

DIVISION 10

SECTION 10430

ARCHITECTURAL SIGNAGE SYSTEMS

PART 1. GENERAL

1.01 SUMMARY

- A. Work of this Section shall include labor, tools, materials, equipment and services required to engineer, fabricate, construct, pack, ship and install Authority-designed signs, including, but not limited to graphics and sign components as shown on the Contract Drawings, as specified herein and as required to furnish and install a complete installation.
- B. This Section includes the following sign types:
1. Interior
 - a. Ceiling mounted single face and double face signs.
 - b. Wall mounted signs and plaques.
 - c. Pylon signs (free-standing signs).
 2. Exterior
 - a. Roadway signs.
 - b. Post and panel signs.
 - c. Suspended and wall mounted signs.
 - d. Pylon signs (free-standing signs).
- C. Coordinate Work of this Section with trades providing structural support systems to which the signs are attached, and cooperate with such trades to assure the steady progress of Work of this Section.

1.02 REFERENCES

- A. The following is a listing of the publications referenced in this Section:

American Architectural Manufacturers Association (AAMA)

- | | |
|-----------|---|
| AAMA 611 | Voluntary Specification for Anodized Architectural Aluminum. |
| AAMA 2605 | Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels. |

American Association of State Highway and Transportation Officials (AASHTO)

- | | |
|--------------|---|
| AASHTO LTS-4 | Standard Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals. |
|--------------|---|

American Society for Testing and Materials (ASTM)

- | | |
|------------|---|
| ASTM A 167 | Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip. |
| ASTM A 424 | Specification for Steel Sheet for Porcelain Enameling. |

ASTM A 591	Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight [Mass] Applications.
ASTM A 653	Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
ASTM A 780	Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
ASTM A 1008	Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
ASTM B 209	Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
ASTM B 221	Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
ASTM C 283	Test Method for Resistance of Porcelain Enameled Utensils to Boiling Acid.
ASTM C 297	Test Method for Flatwise Tensile Strength of Flat Sandwich Constructions.
ASTM C 346	Test Method for 45-deg Specular Gloss of Ceramic Materials.
ASTM C 481	Test Method for Laboratory Aging of Sandwich Constructions.
ASTM C 538	Test Method for Color Retention of Red, Orange and Yellow Porcelain Enamels.
ASTM D 256	Test Method for Determining the Izod Pendulum Impact Resistance of Plastics.
ASTM D 523	Test Method for Specular Gloss.
ASTM D 790	Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
ASTM D 1003	Test Method for Haze and Luminous Transmittance of Transparent Plastics.
ASTM D 1044	Test Method for Resistance of Transparent Plastics to Surface Abrasion.
ASTM D 2244	Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
ASTM D 4802	Poly (Methyl Methacrylate) Acrylic Plastic Sheet.
ASTM G 154	Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.

American Welding Society (AWS)

AWS D1.1	Structural Welding Code, Steel.
AWS D1.2	Structural Welding Code, Aluminum. Standard Code for Arc and Gas Welding in Building Construction.

Flat Glass Marketing Association (FGMA)

Sealant Manual.

Glass Association of North America (GANA)

Glazing Manual.

Military Specifications

DOD-P-15328D	Primer (Wash), Pretreatment (Formula No. 117 for Metals).
	<u>National Association of Architectural Metal Manufacturers (NAAMM)</u>
	Metal Finishes Manual for Architectural and Metal Products.

National Fire Protection Association

NFPA 70 National Electrical Code.

Porcelain Enamel Institute (PEI)

PEI-1001 Specifications for Architectural Porcelain Enamel.

The Society for Protective Coatings (SSPC)

SSPC-Paint 12 Paint Specification No. 12 – Cold Applied Asphalt Mastic (Extra Thick Film).

SSPC-Paint 20 Paint Specification No. 20 – Zinc-Rich Primers (Type I, "Inorganic" and Type II, "Organic").

SSPC-SP 1 Surface Preparation Specification No. 1 – Solvent Cleaning.

SSPC-SP 5 Surface Preparation Specification No. 5 – White Metal Blast Cleaning.

SSPC-SP 8 Surface Preparation Specification No. 8 – Pickling.

B. Comply with the following codes and standards to the extent that they would apply if the Authority were a private corporation:

1. American Institute of Graphic Arts (AIGA) guidelines.
2. The Americans with Disabilities Act Accessibility Guidelines (ADAAG).
3. Building Code of the City of New York for New York City contracts.
4. National Fire Protection Association (NFPA) regulations.
5. New Jersey Uniform Construction Code for New Jersey contracts.
6. Occupational Safety and Health Act (OSHA) standards.
7. Society for Environmental Graphic Design (SEGD) Sourcebook.

1.03 DESIGN AND PERFORMANCE REQUIREMENTS

A. General

When required by Appendix "A" of this Section, submit design calculations for sign panels and structural supports, signed and sealed by a Professional Engineer licensed in the state in which Work is to be performed, indicating compliance with these Design and Performance Requirements.

1. Structural supports shall be capable of carrying total supported load (including sign, hangers, and attachments) and specified live, wind and earthquake loads.
2. Exterior sign design shall allow for thermal movement resulting from a maximum ambient temperature change (range) of 100 degrees F. Base design on actual surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
3. Sign assemblies shall be designed to prevent buckling, opening up of joints and overstressing of welds and fasteners.

B. Interior Signage

1. Wind Gust Loads

Interior signs located in the entrance lobbies, entrance vestibules or boarding platforms of transportation terminals shall be designed for an incidental wind gust pressure of 15 psf. All other interior signs shall be designed for a minimum lateral pressure of 5 psf.

2. Earthquake Loads

Interior signs shall also be designed for earthquake loads per the applicable local building code, as though the Authority were a private corporation.

3. Live Load

Signs which require routine cleaning or servicing (i.e. variable message, internally illuminated, etc.), whether or not specifically designed for a servicing device, shall be designed for all anticipated additional loads, but not less than a 100-lb. concentrated horizontal load and a 300-lb. concentrated vertical load simultaneously applied at the point of assumed or most eccentric loading. The additional concentrated loads shall be calculated in combination with the sign dead load (not concurrent with wind or earthquake loads).

C. Exterior Signage

1. Wind Load

Exterior signs adjacent to vehicular traffic such as streets, highways, trains and light rail vehicles, or in open terrain, shall be designed in accordance with AASHTO LTS-4. All other exterior signs shall be designed per the applicable local building code, as though the Authority were a private corporation.

2. Live Load

Signs which require routine cleaning or servicing (i.e. variable message, internally illuminated, etc.), whether or not specifically designed for a servicing device, shall be designed for all anticipated additional loads, but not less than a 100-lb. concentrated horizontal load and a 300-lb. concentrated vertical load simultaneously applied at the point of assumed or most eccentric loading. The additional concentrated loads shall be calculated in combination with the sign dead load (not concurrent with wind or earthquake loads).

