

# **FIRE SERVICE USE OF HIGH VISIBILITY APPAREL**

## **Answers to Frequently Asked Questions**

### ***1. Why is there a lot of current attention to fire fighter use of high visibility vests?***

On November 24, 2008, a new federal regulation (23 CFR 634) goes into effect mandating that anyone working in the right-of-way of a federal-aid highway must be wearing high visibility clothing that meets the requirements of ANSI / ISEA 107; 2004 edition Class 2 or 3. This requirement will apply to all responders to incidents, whether paid or not, including fire fighters. This regulation is expected to include "all roadways" in 2009.

### ***2. What exactly do the new regulations state?***

The Code of Federal Regulations Title 23 (Highways) Part 634 was originally published in the Federal Register Volume 71, No 226, pp 67792 - 67800. The Rule itself (634.3) simply states that:

"All workers within the right-of-way of a Federal-aid highway who are exposed either to traffic (vehicles using the highway for purposes of travel) or to construction equipment within the work area shall wear high visibility apparel."

'Workers' is defined to mean people on foot whose duties place them within the 'right-of-way of a Federal-aid-highway, such as highway construction and maintenance forces, survey crews, utility crews, responders to incidents within the highway right-of-way, and law enforcement personnel when directing traffic, investigating crashes, and handling lane closures, obstructed roadways, and disasters within the right-of-way of a Federal-aid highway.'

'High Visibility Safety Apparel' is defined to mean 'personal protective safety clothing that is intended to provide conspicuity during both daytime and nighttime usage, and that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107-2004'." The ANSI/ISEA 207-2004 will be included in the 2009 revision.

### ***3. How is this different from current practices in the fire service?***

Previously, there were no requirements for fire fighters to wear high visibility apparel. In the current 2007 edition of NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, paragraph 8.7.10 states:

When members are operating at a traffic incident and their assignment places them in potential conflict with motor vehicle traffic, they shall wear a garment with fluorescent and retro-reflective material visible from all directions.

The only guidance is provided to indicate what types of garments are acceptable is provided in the corresponding appendix section: "Members that operate on roadway incidents should be provided with vests or garments that ensure proper reflectivity such as a highly retro-reflective

vest (strong yellow, green, and orange).” However, it was also possible to interpret the actual requirement as wearing structural fire fighting protective clothing that has reflective trim. The new Federal regulations mandate wearing of supplemental high visibility vests.

#### ***4. What exactly is a fluorescent material and how does it provide visibility?***

Fluorescence refers to a brightness of color or an intensity of color that is relatively visible under daytime conditions. However, in order to be seen, the color must be in contrast to the background environment. This is why colors such as lime yellow or orange-red are used on clothing; however the choice will most generally depends on the color of the clothing shell or background material. Fluorescence is used to enhance the daytime visibility of wearers in areas where workers need to be seen.

Fluorescent materials are made using special dyes. In order for the color to remain intense, the materials must remain colorfast. Washing, soiling, and some environmental conditions can degrade the intensity of the color and make it less visible.

#### ***5. What does retro-reflective mean and what are retro-reflective materials?***

Retroreflectance is a property of specialized materials that allows incident light to be directed back to the source of that light. For example, if you shine a flashlight on a retro-reflective material, the material will appear intense because the majority of the directed light is visible to the flashlight holder. This same principle applies to the headlights of approaching vehicles. Retroreflectance is provided for nighttime visibility of wearers.

These retro-reflective materials contain small beads or prisms that act to provide the special reflecting capabilities, making the material appear extremely bright. This brightness increases as the light comes closer to the material and is the same property that appears in roadway signs. For this reason, retro-reflective material is generally placed in patterns where movement will signify that the lit object is a person; hence the use of trim on coat sleeves and at the bottom of pants near the cuff.

#### ***6. What is ANSI/ISEA 107-2004 and what types of requirements does the standard set?***

ANSI/ISEA 107-2004 was promulgated to promote the safety of workers who need to be visible near roadways, operating machinery, or other situations where not being seen by others creates hazards. The standard establishes minimum requirements for high visibility safety apparel that includes full body garments such as coveralls, jackets, and pants, and part body items such as vests. It also covers harnesses and headwear.

Specific criteria are provided for background (fluorescent) and retro-reflective materials in terms of their color, brightness, strength and durability. For example, background materials are evaluated for how well they maintain their color when continually exposed to simulated sunlight, washing, and other environmental conditions. Similar determinations are made for assessing the effectiveness of retro-reflective materials remaining bright under different wear and use conditions.

