Product Description

3M™ Diamond Grade™ DG^3 Reflective Sheeting Series 4000 ("Sheeting") is a full cube retroreflective prismatic sheeting designed for the production of traffic control and guidance signs ("Signs") exposed vertically in service.

The Sheeting is available in the following colors.

Table A. Product Codes by Color

Color	Product Code
Fluorescent Yellow - FY	4081
Fluorescent Yellow-Green - FYG	4083
Fluorescent Orange - FO	4084
White	4090
Yellow	4091
Red	4092
Blue	4095
Green	4097
Brown	4099

Specifications

The Sheeting conforms to all current performance requirements of ASTM D4956 for Type IX and Type XI retroreflective sheeting. See the "Imaging" section on page 2 for information regarding imaging of Sheeting.

System of Matched Components

See the 3M Sign Warranty Bulletin for a complete list of matched components for the Sheeting.

Physical Properties

Adhesive

The Sheeting has a pressure-sensitive adhesive intended for application at temperatures of 65°F (18°C) and higher. This adhesive meets the ASTM D4956 Class I adhesive requirement.

Entrance Angularity Performance with Respect to Orientation

The Sheeting is designed to be an effective wide angle reflective sheeting, regardless of its orientation on the substrate or the ultimate orientation of the sign after installation. However, because the efficiency of light return from cube corner reflectors is not equal at all application orientations, especially at higher entrance angles, the widest entrance angle light return is achieved when the Sheeting is oriented in a particular manner. Sheeting orientation can be used to easily optimize high entrance angle (>50°) performance when required for a given sign (e.g. "keep right" symbols). In such situations, the completed sign should have the Sheeting positioned at the 0° orientation (downweb direction perpendicular to the road). When the "primary groove line" (which is oriented parallel to the flat sides of the diamond chain links) is vertical on a completed sign, the Sheeting is said to be in a 0° orientation. When the "primary groove line" is horizontal on the completed sign, the Sheeting is said to be in a 90° orientation. See Figure 1.

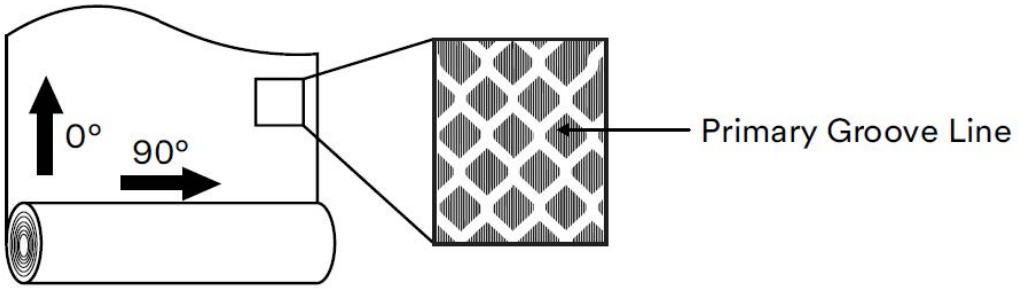


Figure 1. Primary Groove Lines Used to Define Sheeting Orientation

Unless a sign's location and/or position calls for extra-wide entrance angularity performance or a specific installation direction is required in a customer specification, signs and applied copy (letters, arrows, borders, and shields) can be fabricated and installed using the application orientation that most efficiently utilizes the Sheeting.

NOTE

For multi-panel signs, 3M recommends applying all background panels with the Sheeting oriented in the same direction.

Sheeting may be processed into traffic signs using any of the imaging methods described below. 3M assumes no responsibility for the failures of sign face legends or backgrounds processed with non-3M process colors or with any imaging materials other than those listed below.

Substrates

See 3M Information Folder 1.7 for surface preparation recommendations.

The Sheeting has been designed primarily for application to flat substrates. Any application to a substrate with a radius of curvature of less than 5 in. (12.7 cm) should also be supported by rivets or bolts. 3M does not recommend using the Sheeting on plastic substrates where cold shock performance is required.

3M is not responsible for sign failures caused by substrate failures or improper surface preparations.

Sign Fabrication Methods

Squeeze Roll Application

The Sheeting should be applied to sign substrates at temperatures of 65°F (18°C) and higher using either of the following methods:

Mechanical Squeeze Roll Applicator

Applications to edge wrapped extrusions require sufficient softening of the Sheeting prior to edge wrapping. Softening can be accomplished by directing additional heat to the “next to last” edge roller. This practice may increase productivity and minimize cracking. See 3M Information Folder 1.4 for details.

Hand Squeeze Roll Applicator

Background and complete sign applications of Sheeting must be performed using a roll laminator, either mechanical or hand driven.

Splices

The Sheeting must be butt spliced when more than one piece of Sheeting is used on a single piece of substrate. Sheeting pieces should not touch one another. Avoiding overlaps prevents the buckling that can occur as Sheeting expands under extreme temperature and humidity conditions.

Double Faced Signs

Sheeting on the bottom side of a double faced sign can be damaged if rolled through a squeeze roll applicator using an unprotected steel bottom roller. The use of a semi-soft flat sheet between the steel roller and the applied sign face will protect the sign face from damage. 3M recommends using a rubber mat, tag board, or cardboard for this purpose.