D. Connection Support

Sign support structures shall be directly connected to structural elements such as structural steel or structural concrete. Connections shall not be made to architectural, mechanical or electrical components.

1.04 QUALITY ASSURANCE

- A. Ensure that entities performing the fabrication and installation Work of this Section have ten (10) years experience in the fabrication and installation of signage involving complexities equal to or greater than those required for the Work of this Section.
- B. Completed Work shall be structurally sound and free from scratches, abrasions, distortions, chips, breaks, blisters, holes, splits and other disfigurement considered as imperfections for the specific material.
- C. Uniformity of Manufacture: For each sign type shown on the Contract Drawings furnish products of a single manufacturer.
- D. Upon request arrange for the Engineer to inspect the sign fabrication facilities to observe fabrication of Work of this Section to ensure conformance to Contract Document requirements. Refer to Division 1 - General Provisions, Article entitled "Inspections and Rejections".

E. Mock-ups

1. Where shown on the Contract Drawings, supply one mock-up of each sign type shown. Mock-ups shall serve as quality standards for the Work of this Section.
2. Install mock-ups at locations identified by the Engineer.
3. Equip illuminated mock-ups with specified luminaries, switches and ballasts and make the mock-ups fully operational.
4. Construct mock-ups to the level and degree of fabrication and finish proposed for Work of this Section. Mock-ups, if approved by the Engineer, may be installed on site as part of the Work.
5. Remove rejected mock-ups from Authority property.

1.05 DELIVERY, STORAGE, AND HANDLING

Deliver signs in protective wrapping and store protected from weather, moisture and soiling. Coordinate on-site storage with the Engineer.

1.06 GUARANTEE

A. Contractor shall execute and submit a Guarantee, acceptable to the Engineer, that Work of this Section is in accordance with the Contract Documents and free from faults and defects in materials and workmanship for a period of five (5) years from the date of issuance of the Certificate of Final Completion.

1. Guarantee shall cover, but not be limited to:
 - a. Color fastness against fading or chalking.
 - b. Non-yellowing of acrylic.
 - c. Assembly, construction and operation.
 - d. No noticeable cracking, chipping, peeling or delamination.
 - e. Uniformity of light in sign illumination.
 - f. Structural failure.

B. Contractor shall submit extended Warranties provided by suppliers of materials and finishes.

1.07 SUBMITTALS

See Appendix "A" for submittal requirements.

PART 2. PRODUCTS

2.01 MANUFACTURERS

See Appendix "B" for manufacturers list.

2.02 MATERIALS

The following materials shall be used, as applicable. Material gages and thicknesses shall be as shown on the Contract Drawings or, if not shown, as specified in this Section. Refer to 2.05 for Shop Finishing.

- A. Structural Steel and Miscellaneous Steel Framing and Supports
Sizes and shapes shown on Contract Drawings.

- B. Aluminum Sheet
Alloy and temper recommended by the aluminum producer or finisher for the type of use and finish shown on the Contract Drawings, and with not less than the strength and durability properties specified in ASTM B 209 for alloy 6061-T6.
- C. Aluminum Extrusions
Alloy and temper recommended by the aluminum producer or finisher for the type of use and finish shown on the Contract Drawings, and with not less than the strength and durability properties specified in ASTM B 221 for alloy 6063-T5.
- D. Steel Sheet
1. Commercial quality cold-rolled carbon steel sheet, stretcher leveled, complying with the following requirements as applicable:
 - a. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591, with Class C zinc coating; chemically treated in mill with phosphate solution and light chromate rinse.
 - b. Uncoated Steel Sheet: ASTM A 1008, exposed, matte finish.
 - c. Galvanized Steel Sheet: ASTM A 653, Coating Designation G 90, mill phosphatized.
 2. Steel Sheet for Porcelain Enamel Panels: Special purpose "enameling iron or steel" of low metalloid and copper content; especially manufactured and processed for the production of porcelain enamel panels; ASTM A 424, commercial quality, Type II; thickness as required for structural performances, but not less than manufacturer's recommended minimums for profiles and applications shown on the Contract Drawings, and not less than 16 gage.
- E. Aluminum Honeycomb Core for Porcelain Steel Panels
1-1/2 inch aluminum honeycomb with a foil thickness of 0.003 inch minimum, cell size 3/4 inch, and density of 1.8 lbs. per cubic foot.
- F. Aluminum Backing Sheets for Porcelain Steel Panels
ASTM B 209; alloy, temper and finish as recommended by panel manufacturer. Sheet manufacturer's standard "stucco" embossed sheet finish. Thickness as required for structural performances, but not less than manufacturer's recommended minimums for profiles and applications shown on Contract Drawings, and not less than 18 gage for exterior panels.
- G. Stainless Steel
Type 316L, plate, sheet or strip, complying with ASTM A 167.
- H. Plastic Laminate
High-pressure laminate engraving stock with face and core plies in contrasting colors, scratch resistant, in thickness and color shown.

I. Cast Acrylic Sheet

Cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, ASTM D 4802, classification category A-1, smooth finish, UV absorbing, in sizes and thicknesses indicated on Contract Drawings, minimum flexural strength of 16,000 psi when tested in accordance with ASTM D 790, minimum allowable continuous service temperature of 176 degrees F (80 degrees C), unless otherwise noted.

1. At cutout acrylic lettering and graphics locations: Clear transparent and white translucent sheet of densities required to produce uniform brightness and minimum halation effects.
2. At silk screen graphics locations: White translucent sheet of density required to produce uniform brightness and minimum halation effects.
3. At color sheet graphics locations: Clear transparent facing sheet and white translucent backing sheet, same as sheets specified above for silk screen graphics locations.
4. Where "clear" sheet material is shown, furnish colorless sheet in matte finish.
5. Where "opaque" sheet material is shown, furnish colored opaque acrylic sheet in colors and finishes shown or, if not shown, as selected by the Engineer from the manufacturer's standards.

J. Colored Coatings for Cast Acrylic Sheet:

1. Where silk screen graphics are shown on the Contract Drawings: Colored coatings, including inks and paints for copy and background colors, shall be as recommended by acrylic manufacturers for optimum adherence to acrylic surface and non-fading for application shown on the Contract Drawings.
2. Where color sheet film graphics are shown on the Contract Drawings: Photographic sheet graphics placed between two cast acrylic sheets (specified above). Photographic sheet graphics shall be "Duratrans RA" display material, manufactured by Kodak, or approved equal. Finished sheet shall include a minimum 7.0 mil thick translucent base and shall be produced by using "Ektacolor RA" chemicals, manufactured by Kodak, or approved equal.

