What is High-Visibility Safety Apparel (HVSA)?

High-visibility safety apparel (HVSA) is clothing (e.g. vests, bibs or coveralls) that workers can wear to improve how well other people "see" them (their visibility). Most often, high-visibility clothing is worn to alert drivers and other vehicle operators of a worker's presence, especially in low light and dark conditions. High-visibility headwear can also be worn to increase the visibility of the wearer in situations where part or all of the wearer's body could be obscured (e.g., leaves/trees, traffic barriers, construction materials, etc.).

Requirements for high-visibility safety clothing for Canadian workers are found in the CSA Standard Z96-09 (R2014) "High-Visibility Safety Apparel" and in the related guideline "CSA Z96.1, Guideline on selection, use, and care of high-visibility safety apparel." In the United States, see the ANSI/ISEA 107-2010 American National Standard for High-visibility Safety Apparel and Headwear.

Why do I need High-Visibility Safety Apparel?

High-visibility safety apparel (HVSA) is needed if you work when there is low light and poor visibility, especially if you are working around moving vehicles (cars, trucks or other machinery traveling under their own power - e.g. forklifts, backhoes, etc). High-visibility items allow you to be seen by the drivers of those vehicles sooner and more readily. This fact increases your safety at work. The human eye responds best to large, contrasting, bright or moving objects. Worker visibility is enhanced by high colour contrast between clothing and the work environment against which it is seen.
When do I need High-Visibility Safety Apparel?

The CSA Standard recommends that a hazard assessment be carried out on each job site to evaluate the workplace or work site for known or potential hazards a worker can encounter while performing a job or task. This assessment helps determine the risk to workers of being hit by moving vehicles and the environmental conditions under which work is performed. For more information about risk assessments, please see the OSH Answers document Risk Assessment (http://www.ccohs.ca/oshanswers/hsprograms/risk_assessment.html).

When doing a hazard assessment where HVSA might be required, be sure to consider:

- The type and nature of the work being carried out - including the tasks of both the HVSA wearer and any drivers.
- Whether workers will be exposed to heat and/or flames (if so, flame-resistant HVSA would be required).
- Work conditions, such as indoor or outdoor work, temperature, work rates, traffic flow, traffic volume, visibility, etc.
- The workplace environment and the background workers must be seen in (e.g. is the visual area behind the workers simple, complex, urban, rural, highway, filled with equipment, cluttered).
- How long the worker is exposed to various traffic hazards, including traffic speeds.
- Lighting conditions and how the natural light might be affected by changing weather (sunlight, overcast sky, fog, rain, or snow).
- Factors that affect warning distances and times, such as the size of vehicles, their potential speeds, the ability to stop quickly, and surface conditions.
- If there are any engineering and administrative hazard controls already in place (e.g. barriers).
- Any distractions that could draw workers attention away from hazards.
- The sightlines of vehicle operators, especially when vehicles are operated in reverse.
- If certain jobs, or the function being done, need to be "visually" identifiable from other workers in the area.

Once a hazard assessment is complete, the employer can select appropriate controls. The first line of defence for workers' safety would be to control the design of the workplace and reduce the exposure of workers to moving vehicles (e.g., through the use of physical barriers and other engineering and administrative controls). Using high-visibility apparel would be the last line of defence against accidents by providing more warning to vehicle operators that workers are on foot in the area.
What is the difference between fluorescent and retroreflective materials?

**Fluorescent material** takes a portion of invisible ultraviolet light from sunlight, and through special pigments, sends it back to the viewer as more visible light. This material only functions where there is a source of natural sunlight. Fluorescent material will appear brighter than the same coloured non-fluorescent material, especially under low natural light (e.g., cloud cover, fog, dusk, dawn, etc.). This property offers daytime visibility enhancement not present with other colours. These materials enhance daytime visibility, especially at dawn and dusk. Fluorescent colours provide the greatest contrast against most backgrounds.

**Retroreflective material** is created to return light in the direction of the light's source. This property will let a driver see the light being reflected from the retroreflective material on a person's garment (as long as the person is standing in the light's beam). Retroreflective materials are most effective under low-light level conditions. While retroreflective materials can still reflect in the daylight, there is little difference between the light reflected from the garment's material and the surrounding environment. This lack of contrast makes retroreflective materials ineffective for enhanced visibility during (sunny) daytime conditions.

In contrast, **reflective materials** bounce light off of its surface so that it can be seen. While the term "reflective" is not used in the CSA standard, it is typically defined as a material or object that has the ability to "throw back" light (or sound). Most surfaces are already light reflective.

**Combined-performance retroreflective material** is a retroreflective material that is also a fluorescent material. Not all retroreflective materials are fluorescent, however, and not all fluorescent materials are retroreflective.

