



Engineer Grade Work Zone Sheeting

Series CW80

For Use On Work Zone Traffic Control Devices

Product Bulletin CW80

July 2006

Replaces PB CW80 dated July 2003

Description

3M™ Engineer Grade Work Zone Sheeting Series CW80 is a durable, retroreflective sheeting designed for the production of work zone traffic control devices. This sheeting is intended to have a similar appearance when viewed in daylight or by retroreflected light at night. The reflective sheetings consist of optical lens elements enclosed within a transparent resin that has a smooth, flat outer surface. Series CW80 sheeting is available with pressure sensitive adhesive in work zone traffic device colors.

Properties

A. Color Test

Conformance to standard chromaticity (x,y) and luminance factor (Y, %) requirements shall be determined by instrumental method in accordance with ASTM E 1164 on sheeting applied to smooth aluminum test panels cut from Alloy 6061-T6 or 5052-H38. The values shall be determined on a HunterLab ColorFlex 45/0 spectrophotometer. Computations shall be done for CIE Illuminant D65 and the 2° standard observer.¹

¹The instrumentally determined color values of retroreflective sheeting can vary significantly depending on the make and model of colorimetric spectrophotometer as well as the color and retroreflective optics of the sheeting (David M. Burns and Timothy J. Donahue, Measurement Issues in the Color Specification of Fluorescent-Retroreflective Materials for High Visibility Traffic Signing and Personal Safety Applications, Proceedings of SPIE: Fourth Oxford Conference on Spectroscopy, 4826, pp. 39-49, 2003). For the purposes of this document, the HunterLab ColorFlex 45/0 spectrophotometer shall be the referee instrument.

Table A - ASTM D 4956 Chromaticity Coordinate and Daytime Luminance Limits

Color	<u>x</u>	<u>y</u>	<u>x</u>	<u>y</u>	<u>x</u>	<u>y</u>	<u>x</u>	<u>y</u>	Reflectance Limit (Y)	
									<u>Min.</u>	<u>Max.</u>
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	30.0

B. Coefficient of Retroreflection

The coefficients of retroreflection shall be determined in accordance with ASTM E-810, for the minimum requirements of Table B, as specified.

1. Units. Coefficients of retroreflection shall be specified in units of candelas per footcandle per square foot. (candelas/lux/square meter)
2. The observation angles shall be 0.2° and 0.5°.
3. The entrance angles shall be -4°, 30°.

Table B
Minimum Coefficient of Retroreflection
Candelas/Footcandle/Square Foot
Candelas/Lux/Square Meter

Observation Angle (°)	Entrance Angle (°)	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

Note: Retroreflection properties conform to the requirements of ASTM D4956 Type I.

C. Adhesives

Series CW80 sheetings have an adhesive which conforms to the adhesive requirements of ASTM D4956 Class I. The adhesive is recommended for application by hand or with a mechanical squeeze roll applicator to moderately rough or porous wood, metal, and plastic surfaces.

Hand applications should be made at temperatures above 65°F (18°C).

This high performance adhesive system is designed to retain its elastic character through a wide range of temperatures. This feature assures durable adhesion to a variety of substrates, even upon cold impact. The adhesive allows the sheeting to be applied in conditions as low as 45°F.

Table C
Color and Product Number

Color	Product Number
White	CW80
Yellow	CW81
Orange	CW84
Prestriped Barricade	
4" left stripe	CW44 L
4" right stripe	CW44 R
6" left stripe	CW46 L
6" right stripe	CW46 R

Test Methods For Adhesives And Film Properties

A. Conditioning

1. Adhesion, shrinkage flexibility and gloss measurements are performed on test specimens which have been conditioned for 24 hours at 73°F ± 2°F (23°C ± 1°C) and 50% ± 4% R.H. before testing. This condition is maintained during the test.

2. Impact resistance measurements are performed on test specimens which have been further conditioned at 32°F ± 2°F (0°C ± 1°C) for 24 hours before testing. This temperature is maintained during the test.

B. Standard Test Panel Application

Unless otherwise specified the reflective sheeting shall be applied according to the manufacturer's recommendations to smooth 0.020" (0.5 mm) min. thickness 6061-T6 or equivalent aluminum panels that have been degreased and lightly acid etched. Lack of contamination of test panels must be confirmed by passing water break test and tape snap test as described in Information Folder 1.7.

The system is fully compatible with all approved substrates as described in Information Folder 1.7. Rougher plywood surfaces require special attention. Trial applications on representative panels or boards should be tested for effective bonding before proceeding to high volume applications.

C. Test Requirements

<p>1. Adhesion</p> <p><u>Test Weight</u> 1 3/4 lbs. (0.8 Kg)</p>	<p><u>Test Method</u> Apply 4" (10 cm) of 1" x 6" (2.54 x 15 cm) strip to test panel and condition. Face panel down and suspend test weight from free end.</p>	<p><u>Requirement</u> Not more than 2" (5.08 cm) of peel in 5 minutes.</p>
<p>2. Impact Resistance</p>	<p><u>Test Method</u> Apply to a cleaned, etched aluminum panel of alloy, 6061-T6, 0.04 inches by 3.0 inches by 5.0 inches and condition as in A.1. & 2., above. The face of the panel is subjected to an impact of a weight with a 5/8-inch rounded tip on a Gardner Variable Impact Tester using a 100 inch-pound setting.</p>	<p><u>Requirement</u> No separation from panel or cracking outside the immediate impact area.</p>
<p>3. Shrinkage</p>	<p><u>Test Method</u> Following conditioning of 9" x 9" (22.9 cm x 22.9 cm) samples, remove liner and place on flat surface with adhesive side up.</p>	<p><u>Requirement</u> Shrinkage not greater than 1/32" (0.8 mm) in 10 minutes, or more than 1/8" (3.2mm) in 24 hrs. in any dimension.</p>
<p>4. Flexibility</p>	<p><u>Test Method</u> Following conditioning of 1" x 6" (2.54 cm x 15 cm) sample, remove liner and dust adhesive with talc. At standard conditions, bend in one second around 1/8" (3.2mm) mandrel with adhesive side facing mandrel.</p>	<p><u>Requirement</u> No cracking.</p>

