUSPENDED FI□TURES: Provide hangers capable of supporting twice the combined weight of the adjoining fixtures. Provide with swivel hangers to insure a plumb installation. Hangers shall be cadmium-plated steel with swivel-ball tapped for the conduit size indicated. Hangers shall allow fixtures to swing within an angle of 20 degrees. Brace pendants 4 feet or longer provided in shops or hangers to limit swinging. Single-unit suspended fluorescent fixtures shall have twin-stem hangers. Multiple-unit or continuous row fluorescent fixtures shall have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end. Rods shall be a minimum □/16-inch diameter.

2.□ LIGHTING C□NTACT□R: NEMA ICS 2, electrically operated, mechanically held contactor rated as indicated. Provide in NEMA 1 enclosure conforming to NEMA ICS 6. Contactor shall have silver

alloy double-break contacts and coil clearing contacts and shall require no arcing contacts. Provide contactor with hand-off-automatic selector switch. Contactor shall be hermetically sealed.

- 2.6 TIME SWITCH: Astronomic dial type arranged to turn "ON" at sunset, and turn "OFF" at predetermined time between 8:00 p.m. and 2:00 a.m. or sunrise, automatically changing the settings each day in accordance with seasonal changes of sunset and sunrise. Provide switch with automatically wound spring mechanism to maintain accurate time for a minimum of 100 hours following failure. Provide time switch with a manual on-off bypass switch. Housing for the time switch shall be surface mounted, NEMA 1 conforming to NEMA ICS 6.
- 2.7 PHOTO-INITIATED TIME SWITCH: UL and CSA listed. Photo-initiated time control with 7-day calendar dials. 120 Volts, 2 NO, 1 NC contacts rated for 20 ampere tungsten load. Photocontrol turns lights on, time control turns lights off at preset time. Seven day calendar dial shall permit different off time each day of week or omit any day. Provide automatic springwound to carry-over and to keep the control running up to 10 hours during power outage. Heavy duty synchronous timing motor suitable for operation up to 140°F. Enclosure shall have provisions for padlock.
- 2.8 PHOTOCELL SWITCH: UL 770 or UL 770A, as applicable, hermetically sealed cadmium-sulphide cell rated as indicated. in a high-impact resistant non-corroding and non-conductive molded plastic housing with a locking-type receptacle. The switch shall turn on below 10 footcandles and off at 1 to 10 footcandles. A time delay shall prevent accidental switching from transient light sources. Mount a directional lens in front of the cell to prevent fixed light sources from creating a turnoff condition. Aim switch according to manufacturer's recommendations.
- 2.9 EXIT SIGNS: UL 924, NFPA 70 and NFPA 101.
- A. Exit signs shall be as indicated.
 - B. Self-Powered Exit Signs (Battery Type) Provide with automatic power failure device, test switch, pilot light and fully automatic high/low trickle charger in a self-contained power pack. Battery shall be sealed wet or gel electrolyte type, operate unattended, and require no maintenance (including additional water) for a period of not less than 5 years.
- 2.10 LIGHT POLES: Light pole assembly, foundation, fixtures, and fittings shall be designed to withstand 170 MPH wind speed IBC 2009 Exposure C and ASCE7-05 while supporting luminaires. Poles shall have oval-shaped handhole having a minimum clear opening of 2.0 by 1.0 inches. Handhole cover shall be secured by stainless steel captive screw. Aluminum poles shall be corrosion resistant aluminum alloys, seamless extruded or spun seamless type. Steel poles shall have a minimum yield strength of 48,000 psi and hot-dipped galvanized in accordance with ASTM A123. Factory finish shall be as indicated. Provide a pole grounding connection designed to prevent electrolysis when used with copper ground wire.

PART 1 EXECUTION

- 1.1 INSTALLATION: Set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved shop drawings. The installation shall meet with the requirements of NFPA 70. Mounting heights specified or indicated shall be to bottom of fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Obtain approval of the exact mounting for lighting fixtures on the job before installation is commenced and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Light fixtures shall be supported from building main structure. Do not support fixtures by ceiling acoustical panels. Where fixtures of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support such fixtures independently and with at least

two 1/4-inch metal channels spanning, and secured to, the ceiling tees. Provide rods or wires for lighting fixture support under this section of the specifications. Rods or wires shall conform to the requirements of Division 9. Additionally, for recessed fixtures, provide support clips securely fastened to ceiling grid members, a minimum of one at or near each corner of each fixture.

