

Transportation Safety Division

# 3M™ Diamond Grade™ Linear Delineation System Series 340

Product Bulletin Series 340  
June 2020

Replaces PB 340 Dated January 2019

## 1 Description

The 3M™ Diamond Grade™ Linear Delineation System Series 340 is intended for the linear reflectorization of concrete barriers and metal guardrails. Linear delineation system panels are fabricated from 3M™ Diamond Grade™ Reflective Sheeting, laminated onto thin-gauge aluminum and formed into a unique shape that provides retroreflection across a wide range of entrance and observation angles.

3M linear delineation system panels can be used in a variety of applications, including bridge abutments, concrete or metal pillars and posts, and utility boxes. 3M recommends testing all installation surfaces for proper adhesion. See [Technical Bulletin, Surface Preparation for 3M™ VHB™ Tape Applications](#).

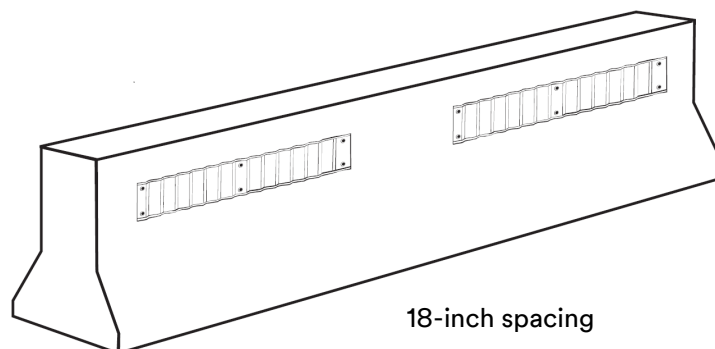
3M linear delineation system panels have been designed in 1.5-inch widths for use on guardrails and concrete barriers and include pre-applied 3M™ VHB™ Acrylic Foam Tape 5962 on their back sides. 1.5-inch wide 3M linear delineation system panels are easily installed into the trough (or “W”) grooves of guardrails.

Four- and six-inch wide panels are available in 34-inch lengths, and 1.5-inch wide panels are available in 31-inch lengths.

**Table 1.** Product codes by width and color.

Color	Available Widths		
	1.5-inch	4-inch	6-inch
White	N/A	LDS-W344	LDS-W346
Red	N/A	LDS-R344	LDS-R346
Yellow	LDS-Y311.5	LDS-Y344	LDS-Y346
Fluorescent Yellow – FY	LDS-FY311.5	LDS-FY344	LDS-FY346
Fluorescent Orange – FO	N/A	LDS-FO344	LDS-FO346

3M linear delineation system panels provide continuous linear delineation when installed edge to edge. If 3M linear delineation system panels are to be spaced for daytime or nighttime contrast, 3M recommends using a spacing of 18 inches between panels. This spacing is especially effective when panels are installed at locations leading into and around curves (e.g. cloverleaf entrances). If 3M linear delineation system panels are spaced on a barrier or guardrail that runs parallel to traffic, there should be no more than 36 inches between panels. For example, on a typical 10-foot concrete barrier, two 3M linear delineation system panels should be spaced 18 inches apart (see Figure 1).



