

Transportation Safety Division

3M™ Diamond Grade™ and Flexible Prismatic Conspicuity Markings

Application Instructions for Trucks, Trailers, and Specialty Vehicles

1 Description

3M™ Diamond Grade™ Conspicuity Markings Series 983, 3M™ Diamond Grade™ Flexible Prismatic Conspicuity Markings Series 973, 3M™ Flexible Prismatic Conspicuity Markings Series 963, and 3M™ Flexible Prismatic Conspicuity Tape Series 913 utilize a pressure sensitive adhesive for application to many clean, dry, weather-resistant surfaces. intended to be applied to the sides and rear perimeters of vehicles in continuous stripes to enhance visibility and

The adhesive is protected by an easy-release liner. 3M conspicuity markings are intended to be applied to the sides and rear perimeters of vehicles in continuous stripes to enhance visibility and recognition by motorists. See examples later in this information folder.

Markings can be applied to flat surfaces (drilled or punched to accommodate rivets) and non-compound curved surfaces with radii greater than five inches. For applications on corrugated vehicles, apply markings to bottom and top rails, or between corrugations if adequate flat surface is available.

3M recommends against application over bolts, rivets, support plates, corrugations, exterior posts, weld joints, the ends of vehicle surfaces, irregularly shaped frameworks, rusted or corroded metal, loose or chalking paint, within 1/8 inch of door hinges, or within three inches of mandated lights, reflectors, or turn signals.

2 Storage

Diamond Grade conspicuity markings can be stored for a period of two years in a cool, dry area at temperatures of 65–75 °F (16–24 °C) and must be applied within the two years of date of manufacture. Rolls should be stored horizontally or in their shipping cartons. Partially used rolls should be returned to the shipping cartons or suspended horizontally from rods or pipes through their cores.

3 Application Instructions

For applications requiring conformance to regulatory specifications, please refer to the governing regulatory documentation for application requirements.

3.1 Required Tools

- 1 3M Blue Squeegee PA-1-B or 3M Gold Squeegee PA-1-G.
- 2 Monkey Strip, applied to the edge of the squeegee; available from distributors listed.
- 3 Utility knife and scissors; available locally at hardware or industrial supply stores.
- 4 Osborne Arch Punch No. 149 or Osborne Belt Punch No. 245 of proper size; available at hardware or industrial supply stores.



- 5 3M™ Scotch-Brite™ Heavy Duty Cleaning Pad (green or brown); available locally at paint or industrial supply stores.
- 6 Lint free paper towels.
- 7 Recommended cleaning solvent (see “Surface Preparation” below).

4 Temperature and Environment

For optimum adhesion and durability, 3M conspicuity markings should be applied when air and application surface temperatures are within the following limits:

- Minimum - 50 °F (10 °C)¹
- Maximum - 100 °F (38 °C)

3M conspicuity markings may also be applied when air and application surface temperatures are beyond these limits if the following precautions are taken:

- Above 100 °F (38 °C) care must be taken to avoid pre-adhesion.
- Below 50 °F (10 °C) the substrate surface may be heated to a temperature within the application range using portable heaters or heat lamps. When air temperature is below the minimum application temperature, markings should be stored in a hotbox to keep them above 50 °F (10 °C) until application.

5 Surface Preparation

All surfaces must be cleaned prior to application.

- 1 Wash surfaces with detergent and water to remove dirt and road film.
- 2 Solvent wipe using lint-free paper towel saturated with non-oily, quick-drying solvent, such as isopropyl alcohol, acetone, or 3M Prep Solvent 70.
- 3 Immediately dry surfaces with clean, dry, lint-free paper towel before solvent evaporates completely, paying close attention to rivets, seams, and door hinge areas.

Note: An application surface that has been washed, dried, and solvent wiped can still have poor adhesion in the areas around rivets and seams due to liquid retention caused by capillary action.

For stainless steel applications, initial adhesion is improved by wiping with distilled vinegar and drying after solvent cleaning has been completed.

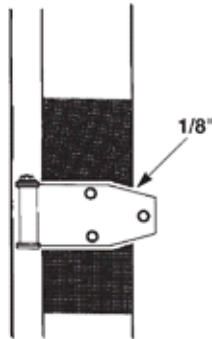
1. Some products may be applied at temperatures below 50 °F. For product specific minimum application temperatures, please refer to specific 3M product bulletins.

