

Transportation Safety Division

# 3M™ Raised Pavement Marker Series 290

Product Bulletin Series 290  
December 2021

Replaces Product Bulletin Series 290 Dated February 2012

## 1 Description

3M™ Raised Pavement Markers Series (“**Markers**”) are designed for application on asphalt and Portland cement concrete road surfaces. The Markers have been designed to provide highly effective, long-term nighttime visibility in non-snow plow regions. Except as noted in Table 6, the Markers meet the requirements of ASTM D4280.

The Marker bodies are made from an engineered thermoplastic that provides impact resistance and weatherability. The Markers include retroreflective elements that provide wet retroreflectance, dry retroreflectance, long-term nighttime visibility and are available in white, yellow, red, blue, or green.

The Markers have been designed to be applied directly to pavement surfaces and are compatible with commercially available bitumen and epoxy adhesives. The use of any other type of adhesive should be thoroughly evaluated prior to any large-scale application.

3M also manufactures Markers 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 more information on Markers with PSA pads, see [3M Information Folder 290 PSA](#).

Markers are available in the types and colors listed in Table 1.

**Table 1.** Product types and colors by product code<sup>a</sup>.

| Color                               | Product Code |             |
|-------------------------------------|--------------|-------------|
|                                     | Marker       | PSA Markers |
| 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-WR   | PSA-290-WR  |
| Two-way white and red, 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  |

a. Other combinations of body color, retroreflector color, one-way/two-way, PSA available. Talk to your customer service representative.

For application information, refer to [3M Information Folder 290](#), [3M Information Folder 290 PSA](#), and [3M Information Folder 290 Groove](#).

For applications not covered by the above mentioned documents, it is the responsibility of the installer to contact the appropriate 3M representative or application engineer for guidance at 1-800-553-1380.

## 2 Product Features

- Durable
- Wet and dry retroreflective
- Impact resistant
- Abrasion resistant
- Molded-in body colors
- Rumble effect
- Lightweight
- Application finger grips
- Compatible with standard bitumen and epoxy adhesives

## 3 Specifications

### 3.1 Product Dimensions

The dimensions of the Marker body without adhesive conform to the values presented in Table 2.

**Table 2.** Marker dimensions.

| Dimension | Value                               |
|-----------|-------------------------------------|
| Height    | 0.625 ± 0.050 in. (15.88 ± 1.27 mm) |
| Width     | 4.00 ± 0.50 in. (101.6 ± 12.7 mm)   |
| Length    | 3.50 ± 0.50 in. (88.9 ± 12.7 mm)    |

### 3.2 Type Retroreflectance

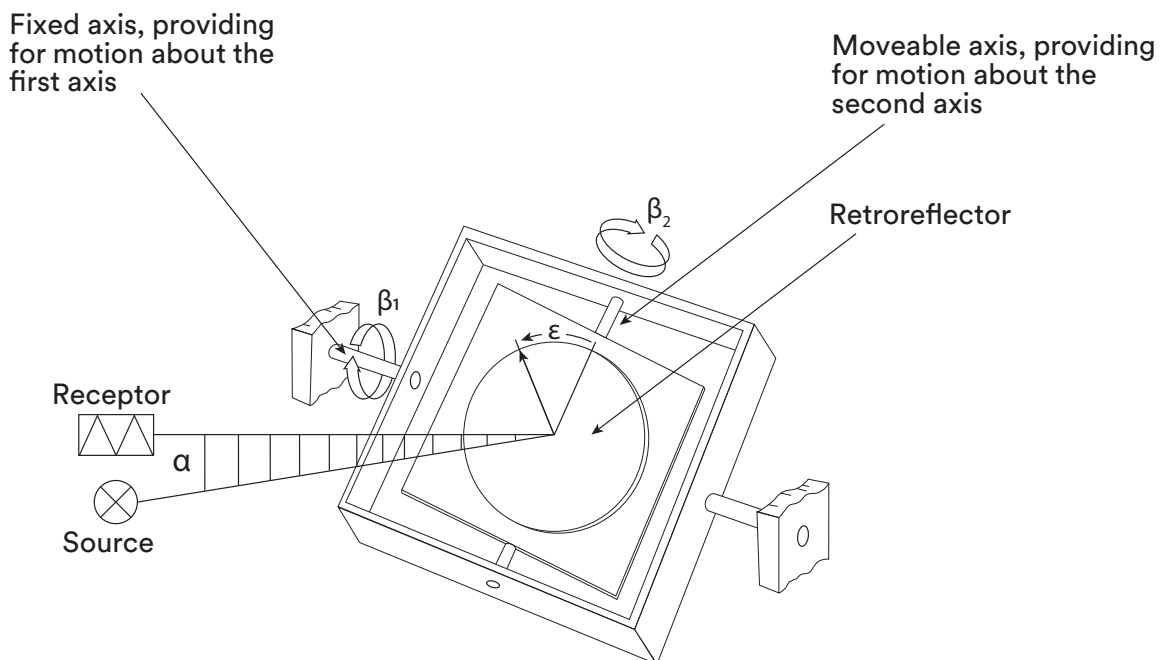
Type retroreflectance refers to marker luminance measurements made using simplified viewing geometries that provide a convenient means of measurement for quality control purposes when specifying a unique marker type. White, yellow, red, blue, and green Markers conform to the initial minimum retroreflectance values specified in Table 3 when measured in accordance with ASTM E809. The photometric quantity presented in Table 3 is the coefficient of retroreflected luminous intensity ( $R_I$ ), expressed as millicandelas per lux (mcd/lx) and candelas per foot-candela (cd/ft cd). One candela per lux equals 10.76 candelas per foot-candle.