What should I look for in High-Visibility Safety Apparel?

**Size/Coverage:**

- Large, bright garments are more visible than small ones. Coverage all around the body (360° full body coverage) provides better visibility in all viewing directions.
- Stripes of colours that contrast (have a distinct colour difference) with the background material to provide good visibility. Stripes on the arms and legs can
provide visual clues about the motion of the person wearing the garment.
- When background material is bright-coloured or fluorescent material, it is intended to be highly visible, but is not intended to provide retroreflective performance.
- Other requirements such as flame resistance, thermal performance, water resistance, durability, comfort, tear-away features, material breathability and flexibility that are applicable to the job.

Employers should select the colour and stripe combination that provides the preferred contrast and visual indication of movement.

**Fit:**

- For safety and best performance, garments should be fitted to the person. Don't forget to consider the bulk of clothing that might be worn underneath the garments, and how the garment should be worn (i.e., done up properly around the body with no loose or dangling components). The garments should sit correctly on your body and stay in place during your work.
- The apparel should be comfortable to wear - the parts of the apparel that come into direct contact with the worker should not be rough, have sharp edges, or projections that could cause excessive irritation or injuries. The apparel should also be lightweight.
- Garments should be selected and worn so that no other clothing or equipment covers the high-visibility materials (e.g., glove gauntlets, equipment belts, and high-cut boots).

**Brightness:**

- Daylight - Bright colours are more visible than dull colours under daylight conditions (e.g. fluorescent materials are suitable for daylight).
- Low light conditions - Fluorescent colours are more effective than bright colours under low light (e.g. dawn and dusk). Under these conditions, reflective materials are also suggested.
- Dark conditions/worksites - Greater retroreflectivity provides greater visibility under low light conditions. Retroreflective materials provide high-visibility conditions and are preferred over bright colours. Fluorescent materials are ineffective at night and less visible than white fabrics.

**Design:**

To comply with the CSA Standard, the HVSA should meet the following criteria:
• Stripes/bands are to be in a distinctive, standardized pattern:

a) A symmetric "X" on the back extending from the shoulders to the waist.

b) Two vertical stripes on the front passing over the shoulders and down to the waist.

c) A waist-level horizontal stripe extending entirely around the back to the bottom of the vertical stripes on the front. This horizontal stripe may continue between the front vertical stripes (optional). For Class 3 apparel, stripes/bands encircling both arms and both legs are added.

• The stripes/bands are to be displayed in a way to ensure that some part of them is visible from all angles around the body (i.e., 360° visibility).

• For all classes, the total width of stripes/bands must be at least 50 mm (1.96") throughout. Stripes/bands near the bottom edge of a garment, sleeve or pant leg must be at least 50 mm (1.96") away from the edge.

• Stripes/bands may be made up entirely of combined-performance or retroreflective material.

**Colour:**

For Classes 2 and 3, the CSA Z96-09 (R2014) High-Visibility Safety Apparel Standard specifies three colours for background materials and contrasting-colour stripes to provide options that are intended to create visibility against most work environments. The stripes should be either retroreflective or combined-performance.

- **Background material:** should be fluorescent yellow-green, fluorescent orange-red or fluorescent red, or bright yellow-green, bright orange-red or bright red.

- **Combined-performance retroreflective material** (i.e. the stripes): should be fluorescent yellow-green, fluorescent orange-red or fluorescent red - and must be in contrast (that is, have a distinct colour difference) to the background material.

**High-Visibility Headwear:**

- Should include both retroreflective materials and fluorescent or bright colour background materials and should be attached to the headwear to provide full (360°) visibility.

- Ensure that materials attached to a hard hat, for example, does not affect the hat's ability to protect the head.
Care/Maintenance:

- Keep your high-visibility apparel clean and well-maintained. Contaminated or dirty retroreflective materials provide lower visibility.
- Replace garments that show signs of wear and tear, soiling, or contamination as it will no longer be able to provide acceptable levels of visibility.
- Purchasers of HVSA should get proof that the materials used and the design of the garment meet the requirements of the CSA Z96-09 (R2014) Standard.

What are the different classes of safety apparel?

The CSA Standard Z96-09 (R2014) High-visibility Safety Apparel sets out levels of retroreflective performance (i.e., the effectiveness of material in returning light to its source), the colours and luminosity of background materials, and how much of the body that should be covered by the high-visibility components. There are also special requirements for garments that to provide electrical flash and flame protection. Note that although specifications for apparel Classes are similar to those in ANSI/ISEA 107, these CSA Classes differ in that they specify body coverage rather than minimum areas.