**Figure 1.** Two linear delineation system panels spaced 18 inches apart on a 10-foot concrete barrier.

## 2 Average Installation Time Using 3M™ VHB™ Acrylic Foam Tape 5962 Method

### Concrete Installation:

- 4 person crew - 120 panels/hour
- 2 person crew - 60 panels/hour

### Guardrail Installation:

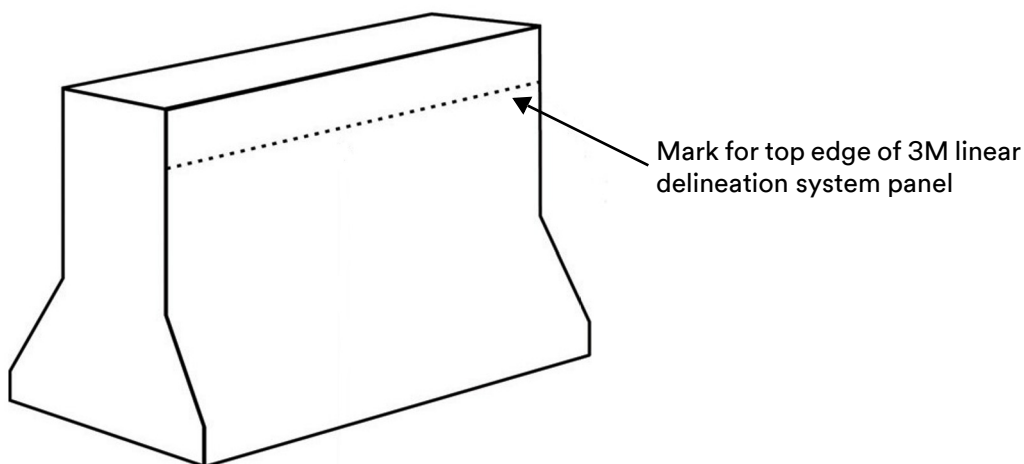
- 2 person crew - panels 50/hour

## 3 Installation Preparation

It is the responsibility of the installer to contact a 3M sales representative or 3M application engineer whenever there is a question regarding application procedures or substrate conditions (1-800-553-1380).

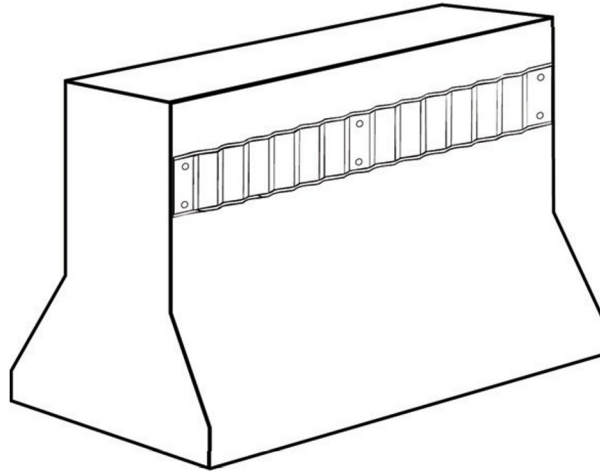
### 3.1 Concrete Barriers

To ensure a straight and level application, snap a chalkline to which 3M linear delineation system panels can be aligned, as shown in Figure 2.



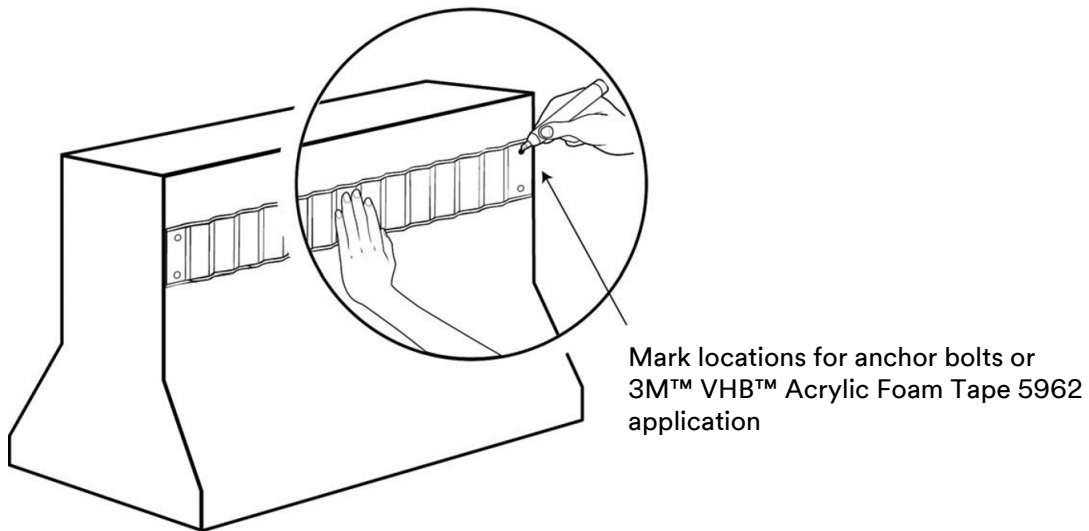
**Figure 2.** Mark the location of the top edge of the 3M linear delineation system panel with chalkline prior to installation.

