SAFE REFLECTIONS

HIGH-VISIBILITY SAFETY APPAREL (HVSA): WHAT YOU NEED TO KNOW

NAVIGATING THE ANSI/ISEA 107-2020 STANDARD

WHAT IS THE ANSI/ISEA 107-2020 STANDARD?

In industries where visibility is critical for worker safety, the ANSI/ISEA 107-2020 standard plays a vital role. This standard, set forth by the American National Standards Institute (ANSI) and the International Safety Equipment Association (ISEA), provides comprehensive guidelines for high-visibility safety apparel (HVSA). Understanding these guidelines ensures that workers have garments that provide adequate protection in various environments. The use of HVSA is mandated by state law and the Occupational Safety and Health Administration (OSHA) in many workplace situations in or around traffic. The ANSI/ISEA 107-2020 standard specifies performance requirements for HVSA to enhance the visibility of workers. These garments are designed for occupations where there is a need to be seen by drivers of moving vehicles or equipment under any light conditions either by day or under illumination by headlights in the dark. The standard outlines the requirements for materials, design, and construction of high-visibility garments, and serves as a guideline for manufacturers in designing HVSA and assists employers in selecting appropriate apparel for their workers. While compliance is voluntary, adherence is often mandated by occupational safety regulations and is crucial for worker safety in environments with vehicular traffic or machinery.

The standard addresses:

- The **type and class** of garments based on job function and risk exposure
- **Material specifications** including color and retroreflectivity
- **Garment design and layout** for 360-degree visibility
- **Testing and certification** protocols to ensure compliance
- **Product labeling** guidelines for communicating compliance

TYPES & CLASSES

Type	Application	Classes Available	Description
Type O	Off-road	Class 1	This type includes only Class 1 garments, requiring a minimum of 217 in^2 of background material and 155 in^2 of retroreflective material. Suitable for workers in warehousing, shopping cart retrieval, and oil & gas extraction.
Type R	Roadway/Traffic	Class 2, Class 3	Class 2 requires 775 in^2 of background material and 201 in^2 of retroreflective material, while Class 3 requires 1240 in^2 of background material and 310 in^2 of retroreflective material. Ideal for road construction workers, airport ramp workers, and DOT workers.
Type P	Public Safety (e.g., Police, EMS)	Class 2, Class 3	This type includes Class 2 and Class 3 garments, with Class 3 requiring more material for higher visibility.

MATERIAL SPECIFICATIONS REQUIREMENTS BY TYPE & CLASS

Type & Class	Description	Background Material	Reflective Material	Reflective Width
Type O, Class 1	Environments with minimal traffic.	217 in^2	155 in^2	1"
Type R, Class 2	Suitable for higher-speed traffic areas.	775 in^2	201 in^2	1.38" (1" for split)
Type R, Class 3	For workers in high-risk environments requiring maximum visibility.	1240 in^2	310 in^2	2" (1" for split)
Type P, Class 2	Designed for fixed installations with moderate flexibility requirements for public safety workers.	450 in^2	201 in^2	2" (1" for split)
Type P, Class 3	Ideal for dynamic public safety worker environments requiring maximum flexibility and durability.	775 in^2	310 in^2	2" (1" for split)

GARMENT DESIGN AND LAYOUT

The ANSI/ISEA 107-2020 standard mandates specific placement and amounts of background and retroreflective materials to achieve 360-degree visibility. Key requirements include horizontal retroreflective bands at least 2 inches above the bottom of the garment, gaps in retroreflective material not exceeding 2 inches horizontally, and retroreflective material encircling the torso and, for Class 3 garments, also the sleeves.

Over-the-shoulder and upper torso regions must include a minimum of **201 inches** of reflective material to ensure visibility, even when the wearer is bent over during work activities. This placement is critical because traditional horizontal reflective stripes across the lower torso may be obscured when a worker is leaning forward. Reflective elements positioned on or above the shoulders remain visible from behind and above, providing consistent conspicuity in various working postures and environments.

These design elements are not arbitrary—they are rooted in visibility science and worker safety. The horizontal retroreflective bands help distinguish human shapes from the environment, especially at night or in low-light conditions. By encircling the torso and limbs, the bands allow moving body parts to be more easily detected by vehicle operators, which is critical for preventing accidents. Limiting gaps in the retroreflective material ensures continuous visibility from all angles, reducing the risk of workers becoming invisible during movement or when partially turned away from light sources. In short, these requirements are intended to maximize a person's detectability in hazardous environments and to enhance safety by ensuring they are seen clearly from all directions.