CSA lists three classes of garments based on body coverage provided. Each class covers the torso (waist to neck) and/or limbs according to the minimum body coverage areas specified for each class.

- Class 1 provides the lowest recognized coverage and good visibility.
- Class 2 provides moderate body coverage and superior visibility.
- Class 3 provides the greatest body coverage and visibility under poor light conditions and at great distance.

Details for each of the classes are listed below. For more details on the exact specifications, please refer to the Standard. (Note: While the Standard does not provide specifications for the application of high-visibility apparel to specific job types, the Guide does provide some examples of jobs where the different classes may be appropriate.)

Different Classes of High-Visibility Safety Apparel

Class 1

Apparel consists of a basic harness or stripes/bands over the shoulder(s) and encircling the waist. The center portion of the front torso band between the two vertical bands is optional. See Figure 1 for examples of Class 1 apparel.
Examples of situations where you may use Class 1:

- Workers in activities that permit full and undivided attention to approaching traffic.
- When work backgrounds are not complex, allowing for optimal visibility.
- When workers on foot are separated from traffic (e.g. by barriers).
- When vehicles are moving slowly (e.g. less than 40 km/h (25 mph)).

Examples of jobs include:

- Workers directing vehicle operators to parking or service locations.
- Workers retrieving shopping carts in parking areas.
- Workers in warehouse operations.
- "Right-of-Way" or sidewalk maintenance workers.
- Workers in shipping or receiving operations.

Figure 1
Examples of Class 1 Apparel
Harness or Colour/Retroreflective Stripes on Other Clothing

Class 2

Provides wearer with more visibility than Class 1. Apparel has full coverage of the upper torso (front, back, sides, and over the shoulders) and includes bib-style overalls. Stripes/bands are composed of retroreflective or combined performance materials. See
Figure 2 for examples of Class 2 apparel.

Examples of situations where you may use Class 2:

- When vehicles or equipment are moving between 40-80 km/h (25-50 mph).
- Workers who require greater visibility under inclement weather conditions or low light.
- When work backgrounds are complex.
- When workers are performing tasks that divert attention from approaching vehicle traffic.
- When work activities are in closer proximity to vehicles (in or near flowing vehicle traffic).

Examples of jobs include:

- Roadway construction, utility, forestry or railway workers.
- Survey crews.
- School crossing guard.
- High-volume parking and/or toll gate workers.
- Airport baggage handlers and ground crews.
- Emergency responders in flagging operations.
- Members of law enforcement.
- Accident site investigators.
- Tow truck operators.
- Roadside vehicle maintenance workers.
Bib overalls

Front view

Back view

Retroreflective stripes/bands (silver or white) or combined-performance retroreflective stripes/bands (fluorescent/bright orange or fluorescent/bright yellow)

High-visibility material (fluorescent/bright orange or fluorescent/bright yellow)

Optional leg bands
Figure 2
Examples of Class 2 Apparel
Vests, Jackets, Coat and Bib overalls

Class 3

Provides the greatest visibility for the wearer under poor light conditions and at great distances. Apparel meets the same requirements as Class 2 with the addition of bands around both arms and legs. These bands are made up of combined performance stripes/bands or a combination of retroreflective and background material. Background material can cover the whole garment or a portion of the garment. See Figure 3 for examples of Class 3 apparel.

Examples of situations where you may use Class 3:

- Vehicle speeds exceeding 80 km/h (50 mph).
- High volume traffic and unmonitored equipment movement.
Workers on foot and vehicle operators with multi-task loads that divert attention and increase risk.
Complex backgrounds.
Work activities taking place in or near to flowing vehicle traffic.
When the wearer must be conspicuous through the full range of body motions at a minimum of 390 m (1,280 ft).
Work activities taking place under icy or snowy conditions.
Work activities taking place in low light or at nighttime.

Examples of jobs include:

- Roadway construction workers in inclement weather, road closures, complex lane shifts, etc.
- Utility workers.
- Survey crews.
- High-volume parking and toll-gate workers.
- Airport baggage handlers and ground crews.
- Emergency responders in flagging operations.
- Law enforcement officers.
- Flaggers in night operations and/or high congestion areas.
What should worker training include?

As with any personal protective equipment, workers should be given appropriate training in the use and care of the equipment. The following minimum information should be provided to workers wearing high-visibility apparel:
(a) When to use the high-visibility apparel.
(b) Fitting instructions, including how to put on and take off the apparel, if relevant.
(c) The importance of using the apparel only in the specified way.
(d) Limitations of use.
(e) How to store and maintain the apparel correctly.
(f) How to check for wear and tear.
(g) How to clean or decontaminate the apparel correctly, with complete washing and/or dry cleaning instructions.

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