

The University of Maryland at the Horn Point Laboratory recognizes that certain job activities require employees to be at risk for injuries and fatalities and that personal protective equipment will reduce these risks.

Therefore, it is the intent of the HPL to minimize or eliminate the risk of occupational exposure to injuries and fatalities by utilizing a combination of employee education, personal protective equipment, administrative controls, engineering controls, and application of recommended work practices.

## **Personal Protective Equipment (PPE)**

Personal Protective Equipment, or PPE, is your last line of defense against various workplace injuries. With the arrival of summer and warm – or rather, hot – weather, people switch their wardrobes to warm weather wear. Often, summertime attire, such as shorts, short skirts, sandals and flip flops, is chosen strictly for comfort and to combat the heat. However, anyone who works in a laboratory should remember that safety is just as important in the summer as at any other time of year. With that in mind, we would like to remind everyone of appropriate clothing and equipment for personal protection in a laboratory. PPE can take many forms, but OSHA regulations cover the following areas:

- eye and face protection —standard 29 CFR 1910.133
- respiratory protection —standard 29 CFR 1910.134
- head protection —standard 29 CFR 1910.135
- foot protection —standard 29 CFR 1910.136
- electrical protective devices —standard 29 CFR 1910.137
- hand protection —standard 29 CFR 1910.138.

Protective equipment = tools to do the job. Appropriate PPE is provided for each employee as appropriate for the identified hazards of your position. Your PPE shall be maintained in a sanitary and reliable condition. Your supervisor will instruct you how to properly don, doff, adjust, and wear your PPE.

### **EYE AND FACE PROTECTION**

Protective eye and face wear must comply with the American National Standards Institute (ANSI) Standard Z87.1-1989 or later.

Some of the most common types of eye and face protection include:

- **Safety Glasses:** Safety glasses have safety frames constructed of metal or plastic and impact-resistant lenses. Side protection is required. Must comply with ANSI standard Z87.1
- **Chemical Splash Goggles:** Tight fitting eye protection that completely covers the eyes, eye sockets and facial area surrounding the eyes. Provides protection from

impact, dust and splashes. Must comply with ANSI standard Z87.1

- **Dust Goggles:** Dust goggles, sometimes called direct ventilated goggles, are tight fitting eye protection designed to resist the passage of large particles into the goggles. Must comply with ANSI standard Z87.1
- **Fluid Resistant Shields:** These shields are fluid resistant or impervious and provide splash protection from biological material, such as human or non-human primate body fluids. These shields do not provide protection against chemicals or impact hazards and do not comply with ANSI Z87.1
- **Face Shields:** These shields extend from the eyebrows to below the chin and across the width of the employee’s head. Face shields protect against potential splashes or sprays of hazardous liquids. When worn for protection against UV, must be specifically designed to protect the face and eyes from hazardous radiation. When used for chemical protection or UV protection, must comply with ANSI standard Z87.1.
- **Laser Eyewear:** Protective eyewear is required for Class 3 and 4 laser use where irradiation of the eye is possible. Such eyewear should be used only at the wavelength and energy/power for which it is intended. Contact the Laser Safety Officer at x8441 for information.
- **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 the face from flying sparks, metal splatter and slag chips produced during welding, brazing, soldering and cutting operations. For more information, see the [OSHA Eye Protection During Welding Fact Sheet](#)

**What Type of Eye Protection Should I Wear for Various Hazards?**

<b>Chemicals</b>	Hazardous dry chemicals and small amounts of hazardous liquid chemicals.	Safety Glasses	Eye Protection is required when working with chemicals on the bench or in a fume hood.
	Hazardous chemicals that Pose a splash hazard	Chemical splash goggles	
	Cryogenic liquids	Chemical splash goggles and a face shield.	
	Highly reactive or explosive materials	Chemical splash goggles and a face shield	Blast shield recommended
	Pyrophoric solids or liquids	Chemicals splash goggles	
<b>Biological</b>	Potentially infectious	Safety glasses plus	Eye protection is

