PERSONAL PROTECTIVE EQUIPMENT

(For assistance, please contact Vince Rodgers, 569-371-7602)

Personal protective equipment (PPE) for the eyes and face is designed to prevent or lessen the severity of injuries to workers. The employer must assess the workplace and determine if hazards that necessitate the use of eye and face protection are present or are likely to be present before assigning PPE to workers. [1910.132(d)]

A hazard assessment should determine the risk of exposure to eye and face hazards, including those which may be encountered in an emergency. Employers should be aware of the possibility of multiple and simultaneous hazard exposures and be prepared to protect against the highest level of each hazard. [1910 Subpart I App B]

<table>
<thead>
<tr>
<th>Hazard type</th>
<th>Examples of Hazard</th>
<th>Common Related Tasks</th>
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<tbody>
<tr>
<td>Impact</td>
<td>Flying objects such as large chips, fragments, particles, sand, and dirt.</td>
<td>Chipping, grinding, machining, masonry work, wood working, sawing, drilling, chiseling, powered fastening, riveting, and sanding.</td>
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<tr>
<td>Heat</td>
<td>Anything emitting extreme heat.</td>
<td>Furnace operations, pouring, casting, hot dipping, and welding.</td>
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<tr>
<td>Chemicals</td>
<td>Splash, fumes, vapors, and irritating mists.</td>
<td>Acid and chemical handling, degreasing, plating, and working with blood.</td>
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<tr>
<td>Dust</td>
<td>Harmful Dust.</td>
<td>Woodworking, buffing, and general dusty conditions.</td>
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<tr>
<td>Optical Radiation</td>
<td>Radiant energy, glare, and intense light</td>
<td>Welding, torch-cutting, brazing, soldering, and laser work.</td>
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Use of an appropriate ensemble of personal protective equipment (PPE) creates a second line of defense against exposure to hazardous chemicals. Engineering controls, such as fume hoods and other ventilation devices, are used to create a first line of defense. When engineering controls are not adequate to minimize exposures to acceptable levels, UALR departments must provide employees with adequate PPE. Components selected for an adequate ensemble of PPE vary with the route and degree of exposure and nature of the contaminant. General classes of PPE, with specific examples, are discussed below. Upon request, EHS will provide guidance on the selection of the appropriate classes and specific types of PPE.
• **Respirators** - When engineering controls are not sufficient to reduce air contaminants to an acceptable level, respirators may be required. Many types of respirators are available, ranging from nuisance masks to self-contained breathing apparatuses. The appropriate type of respirator depends on the concentration of contaminants, as well as the form of contaminants (e.g., dusts, mists, fumes, etc.). Regardless of the type of respirator (with the exception of voluntary use of nuisance masks), respirator users must complete a medical exam, attend training, and participate in fit testing on an annual basis. See the EHS SOPs related to respiratory protection for additional information.

• **Eye and Face Protection** - Safety glasses with side shields, goggles, or face shields may be required when there is potential for exposures to chemical splashes or fumes, dusts, flying projectiles, heat, or optical radiation. All protective eyewear must meet the American National Standard for Eye Protection for Occupational and Educational Eye and Face Protection Z87.1. For additional information, see the EHS SOP, Selecting Personal Protective Equipment for the Eyes and Face.

• **Hand Protection** – Gloves provide protection for the hands from many types of hazards, including chemical absorption. Like other classes of PPE, many types of gloves are available, ranging in material of construction and thickness. Selection of an appropriate glove depends on specific chemicals to which the user is or may be exposed, as well as severity of exposure (e.g., incidental, or low hazard contact verses immersion of the hands, or high hazard contact) and manual dexterity considerations. All glove manufactures provide permeability data for specific gloves. It is imperative to review this data before selecting the appropriate glove. In general, examination-type gloves are very thin and provide protection only for incidental contact (e.g., unexpected small droplets). These types of gloves are disposable and should be removed immediately upon contamination, with the hands washed immediately after removal. It is best to avoid gloves constructed of latex because of associated allergy hazards. Silvershield gloves provide the broadest range of possible protection, but are not suitable for operations where the hands are immersed in a chemical or when dexterity is of great importance. Long, thick gloves, constructed of butyl rubber or other material depending on the chemical of interest, must be used when immersing the hands in chemical solutions. Always try to avoid immersion of the hands in any chemical solution, regardless of glove use, by implementing engineered solutions (e.g., retrieval tongs, removable baskets, etc.).