K. Polycarbonate Sheet

Clear, cast polycarbonate sheet with abrasion resisting coating both sides, in sizes, types and thicknesses shown on the Contract Drawings.

1. Strength: Minimum flexural strength of 13,500 psi when tested in accordance with ASTM D 790; Izod impact resistance of 16 lbf per inch when tested in accordance with ASTM D 256.
2. Service Temperature: Maximum allowable continuous service temperature of 240 degrees F.
3. Abrasion Resistance: Maximum 3 percent haze increase for 100 revolutions of a 500g Taber abraser when tested in accordance with ASTM D 1044.
4. Light Transmittance: Minimum 84 percent light transmittance for 1/4 inch thick clear sheet when tested in accordance with ASTM D 1003.

L. Vinyl Film

Computer generated electro-cut and die-cut vinyl, pressure-sensitive legends, 3M Company "Scotchcal" sheeting film, or approved equal. Execute die-cutting in such a manner that edges and corners of finished letterforms are true and clean. Letterforms with round positive or negative corners or with niched, cut or ragged edges are not acceptable.

1. Thickness: Maximum 0.003 inch.
2. Adhesive Quality: Minimum 55 oz. per inch width, after curing for 24 hours, required to break adhesive bond.
3. Cut in accordance with manufacturer's printed instructions.

M. Glazing Accessories

Setting blocks, spacers, compressible fillers and gaskets, setting points and other accessories required for the installation as recommended by the GANA's *Glazing Manual* and FGMA's *Sealant Manual*, for dry glazing system with compression gaskets. Gaskets shall be cellular, neoprene custom size and configuration as required, with pressure adhesive on one side. Neoprene filler rods, sealants and other accessories shall be as shown on Contract Drawings and as required for weather-tight and light-tight installations.

N. Fasteners

Same basic metal and alloy as fastened metal, unless otherwise shown on the Contract Drawings. Do not use metals that are corrosive or incompatible with metals joined.

1. Types, gages and lengths to suit installation conditions.
2. Concealed fasteners for interconnecting sheet metal fabrications and attachment to other construction.

O. Anchors and Inserts

Stainless steel or hot-dipped galvanized anchors and inserts as required for corrosion resistance, hidden when possible. Include inserts as required, to be set into substrate.

P. Mounting Tapes and Adhesives

Adhesives, as recommended by sign manufacturer, to suit installation conditions; "VHB" (Very High Bond) tape for mounting sign plaques, as manufactured by 3M Company, or approved equal.

Q. Mastic Sealant

Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

R. Gaskets

Tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.

S. Galvanizing Repair Paint

High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing minimum 94 percent zinc dust by weight, and complying with SSPC-Paint 20.

T. Bituminous Paint

Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

2.03 CONSTRUCTION FEATURES

Sign graphics and finish shall be as shown on the Contract Drawings.

- A. **Ceiling Mounted Signs**
Fabricated of metal sheet and steel framing with copy on either one or two faces, as shown on the Contract Drawings.
- B. **Wall Mounted Signs and Plaques**
Fabricated of metal sheet or plastic laminate and directly mounted to wall or fascia as shown on the Contract Drawings.
- C. **Pylon Signs**
Square, triangular, rectangular shaped in plan, or as shown, in the form of either a tower or slab. Fabricated of metal sheet or aluminum sandwich panels and steel framing, as shown on the Contract Drawings.
- D. **Roadway Signs**
Fabricated of metal sheet, aluminum sandwich panels and steel framing, as shown on the Contract Drawings.
- E. **Post and Panel Signs.**
Post mounted units fabricated of metal sheet and either aluminum or steel framing as shown on the Contract Drawings.
- F. **Suspended and Wall Mounted Signs**
Fabricated of metal sheet or aluminum sandwich panels, and either directly mounted to a building fascia or façade or suspended by steel or aluminum framing, as shown on the Contract Drawings.

2.04 FABRICATION

- A. **General**
Work shall be fabricated to details shown on the Contract Drawings and on the approved Shop Drawings, and shall be first class workmanship in accordance with the best trade practices. Cutting, fabrication and assembly shall be performed in the factory. Joints, corners, mitres and splices shall be accurately machined, filled, fitted and filed, rigidly framed together at joints and contact points, and painted smooth to give a monolithic appearance with imperceptible joints; there shall be no visible connections. Mechanical fasteners shall match color and finish of the sign where they occur. Exposed metal surfaces shall be smooth with unblemished finish. The completed sign shall be shipped to the job site as one complete unit.
 - 1. Materials shall be selected for their surface flatness, smoothness and freedom from surface blemishes wherever exposed to view in the finished unit. Exposed-to-view surfaces that exhibit pitting, seam marks, roller marks, "oil canning", stains, discolorations or other imperfections on the finished unit are not acceptable.
 - 2. Surfaces shall be covered with a protective cover non-deleterious to finish for protection until final installation or erection.
 - 3. Field measurements shall be taken prior to preparation of Shop Drawings and fabrication.

4. Sandwich panels shall be made in lengths up to a maximum of 24 feet and shall be designed to be mounted horizontally. Locations of horizontal joints shall be determined by the layout of graphics on the signs in order to minimize graphics overlapping the joints. Minimum panel width shall be 2 feet and overall sign panel sizes shall be as shown on the Contract Drawings. Maximum span between supports on 1 inch panels shall not exceed 9 feet.
5. Porcelain steel panel units shall be formed in shape and size in accordance with approved Shop Drawings with allowable tolerances of plus or minus 1/16 inch.
6. Where aluminum is fastened to steel or other dissimilar metal, or where aluminum is in contact with concrete or masonry, contact surface shall be given a heavy coating of bituminous paint.
7. Form closures and trim members to profiles shown using the gage sheet metal shown. Furnish components required for support and installation of closures and trim. Fabricate closures and trim to tightly close with adjoining Work. Finish exposed edges of trim and closure strips. Joints in exposed Work shall not vary more than 1/32 inch in either width or alignment.
8. Locate fasteners to be concealed wherever possible, otherwise to be as inconspicuous as possible. Size fasteners to securely support the Work, and space to prevent buckling or waviness of the finished surface. Exposed fasteners shall be countersunk and filled to match finish.
9. Drill and tap holes required for securing closures to other surfaces. Fasteners shall be hidden from view or countersunk flush to surface.
10. Joints shall have contiguous concealed support to hold meeting faces in flush alignment. Miter or cope trim members at corners to form tight joints.

B. Welding, Brazing and Soldering

Comply with AWS D1.1 and D1.2 and NAAMM for recommended procedures in welding, brazing and soldering. Use filler metals that blend with and match the color of sheet metal being used and the required exposed finish appearance of the metals. Continuously weld, braze or solder corners and seams, and grind smooth and flush on exposed surfaces. Discoloration or stains between base metal and filler metal are not acceptable for exposed portions of natural metal finish.

