

3M™ Scotchlite™ Reflective Material – Product Bulletin

5535 Segmented Flame Resistant Trim

1. Product Description

3M™ Scotchlite™ Reflective Material – 5535 Segmented Flame Resistant Trim is designed for use on safety garments requiring flame resistance as defined, for example, in test methods ASTM F1506 or ISO 11612. When properly used, 3M™ Scotchlite™ Reflective Material – 5535 Segmented Flame Resistant Trim helps to enhance the visibility of the wearer in night-time or low-light conditions when illuminated by a light source such as vehicle headlights, by returning the light back toward the original source and reaching the driver's eye. 3M™ Scotchlite™ Reflective Material – 5535 Segmented Flame Resistant Trim is composed of wide angle, exposed retroreflective lenses bonded to a heat activated adhesive. The trim is 50.8mm (2 inches) wide and comprised of reflective patterned segments on a blue plastic liner.

2. Product Features

2.1 Product Design

3M™ Scotchlite™ Reflective Material – 5535 Segmented Flame Resistant Trim is designed for use on safety garments requiring flame resistance as defined, for example, in test methods ASTM F1506 or ISO 11612. When properly used, 3M™ Scotchlite™ Reflective Material – 5535 Segmented Flame Resistant Trim helps to enhance the visibility of the wearer in night-time or low-light conditions when illuminated by a light source such as vehicle headlights, by returning the light back toward the original source and reaching the driver's eye. 3M™ Scotchlite™ Reflective Material – 5535 Segmented Flame Resistant Trim is composed of wide angle, exposed retroreflective lenses bonded to a heat activated adhesive. The trim is 50.8mm (2 inches) wide and comprised of reflective patterned segments on a blue plastic liner.

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

3M™ Scotchlite™ Reflective Material – 5535 Segmented Flame Resistant Trim:

- Exceeds the highest brightness requirements for a separate performance retroreflective material.
- Is non-orientation sensitive.
- Offers industrial laundering durability per ISO 20471, Annex B. 15 cycles per ISO 15797-8 and 5 cycles per ISO 15797-2.
- Offers 60°C domestic wash durability per ISO 20471, 65 cycles per ISO 6330 6N. depending on substrate.
- Offers good fabric compatibility.

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

3M™ Scotchlite™ Reflective Material - 5535 Flame Resistant Transfer Film:

- Meets the performance requirements regarding brightness according to EN 469 Annex B, B.3.
- Exceeds the minimum retroreflective performance requirements of ISO 20471 after exposure to heat resistance according to EN 469 Annex B, B3.1.
- Meets the performance requirements for heat resistance according to EN 469 Annex B, B.3.1, depending on the substrate.
- Offers excellent resistance to heat with high retroreflective performance retention after exposure to 260°C for 5 minutes, depending on the substrate.
- Meets requirement for flame spread according to EN 469 Annex B, B3.2, depending on the substrate.
- Meets requirement for limited flame spread index 3 according to ISO 14116, even after 50 wash cycles per ISO 6330 method 6N depending on the substrate.

2.4 Performance according to ISO 11612

3M™ Scotchlite™ Reflective Material – 5535 Flame Resistant Transfer Film:

- Meets the performance requirements for flame spread according to ISO 11612, 6.3.2 (A1).
- Meets the performance requirements for molten metal splash code letter D3 and code E2, both dependant on the substrate.

2.5 Special Features

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

3. General Safety Information

Read 3M™ Scotchlite™ Reflective Material – 5535 Segmented Flame Resistant Trim Product Bulletin carefully. The wearer is ultimately responsible for his/her own safety.

- While the use of 3M™ Scotchlite™ Reflective Material enhances visibility, no reflective material can guarantee absolute visibility, particularly in adverse weather conditions. Performance will vary depending upon actual use, exposure conditions and maintenance.
- Verify the suitability of 3M™ Scotchlite™ Reflective Material – 5535 Segmented Flame Resistant Trim for the intended use of the PPE (EC Directive 89/656/EEC Art. 4 and Art. 5; EC Communication 89/C328/EEC Annex §7).

4. Product Application

Whenever two or more pieces of 3M™ Scotchlite™ Reflective Material are used together on a single surface or as a set, they should be matched to ensure uniform colour and reflectivity. All safety garments should be constructed in accordance with the appropriate standards.

5. Product Converting

5.1 Cutting

Hand-cut or guillotine

5.2 Heat Lamination

- Work on a flat surface where uniform heat and pressure can be applied. Avoid applying film over seams and stitches.
- Place transfer film on fabric substrate with the adhesive side down and apply heat and pressure as described in table below. Use a non-stick slip sheet to protect the reflective surface.
- The lamination temperature, time and pressure listed below should be used as a guide. Each substrate and reflective film combination should be tested to determine the best set of conditions that will meet customer requirements.
- Other lamination methods, such as roll to roll, heat fusing and HF welding can also be used. The proper temperature, time and pressure conditions must be tested for each fabric to ensure adequate adhesion and physical performance.

