
APPENDIX D – ADDITIONAL PPE INFORMATION

Personal protective equipment in the categories listed in this appendix must meet current cited American National Standards Institute (ANSI) or American Society for Testing and Materials (ASTM) standards. Existing PPE stocks must meet the ANSI or ASTM standard in effect at the time of its manufacture or provide protection equivalent to PPE manufactured according to ANSI or ASTM criteria. This appendix contains information on the following:

- Eye and Face Protection
- Head Protection
- Foot Protection
- Glove Protection
- Electrical Protective Devices
- Protective Clothing

Eye and Face Protection: ANSI Z87.1, NFPA 70E

Eye and face protection shall be required where there is a reasonable probability that injury could be prevented by such protection.

- The employer shall ensure that each affected employee uses appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.
- The employer shall ensure that each affected employee uses eye protection that provides side protection when there is a hazard from flying objects. Detachable side protectors (e.g. clip-on or slide-on side shields) meeting the pertinent requirements of this section are acceptable.
- The employer shall ensure that each affected employee who wears prescription lenses while engaged in operations that involve eye hazards wears eye protection that incorporates the prescription in its design, or wears eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.
- The employer shall ensure that each affected employee uses equipment with filter lenses that have a shade number appropriate for the work being performed for protection from injurious light radiation.
- Chemical splash goggles (those with indirect ventilation on sides) are required where protection is needed against chemical splashes or sprays. These may also be used where impact protection is required.
- Where the potential exists for an arc flash, the NFPA 70E standard should be referenced for the proper protective eyewear. It requires an analysis, which includes procedures for determining an electrically safe work condition, a determination of the flash protection boundary and the PPE required for workers that will be within the boundary. An electrically safe work condition is one in which equipment has been deenergized and a proper lockout/tagout has been performed.

Before wearing impact goggles or glasses, inspect them for weaknesses, cracks, scratches, weak elastic band, and other damage or defect as prescribed by the manufacturer, and replace them if they are flawed, will not stay in place, or impair vision. When lenses become severely scratched or pitted they

should be replaced. Frames and elastic bands should be replaced when they become worn or broken. Goggles and glasses should be kept clean with mild soap and water, and stored in a dry, temperate atmosphere out of harm's way. Avoid hanging eyewear by the elastic band as this can significantly weaken the band in a short time. If protective eyewear items are not contaminated with chemical, biological, or radioactive material, there are no special disposal considerations; they are regular trash.

Head Protection: ANSI Z89.1-2014

The employer shall ensure that each affected employee wears a protective helmet when working in areas where there is a potential for injury to the head from falling objects. The employer shall also ensure that a protective helmet designed to reduce electrical shock hazard is worn by each such affected employee when near exposed electrical conductors which could contact the head.

Hard hats should be used when falling object hazards may result from activities with proximity to:

- persons or operations where accidental dropping or loss of material, tools, equipment or other articles could lead to a head injury;
- a barricaded or posted demolition or construction area where head hazards exist;
- objects stored on shelves, platforms, etc. that may fall and cause head injury; or
- overhead exposed energized conductors nearby.

ANSI Hard Hat Classes: The three classes are based on the level of protection they provide from electrical hazards.

- Class G (General) hard hats are rated for 2,200 volts (equivalent to the old Class A). Good impact protection, but limited voltage protection.
- Class E (Electrical) hard hats are rated for 20,000 volts (equivalent to the old Class B). Protect against falling objects, high-voltage shock/burns.
- Class C (Conductive) Designed for comfort, offer limited protection.
- Protects heads that may bump against fixed objects, but do not protect against falling objects or electrical shock.

Each hard hat must have the following information clearly marked inside the hat:

- Manufacturer's name
- ANSI standard that the hard hat conforms with, such as "ANSI Z89.1"
- ANSI type (type I or II) and class designation (G, E or C)
- Size range for fitting
- Date of manufacture

Hard hats with any of the following defects should be removed from service and replaced:

- Perforation, cracking, or deformity of the brim or shell;
- Indication of exposure of the brim or shell to heat, chemicals or ultraviolet light and other radiation (in addition to a loss of surface gloss, such signs include chalking or flaking).

Always replace a hard hat if it sustains an impact, even if damage is not noticeable. Suspension systems are offered as replacement parts and should be replaced when damaged or when excessive wear is noticed. It is not necessary to replace the entire hard hat when deterioration or tears of the suspension

systems are noticed. Never mix suspensions and shells from different manufacturers. Use warm soap and water to clean the helmet as necessary.

Hard hat headbands and chin and nape straps should be adjusted to keep the hat comfortably on the head. Liners or sweatbands can be added for warmth or cooling. The shell or other parts of the hat should be replaced when they become damaged. Clean hats by dipping in hot water with detergent, scrub the shell and rinse in clear hot water. Cleaning solvents may damage the shell.

Foot Protection: ASTM F-2412 and F-2413

The employer shall ensure that each affected employee uses protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, or when the use of protective footwear will protect the affected employee from an electrical hazard, such as a static-discharge or electric-shock hazard, that remains after the employer takes other necessary protective measures.

All ANSI- approved footwear has a protective toe and offers impact and compression protection. Check the product's labeling or the manufacturer to ensure the footwear will protect the user from the on-the-job exposure. The University will, at the request of authorized supervisors and department heads, reimburse any employee or faculty member no less than 30 percent of the cost of such shoes. This subsidy must be budgeted in departmental funds and there will be no general fund set up for financing. To meet the demands of normal wear or damage from on-the-job accidents, the subsidy must be made available as often as necessary.

The first line of the marking will indicate ASTM designation (e.g., "ASTM F2413-05")

The second line of the marking indicates specifications concerning the footwear.

