

Traffic Safety and Security Division

3M™ High Intensity Prismatic Pre-Printed Stop Signs Series 3930S

Series 3930S

Product Bulletin 3930S
May 2016

Description

3M™ High Intensity Prismatic Pre-Printed Stop Signs Series 3930S is a roll of non-metalized microprismatic lens reflective sheeting with pre-printed 30" red stop sign images that meet ASTM D4956¹ Type IV performance specifications for retroreflective sheeting for traffic control. Included with the stop sign images are special markings to support converting processes as shown in Figure 1.

¹ as of the date of publication

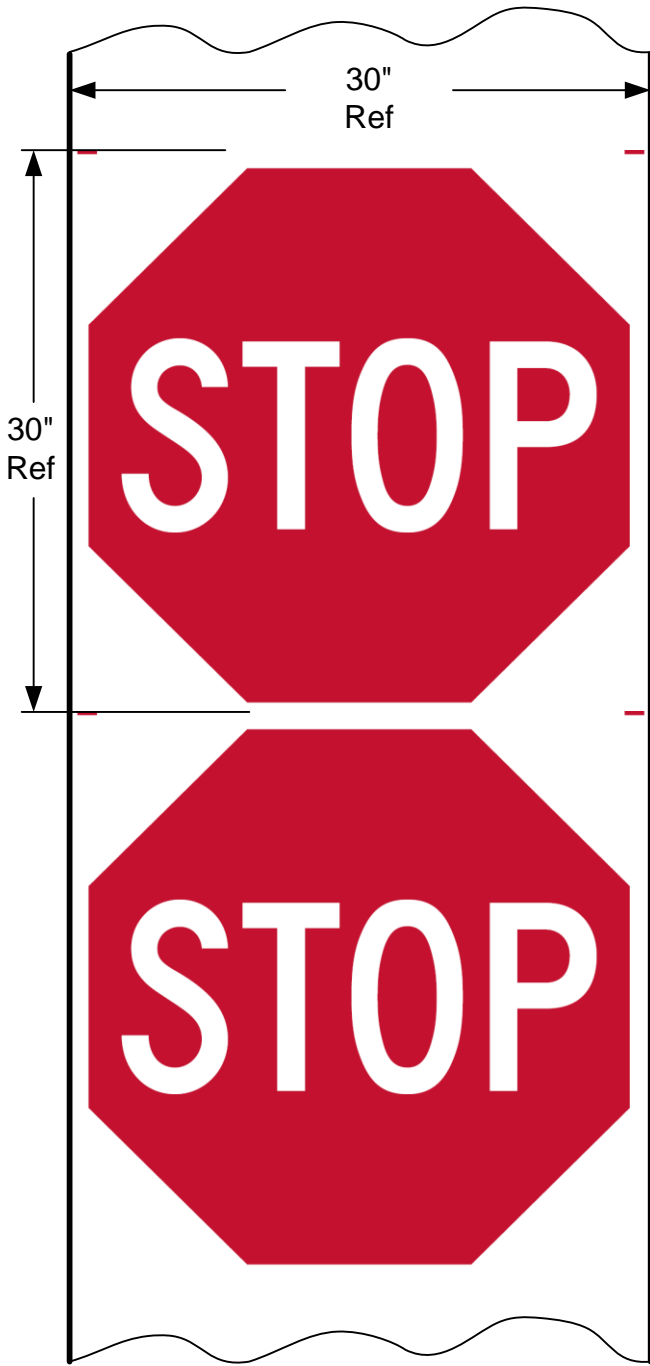


Figure 1. Illustration of Series 3930S with special markings

The critical dimensions are:

Width of Stop Sign/Roll = 30.0312 " +/- 0.0312 (across the roll)

Height of Stop Sign (including white border) = 30" - 0.0" + 0.125" (along the roll)

When applied to properly prepared sign substrates, 3M™ High Intensity Prismatic Pre-Printed Stop Signs Series 3930S images provide long-term reflectivity and durability.

Photometrics

Daytime Color and Luminance Factor (x,y,Y)

The chromaticity coordinates and total luminance factor of the retroreflective sheeting conform to Table 1.

Table 1. CIE Chromaticity Coordinate Limits²

Color	Chromaticity Coordinates								Daytime Luminance Factor (Y%)	
	1		2		3		4			
	x	y	x	y	x	y	x	y	Min.	Max.
White	0.303	0.300	0.368	0.366	0.340	0.393	0.274	0.329	27	--
Red	0.648	0.351	0.735	0.265	0.629	0.281	0.565	0.346	2.5	15

Conformance to standard chromaticity (x, y) and luminance factor (Y %) requirements shall be determined by instrumental method in accordance with ASTM E1164 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 observer³.

Retroreflectivity

The minimum coefficients of retroreflection (R_A) of Series 3930S are given in Table 2.