6 Application Procedure

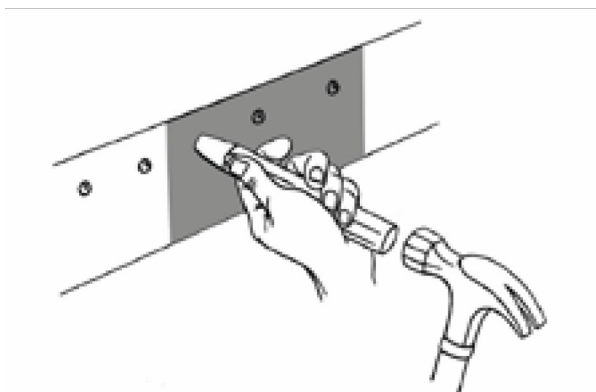
These procedures should be followed when applying markings to cleaned surfaces within the proper application temperature range.

- 1 Markings must be cut to allow three inches of clearance around required lights and reflectors, and $\frac{1}{8}$ inch of clearance around exterior posts, tie down posts, and large bolts and rivets when applied to frame rails. On corrugated trailers, apply markings to frame rails if a flat surface is not available and cut around rivets as recommended below.

Apply markings no closer than $\frac{1}{8}$ inch from door hinges, door hardware, ends of trailers, and weld joints, as illustrated in Figure 1, to avoid wrinkling and lifting. Cut markings back $\frac{1}{8}$ inch on lower panels of tank trailer expansion joints.



- 2 Remove the liner from the back of the marking, position and align the marking on the vehicle, and tack it down lightly to hold it in position. For Flexible Prismatic Conspicuity Markings Series 963 and 973, care should be taken to avoid stretching markings.
- 3 Using a PA-1 applicator, press the marking to the surface using firm, vertical, overlapping strokes. Be sure all edges are well adhered by re-squeegeeing them.
- 4 Apply the remaining markings using the above procedures.
- 5 Apply markings over rivets using firm pressure, leaving bridges over rivet heads. Cut markings around rivets using Osborne punches of proper sizes to fit over rivets. To cut a marking around a rivet, place the tool over the top of the rivet and tap lightly using a small hammer while slightly turning the cutting tool. Remove the cut film from the rivet head. Squeegee the marking around the rivet with firm pressure. Avoid applying markings over closely spaced rivets where possible. Apply markings above the bottom row of closely spaced rivets on side panels.



- 6 Cut markings at all panel seams and door openings using a sharp utility knife, then squeegee the markings to the surface. Cut markings so they are no closer than $\frac{1}{8}$ inch from exterior post weld joints, door hinges, door hardware, lower panels of expansion joints on tank trailers, and ends of trailers to avoid lifting and wrinkling.
- 7 **Markings should not be overlapped to make seams or joints.** Rather, markings should be butted together.
- 8 Do not apply markings beyond panel edges, where moisture and dirt can contaminate the adhesive.

7 Cleaning

Routine washing is recommended for maximum performance. The following cleaning methods are recommended:

- o Wash with sponge, cloth, or soft brush, using water and detergent.
- o Standard high-pressure hand spray:
 - **Maximum** pressure - 1200 PSI (80 bar).
 - **Maximum** water/wash solution temperature - 140 °F (60 °C).
 - **Minimum** of 12 inches (30cm) between cleaning spray tip and marking.
 - Cleaning wands and spray tips are to be used at angles no greater than 45 degrees from perpendicular to marking surfaces.
 - Use Spray Tip #1505 (15 degree spray angle, 05 capacity size).
- o When using metal brighteners, follow manufacturers' recommendations for dilutions. Thoroughly rinse brighteners from markings after soaking rail cars or other vehicles.

8 Removal Instructions

8.1 Required Tools

- 1 Single edged razor blades.
- 2 Handled tool to hold razor blades.
- 3 Safety glasses.
- 4 Solvent resistant protective gloves.
- 5 Absorbent paper towels.

8.2 Recommended Solvents:

- 1 Isopropyl alcohol (rubbing alcohol).
- 2 One of the following adhesive removal products:
 - a 3M Citrus Cleaner.
 - b Brake cleaning fluid.
 - c Paint remover in aerosol can - use **ONLY** on bare metals (non-painted).
 - d Other products may be used to de-tackify the adhesive but take care not to use products that will harm the finish of the application surface.

NOTE: Always follow manufacturers' instructions and safety recommendations.

