

Bureau of Reclamation Warranty – 3M-TSD-PW0001



December 17, 2020

VIA EMAIL

Barry Waryanka
United States Bureau of Reclamation
Denver Federal Center-6th Ave. and Kipling Street
Bldg. 67, 4th Floor
Denver, CO, 80225-0007

Re: *3M Warranty for 3M™ Advanced Flexible Engineer Grade Reflective Sheeting 7310 and 3M™ ElectroCut Film Series 1170 for Bureau of Reclamation Project Sign Replacement Program*

Dear Mr. Waryanka,

This letter is to inform you that 3M will provide a 3M Warranty for white 3M™ Advanced Flexible Engineer Grade Reflective Sheeting 7310 (“Sheeting”) used in combination with 3M™ ElectroCut Film Series 1170 (“Overlamine”) to produce permanent and custom color guide signs (“Signs”), installed for the United States Bureau of Reclamation Sign Replacement Program (“Program”), occurring in 17 States as follows: Washington, Oregon, California, Idaho, Nevada, Montana, Wyoming, Utah, Arizona, Colorado, New Mexico, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas for a period of five (5) years from the date of fabrication (“Fabrication Date”), subject to Attachment A.

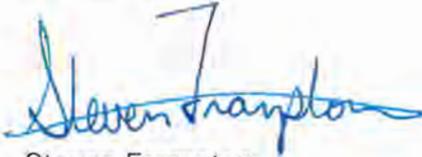
3M has data to reflect that Signs produced using the above Sheeting and Overlamine, according to 3M processes and procedures detailed in the Product Bulletins, for the Program will continue to meet the qualities in Attachment A for the requested 5-year warranty period. The 3M Warranty, its terms and conditions, and the limited exclusive remedy are described in Attachment A.

Except for the specific 3M Warranty described in attachment A, all other terms and conditions described in 3M Product Bulletins, 3M Advanced Flexible Engineer Grade Reflective Sheeting Series 7300 and 3M ElectroCut Film Series 1170, (“Product Bulletins”), provided as ATTACHMENT B and ATTACHMENT C, respectively, apply.

The United States Bureau of Reclamation acknowledges and agrees that acceptance of Sheeting and Overlaminates is permitted under any procurement and/or federal, state, and local laws. Acceptance of Sheeting and Overlaminates is considered consent to these terms and conditions.

If there are questions, please do not hesitate to contact your 3M representative.

Sincerely,



Steven Frampton
Compliance Manager, 3M Transportation Safety Division

Attachments: ATTACHMENT A, ATTACHMENT B, and ATTACHMENT C

ATTACHMENT A

3M warrants to the United States Bureau of Reclamation that the Products, sold by 3M to be used as components in signs ("Signs") in 17 States will, for periods, as measured from the date the sign is fabricated ("Fabrication Date"), meet the criteria presented in this Attachment A ("3M Warranty").

3M Warranty

3M warrants that a Sign made from white Sheeting (7310) printed with any color not made for the purpose of conforming to the standard traffic colors ("Custom Colors"), using the Overlamine, Printers and Inks listed below, as appropriate for the printer or printing method being used, shall remain legible by resisting excessive fading, discoloring, cracking, crazing, peeling, and blistering, for a period of five (5) years, as measured from the Fabrication Date.

3M Warranty Terms and Conditions

The Sheeting and Overlamine must be stored, processed, applied, and maintained as described in the Product Bulletins and in accordance with all applicable, written 3M procedures provided in the applicable 3M documentation listed in the Product Bulletins.

A failure to meet the 3M Warranty must be solely the result of design or manufacturing defect in the 3M Sheeting or Overlamine, and not a result of (a) outside causes including improper fabrication, handling, packing, storing, shipping, maintenance, or installation; (b) non-vertical applications where the Sign is more than +/- 10° from vertical; (c) use of any material or product not recommended by 3M in the Product Bulletins, the 3M documentation listed in the Product Bulletins, or applicable 3M technical memorandums; (d) use of application equipment not recommended by 3M; (e) failure of Sign substrate; (f) loss of adhesion due to incompatible or improperly prepared substrate; (g) exposure to chemicals, abrasion, or other mechanical damage; (h) snow burial or any other Sign burial; (i) collisions, vandalism, or malicious mischief; or (j) an act of God.

Claims made under the 3M Warranty will be honored only if (a) the Sign was dated with the Fabrication Date, which constitutes the start of the Warranty Period, 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.

3M reserves the right to determine the method of replacement.

Any replacement Sheeting or Sign restoration will carry the unexpired warranty of the Sheeting it replaces.

3M is not responsible for any additional warranties that the Sign Manufacturer offers to its customers beyond the 3M Warranty.

Exclusive Limited Remedy

Valid claims under the 3M Warranty will receive the Sign Restoration or refund as detailed in Table 1.