***7. What is the difference between Class 2 and Class 3 ANSI/ISEA 107-2004 garments?***

Class 3 garments offer the highest levels of visibility for the wearer. These garments are intended for those situations where workers are exposed to significantly high vehicle speeds or reduced sight distances, where worker and vehicle operators have high task loads that place the worker in danger, or when the worker must be conspicuous through a full range of body motions at distance of 1,280 feet and identifiable as a person.

Class 3 garments require larger amounts of both fluorescent material (1240 square inches versus 775 square inches) and retro-reflective material (310 square inches versus 201 square inches). To meet these requirements, compliant Class 3 garments tend to be coveralls, coat, or sleeved jackets. In contrast, different types of unsleeved vests constitute Class 2 high visibility safety apparel.

***8. Does fire fighter protective clothing with reflective trim meet the new Federal regulations?***

No, ANSI/ISEA 107-2004 sets minimum requirements for the total surface area of daytime visibility (fluorescent) and nighttime visibility (retro-reflective) material. NFPA 1971, which sets the requirements for fire fighter protective clothing and sets a standard pattern for placement of trim, new turnout clothing do not provide enough fluorescent material to meet the minimum requirements for Class 2 of ANSI/ISEA 107-2004. The nature of the exposures turnout clothing receives disables any fluorescent qualities. In addition, some types of trim, such as the multi-stripped triple trim do not have a solid band of retro-reflective material that is wide enough to meeting the minimum reflective tape requirements for Class 2 of ANSI/ISA 107-2004.

***9. How are the requirements in NFPA 1971 different from those in ANSI/ISEA 107?***

High visibility tapes or “trim” is provided in a pattern on firefighter clothing in horizontal bands. Two bands encircle the torso while one band is placed towards the end of the coat sleeves on both arms. Bands are also placed at the bottom of each leg. Manufacturers have the option of using two vertical stripes off of the bottom torso band at the back of the coat. Likewise, manufacturers can stagger parts of the trim bands around the lower sleeves. A standard pattern is specified for firefighter protective clothing in NFPA 1971 to provide observer recognition of the firefighter in a consistent manner. In the past, the practice had been to specify a minimum area of trim on garments, but this approach yielded different patterns on clothing depending on its size. The establishment of a standard pattern further improves the ease of seeing the firefighter in that trim placement outlines the body for recognition of firefighters by oncoming motorists.

***10. How far below the requirements for ANSI/ISEA 107 do NFPA 1971 garments fall?***

It depends on the type of trim being used and the size of the garment. Structural fire fighting garments use either solid combined performance (both fluorescent and retro-reflective) trim or multi-banded trim that has separate fluorescent and retro-reflective bands. For the smallest garments, there is approximately 160 linear inches of visible trim that equates to 320 square inches of combined performance trim, if used in a 2-inch width. While this provides 320 square inches of retro-reflective material that is slightly above the 310 square inch requirement for Class 3 garments. It falls far short of the minimum 1240 square inches of fluorescent material that is

required for Class 3 and 775 square inches for Class 2. In the case of the popular 3-inch wide multi-banded trim, the amount of retro-reflective surface is substantially less at 160 square inches under both the requirements of both Class 2 and 3 for mandatory areas of retroreflective material. The multi-banded trim has the same amount of fluorescent material as applies to combined performance trim and is less than both Class 2 and 3 requirements of ANSI 107-2004.

***11. If I am required to wear additional high visibility vests, why does my turnout clothing still have to have trim?***

Trim is placed on structural fire fighting protective clothing for reasons other than highway safety. Trim enhances visibility and identification of firefighters on the fireground and at emergency scenes to other firefighters and emergency responders.

***12. Why is it not possible to make fire fighter clothing out of high visibility fluorescent materials?***

The same fluorescent material used in industrial high visibility safety apparel cannot be used for firefighter protective clothing. Today's material technology has only provided limited fabrics that can retain fluorescence and still be flame resistant. Moreover, fluorescent fabrics can only be noticed when kept clean. The nature of fireground operations results in these fabrics being easily soiled, which quickly diminishes their daytime visibility qualities. Exposure to high heat can also rapidly deteriorate material brightness.

***13. Are there any limitations for using ANSI/ISEA 107 vests?***

Just as any kind of personal protective equipment, safety apparel complying with ANSI/ISEA 107-2004 will not protect the wearer from all hazards in terms of remaining visible. Motorist may still not see the wearer or travel at speeds or under conditions where they do not have adequate recognition and stopping capabilities. It is important for the fire service to understand that the wearing of high visibility safety apparel is but one practice that increases responder safety. Other practices such as proper positioning of apparatus and vehicles, use of traffic control devices, and proper operational work practices are needed to ensure the safety of fire fighters and other first responders working near roadways or other areas where visibility of the wearer is needed.

