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Commercial Branding and Transportation Division

3M™ Advanced Flexible Engineer Grade Reflective Sheeting Series 7300

Product Bulletin Series 7300
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1 Description

3M™ Advanced Flexible Engineer Grade Reflective Sheeting Series 7300 ("Sheeting") is a non-metallized (corrosion resistant), non-conductive, microprismatic reflective sheeting. As manufactured by 3M, Sheeting meets the performance requirements of ASTM D4956 for Type I sheeting. It has been specially designed to have high scratch resistance and is flexible and durable. The adhesive on the Sheeting has been designed for application to a variety of signing and temporary traffic control devices, including plywood, metal, and both flat and curved reboundable plastic substrates. The Sheeting utilizes a microseal technology that provides a more uniform appearance than its 3M prismatic counterpart, 3M™ Engineer Grade Prismatic Reflective Sheeting Series 3430, and a whiter base color than 3M beaded sheeting. The incorporated microseal technology also makes the Sheeting plotter- and die-cuttable, and eliminates the need for edge sealing. The Sheeting features microprismatic optics that return light to drivers under a diverse set of nighttime viewing geometries that are encountered by the driving public. When applied to properly prepared substrates, the Sheeting provides long-term reflectivity and durability. White Sheeting has been designed for use in the production of retroreflective commercial signs, regulated and non-regulated traffic control signs that are exposed vertically in service, and pressure sensitive stickers.
The Sheeting is available in the colors and for the applications indicated in Table 1.

Table 1. Product codes and application compatibilities by color.

Color	Product Code	Temporary Traffic Control Devices and Signs	Regulated and Non-Regulated Traffic Control Signs and Stickers
White	7310	✓	✓
Yellow	7311	✓	
Orange	7314	✓	
White/Orange 4" Stripe Barricade L/R	7334L/7334R	✓	
White/Orange 6" Stripe Barricade L/R	7336L/7336R	✓	

2 Specifications

2.1 Coefficient of Retroreflection and Chromaticity

Minimum performance coefficient of retroreflection (R_A) values are presented in Table 2.

Table 2. Minimum coefficient of retroreflection, R_A, cd/fc/ft^2 (cd/lx/m^2) per ASTM D4956 for Type I signing. Measurements taken according to ASTM E810.

Observation Angle[a] (°)	Entrance Angle[b] (°)	White	Yellow	Orange
0.2	-4	70	50	25
0.2	+30	30	22	7
0.5	-4	30	25	13
0.5	+30	15	13	4

a. Observation Angle - The angle between the illumination axis and the observation axis.
b. Entrance Angle - The angle from the illumination axis to the retroreflector axis. The retroreflector axis is an axis perpendicular to the retroreflective surface.

Color specification limits and daytime luminance factor (Y%) data for Sheeting are presented in Table 3.

Table 3. Color specification limits (daytime).

									Daytime Luminance Factor (Y%)	
Color	x	y	x	y	x	y	x	y	Min.	Max
White	.303	.300	.368	.366	.340	.393	.274	.329	27	-
Yellow	.498	.412	.557	.442	.479	.520	.438	.472	15	45
Orange	.558	.352	.636	.364	.570	.429	.506	.404	14	30

3 Substrates

The most reliable and durable traffic devices and signs are made from properly prepared substrates. Refer to 3M Information Folder 1.7 for surface preparation recommendations.

3.1 Regulated and Non-Regulated Signs (White Sheeting Only)

For regulated and non-regulated traffic sign use, the substrates found to be most reliable and durable are properly prepared aluminum sheets and extrusions. Users are urged to carefully evaluate all other substrates for adhesion and sign durability. Other substrates suitable for secure and durable applications of Sheeting have the following characteristics:

- **Clean**
- **Smooth**
- **Flat**

- Rigid
- Dimensionally stable
- Weather resistant
- Non-porous
- High surface energy (pass water break test)

3.2 Temporary Traffic Control Devices and Signs

Refer to 3M Information Folder 1.7 for surface preparation recommendations. Substrates with low surface energies may require additional preparation steps, such as flame treatment, mechanical abrasion, or use of adhesion promoters, prior to Sheeting application.

