



ANSI/ISEA 107-2020 Made Easier: A Quick Reference to the High-Visibility Safety Apparel Standard

Introduction

*NOTE: The statements in this document assume that FHWA will issue a letter of interpretation allowing the use of the ANSI/ISEA 107-2020 standard for compliance with the 2009 Manual on Uniform Traffic Control Devices worker visibility regulation. The letter is expected to issue early 2021 and will be located in Part 6 of this web page: <http://mutcd.fhwa.dot.gov/resources/interpretations/index.html>**

The American National Standard for High-Visibility Safety Apparel (ANSI/ISEA 107-2020) is a standard established by American National Standards Institute, Inc. Construction, maintenance, utility, emergency responders, airport ramp personnel and many categories of off-road workers are routinely exposed to potential injury hazards from their low visibility while on the job. This standard provides guidelines for the selection and use of high-visibility safety apparel (HVSA) such as shirts, rainwear, outerwear and safety vests to help improve worker visibility during the day, in low-light conditions, and at night. Notable changes in this fifth edition (ANSI/ISEA 107-2020) include the removal of the Accessories category and a section around requirements for single-use disposable coveralls. The appendices have been updated to include additional examples of garment designs and trim patterns; picture of the color box for background and combined-performance materials; and an example of the single-use disposable coverall label.

This information “ANSI/ISEA 107-2020: A Quick Reference to the High-Visibility Safety Apparel Standard” summarizes the main provisions of the standard including minimum performance criteria and basic design requirements. **This is not an authoritative guide. You should obtain a copy of the standard and refer to it for more detailed and complete information.** And remember, there is more to designing a high-visibility safety garment than meeting the minimum performance specifications and design guidelines of the ANSI/ISEA 107-2020 standard. Garment designs should incorporate the full range of user needs for functionality, comfort, durability, image, and any additional hazards.

ANSI/ISEA 107 and Related U.S. Regulations

The ANSI/ISEA 107-1999 standard was the first U.S. standard for the design and performance of HVSA. In November 2008, 23 CFR part 634 was the first U. S. Federal regulation applied to worker high-visibility apparel in Federal Aid highway environments and required the use of performance Class 2 or 3 ANSI/ISEA 107 garments. The 23 CFR part 634 regulation was then incorporated into the 2009 edition of the Federal Highway Administration’s Manual on Uniform Traffic Control Devices (MUTCD), to extend its application to all public access roadways. The MUTCD requires all workers, including construction, maintenance, utility, emergency and incident responders, and volunteers, operating on or near any public access roadway, to wear HVSA.

The 2020 revision of ANSI/ISEA 107 continues with the “Type” structure first introduced in ANSI/ISEA 107-2015. This “Type” structure keeps off-road (“Type O”), roadway (“Type R”), and public safety (“Type P”) garments separate by application, and more closely aligns with the definitions and implementation of the U.S. Federal worker high-visibility regulation residing in the MUTCD. Under the ANSI/ISEA 107-2020 standard, all Type R roadway garments are compliant for workers on or near a public access roadway, and Type P public safety garments add a compliance option for emergency and incident responders. As previously designated, firefighters may use retroreflective turnout gear compliant to NFPA standards when exposed to flame, heat, and/or hazardous materials during emergency operations.

ANSI/ISEA 107-2020 focuses on the following:

- Design
- Requirements for Background and Combined-Performance Retroreflective Materials
- Photometric and Physical Performance Requirements for Reflective Materials
- Care Labeling

Important Definitions

See Section 3 of the standard for a complete list of definitions.

Background Material: Colored fluorescent material intended to be highly conspicuous in day, dawn and dusk light conditions, but not retroreflective.

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

Combined-performance Material: Retroreflective material that is also a fluorescent material.

Noncompliant Material: Material used in a HVSA that does not meet requirements for background material, combined-performance material or retroreflective material.

Declaration of Conformity: A statement by the manufacturer or supplier that the garment fulfills the requirements specified in ANSI/ISEA 107-2020. (Appendix D3)

High-Visibility Safety Apparel (HVSA): Personal protective safety clothing intended to provide conspicuity during both daytime and nighttime, and other low-light conditions.

Photometric Performance: The effectiveness of retroreflective material in returning light to its source and measured in terms of coefficient of retroreflection (RA).