MATERIAL TESTING REQUIREMENTS

BACKGROUND/COMBINED-PERFORMANCE MATERIAL:

- **Colorfastness (laundering, UV, perspiration, crocking: how much color rubs off when the fabric is rubbed against another surface (dry or wet rubbing):**
    - This test evaluates the colorfastness of the background fabric against a range of exposures and treatments it may encounter over the garment's lifetime. Because the high-visibility and photometric performance of the product is directly tied to its color, these tests are essential to ensure that any background fabric used in compliant garments maintains its performance throughout its expected service life.
- **Chromaticity/luminance**
    - This test evaluates the light returning performance of background fabrics. Compliance with both the color standard and minimum luminance requirements ensures that the material does more than just

appear bright; it delivers the performance needed to provide true visibility, allowing drivers sufficient stopping distance to detect, react to, and avoid the wearer.

- **Strength (tensile, tear, burst)**
  - These tests verify that the fabrics and materials used in garment production are of high quality and durable enough to withstand wear and tear throughout the garment's expected lifespan.
- **Dimensional stability**
  - This test confirms that the fabrics do not shrink beyond acceptable limits. Excessive shrinkage can reduce the surface area of high-visibility materials, compromising visibility. Additionally, significant garment shrinkage may affect fit, leading to improper wear and further diminishing overall safety performance.
- **Water repellency/resistance/proofing if needed**
  - If fabrics are marketed as water-resistant, waterproof, breathable, or similar, these tests verify that the materials perform as claimed and meet the specified functional standards.

RETROREFLECTIVE/COMBINED-PERFORMANCE MATERIAL:

- **Photometric performance across angles (see Table 5)**
  - For reflective materials, this is the most critical test as it measures how effectively the material returns light to its source. Conducted first on new material and then again after exposure to various conditions, this test ensures that the reflective performance remains reliable throughout typical wear and use.
- **Resistance to abrasion, flexing, cold folding, rainfall, laundering (ISO 6330 6N at 60°C)**
  - These tests ensure that reflective materials can withstand abrasion, repeated laundering, and other physical stresses encountered during normal use. The rainfall test specifically verifies that the materials maintain adequate performance even in wet conditions.
- **UV durability (Xenon exposure)**
  - Like the test for background fabrics, this evaluation ensures that materials maintain their performance after prolonged exposure to direct sunlight, simulated through intense UV light.

DETAILED EXPLANATION OF MATERIAL TESTS – SRI LABS / AATCC / ASTM / ISO STANDARDS

BACKGROUND/COMBINED-PERFORMANCE MATERIAL TESTS

Colorfastness Tests: Performed to ensure fabric color remains stable over time and exposure. This directly affects visibility and compliance.

Test Type	Standard	Explanation
Laundering	AATCC 61	Simulates repeated home/commercial washing to assess color retention.
UV Exposure	AATCC 16 / ISO 105-B02	Tests for color fading after exposure to artificial sunlight (Xenon Arc), simulating outdoor use.
Perspiration	AATCC 15	Evaluates fabric's resistance to acidic and alkaline sweat.

Test Type	Standard	Explanation
Crocking	AATCC 8 / 116	Measures color transfer when rubbed dry or wet, critical for shared-use uniforms.

CHROMATICITY & LUMINANCE

Standard	Explanation
ASTM E1349 / ISO 20471	Chromaticity determines if the fluorescent color falls within regulatory boundaries; luminance measures brightness, ensuring maximum daytime visibility. SRI Labs uses spectrophotometers to verify these values.

STRENGTH TESTS

Test Type	Standard	Explanation
Tensile Strength	ASTM D5034 / D5035	Measures resistance to being pulled apart—important for shoulder seams, harness compatibility.
Tear Strength	ASTM D2261 / D1424	Simulates sharp tears (snagging hazards).
Burst Strength	ASTM D3786	Applies uniform pressure to a fabric until it bursts—important for chest/back areas.

DIMENSIONAL STABILITY

Standard	Explanation
AATCC 135 / ISO 5077	Assesses shrinkage or distortion after laundering. Ensures garment maintains fit and visibility zones after washes.

WATER RESISTANCE (OPTIONAL)

Test Type	Standard	Explanation
Water Repellency	AATCC 22	Evaluates how well water beads off the surface.
Water Resistance	AATCC 35 / ISO 811	Measures how much pressure (rain, splash) the fabric can resist before leaking.

RETROREFLECTIVE/COMBINED-PERFORMANCE MATERIAL TESTS

PHOTOMETRIC PERFORMANCE

Standard	Explanation
ASTM E810 / ISO 20471 Table 5	Tests brightness (RA value) of retroreflective tape at various entrance/observation angles. Done using a retroreflectometer at SRI Labs to mimic headlights hitting at oblique angles.