Sheeting failures caused by substrate failures or improper surface preparations are not the responsibility of 3M. User is responsible for determining whether Sheeting is suitable for a particular purpose and application. It is up to the user to determine if a substrate is appropriate for a specific purpose and users are urged to carefully evaluate all substrates for adhesion and device durability prior to application.

4 Application

4.1 Pressure Sensitive Adhesive

The Sheeting utilizes a pressure sensitive adhesive that has been specially designed to retain adhesion over a wide temperature range and for application to a broad range of surfaces, and although not optimal, may even include moderately rough or porous wood, plastic, and a variety of metal surfaces.

For optimal adhesion, Sheeting should be applied to substrates at room temperature, 65 °F (18 °C), or higher using any of the methods described below. If Sheeting temperature is lower than 65 °F (18 °C), acclimatize it at a temperature of 65 °F (18 °C) or greater for at least 24 hours before application.

4.2 Application Equipment

1 48" Interstate Squeeze Roll Applicator (see 3M Information Folder 1.4)
2 Hand Squeeze Roll Applicator (HSRA) (see 3M Information Folder 1.6)

Note: When using a HSRA with an air cylinder kit, apply the minimum tension needed to properly position the Sheeting on the substrate. A nip roller pressure of 80 psi is recommended for a 48 inch laminator.

4.3 Hand Application

Hand application is recommended for copy only. See 3M Information Folder 1.5 for detailed hand application instructions. Hand applications may result in visual irregularities that may be aesthetically objectionable to some users. Irregularities are more noticeable on darker colors. To obtain a close-up uniform appearance, a roll laminator must be used.

All direct applied copy and border MUST be cut at all panel seams and squeegeed at all joints. Use a squeegee with a low-friction sleeve and change the sleeve often.

4.4 Other Application Methods

Customized application equipment exists for a wide range of flat and curved substrate surfaces. The Sheeting has been found to be compatible with a variety of customized application equipment. Please contact your 3M representative for more information.

4.5 Splices

The Sheeting may be either butt spliced or overlap spliced when more than one piece of Sheeting is used on a single piece of substrate.

5 Regulated and Non-Regulated Sign Installation (White Sheeting Only)

Nylon washers are required when twist style fasteners are used to mount the sign.

6 Imaging by Screen Printing

Screen print Sheeting using 3M's system of matched component materials (Table 4). Process at a temperature of 65–100 °F (18–38 °C) and at a relative humidity of 20–50%. It is the user's responsibility to determine the suitabilities and durabilities of any other process colors. 3M assumes no responsibility for the premature failures of sign face legends that have been processed with non-recommended or non-3M process colors. Since 3M has no control over colors made by other manufacturers, the user should check with the process color manufacturer for processing recommendations and assurance of performance prior to any extensive use. To screen process regulated and non-regulated signs, a P.E. 157 screen mesh screened with a fill pass is recommended. Clear coating is neither required nor recommended. Consult 3M Information Folder 1.8 for details.

Table 4. 3M system of matched component materials.

Matched Components	
Process Color	Series 880N, Series 880I, or Series 990
Slipsheet	SCW 568
Prespacing Tape	SCPS-2
Premasking Tape	SCPM-3
Transfer Tape	TPM-5

Applications other than vertical exposure on stationary objects may have a negative effect on durability. Periodic sign inspection and regular sign replacement are strongly recommended.

7 Imaging by Digital Processing

Digitally imaged areas of white Sheeting that have been processed according to 3M instructions shall provide coefficients of retroreflection of not less than 70% of the values of the corresponding ASTM D4956 Type I sheeting colors. The daytime luminance and chromaticity shall conform to ASTM D4956 tables 2 and 11, respectively.

Conformance to the ASTM D4956 performance requirements for Type I sheeting has been established when 3M printing requirements and procedures are followed. Most consistent results are achieved when 3M's system of matched component materials (Tables 5 and 6) are used.

Use of Sheeting is not restricted to the inks/ printers listed below. Sheeting may perform adequately with select latex, solvent and UV ink jet inks and printers. Please contact your 3M representative for more information on ink and print system compatibilities.

Table 5. Matched components and color availability for permanent regulated or non-regulated traffic control signs and stickers.