Table 2. Minimum Coefficient of Retroreflection (Candelas/Foot Candle/Square Foot; Candelas/Lux/Square Meter)

Obs. Angle ⁴	Ent Angle ⁵	White	Red
0.2°	-4°	360	65
0.2°	+30°	150	27
0.5°	-4°	170	30
0.5°	+30°	72	13

Conformance to coefficient of retroreflection requirements shall be determined by instrumental method in accordance with ASTM E810 "Test Method for Coefficient of Retroreflection of Retroreflective Sheeting", and per E810 the values of 0° and 90° rotation are averaged to determine the R_A in Table 2.

Fabrication Lines

The manufacturing process of prismatic sheeting results in periodic lines in the product. Fabrication 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 2).

² The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 Standard Colorimetric System.

³ The 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). For the purposes of this document, the HunterLab ColorFlex 45/0 spectrophotometer is the referee instrument.

⁴ Observation Angle – The angle between the illumination axis and the observation axis.

⁵ Entrance Angle – The angle from the illumination axis to the retroreflector axis. The retroreflector axis is an axis perpendicular to the retroreflective surface.

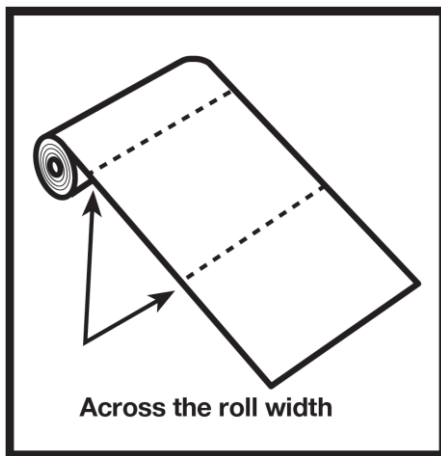


Figure 2. Fabrication Lines

Adhesive

The 3930S sheeting has a pressure-sensitive adhesive that is recommended for application at temperatures of 65° F (18° C) or higher.

Adhesive and Film Properties

Standard Test Panels

Unless otherwise specified herein, the sheeting shall be applied to test panels and conditioned in accordance with ASTM D4956 and test methods and conditions shall conform to ASTM D4956.

Properties

Series 3930S conforms to ASTM D4956 Type IV in the following requirements:

1. Adhesion
2. Outdoor weathering
 - a. retained coefficient of retroreflection
 - b. colorfastness
3. Shrinkage
4. Flexibility
5. Liner removal
6. Impact resistance
7. Night time color

In addition, the following properties of Series 3930S conform to the listed specifications:

1. Gloss

Test Method – Test in accordance with ASTM D523 using a 60° glossmeter.

Requirement – Rating not less than 50.

2. Optical Stability

Test Method – Apply a 3 inch x 6 inch sample to a test panel. Measure R_A then place it in an oven at 71° C \pm 3° C (160° F \pm 5° F) for 24 hours followed by conditioning at standard conditions for 2 hours. Remeasure R_A .

Requirement – The sheeting shall retain a minimum of 85% and a maximum of 115% of the original coefficient of retroreflection.

Sign Fabrication Methods

Application

The 3M™ High Intensity Prismatic Pre-Printed Stop Signs Series 3930S sheeting incorporates a pressure sensitive adhesive and should be applied to the sign substrate at temperature of 65° F (18° C) or higher by any of the following methods:

Mechanical squeeze roll applicator – refer to 3M [Information Folder 1.4](#).

Hand squeeze roll applicator – refer to 3M [Information Folder 1.6](#).

Series 3930S must be applied with a roll laminator.

Hand Application

Hand application is not recommended.

Substrates

For traffic sign use, substrates found to be most reliable and durable are properly prepared aluminum sheets. Users are urged to carefully evaluate all other substrates for adhesion and sign durability. Other substrates that may be satisfactory for proper application of sheeting will have the following characteristics:

- Clean
- Smooth
- Flat
- Rigid
- Dimensionally stable
- Weather resistant
- Non-porous
- High surface energy (passes water break test). Refer to [Information Folder 1.7](#) for surface preparation recommendations.

Substrates with low surface energy may require additional preparation such as flame treatment, mechanical abrasion or use of adhesion promoters prior to sheeting application. Plastic substrates are not recommended where cold shock performance is required. Sign failures caused by the substrate or improper surface preparation are not the responsibility of 3M.

System of Matched Components

High Intensity Prismatic Pre-Printed Stop Signs Series 3930S may be used in conjunction with its matched components listed in Table 3.

Table 3. Matched Component Materials

Matched Components	
Premium Protective Overlay Film	Series 1160
Slipsheet	SCW 568

Storage and Packaging

The 3930S pre-printed stop signs 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 of 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. Finished signs should be stored on edge.

Finished signs must be protected with SCW 568 slipsheet paper.

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 or finished signs must remain dry during shipment and storage. If packaged signs become wet, unpack immediately and allow signs to dry. Refer to [Information Folder 1.11](#) for instructions on packing for storage and shipment.

Installation

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

Cleaning

Refer to [Information Folder 1.11](#).

Health and Safety Information

Read all health hazard, precautionary and first aid statements found in the Safety Data Sheets, Article Information Sheets, and/or product label of chemicals prior to handling or use. To obtain SDS sheets for 3M products, go to 3M.com/SDS, or by mail, or in case of an emergency, call 1-800-364-3577.