- M or F = male or female
- I/(75 or 50) = Impact resistance (75 or 50 foot-pounds)
- C/(75 or 50) = Compression resistance (2500 or 1750 psi)
- Mt/(75 or 50) = Metatarsal Protection (75 or 50 foot-pounds)
- EH = electric shock resistance

Damaged or defective shoes should be replaced. The CAM encourages departments to subsidize the purchase of properly designated safety shoes from departmental funds for their employees.

Hand Protection:

For hand protection, OSHA recommends that PPE selection be based upon the tasks to be performed and the performance and construction characteristics of glove material. There is no standard that provides design or performance characteristics other than chemical and industrial applications. For protection against chemicals, glove selection must be based on the chemicals encountered, the chemical resistance and the physical properties of the glove material. For further assistance, contact the Division of Research Safety.

Gloves must be worn when there is the potential for injury or exposure to skin contact from electrical, chemicals, infectious agents, heat, cold, abrasive, and cutting objects. Appropriate gloves are best selected by referring to glove specifications in laboratory or safety supply catalogs.

- Rubber insulating gloves are among the most important articles of personal protection for electrical workers. To be effective, electrical safety gloves must incorporate dielectric properties and physical strength, along with flexibility and durability. To help ensure safety and performance, they should meet and/or exceed the requirements of the ASTM International ASTM D120-14a – Standard Specification for Rubber Insulating Gloves. Gloves should also be electrically tested following ASTM D120-14a and the International Electrotechnical Commission IEC 60903 standard.
- Chemical resistance information should be verified with each manufacturer since similar materials (e.g., nitrile) available from different manufacturers may vary widely in their performance depending upon the particular manufacturing method and glove design. Not all gloves are equally effective in preventing skin contact, especially from chemical exposures. Chemicals eventually permeate gloves; however, they can be used safely for specific time periods when the conditions of use and glove characteristics (e.g. thickness, permeation, rate and time, are known).
- Disposable gloves can be used for powders and liquids of low toxicity in situations where incidental splashes may occur. They provide good protection against biological material. Should the glove become contaminated, remove it immediately and wash the hands. Disposable gloves have no mechanical resistance, should be changed frequently, and should never be reused.
- There are a wide variety of insulated, thermal cold condition work gloves. From water repellant to thermal insulated, and cut-resistant to freezer ready, there are gloves perfectly suited for your cold condition work environment.
- Heat-resistant gloves are designed to protect workers' hands from burns or other injuries that can result from coming into contact with extremely hot objects, working near sparks or flames, or from being exposed to high temperatures in the workplace. Since the severity of heat hazards can vary from low to extreme depending on the application or industry, certain heat-resistant gloves are better suited to some workplaces over others.
- Cut-resistant gloves are designed to protect hands from direct contact with sharp edges such as glass, metal, ceramics and other materials. Cut resistance is a function of a glove's material composition and thickness. You can increase the level of cut protection by increasing material weight (i.e., ounces per square yard); by using high-performance materials such as Dyneema®, Kevlar®, and metal mesh; or by using composite yarns made with varying combinations of stainless steel, fiberglass, synthetic and high-performance yarns.
- Leather work gloves are capable of standing up to some of your most rigorous tasks. Leather helps protect workers' hands from exposures to cold, heat, abrasion and impact. It also offers dexterity and breathability. These characteristics make leather an ideal choice for work gloves.

Gloves must be cleaned after use and replaced periodically depending upon chemical permeability to the material handled. When gloves become torn or worn through by physical contact they should be replaced.

Protective Clothing: ASTM F1506

Personal protective clothing is required where employees may be exposed to such hazards as toxic or corrosive chemicals, biological pathogens, molten metal splashes, thermal extremes, etc. The protective clothing may take the form of aprons, coveralls, coats, pants, hats, hoods, sleeves, vests, gloves, and totally encapsulating chemical protective suits.

Protective clothing shall be of safe design and construction for the work to be performed. The clothing selected should be able to protect the body by preventing injury or impairment through absorption or physical contact. In general, protective clothing should encompass the following guidelines:

- Wool and specially treated cotton clothing are fire-resistant and comfortable.
- Heavy fabrics protect against cuts and bruises from heavy, sharp or rough materials.
- Leather guards against dry heat and flame.
- Rubber protects against acids and chemicals.
- Synthetic materials may catch on fire more easily.
- Disposable suits of paper like material protect against dusty materials.
- Disposable or reusable suits for liquid or vapor protection should be evaluated on a case-by-case basis.
- Defective or damaged clothing should not be used.

Employees within the right-of-way who are exposed to traffic (vehicles using the highway for purposes of travel) or to construction equipment shall wear high-visibility safety apparel. High-visibility clothing is intended to clearly distinguish the worker from the environment.

- ANSI Z89.1 class 2 high-visibility apparel is required as a minimum when working in and around vehicular traffic and construction equipment.
- ANSI Z89.1 class 3 is required for work at night, for work near traffic above 50 mph, and other situations if determined by a Job Hazard Analysis.

Employees working in areas where electrical hazards are present shall be provided with, and shall use, protective equipment that helps to protect the worker from electrical shock and arc flash hazards. All employees that work on or near energized electrical installations shall wear the appropriate PPE.

- Electrical Protective Hoods and Clothing shall also be in conformance with NFPA 70E and 2112.
- The PPE shall be designed and constructed for the specific part of the body to be protected and for the work to be performed.
- Shock protection: The appropriate nonconductive protective PPE shall be selected and used to protect the electrical worker from injury due to electrical shock from live parts. For example, voltage rated gloves are required to protect the hands from possible electric shock while testing an electrical component for the presence of voltage.
- Arc flash protection: The appropriate flame-resistant PPE shall be selected and used to minimize the thermal effects of an electrical arc flash on the electrical worker.