

EPA Selection Guidelines on Protective Clothing and Respirator Types

The 1986 Superfund Amendment and Reauthorization Act (SARA) required the Occupational Safety and Health Administration (OSHA) to develop regulations to protect the 1.8 million workers involved in hazardous waste operations. This regulation, 29CFR §1910.120, was published on March 6, 1989 and became fully effective on March 6, 1990.

This new OSHA regulation requires employers in all industries where hazardous waste may be encountered to provide their workers with extensive training in the selection and use of personal protective equipment as part of a comprehensive safety and health program.

In Appendix B to this regulation, OSHA assigned Personal Protective Equipment to four different protection levels (Levels A, B, C, and D). The appropriate level is determined by the degree of hazard to which the worker is exposed and the degree of protection afforded by the PPE. Level A provides the highest level of protection, and Level D the least. Levels B and C afford protection from hazards of varying degrees less serious than those requiring Level A protection but more hazardous than those requiring Level D protection.

OSHA intends Appendix B to guide employers in their selection of PPE, but requires [in 1910.120(g) (3) (ii)] that this selection be based on evaluation by the employer of the "performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site". It is essential that employers in the industry be thoroughly familiar with all the provisions of 29CFR§1910.120.

Level A

- Positive pressure (pressure demand), self-contained breathing apparatus (MSHA/NIOSH approved)
- Fully encapsulating chemical resistant suit
- Gloves, inner, chemical resistant
- Gloves, outer, chemical resistant

Level B

- Self-contained breathing apparatus
- Chemical resistant clothing (overall and long sleeved jacket, chemical resistant coveralls)
- Coveralls (under splash suit)*

Level C

- Full-face, air purifying respirator (MSHA/NIOSH approved)
- Chemical resistant clothing (one piece overall, hooded two piece chemical splash suit, chemical resistant hood and apron, disposable chemical resistant coveralls)

Level D

- Primarily a work uniform and should not be worn on any site where respiratory or skin hazards exist.
- * Optional

Description of Hazards (29CFR§1910.120 Appendix B, Part B)

Level A Protection Should Be Used When:

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected gases or particulates of materials that are harmful to skin or capable of being absorbed through the skin.
2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible.
3. Operations are being conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.

Level B Protection Should Be Used When:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection.
2. The atmosphere contains less than 19.5% oxygen.
3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

Level C Protection Should Be Used When:

1. The atmospheric contaminant, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin.
2. The types of air contaminant have been identified, concentrations measured, and an air purifying respirator is available that can remove the contaminant.
3. All criteria for the use of air-purifying respirators are met.

Level D Protection Should Be Used When:

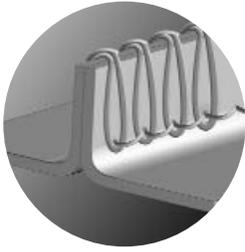
1. The atmosphere contains no known hazard.
2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

- Boots, chemical resistant, steel toe and shank (worn over or under suit boot)
- Underwear, cotton, long-john type*
- Coveralls (under suit)*
- Hard hat (under suit)*
- Two-way radio communications (intrinsically safe)

- Gloves, outer, inner; chemical resistant
- Boots, outer, chemical resistant, steel toe and shank
- Boots, outer, chemical resistant*
- Two-way radios (intrinsically safe)
- Hard hat

- Gloves, outer, chemical resistant
- Gloves, inner, chemical resistant*
- Boots, steel toe and shank, chemical resistant
- Cloth coveralls (inside chemical protective clothing)*
- Two-way radio communications (intrinsically safe)*
- Hard hat*, Escape mask*

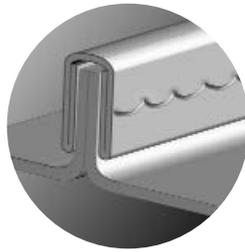
Safety garments are available with a variety of seams for all applications.



Serged Seam

Two pieces of material are joined with a thread stitch that interlocks. Economical.

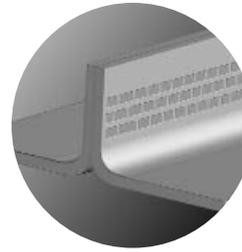
Applications: Basic protection for most general-purpose applications.



Bound Seam

Two pieces of material joined with an overlay of similar material, and chain stitched through all of the layers for increased strength plus holdout of liquids and dry particulates.

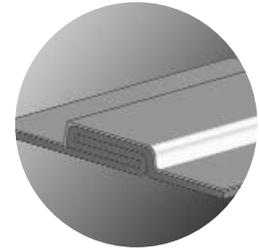
Applications: Light splash situations.



Ultra Sonic Sealed Seam

Similar to a bound seam, with additional protection due to the fusing, under heat and pressure, of the material at the seam. No thread (or needle holes) required.

Applications: Heavy-duty chemical protection.



Sealed Seam

Two plies of material are sewn together. The seam is then overlaid with a barrier tape that is applied under heat and pressure to form a liquid and gas tight seal.

Applications: Heavy-duty chemical and gas-tight protection.

Terms

Particulate Holdout: The filtration efficiency of a material, measured by the number of particulates per 100 that can be pulled through the material. Reported for 2 micron size particles.

Penetration Resistance: Material resistance to liquid penetration is measured using ASTM F903. The outside surface of the material in question is exposed to the test chemical for one hour.

Permeation Resistance: ASTM F739 is used to measure the permeation resistance of materials. Permeation is the molecular movement of chemicals through a material. If exposure to chemical vapors is a concern, this data should be analyzed.

Physical Properties

Tensile Strength: The force required to break a material apart by pulling it from opposing directions. Measured in pounds and is reported in two directions.

Burst Strength: The force required to break through a material when applied perpendicular to its surface area.

Tear Resistance: The force required to tear through a material once a tear has been initiated.

Puncture (or Snag) Resistance: The force required to puncture a material with a sharp probe, such as a nail.

Abrasion Resistance: Measurement of how quickly a material will wear through when rubbed against a coarse, sandpaper (simulated asphalt) surface.

Environmental Hazard Properties

Flame Resistance: Several methods may be used for reporting flame resistance. In this section, we are using NFPA 701.

Static Dissipation or Charge Decay: In NFPA 99, a static charge is applied to the material, and the time for such charge to decay to a safe level is measured. In order to pass, the material in question must dissipate 99% of a 350V charge in less than 5 seconds. Results may be measured in terms of Surface Resistivity or Voltage Decay Time.

Comfort Properties

Weight and Thickness: Material weights are reported in ounces per square yard and thickness in increments of 0.001 inch (mils). Both material weight and thicknesses are indicators of garment bulk and comfort.

Air Permeability: The ability of a material to freely pass air, measured as the number of cubic feet that can be passed in a square foot of material. Non-breathable materials allow no air permeation. Note: Some materials may report zero air permeability, but may still have breathability.

Water Vapor Transmission: In this test, the rate in which a material allows transmission of water vapor is measured. The rate is reported as ounces of water that can pass through a square yard of material in one hour. The ability of a material to allow water vapor transmission is related to wearer comfort because body cooling occurs through the evaporation of sweat.