



## Scotchlite™ Reflective Material 8150 Tire Sheeting

Technical Data Sheet

October 2001

### Description

3M™ Scotchlite™ Reflective Material – 8150 Tire Sheeting is a flexible, durable, exposed lens retroreflective sheeting designed for vulcanization to compatible non-staining natural rubber tire compounds. The sheeting does not require a primer and exhibits good green tack to fresh rubber surfaces.

### Retroreflective Performance

The coefficient of retroreflection ( $R_A$ , in  $\text{cd/lux/m}^2$ ) is measured by methods traceable to either of the following retroreflective intensity testing procedures:

- ASTM E809 and E810 ( $R_A$ )
- CIE 54: 1982 ( $R'$ )

The  $R_A$  values were measured at the listed specific entrance and observation angles.

Entrance Angle	Observation Angle	Typical $R_A$	Minimum $R_A$
-4.0°	0.2°	500	330
+5.0°	0.33°	330	250

The following table gives the minimum coefficients of luminous intensity ( $R_i$ , in  $\text{cd/lux}$ ) for 50 lineal inches (127 lineal cm)<sup>1</sup> of retroreflective material, nominally 3/16" (4.8 mm) wide.

	Observation Angle	Entrance Angle		
		5°	20°	40°
Minimum $R_i$ (3/16" x 50" or 4.8 mm x 127 cm)	0.2°	2.0	1.8	0.4
	0.33°	1.3	1.0	0.3
	1.5°	0.09	0.09	0.04

<sup>1</sup> 50 lineal inches (127 lineal cm) - Ten parallel segments [each 5 inch (127mm) long by 3/16 inch (4.8 mm) wide] are positioned vertically to the observation plane during measurements. The segments are confined within a 5 inch (127mm) by 5-1/8 inch (130mm) area and are adhered but not vulcanized to a flat black surface.

### Color

Product Number	Daytime Color	Reflected Color
8150	Silver	White†

† The color of the retroreflected light is the same as the color of the light source illuminating the material. Typically this is white light.

### Physical Characteristics

To obtain proper performance characteristics, rubber compatibility, proper application, and proper vulcanization conditions are required.

**Abrasion:** Retains 40% of the reflective brightness after simulated wear testing of 100 cyclic hand strokes with a wet, steel-bristle brush.

**Adhesion:** Permanent adhesion to compatible natural rubber compounds. Attempting to remove the Scotchlite reflective material – 8150 tire sheeting will split or tear, but not delaminate, the rubber or sheeting.

**Flexibility:** Withstands tire molding induced stretch of up to 20% and will not release during the normal tire use, providing it has been applied in accordance with 3M recommended fabrication methods and the proper air pressure has been maintained.

Test	Test Method:	Specification:
Break Force:	ASTM D-412 or ISO 37 at 75°F (24°C) with liner removed	6.3 pounds per inch width (1.1 N/mm width)
Elongation:	ASTM D-412 or ISO 37 at 75°F (24°C) with liner removed	50% minimum

## Performance

While use of 3M™ Scotchlite™ Reflective Material – 8150 Tire Sheeting enhances visibility, no reflective material can guarantee absolute visibility, particularly in adverse weather conditions. Rainfall will result in partial loss of reflective performance; however, the reflective surface will return to its original brightness as the surface dries.

Performance will vary depending upon actual use, exposure conditions, and maintenance. Users should test reflective material to satisfy conformance to their own requirements.

## Rubber Compound Compatibility

Maximum performance of Scotchlite reflective material – 8150 tire sheeting, requires preliminary rubber testing for compatibility, adhesion, and staining in addition to existing internal tests of the tire manufacturer. It is essential that the tire manufacturer test any proposed compound for unvulcanized adhesion and avoid rubber staining ingredients.

### 1. Green Tack:

Green tack (temporary attachment) and adhesion to most compounds with significant amounts of natural rubber is expected. To uncured rubber, apply the reflective sheeting with slight pressure and with less than 5% stretch.

Determine if there is sufficient green tack to hold position during handling, molding, and vulcanization procedures.

Partial lifting or loss of green tack can be caused by over stretching or poor lamination of the sheeting, rubber relaxation, or rubber surface contaminants such as primers, solvents, powders, oils, waxes, release agents, and bloomed unreacted rubber additives.

### 2. Vulcanization:

The optimum vulcanization (rheometer 90% crosslink cure) for the sheeting adhesive is 5 minutes at 355°F (180°C) at 200 psi (14 bar) pressure. The optimum cure and adhesion on a given rubber compound may depend on curatives migrating from the rubber into the sheeting adhesive. Whenever possible, time, temperature, rubber, and curative relationship should be optimized for compatibility to the sheeting adhesive.