To minimize soiling by dirt, snow, salt, and road grime, install 3M linear delineation system panels near the tops of barriers, as seen in Figure 3.



**Figure 3.** 3M linear delineation system panel installed near the top of a barrier to avoid dirt, snow salt, and road grime.

Using a black marking pen, mark where panels are to be mounted on the barrier at their mounting points, as shown in Figure 4.



**Figure 4.** Mark mounting point locations with black marking pen prior to 3M linear delineation system panel installation.

## 4 Application Instructions for Concrete

### 4.1 3M™ VHB™ Acrylic Foam Tape 5962 Method

3M™ VHB™ Acrylic Foam Tape 5962 is a double-coated, 1.6 mm thick, pressure sensitive adhesive tape suitable for use on a wide range of substrates, including concrete. When installing 3M linear delineation system panels with 3M VHB tape, 3M™ Hi-Strength 90 Spray Adhesive - Low VOC <25%, or equivalent, must be used to unify the surface and improve tape adhesion.

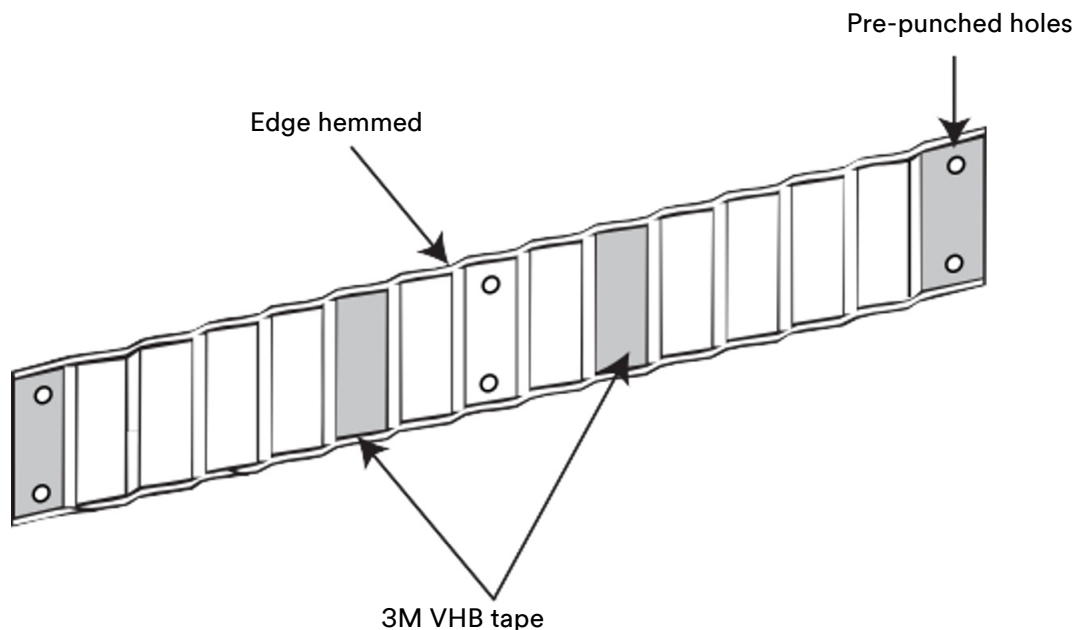
**Note:** 3M Hi-Strength 90 Spray Adhesive - Low VOC <25% must dry or cure for 15 minutes (until tacky to finger touch) before 3M VHB tape is applied.

Do not install onto concrete surfaces with excessive grime, oil, grease, or loose paint. Ensure installation surface is clean, dry, and free of dust, oil, and grease before applying 3M linear delineation system panels. The end user is responsible for testing and determining the suitability of any spray adhesive other than 3M Hi-Strength 90 Spray Adhesive - Low VOC <25%. Refer to adhesive manufacturer's documentation for application recommendations and instructions.

