



## **GUIDELINE FOR CHOOSING PROTECTIVE EYEWEAR**

According to the National Institute of Occupational Safety and Health (NIOSH), each day about 2000 U.S. workers have a job-related eye injury that requires medical treatment. About one third of the injuries are treated in hospital emergency departments and more than 100 of these injuries result in one or more days of lost work.

Some common eye hazards are:

- Dust, concrete, and metal particles
- Falling or shifting debris, building materials, and glass
- Smoke and noxious or poisonous gases
- Chemicals (acids, bases, fuels, solvents, lime, and wet or dry cement powder)
- Cutting or welding light and electrical arcing
- Thermal hazards and fires
- Bloodborne pathogens (hepatitis or HIV) from blood, body fluids, and human remains

Some common eye injuries include:

- Corneal abrasions and conjunctivitis (red eyes)
- Concrete or metal particles or slivers embedded in the eye
- Chemical splashes or burns
- Welder's flash
- Eyeball laceration
- Facial contusions and black eyes

### **Safety Eyewear**

Safety eyewear is defined as any face or eye covering designed to protect the wearer's eyes from contact with flying objects, hazardous liquids, gases or other materials that may be hazardous to the eye. This eyewear is designed to resist impact and shattering when struck by flying objects or hazardous materials. Safety eyewear may include glasses, goggles, and faceshields with or without a prescription lens component.

Some examples of professions where safety eyewear should be routinely considered include carpenters, electricians, machinists, mechanics, plumbers, sheetmetal workers, sanders, grinding machine operators, welders, chemical handlers, and laser device/machine operators.

When evaluating the type of eye protection, the supervisor and employee should consider the following:

- The ability of the safety eyewear to protect against specific workplace hazards.
- The safety eyewear should fit properly and be comfortable to wear.
- The safety eyewear must provide unrestricted vision and movement.
- The safety eyewear should be durable and cleanable.
- The safety eyewear should not interfere with or restrict the function of any other PPE the employee wears.



**Safety spectacles** are protective eyeglasses that have safety frames constructed of metal or plastic and impact-resistant lenses. Side shields are available on some models.



Figure 1. Nonprescription safety glasses with wrap-around side protection



Figure 2. Prescription safety glasses with side shields.

## **Objective**

Protective equipment including personal protective equipment for eyes, face, head and extremities, protective clothing, respiratory devices, and protective shields and barriers should be provided, used and maintained in a sanitary and reliable condition. Appropriate PPE must be provided wherever it is necessary based on the hazards of processes or environment, chemical hazards, radiological hazards or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

## **Risk Assessment and Guidance**

The employer, supervisor, or manager should:

1. Evaluate all jobs and tasks to be performed by employees and identify potential eye injury hazards.
2. Determine appropriate feasible controls, including engineering controls, work practices and safety eyewear.
3. Provide safety eyewear to all employees whose job pose identified eye injury hazards where engineering and work practice controls are infeasible or insufficient to provide adequate protection. Examples where safety eyewear is needed include potential exposure to eye and face hazards from flying particles, molten metal, liquid chemicals, acids, caustic gases, vapors or injurious light radiation such as lasers.



4. Provide safety glasses with prescription corrective lenses according to the provision of this guidance for employees who normally use prescription corrective lenses at work.

Table Designed to Help Risk Assess Work Activity, Related Hazards and Required PPE