• **Body Protection** – Protective body apparel may be required when there is potential for accidental spills or splashes. To be effective in high-risk splash hazard situations, body apparel should fully cover the torso, arms and legs. Material of construction varies with type of garment selected. Cotton, flame-retardant laboratory smocks or coats provide protection in low hazard situations. More sophisticated apparel, such as Tyvek coveralls, may be necessary when working with large quantities or highly dangerous chemicals. Laboratory coats and other reusable outer garments (e.g., rubber suits) should be laundered frequently, and not commingled with ordinary street clothing. Consider using a laundry service for washable outer garments. Most coveralls are disposable and need to be discarded when compromised through tears or rips or when contaminated. Consult the manufacturer's permeability data when selecting the material of construction and follow the manufacturer's recommendations for cleaning or discarding.

• **Foot Protection** – Protective footwear should be selected based on the degree of hazard. Street shoes are generally sufficient to provide protection in low-hazard operations (e.g., laboratory scale). Bare feet, sandals, and open-toed shoes are not permitted when working with chemicals. Shoe covers provide protection in medium-hazard operations (e.g., contact with chemicals is likely but risk of splash is low). Selection of the material of construction for shoe covers is very important. Like gloves, the material of construction and thickness determines the level of protection of the shoe cover. Formed boots provide the highest level of protection and are designed for operations with significant potential for contact with chemicals. Formed boots may also be necessary for medium-hazard activities that are not compatible with shoe covers because of the likelihood of damage to the shoe cover (e.g., outdoors, abrasive floor coverings, etc.) and for activities that require good footing (e.g., slippery surfaces). Consult the manufacturer's permeability data when selecting the material of construction and follow the manufacturer's recommendations for cleaning or discarding.

All types of PPE have limitations and are only effective when in good condition. Ensure that selected PPE:
• Is appropriate for the task at hand.
• Has a low permeability rating for the chemical(s) it is being used to protect against.
• Is cleaned upon donning and doffing.
• Is routinely inspected for damage and is repaired or replaced as necessary.
• Is stored in a clean area that is protected from excessive light, cold, and heat when not in use.

GENERAL EYE PROTECTION

In accordance with the Revised American National Standard for Occupational and Educational Eye and Face Protection Devices, ANSI Z87.1-2003, all students, faculty, staff, and visitors at UALR who observe or participate in any chemical laboratory course, research laboratory, or chemical demonstration event will wear appropriate protective eye goggles.

Departments are responsible to provide eye protection to all UALR employees. At the Department's option, eye protection for students can be supplied at the Department's cost, purchased and sold to the students at cost, made available for a moderate rental fee, or students may be required to supply their own.

Employers must provide training for each employee who is required to use PPE in the workplace. [1910.132(f)]

  o Each employee shall be trained to know at least the following:
    ▪ When PPE is necessary
    ▪ What PPE is necessary
    ▪ How to properly don, doff, adjust, and wear PPE
    ▪ Limitations of the PPE
    ▪ Proper care, maintenance, useful life, and disposal of the PPE

  o All training should be conducted by a knowledgeable designated person.

  o All required training should be presented in a manner that the employee can understand.

  o Each affected employee shall demonstrate an understanding of the training specified and the ability to use PPE properly, before being allowed to perform work requiring the use of PPE.

Written Certification

  o The employer shall verify that each affected employee has received and understood the required training through a written certification that contains the name of each employee trained, the date(s) of training, and the subject of the certification.