Use

A. Application Equipment

Pressure Sensitive Adhesive

1. 48" Interstate Squeeze Roll Applicator (Reference Information Folder 1.4)
2. Hand Squeeze Roll Applicator (Reference Information Folder 1.6) Note: When using HSRA with Air Cylinder Kit, apply the minimum tension needed to properly position the sheeting onto the substrate. The nip roller pressure of 80 psi is recommended.
3. Hand application. To obtain maximum initial adhesion use firm pressure with 2" (5 cm) rubber roller or plastic squeegee. Multiple, heavy overlapping strokes should be used. Resqueegee all edges. (Reference Information Folder 1.5). Do not stretch sheeting during application. Maintain minimum distance between liner removal and adhesive contact point.

B. Substrates

Most clean, smooth, relatively non-porous, flat, rigid, weather resistant surfaces are satisfactory for proper application of reflective sheetings. Series CW80 sheeting is recommended for application to high density overlay plywood, metal, and plastic substrates. Application to unprimed, excessively rough or non-weather resistant surfaces can shorten the performance life. For best adhesion to plastic substrates, flame treatment of the substrate before sheeting application is recommended. (Reference Information Folder 1.7)

C. Process Colors

Series CW80 sheeting may be screen processed using 3M™ Process Colors Series 700 or Series 990. Process at 60°-100°F (16°-38°C) at relative humidity of 20-50%. If other series process colors are used, it is the user's responsibility to determine their suitability and durability. 3M assumes no responsibility for premature failure of sign face legends that have been processed with non-3M process colors. Since 3M has no control over colors made by other manufacturers the user should check with the manufacturer for processing recommendations and assurance of performance prior to any extensive use. Process colors of the same series may be thinned, toned, blended and either air or oven dried. For screen processing of traffic signs, PE 157 screen mesh, screened with a fill pass, is recommended. Consult Information Folder 1.8 for details.

D. Cutting

The sheeting may be hand cut or die cut one sheet at a time or guillotined in a stack. Whenever two or more pieces are used side-by-side they must be matched to assure uniform day color and night reflective appearance.

Use a sharp razor blade (i.e.: Exacto™ or Stanley™) for edge trimming. From the face side of the sign, cut downward to eliminate initial edge lift or tearing.

E. Cleaning

Refer to Information Folder 1.11 for procedures on cleaning.

Health and Safety Information

Read all Health Hazard, Precautionary, and First Aid statements found in the Material Safety Data Sheet, and/or product label of chemicals prior to handling or use.

Storage

3M sheeting should be stored in a cool, dry area, preferably at 65°-75°F (18°-24°C) and 30-50% relative humidity, and should be applied within one year after purchase.

Rolls should be stored horizontally in the shipping carton. Partially used rolls should be returned to the shipping carton or suspended horizontally from a rod or pipe through the core. Unprocessed sheets should be stored flat.

Screen processed faces or signs must be protected with No. 8 resin coated paper or the liner from Series CW80 sheeting as slipsheeting. Place the glossy side of the slipsheeting against the sign face. Double faced signs must have the glossy side of the slipsheet against each face of the sign.

Avoid banding, crating, or stacking which puts signs or faces under pressure. Package in accordance with commercially accepted standards to prevent movement and chafing which may cause damage during handling. Store sign packages indoors on edge.

Do not allow panels or finished signs to become wet in shipment or storage. Should packaged signs become wet, unpack immediately and permit signs to dry.

See Information Folder 1.11 for details of storage and packaging.

Installation

Nylon washers are recommended 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 bolt heads. 3M recommends the use of nylon washers or an approved anti-theft system.

General Performance Considerations

The durability of Series CW80 sheeting will depend upon substrate selection and preparation, compliance with recommended application procedures, geographic area, exposure conditions and maintenance.

Maximum durability of this sheeting can be expected in applications subject to vertical exposure on stationary objects when processed and applied according to 3M recommendations to properly prepared substrates according to Information Folder 1.7 on Sign Base Surface Preparation.

The user must determine the suitability of any sign substrate for its intended use. Applications to unprimed, excessively rough or non-weather-resistant surfaces, or exposure to severe or unusual conditions can shorten the durability of such applications.

Purchaser should select a suitable test for determining reflective sheeting performance on reboundable plastic substrates. Test should include plastic manufacturer's recommendations for impacting reboundable plastic traffic control devices.

Literature Reference

Screen Processing

Product Bulletin for Process Color PB 1805

Clears

Color Application Instructions IF 1.8

Application

Cutting and Matching Instruction IF 1.10

Application Instructions for Squeeze Roll Application IF 1.4

Application Instructions for Hand Squeeze Roll Application

Application Instructions for Hand Squeeze Roll Application IF 1.6

Hand Application IF 1.5

Sign Base Surface Preparation IF 1.7

Maintenance Specifications

Storage, Maintenance & Removal Instructions IF 1.11

Reflective Sheeting for Traffic Control ASTM D 4956

Color Measurement ASTM E 1164

Retroreflection Measurement ASTM E 810

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