It is also critically important that fire fighters understand that the majority of commercially available high visibility safety apparel where claims are made for ANSI/ISEA 107-2007 compliance, IS NOT FLAME OR HEAT RESISTANT. The majority of materials used in the construction of these vests and similar clothing are highly flammable and will burn if contacted by flame or shrink and melt if exposed to high heat. Manufacturers of high visibility apparel claiming that their products are flame resistant must do so by demonstrating that the materials used in the vests or other clothing meet appropriate flame and heat resistance test methods and specifications.

***14. What is the difference between vests that comply with newer ANSI/ISEA 207-2006 and ANSI/ISEA 107-2004?***

ANSI/ISEA 207-2006 is a new standard that was developed to cover specific needs for public safety/ law enforcement personnel. This standard specifically addresses vests for public safety personnel and includes optional requirements for pockets, identification panels, and tear away features. The material requirements apply for background and retro-reflective materials are nearly identical. The primary differences in the standard are the minimum requirements for background material. ANSI/ISEA 207 only requires 450 square inches of fluorescent material while the minimum Class 2 requirements for ANSI 107-2004 is at 775 square inches. Both ANSI/ISEA 107 and 207 vests require the same amount of retro-reflective material (201 square inches).

***15. Do vests meeting ANSI/ISEA 207 comply with the new Federal regulations?***

After 23 CFR 634 was finalized, a new standard for Public Safety Vests was published as ANSI/ISEA 207-2006 edition. Because ANSI/ISEA 207 was not published until after 23 CFR 634 was finalized, the federal regulation could only reference ANSI/ISEA 107.

ANSI 107 requires that class 2 garments (vests) have at least 775 square inches of high-visibility, fluorescent background material and at least 201 square inches of retro-reflective material. While the ANSI 207 requirement for reflective material is the same, it requires only 450 square inches of background material. Therefore, ANSI/ISEA 207 vests do not meet the requirements of ANSI/ISEA 107 and therefore do not currently meet the requirements of 23 CFR 634.

***16. Is it true that there are exemptions for the use of ANSI/ISEA 207 vests for compliance with the new Federal regulations?***

The DOT Federal Highway Administration's Associate Administrator for Operations has written a letter to the Emergency Responder Safety Institute that is being circulated in discussions about this issue. The letter acknowledges that DOT has reviewed ANSI/ISEA 207 standard and "found this standard compatible with the ANSI/ISEA [107] Class II requirements for night-time visibility." Nevertheless, those affected by 23 CFR 634 should understand that the high-visibility clothing must be worn day and night, so this statement by the FHWA does not officially validate the use of ANSI 207 vests in place of ANSI 107 where legally mandated.

***17. Are there any other exemptions that are under consideration by the Department of Transportation?***

The DOT/FHWA has proposed a number of changes that will affect 23 CFR 634. Of the most immediate concern is that they propose allowing ANSI 207 vests for emergency responders. This change cannot go into effect in time for the November 24 deadline and is not likely to go into effect until the 2nd or 3<sup>rd</sup> quarter of 2009. In a much more comprehensive change, the current proposals would incorporate 23 CFR 634 into the MUTCD (Manual on Uniform Traffic Control Devices). This would make high-visibility garments (under the proposal, either ANSI/ISEA 107 or 207 certified) mandatory for anyone working on "all roads open to public travel in accordance with 23 CFR Part 655, not just Federal-aid highways."

There have further been some proposals for providing exemptions for fire fighters that are engaged in operations where there are flame or heat exposure risks. When firefighters encounter competing hazards from heat and/or flame exposure, a source of potential ignition, Hazardous Materials release/spills, or IDLH, they are not classified as “workers” in the variance and are not subject to wearing HVA. However, it is necessary to provide additional means of protection of firefighters to meet the intent of the regulation when applicable.

***18. As a fire fighter or someone responsible for fire fighters, what specific features or characteristics of high visibility safety apparel should I consider for its purchase?***

First and foremost, any high visibility safety apparel must at a minimum meet the Class 2 requirements in ANSI/ISEA 107-2004 as stated in the new Federal regulations.

The type of apparel should be compatible with the standard uniform or other protective clothing to be worn. If high visibility safety apparel will be worn with structural fire fighting protective clothing, it must be large enough to fit over this relatively bulky insulative clothing without binding or inhibiting movement. Ideally, the selected vests should offer features of expanding to cover the range of workforce sizes including their wearing of protective clothing. The HVA (vest) is not to be worn with SCBA.