

HiVis ANSI/ISEA 107-2020 Standard

High Visibility Rainwear

Summary

Scope:

This standard specifies performance requirements for high-visibility safety apparel (HVSA). For the purpose of this standard, HVSA shall be used to mean PPE intended to provide conspicuity to the user in hazardous situations under any light conditions by day and under illumination by vehicle headlights in the dark or other low light conditions.

Performance requirements are included for:

- Color
- Retroreflection
- Physical properties
- Minimum areas of background material
- Minimum areas of retro-reflective and combined performance materials
- Recommended configurations

Terminology:

Background material: Colored fluorescent material intended to be highly conspicuous in daytime and dawn/dusk conditions, but not intended to comply with the requirements of this standard for retro-reflective material.

Combined-performance retro reflective material: Material that exhibits both background and retro-reflective properties.

Conspicuity: The characteristics of an object influencing the probability that it will come to the attention of an observer, especially in a complex environment, which has competing objects.

Fluorescent material: Material that instantaneously emits optical radiation within the visible range at wavelengths longer than absorbed and for which emission ceases upon removal of the source of irradiation. These materials enhance daytime visibility, especially during dawn and dusk.

Retro reflective material: Material that reflects and returns a relatively high proportion of light in a direction close to the direction from which it came.

Types and Classes:

Types are designated for work environment application. Classes specify the minimum areas of materials used.

Types:

- Type O – Off Road – Non-roadway use
- Type R – Roadway – Roadway use
- Type P – Public Safety – Emergency, incident responders and law enforcement

Classes:

- Class 1 – Type O only
- Class 2 – Type R or P

- Class 3 – Type R or P
- Class E – supplemental, to be used in conjunction with Class 2 or 3

Garment Design Requirements:

- Whenever multiple bands are placed on the garment, then bands shall be spaced in a manner which provides a minimum distance between bands of retro reflective material at least equal to the width of the band.
- Whenever horizontal retro reflective materials are placed near the bottom edge of a garment, the material shall not be placed less than 50mm (2”) above the bottom.
- If upper bands are utilized, they shall encircle the upper part of the sleeves between the elbow and the shoulder. When lower placement is utilized, the bottom edge of the material shall not be less than 50mm (2”) from the bottom of the sleeve.
- Gaps in retro reflective and background materials to enable fastening shall not be more than 50mm (2”) horizontally.
- Retro-reflective or combined-performance and background materials shall be positioned so as to provide 360 ° visibility. A contiguous band of background or combined-performance material shall fully encircle the wearer.
- There must be retro-reflective or combined-performance material that encircles the arm and have a minimum of 150 cm² (23.3 in²) in the shoulder area.
- Overalls or Waistband trouser may be classified as Class E garments if they have a minimum of .07 m² retro reflective material.
- When such Class E garments are worn with a Class 2 vest, waistcoat, jacket, or poncho, the overall classification for the ensemble shall be classified as a Class 3 ensemble.
- All reflective tape shall be placed no less than 2 inches above the bottom of the trouser leg.

Color Requirements:

Only 3 colors are acceptable; Fluorescent yellow-green, fluorescent orange-red and fluorescent red.

Chromaticity, both initially and after 40 AATCC 16-1993 fading units, is defined as shown below:

Background Material Color			
Fluorescent Color	Chromaticity Coordinates		Min. Luminance Factor Y (%)
	x	y	
Fluorescent Yellow-Green	0.387	0.610	70
	0.356	0.494	
	0.398	0.452	
	0.460	0.540	
Fluorescent Orange-Red	0.610	0.390	40
	0.535	0.375	
	0.570	0.340	
Fluorescent Red	0.655	0.345	25
	0.570	0.340	
	0.595	0.315	
	0.690	0.310	

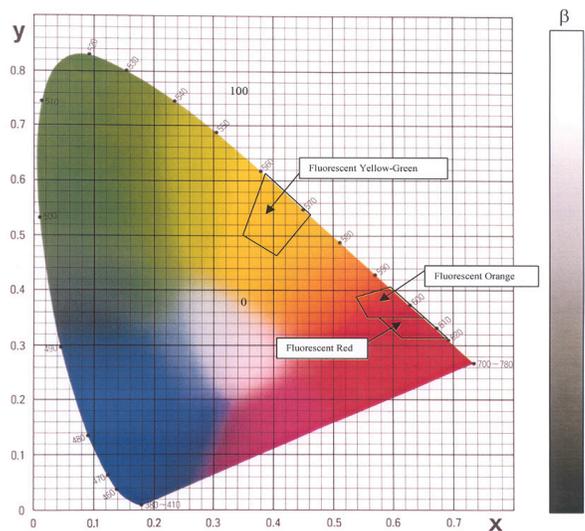


Figure 1: CIE 1931 x, y Chromaticity Diagram. Also noted are color requirement areas for ANSI/ISEA 107.

Physical Requirements:

- Bursting Strength of Knitted Materials and other Nonwoven Constructions: 178N (40 lb)
- Tear Resistance of Woven Materials (Uncoated, Coated or Laminate) Min: 13N (1.3 kg)
- Resistance to Water Penetration: Per AATCC 35-2018; Less than or equal to 1.0 gram of water for level 1. Per AATCC 127-2017, hydrostatic resistance minimum of 200cm after 5 launderings. Per AATCC 22-2017, spray test, requires 90 originally and 70 after 5 launderings.
- Water Vapor Permeability for breathable materials: Per ASTM E96-2016:
 - For microporous materials Procedure B – 600 g/m²/24 hrs.
 - For hydrophilic materials Procedure BW – 3600 g/m²/24 hrs.

Flame Resistance:

To be marked as Flame Resistant, the material must fully meet the requirement of one of the following specifications or standards:

- ASTM F1506
- ASTM F1891
- ASTM F2302
- ASTM F2733
- NFPA 1977
- NFPA 2112

Labeling Requirements:

- **Care Labeling:** Washing or cleaning instructions shall be indicated in accordance with ASTM D5489-01a, as relevant. Then maximum number of processes shall be stated after ‘maximum’ next to the care labeling.
- **Specific Marking:**
 - Name of manufacturer
 - Product name, size
 - Number of this specific ANSI standard (ANSI/ISEA 107-2020)
 - Letters “FR” and statement of which FR standard has been met
 - If not FR, the following must be stated: “This garment is not flame resistant as defined by ANSI/ISEA 107-2020 Section 10.5”
 - Pictogram showing the Type, Class and Flame Resistance.
 - Instructions for use to include:
 - Fit, how to don and doff
 - Necessary warnings of misuse
 - Limitation of use
 - Storage
 - Maintenance and cleaning instructions

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