

Transportation Safety Division

3M™ Diamond Grade™ Flexible Roll-Up Sheeting Series RS20/RS24

Product Bulletin Series RS20/RS24
July 2020

Replaces Product Bulletin RS20/RS24 Dated December 2007

1 Description

3M™ Diamond Grade™ Roll-Up Sign Sheeting Series RS20/24 (“Sheeting”) is a visible light-activated fluorescent wide angle prismatic lens reflective sheeting designed for the production of roll-up traffic control signs (“Signs”) used in construction work zones. Sheeting meets or exceeds all ASTM D4956 requirements for Type VI sheetings. Sheeting has been designed to provide higher nighttime Sign brightness than sheetings that use glass bead lenses. Fluorescent orange Sheeting, RS24, has a higher daytime visibility than standard orange sheetings.

Sheeting is backed with a strong, flexible, gray-coated fabric.

For details regarding the features and benefits of Sheeting, please refer to the 3M Transportation Safety Division website (<http://www.3M.com/roadsafety/>).

Sheeting is available in the colors listed in Table 1.

Table 1. Product codes by color.

Color	Product Code
White	RS20
Fluorescent Orange	RS24

2 Specifications

2.1 Daytime Color (x, y, Y_T, Y_F)

The chromaticity coordinates (x, y) and total daytime luminance factors (Y%) of the Sheeting conforms to the ASTM D4956 standards presented in Table 2.

Table 2. ASTM D4956 CIE daytime chromaticity coordinate limits and luminance factor minima standards for new Sheeting.

Color	1		2		3		4		Luminance Factor <u>Min.</u>
	x	y	x	y	x	y	x	y	Y _T
White	0.303	0.300	0.368	0.366	0.340	0.393	0.274	0.329	40
Fluorescent Orange	0.583	0.416	0.535	0.400	0.595	0.351	0.645	0.355	30

2.2 Coefficients of Retroreflection, R_A

Minimum coefficients of retroreflection, R_A, values for new Sheeting are presented in Table 3, expressed in candelas per lux per square meter (cd/lux/m²).

Table 3. Minimum coefficient of retroreflection, R_A, for new Sheeting (cd/lux/m²).

Observation Angle ^b	White			Fluorescent Orange		
	Entrance Angle ^a					
	-4°	30°	45°	-4°	30°	45°
0.2°	500	200	100	200	120	60
0.5°	225	85	60	120	50	30
1.0°	15	15	15	10	10	10

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

Conformance to coefficient of retroreflection requirements shall be determined by instrumental methods in accordance with ASTM E810 “Test Method for Coefficient of Retroreflection of Retroreflective Sheeting,” and, per ASTM E810, values obtained at 0° and 90° rotations are to be averaged when determining R_A conformance to Table 3.

3 Orientation

Sheeting has been 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, it is possible to get the widest entrance angle light return when the Sheeting is oriented in a particular manner.

For test measurement purposes, RS24 Sheeting has a datum mark (orientation arrow) so that samples can be properly oriented in test machinery. In situations where extra wide entrance angle performance is required, orientation arrows can be used to assure preferred orientations.

3.1 Orientation Marks (Arrows)

Fluorescent orange Sheeting, RS24, is made with small orientation arrows (↖) in its surface. These arrows are oriented at an angle of 45° relative to the edge of the Sheeting, are the same color as the seal pattern, and repeat three times across a 48-inch roll and at 17¾ inch intervals in the downweb direction, as illustrated in Figure 1. Arrows can be used to assist in aligning RS24 Sheeting to achieve maximum angularity of Signs (when arrows point up and down on finished Signs). RS20 Sheeting does not have orientation arrows.

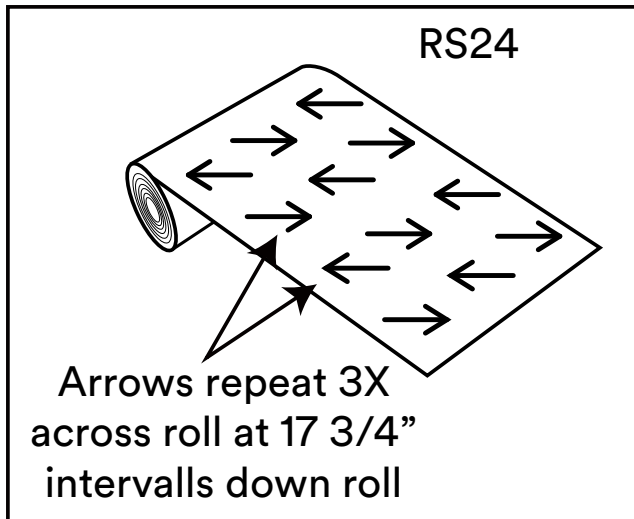


Figure 1. Full head, 45° orientation arrows. **Note:** RS20 does not have orientation arrows.

