Scotchlite™ Reflective Material

3M™ Scotchlite™ Reflective Material – Product Bulletin

8735 Silver Flame Resistant Transfer Film

1. Product Description

3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film is intended for the application on a variety of different flame resistant garments to provide both enhanced visibility of the wearer during darkness and low light conditions and resistance to heat and flame.

The product will appear brilliant white, when illuminated by vehicle headlights, by returning the light back toward the original source and reaching the automobile driver's eye.

2. Product Features

2.1 Product Design

3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film consists of exposed high-performance glass lenses bonded to a special polymer layer, which is coated with a heat activated adhesive.

3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film comes without any liner and can directly be laminated to a variety of compatible substrates.

To ensure consistency of performance, 3M™ Scotchlite™ Reflective Materials are manufactured within an ISO 9001 controlled manufacturing environment.

2.2 High Performance according to ISO 20471 (High visibility warning clothing)

3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film:

- Exceeds the highest brightness requirements for retroreflective material according to ISO 20471.
- Is non-orientation sensitive.
- Offers industrial laundering durability per ISO 20471, Annex B. 15 cycles per ISO 15797, table 4 (procedure 2) depending on substrate.
- Offers 60 °C domestic wash durability per ISO 20471, 50 cycles per ISO 6330 6N/F depending on substrate.
- Offers good drape and fabric compatibility.

2.3 High Performance according to EN 469 (Protective clothing for firefighters)

3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film:

- Meets the performance requirements regarding brightness according to EN 469, 6.2.6.
- Exceeds the minimum retroreflective performance requirements of ISO 20471 after exposure to heat resistance according to EN 469, 6.2.6.
- Meets the performance requirements for heat resistance according to EN 469, 6.2.1.6, depending on substrate.
- Meets requirement for flame spread according to EN 469, 6.2.1.1, depending on the substrate.

2.4 Other Flame Resistant Standards

3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film:

- Meets the performance requirements for flame spread according to ISO 11611, 6.7, even after wash treatments as described under 2.2.
- Meets the performance requirements for flame spread according to ISO 11612, 6.3.2 (A1), even after wash treatments as described under 2.2.
- Meets requirement for limited flame spread index 3 according to ISO 14116, even after wash treatments as described under 2.2.

3. General Safety Information

Read the 3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film Product Bulletin carefully. The wearer is ultimately responsible for their own safety.

- Verify the suitability of 3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film for the intended use of the PPE (EC Directive 89/656/EEC Art. 4 and Art. 5; EC Communication 89/C328/EEC Annex § 7).
- No reflective material can guarantee absolute visibility.
- Various factors (e.g. environmental) can influence visibility. For further details, see chapter 9 – "Specific Safety Information".
- Field test the finished garment to verify suitability for intended use and for the selection of appropriate care conditions.

4. Product Application

Retroreflective materials are important in applications where enhanced visibility can reduce the risk of an accident.

Examples are

- Garments according to ISO 20471 (high visibility standard), EN 469 (protective clothing for firefighters) or garments according to EN 17353 (medium-risk standard) used for e.g. oil and gas industry, fire and rescue services, multi-norm garments.
- Reflective design elements

The final garment design is depending on the specific applications and needs to be assessed by the end-user

5. Product Converting

When converting/storing the reflective material, certain circumstances (see e.g. 6.2) may change the uniform appearance of the reflective material; the reflective properties – and hence the defined functionality – will not be affected by this.

5.1 Cutting

3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film can be hand cut or guillotined. Use very sharp cutting knives only and cut from the reflective side.

Note:

Cutting of 3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film may cause handling difficulties, particularly if the cut design is complex.

For the purpose of plotter-cut or kiss-cut of complex designs, application tape should be used on the reflective side prior to cutting. In this case, cut with the adhesive side up. Weed strip the cut material before placing it on the substrate with the adhesive side facing the substrate.

Please also refer to the 3M Technical Information "Plotter Cutting Guidelines for Glass Bead Products".

5.2 Lamination onto substrate

3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film can be applied directly to many different types of substrates.

3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film can be laminated using the process conditions recommended below. Converters are advised to determine which configuration best suits their lamination process.

5.3 Lamination Process – Heat Press

Work with lamination equipment which provides uniform heat and pressure.

The following recommendations are guidelines for heat press lamination. Other lamination methods (roll-to-roll, heat fusing, HF welding, hot air etc.) may also be used. Proper lamination parameters must be determined for each substrate to assure adequate adhesion.