<b>Material</b>	materials, including BSL2 microorganisms and viruses, human and non-human primate material, outside of a biosafety cabinet	mask or face shield	typically not required when working in a biosafety cabinet, except if other hazardous materials are being handled in the lab. Eye protection may be needed when removing items from the biosafety cabinet.
<b>Radiation</b>	Unsealed radioactive materials, liquid or powder	Safety glasses	
	Lasers	Eyewear is dependent on wavelength and energy/power of laser	Contact Laser Safety Officer at 8441
	Open ultraviolet light source	Face shield with UV protection	
	Infrared emitting equipment	Shaded goggles	
<b>Machining and Physical Hazards</b>	Soldering, spatter of flux or hot metal	Safety glasses or chemical splash goggles	
	Furnaces, molten metal or glass, heat, sparks, glare	Dust goggles, reflective face shield	
	Chips, particles, dust, glass shards	Safety glasses	
	Glassware under pressure	Safety glasses or chemical splash goggles	
	Cutting/connecting glass tubing	Safety glasses	
	Welding and brazing operations	See: <a href="#">OSHA Factsheet - Eye Protection During Welding</a>	
	Changing out compressed gas	Safety glasses	

	cylinders, affixing regulator to cylinder		
	Use of compressed air for cleaning equipment	Dust goggles	Use of compressed air for personal cleaning is prohibited

<b>Hazard</b>	<b>Degree of Hazard</b>	<b>Protective Material</b>
Abrasion	Severe	Reinforced heavy rubber, staple-reinforced heavy leather
	Less Severe	Rubber, plastic, leather, polyester, nylon, cotton
Sharp Edges	Severe	Metal mesh, staple-reinforced leather, Kevlar-steel mesh
	Less Severe	Leather, terry cloth (aramid fiber)
	Mild with delicate work	Lightweight leather, polyester, nylon, cotton
Chemicals and Fluids	Risk varies according to the chemical, its concentration, and time of contact among other factors. Refer to the manufacturer or product SDS	<a href="http://www.ansellpro.com/download/Ansell_7thEditionChemicalResistanceGuide.pdf">http://www.ansellpro.com/download/Ansell_7thEditionChemicalResistanceGuide.pdf</a>
Cold		Leather insulated plastic or rubber, wool, cotton
Electricity		Rubber-insulating gloves tested to appropriate voltage with leather outer glove
Heat	Temperatures over 350 <sup>0</sup> C	Asbestos, <u>Zetex</u>
	Up to 350 <sup>0</sup> C	<u>Nomex</u> ,Kevlar, neoprene-coated asbestos, heat resistant leather with linings Chrome-tanned leather, terry cloth
	Up to 200 <sup>0</sup> C	<u>Nomex</u> ,Kevlar, heat resistant leather,

		Terry cloth (aramid fiber)
	Up to 100°C	Chrome-tanned leather, terry cloth
General Duty		Cotton, barrier creams, terry cloth, leather

### **HAND & ARM PROTECTION: 29 CFR 1910.138 – Hand Protection**

Potential hazards to hands and arms include skin absorption of harmful substances, chemical or thermal burns, electrical dangers, bruises, abrasions, cuts, punctures, fractures or amputations. Protective equipment includes gloves, finger guards and arm coverings.

#### **Guide to Selection of Skin Protection**

For chemical resistant gloves, check compatibility and breakthrough time.

Gloves should fit the user's hands comfortably – they should not be too loose or too tight. They also should not tear or damage easily. Gloves are sometimes worn for several hours and need to stand up to the task. See the glove compatibility chart to ensure you have the correct glove material for the chemicals you are using.

Once gloves become contaminated, they can become a means for spreading hazardous materials to yourself, others or environmental surfaces. Therefore, the way YOU use gloves can influence the risk of hazards in your work setting.

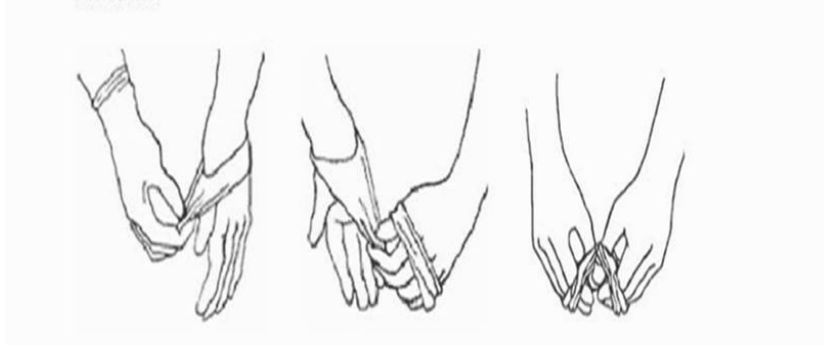
These are the most important do's and don'ts of glove use.

- Limit opportunities for "touch contamination" - protect yourself, and others. Think about unnecessarily touching surfaces with contaminated gloves. Surfaces such as light switches, door and cabinet knobs, keyboards, phones, can become contaminated if touched by soiled gloves.
- Change gloves as needed.
- Never wash or reuse disposable gloves.

