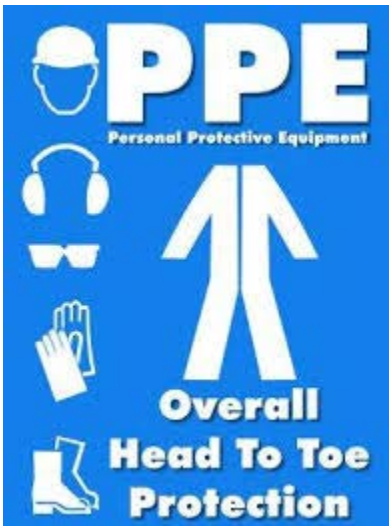
Personal Protective Equipment (PPE)



The University of Maryland Center for Environmental Science recognizes that certain job activities require employees to be at risk for injuries and fatalities and that personal protective equipment will reduce these risks. Personal Protective Equipment, or PPE, is your last line of defense against various workplace injuries. PPE should be maintained in a clean and reliable fashion. Proper fit and comfort is the difference between being safely covered or dangerously exposed. OSHA requires that many categories of PPE meet or be equivalent to standards developed by the American National Standards Institute (ANSI). ANSI has been preparing safety standards since the 1920s.

OSHA requires PPE to meet the following ANSI standards:

- Eye and Face Protection: ANSI Z87.1-1989 (USA Standard for Occupational and Educational Eye and Face Protection).
- Head Protection: ANSI Z89.1-1986
- Foot Protection: ANSI Z41.1-1991.

Selecting the most suitable protection for employees should take into consideration the following elements:

- Ability to protect against specific workplace hazards.
- Should fit properly and be reasonably comfortable to wear.
- Should provide unrestricted vision and movement.
- Should be durable and cleanable.
- Should allow unrestricted functioning of any other required PPE.

All costs for equipment and medical services will be the responsibility of the affected Principal Investigator(s) (PI). PI's are responsible for the selection, procurement and distribution of all supplies and materials which are necessary to assure compliance with this *PPE Hazard Control Plan*. Departments are also expected to provide specific work practices, training and to maintain copies of training records for insertion into personnel files. The Environmental Safety Compliance Officer (ESCO) will assist the PI's and various departments in the training requirements and record retention for the Personal Protective Equipment program.

Eye and Face Protection

Appropriate eye and face protection must be used when exposed to liquid

chemicals, acids or caustic liquids, chemical gases or vapors, molten metal, flying objects, potentially infected material or potentially harmful light radiation.

The following are different types of eye and face protection:

- **Safety spectacles**. These protective eyeglasses have safety frames constructed of metal or plastic and impact-resistant lenses. Side shields are available on some models.
- **Goggles**. These are tight-fitting eye protection that completely cover the eyes, eye sockets and the facial area immediately surrounding the eyes and provide protection from impact, dust and splashes. Some goggles will fit over corrective lenses.
- **Welding shields**. Constructed of vulcanized fiber or fiberglass and fitted with a filtered lens, welding shields protect eyes from burns caused by infrared or intense radiant light; they also protect both the eyes and face from flying sparks, metal spatter and slag chips produced during welding, brazing, soldering and cutting operations. OSHA requires filter lenses to have a shade number appropriate to protect against the specific hazards of the work being performed in order to protect against harmful light radiation. 29 CFR 1910.133(a)(5).
- **Laser safety goggles**. These specialty goggles protect against intense concentrations of light produced by lasers. Laser light radiation can be extremely dangerous to the unprotected eye and direct or reflected beams can cause permanent eye damage. Laser retinal burns can be painless, so it is essential that all personnel in or around laser operations wear appropriate eye protection. 29 CFR 1926.102(b)(2)
- **Face shields**. These transparent sheets of plastic extend from the eyebrows to below the chin and across the entire width of the employee's head. Some are polarized for glare protection. Face shields protect against nuisance dusts and potential splashes or sprays of hazardous liquids but will not provide adequate protection against impact hazards. Face shields use in combination with goggles or safety spectacles will provide additional protection against impact hazards.
- **Prescription Lenses.** Everyday use of prescription corrective lenses will not provide adequate protection against most occupational eye and face hazards, so employees with corrective lenses must either wear eye protection that incorporates the prescription into the design or wear additional eye protection over their prescription lenses. It is important to ensure that the protective eyewear does not disturb the proper positioning of the prescription lenses so that the employee's vision will not be inhibited or limited. Also, employees who wear

Personal Protective Equipment (PPE)

contact lenses must wear eye or face PPE when working in hazardous conditions.

