INFORMATION HANDOUT

For Contract No. 05-1F3204
At 05-SB-101-13.0/22.8

Identified by
Project ID 0513000085

PRODUCT INFORMATION

3m Linear Delineation System
Positive guidance through changing roadway geometry

- Made with bright, durable Diamond Grade prismatic sheeting technology
- Unique crimped wave pattern provides superior visibility—even at high entrance angles
- Available in fluorescent colors for 24-hour performance
- Fast and easy to install
- A low-cost safety improvement
Providing positive guidance through changing roadway geometry

It is well known that changes in roadway geometry lead to increased crashes, resulting in escalating costs to agencies and society. Navigating changing roadways becomes even more difficult at night.

- Two-thirds of fatalities occur when vehicle leave the road
- Single vehicle run-off-the-road accidents continue to lead U.S. crash statistics
- In the U.S., the nighttime accident rate is three times that of the day rate

The 3M™ Diamond Grade™ Linear Delineation System provides clear visual guidance to help drivers through work zones and other challenging roadway conditions.

Proven technology for increased safety

3M’s linear delineation system is designed to enhance driver safety where there is a need to call attention to a changed or changing condition, such as an abrupt roadway narrowing or curvature, or to provide guidance through a work zone. Common applications include:

- Curved roadways
- Tunnel approaches
- Entrance and exit ramps
- Bridges

Linear delineation system panels combine high performance 3M™ Diamond Grade™ Reflective Sheeting with a unique crimped design for optimal visibility and angularity. Panels are available in fluorescent colors that provide increased visibility from dawn to dusk, as well as at night.

Economical and durable

Linear delineation technology continues 3M’s 70-year tradition of delivering traffic safety solutions with industry-leading service life.

3M’s linear delineation system panels are economical and now even easier to install with 3M™ VHB™ Tape. High performance VHB tape is pre-applied to the panels for fast, easy application to metal guardrails, work zone barriers and median barriers. No special tools or messy adhesives are required.

3M linear delineation system panels are now available in a 1.5-inch version designed to fit into guardrail troughs and offers flexibility for application to concrete or other surfaces both on and off the roadway.

<table>
<thead>
<tr>
<th>Size</th>
<th>Available Colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>4- and 6-inch panels</td>
<td>White, Red, Fluorescent Yellow,</td>
</tr>
<tr>
<td></td>
<td>Fluorescent Orange</td>
</tr>
<tr>
<td>1.5-inch panels</td>
<td>White, Fluorescent Yellow</td>
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</tbody>
</table>

For more information about the 3M Diamond Grade linear delineation system, or 3M’s full line of traffic safety products and services, contact your 3M representative or visit www.3M.com/tss.
Description

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

The 1.5-inch linear delineation system panels are designed for use on guardrail and concrete barrier application. These panels include pre-applied 3M™ VHB™ tape on the back side. The panels can easily be installed onto the guardrail in the trough (or “W”) groove.

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 surface for proper adhesion. See Technical Bulletin, Surface Preparation for 3M™ VHB™ Tape Applications.

All panels have a standard length of 34 inches (36 inches is the actual length of the panel prior to formation).

<table>
<thead>
<tr>
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<th>Available Sizes</th>
</tr>
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<tbody>
<tr>
<td>White</td>
<td>1.5, 4, 6 inch</td>
</tr>
<tr>
<td>Fluorescent Yellow</td>
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</tr>
<tr>
<td>Fluorescent Orange</td>
<td>4, 6 inch</td>
</tr>
<tr>
<td>Red</td>
<td>4, 6 inch</td>
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</tbody>
</table>

Linear delineation system panels will provide continuous linear delineation by installing the panels edge to edge. If linear delineation system panels are spaced for day or night contrast, 3M recommends a spacing of 18 inches between each panel, especially into and around a curve, such as a cloverleaf entrance. If linear delineation system panels are spaced on a barrier or guardrail, running parallel with traffic, space should be at a maximum of 36 inches between panels. For example, on a typical 10-foot concrete barrier, two linear delineation system panels are recommended at a spacing of 18 inches (see Figure 2).

