

# 3M Scotchlite™

Reflective Material

We make people visible

## Important Notice

To order a copy of the Standard visit The Canadian Standards Association online store at [www.csa.ca](http://www.csa.ca) or call 800.463.6727.

This brochure is a general guide only. For complete details of the CAN/CSA Z96-02 Standard, please contact your local 3M Personal Safety Products Sales Representative.

Personal Safety Products Department  
3M Occupational Health and  
Environmental Safety Division

3M Canada Company  
P.O. Box 5757  
London, Ontario, Canada  
N6A 4T1

1-800-265-1840 ext. 6236  
[www.3M.com/ca/besaferbeseen](http://www.3M.com/ca/besaferbeseen)

3M and Scotchlite are trademarks of 3M. Used under license in Canada.  
© 3M 2005  
0310-CL-18405E

3M Scotchlite™  
Reflective Material

# 3M Scotchlite™

Reflective Material

We make people visible

## CAN / CSA Z96-02 Standard High Visibility Safety Apparel Overview



3M Scotchlite™  
Reflective Material

## Index

Page 2	Introduction
Page 2	Elements
Page 2	Classification of Garments
Page 3	Garment Class Examples
Page 4	Alternative Designs
Page 5	Stripes/Bands Configuration
Page 5	Stripes/Bands Requirements
Page 5	Patches and Lettering
Page 5	Chromaticity and Luminance
Page 6	Background Material
Page 6	Retroreflective Material
Page 7	Flame Resistant Criteria
Page 8	Label Requirements
Page 8	Selection
Page 9	Summary



## Introduction

The Canadian Standards Association (CSA) exists to produce standards that help to protect Canadians from hazards in almost every aspect of daily living. Recently, standards for personal protective equipment was developed by CSA with the support of many Canadian employer/labour users, producers, special interest groups, and regulators. The CAN/CSA Z96-02 addresses high visibility safety apparel, an area where consistency in Canadian regulations and standards was necessary.

## CAN/CSA Z96-02: Elements

- 1 Classification of High Visibility Garments
  - Three classes of garments
- 2 Garment Design Criteria
  - Trim placement to enhance visibility and safety
- 3 Background material – Daytime Visibility
  - Performance tests and colour specifications
- 4 Retroreflective material – Nighttime Visibility
  - Performance specifications
- 5 FR issues
  - Allowances for background and retroreflective materials
- 6 Certification and Labels
  - Self - Declaration
  - Detailed Garment Labels

## Classification of Garments

	Class 1 Apparel	Class 2 Apparel	Class 3 Apparel
Description of Minimal Coverage	Basic harness or stripes/bands over the shoulder(s) and encircling the waist.	Full coverage of upper torso (front, back, sides and over the shoulders*).	Class 2 apparel plus bands encircling both arms and both legs. These bands shall be composed of combined performance stripes/bands or a combination of retroreflective and background material.
Background material minimums	0.14 m <sup>2</sup> (217 in <sup>2</sup> )	See Above	See Above
Retroreflective or combined-performance material used in conjunction with background material	0.10 m <sup>2</sup> (155 in <sup>2</sup> )	0.13 m <sup>2</sup> (201 in <sup>2</sup> )	0.20 m <sup>2</sup> (310 in <sup>2</sup> )
Photometric performance	Level 1 or Level 2	Level 1 or Level 2	Level 2
Combined-performance material used without background material	0.20 m <sup>2</sup> (310 in <sup>2</sup> )		
Photometric performance	Level 1 or Level 2		

## CAN/CSA Z96-02 Garment Classes

### Class 1 Apparel



Basic harness or stripes/bands over the shoulder(s) and encircling the waist.

### Class 2 Apparel



Full coverage of upper torso (front, back, sides and over the shoulders).

Note: The center portion of the front torso band, between the two vertical bands, is optional.

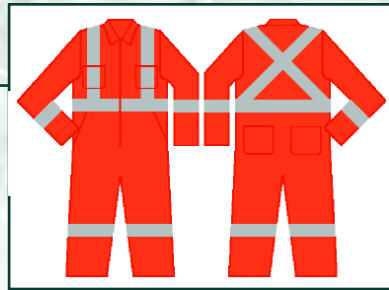
### Class 2 Apparel (Special Case)



As a special case, bib-style overalls are recognized as Class 2 apparel.

Note: The leg bands shown here are optional.