Substrate	Temperature	Dwell Time	Line Pressure
5535 Segmented Flame Resistant Trim	175-190 °C (350-375 °F)	20 seconds	Firm (30-40 psi)

Note: The optimal application temperature and pressure will vary depending on substrate and equipment.

Manufacturers should carry out tests to determine appropriate conditions for each and every application.

6. Handling and Storage

6.1 Product Storage

In order to preserve performance, store in a cool, dry area and use within one year after date of receipt. Store rolls in original shipping cartons. Return partially used rolls to the carton or suspend horizontally through the core. Cut pieces should be stored flat.

6.2 Handling and Storage Precautions

This product contains an aluminum layer as part of the construction. Blemishing of this aluminum layer can occur if the front surface of the product has direct contact from hands during application and is then exposed to hot and humid conditions greater than 27 °C (80 °F) and greater than 70% relative humidity for a period of weeks. These blemishes do not affect performance of the product. Please refer to 3M Technical Bulletin “Care Guidelines to Reduce Staining on 3M™ Scotchlite™ Reflective Material.”

7. Product Cleaning and Maintenance

Important: Test each application according to appropriate care instructions required for the finished product. Actual life of 3M™ Scotchlite™ Reflective Material – 5535 Segmented Flame Resistant Trim depends on cleaning methods and wear conditions. Care label recommendations:



7.1 Caution

Washing/cleaning conditions harsher than those recommended below could diminish the brilliance of the fabric and shorten the product’s lifetime significantly. The following instructions therefore 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 detergents or micro-emulsions.
- No additional bleaches.
- Do not overdry.

Before use, the suitability of the intended care process for 3M™ Scotchlite™ Reflective Material – 5535 Segmented Flame Resistant Trim 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

Scotchlite 5535 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 coloured clothing should be washed separately from normal coloured 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 interspin. 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.

Use of a lower pH and active alkalinity will increase the lifetime of the reflective fabric. 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.

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 or potassium hydroxide.

Controlled detergent dosage should give actual wash lye concentration not exceeding those detailed below.

Parameter	Recommended	Maximum
pH- value	10.0 to 10.5	≤ 11.0
Active Alkalinity Na ₂ O 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 BaCl₂ 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 oxidising chemicals, (e.g. chlorine bleach).

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

7.2.2 No chlorine bleach

- Do not store a wash batch even in a low concentration of bleach.

7.2.3 Drying conditions

Tumble Dryer

- 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.

Tunnel finish

For 3M™ Scotchlite™ Reflective Material – 5535 Segmented Flame Resistant Trim laminated to aramid blend fabrics with an area weight of 220-240 g/m².

- Inlet temperature should not exceed 160°C.
- The drying time should not exceed 5 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

Recommendation:

Wash temperature range: 30°C to 60°C
 Max. wash time at highest wash temperature: 12 minutes
 Max. program time: 50 minutes
 Recommended load ratio: 70%

Detergent: Brand powdered household detergents should be used. Recommended are detergents for delicate or

coloured laundry. Refer to the detergent manufacturer's recommendations for dosage in areas of high water hardness and for various degrees of garment soiling.

The use of bleach or detergents containing organic solvent will result in a reduction in retroreflective performance.

Use of temperatures lower than 40°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 bleach

Do not pre-soak laundry even in a low concentration of 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 Dry Cleaning Conditions

- Dry Cleaning is not recommended.

7.5 Ironing Conditions

- Use low setting. Use press cloth.
- Do **not** apply steam.

8. Specific Safety Information

8.1 Maintenance Misuse

- 3M™ Scotchlite™ Reflective Material – 5535 Flame Resistant Transfer Film is an optical system. Coating of the product with material of high refractive index, such as oil, will greatly diminish reflective performance.
- No harsh mechanical treatment e.g. abrasion with wire brushes or sand paper.
- No uniform coating or spraying of oils, protective waxes, inks or paint.
- No application of products such as leather sprays or shoe shine.

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 carried out after every cleaning cycle. Records of test results should be kept for reference.

8.3 Product Disposal

Product can be recycled 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 – 5535 Segmented Flame Resistant Trim can also be diminished in extreme weather conditions. Test results show, that 3M™ Scotchlite™ Reflective Material – 5535 Flame Resistant Transfer Film exceeds the retroreflective performance requirements in rainfall conditions as defined in ISO 20471. Initial brightness levels return as the material dries.
- Fog, mist, smoke and dust can scatter the light from headlights so the wearer must be aware that the detection distance 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.



Important Notice to Purchaser / Converter / Wearer:

All statements, technical information and recommendations herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed. We shall not be liable and no warranty shall apply for products not applied according to our published information folder. Before using / converting, the user / converter must determine the suitability of the product for its intended use / converting, and the user / converter assumes all risk and liability whatsoever in connection therewith. All questions of warranty and liability relating to this product are governed by the terms of the sale subject where applicable to the prevailing law. No statement or recommendation not contained herein shall have any force or effect unless in an agreement signed by officers of us.



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