FIGURE 2

18" Spacing

Average Installation Time Using VHB™ Tape Method

Concrete Installation
4 Person Crew = 120 Panels/hour
2 Person Crew = 60 Panels/hour

Guardrail Installation
2 Person Crew = 50/hour
Installation Procedures

Product Installation Requirements

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

Concrete Barriers
To assure a straight level application, snapping a chalk-line is recommended. (see Figure 3).

FIGURE 3
Mark for top edge of LDS
Marking the application area

FIGURE 4
Using a black marking pen, mark where the panels will be mounted on the barrier (see Figure 4).

FIGURE 5
Mark location for anchor bolts or VHB application

Application Instructions on Concrete

3M™ VHB™ Tape Method
VHB Acrylic Foam Tape 5962 is a double-coated (1.55mm) pressure sensitive adhesive tape for bonding a wide range of substrates, including concrete. 3M™ Spray 90 Adhesive must be used to unify the surface and improve the tape bond.

Note: Spray 90 must dry or cure for 15 minutes (tacky to finger touch) before VHB application

Application to concrete surface that has excessive grime, oil, grease or loose paint is not recommended. Ensure surface is clean, dry and free from dust, oil or grease before application of linear delineation system panels.

- Application temp: 50°F (10°C) and rising
- Remove surface dirt with wire brush from concrete surface
- High velocity air must be used to remove any loose particles or dust
- Pre-cut strips of VHB tape can be used to apply panels to concrete substrate. Both 6 and 4 inch strips are available and can be purchased from 3M.
- Apply 3M™ Spray 90 or other recommended adhesive primer to surface where VHB tape will be applied
- Remove backing from VHB tape and press linear delineation system panels firmly into place (avoid pressing in raised surface of panel).

Roller or adequate hand pressure must be applied to the linear delineation system panel at the VHB surface point.

Anchor Bolt Method
Once the barriers are marked for location, drill holes with a rotary hammer drill with a concrete drill bit. The linear delineation system panels are predrilled and can be used as individual drilling jig fixtures for concrete application (see Figure 6).

FIGURE 6
Anchor bolts
Use a power drill
Pre-punched holes
Edge hemmed
VHB strips
Mark for top edge of LDS
After drilling, hammer in 1/4" x 1" stainless steel anchors (such as Hilti Stainless Steel Metal Hit Anchor 304 (Model #230520/9). Be sure to use a 5/16" nylon washer with each anchor, other than the Hilti anchor mentioned above. The Hilti anchors are removable, if necessary.

**Note:** It is helpful to use an adhesive caulking system (similar to the 3M™ Windo-Weld™ Super Fast Urethane mentioned in the guardrail section) to aid in the alignment of the panels to the chalk line, prior to drilling through the pre-drilled linear delineation system holes. The Windo-Weld Urethane will adhere fast at temperatures ranging from 60˚F to 100˚F. The Windo-Weld Urethane can only be used with linear delineation system panels on concrete in conjunction with the Hilti anchoring system.

**Note:** Other anchor systems, including drilling (mechanical fasteners) or concrete epoxy systems, can be used to attach linear delineation system panels to concrete. The end user is responsible to test durability and strength of the anchor or epoxy.

**Application Instructions on Standard Galvanized Metal Guardrails**

**Application of 1.5-inch panels**

**Panel Width** - The 1.5-inch wide linear delineation system panels will fit your guardrail properly.

**Panel Positioning** - Check on spacing recommendations. Mark the area on the guardrail where the linear delineation system panels will be installed. Spacing distances may vary depending upon configuration and construction of the guardrail (see Figure 7). Where possible avoid application over bolt heads and seams to ensure best possible adhesion to guardrail surface.