**Class 3 Apparel**



Class 3 apparel plus bands encircling both arms and both legs. These bands shall be composed of combined performance stripes/bands or a combination of retroreflective and background material.

**Class 3 Apparel (Minimum)**



Class 3 apparel plus bands encircling both arms and both legs. These bands shall be composed of combined performance stripes/bands or a combination of retroreflective and background material.

**CAN/CSA Z96-02 Alternative Garment Designs**

**Class 2**



**Class 3**



**Stripes/Bands Configuration**

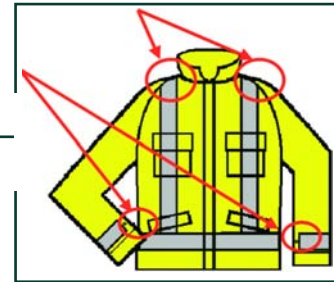


Note: The center portion of the front torso band, between the two vertical bands, is optional.

Stripes/bands shall be laid in the following distinctive standardized pattern:

- a) A symmetric "X" on the back extending from the shoulders to the waist
- b) Two vertical stripes on the front extending over the shoulders and down to the waist; and
- c) A waist-level horizontal stripe extending entirely around the back to the bottom of the vertical stripes

**Stripes/Bands Requirements**



- All bands shall be not less than 50 mm in width
- Gaps for fastening or seams shall not exceed 50 mm
- Multiple bands must be spaced a minimum of 50 mm apart
- Bands near edges shall not be placed less than 50 mm from edge

**Patches and Lettering**

**Retroreflective**



- 500 cm<sup>2</sup>
- 15 cm x 33 cm
- 77 1/2 inches<sup>2</sup>
- 7" x 11"
- Can not obscure pattern

**Non - Retroreflective**



- 100 cm<sup>2</sup>
- 5 cm X 20 cm
- 15 1/2 inches<sup>2</sup>
- 2" X 7 3/4"
- Can not cover trim

**Chromaticity and Luminance**

The chromaticity and luminosity values of the background material shall meet or exceed the minimums listed in Table 2A or 2B

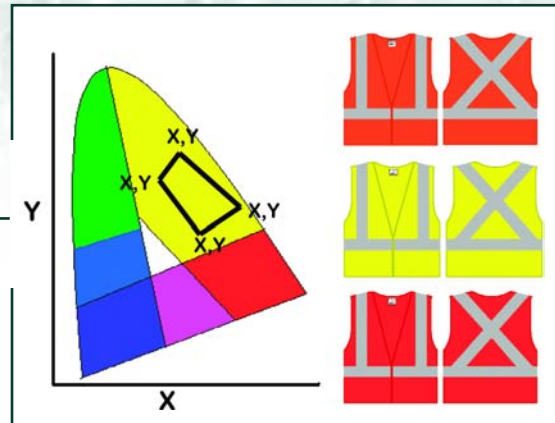
Samples of material should be tested over a Black background and be only 1 layer thick

**Table 2A – Colour, Fluorescent background material**

Colour	Chromaticity coordinates		Minimal luminance factor 8 min
	x	y	
Fluorescent Yellow-Green	0.387	0.610	0.76
	0.356	0.494	
	0.398	0.452	
	0.460	0.540	
Fluorescent Red-Orange	0.610	0.390	0.40
	0.544	0.376	
	0.579	0.341	
	0.655	0.344	
Fluorescent Red	0.655	0.344	0.25
	0.579	0.341	
	0.606	0.314	
	0.690	0.310	



## Background Material - Daytime Visibility



Bright or  
Fluorescent  
Red-Orange

Bright or  
Fluorescent  
Yellow-Green

Bright or  
Fluorescent  
Red

## Retroreflective Material - Nighttime Visibility

### Level 2

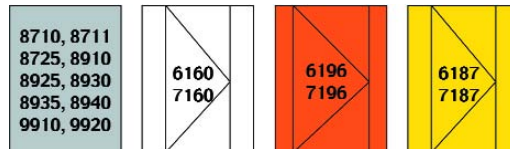
Table 5: Minimum coefficient of retroreflection in cd/ (lx m<sup>2</sup>) for Level 2 retroreflective or combined-performance retroreflective material

Observation angle	Entrance angle			
	5°	20°	30°	40°
12°	330	290	180	65
20°	250	200	170	60
1°	25	15	12	10
1° 30'	10	7	5	4