### 3. Adhesion:

The condition, age, surface composition, and migration potential of the uncured rubber may affect cured adhesion of the sheeting. The optimized cured adhesion on natural rubber compounds is permanent. Attempting to remove the sheeting will split or tear, but not delaminate, the rubber or sheeting. Adhesion tests may be attempted by

hand after the vulcanized rubber reaches ambient conditions for 2 hours or by mechanical means after 16 hours of ambient conditioning.

### 4. Migration Contamination:

Migrating rubber ingredients may cause reduced green tack, reduced vulcanized adhesion, and reduced sheeting reflectivity. Non-staining rubber components and additives are required. Staining of vulcanized rubber and its effect on the sheeting is determined by reflectivity measurements ( $R_A$ ) before vulcanization, after vulcanization, and after extended storage.

4.1 Apply parallel segments of the Scotchlite reflective material - 8150 tire sheeting onto 0.125" (3mm) thick slabs of the uncured rubber. If the rubber is only going to be used as veneer, it should be tested at the intended thickness and backed with the intended base rubber. Duplicate standard tire preparations but avoid leaving the rubber surface powdery or wet prior to sheeting application.

4.2 Make two rubber slabs (with parallel segments of Scotchlite reflective material – 8150 tire sheeting) for each anticipated compound.

4.3 Measure the initial  $R_A$  for each slab of striped uncured rubber.

4.4 Vulcanize the segments onto the rubber with proposed time, temperature, and pressure.

4.5 After cooling, measure the vulcanized sheeting  $R_A$  and compare to initial  $R_A$ .

4.6 Store all vulcanized samples in individual envelopes for 6 weeks at 120°F (49°C) and 10 weeks at 75°F (24°C).

4.7 Measure the stored sample  $R_A$  and compare reflectivity to initial  $R_A$ .

4.8 If there is greater than 40% loss of reflectivity after vulcanization or storage, then migration is substantially present and modifications to the rubber compound are required. Less than 20% loss of reflectivity is best for Scotchlite reflective material – 8150 tire sheeting. Processing oils, liquids, volatiles, waxes, and other staining materials should be drastically reduced or eliminated when staining is observed.

4.9 To further duplicate actual end use, an outdoor exposure test of at least 6 months is recommended under the anticipated climatic conditions. The outdoor exposure test should indicate any tendency for corrosion, blockage, or discoloration on the sheeting as caused by migration from the rubber. If there is greater than 40% loss of reflectivity after exposure then migration is substantially present and modifications to the rubber compound are required.

### Reflective Stripe Placement

3M™ Scotchlite™ Reflective Material – 8150 Tire Sheeting is recommended for application on tire sidewalls where the vulcanized elongation does not exceed 20%. Experience with vulcanized elongations of greater than 20% is limited, therefore, the use on moped or motorcycle tires should be very carefully evaluated.

The reflective sheeting should be applied on the tire sidewall plane in such a way that it is nearly parallel to the wheel plane. It should not be so close to the tire bead as to be obscured by the wheel rim when viewed at wide entrance angles. Application should not be made so close to the tire tread as to be on raised sidewall ribs where the sheeting will be exposed to excessive scuffing. Ideal sidewall angle placement is within + 5° of parallel to the wheel plane. The sidewall angle is the angle formed between the vertical axis and the line tangent to the surface of the sheeting on a mounted, inflated tire (see Fig. 1).

Sheeting may be applied over sidewall mold indicia (lettering, symbols, etc.); however, if the lettering is large enough to cause rubber flow, the sheeting may be displaced during molding. Sharp indicia may cut the sheeting and break the reflective stripe. Mold redesign to minimize ribs, lettering, etc., conflicting with the stripe location should be considered.

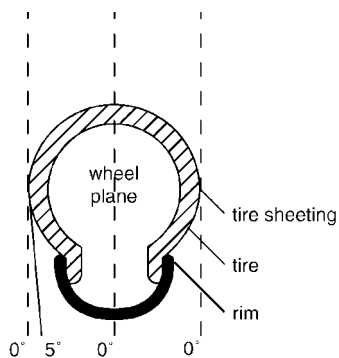


Figure 1

### Application Instructions and Equipment

Scotchlite reflective material – 8150 tire sheeting is an entirely elastomeric product designed for surface application

to flexible natural rubber products. During application the sheeting stretch should not exceed 5%. The full roll weight of the tire sheeting may be such that uncontrolled acceleration and stopping will over stretch the material and cause adhesion or aesthetic problems. Motorized or accumulator assistance is strongly recommended.