Lamination Parameters	Time (s)	Tempera-ture (°C)	Pressure (kg/cm²)
Scotchlite 8735	15 - 20	165 - 190	1.5 - 2.8

- Preheat the press.
- Place the transfer film with the adhesive side facing the substrate.
- Apply heat and pressure as described. It is not recommended to apply film over seams and stitches.
- A press-cloth or a siliconized slip-sheet may be used to cover the transfer film and substrate during lamination, preventing the transfer of residues from the heat press to the surface of the reflective film.
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- For parameters for other specific machines or substrates, please contact your 3M representative.
- For future references carefully record all application parameters for each substrate and application.
- Following these parameters is essential to avoid variations in quality due to changes of machine set-up.

Note:

- In general, 3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film is not recommended for polyamide fabrics. The adhesion on polyamides such as Nylon is often not satisfying.

- Lamination onto polyurethane/polyvinylchloride coated substrates or other fabrics with a heat sensitive surface is not recommended.
- High lamination temperatures can damage the substrate and lower temperatures than recommended might result in unsatisfactory adhesion of the transfer film.
- Substrate finishes such as silicone, paraffin, fluorocarbon resin or flame-resistant coating might strongly influence the level of adhesion to the substrate.
- To ensure adequate adhesion to substrate, it is strongly recommended to test the application in the intended care procedure for the finished product.

Prior to production, it is essential to test the actual 3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film on the actual substrate being used.

- Whenever two or more pieces of reflective transfer film are used together on a single surface or as a set, they should be matched to assure uniform day time color appearance.
- Production dependent color deviations of new retroreflective material do not affect the suitability of 3M™ Scotchlite™ Reflective Material according to the performance requirements laid down in ISO 20471 or ISO 17353 for retroreflective material.

6. Handling and Storage

6.1 Product Storage

Store in a cool, dry area and use within 1 year of receipt.

Rolls should be stored in their original cartons, whilst partially used rolls should be returned to their shipping carton or suspended horizontally from the core via a rod or pipe.

Cut sheets should be stored flat.

6.2 Handling and Storage Precautions

Aggressive chemicals, e.g. Sulphur or chlorine containing compounds, perspiration, strong acids or bases may affect the aesthetic appearance of 3M™ Scotchlite™ Reflective Material.

Care must be taken by the user when handling 3M™ Scotchlite™ Reflective Material in hot and humid environments.

Measures like cooling, dehumidifying the manufacturing area and specific handling precautions should be taken. Appropriate specific storekeeping is essential.

Blemishing of the silver layer can occur if the front surface of the product has direct contact from hands during application or handling and is then exposed to hot and humid conditions, greater than 26 °C and greater than 70 % relative humidity, for a period of weeks.

These stains do not affect the retroreflective performance of the material and do not indicate that the input product was defective.

Knowing the individual situation, the user may contact 3M for further advice if needed.

7. Product Cleaning

Reflective fabrics and films naturally age. Ageing depends upon material type, conditions of use, environment and maintenance procedures.

The retroreflective performance of all reflective materials is affected by soiling. Any kind of dirt, liquid chemicals, grease and alike will reduce brightness in the area of contamination.

7.1 Caution

Washing/cleaning conditions harsher than those recommended below could diminish the brilliance of the material and shorten the product's lifetime significantly.

Therefore, the instructions must be strictly followed.

- No presoaking.
- No application of high alkaline products (e.g. heavy-duty products or stain removal products).
- No application of solvenated surfactants/detergents.
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- No additional bleaches.
- Do not overdry.

Before use, the suitability of the intended care process for 3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film must be determined. Test duration should mirror the anticipated maximum number of care cycles in use.

7.2 Industrial Wash 

7.2.1 Washing Conditions

3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film can be used in commercially available industrial wash equipment. The best results so far have been achieved with a front-loading, open pocket washer extractor.

- Brightly colored clothing should be washed separately from normal colored work wear.
- The wash process in such a single front-loading wash extractor should be based on a pre- and main-wash followed by a third bath, or a cool down and three rinse cycles with inter-spin.
- Extended rinsing is recommended to completely remove all detergent residues.
- Load factor should not exceed 70 %, with the liquor ratio for washing in the range of 1:4 to 1:5 and for rinsing in the range of 1:6 to 1:8.

Wash temperature should not exceed 75 °C. Total time of the pre- and main-wash bath should not exceed 20 minutes. Detergent: Low- to medium-alkaline, high-surfactant detergents are preferred.

- The detergent should not contain free sodium hydroxide or potassium hydroxide.
- Controlled detergent dosage should give actual wash lye concentration not exceeding those detailed below.

Parameter	Recommended	Maximum
pH value	≤10.0	≤ 11.0
Active Alkalinity Na_2O sodium oxide	≤ 600 mg/l	≤ 900 mg/l

Sour: The wash load should be effectively soured achieving a pH-value of 5.5 - 6.5 in the final rinse. (Alkalinity titration against phenolphthalein endpoint, without $BaCl_2$ addition).