#### 4.1.1 Installation procedure:

- Apply at a temperature of at least 50 °F (10 °C) and rising
- Remove dirt from concrete surface using wire brush
- Remove loose particles and dust using high velocity air
- Apply 3M Hi-Strength 90 Spray Adhesive - Low VOC <25%, or equivalent adhesive primer, to the surface to which 3M VHB tape is to be applied
- Allow primer to cure until tacky to finger touch
- Remove backing from 3M VHB tape and press linear delineation system panels firmly into place (avoid pressing on raised surfaces of panels)
- Use pre-cut strips of 3M VHB tape (six- and 4-inch strips are available and can be purchased from 3M) to apply panels to concrete substrates

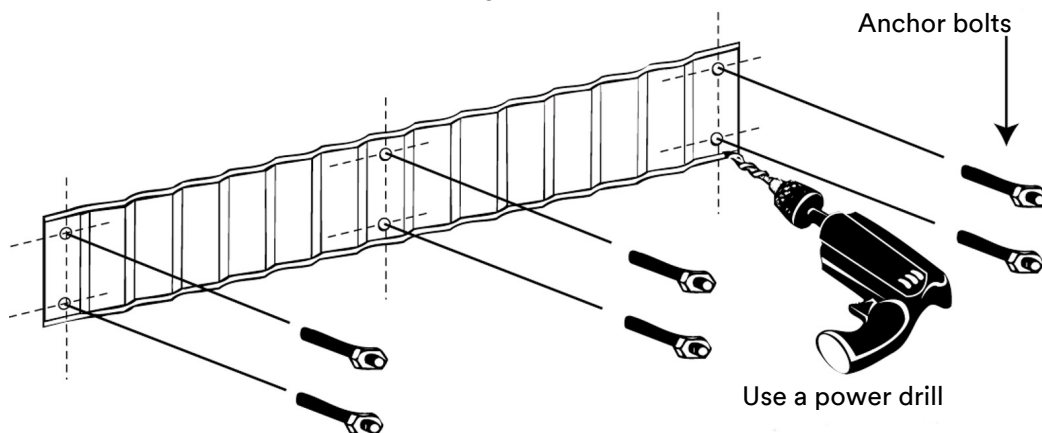
**Note:** Roller pressure or adequate hand pressure must be applied to the linear delineation system panel at all 3M VHB tape locations.



**Figure 5.** Parts of a 3M linear delineation system panel that have been prepared for installation.

## 4.2 Anchor Bolt Method

Once panel anchor locations have been marked on barriers, drill holes using a rotary hammer drill equipped with a concrete drill bit. 3M linear delineation system panels are pre-drilled and can be used as drilling jig fixtures for concrete applications, as shown in Figure 6.



**Figure 6.** Install anchor bolts using 3M linear delineation system panel as drilling jig.

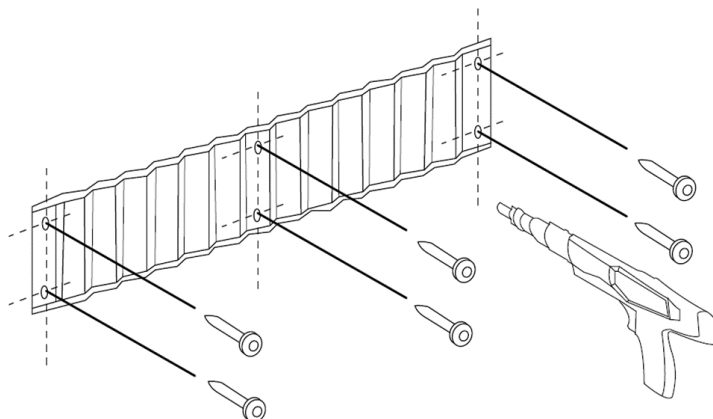
After drilling anchor holes, hammer in 1/4- by one-inch stainless steel anchors, such as Hilti® Stainless Steel Metal Hit Anchor 304 Model #230520/9, which can be removed if necessary. When using other anchors, include a 5/16-inch nylon washer at each anchor.

**Note:** Adhesive caulking (similar to the 3M™ Windo-Weld™ Super Fast Urethane (#08609) discussed in Section 5.3.1) can be used to aid in the alignment of panels to chalk lines prior to drilling through the pre-drilled holes in the 3M linear delineation system panel. 3M Windo-Weld Super adheres quickly at temperatures ranging from 60–100 °F and can be used to install 3M linear delineation system panels to concrete only in conjunction with the Hilti® Anchor 304 anchoring system.