3M Digital Printing Solutions[a]	Traffic Colors	Ink
Durst Rho 161TS Durst Rho 162TS	Red, blue, green, brown, yellow, and black	3M™ Piezo Inkjet Series 8800UV Ink
Durst Rho 163	Red, blue, green, brown, yellow, and black	3M™ Piezo Inkjet Series 8900UV Ink
EFI H1625-RS	Red, blue, green, brown, yellow, and black	3M™ Piezo Inkjet Series 8900UV Ink
HP 360/365	Red, green, brown, and black	HP Series 831/871 Inkjet inks
Overlay Film (REQUIRED)	3M™ ElectroCut™ Film, Series 1170	

a. Must be printed according to the requirements including printer settings and profiles given in printer specific product bulletins.

Table 6. Matched components and color availability for temporary traffic control signs.

3M Digital Printing Solutions[a]	Traffic Colors	Ink
Durst Rho 161TS Durst Rho 162TS	Black	3M™ Piezo Inkjet Series 8800UV Ink
Durst Rho 163		3M™ Piezo Inkjet Series 8800UV Ink
EFI H1625-RS		3M™ Piezo Inkjet Series 8800UV Ink
HP 360/365		HP Series 831/871 Inkjet inks
Overlay Film	Not required for temporary traffic control signs	

a. Must be printed according to the requirements including printer settings and profiles given in printer specific product bulletins.

8 Cutting Methods

The Sheeting may be cut into letters and shapes for direct applied copy. The Sheeting does not require edge sealing.

8.1 Plotter Cutting

The plotter cutting procedure used for Sheeting is similar to that used for typical beaded engineer grade sheeting. Start with the cutter settings typically used for beaded engineer grade sheeting and adjust as necessary. Slight adjustments in down force and knife depth may be required.

8.2 Premasking/Prespacing Markings

When premasking/prespacing with paper tape, use Prespacing Tape SCPM-2 or Application Tape SCPM-3. When premasking/prespacing with transparent tape, use Application Tape TPM-5.

8.3 Other Cutting Methods

Users are encouraged to evaluate cutting procedures for their own equipment and shop conditions. Sheeting may be hand cut, die cut, plotter cut, or guillotined multiple sheets at a time. The Sheeting may be cut into any desired shape, including cone sleeves. The cut edges of Sheeting do not require sealing. Details regarding cutting methods can be found in 3M Information Folder 1.10.

9 Fabrication Lines

The Sheeting manufacturing process results in repeating fabrication lines in the product, as illustrated in Figure 1. The lines repeat at the same interval throughout the roll. Fabrication lines may be noticeable in some situations but should not impact sign functionality on the road, either in daylight or at night, under typical use conditions.

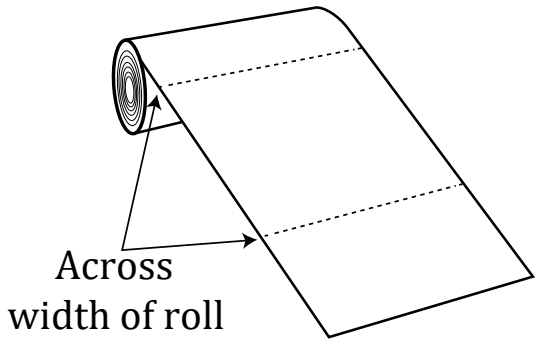

Figure 1. Fabrication lines.

10 Cleaning

Devices and signs that require cleaning should be flushed with water then washed with a detergent solution and soft bristle brush or sponge. Avoid pressure that may damage the device or sign face. Flush with water following washing. Do not use solvents to clean signs. See in 3M Information Folder 1.10 for further details.

11 Storage and Packaging

Sheeting should be stored in a cool, dry area, preferably at a temperature of 65–75 °F (18–24 °C) and a relative humidity of 30–50%, and be applied within two years of date of receipt. Rolls should be stored horizontally in their shipping cartons. Partially used rolls should be returned to their shipping cartons or suspended horizontally from rods or pipes through their cores. Unprocessed sheets should be stored flat. Refer to 3M Information Folder 1.11 for instructions on packing for storage and shipment.

