



Scotchlite™

Plus Removable Reflective Sheeting

Series 690

Product Bulletin 690P

January 1997

Replaces PB 690P dated January 1994

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.

Description

3M™ Scotchlite™ Plus Removable Reflective Sheeting Series 690 is a highly durable, adhesive-coated, enclosed lens sheeting designed for use in production of multi-color emblems, stripes, and markings. When properly processed markings are viewed at night, they have the same appearance as during the day. 690-85 Black sheeting, appears white at night.

Series 690 sheeting is flexible providing excellent conformance on curved surfaces, and is unique in that it allows for removal up to five years after application from most vertical surfaces. (See Warranty section.) It has a lay-flat liner for easy screen processing.

Removability from bare aluminum, stainless steel, rivets and corrugations is not warranted. Significant amounts of adhesive can be expected to remain.

CAUTION: Paints which have poor paint-to-substrate adhesion and/or poor interply adhesion may be pulled off during removal of sheeting. Series 690 sheeting may not be removable from rivet heads.

<u>Color</u>	<u>Product Code</u>
White	690-10
Gold	690-64
Yellow	690-71
Light Blue	690-76
Lemon Yellow	690-81
Ruby Red	690-82
Black	690-85

Adhesive	Positionable, pressure activated Controltac™ Adhesive
Adhesive Color	Green
Minimum Application Temperature (Sheeting and Substrate)	50°F (10°C) Flat surfaces without rivets 55°F (13°C) Flat surfaces with rivets
Maximum Application Temperature (Sheeting and Substrate)	100°F (38°C)
Liner Printing	Scotchlite™ Plus Series 690 with Controltac Adhesive

Coefficient of Retroreflection

The typical coefficients of retroreflection of unprinted Series 690 sheetings, when measured in accordance with ASTM E810, are stated below in units of candlepower/foot-candle/square foot (candelas/lux/square meter). THESE VALUES SHOULD NOT BE USED FOR SPECIFICATION OR PURCHASE DESCRIPTION PURPOSES. IF SUCH VALUES ARE NEEDED, CONTACT YOUR 3M REPRESENTATIVE.

The values were obtained using an entrance angle of -4° and observation angle of 0.2°. The entrance angle is between the illumination axis and the retroreflector axis. The retroreflector axis is an axis perpendicular to the retroreflective surface. The observation angle is between the illumination axis and the observation axis.

<u>Color</u>	<u>Product Code</u>	<u>Typical Initial Candlepower</u>
White	690-10	100
Gold	690-64	65
Yellow	690-71	60
Light Blue	690-76	10
Lemon Yellow	690-81	40
Ruby Red	690-82	20
Black	690-85	30

90% of these brightness values are retained when the sheeting is wet.

To obtain uniform day and night appearance, multiple pieces of sheeting used together as a set should be matched. See Instruction Folder 4.6.

Fabrication

Letters and characters should be a minimum height of 3" with a minimum stroke width of 3/8".

A. Screen Printing Inks

Scotchlite™ Transparent Screen Printing Inks Series 4400 Product Bulletin 1413 (4400).

Scotchcal™ Opaque Screen Printing Inks Series 3900 (Except Gold Color 3919) (Instruction Bulletin 1A).

Scotchcal Series 9700 UV Screen Printing Inks

B. Clear Coating

Scotchlite™ Transparent Screen Printing Inks Series 4400 must be clear coated with 4430R for stated durability.

Scotchcal™ Opaque Screen Printing Inks Series 3900 must be clear coated with 4430R for stated durability.

Scotchcal Series 9700 UV Screen Printing Inks must be clear coated with 9720 for stated durability.

C. Cutting - Information Folder 320

Series 690 sheeting may be cut by hand, saw, guillotine, cold die or hot die. Letters or designs 3" high or more can be kiss cut. Series 690 sheeting can be kiss cut on friction fed electronic cutting machines. (See D)

D. Electronic Cutting Machines

Users are encouraged to evaluate cutting procedures for their own equipment and shop conditions. However, these general recommendations should be followed to ensure easy handling.

