



Scotchlite™
Reflective Material

3M™ Scotchlite™ Reflective Material – Product Bulletin

8986 NFPA Fluorescent Orange Flame Resistant Fabric

1. Product Description

3M™ Scotchlite™ Reflective Material – 8986 NFPA Fluorescent Orange Flame Resistant Fabric is intended to enhance the visibility of the wearer, when applied to firefighting apparel and flame-resistant occupational work wear. It is most appropriate where enhanced visibility of the wearer during daytime, and in lowlight nighttime conditions, in combination with heat resistance and wear durability, is required.

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

2. Product Features

2.1 Product Design

3M™ Scotchlite™ Reflective Material 8986 NFPA Fluorescent Orange Flame Resistant Fabric consists of exposed high performance glass lenses bonded to a special polymer layer and a flame resistant, durable cloth backing (100 % cotton).

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 – 8986 NFPA Fluorescent Orange Flame Resistant Fabric:

- Exceeds the highest brightness requirements for a combined performance retroreflective material according to ISO 20471.
- Is non-orientation sensitive.
- Meets the requirements for fluorescent yellow background material when new (clause 5.1), after Xenon (clause 5.2) and after being subjected to

convective heat test at 180°C for 5 minutes for the fluorescent yellow parts.

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

3M™ Scotchlite™ Reflective Material – 8986 NFPA Fluorescent Orange Flame Resistant Fabric:

- 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.

2.4 Other Flame Resistance Standards

3M™ Scotchlite™ Reflective Material – 8986 NFPA Fluorescent Orange Flame Resistant Fabric:

- Meets the performance requirements for flame spread according to ISO 11611, 6.7.
- Meets the performance requirements for flame spread according to ISO 11612, 6.3.2 (A1).
- Meets requirement for limited flame spread index 3 according to ISO 14116.

3. General Safety Information

Read the 3M™ Scotchlite™ Reflective Material – 8986 NFPA Fluorescent Orange Flame Resistant Fabric Product Bulletin carefully. The wearer is ultimately responsible for his/her own safety.

- Verify the suitability of 3M™ Scotchlite™ Reflective Material – 8986 NFPA Fluorescent Orange 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 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 – 8986 NFPA Fluorescent Orange Flame Resistant Fabric can be hand cut, die-cut or guillotined. Use very sharp cutting knives only and cut from the reflective side.

- Whenever two or more pieces of reflective fabric 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 combined performance 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.

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 fabric 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.
- No additional chlorine bleaches.
- Do not overdry.

Before use, the suitability of the intended care process for 3M™ Scotchlite™ Reflective Material – 8986 NFPA Fluorescent Orange Flame Resistant Fabric must be determined.

7.2 Homewash



7.2.1 Washing Conditions

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

Parameter	Recommendation
Wash temperature range	Up to 40 °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 40 °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 40 °C will increase the lifetime of the reflective fabric. Actual lifetime will be dependent upon the detergent system and its dosage level.

7.2.2 Do not use additional bleach.

7.2.3 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.

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.

7.3 Ironing Conditions

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

8. Product Maintenance

8.1 Maintenance Misuse

3M™ Scotchlite™ Reflective Material – 8986 NFPA Fluorescent Orange Flame Resistant Fabric 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 $R' = 30 \text{ cd} / (\text{lx} \cdot \text{m}^2)$ (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 – 8986 NFPA Fluorescent Orange Flame Resistant Fabric can also be diminished in extreme weather conditions.

- Test results show that 3M™ Scotchlite™ Reflective Material – 8986 NFPA Fluorescent Orange Flame Resistant Fabric 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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