Table 1. Warranty Periods and Limited Remedy.

		Limited Remedy Type and Period [years from Fabrication Date]
Product	Description	Sign Restoration or Refund
7310	White Sheeting with printed custom colors and 1170 overlamine	Years 0-5

Printers

HP360, HP365, HP1500, EFI H1625-RS, Durst RHO161TS, RHO162TS, and RHO163

Inks

HP Series 831/871 Inkjet Ink, For EFI and Durst Printers: 3M™ Piezo Inkjet Series 8800UV and 8900UV

Substrates

Treated Aluminum (conversion coated or treated per 3M Information Folder 1.7) or high-density overlay - highway grade (HDO)

Sign Restoration

During the Sign Restoration period, as provided in Table 1, if Sign is proven to not meet the 3M Warranty, then the Sign Manufacturer's exclusive remedy, and 3M's sole obligation, at 3M's sole option, shall be that 3M, at its expense, will either refund the Sign Manufacturer's total original cost of the Sign, or refabricate the Sign, including (i) Sheeting and (ii) the aluminum sign substrate (as needed). However, 3M will not provide other hardware or labor to install the replacement sign. The Fabrication Date of the replacement Sign will be considered to be the original Fabrication Date of the sign it replaces under the 3M Warranty.



Transportation Safety Division

3M™ Advanced Flexible Engineer Grade Reflective Sheeting Series 7300

Product Bulletin Series 7300
November 2020

Replaces Product Bulletin Series 7300 Dated March 2020

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/ft² (cd/lx/m²) 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).

Color	x	y	x	y	x	y	x	y	Daytime Luminance Factor (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:

- o Clean
- o Smooth
- o Flat

- o Rigid
- o Dimensionally stable
- o Weather resistant
- o Non-porous
- o 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 suitability 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.

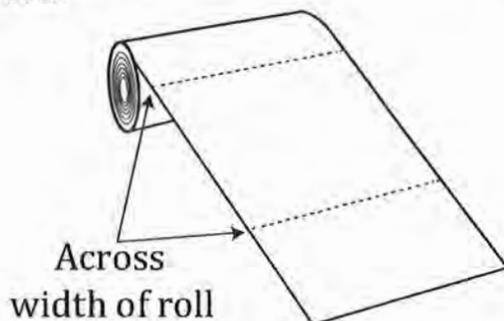


Figure 1. Fabrication lines.

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

Except where prohibited by law, 3M SHALL NOT, UNDER ANY CIRCUMSTANCES, BE LIABLE TO USER, INCLUDING WITHOUT LIMITATION, TTC AND SIGN MANUFACTURER, FOR ANY DIRECT (EXCEPT FOR THE EXCLUSIVE LIMITED REMEDY PROVIDED IN SECTION 14.2), INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (INCLUDING BUT NOT LIMITED TO, LABOR, NON-3M MATERIAL CHARGES, LOSS OF PROFITS, REVENUE, BUSINESS OPPORTUNITY, OR GOODWILL) RESULTING FROM OR IN ANY WAY RELATED TO THE SHEETING, SERVICES, OR THIS BULLETIN. This limitation of liability applies regardless of the legal theory asserted including warranty, contract, negligence, or strict liability.

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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Important Notice

All statements, technical information and recommendations contained herein are based on tests we believe to be reliable at the time of this publication, 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, indirect, 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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Traffic Safety and Security Division

3M™ ElectroCut™ Film Series 1170

Product Bulletin 1170
October 2016

Replaces PB 1170 dated July 2007

Description

3M™ ElectroCut™ Film Series 1170 is a durable, transparent, acrylic film coated with a transparent, pressure-sensitive adhesive that is protected by a removable liner, available in the colors in Table 1.

Table 1. Product Codes by Color

Color	Product Code
Clear	1170C
Yellow	1171
Red	1172
Orange	1174
Blue	1175
Worboy Green*	1176
Green	1177
Black (Opaque)	1178
Brown	1179

*Standard green color for U.K., Australia, and New Zealand

Series 1170 is intended for use on 3M Reflective Sheeting as part of 3M's system of matched components for signing. Series 1170 has a clear pressure-sensitive adhesive compatible with all the following 3M reflective sheetings used in permanent signing:

- 3M Advanced Engineer Grade Prismatic Series 7930
- 3M Engineer Grade Prismatic Series 3430
- 3M Engineer Grade Series 3290
- 3M High Intensity Prismatic Series 3930 and 3930TT
- 3M Diamond Grade™ Series 3990 and 3990TT
- 3M Diamond Grade™ DG³ Series 4000 and 4000TT
- 3M Diamond Grade™ Translucent DG³ Reflective Sheeting 4090T

Additionally, 3M™ ElectroCut Film 1170C Clear must be used with the following 3M reflective sheetings:
 3M Diamond Grade DG³ Prismatic Digital Sheeting 4090DS (White)
 3M High Intensity Prismatic Digital Sheeting 3930DS (White)

