

3M™ Scotchlite™ Reflective Material – Product Bulletin

9945 Silver Industrial Wash Flame Resistant Fabric

1. Product Description

3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric is intended to enhance the visibility of the wearer during darkness and in low-light conditions. It can be applied to fire fighting apparel and flame resistant occupational work wear, where enhanced visibility of the wearer, in combination with heat resistance and wear durability is required.

The fabric will appear brilliant white when illuminated by vehicle headlights, even when the wearer is situated at the side of the road.

When converting/storing the reflective material certain circumstances (see e.g. 6.2) may change the uniform appearance of the reflective material, but will not affect the reflective properties, and therefore, the defined functionality.

2. Product Features

2.1 Product Design

3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric consists of exposed high performance glass lenses bonded to a special polymer layer and a flame resistant aramid backing.

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

3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric:

- Exceeds the highest brightness requirements for retroreflective material.
- Is non-orientation sensitive.
- Offers industrial laundering durability per ISO 20471, Annex B. 100 cycles per ISO15797 table 4 (procedure 2)
- Offers industrial laundering durability per ISO 20471, AnnexB. 50 cycles per ISO15797 table 1 (procedure 2)
- Offers 60°C domestic wash durability per ISO 20471, 100 cycles per ISO 6330 6N.
- Offers good dry cleaning durability, per ISO 20471. 50 cycles per ISO 3175-2, 8.1.
- Offers enhanced resistance against abrasion and chemicals.

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

3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric:

- Complies with the performance requirements for flammability
- after all wash claims mentioned in chapter 2.2.
- Exceeds the minimum retroreflective performance requirements of ISO 20471 after radiant heat at 10kw/m² for 3 minutes and convective heat exposure at 180°C for 5 minutes.
- Offers excellent resistance to heat with high retroreflective performance retention after exposure to 260°C for 5 minutes after all wash claims mentioned in chapter 2.2.

2.4 Special Feature

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

3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric is certified according to Standard 100 by OEKO-TEX®, Class 1.

3. General Safety Information

Read 3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric Product Bulletin carefully.

The wearer is ultimately responsible for his/her own safety.

- Verify the suitability of 3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric 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 its suitability for intended use and to select appropriate care conditions.

4. Product Application

Retroreflective materials are important in applications where being visible can reduce the risk of an accident. Examples of hazardous situations where high-visibility garments should be worn include exposure to vehicular traffic of motorways, rural and urban roads, railway environments, airports and docks.

3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric is a highly durable flame resistant material recommended for garments that will be subjected to domestic or industrial laundry procedures.

4.1 Occupational Application

Fire fighting apparel and flame resistant occupational work wear, where enhanced flame and heat resistance as well as high wear durability is required, such as fire coats, turnout coats, trousers, coveralls, jackets and uniforms.

5. Product Converting

5.1 Cutting

3M™ Scotchlite™ Reflective Material 9945 Silver Flame Resistant Fabric can be handcut, die-cut or guillotined (max. 5 cm stack height).

Note:

Use very sharp cutting knives only and cut from the reflective side.

5.2 Sewing

3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric can be applied directly to a fabric. It is best suited for flame resistant fabrics with a weight of 230 – 350 g/m².

The reflective fabric should be sewn with a coated circular top needle, using a flame retardant thread (e.g. aramid). To minimise edge fraying, sew in place using a lockstitch of 3mm stitch length, placed at least 2mm from the edge of the reflective fabric.

Note: Whenever two or more pieces of reflective fabric are used together on a single surface or as a set, they should be matched to ensure uniform daytime colour appearance.

Production dependent colour 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 for retroreflective material.

5.3 Silk Screen Printing

Due to the product construction, durable prints on glass bead products are difficult to obtain.

Choice of ink will depend upon usage conditions and care procedures. User should make test applications and select the appropriate care instruction for the finished product to ensure adequate adhesion of the ink. It is recommended that the ink adhesion be tested on the actual batch of 3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric being used before production.

When illuminated by e.g. vehicle headlights, opaque silk screen printing inks will appear black and greatly diminish the brightness in the printed areas, transparent inks will reduce brightness when viewed as retroreflected light at lowlight conditions.

Note: Refer to 3M Technical Information “**Printing Guideline for Glass Bead Products**”. For further information contact your 3M representative.

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 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 Materials. When exposed to excessive heat and more than 70% relative humidity conditions, these products have the potential to become stained. These stains do not affect the retroreflective performance of the material and do not indicate that the input product was defective.

Care must be taken by the user when handling 3M™ Scotchlite™ Reflective Materials in hot and humid environments. During application, storage and shipping, ambient conditions should be kept. Measures like cooling, dehumidifying the manufacturing area and specific handling precautions should be taken. Appropriate specific store keeping is essential.

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

7. Product Cleaning and Maintenance

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 significantly diminish the brilliance of the fabric and shorten the product's lifetime.

Therefore, the instructions must be strictly followed.

- No pre-soaking.
- No application of high alkaline products (e.g. heavy duty products or stain removal products).
- No application of solvenated detergents
- Per-acetic bleaches are approved by certification
All other bleaches need to be evaluated
No additional chlorine bleaches.
- Do not overdry.

Before use, the suitability of the intended care process for 3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric 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 9945 Silver Industrial Wash Flame Resistant Fabric can be washed 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.

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	10.5 to 11.0	≤ 11.6
Active Alkalinity Na ₂ O sodium oxide	≤ 650 mg/l	≤ 1000 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.

Use of a lower pH and lower 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

7.2.2 No chlorine bleach

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

Tunnel finish

For 3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric sewn 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

7.3.1 Washing Conditions

A coloured clothing wash programme without pre-wash should be used.

Recommendation:

Wash temperature range:	30 °C to 60 °C
Max. wash time at highest wash temperature:	12 minutes
Max. program time:	50 minutes

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

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.
- Feasibility of other bleaches has to be evaluated

Do not store a wash batch even in a low concentration of chlorine 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

Cleaning process should be based on a pre- and main-bath only. For P it is recommended to only use pure perchloroethylene. Adjust load and solvent level to give a moderate mechanical action.

Max. solvent temperature:	30 °C
Recommended drying temperature:	48 °C
Max. inlet temperature:	80 °C
Max. exhaust temperature:	60 °C
Max. drying time:	15 minutes
Max. program time:	60 minutes

If stain removing substances (e.g. surfactant-based cleaning booster) need to be used, their compatibility with the reflective material should be determined prior to the application.



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 9945 Silver Industrial Wash Flame Resistant Fabric is an optical system. Coating of the fabric 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 materials such as leather spray 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 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 RA = 100 cd/lux/m² (refer to ISO 20471).

For specific guidance contact your local 3M representative.

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 such as 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 personal protective equipment or obstacles in the working zone.

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

The brightness of 3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric can also be diminished in extreme weather conditions.

- The brightness of 3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric can also be diminished in extreme weather conditions. Test results show, that 3M™ Scotchlite™ Reflective Material 9945 Silver Industrial Wash Flame Resistant Fabric 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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