[http://www.ansellpro.com/download/Ansell\\_7thEditionChemicalResistanceGuide.pdf](http://www.ansellpro.com/download/Ansell_7thEditionChemicalResistanceGuide.pdf)

#### **How to Remove Gloves**

- Grasp outside edge near wrist
- Peel away from hand part way down turning glove inside-out (leave glove over fingers).
- Grasp second glove and pull it part way off.
- Pull off the two gloves at same time touching only the inside surfaces
- Discard and wash hands



## **FOOT PROTECTION**

Potential hazards which may lead to foot and leg injuries include falling or rolling objects, crushing or penetrating materials, hot, corrosive or poisonous substances, electrical hazards, static electricity, or slippery surfaces.

Closed-toed shoes should be worn at all times in laboratories; for maintenance personnel; and for housekeeping.

- Chemical resistant overshoes or boots may be used to avoid possible exposure to corrosive chemical or large quantities of solvents or water that might penetrate normal footwear (e.g., during spill cleanup).
- Steel-toed safety shoes may be necessary when there is a risk of heavy objects falling or rolling onto the feet. Safety-toed footwear must meet the minimum compression and impact performance standards in ANSI Z41-1999 or provide equivalent protection.
- 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 regular work 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.
- Shoes with slip-resistant soles are required for certain departments and should be used in areas where slips and falls on wet floors are most likely.
- 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.
- Shoes with open backs may be allowed in laboratories at the discretion of the Supervisor.
- Sandals or flip flops may be worn while at your desk and to and from work only if you have an appropriate pair of closed toe shoes with you to wear in the laboratory. Crocs or other shoes with holes in the tops are not appropriate foot protection.

## **LEG PROTECTION**

- 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
- While not considered PPE, personal clothing offers a measure of protection against chemical splash and other hazards. For this reason, long pants are a much

better option than shorts or short skirts. A recent lab accident resulted in severe chemical burns on the worker's legs and feet, because the person was wearing shorts and flip flops.

### **BODY PROTECTION:**

While there is no specific OSHA standard for body protection like there is for eye/face, head, foot, and hand protection, OSHA's general PPE requirements, 29 CFR 1910.132, specifically state that protective clothing should be used when appropriate. Consider the permeability and penetration aspects with respect to the classes of hazardous material exposure.

- In a typical laboratory setting where small containers of biological agents, radioactive materials, or hazardous chemicals are handled, a lab coat is the minimum required body protection. In this type of setting, potential for contact with significant quantities of hazardous materials/agents is relatively low. Lab coats protect the body against incidental exposure to hazardous agents and minimize potential for "transferring" hazardous agents to other areas through contaminated clothing. Lab coats come in a variety of materials of construction.
- Full body coverage is necessary if there is potential for large splashes that could impact the legs, arms, and torso. If exposure potential is limited, then an apron, sleeves, or jacket may be sufficient.
- Welding aprons, sleeves, bibs, and coats are available to protect against hot splashes from molten metals. The authority mandating welding protective clothing is ANSI Z49.1, Safety in Welding, Cutting, and Allied Processes.
- In the United States, the primary performance standard for chainsaw protective clothing is ASTM F1897, Standard Specification for Leg Protection for Chain Saw Users. When selecting leg protection for chainsaw use, select a manufacturer that adheres to this standard or an equivalent international consensus standard.
- Cut-resistance clothing to help protect against cuts can be made from a variety of materials.

### **HEAD PROTECTION:**

Hard hats are required when working in areas where there is a potential for injury to the head from falling objects. In addition, hard hats designed to reduce electrical shock are required when working near exposed electrical conductors that may contact the head. Hard hats are also required when working around raised tow motor or tractor forklifts, with or without cargo and when on or around scaffolding. Specialty types of hard hats include those with miner's light attachments, reflective stripe for night work, face shields for welders, and attachments for visors or earmuffs. All hard hats must comply with ANSI Z89.1, American National Standard for Personal Protection - Protective Headwear for Industrial Workers - Requirements. The suspension system inside the hat is designed to

help absorb and dissipate impact while keeping a clearance between the head and shell of the hat. The class of hat is usually noted inside the hat shell.