**Note:** Other anchor systems, including drilled mechanical fasteners and concrete epoxy systems, can be used to attach 3M linear delineation system panels to concrete. The end user is responsible for testing the durability and strength of any other potential anchor or epoxy system and determining its suitability.

## 4.3 Powder Actuated Method

Position the 3M linear delineation system panel on the barrier and, using a powder actuated tool such as a Hilti® DX 2 or DX 5, secure the 3M linear delineation system panel to the concrete barrier as shown in Figure 7. Follow all of the tool manufacturer's operating instructions and use an appropriately sized fastener, such as the Hilti® X-CR P8. Anchors can be installed either via pre-drilled holes, as shown in Figure 6, or as recommended by the fastener manufacturer.



**Figure 7.** Install anchors using powder actuated tool.

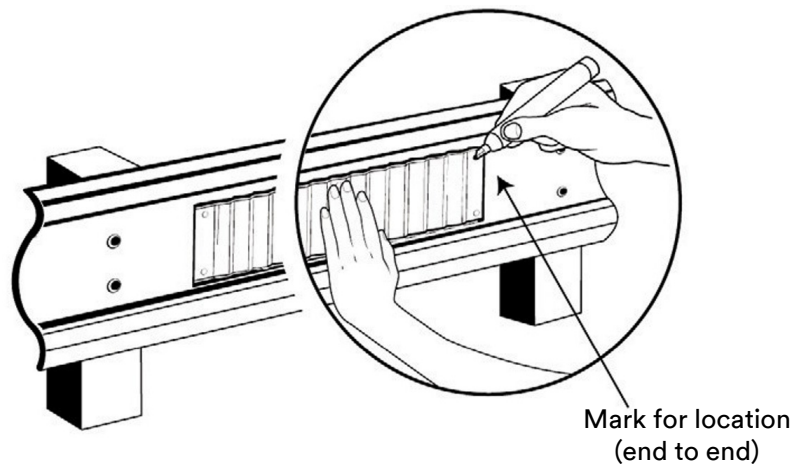
**Note:** Powder actuated systems other than the above-mentioned Hilti® products can be used to attach 3M linear delineation system panels to concrete. However, the end user is responsible for testing the strength and durability of any potential alternative and for determining its suitability. Care must also be taken to choose a fastener that, once installed, sits flush with the panel and does not damage the panel's metal backing. Refer to the tool manufacturer's documentation for application recommendations and operating instructions.

## 5 Application Instructions for Standard Galvanized Metal Guardrails

### 5.1 Application of 1.5-inch Panels

**Panel Width** - 1.5-inch wide 3M linear delineation system panels fit standard guardrails.

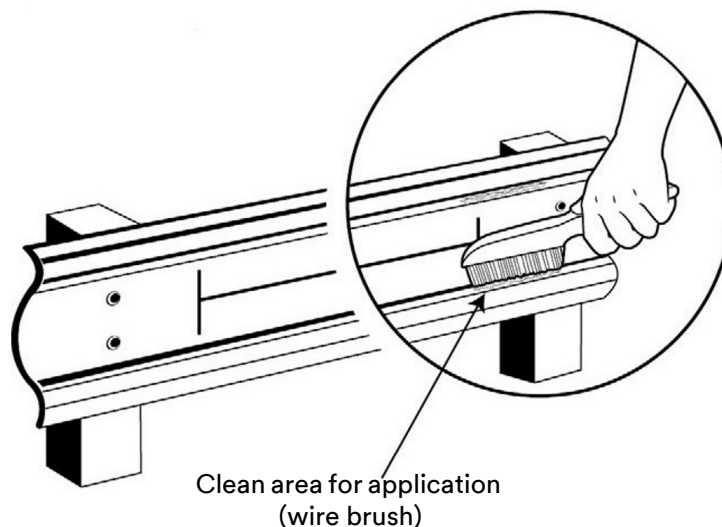
**Panel Position** - Check suitability of spacing recommendations for each application. Spacing distances depend upon guardrail configurations and constructions. Where possible, avoid applying panels over bolt heads and seams to ensure the best possible adhesion to the guardrail surface. Mark guardrail locations where 3M linear delineation system panels are to be installed, as shown in Figure 8.



