

High Voltage –Personal Protective Equipment (PPE)

- Personal Protective Equipment is an integral part of any employer’s Safety program.
- OSHA has determined that PPE although a good way to Protect employees, should be used as a last line of defense and it is important to understand the limitations of PPE in the workplace.
- Prior to using PPE, the employer must determine if other means of protection are available.
- OSHA uses the following sequence for employee protection:
 - Engineering Controls (deals with equipment)
 - Administrative Controls (deals with people or processes)
 - Personal Protective Controls (deals with what you wear)
- If no other method is available to protect employees, then PPE is an acceptable method.
- For those employees working in areas where there are potential electrical hazards, they must be provided with (and must use) electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed.

❖ PPE for the Head

- Employees must wear nonconductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with exposed energized parts [see 1910.335(a)(1)(iv)]. *ANSI Z89.1-1986*
- OSHA requires that protective helmets purchased after July 5, 1994, must
- Comply with the performance guidelines in the ANSI Z89.1-1986, American National Standard for Personal Protection—Protective Headwear for Industrial Workers Requirements or shall be demonstrated to be equally effective. ANSI Z89.1-1986 separates protective helmets into two different types and three different classes.

Type 1 helmets incorporate a full brim (brim fully encircles the Dome of the hat)

Type 2 helmets have no encircling brim, but may include a short bill on the front
Regarding electrical performance, ANSI Z89.1-1986 recognizes three classes:

- Class A Helmets reduce the force of impact of falling objects and also reduce the danger of contact with exposed low-voltage electrical conductors. Helmet shells are proof-tested at 2,200 volts of electrical charge.

- Class B Helmets reduce the force of impact of falling objects and also reduce the danger of contact with exposed high-voltage electrical conductors. Helmet shells are proof-tested at 20,000 volts.
- Class C Helmets reduce the force of impact of falling objects, but offer no electrical protection. Every protective helmet that conforms to the requirements of ANSI Z89.1-1986 must be appropriately marked to verify its compliance. The following information must be marked inside the hat:
 - Manufacturer's name
 - The "ANSI Z89.1-1986" designation
 - Class designation (A, B or C) *ANSI Z89.1-1997*

In 1997 ANSI revised its head protection standard. The 1997 version of ANSI Z89.1 contains a few notable changes. ANSI Z89.1-1997 no longer uses Type 1 and Type 2 to describe the brim characteristics of a protective helmet. The new Type designation is as follows:

- **Type I helmets** offer protection from blows to the top of the head
 - **Type II helmets** offer protection from blows to both the top and sides of the head
- Z89.1-1997 also changed the class designations for protective helmets.

❖ **PPE for the Eyes & Face**

- Employees shall wear protective equipment for the eyes or face wherever there is danger of injury to the eyes or face from electric arcs or flashes or from flying objects resulting from electrical explosion. [see 1910.335(a)(1)(v)]
- When working on energized parts, the possibility of arc flash exists and the employee must be protected. Dangers could include heat, flying hazards and molten metal, therefore the PPE must be durable, non-conductive, heat resistant and provide deflection qualities.
- As with much of the arc flash PPE, the heat resistance is measured in calorie/cm². Remember an unprotected worker exposed to a 1.2 cal/cm² energy burst would result in second degree burns.

❖ **PPE for the Body (FR Clothing)**

- As mentioned earlier, employees working in areas where there are potential electrical hazards must be provided with, and must use, electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed [see 1910.335(a)(1)(i)].
- This would include flame resistant (FR) clothing.

- During an arc flash event the temperatures can reach an excess of 35,000degrees.
- Even at temperatures much lower, typical daily wear clothing would do little to protect the worker from being seriously injured. In fact, at such high temperatures, the clothing will ignite and continue to burn on the body well after the arc flash has dissipated.
- This is where serious injury and death often occur.
- To counteract the extreme heat from an arc flash, FR clothing is required.
- FR clothing can take the form of pants, shirts, coveralls, jackets, parkas and full flash suits.
- Obviously, fit, comfort and flexibility are important but the greatest indicator of adequate FR clothing for a given task is based on the "arc thermal performance value" (ATPV).
- The ATPV is incident energy on a material that results in sufficient heat transfer through the fabric or material to cause the onset of a second degree burn.
- Manufacturers of FR clothing will provide an ATPV rating on their clothing and you must match the ATPV with the potential exposures in the workplace.