Flame Resistance: The property of a material whereby flaming combustion is prevented, terminated, or inhibited when a flaming or non-flaming source of ignition is applied and then removed from the material.

Roadway: An area designed, or ordinarily used for the purposes of vehicular travel.

Accredited Laboratory: A laboratory meeting the requirements and holding a certificate of accreditation for ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories for the collection and analysis of data within the parameters of this standard.

Single-use Disposable Coverall: A HVSA that will be disposed of after one use and is to be worn over clothing to cover arms, legs and torso.

Torso Area: The trunk of the body. This includes the area from the underarm to the hip. See Figure 1 in the standard for more information.

Design

The ANSI/ISEA 107-2020 standard provides design guidelines and specifies the photometric requirements, minimum amounts of component materials, colors, and placement to create garments for the purpose of enhancing the visibility of workers. Refer to Section 6 of the standard for more detailed information on design and Appendix D for garment design examples. The selection of components and classes of apparel should be made based upon what is appropriate for the hazard and with the safety of the worker in mind. See Appendix C entitled “Suggested Type and Class Guidelines and Scenarios” for additional information.

Component Colors

There are three different colors for background and combined-performance material from which to choose: fluorescent yellow-green, fluorescent orange-red and fluorescent red. Users should consider the work and natural environment to determine the most conspicuous color for daytime use. Is the environment urban or rural, heavy foliage or desert? Are work zone devices and equipment yellow or orange? Choose the fluorescent color that achieves the highest degree of worker contrast.

Garment Types and Classes

Three type designations for HVSA help the user to choose options according to the work environment. These types are further broken down into classes 1, 2 or 3.

Type “O” garments are for occupational workers who are not required by the MUTCD 2009 edition to wear HVSA but may still work in an environment with moving equipment/vehicles and accompanying struck-by hazards, and where visibility is a concern. Class 1 is the only option for Type “O” garments.

Type “R” garments are for occupational workers who are exposed to roadway traffic and who work in an environment with moving equipment/ vehicles. This type designation and the classes within it now describe and the PPE that is federally mandated per the MUTCD 2009.*

Type “P” garments give additional options for fire, police, and EMS personnel who have other potential hazards that require them to access equipment on their person. Type P garments differ from type R garments mainly in the area requirements for background material.

Three classes of HVSA help the user and employer choose the proper garments based on expected work environment risks. The classes state the minimum amount of background and retroreflective material and specify placement of retroreflective material, as well as any technical requirements for garment design.

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Garment Type	Type "O" (Off-Road)	Type "R" (Roadway)	Type "R" (Roadway)	Type "P" (Fire, Police, EMS Personnel)	Type "P" (Fire, Police, EMS Personnel)	Supplemental Items (Garments with Legs, including Gaiters)
Performance Class	Class 1	Class 2	Class 3	Class 2	Class 3	Class E
Background Material Amounts	217 in ²	775 in ^{2*}	1240 in ^{2**}	450 in ²	775 in ²	465 in ²
Retroreflective Material Amounts	155 in ²	201 in ²	310 in ²	201 in ²	310 in ²	109 in ²
Width Minimums of Retroreflective Materials	1"	1.38" (1" for split trim designs)	2" (1" for split trim designs)	2" (1" for split trim designs)	2" (1" for split trim designs)	2" (1" for split trim designs)

* Type R, Class 2 garments can have the smallest size in the size range compliant to the standard with a minimum of 540 in² in background material to accommodate smaller workers. All larger sizes must have a minimum of 775 in². No reduction in retroreflectivity is allowed and 201 in² is still the required minimum.

**Type R, Class 3 garments can have the smallest size in the size range compliant to the standard with a minimum of 1000 in² in background material to accommodate smaller workers. All larger sizes must have a minimum of 1240 in². No reduction in retroreflectivity is allowed and 310 in² is still the required minimum.

Logos, Panels, and Lettering

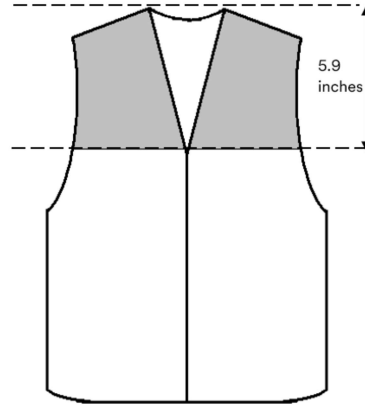
Type R, Class 3 garments can have the smallest size in the size range compliant to the standard with a minimum of 1000 in² in background material to accommodate smaller workers. All larger sizes must have a minimum of 1240 in². No reduction in retroreflectivity is allowed and 310 in² is still the required minimum.