Imaging

The Sheeting may be processed into traffic Signs using the imaging methods described below. Compatibility is backed with a 3M™ MCS™ Warranty or 3M™ MCS™ Warranty for Traffic when the printing guidelines in the documents listed in the “3M Related Literature” section on page 4 are followed. See the “Warranty Information” section on page 4 for more information regarding the warranties. 3M assumes no responsibility for the failures of Sign face legends or backgrounds that have not been processed according to the 3M Sign Warranty Bulletin.

Digital Imaging

The Sheeting is compatible with 3M qualified latex inkjet printers and ink systems. See 3M Information Folder 1.17 for details. Use of 3M™ ElectroCut™ Film 1170C or 3M™ Premium Protective Overlay Film Series 1160i.2 is required.

Screen Processing

The Sheeting may be screen processed into traffic Signs using 3M Process Colors Series 880I or Series 880N before or after mounting onto Sign substrates. See 3M Information Folder 1.8 for details. Clear coating is neither required nor recommended. Use of process colors series other than 880I or 880N is not recommended.

3M™ ElectroCut™ Film

3M™ ElectroCut™ Film Series 1170 may be used on Sheeting to provide transparent colored background copy for traffic control Signs. See 3M Product Bulletin 1170 for fabrication procedures.

Applying Cut-Out Copy

Sheeting cut-out copy may be applied to Sheeting backgrounds to create Sign legends. See 3M Information Folder 1.10 for details.

Cutting

Sheeting may be cut into letters and shapes with heights of at least 3 in. and stroke widths of at least ½ in. Smaller sizes are not recommended. Sealing the cut edges of Sheeting is not required.

Plotter Cutting

- Flat bed plotters can be used to cut the Sheeting and offer the most consistent and reliable performance.
- Friction fed plotters can only be used to kiss cut the Sheeting. This is achieved using 600 grams of down force and a 60° cutting blade. Additional drive wheels may be needed to improve tracking. Alternatively, the Sheeting can be cut from the liner side. To do so, the blade force and knife depth must be set to score, but not cut through, the top film. After scoring, break apart individual copy or apply premask to retain spacing.

Other Cutting Methods

The Sheeting may be hand cut or die cut one sheet at a time. Cutting procedures can be found in 3M Information Folder 1.10.

Installation

3M recommends installing nylon washers between the heads of all twist fasteners (such as screw heads, bolts, or nuts) and the Sheeting to protect the Sheeting from the twisting action of the faster heads.

Shelf-Life, Processing, Storage, Packaging, and Cleaning

See 3M Information Folder 1.11.

Durability

See 3M Information Folder 1.11. 3M strongly recommends conducting periodic sign inspections and regular sign replacements in order to help sign owners establish their own effective service life exceptions, beyond the warranty period.

3M Related Literature

Always confirm you have the most current version of the applicable product bulletin, information folder, or other product information from 3M's website at www.mmm.com/roadsafety.

- 3M Information Folder 1.10 Cutting, Premasking and Prespacing of 3M™ Reflective Sheetings
- 3M Information Folder 1.11 3M™ Reflective Sheeting Sign Maintenance Management
- 3M Information Folder 1.17 User Guide 3M™ Reflective Sheeting and HP Latex 360/365 Printers
- 3M Information Folder 1.4 Instructions for Operation of the Interstate Squeeze Roll Applicator
- 3M Information Folder 1.5 Hand Application Instructions for Reflective Sheeting and Scotchcal™ Film with PSA
- 3M Information Folder 1.7 Substrates and Preparations for Retroreflective Sign Sheeting Applications
- 3M Information Folder 1.8 3M™ Process Colors Series 880I, 880N, and 990 Instructions for Use
- 3M Product Bulletin 880 3M™ Process Color Series 880I and 3M™ Process Color Series 880N
- 3M Product Bulletin 1160i.2 3M™ Premium Protective Overlay Film 1160i.2
- 3M Product Bulletin 1170 3M™ ElectroCut™ Film Series 1170
- 3M Product Bulletin 1170C 3M™ ElectroCut™ Film Series 1170C
- 3M Product Bulletin Slipsheeting 3M™ Slipsheeting
- 3M Sign Warranty Bulletin
- 3M™ MCS™ Warranty and 3M™ MCS™ Warranty for Traffic Matrices Selector

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

Health and Safety

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.

Tools and Equipment Usage

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

Warranty Information

3M Standard Product Warranty

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

3M™ MCS™ Warranty and 3M™ MCS™ Warranty for Traffic

See the 3M Sign Warranty Bulletin for the warranty on digitally printed Sheeting.

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 for people with knowledge and technical skills sufficient to assess and apply their own informed judgment to the information. No license to any intellectual property rights is granted or implied with respect to this technical information.

Product Selection and Use

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Customer is solely responsible for evaluating the product and determining whether it is appropriate and suitable for customer's application, including conducting a workplace hazard assessment, reviewing all applicable regulations and standards, and reviewing the product label and use instructions. Failure to properly evaluate, select, and use a 3M product in accordance with instructions or to meet all applicable safety regulations may result in injury, sickness, death, and/or harm to property.

Warranty, Limited Remedy, and Disclaimer

Unless a different warranty is specifically stated on the applicable 3M product packaging or product literature (in which case such warranty governs), 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ARISING OUT OF A COURSE OF DEALING, CUSTOM, OR USAGE OF TRADE. If a 3M product does not conform to this warranty, the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price.

Limitation of Liability

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

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