Series 1170 is designed with a special film liner for kiss-cutting on electronic cutting machines. Rolls are available prepunched for sprocket fed cutters or unpunched for flatbed or friction fed cutters. The colored films in the Series 1170 are often used instead of silk screened inks to provide transparent colored background copy for retroreflective street name signs and other traffic control signs. Various film widths are available to fabricate single sign panels up to 48 inches wide. For single panel signs requiring more than a single piece of sheeting or for multipanel signs such as guide signs, be sure to follow 3M color matching procedures in Information Folder 1.10 to achieve satisfactory results. For best color uniformity on a colored multipanel sign, all panels must be made from the same lot of Series 1170.

Properties

Transparent clear, yellow, red, orange, blue, worboy green, green, black (opaque), and brown versions of the Series 1170 applied to compatible 3M retroreflective sheetings listed in the above section can be expected to provide performance comparable to the integrally colored version of the same reflective sheeting. The coefficient of retroreflection of a white sheeting overlaid with the Series 1170 depends primarily on the overlay film transparency and the coefficient of retroreflection of the white base sheeting. Series 1170 applied on the compatible microprismatic 3M retroreflective sheetings listed in the above section according to 3M recommendations will yield chromaticity values within the chromaticity limits given in ASTM D4956-16.

Table 1 gives the resultant minimum and maximum coefficient of retroreflection (R_A) values for each transparent Series 1170 film as a percentage of the R_A of the white reflective base sheeting on which it is applied.

Table 2. Coefficient of retroreflection* (R_A) after application of colored film Series 1170 versus the R_A of the white base sheeting (expressed as %)

Film	Minimum (% of base sheeting)	Maximum (% of base sheeting)
1171 (Yellow)	60	80
1172 (Red)	14	24
1174 (Orange)	30	--
1175 (Blue)	6.5	20
1176 (Worboy Green)	8	14
1177 (Green)	13	20
1179 (Brown)	5	--

* R_A measurements shall be made at 0.2° observation angle, -4° entrance angle, and 0° rotation, per ASTM E810.

Film Liner

Series 1170 films have a transparent film release liner designed to aid the cutting process and the removal of the film weed after cutting.

Storage

Store in a cool, dry area 65-75° F (18-24° C), 30-50% relative humidity, and use within one year from date of receipt.

Fabrication – Cutting and Application Procedures

Important Note: Read and follow the manufacturer's operating manual carefully for proper use of cutting equipment.

1. Adjust knife pressure to cut cleanly through the film and slightly score the liner. A 30° blade works best.
2. A clean cutting blade is required. To remove adhesive build-up use a soft cloth dampened with mineral spirits, isopropyl alcohol or 3M™ Citrus Base Cleaner.
3. Avoid excessive flexing when handling film as this may cause film to release from the liner.
4. After cutting is complete, lay sheets flat, face to face, back to back. Always store sheets in this manner until the sheeting has been weeded and transfer tape has been applied to sheeting.
5. Use a stripping tool designed for weeding films that has a blunt (not a sharp) edge.
6. After weeding is completed, also store sheets flat, face to face and back to back, until transfer tape is applied.
7. TPM-5 Clear Transfer Tape is recommended for best results. SCPM-3 Application Tape is also satisfactory for use on small signs. Other transfer tapes are not recommended.
8. Transfer tape can be applied either by hand using a plastic squeegee or through a hand squeeze roll applicator (HSRA). If applying the transfer tape by hand, care must be taken to always squeegee from the center to the outside in both directions. If applying the transfer tape through the HSRA the air pressure must be at 30 psi to avoid stretching the premask during application, and the "lead" edge must be cut square and fed into the nip very carefully to avoid wrinkles in the Series 1170.
9. Film Series 1170 may be applied to the sheeting either before or after the sheeting has been applied to the substrate. Use of an HSRA is recommended to ensure satisfactory results. Use the "split liner method" – start in the middle of the sheet and remove half the liner to ensure proper alignment.
10. After film Series 1170 and sheeting have been applied, remove the transfer tape by carefully removing the tape at as low an angle as possible.
11. IMPORTANT! When the transfer tape has been removed, reroll the sign through the laminator to ensure good adhesion.
12. Excess or overhanging film Series 1170 should be trimmed using a sharp utility knife held at a 30° angle with the substrate.

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, or by mail, or in case of an emergency, call 1-800-364-3577.

Warranty

For detailed warranty information, please refer to the sheeting product bulletins and the [3M™ MCS™ Warranty for Traffic](#) and [MCS Warranty Bulletins](#).

For Information or Assistance

Call: 1-800-553-1380

In Canada Call:
1-800-265-1840

Internet:

www.3M.com/roadwaysafety

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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