- **Respirators**:  Regulations concerning the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, vapors, or in oxygen-deficient environments can be found in 29 CFR Part 1910.134. You must be part of the **Respiratory Fit Program** to wear a respirator. This includes selecting an appropriate respirator and cartridges, completing a medical questionnaire, have a "respirator fit test" and physical exam prior to working with any material requiring a respirator (this is not a dust mask). Please contact the Safety Officer (SO) for the appropriate forms, information, and appointments you need.

Head Protection

A head injury can impair an employee for life or it can be fatal. Wearing a safety helmet or hard hat is one of the easiest ways to protect an employee's head from injury. Hard hats can protect from impact and penetration hazards as well as from electrical shock and burn hazards. Hard hats must be worn with the bill forward to protect employees properly. Hard hats must have a hard outer shell and a shock absorbing lining that incorporates a headband and straps that suspend the shell from 1 to 1 ¼ inches away from the head. This type of design provides shock absorption during an impact and ventilation during normal wear. Protective headgear must meet ANSI Standard Z89.1-1986 (Protective Headgear for Industrial Workers) or provide an equivalent level of protection.

Hard hats are divided into three industrial classes:

- Class A hard hats provide impact and penetration resistance along with limited voltage protection (up to 2,200 volts).
- Class B hard hats provide the highest level of protection against electrical hazards, with high-voltage shock and burn protection (up to 20,000 volts). They also provide protection from impact and penetration hazards by flying/falling objects.
- Class C hard hats provide lightweight comfort and impact protection but offer no protection from electrical hazards.

Another class of protective headgear on the market is called a "bump hat," designed for use in areas with low head clearance. They are recommended for areas where protection is needed from

Personal Protective Equipment (PPE)

head bumps and lacerations. These are not designed to protect against falling or flying objects and are not ANSI approved. It is essential to ensure that the equipment provides appropriate protection. Each hat should bear a label inside the shell that lists the manufacturer, the ANSI designation and the class of the hat.

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.

Foot and Leg Protection

Safety footwear must meet ANSI minimum compression and impact performance standards in ANSI Z41-1991 (American National Standard for Personal Protection-Protective Footwear) or provide equivalent protection. Different footwear protects in different ways. Check the product's labeling or consult the manufacturer to make sure the footwear will protect the user from the hazards they face.

Examples of situations in which an employee should wear foot and/or leg protection include:

- When heavy objects such as barrels or tools might roll onto or fall on the employee's feet;
- Working with sharp objects such as nails or spikes that could pierce the soles or uppers of ordinary shoes;
- Exposure to molten metal that might splash on feet or lets;
- Working on or around hot, wet or slippery surfaces; and
- Working when electrical hazards are present.

Foot and leg protection choices include the following:

- **Leggings** protect the lower legs and feet from heat hazards such as molten metal or welding sparks. Safety snaps allow leggings to be removed quickly.

Personal Protective Equipment (PPE)

- **Metatarsal guards** protect the instep area from impact and compression. Made of aluminum, steel, fiber or plastic, these guards may be strapped to the outside of shoes.
- **Toe guards** fit over the toes of regular shoes to protect the toes from impact and compression hazards. They may be made of steel, aluminum or plastic.
- **Combination foot and shin guards** protect the lower legs and feet, and may be used in combination with toe guards when greater protection is needed.
- **Safety shoes** have impact-resistant toes and heat-resistant soles that protect the feet against hot work surfaces common in roofing, paving and hot metal industries. The metal insoles of some safety shoes protect against puncture wounds. Safety shoes may also be designed to be electrically conductive to prevent the buildup of static electricity in areas with the potential for explosive atmospheres or nonconductive to protect employees from workplace electrical hazards.
- **Closed Toe Shoes,**

meaning shoes where the entire foot is covered, must be worn in all laboratories with hazardous materials. If you wear sandals or other shoes outside the lab, you must always keep a pair of appropriate shoes at your desk so you can change into them when you do your lab work.

Hand and Arm Protection

Potential injury to hands and arms include skin absorption of harmful substances, chemical or thermal burns, electrical dangers, bruises, abrasions, cuts, punctures, fractures and amputations. Protective equipment includes gloves, finger guards, and arm coverings or elbow-length gloves. Engineering and work practice controls should be in place to control or eliminate hazards and the use of PPE provides additional protection against hazards not completely eliminated through other means.

There are a wide variety of gloves available today to protect against a variety of hazards. There is no ANSI standard for gloves, but OSHA recommends that selection be based upon the tasks to be performed and the

Personal Protective Equipment (PPE)

performance and construction characteristics of the glove material. For protection against chemicals, glove selection must be based on the chemicals encountered, the chemical resistance and the physical properties of the glove material. The hazard and operation involved will affect the selection of gloves. Choose wisely because gloves designed for one function may not protect against a different function even though they may appear to be of the appropriate material. In general, gloves fall into four groups:

- Gloves made of leather, canvas or metal mesh;
- Fabric and coated fabric gloves;
- Chemical and liquid resistant gloves;
- Insulating rubber gloves (See 29CFR 1910.137).