11.1 Special Instructions for Regulated and Non-Regulated Signs (White Only)

Finished signs and applied blanks should be stored on edge. Processed sign faces must be protected with SCW 568 slipsheet paper. Place the glossy side of the slipsheet against the sign face. Double faced signs must have the glossy side of a slipsheet against each face of the sign.

Unmounted sign faces must be stored flat and interleaved with SCW 568 slipsheet, glossy side against the sign face.

Avoid banding, crating, or stacking signs. Package for shipment in accordance with commercially accepted standards to prevent movement and chafing. Store sign packages indoors on edges.

Panels and finished signs must remain dry during shipment and storage. If packaged signs become wet, unpack immediately and allow signs to dry. Refer to 3M Information Folder 1.11 for instructions on packing for storage and shipment.

12 Durability

The durability of a Sheeting application will depend upon substrate selection and preparation, compliance with recommended application procedures, geographic area, exposure conditions, and maintenance practices. Maximum durability can be expected in applications subject to vertical exposures on stationary objects when processed and applied to properly prepared substrates according to 3M recommendations available in 3M Information Folder 1.7. The user must determine the suitability of any substrate for its intended use. Exposure to severe or unusual conditions and applications to unprimed, excessively rough, or non-weather-resistant surfaces can reduce durability.

The durability statements contained herein do not constitute warranties of quality, life, or characteristics. Purchaser should perform appropriate tests to determine if Sheeting meets their performance requirements when applied to reboundable plastic substrates. Tests should incorporate plastic manufacturer's recommendations for impacting reboundable plastic traffic control devices.

12.1 Durability Considerations for Signing Applications

When 3M's system of matched component materials (Table 4) are used, depending upon the substrate selection and preparation, compliance with recommended application procedures, geographic area, exposure conditions, and maintenance.

Applications other than vertical exposure on stationary objects may reduce durability. Periodic sign inspection and regular sign replacement are strongly recommended.

12.2 Durability Considerations for Work Zone Construction Signs

Work zone construction signs are exposed to severe or unusual conditions and are considered to be nonstationary objects which could result in reduced durability compared to permanent sign applications.

12.3 Exposure Considerations

Exposure to severe or unusual conditions can shorten Sheeting lifetime. Signs in mountainous areas that are covered by snow for prolonged periods may also have reduced durability. Atmospheric conditions in certain geographic areas may have a negative effect on durability.

12.4 Custom Process Colors Considerations

Custom colors may have reduced durability compared to regulated traffic colors.

13 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. To obtain SDSs and Article Information Sheets for 3M products, go to 3M.com/SDS, contact 3M by mail, or for urgent requests call 1-800-364-3577.

14 Warranty Information

14.1 3M Basic Warranty

3M warrants to the user that, at the time of shipment, the Sheeting will (a) be free of defects in materials and (b) manufacture and meet the specifications stated in this product bulletin ("3M Basic Warranty").

14.2 Exclusive Limited Remedy

If Sheeting is proven not to have met the 3M Basic Warranty on its shipment date, then a user's exclusive remedy, and 3M's sole obligation, at 3M's option, will be refund or replacement of the Sheeting.

14.3 Disclaimer

THE 3M WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING OR OF PERFORMANCE, CUSTOM, OR USAGE OF TRADE.

14.4 Limitation of Liability

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15 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.

16 Literature References

3M IF 1.4	**Instructions for Interstate Squeeze Roll Applicator**
3M IF 1.5	**Hand Application Instructions**
3M IF 1.6	**Hand Squeeze Roll Applicator**
3M IF 1.7	**Sign Base Surface Preparation**
3M IF 1.8	**Process Color Instructions**

3M IF 1.10	Cutting, Premasking, and Prespacing
3M IF 1.11	Reflective Sheeting Sign Maintenance Management
3M IF 3.3	Procedures for Applying Reflective Sheeting to Reboundable Traffic Control Devices
3M PB 880I	3M™ Process Color Series 880I
3M PB 880N	3M™ Process Color Series 880N
3M PB 990	3M™ Process Color Series 990
3M PB 1170	3M™ ElectroCut™ Film Series 1170
8800UV	3M™ Piezo Inkjet Ink Series 8800UV
8900UV	3M™ Piezo Inkjet Series 8900UV Ink

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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