Handling Emergencies

  o If an eye injury occurs, quick action can prevent a permanent disability. For this reason:
    ▪ Emergency eyewashes should be placed in all hazardous areas
    ▪ First-aid instructions should be posted close to potential danger spots
    ▪ Employees must know where the closest eyewash station is and how to get there with restricted vision
Eye and face protection must comply with the American National Standards Institute, ANSI Z87.1-1989 standard if purchased after July 5, 1994 or ANSI Z87.1-1968 if purchased before July 5, 1994. [1910.133(b)(1), 1915.153(b), 1926.102(a)(2)]

- Eye and face PPE shall be distinctly marked to facilitate identification of the manufacturer. [1910.133(a)(4)]

- The following minimum requirements must be met by all protective devices. Protectors shall:
  - Provide adequate protection against the particular hazards for which they are designed
  - Be of safe design and construction for the work to be performed
  - Be reasonably comfortable when worn under the designated conditions
  - Fit snugly and not unduly interfere with the movements of the wearer
  - Be durable
  - Be capable of being disinfected
  - Be easily cleanable
  - Be distinctly marked to facilitate identification only of the manufacturer

Consideration should be given to comfort and fit. Poorly fitting eye and face protection will not offer the necessary protection. [1926.102(a)(6)(iii)]

- Fitting of goggles and safety spectacles should be done by someone skilled in the procedure.
  - Prescription safety spectacles should be fitted only by qualified optical personnel.

- Devices with adjustable features should be fitted on an individual basis to provide a comfortable fit that maintains the device in the proper position.

- Eye protection from dust and chemical splash should form a protective seal when fitted properly.

- Welding helmets and face shields must be properly fitted to ensure that they will not fall off during work operations.

Employees must be trained in the proper care, maintenance, useful life, and disposal of PPE. [1910.132(f)(1)(v)]

Maintenance:

- PPE must be used and maintained in a sanitary and reliable condition.

- The use of equipment with structural or optical defects is prohibited. [1926.102(a)(4)]

- Pitted lenses, like dirty lenses, can be a source of reduced vision. They should be replaced. Deeply scratched or excessively potted lenses are apt to break.
Cleanliness:

- Slack, worn-out, sweat-soaked, or twisted headbands do not hold the eye protector in proper position. Visual inspection can determine when the headband elasticity is reduced to a point below proper function.

Cleaning:

- Atmospheric conditions and the restricted ventilation of the protector can cause lenses to fog. Frequent cleansing may be necessary.

- Eye and face protection equipment that has been previously used should be disinfected before being issued to another employee.

- When employees are assigned protective equipment for extended periods, the equipment should be cleaned and disinfected regularly.

- Several methods for disinfecting eye-protective equipment are acceptable. The most effective method is to disassemble the goggles or spectacles and thoroughly clean all parts with soap and warm water.
  - Carefully rinse all traces of soap and replace defective parts with new ones.
  - Swab thoroughly or completely and immerse all parts for 10 minutes in a solution of germicidal deodorant fungicide.
  - Remove parts from solution and suspend in a clean place for air drying at room temperature or with heated air.
  - Do not rinse after removing parts from the solution because this will remove the germicidal residue that retains its effectiveness after drying.

Storage:

- Goggles should be kept in a case when not in use. Spectacles, in particular, should be given the same care as one’s own glasses, since the frame, nose pads, and temples can be damaged by rough usage.

- Items should be placed in a clean, dust-proof container, such as a box, bag, or plastic envelope, to protect them until reissue.

Employers must ensure that employees who wear prescription (Rx) lenses or contacts use PPE that incorporates the prescription or use eye protection that can be worn over prescription lenses. [1910.133(a)(3), 1915.153(a)(3), 1926.102(a)(3)]

- Workers who wear prescription glasses must also wear required eye protection.
  - Eye and face protection that fits comfortably over glasses is available.
  - Safety goggles and spectacles may incorporate prescription lenses.