Leather, canvas or metal mesh gloves proved protection against cuts and heat and cold. Leather gloves also protect against sustained heat. Fabric gloves protect against dirt, slivers, chafing and abrasions. Coated fabric gloves offer general purpose hand protection of slip resistant qualities. Chemical resistant gloves are mad with different kinds of rubber: natural, butyl, neoprene, nitrile, and fluorocarbon (viton); or various kinds of plastic: polyvinyl chloride (PVC), polyvinyl alcohol and polyethylene. These materials can be blended or laminated for better performance.

Ansell Guide to Chemical Resistant Gloves give the permeation and breakthrough time for different types of gloves with a wide range of chemicals. Permeation is the process by which a potentially hazardous chemical moves through a material on a molecular level. Molecules of chemical adsorb onto the outer surface of a material. They then enter and diffuse across the material and are released or desorbed from the inner surface. Breakthrough time is the average time between initial contact of the chemical with the outside surface of the fabric and the time at which the chemical is detected at the inside surface of the fabric. One type of glove does not protect from all chemicals. When selecting chemical-resistant gloves be sure to consult the manufacturer's recommendations, especially if the gloved hand(s) will be immersed in the chemical. Sometimes it is even suggested to double layer gloves for additional protection.

Protective gloves should be inspected before each use to ensure that they are not torn, punctured or made ineffective in any way. Gloves that are discolored or stiff may indicate deficiencies caused by excessive use or degradation from chemical exposure. Any gloves with impaired protective ability should be discarded and replaced. Disposable gloves should not be reused (hence "disposable").

Personal Protective Equipment (PPE)

Body Protection

Appropriate body protection in the workplace is required when the following hazards are involved:

- Hazardous chemicals and radioactive materials;
- Temperature extremes;
- Hot splashes from molten metals and other hot liquids
- Potential impacts from tools, machinery and materials.

Examples of body protection include laboratory coats, aprons, coveralls, vests, jackets, and full body suits. When protection against toxic substances or harmful physical agents the clothing should be carefully inspected before each use. The PPE must fit and function properly for the purpose for which it is intended. Permeation and breakthrough time is just as important here as it is with gloves.

Protective clothing comes in a variety of materials, each effective against particular hazards:

- Paper-like fiber provides disposable protection against dust and splashes.
- Treated wool and cotton adapts to changing temperatures and protects against dust, abrasions and rough irritating surfaces.
- Duck protects against cuts and bruises when handling heavy, sharp or rough materials.
- Leather is used to protect against dry heat and flames.
- Rubber, rubberized fabrics, neoprene and plastics protect against certain chemicals and physical hazards.

Life jackets, work vests, exposure/survival suits must be worn when working over or near water where danger of drowning exists (29 CFR1926.106). Prior to and after each use they must be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used.

Work harnesses, lifelines, and lanyards must be used when doing confined space work. See the Confined Space Policy. These units must also be inspected prior to and after each use for defects and wear. Defective units will be discarded.

Hearing Protection

If engineering and work practice controls do not lower employee exposure to workplace noise to acceptable levels, employees must wear appropriate hearing protection. The attenuation (reduced noise that gets to your ears)

Personal Protective Equipment (PPE)

differs according to the type of protection used and how well it fits. Hearing protection must reduce an employee's noise exposure to within the acceptable limits listed in 29 CFR 1910.95. If employees are exposed to occupational noise at or above 85dB averaged over an eight-hour period, the employer is required to institute a hearing conservation program that includes regular testing of employees' hearing by qualified professionals. Some types of hearing protection include:

- Single-use earplugs made of waxed cotton, foam, silicone rubber or fiberglass wool. They are self-forming and, when properly inserted, they work as well as most molded earplugs.
- Pre-formed or molded earplugs must be individually fitted by a professional and can be disposable or reusable.
- Earmuffs require a perfect seal around the ear. Glasses, facial hair, long hair or facial movements such as chewing may reduce the protective value of earmuffs.

RECORD KEEPING

All medical documents pertaining to an employee's work-related injury or fatality will be kept on file in their Worker's Compensation file for seven years.

CONCLUSION

Personal protective equipment can be effective only if the equipment is selected based on its intended use, employees are trained in its proper use, and the equipment is properly tested, maintained, and worn.

Personal Protective Equipment (PPE)

For more information and/or suggestions contact the Environmental Safety Compliance Officer (ESCO) at Ext. 8441 or Email: mailto:umces-safety@umces.edu.