General Performance Considerations

The durability of 3M™ High Intensity Prismatic Pre-Printed Stop Signs Series 3930S will depend upon substrate selection and preparation, compliance with recommended application procedures, geographic area, exposure conditions, and maintenance. Maximum durability of 3930S pre-printed stop signs can be expected in applications subject to vertical exposure on stationary objects when processed and applied to properly prepared aluminum according to 3M recommendations provided in [Information Folder 1.7](#). The user must determine the suitability of any nonmetallic sign backing for its intended use. Sign failures caused by the substrate or improper surface preparation are not the responsibility of 3M. Applications to unprimed, excessively rough or non-weather resistant surfaces or exposure to severe or unusual conditions can shorten the performance of such applications. Signs in mountainous areas that are covered by snow for prolonged periods may also have reduced durability. Atmospheric conditions in certain geographic areas may result in reduced durability. Periodic sign inspection and regular sign replacement are strongly recommended in order for sign owners to establish their own effective service life expectation, beyond the warranty period.

3M Basic Product Warranty and Limited Remedy

3M™ High Intensity Prismatic Pre-Printed Stop Signs Series 3930S (“Product”) is warranted to be free of defects in materials and manufacture at the time of shipment and to meet the specifications stated in this product bulletin. If the Product is proven not to have met the Basic Warranty on its shipment date, then a buyer’s exclusive remedy, and 3M’s sole obligation, at 3M’s option, will be refund or replacement of the Product.

Additional Warranty & Limited Remedy

3M also warrants (“3M Warranty”) in the United States and Canada that a rigid traffic control and guidance sign (“Sign”) made with the Product will:

- remain legible when viewed from a moving vehicle under normal day and night driving conditions by resisting excessive fading, discoloring, cracking, crazing, peeling, and blistering and,
- after cleaning, will meet the minimum values for coefficient of retroreflection stated in Table 4 for the applicable warranty period (“Warranty Period”) measured from the Sign’s initial fabrication date (“Fabrication Date”) as given in Table 4.

Table 4. Minimum Percent Retained R_A of Table 2, and the Applicable Warranty Period

Warranty Period	Minimum Percentage R_A Retained
0-7 Years	80%
8-10 Years	70%

3M Warranty Terms and Conditions

- Product must be processed and applied to a vertically-mounted ($\pm 10^\circ$) 3M™ recommended substrate as described in this product bulletin in accordance with all 3M application and fabrication procedures provided in 3M's product and information folders and technical memos (which will be furnished to the manufacturer upon request).
- A failure to meet the 3M Warranty must be solely the result of design or manufacturing defects in the Product and not of (a) outside causes including improper storage, fabrication, handling, maintenance or installation; (b) failure of sign substrate; (c) exposure to chemicals, abrasion and other mechanical damage from fasteners used to mount the sign; (d) snow or any other sign burial; (e) collisions, vandalism or malicious mischief; (f) or an act of God.
- Use of any material or product (such as process colors, thinners, coatings, solvents, or overlay films and sheetings) not included in the list of system of matched components in Table 3 voids the 3M Warranty.
- Use of application equipment not recommended by 3M voids the 3M Warranty.
- 3M reserves the right to determine the method of replacement. Replacement sheeting will carry the unexpired warranty of the sheeting it replaces. Claims made under this warranty will be honored only if the signs have been dated at the time of sheeting application, which constitutes the start of the Warranty Period. Claims made under this warranty will be honored only if 3M is notified of a potential failure within thirty days of discovery, reasonable information requested by 3M is provided, and 3M is permitted to verify the cause of the failure.

Exclusive Limited Remedy and Disclaimer

If a Sign made with the Product is shown to not meet the 3M Warranty during the Warranty Period, 3M's sole and exclusive remedy is, at 3M's option:

- if this occurs within seven (7) years after the Fabrication Date, then 3M will, at its expense, restore the Sign's surface to its original effectiveness (this remedy shall include only the expense of making the new Sign face including the aluminum sign substrate, but will not include other hardware or labor to install the replacement Sign); or
- if this occurs during the remainder of the Warranty Period, then 3M will furnish only the necessary Product and matched component materials quantity to restore the Sign's surface to its original effectiveness.

The replacement Sign will carry the unexpired warranty period of the Sign it replaces.

THE 3M WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES, 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.

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.

Other Product Information

Always confirm that you have the most current version of the applicable product bulletin, information folder or other product information from the 3M™ Website at www.3M.com/roadwaysafety.

Literature Reference

- [IF 1.4](#) Instructions for Interstate Squeeze Roll Applicator
- IF 1.5 Hand Application Instructions
- [IF 1.6](#) Hand Squeeze Roll Applicator
- [IF 1.7](#) Sign Base Surface Preparation

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

For Information or Assistance

Call: 1-800-553-1380

In Canada Call:

1-800-265-1840

Internet:

www.3M.com/roadwaysafety

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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, 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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