

9-21 RAISED PAVEMENT MARKERS (RPM)**9-21.1 Raised Pavement Markers Type 1**

Markers Type 1 shall be plastic or thermoplastic markers composed of thermosetting resins, pigments, and inert ingredients and be of uniform composition. Markers shall not contain glass.

9-21.1(1) Physical and Chemical Properties

The markers shall be of uniform composition and free from surface irregularities, cracks, checks, chipping, peeling, spalling, crazing, and other physical damage interfering with appearance, application, or durability.

The markers shall be precast in the form of a single based spheroidal segment terminating in a rounded or squared shoulder. Markers shall be white or yellow.

The markers shall meet the following requirements:

Property	Unit	Thermoplastic Markers	Plastic Markers
Mass	grams	N/A	125 min.
Height	inches	0.65-0.78	0.65-0.78
Diameter/Width	inches	3.85-4.05	3.85-4.05
Shoulder height	inches	0.08-0.22	0.08-0.22
Planeness of base:			
Concavity	inches	0.05 max.	0.05 max.
Convexity	inches	0.05 max.	0.05 max.
Reflectance (white only)	%MgO	80 min.	80 min.
Impact resistance	inch-pound	15 min.	15 min.
Titanium Dioxide (white only)	% by weight	N/A	21 min.

The markers passing laboratory tests will be field tested for approval. The field tests will include installation with control markers to determine relative adhesion and durability characteristics.

9-21.2 Raised Pavement Markers Type 2

The marker housing shall contain reflective faces as shown in the Plans to reflect incident light from either a single or opposite directions.

9-21.2(1) Physical Properties

The markers shall be not less than 4.0-inches nor more than 5.0-inches in width, and not more than 0.75-inch in height.

The outer surface of the marker housing shall be smooth except for the purpose of identification.

The base of the markers shall be substantially free from gloss or substances that may reduce its bond to adhesive.

The markers passing laboratory tests will be field tested for approval. The field tests will include installation with control markers to determine relative adhesion and durability characteristics.

9-21.2(2) Optical Requirements

1. **Definitions:** Horizontal entrance angle shall mean the angle in the horizontal plane between the direction of incident light and the normal to the leading edge of the marker.

Observation angle shall mean the angle at the reflector between observer's line of sight and direction of the light incident on the reflector.

Specific intensity (S.I.) shall mean candle power of the returned light at the chosen observation and entrance angles for each foot-candle of illumination at the reflector on a plane perpendicular to the incident light.

2. **Optical Requirements:** The specific intensity of each reflecting surface at 0.2 degrees observation angle shall be not less than the following when the incident light is parallel to the base of the marker.

Hor. Ent. Angle	S.I.
0	3.0
20	1.2

Yellow reflectors shall be not less than 60 percent and red reflectors not less than 25 percent of the above values.

3. **Optical Testing Procedure:** a random lot of markers will be tested. The markers to be tested shall be located with the center of the reflecting face at a distance of 5-feet from a uniformly bright light source having an effective diameter of 0.2-inch.

The photocell width shall be 0.05-inch. It shall be shielded to eliminate stray light. The distance from light source center to the photocell center shall be 0.21-inch. If a test distance of other than 5-feet is used, the source and receiver dimensions and the distance between source and receiver shall be modified in the same proportion as the test distance.

Failure of more than 4 percent of the samples shall be cause for rejection of the lot.

9-21.2(3) Strength Requirements

Markers shall support a load of 2,000 pounds as applied in the following manner:

A marker shall be centered over the open end of a vertically positioned hollow metal cylinder. The cylinder shall be 1-inch high with an internal diameter of 3-inches and wall thickness of ¼-inch. The load shall be slowly applied to the top of the marker through a 1-inch diameter by 1-inch high metal plug centered on the top of the marker.

Failure shall constitute either a breakage or significant deformation of the marker at any load of less than 2,000 pounds.

9-21.3 Raised Pavement Markers Type 3

Raised pavement markers Type 3 shall be extruded from high impact thermoplastic material which has been ultra-violet radiation stabilized and shall meet the following requirements:

Impact resistance	15-inch-lbs., min.
Reflectance (White Only)	80% min.
Concavity & Convexity	

Transverse	1/16-inch, max.
Longitudinal	1/8-inch, max
Base Width	4"
Length	6", 8", 10" or 12"
Height	0.60-0.75"
Shoulder height	0.08-0.20

The ends shall be beveled from the top of the shoulder edge at a slope of 1:1 nominal.