3.2 Interlocking Diamond Seal Pattern

Diamond Grade sheeting is differentiated from other prismatic or encapsulated lens sheeting by its distinctive seal pattern. Under normal light, this seal pattern appears lighter in color than the reflective portion of the Sheeting, as shown in Figure 2.

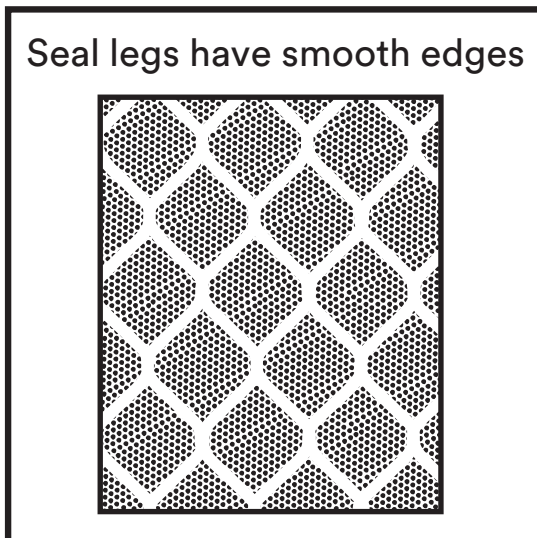


Figure 2. Diamond seal pattern of Sheeting positioned at 0° angle of rotation.

4 Tooling Lines

The manufacturing process used to produce prismatic sheeting results in tooling lines being present in the product. In Sheeting these lines, which are slightly thicker than the seal pattern legs, occur across the web every at 54-inch intervals, as illustrated in Figure 3. Tooling lines may be noticeable in shop light but do not impact Sign functionality on the road, either in daylight or at night, under typical use conditions.

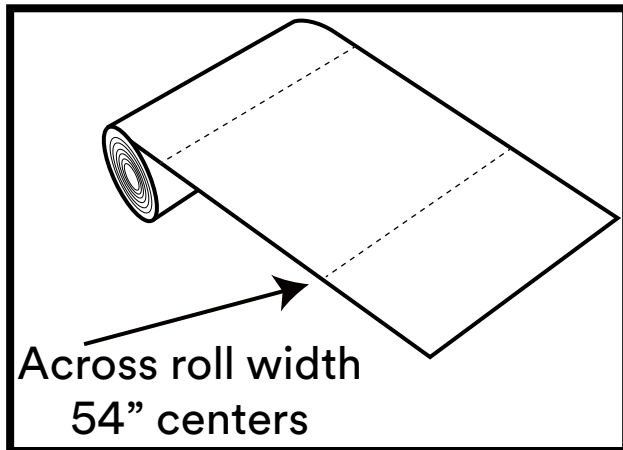


Figure 3. Prismatic sheeting tooling lines.

5 Structural Support and Application Procedures

5.1 Structural Support

The Sheeting has been designed so that corner pockets or snaps can be sewn or riveted into it. Cross brace supports can then be used in conjunction with portable Sign stands. Cross braces should not bow more than $\frac{1}{2}$ " when inserted. All corner pockets should be fabric, plastic, or rubber. Plastic or rubber molded pockets should have rounded edges. Washers should be rubber or plastic. Metal washers should be backed with rubber or plastic washers.

5.2 Screening/Thinning/Conditioning Process Colors

Off-contact screen process methods are preferred for the Sheeting. The screening table must be perfectly flat. When screening Sheeting, hold sheets in place using a vacuum table or, if a vacuum table is not available, sheets can be held in place on a non-porous table surface using a thin, uniform layer of low tack pressure sensitive adhesive. Use a monofilament screen with a mesh of P.E. 157–230. Stenciling process colors or the use of other screen fabrics may not produce satisfactory colors or durabilities and are not recommended practices.