**Surface Preparation and Cleaning** - With the guardrail properly marked for installation, use a wire brush to clean surface dirt from application area (see Figure 8). Lightly clean guardrail with rubbing alcohol or isopropyl alcohol. Allow alcohol to dry before application.

**FIGURE 7**

Mark for location (end to end)

**FIGURE 8**

Clean area for application (wire brush)

Once guardrail is clean and dry, apply panels with VHB™ tape by removing the liner from tape and pressing panel firmly to guardrail. Avoid pressing in raised area of panel.

**Application with Brackets**

**Bracket Size** - Two styles of brackets are available and can be purchased from 3M.

The brackets must be matched to fit the exact 4-inch or 6-inch wide linear delineation system panels. The brackets are packaged 150 each to a carton and labeled LDS-4B for 4-inch brackets and LDS-6B for 6-inch brackets. End user must use three brackets per panel on either 4-inch or 6-inch LDS styles (see Figure 9).

**FIGURE 9**

Linear delineation system Panel and Bracket Mounting - For mounting the 3M brackets to the guardrail and the linear delineation system panels to the brackets, 3M recommends the use of 3M™ Windo-Weld™ Super Fast Urethane (#08609).* This product is stocked at most local general Automotive Supply Stores. The product is available in a standard caulk tube and should be applied to the brackets and panels with a construction style caulking gun. The Windo-Weld urethane must be applied at 60F + in dry weather conditions. One tube of Windo-Weld caulk will adhere 10 linear delineation system panels and 30 linear delineation system brackets of either 4-inch or 6-inch styles (see Figure 10).

**FIGURE 10**

Apply adhesive to bracket

**Mounting 3M Brackets**

**Note:** Guardrails should be dry, without rain in the forecast for at least 8 hours after the Windo-Weld caulk is applied for the linear delineation system installation.

*Other epoxy and adhesive systems can be used to mount brackets and linear delineation system panels to the guardrails, but the end user is responsible to test the durability and strength of the epoxy type system they use.
Finished panels can provide continuous linear delineation by installing panels edge to edge (as shown in Figure 11) or if desired, may be spaced at an 18-inch distance apart along the guardrail.

**FIGURE 11**

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

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**Health and Safety Information**

Read all health hazard, precautionary and first aid statements found in the Material Safety Data Sheets (MSDS) and/or product label of chemicals prior to handling and use. Also refer to the MSDS for information about the volatile organic compound (VOC) content of chemical products. Consult local regulations on product VOC content and/or emissions. This product is manufactured without the use of heavy metals, lead chromate pigments or other similar lead containing chemicals. Electronically, visit us at www.3M.com/us and select MSDS search.

**Limitation of Liability and Remedies**

3M's liability under this warranty is limited to replacement or allowance as stated herein, and 3M assumes no liability for incidental or consequential damages such as lost profits, business or revenue in any way related to the product regardless of the legal theory on which the claim is based.

**Literature Reference**

3M™ VHB™ Acrylic Foam Tape 5962 Product Data Sheet Surface Preparation for 3M™ VHB™ Tape Applications.

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3M assumes no responsibility for any injury, loss or damage arising out of the use of a product that is not of our manufacture. Where reference is made in literature to a commercially available product, made by another manufacturer, it shall be the user's responsibility to ascertain the precautionary measures for its use outlined by the manufacturer.

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All statements, technical information and recommendations contained herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed, and the following is made in lieu of all warranties, or conditions express or implied. Seller's and manufacturer's only obligation shall be to replace such quantity of the product proved to be defective. Neither seller nor manufacturer shall be liable for any injury, loss or damage, direct, special or consequential, arising out of the use of or the inability to use the product. Before using, user shall determine the suitability of the product for his/her intended use, and user assumes all risk and liability whatsoever in connection therewith. Statements or recommendations not contained herein shall have no force or effect unless in an agreement signed by officers of seller and manufacturer.

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