

SECTION 710

DELINEATORS

Description. This Section establishes the requirements for materials and tests for delineators in Section 853.

710.01. REFLECTORS.

- (a) **General.** Reflectors that are mounted on a post to form a delineator unit shall be circular and provided with a single mounting hole through the center. The mounting hole shall have an inside diameter of 0.188 to 0.203 inch (4.78 to 5.16 mm). The reflector shall have the capacity of accommodating a 3/16 inch (4.76 mm) nominal diameter blind rivet expanded to 0.196 inch (4.98 mm) without fracturing. The center mount reflectors may or may not be fabricated with an aluminum housing.
- (b) **Delineators.** Delineators shall consist of reflectors as specified herein, mounted on galvanized steel posts when installed on roadway shoulders, galvanized steel posts installed on guard rail posts, or galvanized steel posts and brackets installed on bridges.
- (c) **Acrylic Plastic Reflector.** The reflector shall be acrylic plastic methyl methacrylate, meeting requirements of Federal Specifications L-M-5002, Type 1, Class 3.

Reflectors shall consist of a crystal (colorless), amber, or red transparent plastic face with a minimum dimension of 3 inches (76.2 mm) and not less than 7 square inches (4516 mm²) of reflective area, herein referred to as the lens, with a heat sealable acrylic plastic or heat sealable metal foil back fused to the lens under heat and pressure around the entire perimeter of the lens and the central mounting hole to form a unit permanently sealed against water and water vapor. The embossed aluminum housing shall have a thickness of 0.02 ± 0.002 inches (0.51 ± 0.051 mm). The center mount reflectors without aluminum housing shall be backed by a vapor-tight, hermetically- sealed plastic backing to prevent vapor and dust from reaching the reflex surface.

The lens shall consist of a smooth front surface free from projection or indentation other than a central mounting hole and identification with a rear surface bearing a prismatic configuration such that it will effect total internal reflection of light. The manufacturer's name or trade mark shall be molded legibly into the face of the lens.

- (d) **Definitions.**
 - 1. **Incidence angle** shall mean the angle at reflector between direction of light incident on it and direction of reflector's axis.
 - 2. **Divergence angle** shall mean the angle at reflector between observer's line of sight and direction of light incident on the reflector.
 - 3. **Specific intensity** shall mean candela returned at the chosen divergence angle by a reflector for each Lux illumination at the reflector.
- (e) **Specific Intensity.** The specific intensity of each reflex reflector intended for use as delineators or markers shall be equal to or exceed the following minimum values regardless of reflector orientation:

Divergence Angle, <u>Degrees</u>	Incidence Angle, <u>Degrees</u>	<u>Crystal</u>	Specific Intensity, Candela Per Lux	
			<u>Amber</u>	<u>Red</u>
1/10	0	11.1	6.6	2.7
1/10	20	4.4	2.6	1.0
1/3	0	1.9	1.1	0.46
1/3	20	0.7	0.46	0.19

- (f) **Specific Intensity Test.** Specific intensity will be determined in accordance with Federal test method Standard 370.

Failure to meet the specific intensity minimum shall constitute failure of the reflector being tested. Failure of more than 4 percent of the reflectors subjected to testing shall constitute failure of the lot or shipment-- except that when 25 or fewer samples are submitted, failure of more than one reflector subjected to testing shall constitute failure of the lot or shipment.

- (g) **Seal Test.** The following test shall be used to determine whether a reflector is completely sealed against dust and water: Submerge the samples in a water bath at room temperature. Subject the submerged samples to a vacuum of 2.45 psi (16.9 kPa) for 5 minutes. Restore atmospheric pressure and leave sample submerged for 5 minutes, then examine the samples for water intake. Failure of more than 4 percent of the number tested is cause for rejection.

- (h) **Sampling.** The sample reflectors required for optical and seal tests will be selected at random by the Engineer. The number of reflectors required for a sample are as indicated in the schedule below:

<u>Quantity in Shipment or Lot</u>	<u>Reflectors Reflectors Required for Sample</u>
100 or less	3
100 to 800	3%
800 to 5000	25 to 50
5000 and over	1%

710.02. POSTS.

- (a) **Galvanized Steel Delineator Posts.** This item shall consist of furnishing, cutting, drilling, punching, fabricating, and galvanizing a finished channel-type or hat-type delineator post, according to these requirements and the Plans.

The galvanized channel-type post shall be fabricated from 1 1/2 x 1/2 x 1/8 inch (38 x 12 x 3 mm) steel bar channel, cut to the specified length, and drilled, or punched, as required; it shall be suitable for mounting the approved type delineator and installed on guard rail posts when so intended. The basic steel channel employed in the fabrication shall meet dimensional tolerances for the specified size above according to Table 28 of ASTM A 6 for bar- size shapes less than 3 inches (75 mm).

An alternate galvanized steel hat section type post may be used. It shall be rolled from sheet

steel to the dimensions and shape shown on current Department standard drawings. The alternate post shall have a mass of 1.12 pounds \pm 3.5% per linear foot (1.67 kg \pm 3.5 percent per meter) before galvanizing.

Furnish the correct size fasteners required for the type post used, unless otherwise shown on the Plans.

Perform all cutting and hole drilling or punching prior to galvanizing.