**Figure 8.** Mark 3M linear delineation system panel installation locations.

### 5.2 Surface Preparation and Cleaning

Once the guardrail has been properly marked for installation, use a wire brush to clean any surface dirt from the application area, as shown in Figure 9. Next, lightly clean the guardrail with rubbing alcohol or isopropyl alcohol. Allow alcohol to dry before installing 3M linear delineation system panel.



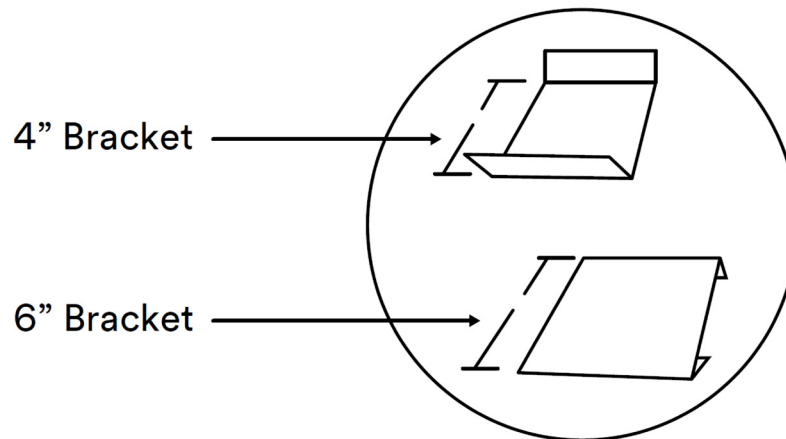
**Figure 9.** Clean guardrail first with wire brush, then with rubbing alcohol or isopropyl alcohol. Allow alcohol to dry before installing panel.



Once the guardrail is clean and dry, apply the 3M linear delineation system panels using 3M™ VHB™ Acrylic Foam Tape 5962 by removing tape liners and pressing the panel firmly to the guardrail. Avoid pressing on the raised areas of panels.

### 5.3 Application with Brackets

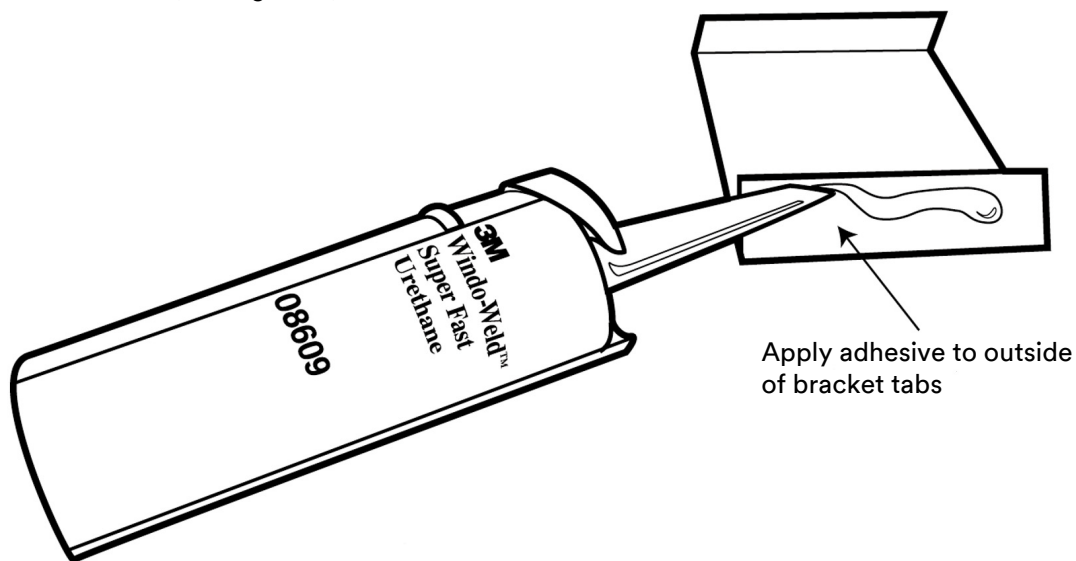
As shown in Figure 10, brackets come in two widths, 4- and 6-inch. The width of the bracket used must match that of the 3M linear delineation system panel being installed. Use three brackets for each panel, regardless of panel width. Brackets are available in packages of 150 and are labeled as either LDS-4B (four-inch brackets) or LDS-6B (six-inch brackets).