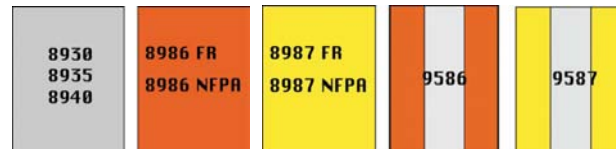
### Level FR

Table 7: Minimum coefficient of retroreflection in cd/ (lx m<sup>2</sup>) for Level FR retroreflective or combined-performance retroreflective material

Observation angle	Entrance angle			
	5°	20°	30°	40°
12°	65	50	20	5
20°	25	20	5	1.75
1°	5	4	3	1
1° 30'	1.5	1	1	0.5



These 3M products meet and exceed Level 2 brightness



These 3M products meet and exceed Level FR brightness

## Flame Resistant Allowances

The stripes or bands shall be not less than 50mm wide and shall have retroreflective or both retroreflective and fluorescent surfaces

The chromaticity and luminosity values of the background material shall meet or exceed the minimums listed in Table 2B

Table 2B – Colour, Bright background material

Colour	Chromaticity coordinates		Minimal luminance factor
	x	y	
Bright Yellow-Green	0.387	0.610	0.38
	0.356	0.494	
	0.398	0.452	
Bright Red-Orange	0.460	0.540	0.20
	0.610	0.390	
	0.544	0.376	
Bright Red	0.579	0.341	0.125
	0.655	0.344	
	0.655	0.344	
	0.579	0.341	
	0.606	0.314	
	0.690	0.310	

## Flame Resistant Garments - Examples

### Class 1/Level FR



7.2.2.3  
The design of the stripes or bands on the garment should also comply with Clause 4.2.2

### Class 3/Level 2



## Label Requirements

**Safetywear Co.  
Utility Coverall – Model 1000**

3M™ Scotchlite™ Reflective Material –  
8940 Silver Industrial Wash FR Fabric

**Size: Extra Large**

**CAN/CSA Z96**

**Class 3**

**Level 2**

**FR Bright Red-Orange**

**NOMEX® Background Material**

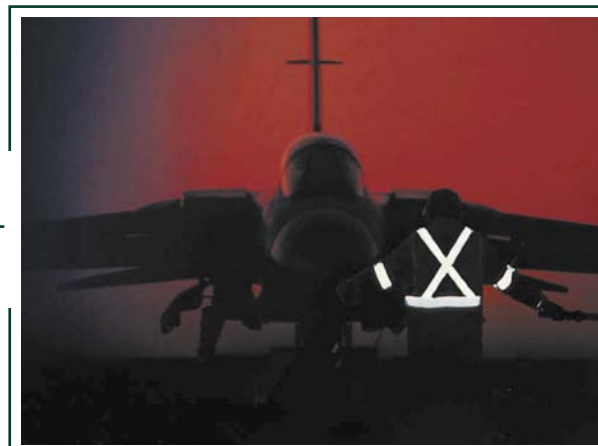


Machine wash warm, 60°C (140°F)  
Only non-chlorine bleach, if needed  
Tumble dry low  
Iron medium  
Dry-clean normal



## Selection

- Evaluate the workplace background or the environment
- Consider the work conditions (e.g. indoor or outdoor?)
- Calculate the degree of exposure to hazards
- Speeds of vehicles (warning distances and times)
- Existing engineering and administrative hazard controls
- Compatibility with other P.P.E used
- Sight lines of vehicle operators
- Other special work demands
- Is the retroreflective product certified to CAN/CSA Z96-02?



## CAN/CSA Z96-02: Summary

**Minimum trim width:**

- 50 mm

**Stripes/ bands pattern:**

- Symmetric “X” on the back
- Two vertical stripes on the front
- Waist-level horizontal stripe extending entirely around garment

**Others:**

- Gaps for fastening or seams shall not exceed 50 mm
- Bands be placed no closer than 50 mm from edges
- ID Patches and Lettering
  - Retroreflective = 500 cm<sup>2</sup>
  - Non-Retroreflective = 100 cm<sup>2</sup>



CAN/CSA Z96-02 Classes	Class 1	Class 2	Class 3
<b>Trim Levels (Minimum Ra)</b>	<b>Level FR (≥65 Ra)</b> 	<b>Level 1 (≥250 Ra)</b> 	<b>Level 2 (≥330 Ra)</b> 
<b>Background Colours (Fluorescent or Bright)</b>	<b>Yellow-Green</b> 	<b>Red-Orange</b> 	<b>Red</b> 