DURABILITY TESTS

Test Type	Standard	Explanation
Abrasion	ASTM D4966 / ISO 12947	Measures wear over time (e.g., rubbing against tools, seats).
Flexing	ISO 7854	Tests breakdown of reflectivity after repeated bending.
Cold Folding	ISO 4675	Ensures material doesn't crack or delaminate in cold climates.
Rainfall Resistance	ISO 22958	Verifies visibility performance under heavy rain.
Laundering	ISO 6330 (Method 6N, 60°C)	Tests reflectivity after repeated wash cycles—SRI uses this to confirm compliance over full service life.

UV DURABILITY

Standard	Explanation
ISO 4892-2 (Xenon Arc) / AATCC 16	Simulates long-term sunlight exposure. Xenon light chambers replicate UV aging and test for reflectivity loss or material degradation.

Why these labs and tests matter

SRI Labs and similar certified testing labs use the above protocols to verify ANSI/ISEA 107 compliance, ensuring that garments perform as claimed. Using globally recognized standards from AATCC, ASTM, and ISO adds third-party credibility and ensures results are consistent and auditable.

REFLECTIVE REQUIREMENTS & PLACEMENT

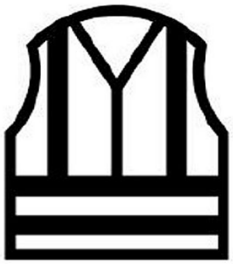
- 360° visibility with ≤50 mm horizontal gaps
- 150 cm^2 (23.25 in^2) of retroreflective material on shoulders if sleeves lack reflective bands
- Proper vertical/horizontal band placement on torso, sleeves, legs
- Logos/text can count toward area requirements

CARE LABELING & CONFORMITY

- Must include care instructions, markings, and declaration of conformity per Appendix D3
- Tested by ISO/IEC 17025-accredited labs

MANUFACTURER NAME

ANSI/ISEA 107 – 2020
Safe Reflections, Inc. Airex®
Reflective Material
Model#: 12345-ABC
Size: X-Large



Type R

Class 2

Not FR

This garment is not flame resistant as defined by ANSI/ISEA 107 – 2015 Section 10.5

Washing Instructions:

Machine Wash Hot – 60° C (140° F)
Do Not Bleach
Tumble Dry Low
Do Not Iron
Do Not Dry Clean

WHY COMPLIANCE MATTERS

Compliance with the ANSI/ISEA 107-2020 standard is not just a regulatory requirement but a critical aspect of workplace safety. Properly certified HVSA significantly reduces the risk of accidents and injuries by ensuring that workers are visible under all conditions. By understanding these standards and selecting the appropriate high-visibility apparel, we can enhance safety, provide the best possible protection for employees, and reduce the likelihood of workplace accidents.

STANDARD REVISIONS

A key feature of the ANSI ISEA 107 standard is its regular revision cycle, which ensures it stays current with evolving industry needs. The standard is updated every five years through the dedicated efforts of a volunteer product group who collaborate to keep it relevant for the industries and workers it serves. While many revisions clarify existing language to eliminate ambiguity, significant changes are also made to address emerging challenges in producing compliant garments, always without compromising safety. The following are some examples of changes that were made in the previous revision. A new 2025 revision is coming soon.

UPDATED GARMENT CLASSIFICATIONS

The 2020 revision introduced clearer garment classifications based on work environments. This was done in part to help clarify the types of situations each garment class could be used.

- Type O (Off-Road): For non-roadway use, such as in warehouses or mining operations.
- Type R (Roadway): Designed for workers exposed to traffic, including construction and utility personnel.
- Type P (Public Safety): Tailored for emergency responders and law enforcement, combining elements from previous standards.

ADJUSTED SIZING FOR SMALLER GARMENTS

Recognizing the need for better-fitting apparel for smaller workers, the minimum required background material for the smallest sizes was reduced

- Class 2R: From 775 to 540 square inches.
- Class 3R: From 1,240 to 1,000 square inches.
- This change aims to improve comfort and safety by ensuring garments fit properly without excessive material that will either get in the way or end up getting tucked under pants which would negate the effects of additional background fabric.

UPDATED LABELING REQUIREMENTS

Labels on high-visibility garments must now include:

- Manufacturer's name.
- Item number and size.
- Maximum number of wash cycles.
- Pictogram indicating the garment's class, type, and performance level.
- Flame-resistant properties, if applicable.

This comprehensive labeling ensures users have all necessary information for proper garment use and maintenance.

FINAL THOUGHTS

The ANSI/ISEA 107-2020 standard represents the current benchmark for high-visibility safety gear in the U.S. By selecting garments that meet the appropriate **type and class** for your specific work environment—and ensuring those garments are properly **certified and maintained**—you can dramatically reduce the risk of injury or fatality on the job. Safety starts with being seen. Don’t cut corners with compliance.