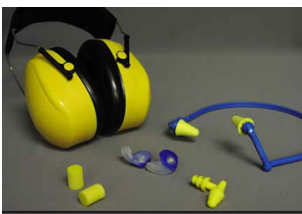
### **Types and Classes**

- Type 1 - Helmets intended to reduce the force of impact resulting in a blow only to the top of the head.
- Type 2 - Helmets intended to reduce the force of impact resulting in a blow to the top and the side of the head
- Class E (Formerly Class B): Helmets for use where electrical hazards are present (in utility services) that are non-conducting and intended to protect against falling objects and reduce the danger of exposure to high voltage electrical shocks and burns. Offers the highest protection with high-voltage shock and burn protection up to 20,000 volts.
- Class G (Formerly Class A): General Use (limited voltage - non-conducting) intended to protect against falling objects and reduce the danger of exposure to low voltage electrical conductors. They provide impact and penetration resistance and protection from up to 2,200 volts.
- Class (Formerly Class C): Class C Hard Hats are not tested for electrical resistance. They are designed for lightweight comfort and impact protection and are not intended to provide protection from electrical conductors.

### **Hard Hat Wear Factors and Limitations**

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.

### **HEARING PROTECTION:**



Exposure to loud noise, even for short periods of time, can permanently damage your hearing. Whether you are using equipment, in a machine room, or working with power tools, if you have to shout to be heard, the noise level is probably harming your hearing. If you think you are exposed to loud noise on campus, tell your supervisor or contact your Safety Officer. PPE for hearing protection is required for employees who are exposed to noise levels equal to or greater than 85 decibels averaged over an eight-hour period.

Commonly used hearing protective devices are earmuffs, and different types of earplugs. When choosing hearing protective devices, at least two choices should be provided and "the BEST protector is one you'll wear." Choose wisely. Plugs are available in different sizes and shapes to fit different ear canals; muffs are easy to put on and take off for short-term loud noise exposure. At times a combination of earmuffs and earplugs may



need to be used. These may be recommendations after a Noise Survey is completed.

### **RESPIRATORY PROTECTION:**

Respiratory Hazards may include:

- Harmful dusts (lead, silica, and other heavy metals)
- Fumes and smokes (welding fume)
- Gases and vapors (chemical exposures)
- Biological hazards (viruses)

Respiratory hazards are eliminated through the use of engineering and administrative controls (e.g. ventilation, isolation, work practices, product substitution) to minimize or eliminate the use of respirators. For situations where engineering controls are not feasible or during emergencies, respirators are used for protection from inhalation hazards. The respiratory protection program requires:

- Training
- Medical evaluation
- Respirator fit testing
- Record keeping

*Air-purifying respirator* means a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

*Powered air-purifying respirator (PAPR)* means an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

*Self-Contained Breathing Apparatus, or SCBA*, sometimes referred to as a compressed air breathing apparatus (CABA), or simply breathing apparatus (BA), is a device worn by rescue workers, firefighters, and others to provide breathable air in an immediately dangerous to life or health atmosphere (IDLH).

No employee should wear a respirator unless they have been through the Respiratory Protection Program. Contact the Safety Officer (<mailto:safety-hpl@umces.edu>) if you need a respirator to perform your work.

### **FLOTATION DEVICES:** Personal Flotation Devices (PFD's)

Employees working near, on, in, or over water where the danger of drowning exists must wear U.S. Coast Guard-approved life jackets or buoyant work vests. Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects which would alter their strength or buoyancy. Defective units must be taken out of commission and then destroyed or repaired if possible. Ring buoys with at least 90 feet of line must be available for emergency rescue operations. The distance between ring buoys must not exceed 200 feet.

### **General Guidance on Proper Use**

Regardless of the type of protective garment used:

- Most protective garments inhibit the loss of heat from the body and therefore increase physical and psychological burdens on the user. Therefore, it is important to achieve a balance between user comfort considerations and adequate hazard protection. Protection should not be compromised, nor should the worker be unnecessarily burdened.
- Protective clothing should be carefully inspected before each use, it must fit each worker properly, and it must function properly and for the purpose for which it is intended.
- The general PPE use considerations and information provided for protective gloves also apply to garments used for body protection.
- PPE should be stored in a well-ventilated, clean, and dry environment, away from direct sunlight and contaminants. Sometimes, a manufacture will specify storage of certain PPE in sealed bags.
- Users of any type of PPE must read and adhere to the manufacturer's use and care/maintenance instructions. These instructions should be kept in a manner that they can be easily referenced from time-to-time.
- Care must be taken to prevent the spread of contaminants from the work area to "clean" areas. Remove PPE before leaving the work area. Wash hands after removing contaminated PPE. Do not take contaminated PPE home for cleaning or other use.
- Do not reuse disposable/single use PPE.
- Decontaminate reusable PPE immediately after use and in accordance with manufacturer's instructions.
- All PPE should be inspected prior to each use to verify its integrity. Compromised PPE should be removed from service. Refrain from wearing items that could compromise the integrity of the PPE. For example, sharp tools carried in pockets could penetrate protective coveralls.

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