These amounts are for the entire garment, front and back. The covered material cannot create a gap wider than 2 inches in retroreflective material horizontally.

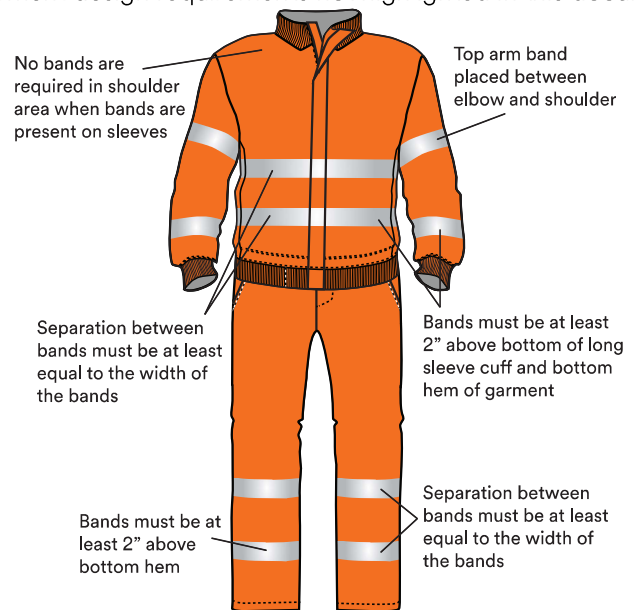
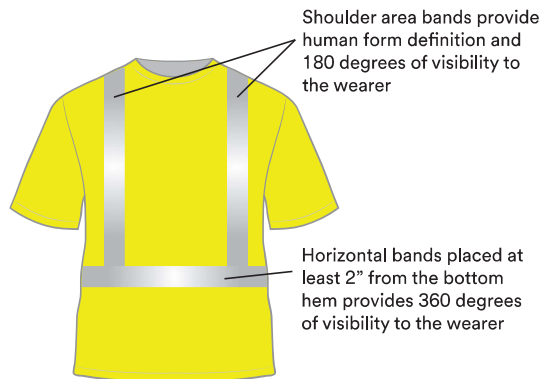
Retroreflective Material Placement

All Types and Classes of garments should achieve the following:

- Use of retroreflective band widths and amounts appropriate for the garment class
- Provide 360° visibility with horizontal gaps of 2 inches or less.
- Horizontal bands placed at least 2 inches above the bottom of the garment.
- Garments without retroreflective material encircling the sleeves are required to have 23.25 in² of retroreflective material in the shoulder area, to provide 180° visibility of the wearer. Shoulder area is defined as measuring 5.9 inches down from the shoulder high point, on the front and back of the garment. The requirement of 23.25 in² is the total amount of retroreflective material required in the shoulder area including the front and back of the garment, e.g., shoulder area retro-reflective material amount front + rear = 23.25 in².



- Appropriate separation distances for vertical and horizontal bands placed on the torso, sleeves and trouser areas.
- Garment designs should consider a front-to-back balance of background and retroreflective materials by incorporating at least 40% of the minimum required materials, per Table 1 of the standard, on the front or back.
- Class 3 garments must have at least one retroreflective band encircling each sleeve. When retroreflective is placed towards the bottom of a long sleeve garment, it must be 2 inches or more from the bottom of the sleeve. Retroreflective placed between the shoulder and elbow of a short sleeve garment can be placed right up to the edge of the sleeve.
- Appropriate retroreflective band placement and other garment design requirements not highlighted in this document.



Requirements for Background and Combined-Performance Materials

Section 8 of the standard provides specifications for color, brightness, fabric strength, and moisture resistance after various exposure tests.

