3M™ Raised Pavement Marker Series 290
3M™ Raised Pavement Marker Series 290PSA

Product Bulletin 290
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Description

3M™ Raised Pavement Markers Series 290 (“Series 290”) and 3M™ Raised Pavement Markers Series 290PSA (“Series 290PSA”)—collectively the “Markers”—are designed for application on asphalt and Portland cement concrete road surfaces. The Marker bodies are made from an engineered thermoplastic that provides impact resistance and weatherability. The Markers have a highly effective retroreflective lens that provide long-term dry and wet retro reflectance, and night time visibility. The Markers meet the requirements of ASTM D4280, except as noted in Table F. Markers are available in the types and colors listed in Table A.

Series 290 is designed for use with bitumen and epoxy adhesives. The use of any other type of adhesive should be thoroughly evaluated prior to application.

Series 290PSA comes fitted with pressure sensitive adhesive (PSA) pads. To use Markers with PSA pads, a liner is removed from the adhesive pad on the bottom of the Marker before it is placed onto the road surface.

For application information on Markers, refer to 3M Information Folder 290. For installation in snow plow regions, these Markers must be installed in grooves.

Table A. Product Types and Colors by Product Code

Color	Product Code	
	Series 290	Series 290PSA
One-way yellow, white body	RPM-290-Y	PSA-290-Y
One-way yellow, yellow body	RPM-291-Y	PSA-291-Y
Two-way yellow, yellow body	RPM-291-2Y	PSA-291-2Y
Two-way yellow and red, yellow body	RPM-291-YR	PSA-291-YR
One-way white, white body	RPM-290-W	PSA-290-W
Two-way white, white body	RPM-290-2W	PSA-290-2W
Two-way white and red, white body	RPM-290-YWR	PSA-290-YWR
Two-way white and yellow, white body	RPM-290-WY	PSA-290-WY
Two-way red, white body	RPM-290-2R	PSA-290-2R
Two-way blue, blue body	RPM-295-2B	PSA-295-2B
Two-way green, green body	RPM-297-2G	PSA-297-2G
Two-way red, red body	RPM-292-2R	PSA-292-2R

Product Features

- Durable
- Wet and dry retroreflectivity
- Impact resistant
- Abrasion resistant
- Molded-in body colors
- Rumble effect
- Lightweight
- Application finger grips
- Compatible with standard bitumen and epoxy adhesives (Series 290 only)
- Meets the requirements of ASTM D4280

Specifications

Product Dimensions

Table B. Marker Dimensions

Dimension	Value
Height	0.625 in. ± 0.05 in. (15.88 mm ± 1.27 mm)
Width	4.00 in. ± 0.05 in. (101.6 mm ± 1.27 mm)
Length	3.50 in. ± 0.05 in. (88.9 mm ± 1.27 mm)

Flexural Strength

Markers meets the ASTM D4280 flexural strength of 2,000 lbf (907 kg) without breakage.

Compressive Strength

Markers meet the minimum compressive strength of 6,000 lbf (2,722 kg) as per ASTM D4280.

Lens Impact Strength

The Marker lenses meet the ASTM D4280 impact strength requirement, showing no signs of cracking or delamination.

Type Retroreflectance

Type retroreflectance refers to Marker lens luminance measurements made using simplified viewing geometries that provide a convenient means of measurement for quality control purposes when specifying a unique marker type. Markers conform to the initial minimum retroreflectance values specified in Table C. The photometric quantity presented in Table C is the coefficient of retroreflected luminous intensity (R_I).

Table C. Initial Minimum Coefficient of Retroreflected Luminous Intensity Values in Accordance with ASTM E809

Entrance angle ß$_2$ (ß$_1$ = 0°)	**0°**		**±20°**	
Observation Angle	**0.2°**		**0.2°**	
Lens Color	**Minimum R_I (mcd/lx)**	**Minimum R_I (cd/ft cd)**	**Minimum R_I (mcd/lx)**	**Minimum R_I (cd/ft cd)**
White	279	3.00	112	1.20
Yellow	167	1.80	67	0.72
Red	70	0.75	28	0.30
Blue	26	0.28	10	0.11
Green	93	1.00	37	0.40

Performance Retroreflectance

Performance retroreflectance refers to Marker lens luminance as viewed by the driver under standardized road and vehicle conditions. This property is often called "Driver Geometry Retroreflection". Measurements are taken under simulated use conditions using the measurement geometry illustrated in Figure 1. This ensures all geometric viewing angles are taken into account during testing, including the retroreflector orientation, which is an important consideration when evaluating Markers with prismatic retroreflective lenses.