1. Clean, preheat, heat, flux and sweat solder through full contact area of surfaces to be joined, in accordance with best standards of practice. Remove flux residue and foreign matter after soldering. Rinse soldered areas with water and wipe clean.

C. Graphics

1. The standard for sign messages shall be as shown on the Contract Drawings. Produce "camera-ready" artwork as required based on design furnished by the Engineer on a Macintosh compatible computer disk produced using Adobe Illustrator and QuarkXPress software.
2. Messages
 - a. Letterforms, numbers and symbols for silk-screens or die-cuts shall be prepared from photographic reproductions of repro-proofs of type set copy or computer-generated sign layouts. Film positives shall be submitted to the Engineer for approval, prior to preparation of silk-screens or vinyl lettering.

- b. Silk-screen printing or vinyl die-cutting shall be executed in a such a manner that edges and corners of finished letterforms are sharp, true and clean. Copy with rounded positive or negative corners, edges built-up, bleeding or spattering, shall not be acceptable. Prepare each silk-screen in one continuous piece to accommodate total message coverage, unbroken horizontally or vertically.
- c. Silk-screens and film positives shall be turned over to the Engineer. Refer to Appendix "A".
- d. Silk-screen messages and symbols shall be per Contract Drawings and "camera-ready" artwork. Paint or ink shall be of the finest quality of heat, moisture and fadeproof pigments and vehicles.
- e. Paint or ink shall be of type specially formulated and manufactured for application on the surface material upon which it is to be applied and recommended for such use by the manufacturer of the paint or ink. Priming, surface preparation and application of materials shall be in strict accordance with the manufacturer's written product data and description and as otherwise necessary to produce a finish free of blistering, bleeding, fading and other imperfections. Paint shall be ordered or mixed in quantity to assure consistent application for signs. Finishes shall be as approved by the Engineer during Shop Drawing review.
 - (1) Inks shall be products manufactured by Naz-Dar/KC, 3M Company, or approved equal that are specifically suited for applications shown on the Contract Drawings.

D. Internally Illuminated Signs

- 1. Internal housings and baffles shall be of aluminum sheets or bent plates in gages and thickness as shown on the Contract Drawings or, if not shown, as required by this Section.
- 2. Lamping and box design shall be such that even, consistant illumination is achieved across the sign face from edge to edge. Hot or cold spots, shadows or ghosting are not acceptable.
- 3. Graphics display shall use one of the following methods as shown on Contract Drawings:
 - a. Silk screen graphics or color sheet graphics as specified in this Section.
 - b. Cutout Copy:
 - Machine-cut letters, numbers, symbols and other graphic devices through the sign panel to produce precisely formed copy. Use high-speed cutters mechanically linked to master templates in a pantographic system, or equivalent process capable of producing characters of the style shown on the Contract Drawings with sharply formed edges.
 - (1) Backup
 - 0.125 inch thick acrylic sheet backup attached to backside of the panel.
 - (2) Pushed-Through Graphics
 - Precise-fitting copy cut from 0.250 inch thick transparent acrylic sheet projecting through engraved copy, chemically welded to 0.125 inch thick acrylic sheet backup, where pushed-through graphics are shown on the Contract Drawings. Apply vinyl films where shown on the Contract Drawings.

4. Wiring within the sign shall be installed in accordance with the National Electrical Code and shall be neatly arranged and supported.
5. Ballasts shall be individually fused in an approved manner.
6. Wire terminals, taps and other electrical connectors shall be of an approved swaged, clinched or positive clamping type. Plain soldered lugs with no means of mechanically holding the wire without solder are not permitted.
7. Lamps, ballasts and fuses shall be arranged so that they are readily accessible for maintenance. Lamps and ballasts shall comply with the requirements of Division 16 Section on Lighting Systems. Determine actual types, lengths and wattages required for individual and fully legible signs. Furnish suitable lamps for interior and exterior use as required for even illumination of messages.
8. Illuminated signs shall be connected into the existing building circuitry. Install conductors from the existing junction boxes or relays to the service entrances in the signs in order to provide power to the lamps. The exact location of existing junction boxes or relays shall be determined in the field before making provisions for concealed service entrances in the signs. Make electrical fixture and power connections.
9. Illuminated signs shall be furnished with vent holes protected with insect screening, and adequately lightproofed.
10. Illuminated signs shall be of weather-tight construction.
11. Furnish prop bar for ease in relamping.
12. Furnish a photocell-operated switch in an inconspicuous location, for the individual operation of each sign for maintenance purposes.

E. Lighting Fixtures for Externally Illuminated Roadway Signs

1. Sign lighting fixtures shall be of the type specified hereinafter and shall be complete with self-contained ballasts, wired for operation and mounted and supported as shown on the Contract Drawings.
2. Fixtures shall be dust-tight, weather-tight and suitable for outdoor use. Ballasts shall be of the high power factor type and shall bear the stamp of approval of the Electrical Testing Laboratory. Ballasts and lamps shall be suitable for operation at temperatures down to minus 20 degrees F. Ballasts shall be fused with the proper size fuse as recommended by the manufacturer. The fuse holders shall be type HLR and be equipped with type GMF glass tube fuses as manufactured by Bussman Manufacturing Company, or approved equal.
3. Fixture housings shall be constructed of 18 gage (0.040 inch) aluminum, ASTM B 209, alloy 3003-H14, welded construction.
4. Exterior surfaces of fixtures shall be field painted or shall receive a factory-applied finish as shown on the Contract Drawings.
5. Fixture reflectors shall be minimum 0.020 inch thick aluminum, specular Alzak processed finish and of paracylindrical form.
6. Housing door for internal access shall consist of an enclosure lens of clear, unribbed acrylic plastic, 1/8 inch thick, and an enclosure frame of extruded aluminum, with vinyl or neoprene gasketing. This framed plastic door shall be connected to the fixture body by a continuous extruded hinged frame member. Extruded hinge shall be constructed to form a stop so that when the door is in the upward position it is past 90 degrees. Furnish a positive latch assembly to keep the cover in the open position and to prevent accidental release.