- Background and combined-performance material needs to be tested for chromaticity /color and luminance and/or brightness without pre-conditioning; and again for colorfastness after standard cleaning processes and Xenon (UV light) exposure. Table 2 in Section 8 is the requirement for both background and combined-performance materials.
- A footnote in Table 1 of the ANSI/ISEA 107-2020 standard includes a background fabric area reduction exception for the smallest garment offered in each design, to better accommodate smaller sized workers. See Table 1 for more details.
- Background materials must also be tested for colorfastness after crocking tests, perspiration tests and laundering according to care label.
- Other tests for background materials include testing for dimensional change (shrinking) after washing and dry-cleaning, tear resistance and bursting strength.
- If the garment is intended to provide protection during rainfall, background materials also need to be tested as water repellent, water resistant, waterproof and /or breathable waterproof. See Section 8.5 and 8.6 of the standard for definitions.
- If the garment is intended to be a single-use disposable coverall, check Section 11 of the standard for specific guidelines.

Photometric and Physical Performance Requirements for Retroreflective and Combined-Performance Materials

The standard specifies photometric and physical performance requirements for retroreflective and combined-performance materials.

- Initial photometric performance is defined in Table 4 of the standard with a combination of 4 entrance, 4 observation, and 2 orientation angles (32 angles total).
- All material must meet the minimum brightness requirements after tests for abrasion resistance, flexing, folding at cold temperatures, variation in temperatures, influence of rainfall, and laundering. When washing is indicated on the care label, the retroreflective or combined-performance product shall be tested to ISO 6330 Method 6N, 60°C.
- Combined-performance material must also meet the minimum luminance or brightness factors after a Xenon exposure test (UV light).
- If the garment is intended to be a single-use disposable coverall, check Section 11 of the standard for specific guidelines.

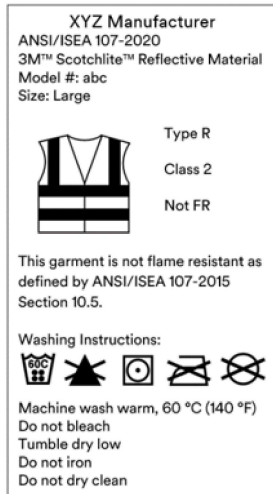
Care Labeling, General Marking and Instructions for Use

Once all materials have been tested against performance requirements and certificates of conformance issued from an accredited laboratory, apparel manufacturers then assemble garments according to the design guidelines in Section 6 of the standard for the appropriate Type and Class of garment. Only after all the materials' performance and design requirements have been met, can a garment be labeled ANSI/ISEA 107-2020 compliant. Care labeling, general marking and instructions for use are described in Sections 12 to 14 of the standard.

Specific Marking

Label marking includes, at a minimum, the following information:

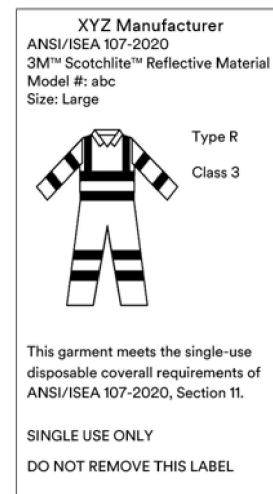
- Manufacturer's name or other means of identification.
- Item number or other identification of the specific style of product.
- Size.
- This ANSI/ISEA standard name including year (ANSI/ISEA 107-2020).
- Compliance with flame resistance can be indicated in one of 2 ways:
 - a) The letters "FR" on the label followed by the designation of the ASTM or NFPA standard specification from the list of allowed standards in Section 10.5.
 - b) Garments which fully meet the third-party certification requirements to NFPA 1977, or 2112, may use the separate label indicated by the NFPA standard to indicate FR compliance.
- If garment is not flame resistant, label must include the statement: This garment is not flame resistant as defined by ANSI/ISEA 107-2020.
- Pictogram showing the garment Type and Class of performance for the retroreflective material. Universal pictogram can be used or a pictogram that represents the garment being labeled.
- If the garment is intended to be a single-use disposable coverall, the label must include the following language:
 - This garment meets the single-use disposable coverall requirements of ANSI/ISEA 107-2020, Section 11.
 - SINGLE-USE ONLY.
 - DO NOT REMOVE THIS LABEL