Dust and chemicals present additional hazards to contacts wearers. OSHA recommends that workers have an extra pair of contacts or eyeglasses in case of contact failure or loss. 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.
Impact Hazards: Safety Spectacles

Safety spectacles are intended to shield the wearer's eyes from impact hazards such as flying fragments, objects, large chips, and particles. Workers are required to use eye safety spectacles with side shields when there is a hazard from flying objects. Non-side shield spectacles are not acceptable eye protection for impact hazards. [1910.133(a)(2), 1915.153(a)(2)]

The frames of safety spectacles are constructed of metal and/or plastic and can be fitted with either corrective or plano impact-resistant lenses. Side shields may be incorporated into the frames of safety spectacles when needed. Consider each component of safety spectacles when selecting the appropriate device for your workplace.

Eye and Face Protection Selection Chart

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<thead>
<tr>
<th>Source</th>
<th>Assessment of Hazard</th>
<th>Protection</th>
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</thead>
<tbody>
<tr>
<td>CHEMICALS-Acid and chemicals handling,</td>
<td>Splash</td>
<td>Goggles, eyecup and cover types. For severe exposure, use face shield. See notes (3), (11).</td>
</tr>
<tr>
<td>degreasing plating.</td>
<td></td>
<td>Special-purpose goggles.</td>
</tr>
<tr>
<td>Irritating mists</td>
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Notes to Eye and Face Protection Selection Chart:
(3) Faceshields should only be worn over primary eye protection (spectacles or goggles).
(5) As required by the standard, persons whose vision requires the use of prescription (Rx) lenses must wear either protective devices fitted with prescription (Rx) lenses or protective devices designed to be worn over regular prescription (Rx) eyewear.
(6) Wearers of contact lenses must also wear appropriate eye and face protection devices in a hazardous environment. It should be recognized that dusty and/or chemical environments may represent an additional hazard to contact lens wearers.
(8) Atmospheric conditions and the restricted ventilation of the protector can cause lenses to fog. Frequent cleansing may be necessary.
(10) Non-sideshield spectacles are available for frontal protection only, but are not acceptable eye protection for the sources and operations listed for "impact."
(11) Ventilation should be adequate, but well protected from splash entry. Eye and face protection should be designed and used so that it provides both adequate ventilation and protects the wearer from splash entry.

The Chemistry Department Safety Committee recommends Tomahawk® Eyewear TK110 (black frame), TK120 (blue frame), or TK130 (red/white/blue frame) with clear lenses. These glasses meet ANSI Z87.1-1989 standards. They have fully adjustable ratchet action temples and 99.9% UV protection. Beginning January 2006, the above style of protective eyewear will be the only type available for purchase through the UALR Chemistry Department ACS-SA. Safety glasses left in lab drawers or in labs will be appropriated. Students who want to use previously purchased eyewear may do so as long as the eyewear has the ANSI Z87.1 (or simply Z87) designation on the eyewear.

ANSI Z87.1-2003 is the product of Accredited Standards Committee Z87, recognized by the American National Standards Institute. ISEA assumed the secretariat of this committee in June 2004; previously it was held by the American Society of Safety Engineers. ISEA now administers the committee, and will provide support it future revisions of the standard, as well as manage the process through which the committee provides interpretations of the standard.
ANSI Z87.1-2003, published in August 2003, establishes performance criteria and testing requirements for devices used to protect the eyes and face from injuries from impact, non-ionizing radiation and chemical exposure in workplaces and schools. It covers all types of protective devices, including spectacles (plano and prescription), goggles, faceshields, welding helmets and handshields, and full facepiece respirators.

The standard includes descriptions and general requirements, as well as criteria for testing, marking, selection, use and care. Note that it does not apply to hazardous exposure to bloodborne pathogens, X-rays, high-energy particulate radiation, microwaves, high-frequency radiation, lasers, masers, or sports.

Copies of the standard are available from the ISEA. The single-copy cost is $53. Discounted rates for bulk orders are offered. ISEA also publishes an Eye and Face Protection Use and Selection Guide as a companion to the standard.