The posts shall receive a 2 ounce per square foot (610 g/m²) zinc coating according to ASTM A 123.

- (b) **Testing.** One or more samples will be required for determination of zinc coating, according to ASTM A 123, and compliance with dimensional requirements of ASTM A 6 and these Specifications.

710.03. FLEXIBLE DELINEATOR POSTS.

- (a) **Flexible Delineator Posts.** The flexible delineator post shall consist of a delineator post with Type III retroreflective sheeting material.

The side or sides of the post facing traffic may be either flat or curved in design and shall have a minimum of 3 inches (76.2 mm) wide flat surface suitable for adherence of the reflective sheeting. The minimum length of the post shall be 62 inches (1575 mm). The lower end of the post shall be designed so as to facilitate installation and replacement by field personnel.

The reflective sheeting material attached to the post shall be 9 inches long x 3 inches wide (228.6 mm x 76.2 mm) with 1 inch (25.4 mm) gaps (beginning 1 inch (25.4 mm) below the top of the post) and shall be provided in white, yellow or red colors as specified. The delineator posts shall be designated as (a) Mono-direction-sheeting material on one side or (b) Bi-directional-reflective sheeting material on both sides or with one, two or three reflective sheeting strips applied around the delineator post.

- (b) **Materials.**

1. *Posts.* The posts may be manufactured from any combination of thermosetting resins, plasticizers, coloring pigments, and inert fillers as long as the other requirements are satisfied.
2. *Reflective Sheeting.* Type III retroreflective sheeting material shall be in accordance with AASHTO M 268.

- (c) **Performance.** The posts shall be capable of remaining in service after sustaining ten vehicle impacts from front, side, or back of the posts at any temperature between -0°F and 100°F (-17°C and 37°C). The impacting vehicle shall be a typical medium size, American-made sedan traveling at a speed of 55 mph (88 km/h). The posts shall demonstrate the ability to remain in place and in an upright position after 10 vehicle impacts.

- (d) **Testing and Sampling.**

1. *Temperature Resistance.* A post, after remaining a minimum of two hours in a conditioning chamber at a temperature in a range from 0°F to 140°F (-17°C to 60°C), and tested as described below, shall straighten itself out, showing no adverse effects 60 seconds after testing. A segment of post, 36 inches (914.4 mm) in length, shall be secured in any suitable device and bent 90 degrees and then released. The procedure shall be repeated for a total of four bends. Cracking or permanent deformation shall be cause for rejection.
2. *Weathering.* A post shall show no significant change in color, flexibility or integrity when subject to 300 hours of exposure in an Atlas-Sunshine Weather-o-Meter fitted with a 19-102 cyclic gear. Random samples shall be selected from any shipment for testing in accordance

with the above testing procedures. The manufacturer shall provide a type D certification for the reflective sheeting with each shipment of delineator units.

- (e) **Prequalification.** Prior to the installation of flexible delineator posts, the Contractor shall have demonstrated to the satisfaction of the Department of Transportation that the posts to be provided shall meet the physical and performance requirements of this Specification.

SECTION 711

TRAFFIC STRIPE

Description. This Section establishes the requirements for materials and tests for thermoplastic compounds, preformed plastic tapes, traffic stripe paint, and glass beads.

711.01. THERMOPLASTIC COMPOUNDS.

Hot Applied Thermoplastic Compound Materials. The hot applied thermoplastic compound shall meet the requirements of AASHTO M 249. The binder component shown in Section 4.2, Table 1 Composition, shall be made of hydrocarbon material unless otherwise specified on the Plans. Each shipment of the product shall be accompanied by a type A certification as specified in Subsection 106.04.

711.02. PERMANENT PAVEMENT MARKING TAPE.

General. The plastic striping tape as supplied shall be of good appearance, free from cracks, and have edges that are true, straight and unbroken. The material shall be available in rolls with no more than 3 splices per 150 feet (45.7 m) of length.

Preformed words and symbols shall conform to the applicable shapes and sizes as outlined in the current "Manual on Uniform Traffic Control Devices for Streets and Highways."

The plastic striping tape shall be packaged in standard commercial containers constructed so as to insure acceptance by the carrier and prevent damage during shipment and storage.

The plastic striping tape as supplied shall be capable of retaining required properties when stored at temperatures up to 100°F (38°C) for periods up to one year.

A Type A certification shall be furnished in accordance with Subsection 106.04.

The plastic striping tape shall conform to the following requirements:

1. *Composition.* The retroreflective, preformed pavement marking film shall consist of high-quality plastic materials, pigments, and glass beads uniformly distributed throughout its cross-sectional area and with a retroreflective layer of glass beads firmly bonded on the top surface. The preformed plastic film shall be precoated with a pressure-sensitive adhesive which is compatible with bituminous concrete and portland cement concrete road surfaces.
2. *Skid Resistance.* The surface of the retroreflective preformed film shall provide a minimum skid resistance value of 35 British Pendulum Number when tested in accordance with ASTM E 303.
3. *Thickness.* The thickness of the preformed plastic film without adhesive for lane and edge lines shall be not less than 0.060 inch (1.52 mm) and not more than 0.090 inch (2.29 mm).
4. *Tensile Strength and Elongation.* The film shall have a minimum tensile strength of 40 psi (275.8 kPa) of cross section when tested according to ASTM D 638, except that a sample 6 x 1