Example of Non-FR Label



Example of FR Label



Example of Disposable Coverall Label

Answers to Some Frequently Asked Questions

- 1) **Are there other differences between the ANSI/ISEA 107-2015 and ANSI/ISEA 107-2020 standards?**
Yes. There are additional differences between the 2015 and 2020 editions of this standard. See the companion document, “Highlights of ANSI/ISEA 107-2020 What’s Changing,” talk with a 3M Application Engineer, or obtain a copy of the new standard at www.safetyequipment.org for additional information.
- 2) **Do U.S. Federal regulations require the use of HVSA for construction workers working in highway/construction work zones at risk of being struck by traffic?**
Yes. Section 6D.03 of the 2009 Manual on Uniform Traffic Control Devices (MUTCD) specifies the kinds of HVSA which workers must use when operating on or near public access roadways.
- 3) **Does this edition of the standard replace the 2015 edition?**
ANSI/ISEA 107-2020 replaces the ANSI/ISEA 107-2015 version as the current version of the standard.
- 4) **Is ANSI/ISEA 107-2020 recognized by the Federal Highway Administration (FHWA) as a performance equivalent standard to ANSI/ISEA 107-2004, which is required in the MUTCD?**
When the FHWA issues a letter of interpretation accepting ANSI/ISEA 107-2020 garments as performance equivalent to previous additions, then 2020 garments may be used to comply with the MUTCD requirements as explained in the letter. The letter is expected to issue a month or two after the standard releases. FHWA interpretations related to worker visibility and the MUTCD can be found online at <http://mutcd.fhwa.dot.gov/resources/interpretations/index.htm>.
- 5) **What version of ANSI/ISEA 107 does MUTCD 2009 require?**
For all workers, including emergency responders, within the right-of-way who are exposed either to traffic or to work vehicles and construction equipment within a Temporary Traffic Control zone, MUTCD 2009 Section 6D.03 requires Class 2 or Class 3 garments of ANSI/ISEA 107-2004 or equivalent revisions, such as ANSI/ISEA 107-2010, ANSI/ISEA 107-2015 or ANSI/ISEA 107-2020 as noted in question 3. Section 6E.02 requires ANSI/ISEA 107-2004 Class 2 or 3 for flaggers- FL orange-red or yellow green are required background colors. Section 7D.04 requires ANSI/ISEA 107-2004 Class 2 for Adult Crossing Guards¹.
- 6) **Why are single-use disposable coveralls called out separately in the standard?**
When working in environments where visibility is important, but the task is extremely dirty, an option for single-use disposable coveralls was desired. ANSI/ISEA 107-2020 allows for such garment. Some test requirements are varied and a special label is required, so reference Section 11 of the standard for full information.
- 7) **Can NFPA 701 be used to claim flame resistance for an ANSI/ISEA 107-2020 garment?**
No.
- 8) **I have only found larger-sized garments that meet the standard. I have smaller workers that need appropriately fitting garments to work safely. Is this being addressed?**
Type R “roadway” Class 2 and Class 3 garments have an allowance for a reduced minimum area requirement, but only for the smallest size garment that is offered in a given design. This should allow for better accommodation of garment sizing for smaller workers. More information can be found in Table 1 of the standard.
- 9) **If a garment passes Type R requirements does it automatically pass Type O and P? Will it need to be labeled with all designations, i.e., Type O, R, and P?**
A garment only needs to be marked for the claim the manufacturer is making. Sometimes manufacturers claim conformance to multiple standards or requirements and can include separate conforming labels as an indication.
- 10) **Are “biomotion” design concepts integrated into standard requirements?**
Garments with sleeves or pant legs are required to include high-visibility materials in these key areas, because they have been shown in multiple scientific studies to be particularly effective in enhancing conspicuity.

This summary of the ANSI/ISEA 107-2020 standard was prepared by 3M PSD and focuses primarily on the personal protective equipment aspects of the standard. It does not represent an official or legal or complete interpretation of the standard. If specific questions rise, the standard itself should be reviewed and relied on rather than this summary. A copy of this standard can be obtained at www.safetyequipment.org

1. Manual on Uniform Traffic Control Devices 2009 Edition pages 564-566, 745

Personal Safety Division

3M Center, Building 235-2F-06
St. Paul, MN 55144-1000
800-328-7098
Scotchlite.com

3M Canada

P.O. Box 5757
London, Ontario N6A 4T1
800-267-4414 Technical Service
800-364-3577 3M HELPS
3M.ca/Scotchlite

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