Detergent systems with a high alkaline strength, containing organic solvents or free sodium/potassium hydroxide should **not** be used.

Detergent systems and sour should not contain any oxidizing chemicals, (e.g. chlorine bleach). Use of a lower pH and active alkalinity will increase the lifetime of the reflective fabric.

Use of a lower pH and lower active alkalinity will increase the lifetime of the reflective material. Actual lifetime will be dependent upon the wash equipment, the detergent system and its dosage level.

For different wash equipment types an equivalent wash process needs to be developed by the user to achieve maximum number of wash cycles. Number of wash cycles may differ from number certified in ISO 15797 wash process in each individual wash process.

7.2.2 Pretreatment

- Do not pre-soak laundry even in a low concentration of any bleach.

7.2.3 Drying conditions

Tumble Dry

- Load ratio: 1:25.
- Inlet temperature should not exceed 135 °C.
- The drying process must be controlled to ensure that the exhaust temperature does not exceed 90 °C.
- The drying process should be continued until the load is damp dry. Maximum drying time should not exceed 20 minutes.

Tunnel finish

- Inlet temperature should not exceed 160 °C.
- The drying time should not exceed 7 minutes.
- Spray steam pressure should not exceed 4 bar
- The distance between the garments during the finishing process should be in a range of 70 – 100 mm.
- Do not overdry. Reflective fabric temperature should not exceed 135 °C at any time during drying.

7.3 Homewash 

7.3.1 Washing Conditions

A colored clothing wash program without pre-wash should be used.

Parameter	Recommendation
Wash temperature range	30 °C to 60 °C
Max. wash time at highest wash temperature	12 minutes
Max. program time	60 minutes

Detergent: Brand powdered household detergents should be used. Recommended are detergents for delicate or colored laundry. Refer to the detergent manufacturer's recommendations for dosage in areas of high water hardness and for various degrees of garment soiling.

Wash temperatures higher than 60 °C are not recommended. The use of bleach or detergents containing organic solvent will result in a reduction in retroreflective performance.

Use of temperatures lower than 60 °C will increase the lifetime of the reflective fabric. Actual lifetime will be dependent upon the detergent system and its dosage level.

7.3.2 Do not use additional bleach. 

- No chlorine bleach.
- Do not presoak laundry even in a low concentration of any bleach.

7.3.3 Drying conditions 

Tumble Dryer

Tumble drying should be performed in a commercially available household dryer using the medium dry setting.

Do **not** overdry. Damp dry only.

Air Drying

Line drying is recommended where possible

7.4 Ironing Conditions 

- Use medium setting, use press cloth.
- Do **not** apply steam.

8. Product Maintenance

8.1 Maintenance Misuse

3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film is an optical system. Coating of the product with material of a high refractive index, such as oil, will greatly diminish reflective performance.

- No harsh mechanical treatment, e.g. abrasion with wire brushes or sandpaper.
- No uniform coating or spraying of oils, protective waxes, inks or paint.
- No application of products such as leather sprays or shoeshine.

8.2 Inspection

High-visibility warning clothing should be maintained in good condition and inspected regularly for signs of damage or deterioration.

Where frequent care cycles are performed, inspection should be pursued after every cleaning cycle. Records of test results should be kept for reference.

Replacement of the reflective material must be considered if the retroreflective performance is below

$R' = 100\ cd / (lx \cdot m^2)$ (refer to ISO 20471).

For specific guidance contact your 3M representative

8.3 Product Disposal

Product can be discarded attached to the garment. The product can be incinerated in a commercial or industrial facility or disposed in a sanitary landfill. Before recycling, the compatibility shall be determined with the intended recycling process.

9. Specific Safety Information

Visibility Limits see chapter 3 "General Safety Information"

Various environmental factors, like line of sight, rain, fog, smoke, dust and visual noise can influence visibility.

Recognition of the wearer can also be significantly reduced if the reflective material is covered, e.g. by simultaneously wearing other personal protective equipment or by obstacles in the working zone.

In such instances the wearer should be aware of these limitations.

The brightness of 3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film can also be diminished in extreme weather conditions.

Test results show that 3M™ Scotchlite™ Reflective Material – 8735 Silver Flame Resistant Transfer Film exceeds the retroreflective performance requirements in rainfall conditions as defined in ISO 20471 or ISO 17353. Initial brightness levels return as the material dries.

- Fog, mist, smoke and dust can scatter the light from headlights. The wearer must be aware that detection distances will be severely reduced.
- Visual noise (contrast variations in the visual field) decreases the contrast of the reflective material with the background and affects the visibility in low-light conditions.

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