**Table 3.** Minimum  $R_I$  Values.

| Entrance angle $\beta_2$<br>( $\beta_1 = 0^\circ$ ) | $0^\circ$              |                          | $\pm 20^\circ$         |                          |
|---|------------------------|--------------------------|------------------------|--------------------------|
| Observation angle                                   | $0.2^\circ$            |                          | $0.2^\circ$            |                          |
| 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                     |

### 3.3 Performance Retroreflectance

Performance retroreflectance refers to marker luminance as viewed by the driver under standardized road and vehicle conditions. This property is often called “Driver Geometry Retroreflection.” Measurement under simulated use conditions are performed using the measurement geometry illustrated in Figure 1. This ensures that 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  $R_1$  values in Table 4 and the color-dependent multiplying factors in Table 5, when measured in accordance with ASTM E809. The angles referenced in Table 4 correspond to the entrance ( $\beta$ ), rotation ( $\epsilon$ ), and observation ( $\alpha$ ) 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  $R_1$  values are the sum of Marker retroreflection from incident illumination from both the left and right headlights.

**Table 4.** Minimum initial “Driver Geometry”  $R_1$  values.

| Simulated Distance |        | Headlight | Observation Angle ( $\alpha$ )<br>(degrees) | Rotation Angle ( $\epsilon$ )<br>(degrees) | Entrance Angles ( $\beta$ ) |           | Minimum $R_1$<br>(mcd/lx)<br>left + right | Typical $R_1$<br>(mcd/lx)<br>left + right |
|--------------------|--------|-----------|---|--|-----------------------------|-----------|---|---|
| Feet               | Meters |           |   |  | $\beta_1$                   | $\beta_2$ |   |   |
| 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  $\beta_1$  and  $\beta_2$  are set to equal  $0^\circ$  and Left/Right Rotation Angles are set to approximated as  $20^\circ/-70^\circ$  with little loss of accuracy.