**Figure 10.** Two bracket sizes available.

#### 5.3.1 Bracket Installation with 3M™ Windo-Weld™ Super Fast Urethane

When mounting 3M brackets to guardrails and 3M linear delineation system panels to brackets, 3M recommends the use of 3M™ Windo-Weld™ Super Fast Urethane (#08609).<sup>1</sup> 3M Windo-Weld is stocked at most local general automotive supply stores, available in standard caulking tubes, and should be applied to brackets and panels using a construction style caulking gun. 3M Windo-Weld must be applied only under dry weather conditions and at a temperature of no less than 60 °F. One tube of 3M Windo-Weld will adhere 10 3M linear delineation system panels and 30 3M linear delineation system brackets, either four- or six-inch wide (see Figure 11).



**Figure 11.** Applying 3M Windo-Weld to 3M bracket tabs.

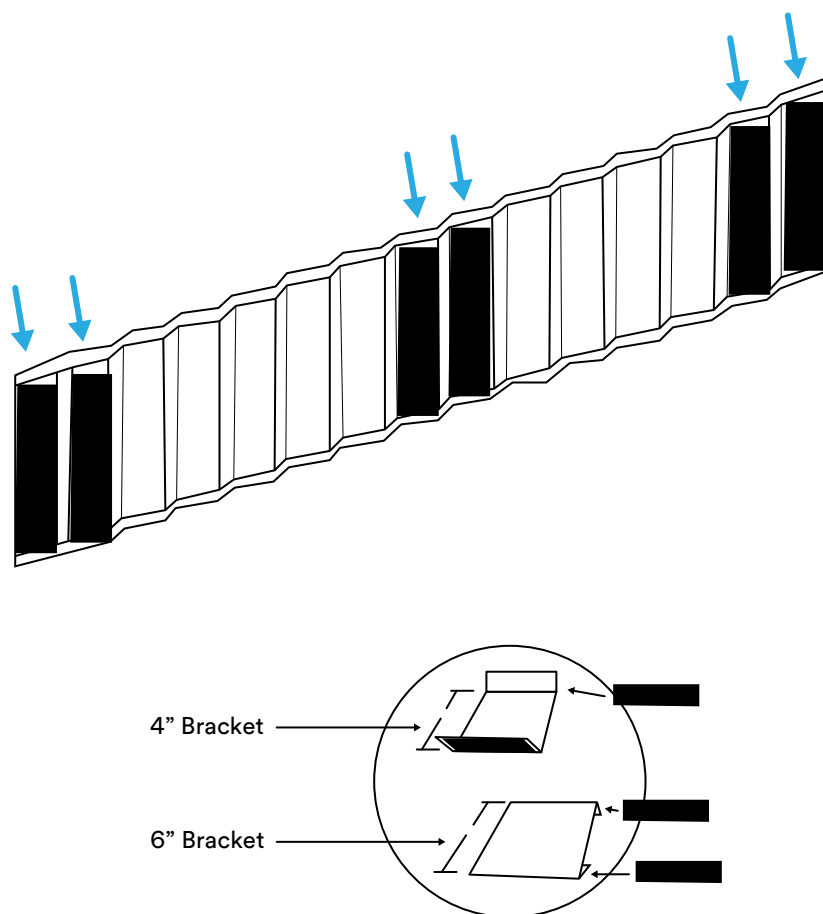
1. Other epoxy and adhesive systems can be used to mount brackets and 3M linear delineation system panels to guardrails. However, the end user is responsible for testing the durability and strength of any other epoxy system and determining its suitability.

**Note:** To ensure proper adhesion, apply 3M Windo-Weld caulk only to dry guardrails and allowed it to dry for at least eight hours in the absence of rain. Prior to installation with Windo-Weld, verify that no rain is forecast to fall for at least 8 hours.

### 5.3.2 3M Linear Delineation System Installation with 3M™ VHB™ Acrylic Foam Tape 5962

Proper installation of 3M linear delineation system panels requires the use of three brackets per 3M linear delineation system panel. The 3M linear delineation system panels have been engineered to fit into the center curvature of a standard guardrail. Use 3M VHB tape, or equivalent, to install brackets to 3M linear delineation system panels and to install 3M linear delineation system panels to guardrails. Follow all manufacturer recommendations to achieve proper application.