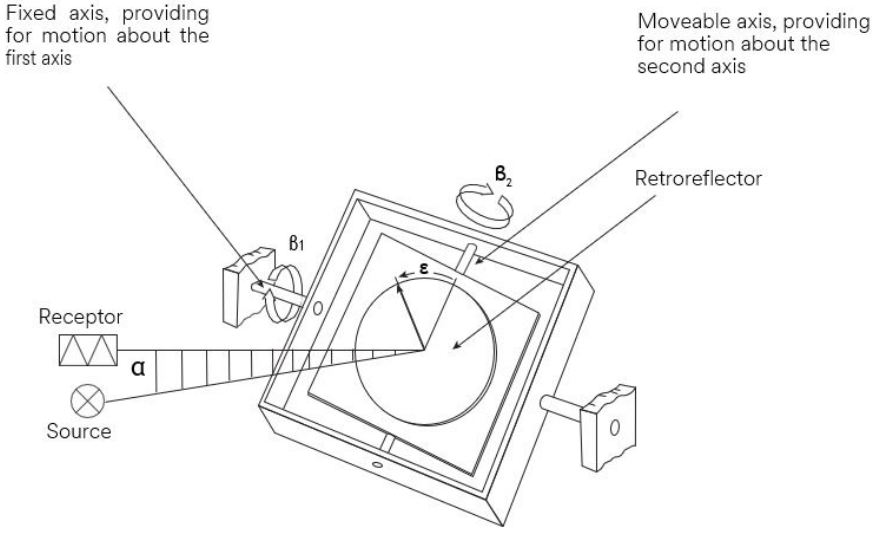

Figure 1. Driver Geometry (CIE Notation)

The Markers meet or exceed the initial minimum retroreflectance values specified by the product of the R_I values in Table D and the color-dependent multiplying factors in Table E, when measured in accordance with ASTM E809. The angles referenced in Table D correspond to the entrance (ß), rotation (ε), and observation (α) angles relative to a standard driver in a standard vehicle with Markers

placed on a lane line to the left of the vehicle. Driver geometry R_I values are the sum of Marker retroreflection from incident illumination from both the left and right headlights.

Table D. Minimum Initial "Driver Geometry" R_I Values

Simulated Distance		Headlight	Observation Angle (α)	Rotation Angle (ε)	Entrance Angles (ß)		Minimum R_I (mcd/lx)	Typical R_I (mcd/lx)
Feet	Meters		(Degrees)	(Degrees)	$ß^1$	$ß_2$	left + right	left + right
100	30	Left	0.95	19	-2.0	-1.6	40	80
		Right	2.91	-72	4.6	-2.9		
300	91	Left	0.35	24	-0.7	-0.5	350	500
		Right	0.90	-69	1.4	-1.0		
500	152	Left	0.22	24	-0.4	-0.3	600	1000
		Right	0.53	-68	0.8	-0.6		

NOTE

In laboratory testing, entrance angles $ß_1$ and $ß_2$ are set to equal 0° and left/right rotation angles are set to approximately 20°/-70° with little loss of accuracy.

Table E. Color Multiplying Factors

Color	Multiplying Factor
White	1
Red	0.25
Yellow	0.6
Blue	0.1
Green	0.33

Retroreflected Color

The retroreflected colors of the Markers lens lie within the respective retroreflected color gamut coordinates. Coordinates are plotted on the 1931 CIE Chromaticity (x, y) diagram, as described in Table F and Figure 2. Lenses are then tested in accordance with ASTM E811 using CIE Illuminant Source A under 0.2° observation angle and 0° entrance angle viewing conditions. The source and receptor angular apertures are each 6 minutes of arc. All retroreflected colors meet the requirements of ASTM D4280, with the exception of green.

Table F. Retroreflected Color Gamut Coordinates

Point Number	White		Yellow		Red		Blue		Green*	
	x	y	x	y	x	y	x	y	x	y
1	0.310	0.348	0.545	0.424	0.650	0.330	0.039	0.320	0.030	0.385
2	0.453	0.440	0.559	0.439	0.668	0.330	0.160	0.320	0.228	0.351
3	0.500	0.440	0.609	0.390	0.734	0.265	0.160	0.240	0.321	0.493
4	0.500	0.380	0.597	0.390	0.721	0.259	0.183	0.218	0.302	0.692
5	0.440	0.380	-	-	-	-	0.088	0.142	-	-
6	0.310	0.283	-	-	-	-	-	-	-	-

* The retroreflected color of green Markers conforms to the specification of EN1463.