The application equipment should accommodate and unwind the level wound rolls, continuously remove the liner, and with slight pressure, tack the striping in a single revolution to pre-selected areas on the rubber carcass. The unwinder, liner removal, guides, and application head design must allow for smooth travel and minimum tension on the sheeting. An overlap splice of approximately 1/8 inch (3mm) should allow for carcass expansion during molding.

### Tire Quality Assurance

Tire manufacturers are individually responsible to assure that the rubber products they produce meet all applicable performance standards or specifications. The reflective performance should be monitored as part of a formal quality testing program. Reflective performance tests require the proper equipment and practices for measurements according to ASTM E809 or CIE Publication 54. Tire manufacturers should monitor the tire building and vulcanization processes giving special attention to adverse effects on the reflective performance.

### Avoid the following:

- Rubber staining ingredients and materials influencing staining migration.
- Handling the reflective areas during rubber piece(s) assembly, shaping, curing, and cooling.
- Stretching or distorting the rubber while over 212°F (100°C).
- Dust or mold release agents on the rubber or in the mold.
- Dirt and oil transfer from mold, steam leaks during molding, and condensation of volatiles after molding.
- Exterior coatings or sprays, finishing waxes, silicones, lacquers, or dressings.

### Storage and Shelf Life

Store new or partially used rolls of Scotchlite reflective material – 8150 tire sheeting in the original shipping container and packaging. Store at or below 80°F (27°C) and use within one year of receipt. Properly stored rolls can remain useful beyond this period but must be retested for physical, vulcanized, and reflective properties. Handling, applicator mounting, and application procedures should not disrupt the integrity of the wound rolls.

## Cleaning

To achieve and maintain the maximum reflective brilliance of the reflective tire sheeting, cleaning of the sidewall is recommended following tire mounting and periodically during use to remove accumulated road dirt and other oils.

Scrub the reflective sheeting with a stiff bristle brush which has been soaked in a soap or detergent and water solution. Rinse thoroughly with clean water and dry with a “clean” oil-free cloth.

Do not use abrasive cleaning powders, steel wool, abrasive pads, steel brushes, or abrasive papers as these may damage the lenses in the reflective sheeting and cause a reduction in reflective efficiency.

## Product Availability

3M™ Scotchlite™ Reflective Material – 8150 Tire Sheeting is available on level wound rolls with the following standard widths and roll lengths:

Units	Width	Width Tolerance	Standard Roll Length
inches	3/16” 5/16” 3/8”	< ±1/64”	5000 ft. 4165 ft. 2500 ft.
mm	4.8 mm 8.0 mm 9.5 mm	< ±0.4 mm	1524 m 1269 m 762 m

## Important Notice to Purchaser:

Except where prohibited by law, 3M makes the following limited warranty in place of any others, express or implied, including any implied warranties or conditions of MERCHANTABILITY or fitness for a particular purpose or any implied warranty or condition commonly found in the industry: 3M shall replace or, at its option, refund the price paid to 3M for any 3M™ Scotchlite™ Reflective Material or other 3M reflective products (“Products”) which at the time of shipment to 3M’s purchaser do not meet 3M’s published Product specifications.

Because of the unlimited variety of potential applications for Products, BEFORE production use, the User (which may be a converter or end product manufacturer or others) must determine that the Products are suitable for the intended use and are compatible with other component materials. User is solely responsible for determining the proper amount and placement of Products. While reflective Products enhance visibility, no reflective product can ensure visibility or safety under all possible conditions. **3M shall not be liable in contract or in tort, for any indirect, incidental, special, or consequential damages (including, without limitation, lost profits, goodwill and business opportunity) relating to the use or inability to use the Products.**



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## Order and Product Information

To order 3M™ Scotchlite™ Reflective Material Products, contact 3M Personal Safety Products Department Customer Service at 800-328-7098 Ext. 2.

## Health and Safety Information

Read all health hazards, precautionary and first aid statements found in the Material Safety Data Sheet, and/or product label of chemicals prior to handling or use. This product is a flexible film in which all ingredients are bound in a solids matrix. As shipped, the potential for hazardous exposure is not expected. However, upon heating or vulcanization, some vapors may be released, and the end-user (fabricator) must take the necessary precautions (mechanical ventilation, respirator program, etc.) to protect employees from exposure. Avoid inhaling fumes from hot rubber processing and vulcanization.

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