A. Exit and Emergency Lights: Wire exit light on separate circuits and serve from an emergency panel. Connect this panel ahead of the main service disconnect switch. The lights shall have only one control, which shall be the circuit breaker in the emergency panel. Wire emergency lights ahead of the switch to the normal lighting circuit located in the same room or area.

2.2.2.1.2 GRONDING: Ground noncurrent-carrying parts of equipment as specified in Section 16402, "Interior Wiring System". Where the copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

2.2.2.1.3 FIELD TESTS: The Contractor shall provide electric power required for field tests.

A. Operating Test: Upon completion of the installation, conduct an operating test to show that the equipment operated in accordance with the requirements of this section.

B. Insulation Resistance Test: Perform as specified in Section 16402, "Interior Wiring Systems", both before and after connection of fixtures and equipment.

C. Ground Resistance Test: Perform as specified in Section 16402, "Interior Wiring Systems".

2.2.2.1.4 RELAMPING: Relamp luminaires which have failed lamps at completion of work.

2.2.2.1.5 ADJUSTING AND CLEANING:

A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Touch up luminaire and pole finish at completion of work.

END OF SECTION

SECTION 16721

FIRE ALARM AND DETECTION SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide fire alarm and detection systems where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
1. Control panel;
 2. Annunciator;
 3. Smoke detectors;
 4. Signal devices;
 5. Manual stations;
 6. Audiovisual Alarms;
 7. Auxiliary Power; and
 8. Connection to related items furnished under other Sections of these Specifications, or under separate contract, such as (when required):
 - a. Air Handling Unit (AHU) Control.
- B. Related Work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications;
 2. Section 16402: Interior Wiring System.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Qualifications of Installer:
1. Prior to installation, the Prime Contractor shall submit data for the approval of the Contracting Officer which will show that he has successfully installed fire alarm systems of the same type and design as specified herein, or that he has a firm contractual agreement with a subcontractor having such required experience. The data shall include the names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. The

Contractor shall indicate the type and design of these systems and certify that these systems have performed satisfactorily in the manner intended for a period of not less than 18 months; and

2. Manufacturer's Representative: The service of a qualified manufacturer's representative or technician, experienced in the installation and operation of the type of system being provided shall be furnished to supervise the complete installation including all wiring, testing, final testing, adjustment of the system and instruction to Owner's representative.

C. Codes and Regulations:

1. In addition to complying with the specified requirements, comply with pertinent regulations of governmental agencies having jurisdiction; and
2. In the event of conflict between or among requirements specified herein and those of governmental agencies having jurisdiction, the more stringent requirement shall govern if so determined by the Contracting Officer.

D. Certificates:

1. Submit with the Shop Drawings a certified statement that the battery installation conforms to the referenced operating requirements; and
2. Submit with the O&M manual a certified statement that the complete installation is installed in accordance with latest code, contract documents, and that the system is in proper operation.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Division 1.

B. Product Data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades; and
4. Manufacturer's recommended installation procedures which, when approved by the Contracting Officer, will become the basis for accepting or reflecting actual installation procedures used on the Work.

C. Upon completion of the work of this Section, and as a condition of its acceptance, deliver to the Contracting Officer three copies of an operation and maintenance manual compiled in accordance with the provisions of Section 16050 of these Specifications.

1.4 PRODUCT HANDLING: Comply with pertinent provisions of Section 16050 and Division 1.

PART 2 PRODUCTS

2.1 DESIGN

- A. Design a fire alarm and detection system acceptable to the Contracting Officer and to all governmental agencies having jurisdiction, providing the following functions and such others as are required:
 - 1. Upon activation of any manual station or automatic detectors or sprinkler flow switch, visual and audible signals shall occur immediately, light the red alarm light at the control panel, turn off the AHU, send signal to elevator controller, and signals shall remain locked in until manually reset at the control panel;
 - 2. Upon activation of any sprinkler supervisory switch, visual and audible signals shall occur immediately at the control panel, and signals shall remain locked in until manually reset at the control panel; and
 - 3. All detection and signal circuits shall be supervised with warning and visual trouble light for each zone, in case of grounds or loss of continuity.