3M Process Color Series 1805 (black) is the only recommended ink color for fluorescent orange Sheeting, RS24. Thin Series 1805 inks using only CGS 50 or CGS 80 thinners. Series 1805 colors must be allowed to dry for 24 hours (on drying rack) before being rolled up. See [3M Product Bulletin 1805](#) or call 3M Technical Services at 1-800-553-1380 extension 4-1 for details.

3M Process Color Series 990 is the only ink recommended for use with white Sheeting, RS20. Series 990 inks must be used with 4430R, a clear ink that protects the colors from rewetting. Series 990 colors must be allowed to dry for a minimum of three hours before a 4430R clear coat is applied.

6 Storage, Packaging, and Cleaning

Diamond Grade Roll Up 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 should be used within two year of date of receipt.

Unprocessed sheets should be stored flat.

See [3M Information folder 1.11](#) for details regarding storage and packaging. Finished roll-up Signs should be stored dry and rolled up per OEM specifications.

7 Durability

The durability of the Sheeting will depend upon preparation, compliance with recommended application procedures, geographic area, exposure conditions, and maintenance practices.

8 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.

9 Warranty Information

9.1 3M Warranty

3M warrants to the Sign manufacturer (“Sign Manufacturer”) that Sheeting sold by 3M to be used as components for use in roll up traffic control Signs used in work zones in the United States and Canada will meet 50% of the minimum values for coefficient of retroreflection¹ presented in Table 3 of this product bulletin for a period of three (3) years (“3M Warranty”).

9.2 3M Warranty Terms and Conditions

- o Sheeting must be stored, processed, applied, and maintained as described in this product bulletin and in accordance with all applicable 3M procedures provided in the applicable 3M Information Folders listed in Section 11, including the exclusive use of 3M matched components systems, process colors, and recommended application equipment.
- o A failure to meet the 3M Warranty must be solely the result of design or manufacturing defect in the Sheeting, and not a result of (a) outside causes including improper fabrication, handling, packing, storing, shipping, maintenance, or installation; (b) use of any material or product not recommended by 3M in this product bulletin, in the 3M Information Folders listed in Section 11, or in applicable 3M Technical Memorandums; (c) use of application equipment not recommended by 3M; (d) failure of Sign substrate; (e) loss of adhesion due to incompatible or improperly prepared substrate; (f) exposure to chemicals, abrasion, and other mechanical damage; (g) snow burial or any other Sign burial; (h) collisions, vandalism, or malicious mischief; or (i) an act of God.
- o 3M reserves the right to determine the method of replacement.
- o Replacement sheeting will carry the unexpired warranty of the Sheeting it replaces.
- o Claims made under this warranty will be honored only if (a) the Sign was dated with the Fabrication Date using a permanent method (sticker, marker, metal stamp, etc.), (b) 3M is notified in writing of the claim within thirty days of discovery, (c) 3M is provided with the information reasonably required to validate the claim, and (d) 3M is permitted to verify the cause of the failure.
- o 3M is not responsible for any additional warranties that the Sign Manufacturer offers to its customers beyond the 3M Warranty.

1. All measurements shall be made after Sign cleaning according to 3M recommendations and in accordance with ASTM E810 “Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting.”

9.3 Exclusive Limited Remedy

If Sheeting is proven to not meet the 3M Warranty, then the Sign Manufacturer's exclusive remedy, and 3M's sole obligation, at 3M's option, shall be that 3M, at its expense, will provide pro-rata replacement of the 3M materials. However, 3M will not provide other hardware or labor to install the replacement Sign.

9.4 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.

9.5 Limitation of Liability

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

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 at <http://www.3M.com/roadsafety>.

11 Literature References

3M IF 1.10	Cutting, Matching, Premasking & Prespacing Instructions
3M IF 1.11	Storage Maintenance and Removal Instructions
3M IF 3.5	Digital Imaging with HP Latex 360/365/370/375 Printer on 3M™ Reflective Sheeting Series 4000 and 3930 for Rigid Temporary Traffic Control Signing Applications
3M PB 990	3M™ Process Colors
3M PB 1805	3M™ Process Colors

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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