1. The character height should be a minimum of three inches.
2. The stroke width should be a minimum of 3/8 inches.

3. There should be enough weight on the knife blade to slightly score the liner. Too little weight will not completely cut through the sheeting and adhesive. Too much weight will cut through the liner, dull the blade and serrate the cut edge.
 4. The knife blade should be sharp and clean. If there is adhesive on the blade, wipe it off with mineral spirits or isopropyl alcohol.
 5. Sheeting should be properly aligned and fed from a roll holder. Place the roll holder twelve inches back from the cutting area to allow the sheeting to relax as it is pulled into the machine.
 6. Sheeting temperature should be at least 65°F (18°C) or higher. If the sheeting temperature is less than 65°F (24°C), allow it to condition at 65°F - 75°F (18°C - 24°C) for at least 24 hours.
- E. Weeding
Weed (remove) the excess sheeting as soon as possible after cutting. After more than 24 hours, the adhesive may flow into the cut areas and make weeding more difficult.
- F. Scoring
Series 690 sheeting has an easy release liner and generally does not require scoring. However, if scoring is required, a mechanical scoring device such as one supplied by the Pierce Company, San Mateo, CA is recommended. Sheeting should be scored after color processing.
- G. Premasking/Prespacing
1. Premasked Markings: Application Tape SCPM-3.
 2. Prespacing Markings: Prespacing Tape SCPS-2 or Application Tape SCPM-3.
 3. Premasked/Prespacing Markings: Application Tape SCPM-3 or Prespacing Tape SCPS-2.
 4. "Kiss Cut" Premasked/Prespacing Markings: Prespacing Tape SCPS-2.
 5. Markings with 9720 Overprint Clear:
Premasking - SCPM-44X
Prespacing - SCPS-53
- H. Cleaning - Information Folder 4.5
Hand wash with sponge, cloth, or soft brush using warm water and detergent. Rinse thoroughly.
To remove grease, oil, or tar use cloth moistened with heptane, VM&P naphtha or mineral spirits. Wash with detergent and water and rinse thoroughly.
- I. Storage - Information Folder 4.5
Unused rolls should be suspended horizontally or replaced on their original carton. Lay sheets flat in a cool, dry area.

J. Unprinted Film

May be stored by the fabricator for a period of up to one (1) year and, after printing, markings may be stored for an additional year. Sheeting and markings must be stored in a clean area, free from excessive moisture and out of direct sunlight, with ambient temperatures of 100°F (38°C) or less.

NOTE: Markings that are Overprint Cleared with 4430R, air dried, and premasked must be stored at temperatures below 85°F (30°C). If stored above this temperature, blocking of the premask to the sheeting will occur.

Application

Series 690 sheeting must be applied to a properly cleaned automotive-type surface with recommended application techniques. See Information Folder 4.2 and 4.7.

Application to Uncured Substrates:

Bubbling can occur on uncured paints and some plastic substrates. Two-part polyurethane paints and clear coats may stop curing when ambient temperatures are below 75°F even when the surface feels cured (dry). The following test should be conducted to see if the surface is cured:

Apply a 6" x 6" piece of sheeting to the area to be marked. Allow to set in temperatures above 75°F for 48 hours. If no bubbling occurs, mark the vehicle. If bubbling occurs, allow the paint on the vehicles to cure in warm temperatures (above 75°F) and repeat the test.

Removal

Series 690 sheeting is removable from vertical automotive painted surfaces with minimal adhesive residue when removed using the following procedures:

Temperatures above 60°F (15°C) for substrate and air are recommended for removal. See Information Folder 4.8 for detailed instructions.

NOTE: Paints with low paint-to-substrate adhesion or low internal strength could be removed during removal of sheeting. The use of adequate heat and slow pulling action is required to minimize paint lifting in poorly bonded areas.

Removal Procedures:

1. Heat one corner of the markings with an industrial heat gun until hot to touch. (See Figure 1)
2. Lift edge of sheeting using a razor blade or sharp putty knife being careful not to damage the painted surface.

3. Slowly pull marking at a low angle (30° to surface) while continuing to apply heat to the marking ahead of the area being removed. **CAUTION:** Lifting sheeting up from the surface at 90° or greater will leave green adhesive residue on the surface. If the adhesive remains on the surface, repeat the removal instructions or consult a 3M representative. Slow pulling action is required where the paint-to-metal bond may be weak.

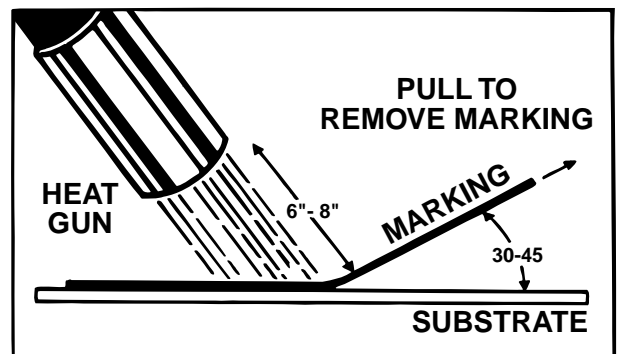


Figure 1

4. Adhesive residue can be removed by wiping with a rag saturated with DuPont's Prep-Sol Solvent Cleaner 3919S, VM&P naphtha, R231 Adhesive Remover. Care should be taken when using these mixtures to avoid possible damage to painted surfaces. Determine suitability of these solvents by testing on paint in an inconspicuous area. Use in a well ventilated area away from fire or flame.