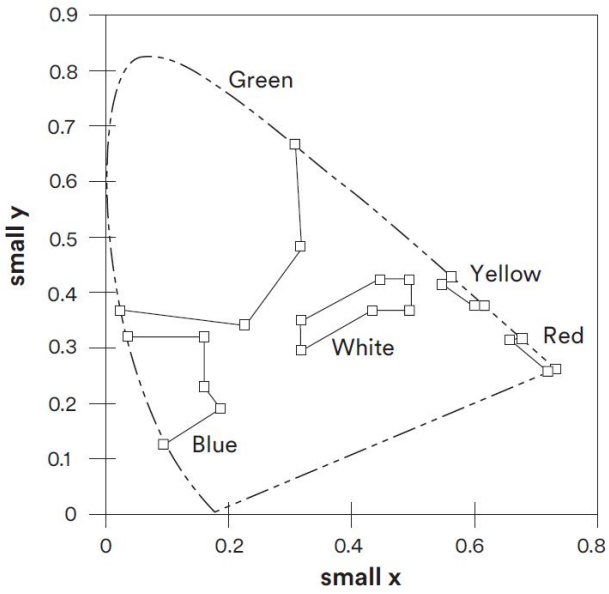

Figure 2. Marker Lens Colors Plotted on CIE 1931 Chromaticity Chart

NOTE

If two points lie on the spectrum locus line, they are not connected by a straight line. Instead they are connected by the boundary of the spectrum locus.

Abrasion Resistance

The coefficient of retroreflected luminous intensity of the Markers shall be measured after subjecting the entire lens surface to the test described in ASTM D4280 Section 9.5. After the exposure described above, retroreflection values shall not be less than 0.5 times the values listed in Table C.

Temperature Resistance

Markers shall comply with the initial minimum lens brightness requirements specified in Table C and the product of the values in Table D and Table E, after being conditioned for 12 hours at 145°F ± 5°F (62.7°C ± 2.5°C).

Markers meet the temperature cycling requirements of ASTM D4280 Section 9.4, when subjected to three cycles of 140°F (60°C) for four hours followed by 20°F (-7°C) for four hours, showing no cracking or delamination.

Impact Resistance

Marker Body Test

Test for the Marker bodies shall display no cracking or breakage when tested according to ASTM D2444 Tup A, using a 1000 gm weight at a height of 1 meter. The Markers shall be positioned in such a way that the Tup strikes the top of the Markers.

Marker Lens Test

Test for the Marker lenses shall display no cracking outside the impact area when tested according to ASTM D2444 Tup A, using a 1000 gm weight at a height of 1 meter. The Marker shall be placed in a steel fixture designed to hold the Marker lens horizontal while being positioned such that the Tup strikes the center of the lens.

Resistance to Water Penetration

The Markers shall be conditioned for 10 minutes at 145°F ± 5°F (62.7°C ± 2.5°C) and then immediately submerged in a 70°F ± 5°F (21°C ± 2.5°C) water bath for 10 minutes. The Markers shall then be removed from the water bath, wiped dry with a soft cloth, visually inspected for water penetration behind the lenses, and measured for retroreflectance according to ASTM E809. The Markers shall meet the initial minimum retroreflectance values specified in Table C and those specified by the products of the values in Table D and Table E.

Application

Refer to 3M Information Folder 290 for application instructions and substrate requirements prior to installation.

Durability

Maximum Marker durability is achieved when Markers are properly applied according to all applicable recommendations in this product bulletin and all 3M Related Literature listed below. Because reflective performance is reduced by wear, the lens of the raised pavement marker is coated with an abrasion-resistant material which helps maintain retroreflective performance under normal traffic wear conditions. Minimal marker loss may occur under normal traffic conditions when applied according to 3M recommendations using standard bitumen or epoxy adhesives designed for use with raised pavement markers.

Storage

Store indoors in a cool dry area. Use 290PSA markers within two years of the date of manufacture.

3M Related Literature

Always use the most current version of the applicable product bulletin, information folder, and/or other product information. These are available at www.mmm.com/roadsafety.

- 3M Information Folder 290 3M™ Raised Pavement Markers Surface Preparation and Application Procedures

Health and Safety

Tools and Equipment Usage

When using any equipment, always follow the manufacturer's instructions for safe operation.

Chemicals

When handling any chemical products, read the manufacturers' container labels and the safety data sheets (SDS) for important health, safety, and environmental information.

Follow this link to obtain SDS sheets for 3M products.

Follow this link to obtain information about substances of very high concern (SVHC) for EU products.

Warranty Information

3M Standard Warranty

The Markers are warranted ("3M Standard Warranty") to be free of defects in materials and manufacture at the time of shipment and to meet the specifications stated in this product bulletin. If Markers are proven not to have met the 3M Standard Warranty on their shipment date, then a buyer's exclusive remedy, and 3M's sole obligation, at 3M's option, will be refund or replacement of the Markers.

Technical Information

Technical information, guidance, and other statements provided by 3M are based upon records, tests, or experience that 3M believes to be reliable, but the accuracy, completeness, and representative nature of such information is not guaranteed. Such information is intended

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