2.2 MATERIALS

- A. Acceptable Manufacturers:
 - 1. To the maximum extent practicable, use only the products of a single manufacturer; and
 - 2. Use products of one of the following, or an equal approved in advance by the Contracting Officer:
 - a. Edwards;
 - b. Honeywell;
 - c. Simplex;
 - d. Gamewell;
 - e. Faraday; or
 - f. FCI
- B. Fire Alarm Control Panel:
 - 1. Provide zoned, non-zoned, solid state type, with rechargeable batteries and ground fault protection, able to be flush mounted or surface mounted, and expandible for future use; and
 - 2. Provide for expansion by simple insertion of additional zone modules.
- C. Annunciator:
 - 1. Provide LED type with long life and high reliability, flush mounted and with engraved face plate (add-on plastic labels or tags will not be acceptable); and
 - 2. Provide face plate finish as selected by the Contracting Officer from standards of the approved manufacturer.

- D. Smoke Detectors: Provide photoelectric detectors. Operate on a multiple cell concept using a LED light source. Failure of the LED shall not cause an alarm condition but shall operate the detector indicating lamp. The detector shall automatically reset when smoke condition clears.
- E. Duct Smoke Detectors: Refer to Division.
- F. Audiovisual Alarms: Provide an approved audiovisual alarm devices consisting of a vibrating type alarm horn suitable for use in an electrically supervised circuit and top mounted integral flashing strobe light. Horn shall have a sound rating of at least 100 decibels at 10 feet. Strobe light shall be in accordance with ADA current requirements.
- G. Magnetic Door Holders: Provide wall mounted type, with brush aluminum finish.
- H. Manual Stations: Shall be pull levers type with cast in operating directions. Switch shall be normally open, U.L. approved for fire alarm service.
- I. Power Supply:
 - 1. Primary Power: Power shall be 120 volts AC service, transformed through a two winding isolation type transformer and rectified to low voltage DC for operation of all signal initiating, signal sounding, trouble signal and annunciator tripping circuits. A secondary DC power supply for operation of system in the event of failure of the AC supply shall be provided. Transfer from normal to secondary power shall be fully automatic and shall not cause transmission of a false alarm. AC operating power shall be obtained at the location indicated with provisions for locking the cover. The switch box shall be painted red and shall be suitably identified by a lettered designation.
 - 2. Auxiliary Power: Consist of maintenance free nickel cadmium or lead calcium rechargeable storage batteries and battery charger. Batteries shall have sufficient ampere hour rating to operate the system under supervisory and trouble condition for 24 hours and audible and visual signal devices under alarm conditions for an additional 10 minutes.
- Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Contracting Officer.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS: Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Install the work of this Section in strict accordance with pertinent requirements of governmental agencies having jurisdiction, and with the manufacturer's recommendations as approved by the Contracting Officer.

- C. Put all components through at least five complete cycles of operation, adjust as required, and verify that the complete system functions at optimum operating level.

3.3 PRELIMINARY TESTS

- A. Conduct the following tests during installation of wiring and system components. Correct any deficiency pertaining to these requirements prior to formal functional and operational tests of the system.
 - 1. Ground Resistance: Measure the resistance of each connection to ground. Ground resistance shall not exceed 25 ohms.
 - 2. Dielectric Strength and Insulation Resistance: Test the dielectric strength and the insulation resistance of the system interconnecting wiring by means of an instrument capable of generating 500 volts dc and equipped to indicate leakage current in 1000 megohms. For the purpose of this test, the instrument shall be connected between each conductor on the line and between each conductor and ground at the control panel end of the line, with the other extremity open circuited and all series-connected devices in place. The system shall withstand the test without breakdown and shall indicate a resistance of not less than 500,000 ohms, the measurement being taken after an electrification of not more than 1.0 minute with a dc potential of not less than 100 volts nor more than 550 volts.
 - 3. Smoke Detector Tests: Prior to formal inspection and tests, clean and perform sensitivity tests on each smoke detector. Clean the smoke detectors in accordance with the manufacturer's recommended procedures. Present recorded data at the formal inspection for verification. Approved copies shall become part of the operations and maintenance manual for the fire alarm system.

3.4 FIELD INSPECTION AND TEST: Before final acceptance of the work, test each system to demonstrate compliance with the contract requirement. Each system shall be subjected to complete functional and operations test including tests in place of each heat and smoke detector. When tests have been completed and corrections made, submit a signed and dated certificate with a request for formal inspection and tests.

3.5 FORMAL INSPECTION AND TEST: The Contracting Officer and Fire Chief will witness formal tests after receipt of written certification that preliminary tests have been completed and that the system is ready for final inspection. The system manufacturer's technical representative shall be present for the final inspection and test. Preliminary tests shall be repeated, and functional and operational tests conducted, as requested by the Contracting Officer or Fire Chief. Correct defects and conduct additional tests to demonstrate that the system conforms to contract specifications.

END OF SECTION