7. Door shall be secured in place against a polyvinyl gasket around the opening and secured with toggle action stainless steel catches.
 8. Lamp sockets shall be protected by a polychloroprene moisture-proof boot.
 9. Fixture shall have a barrier type terminal block for terminating the lamp socket wires.
 10. Wiring shall be minimum number 10 AWG and as specified in Division 16 Section on Wires, Cables, Splices, Terminations.
 11. Conduit shall be watertight and as specified in Division 16 Section on Raceways.
 12. Signs shall be completely factory wired with at least five feet of slack to handholes at base of support for connection to branch circuits as shown on the Contract Drawings.
- F. Plastic Laminate Sign Panels
1. Face Material
High pressure plastic laminate engraving stock in finishes and color combinations shown on the Contract Drawings or, if not shown, as selected by the Engineer from the manufacturer's standard colors.
 2. Back-Up Material
Cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet in sizes and thickness shown on the Contract Drawings.
- G. Plastic Laminate Plaques and Room Identification Signs
1. Unframed panel signs fabricated as follows, unless otherwise shown on the Contract Drawings:
 - a. Edges: Square cut with edge color same as the background.
 - b. Corners: Square.
 2. Graphic Image
Sign copy shall comply with the requirements for size, style, spacing, content and symbols shown on the Contract Drawings.
 3. Machine-engrave letters, numbers and symbols into sign face to expose the contrasting core ply.
- H. Sandwich Panel Signs
1. Perimeter Frames: Extruded aluminum alloy 6063-T6, heliarc welded.
 2. Panel Thickness: 1 inch, unless otherwise shown on the Contract Drawings.
 3. Finish: As specified in this Section or as shown on the Contract Drawings.
 4. Aluminum honeycomb laminate construction: Minimum tensile strength of 50 psi in accordance with ASTM C 297 and ASTM C 481.
 5. Adhesives: Thermosetting epoxy type. Bonding shall be done in a heated flat platten press of sufficient size to contain the entire panel at one time with 10 psi over the entire platten area.
 6. Adhesively bonded panels shall have exterior faces of such flatness when measured at normal room temperature of 70 degrees to 80 degrees F that the maximum slope of the surface at any point, measured from the nominal plane of the surface, shall not exceed 1.5 percent. Wave slope shall be computed by measuring the distance between high points and placing a straight edge across these points to determine the depth of slope. Flatness of signs shall be within a slope determination of 1 percent when checked in this manner.

7. For exterior signs, 1/8 inch diameter weep holes shall be drilled in the cap and the perimeter frame at the bottom of each panel 3 inches in from either end, and in the center of each panel.

I. Aluminum Sheet on Plywood Signs

Form sign panels of aluminum sheet, adhesively attached to fire-retardant plywood backing, as shown on the Contract Drawings.

2.05 SHOP FINISHING

A. General

1. Shop finish of signs shall be as follows and as shown on the Contract Drawings:
 - a. Porcelain Enamel finish on Sandwich Panel signs, Aluminum Sheet on Plywood signs, or other type of sign face as shown on the Contract Drawings.
 - b. Fluoropolymer 3-Coat System on aluminum.
 - c. Clear or Color Anodic on aluminum.
 - d. Acrylic Polyurethane on aluminum.
 - e. Baked Enamel on steel or galvanized steel.
 - f. Paint on steel or galvanized steel.
 - g. Stainless Steel: Finish as shown on the Contract Drawings.
2. Comply with NAAMM's *Metal Finishes Manual for Architectural and Metal Products* for finish description and application recommendations, except as otherwise shown and specified.
3. Materials comprising a sign shall be finished with a coating system compatible with that material; priming shall be done in accordance with finisher's specification. Exposed surfaces, edges and connections shall receive this same finish system.

B. Surface Preparation

1. Aluminum: AA-C12-C42-R1x (Chemical Finish: Cleaned with inhibited chemical conversion coating, acid chromate-fluoride-phosphate pretreatment); coating system as specified below.
2. Steel for Porcelain Enamel Finish: Panels shall be thoroughly cleaned, degreased, acid etched, and neutralized.
3. Stainless Steel: The cleaned stainless steel surface shall be pretreated with a wash-coat conforming to Military Specification DOD-P-15328D or approved equal.
4. Before finishing, remove loose mill scale, dirt, weld flux, weld spatter and other foreign material.

C. Color

1. Exposed sign surfaces, including panel backgrounds, shall be in a color and gloss as shown on Contract Drawings or, if not shown, as selected by the Engineer from manufacturer's custom range.
2. Messages on sign panels to be satin or matte finish white, unless otherwise shown on Contract Drawings.
3. Exposed conduit, electrical boxes, clamps and connectors shall be painted to match sign finish.
4. Interior housing surfaces of internally illuminated signs shall be painted in a high-gloss white enamel finish.

5. Colors and degree of gloss for surface paint and finish applications shall be consistent throughout, regardless of substrate.

D. Porcelain Enamel Finish

1. General

- a. Weather Resistance: The porcelain enamel finish on surfaces exposed to weathering shall pass the acid spot test in accordance with ASTM C 283. In addition, red, yellow and orange porcelain enamels shall pass the cupric sulfate test in accordance with ASTM C 538.
- b. Continuity of Coating: Visual inspection of each piece shall reveal no visible breaks or surface defects in the cover coating that expose the underlying coating or the steel on surfaces exposed to weathering, nor the underlying steel on either the back or flanges. This requirement shall not apply to sheared edges.
- c. Surface Appearance: The porcelain enamel on surfaces exposed to weathering shall be free of blemishes in the coating that may impair its serviceability or detract from the general appearance of the panel when viewed from a 5 foot distance.

2. Compliance Statement

Obtain from Manufacturer certification that the porcelain enameling is performed in accordance with PEI 1001.

E. Porcelain Enamel on Aluminum

1. Application: By automatic spray equipment and in conformance with PEI specifications; ASTM C 346 gloss reading of 50 to 70 units at an angle of 45 degrees when measured on the Photovolt meter.
2. Weight loss of porcelain enamel shall be less than 20 mg per square inch when tested in accordance with ASTM C 283.
3. Sign Graphics
 - a. Applied graphics shall be 0.080 inch thick flat sheet aluminum with a lamination of heat sensitive reflective sheeting, unless otherwise shown on the Contract Drawings to have integral colors.
 - b. Affix graphics to the sign panel with tape.
 - c. This method shall be used on other sign types and finishes, where shown on the Contract Drawings.

F. Porcelain Enamel on Steel

1. Application: Apply porcelain enamel by spray application. Panels are to be given a ground coat of porcelain enamel on all surfaces. Panel surfaces exposed to the weather shall be given a cover coat of porcelain enamel necessary to produce the required colors specified. Back and other concealed areas of the panel shall be given at least one coat of porcelain enamel (in addition to the ground coat) for protection and as an aid to maintain shape during firing. Ground and cover coats of porcelain enamel on the front or exposed surface of the panel shall be a minimum of 8.5 mils. Minimum thickness of ground coat shall be 2.5 mils.
 - a. Fire panels at approximately 1450 degrees F in a continuous furnace to properly fuse the porcelain enamel to the metal and ensure color uniformity.
 - b. Check colors and gloss of the porcelain enamel finish during each production run. Produce colors and gloss finishes within the limits established by porcelain samples approved by the Engineer.

