

915.2 Materials**915.2.01 Steel Posts and Arms for Mast Arm Assembly****A. Requirements**

1. Use steel posts and arms of the dimensions shown on the Plans and that meet the requirements of ASTM A 53 for Type E or S, Grade B with a galvanized finish.
2. Use pipe of weight class XS, schedule No. 80. Do not use the hydrostatic test requirements.
3. Submit a certification to the Engineer from the manufacturer that the materials meet the requirements of this section.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Engineer will accept the material based on the certification, according to Subsection 106.05, "Materials Certification," and on results of galvanized coating tests made by the Department.

D. Materials Warranty

General Provisions 101 through 150.

915.2.02 Guy Wires and Cable**A. Requirements**

1. Use guy wires for mast arm assemblies and cable for overhead sign assemblies of the dimensions shown on the Plans and that meet the requirements of ASTM A 475, Siemens-Martin Grade, with Class A coating.
2. Provide extra heavy wire rope thimbles that meet Federal Specification FF-T-2765, Type III for each end of the cable.
3. Submit a certificate from the manufacturer according to Subsection 106.05, "Materials Certification."
For a list of sources, see QPL 72.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Engineer will accept the material based on the certificate.

D. Materials Warranty

General Provisions 101 through 150.

Section 916—Delineators**916.1 General Description**

This section includes the requirements for center mount reflector delineators.

916.1.01 Related References**A. Standard Specifications**

General Provisions 101 through 150.

B. Referenced Documents

General Provisions 101 through 150.

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Definitions for Optical Requirements: Use the following definitions in this Specification:

1. Entrance Angle
The angle at reflector between direction of light incident on it and direction of reflector axis.

2. Observation Angle
The angle at reflector between observer's line of sight and direction of light incident on reflector.
3. Specific Intensity
Candlepower/footcandle (Candela) returned at the chosen observation angle by a reflector for each footcandle (lux) of illumination at the reflector.

916.2.01 Center Mount Reflector Delineators

A. Requirements

1. Use a reflector delineator made of a hermetically sealed, acrylic plastic, prismatic reflex reflector with a single grommetted hole.
2. Submit 50 delineators of each color to be used on the Project to the Department for testing.
3. Acrylic Plastic Reflector
Use an acrylic plastic reflector. Submit to the Department the manufacturer of the raw material and the identification number of the particular molding compound to be furnished.
 - a. Ensure that the reflector has the following characteristics:
 - A clear, transparent plastic face with at least 6.5 in² (4200 mm²) of reflective area (the lens)
 - A heat-scalable plastic back fused to the lens under heat and pressure around the entire perimeter of the lens and the central mounting hole
 - A unit permanently sealed against dust, water, and water vapor
 - b. Use a crystal (colorless), amber, or red reflector, as specified on the Plans.
 - c. Ensure that the lens has the following characteristics:
 - A smooth surface without projection or indentations other than a central mounting hole and identification number
 - A rear surface bearing a prismatic configuration that will affect total internal reflection of light
 - The manufacturer's trademark molded legibly into the lens face
4. Specific Intensity
Ensure that the specific intensity of each reflex reflector used in delineators or markers equals or exceeds the following minimum values, regardless of reflector orientation.

Observation Angle	Entrance Angle	Specific Intensity, candlepower per footcandle (candelas per lux)		
		Crystal	Amber	Red
0.1	0	119	71	29
0.1	20	47	28	11

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

1. The Engineer will accept the material based on test results (optical, seal, and heat resistance) of samples taken by the Department.
The Department will return undamaged delineators to the Contractor.
2. Optical Test
 - a. Place the reflex reflector to be tested about 100 ft (30 m) from a single light source that has an effective diameter of 2 in (50 mm). Operate the light source at normal efficiency.

NOTE: If using a test distance other than 100 ft (30 m), modify all other dimensions for this test in the same proportion as the test distance.

- b. Measure the return light from the reflector with a photoelectric photometer that has a minimum sensitivity scale of 1×10^{-7} footcandles/mm (1×10^{-6} lux/mm).

NOTE: Use a photometer with a receiver aperture 0.5 in (13 mm) diameter, shielded to eliminate stray light.

- c. Place the light source center 2.1 in (53 mm) from the aperture center for a 0.1 degree observation angle.
- d. During testing, spin the reflectors to average the orientation effect.
- e. The Department will reject a tested reflector if it fails the specific intensity minimum. If more than 2 reflectors fail out of 50 tested, the Department will reject the lot.

3. Seal Test

Use this test to determine if a reflector is adequately sealed against dust and water.

- a. Submerge 50 samples in a water bath at room temperature.
- b. Subject the submerged samples to a vacuum of 5 in (125 mm) gauge for 5 minutes.
- c. Restore atmospheric pressure and leave the samples submerged for 5 minutes.
- d. Examine the samples for water intake.
- e. The Department will reject the lot if more than 2 percent of the reflectors fail.

4. Heat Resistance Test

- a. Place three reflectors in a horizontal position on a grid or perforated shelf inside a circulating oven that allows air to circulate freely.
- b. Set the oven temperature at 175 °F, ± 5 °F (80 °C, ± 3 °C) and let the specimens sit at this temperature for 4 hours.
- c. After the 4 hours, remove the samples from the oven and let them cool in air to room temperature.
- d. Rejection: The Department will reject the lot if any sample shows significant change in shape and general appearance when compared with unexposed control standards.

D. Materials Warranty

General Provisions 101 through 150.

Section 917—Reflectors and Nonreflective Characters

917.1 General Description

This section includes the requirements of demountable characters with Type VI reflective sheeting, and direct-applied, nonreflective characters.

917.1.01 Related References

A. Standard Specifications

Section 106—Certification of Materials

Section 913—Reflectorizing Materials

B. Referenced Documents

ASTM B 209 (B 209M)

ASTM D 822

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917.2.01 Demountable Characters with Type VI Reflective Sheeting

A. Requirements

- 1. Use Type VI reflective sheeting letters, numerals, symbols, and borders that meet the requirements of Subsection 913.2.02, Type VI.
- 2. Use a silver color, unless otherwise specified on the Plans.
- 3. Apply the characters to aluminum flat frames as recommended by the sheeting manufacturer.
- 4. Use flat frames (letter, numerals, symbols and borders) made from aluminum sheet 0.032 in (0.813 mm) thick matching ASTM B 209 (209M), Alloy 3003-H14.