**Install brackets onto 3M linear delineation system panel:** Adhere three brackets to the mounting surface of each 3M linear delineation system panel, one at either end of the panel and one in the middle, using two one- by four-inch or one- by six-inch strips of 3M VHB tape per bracket, as shown in Figure 12.



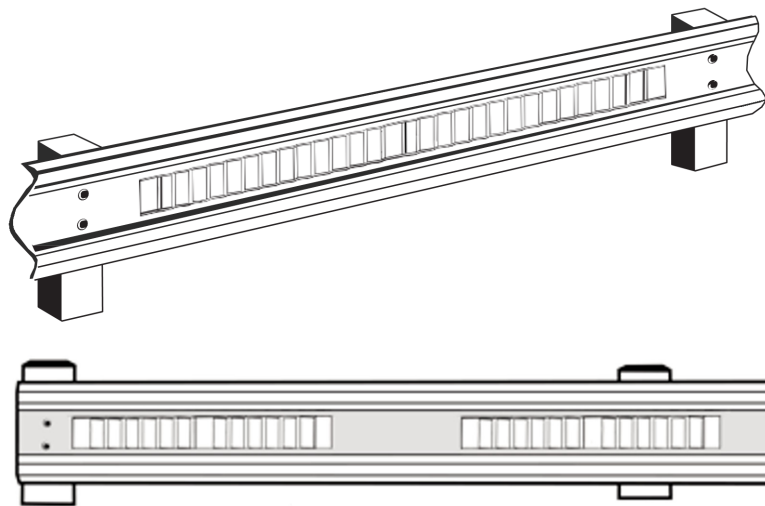
**Figure 12.** Attach three brackets to the mounting surface of the 3M linear delineation system panel using two strips of 3M VHB tape per bracket.

**Install 3M linear delineation system panel onto guardrail:** Apply a one- by four-inch or one- by six-inch strip of 3M VHB tape to each of the two mounting wings located on the back side of each bracket. Press the 3M linear delineation system panel to the guardrail at its center curvature.

Apply 3M linear delineation system panels to dry guardrails where there is no rain in the forecast for at least eight hours after application. Minimum application temperature is 50 °F and rising. To help ensure the best possible adhesion to the guardrail and allow for future repair or replacement of the guardrail, do not apply 3M linear delineation system panels over seams or bolt heads.



Finished 3M linear delineation system panels provide continuous linear delineation when installed edge to edge and intermittent linear delineation when spaced 18 inches apart along a guardrail, as shown in Figure 13.



**Figure 13.** 3M linear delineation system panels provide continuous linear delineation when installed edge to edge (top) and intermittent linear delineation when spaced 18 inches apart (bottom).

**Note:** For 3M linear delineation system mechanical guardrail mounting brackets, please call WSIH/Irwin-Hodson Company at 1-877-641-3021.

## 6 Health and Safety Information

Read all health hazard, precautionary, and first aid statements found in the Safety Data Sheets (SDS) and Article Information Sheets for important health, safety, and environmental information. Consult federal, state, and local air quality regulations that may regulate or restrict product use, including those governing volatile organic compound (VOC) content and/or emissions. This product is manufactured without the use of heavy metals, lead chromate pigments, or other similar lead containing chemicals. 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.

## 7 Warranty Information

### 7.1 3M Basic Warranty

3M Linear Delineation System Series 340 (“Product”) is warranted to be free of defects in materials and manufacture at the time of shipment and to meet the specifications stated in this product bulletin (“Basic Warranty”). If the Product is proven not to have met the Basic Warranty on its shipment date, then a buyer's exclusive remedy, and 3M's sole obligation, at 3M's option, will be refund or replacement of the Product.

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## 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 Data Sheet 5962](#)

3M™ VHB™ Acrylic Foam Tape 5962 Product Data Sheet

[3M Technical Bulletin VHB](#)

Surface Preparation for 3M™ VHB™ Tape Applications

[3M™ Hi-Strength 90 Spray Adhesive - Low VOC<25%](#)

## **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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