**Table 5.** Color Multiplying Factors

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

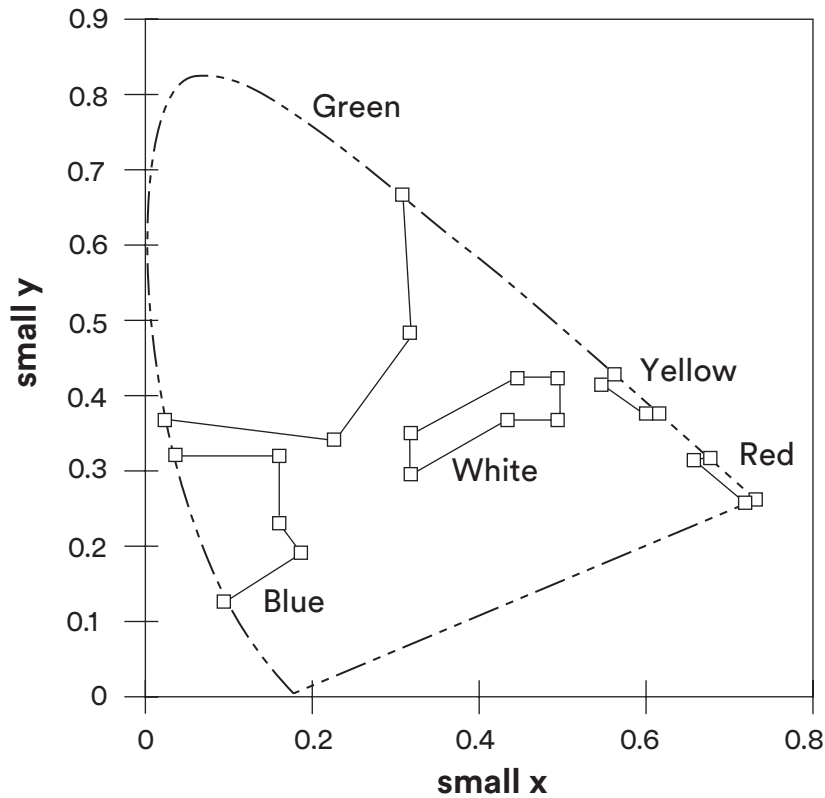
### 3.4 Retroreflected Color

The retroreflected colors of the Markers lie within the respective retroreflected color gamut coordinates, plotted on the 1931 CIE Chromaticity ( $x$ ,  $y$ ) diagram, described in Table 6 and Figure 2, when tested in accordance with ASTM E811 using CIE Illuminant Source A under viewing conditions of  $0.2^\circ$  observation angle,  $0^\circ$  entrance angle. 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, which meets the requirements of EN1463.

**Table 6.** Retroreflected Color Gamut Coordinates.

| Point Number | White |       | Yellow |       | Red   |       | Blue  |       | Green <sup>a</sup> |       |
|--------------|-------|-------|--------|-------|-------|-------|-------|-------|--------------------|-------|
|              | 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 | –      | –     | –     | –     | –     | –     | –                  | –     |

a. **Note** - the retroreflected color of green Markers conforms to the specification of EN1463, but not ASTM D4280



**Figure 2.** Marker colors plotted on CIE 1931 Chromaticity Chart. If two points lie on the spectrum locus line, they are not connected by a straight line but, rather, by the boundary of the spectrum locus.

### 3.5 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, using a sand drop apparatus. After the exposure described above, retroreflection values shall not be less than 0.5 times the values listed in Table 3.

### 3.6 Temperature Resistance

Test Markers shall comply with the initial minimum brightness requirements specified in Table 3 and the product of the values in Tables 4 and 5 after being conditioned for 12 hours at  $145 \pm 5$  °F ( $62.7 \pm 2.5$  °C).

### 3.7 Impact Resistance

Test 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. 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.

### 3.8 Resistance to Water Penetration

The Markers shall be conditioned for 10 minutes at  $145 \pm 5$  °F ( $62.7 \pm 2.5$  °C) and then immediately submerged in a  $70 \pm 5$  °F ( $21 \pm 2.5$  °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 3 and those specified by the products of the values in Tables 4 and 5.

## 4 Health and Safety Information

Read all health hazard, precautionary, and first aid statements found in the Safety Data Sheets (SDS), Article Information Sheets, and products labels of any materials for important health, safety, and environmental information prior to handling or use. To obtain SDSs and Article Information Sheets for 3M products, go to [3M.com/SDS](http://3M.com/SDS), contact 3M by mail, or for urgent requests call 1-800-364-3577.

## 5 Durability

Maximum Marker durability is achieved when Markers are properly applied according to all applicable recommendations provided in product bulletins and information folders listed in Section 9. 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.

## 6 Storage

Store indoors in a cool dry area.

## 7 Warranty Information

### 7.1 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.

### 7.2 Exclusive Limited Remedy

If Markers are proven not to have met the 3M Standard Warranty or 3M Warranty, then a user's exclusive remedy, and 3M's sole obligation, at 3M's option, will be refund or replacement of the non-conforming Markers.

### 7.3 Disclaimer

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### 7.4 Limitation of Liability

Except for the limited remedy stated above, and except where prohibited by law, 3M will not be liable for any loss or damage arising from the Markers or any 3M product, whether direct, indirect, special, incidental, or consequential damages (including but not limited to lost profits, business, or revenue in any way), regardless of the legal theory asserted including warranty, contract, negligence, or strict liability.

## 8 Other Product Information

Always confirm that you have the most current version of the applicable product bulletin, information folder, or other product information from 3M's Website at <http://www.3M.com/roadsafety>.

## 9 Literature References

[3M IF 290](#)

[3M IF 290 Groove](#)

[3M IF 290 PSA](#)

3M™ Markers Series 290 Pavement Surface Preparation and Application Procedures

Application Procedure for 3M™ Markers Series 290 in Grooved Pavement Surfaces

3M™ Raised Pavement Marker Series 290 With Pressure Sensitive Adhesive Surface  
Preparation and Application Procedures

ASTM Test Methods are available from ASTM International, West Conshohocken, PA.

## For Information or Assistance

Call: 1-800-553-1380

In Canada Call:

1-800-3M HELPS (1-800-364-3577)

## Internet:

<http://www.3M.com/roadsafety>

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