G. Fluoropolymer 3-Coat System

Manufacturer's standard 3-coat thermocured system composed of specially formulated inhibitive primer, fluoropolymer color coat and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene resin by weight (Atofina "Kynar 500", or Solvay Solexis, Inc. "Hylar 5000"), complying with AAMA 2605; color and gloss as shown on the Contract Drawings or, if not shown, as selected by the Engineer from manufacturer's custom range.

H. Anodic Finishes

Finish designations prefixed by "AA" shall conform to the system established by the Aluminum Association for designating aluminum finishes, listed in NAAMM's *Metal Finishes Manual for Architectural and Metal Products*.

1. Class I Clear Anodic Finish
AA-M12-C22-A41 (nonspecular as fabricated; medium matte etched surface; Architectural Class I clear coating 0.7 mil or thicker), complying with AAMA 611.
2. Class I Color Anodic Finish
AA-M12-C22-A42/A44 (nonspecular as fabricated, medium matte etched surface, Architectural Class I, integrally color or electrolytically deposited color coating 0.7 mil or thicker), complying with AAMA 611.
3. Apply protective coating of clear acrylic lacquer of not less than 0.05 mil, dry film thickness.

I. Acrylic Polyurethane on Aluminum

1. As manufactured by Matthews Paint Company, 8201 100th St., Pleasant Prairie, WI, or approved equal.
 - a. Colors must be proven to be equal in color and gloss retention to corresponding colors of Matthews Acrylic Polyurethane by United States Testing Company, Inc., Chemical Service Div., 1415 Park Avenue, Hoboken, NJ. The laboratory test shall consist of 1,000 hours in a QUV accelerated weathering tester maintained in accordance with ASTM G 154. The tester shall be programmed to alternate 40 degrees Celsius water condensation 4-hour periods with 60 degrees Celsius ultraviolet 4-hour periods. Gloss measurements are to be made with a Hunterlab color difference meter (ASTM D 523 and D 2244, respectively).
 - b. Proposed alternate coating systems shall include comparative results as indicated above from United States Testing Company, Inc., or other equivalent testing lab acceptable to the Engineer.
2. Acrylic polyurethane system shall be ultraviolet inhibited, lead and heavy metal free.
3. Surface to be coated shall be prepared, primed and finish coated in accordance with coating manufacturer's instructions.
4. Paint shall be thoroughly and evenly applied and shall be well worked into corners and joints and shall have no edge or joint build-up.
5. Coating shall be applied at not less than the manufacturer's recommended spreading rate, to establish a total dry film thickness of not less than 4.0 mils for the entire coating system of prime/conversion coating and finish coats for 2-coat work.

- J. **Baked Enamel Finish on Steel or Galvanized Steel**
Immediately after cleaning and pretreatment, apply manufacturer's standard 2-coat baked enamel finish, consisting of prime coat and minimum 1.0 mil dry film thickness thermosetting topcoat. Comply with paint manufacturer's instructions for application and baking to achieve total minimum dry film thickness of 2.0 mils; color and gloss shall be as shown on the Contract Drawings.
- K. **Paint Finish on Steel Sheet**
1. **Surface Preparation**
Solvent-clean surfaces in compliance with SSPC-SP 1 to remove dirt, oil, grease and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel in compliance with SSPC-SP 5 or SSPC-SP 8.
 2. **Factory-Priming for Factory Painted Finish**
Apply shop primer, specified in Division 9 Section on Painting, immediately following surface preparation and pretreatment.
- L. **Paint Finish on Galvanized Steel Sheet**
1. **Surface Preparation**
Clean surfaces of dirt, grease and other contaminants. Follow by a conversion coating of type suitable for organic coating application. Clean welds, mechanical connections and abraded areas. Follow by SSPC-Paint 20 galvanizing repair paint applied in accordance with ASTM A 780.
 2. **Factory-Priming for Field Painted Finish**
Where field painting after installation is specified or shown on the Contract Drawings, apply air-dried primer, specified in Division 9 Section on Painting immediately following cleaning and pretreatment.
- M. **Stainless Steel Finish**
Furnish one or more of the following finishes, where shown on the Contract Drawings:
1. Bright, Directional Polish: AISI No. 4 finish.
 2. Satin, Directional Polish: AISI No. 6 finish.
 3. Satin, Reflective, Directional Polish: AISI No. 7 finish.
 4. Mirror-Like Reflective, Non-Directional Polish: AISI No. 8 finish.
 5. Non-Directional Finish: As specified in Division 5 Section on Stainless Steel Finish.

PART 3. EXECUTION

3.01 EXAMINATION

Examine substrates and conditions under which Work is to be installed before sign components are delivered to the site. Report in writing to the Engineer conditions that will prevent proper execution of the Work or endanger its permanency. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer. Commencement of the Work shall constitute acceptance of the conditions.

3.02 PREPARATION

- A. Determine location of utilities that will be within the excavation site. Immediately notify the Engineer of conflicting conditions.

- B. Schedule installation of signs at the convenience of the Engineer, so that the Work may be coordinated with other finishing in progress within the building. Signs shall be erected by skilled workmen especially trained in this type of work.

3.03 INSTALLATION

- A. Install signs, including sign structures, anchorages, electrical components and required connections into existing circuits.
- B. Comply with manufacturer's product data and published instructions for material installation requirements.
- C. Install the Work in location, in alignment and in elevation, free of rack, plumb, level and straight with no distortions, measured from established lines and levels. Shim as required using concealed shims. Install to a tolerance of 1/8 inch in 8 feet for plumb and level, with maximum 1/32 inch offset in flush adjoining sign panels, and maximum 1/16 inch offsets in flush and in revealed adjoining surfaces. Level with instruments; measuring equal distances from existing building surfaces is not acceptable as a basis of level and plumb.
- D. Execute drilling, cutting and fitting carefully and fit at job before finishing. Install anchors, expansion bolts and anchor bolts for complete anchorage. Install supporting members, fastenings, framing, bracing brackets, straps, bolts and angles as required to set and connect signage Work rigidly and properly to underlying construction.
- E. Obtain prior approval of Engineer before field cutting or drilling galvanized steel.
- F. Set anchor bolts and anchorages with templates to correct elevations, plumb and true, where shown on the Contract Drawings; complying with approved Shop Drawings. Complete connections in proper alignment and tighten bolts securely.
- G. Sign faces shall be flat, true and free from oil canning and waviness; exposed surfaces shall not deviate from flat by more than 1/16 inch in any 36 inch distance.
- H. Bases and Pedestals
Coordinate setting with Contract Drawings, diagrams, templates, instructions and directions for the installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the construction site.
- I. Sign Posts and Supports
 1. Locate field splices in the sign structures where shown on the Contract Drawings.
 2. Form weather-tight joints with connections.
 3. Connections shall not be visible, unless otherwise shown.
 4. Install concealed gaskets, flashing, sealants, fillers and insulation per manufacturer's recommendations as the Work progresses, to make the installations sealed.
 5. Repair finishes damaged by cutting, welding, soldering and grinding operations required for shop fitting and jointing. Restore finishes and paint so that there is no evidence of corrective work. Return items that cannot be refinished in the field to the shop, make the new required alterations, and refinish the entire unit or furnish and install new units at fabricator's option.