General Performance Considerations

Maximum durability of Series 690 sheetings will result from fabrication and application according to 3M recommendations and exposure of less than 10° from the vertical. Angular exposure greater than 10° from vertical may reduce durability. Horizontal exposure is not recommended.

Warranty

Minnesota Mining and Manufacturing Company (3M) warrants that Scotchlite™ Flexible Reflective Sheeting Series 690 sold by 3M to be used for emblems and markings in the United States and Canada will remain effective for its intended use, subject to the following provision:

*Warranty Period-Years

Sheeting Color	Canada and U.S. Except Desert Southwest (AZ, NM, and desert areas of NV, CA, UT, and TX)	Desert Southwest		
		Vertical ± 10°	10-45° From Vertical	Removability
All except Black		7	5	5
Black		5	3	4
<u>Process Colors</u>				
3900 & 4400 with 4430R		7	5	5
9700 with 9720 UV		7	5	5
3900 & 4400 with 9720 UV		6	4	5
4400 4C with 4430R		5	3	4
9700 4C with 9720 UV		5	3	4

*There is no removability warranty for the exposure at greater than 10° from vertical. Exposure at angles greater than 45° from vertical is not warranted.

If Scotchlite Plus removable reflective sheeting is processed and applied in accordance with all 3M application and fabrication procedures provided in 3M's product bulletins, information folders, technical memos (which will be furnished to the agency upon request), including the exclusive use of 3M matched component systems, process colors, clear coatings, protective overlay films, application tapes, and recommended application equipment; and

If the emblem or marking deteriorates due to natural causes; such as fading, cracking, peeling, lifting, or discoloration; 3M's sole responsibility and purchaser's and user's exclusive remedy shall be that 3M will provide replacement of the 3M materials per the following table:

Total Warranty Period	Full Replacement	Pro-Rata Replacement Period	Monthly Reduction in Allowance
7 yrs. (84 mos)	52 months	53rd - 84th mo.	1/32
5 yrs. (60 mos)	36 months	37th - 60th mo.	1/24
4 yrs. (48 mos)	30 months	31st - 48th mo.	1/18
3 yrs. (36 mos)	24 months	25th - 36th mo.	1/12
2 yrs. (24 mos)	18 months	19th - 24th mo.	1/6

In the event of a problem arising in fabrication, application, or performance of the graphics manufactured from Controltac Plus product Series 690, 3M will also reimburse a portion of the labor and other costs incurred in correcting the situation involved in the approved complaint. The amount of reimbursement will be determined by 3M on a case-by-case basis taking into account the expected amount of labor needed to make such repairs and other similar considerations. In the case of failure outside the initial full replacement period, the Adjustment Schedule above also will apply to reimbursement of the labor and other costs. This labor reimbursement provision applies to standard products only.

If end-users are unsuccessful in removing applied graphics within the period for which removability is claimed, 3M will reimburse the end-user's documented excess costs actually incurred beyond the anticipated normal removal costs; provided, however, that the reimbursed amount shall not exceed the current low net selling price for the film or sheeting for which end-user claims warranty coverage. Removability shall be defined as leaving no more than thirty percent (30%) of the adhesive behind. This warranty requires that 3M's recommended removal methods were used and that 3M was advised in writing within seven (7) days of the alleged inability to remove.

Conditions

Such failure must be solely the result of design or manufacturing defects in the Scotchlite Flexible Reflective Sheeting and not of outside causes such as: improper fabrication, handling, maintenance or installation; use of process colors, thinners, coatings, or overlay films and sheetings not made by 3M; use of application procedures not recommended by 3M; failure of substrate; exposure to chemicals, abrasion and other mechanical damage from fasteners used to mount the emblem or marking; collisions, vandalism or malicious mischief.

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 3M is notified of a failure within a reasonable time, reasonable information requested by 3M is provided, and 3M is permitted to verify the cause of the failure.

Limitation of Liability

3M's liability under this warranty is limited to replacement as stated herein, and 3M assumes no liability for any incidental or consequential damages, such as lost profits, business or revenues in anyway related to the product regardless of the legal theory on which the claim is based. THIS WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING OR OF PERFORMANCE, CUSTOM OR USAGE OF TRADE.

**FOR INFORMATION OR ASSISTANCE
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