8.3 Marking Removal

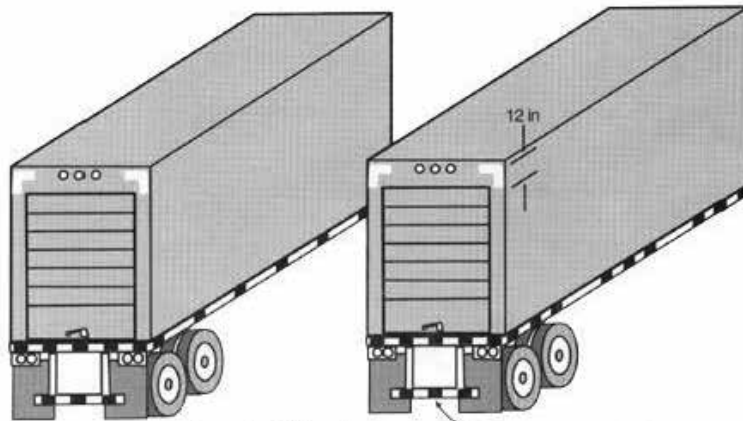
- 1 Use handled tool containing a new single edged razor blade to lift an edge of the marking.
- 2 While keeping the edge of the razor close to the surface of the substrate, begin to work the razor from side-to-side in small strokes in the direction of removal.
- 3 Pull the loose marking with minimal tension from the substrate at an angle of approximately 45 degrees while working the razor back and forth.
- 4 If markings break away from the substrate, keep repeating steps one through three above.
- 5 It is very important to change razor blades frequently. A sharp blade will give best results.

Note: Ease of marking removal will depend on initial adhesion and time on substrate.

8.4 Adhesive Removal

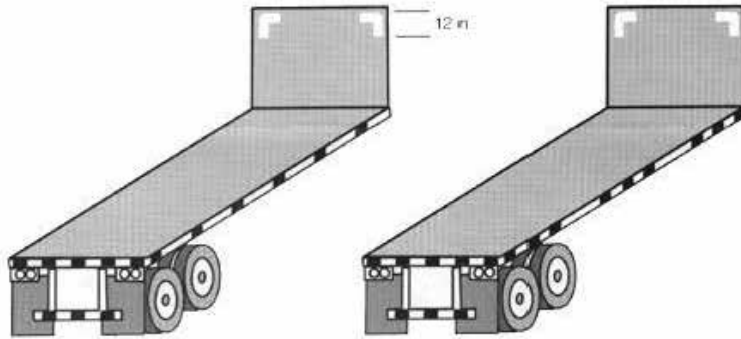
- 1 Spray one of the suggested adhesive removal products (Section 8.2) onto the adhesive residue.
- 2 Let the remover soak on the adhesive for three to five minutes.
- 3 Use a sharp razor blade in a handled tool to scrape off adhesive.
- 4 Wipe residue off razor onto paper towel.
- 5 It may be necessary to repeat steps one through four several times to remove all adhesive.
- 6 Always use a sharp razor blade for best results.
- 7 All adhesive residue must be removed before reapplying markings.
- 8 Substrate must be cleaned with alcohol using one towel to clean and another to wipe away residue before reapplying markings.

Truck and Trailer Application Guidelines for Series 983/963/913 Markings with DOT-C2 Certification Marks

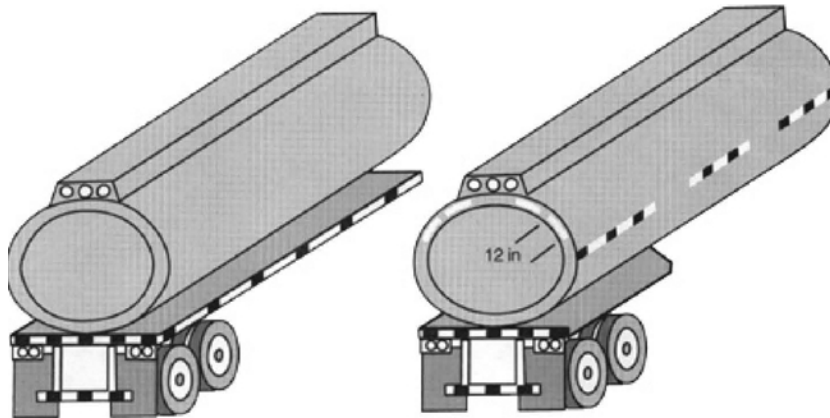


Typical Spacing

Underride bar is not required to be marked on trailers manufactured prior to December 1, 1991.



Typical Spacing



Typical Spacing

Unregulated Application Guidelines for Conspicuity Markings Series 983/973/963/913

Suggested Applications

9 Health and Safety Information

Read all health hazard, precautionary, and first aid statements found in the Safety Data Sheet (SDS), Article Information Sheet, and/or product labels of chemicals prior to handling or use. Consult local regulations and authorities for possible restrictions.

10 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.