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.

916.2 Materials

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)		
Degrees	Degrees	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.