6. Fasteners

- a. Fasteners shall be concealed, except where otherwise noted on Contract Drawings. Exposed fasteners, if any, shall be flush and match color and finish of adjacent surfaces.
- b. When dissimilar metals are in contact, coat and finish the contacting surfaces compatibly to their adjacent surfaces.
- c. Visible welding shall be continuous, ground smooth and finished; seams shall be made invisible. Internal welding shall be structurally sound and eliminate racking.

J. Touch-Up

1. Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint, and paint exposed areas with same paint used for shop painting. Field apply by brush or spray to yield a minimum dry thickness of 2.0 mils.
2. Touch-up abraded galvanized surfaces with galvanized repair paint applied in accordance with ASTM A 780.

3.04 FIELD TESTS

Test and adjust illuminated electrical signs for illumination level, hot spots and light leaks.

3.05 CLEANING

- A. Upon completion of Work, remove tools, equipment, surplus and discarded materials from the site, including debris, dirt and rubbish accumulated as a result of the sign installation. Leave the site in a neat and presentable condition.
- B. Clean site of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petrochemical spills and other foreign deposits.
- C. Upon completion of final installation, clean surfaces of units of work to normal "clean" condition. Comply with manufacturer's instructions for cleaning operations. The following are examples, but not by way of limitation, of cleaning levels required:
 1. Remove temporary protective coverings and labels that are not required as permanent labels.
 2. Clean exposed hand-surface finishes to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Avoid disturbance of natural weathering of surfaces, except as otherwise indicated. Restore reflective surfaces to original reflective condition.
 3. Wipe surfaces of mechanical and electrical equipment clean; remove excess lubrication and other substances.
 4. Clean light fixture housings and lamps to permit functioning with full efficiency.

END OF SECTION

SECTION 10430

ARCHITECTURAL SIGNAGE SYSTEMS

APPENDIX "A"

SUBMITTALS

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts, and Samples" of Division 1 - GENERAL REQUIREMENTS:

A. Product Data

1. Submit manufacturer's literature and descriptive data including catalog sheets for materials, instructions for cleaning, equipment and fixtures showing control, schedule and other pertinent information as required.
2. Where printed materials describe more than one product or model, clearly identify which is submitted for approval.
3. Submit data for fire-retardant treatment type for plywood, if any.

B. Shop Drawings

1. Mark Shop Drawings and samples to show name and address of project, Engineer, Contractor, manufacturer and supplier.
2. Identify the locations where materials or equipment are to be installed. Show the various parts of the sign construction, including: fastenings, anchorage, lighting, details of lighting fixture supports, electrical fixtures and connections, wiring, stiffening, bracing, types and thicknesses of metal, finishes and complete instructions regarding concealed joints, welds and adjacent and related Work.
3. Submit erection drawings for the complete installation of the signs.

C. Samples

1. Submit samples of each sign type to demonstrate quality of fabrication methods, material finishes and color. Matching shall be subject to approval by the Engineer.
2. Submit samples of required finish materials and graphics processes for signage.
3. Color match Engineer's samples for sign support coating and for sign panel paint or finish system. Submit color chips on samples of actual materials in each color required by project to be used for sign construction, including light fixture finishes. Minimum sample size is 12 by 12 inches.
4. Vinyl lettering and graphics shall include at least one uppercase and one lowercase letter of each lettering style and one of each type of graphics shown on the Contract Drawings. Submit actual full size letterforms and graphics of each size to be used, mounted on samples of actual materials to be used for Work of this Section.
5. Submit actual full-scale silk-screen letterforms of each size and style of letters shown on Contract Drawings to be used, mounted on samples of actual materials to be used for sign construction.
6. Stencil-cut aluminum with pushed-through acrylic for fabrication of illuminated signs, including accessory materials. Submit samples for both pylon type sign and existing sign band locations. Supply one uppercase and one lowercase letter form for each lettering style shown on the Contract Drawings.

7. Porcelain enamel sign panels, including lettering and graphics. Include at least one uppercase and one lowercase letter of each lettering style shown on the Contract Drawings.
8. Exposed trim, connections and closures. Submit color and material samples of actual materials to be used.
9. Each sample submittal shall have a typed label showing:
 - Name of project.
 - Address of project.
 - Contractor's name.
 - Name and description of item represented.
10. Record Samples
 - a. Sign Panel Materials and Sign Graphics: Furnish one 6 inch by 6 inch sample of each different sign panel material and finish type and of each graphic material type with sample letter used in the Work of this Section. Mark each sample with typed label per C.9 above. Deliver samples to the Engineer. Samples shall become the property of the Authority.
 - b. Silk-Screens and Film Positives: Deliver to the Engineer in good, usable condition to become the property of the Authority. Number in accordance with the Type nomenclature.
- D. Design Calculations
 - Submit design calculations for sign panels and structural supports.
- E. Guarantees
 1. Sample of guarantee for materials and workmanship.
 2. Sample of material and finish extended warranties.
- F. Qualifications
 - For entities specified in this Section (professional engineer, fabricator and installer), demonstrating their capabilities and experience. Include list of completed projects with project names, addresses, names of architects, owners and other information specified.

END OF APPENDIX "A"

SECTION 10430

ARCHITECTURAL SIGNAGE SYSTEMS

APPENDIX "B"

MANUFACTURERS

- A. Subject to compliance with the requirements of this Section, furnish and install products by the following, or approved equal:
- ABC Architectural Signing System, Div. of Nelson Harkins Ind., Chicago, IL
 - Andco Industries Corp., Greensboro, NC
 - Artisan Graphic Group, Huntington Station, NY
 - ASI Sign Systems, Inc., New York, NY
 - Going Sign Co., Inc., Plainview, NY
 - Lolite International, West Columbia, SC
 - Signal Sign Co., Livingston, NJ
 - Signs + Decal Corp., Brooklyn, NY
 - Spectrum Signs Inc., Farmingdale, NY
 - Wilcox Brothers Sign & Awning Co., Tonawanda, NY
- B. Subject to compliance with the requirements of this Section, furnish and install porcelain sign products by one of the following, or approved equal:
- American Porcelain Enamel Co., Dallas, TX
 - Cherokee Porcelain Enamel Co., Knoxville, TN
 - Enameltec, Div. of P.G. Bell, Georgetown, Ontario, CN

END OF APPENDIX "B"

DIVISION 12
SECTION 12522
SHADES

PART 1. GENERAL

1.01 SUMMARY

- A. This Section specifies manually operated and motorized roll shades.

1.02 REFERENCES

The following is a listing of the publications referenced in this Section:

	<u>American Society for Testing and Materials (ASTM)</u>
ASTM D 1925	
	<u>National Fire Protection Association (NFPA)</u>
NFPA 701	Fire Tests for Flame Resistant Textiles and Films
NFPA 70	National Electrical Code
	<u>Occupational Safety and Health Administration (OSHA)</u>
OSHA Regulation 1910.7	

1.03 QUALITY ASSURANCE

A. Installer Qualifications

Engage an experienced installer with at least five years experience performing shade installations similar in material, design, and extent to that shown on the Contract Drawings for Work of this Contract and with a record of successful in-service performance.

B. Source Limitations

Obtain shades through one source from a single manufacturer.

C. Fire-Test-Response Characteristics

Provide shades that are identical to products that pass NFPA 701 Small Scale Test for flame-propagation resistance performed by UL or another testing and inspecting agency acceptable to the Engineer. Identify shades with appropriate markings of applicable testing and inspecting agency.

D. Listing and Labeling

Provide electrically operated fixtures specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

E. Mock-ups

Before installing shades, construct mock-ups for each type required to verify selections made under Sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials shown on the Contract Drawings for completed Work.

1. Locate mock-ups in the location and of the size shown on the Contract Drawings or, if not shown on the Contract Drawings, as directed by Engineer.
2. Notify Engineer 7 days in advance of the dates and times when mock-ups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Engineer's approval of mock-ups before proceeding with installation of shades.
5. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. Approved mock-ups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

F. Field Measurements

Verify shade openings by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating shades without field measurements. Coordinate wall and ceiling construction to ensure actual opening dimensions correspond to established dimensions.

1.04 EXTRA STOCK

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
1. Shade Units: Full-size units equal to 5 percent of amount installed for each size shown on the Contract Drawings, but not less than 1 unit.

1.05 SUBMITTALS

For Submittals, see Appendix "A" to this Section.

PART 2. PRODUCTS

2.01 MATERIALS

A. Products

Subject to compliance with requirements, provide one of the shades indicated in the Shade Schedule in Appendix "B".

2.02 ACCESSORIES

A. Side and Sill Closure Channels

Between side of shade and opening jambs, and between hem bar and opening sill.

1. Finish: Manufacturer's standard, to match shade color or as selected by Engineer from manufacturer's color charts.

B. Electric Motors

UL-approved, low-voltage motor with thermal-overload switch; microprocessor controlled; sized by shade manufacturer for installation shown on the Contract Drawings.

1. Control: Wall switch.

C. Installation Fasteners

Fabricated from metal that is non-corrosive to shade hardware and adjoining construction and to support shades as required by manufacturer's written instructions.

2.03 FABRICATION

A. Components

Non-corrosive, self-lubricating materials.

B. Shade Units

Fill opening with not more than 1/4-inch clearance at jambs and 3/8-inch clearance at sill.

1. Fabricate end-to-end installations with terminations at mullions or other defined vertical separations.
2. Fabricate to fit irregular conditions, such as curved glass configurations - where required.

PART 3. EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of shades. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install shades level and plumb, mounted not less than 1 inch from face of exterior glass, unless otherwise shown on the Contract Drawings.
- B. Install metal parts isolated from concrete or mortar to prevent corrosion.
- C. Install mounting brackets with not less than 2 fasteners per bracket.
- D. Coordinate installation of electrical items, as required for motorized shade installation and as shown on approved shop drawings.

3.03 CLEANING

- A. Clean shade surfaces after installation, according to manufacturer's written instructions.

3.04 DEMONSTRATION FOR MOTORIZED SHADES.

A. Startup Services

Engage a factory-authorized service representative to provide startup service and to demonstrate and the Authority's maintenance personnel as specified below.

1. Test and adjust controls. Replace damaged and malfunctioning controls and equipment.
2. Train the Authority's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
3. Schedule training with the Authority, with at least seven days' advance notice.

END OF SECTION

DIVISION 12

SECTION 12522

SHADES

APPENDIX "A"

SUBMITTALS

- A. Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts, and Samples" of Division 1 - GENERAL PROVISIONS:
1. **Product Data:** For each type of shade shown on the Contract Drawings, including dimensions and profiles and rated capacities, for each type of motor assembly required.
 2. **Shop Drawings:** Show location and extent of shades. Show installation details at and relationship to adjoining Work. Include elevations indicating shade units. Indicate location of controls.
 - a. **Motorized Systems:** Indicate location of control panel, wall switches, motor, access to motor, and mounting details. Include wiring diagrams.
 - b. **Include reflected ceiling plans drawn accurately to scale and coordinating penetrations and ceiling-mounted items. Show the following:**
 - (1) Ceiling suspension assembly members.
 - (2) Method of attaching ceiling hangers to building structure.
 - (3) Size and location of access to motor.
 - (4) Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 3. **Samples for Initial Selection:** If manufacturer's colors, textures and patterns are not shown on the Contract Drawings, manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of shade material required.
 4. **Samples for Verification:** Full-size units of each type of shade material required; in sets for each color, texture, and pattern, showing the full range of variations expected in these characteristics.
 - a. **Shade Material:** Not less than 12 inches square, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
 5. **Schedule:** Use same room designations shown on the Contract Drawings in preparing schedule for shades.
 6. **Maintenance Data:** For shades and operating hardware.

END OF APPENDIX "A"

DIVISION

SECTION 12522

SHADES

APPENDIX "B"

SHADE SCHEDULE

- A. Shade SH-1: Where shades of this designation are shown on the Contract Drawings, provide products complying with the following:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Mecho Slimline; Mecho Shade
 - b. Approved equal
 2. Shade Material: Vinyl-coated polyester, complying with ASTM D 1925; 79 percent vinyl, 21 percent polyester core
 - a. Pattern: "EuroTwil" Reversible Fabric
 - b. Color: #6020 White/Black
 3. Material Width: As shown on the Contract Drawings. Shades to fill space between vertical mullions.
 4. Openness Factor: +/- 3 percent
 5. Mounting: As shown on the Contract Drawings.
 6. Direction of Roll: Regular
 7. Manual Operation: As follows:
 - a. Shade Pulls: Chain.
 - b. Location of Shade Pulls: Right side, unless otherwise noted

END OF APPENDIX "B"