| Work Activity  | Work-Related Exposure Hazard   | Require PPE   |
|--|--|---|
| <input type="checkbox"/> Abrasive blasting<br><input type="checkbox"/> Chipping<br><input type="checkbox"/> Chopping<br><input type="checkbox"/> Computer work<br><input type="checkbox"/> Cutting<br><input type="checkbox"/> Drilling<br><input type="checkbox"/> Grinding<br><input type="checkbox"/> Hammering<br><input type="checkbox"/> Punch press operations<br><input type="checkbox"/> Sanding<br><input type="checkbox"/> Sawing<br><input type="checkbox"/> Soldering<br><input type="checkbox"/> Torch brazing<br><input type="checkbox"/> Welding<br><input type="checkbox"/> Working outdoors<br><input type="checkbox"/> OTHER (include description): | <input type="checkbox"/> Blood splashes or aerosols<br><input type="checkbox"/> Chemical mists or liquids<br><input type="checkbox"/> Dirt, chips or sand<br><input type="checkbox"/> Dust, nuisance and airborne<br><input type="checkbox"/> High intensity lights or glare<br><input type="checkbox"/> Hot sparks, grinding<br><input type="checkbox"/> Laser operations<br><input type="checkbox"/> Molten metal splashes<br><input type="checkbox"/> Particles or flying objects<br><input type="checkbox"/> UV light<br><input type="checkbox"/> OTHER (include description): | <input type="checkbox"/> Chemical goggles<br><input type="checkbox"/> Chemical splash goggles<br><input type="checkbox"/> Dust-tight goggles<br><input type="checkbox"/> Face shield<br><input type="checkbox"/> Face shield with safety glasses or goggles<br><input type="checkbox"/> Impact goggles<br><input type="checkbox"/> Laser safety eyewear<br><input type="checkbox"/> Safety glasses<br><input type="checkbox"/> Safety glasses with side shields<br><input type="checkbox"/> Safety goggles<br><input type="checkbox"/> Welding helmet/shield<br><input type="checkbox"/> Welding helmet/shield with safety glasses & side shields<br><input type="checkbox"/> OTHER: (include description): |

**General Requirements**

1. The affected employee must use 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) are acceptable.
2. The employee who wears prescription lenses while engaged in operations that involve eye hazards must wear 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.
3. Eye and face personal protective equipment must be distinctly marked to facilitate identification of the manufacturer and meets the American National Standards Institute (ANSI) code Z87.1.
4. The employee must use equipment with filter lenses that have a shade number appropriate for the work being performed from protection from injurious light radiation (e.g., sunlight, lasers).
5. Employees who work in a laboratory with potential eye hazards should always wear protective eyewear. There are several different options for eye protection. Call the Environment, Health and Safety Department at x2320 for assistance.



## Other Types of Safety Eyewear

### Faceshields



Figure 1. Clear faceshield with crown protector.

**Faceshields** are usually transparent sheets of plastic that extend from the eyebrows to below the chin and across the entire width of the employee's head. Some are polarized for glare protection. Faceshields protect against nuisance dusts and potential splashes or sprays of hazardous liquids but will not provide adequate protection against impact hazards. Faceshields are supplementary protective devices worn to shield the wearer's face from certain hazards. Faceshields used in combination with goggles or safety spectacles will provide additional protection against impact hazards. Faceshields are secondary protectors only so in order to provide the best protection against impact hazards, faceshields must be worn with safety glasses or goggles, as stated in the ANSI code.

### Goggles



Figure 2. Indirectly vented goggles

**Goggles** 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 and vapors. Some goggles will fit over corrective lenses. Goggles offer the most complete impact protection because they form a seal around the eye area keeping dangerous objects out.



When buying goggles, you'll have to choose from the two main types:

1. **Vented** goggles with direct vents offer protection from impact only. They fit snugly around the eye area to prevent flying objects from striking your eyes. Direct vented goggles offer more comfort because they allow air to flow in and out to reduce the chance of fogging.

Indirect vents are "capped" to allow air to move freely in and out without allowing splash or particles in. They offer the same impact protection as the direct vented goggles. Because there isn't as much space for the air to move in and out, lens fogging may be a slight problem and you may want to consider an anti-fog lens coating to alleviate any potential problems.

2. **Non-Vented** goggles are lenses and frames with no holes for air to seep through. They offer a higher level of protection against vapors and fumes and can be used to keep harmful vapors out of sensitive eyes. These goggles must have an anti-fog coating to keep them from steaming up while you work.

### Laser Safety Eyewear



Figure 3. Laser safety glasses

**Laser safety goggles and spectacles** are a special type of eye protection for eyes against intense concentrations of light produced by lasers. The type of laser safety goggles an employer chooses will depend upon the equipment and operating conditions in the workplace. Safety eyewear for laser use must be of the required optical density for the wavelength(s) of the laser. Laser protective eyewear must be approved by ANSI and clearly labeled with optical densities and wavelengths for which protection is afforded. For additional information on laser safety and requirements, see our website <http://www.uwsp.edu/rmgt/Pages/ehs/safety/laser-safety.aspx>.

### Welding Helmet



Figure 4. Welding helmet



**Welding shields or helmets** are 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. The lenses for protection from cutting or welding light must be marked with the shade number -1.5 through 14 (the darkest).

### Other Specialized Eyewear



Figure 5. Sunglasses

For example, **sunglasses** are a specialized type of safety eyewear designed to protect the eyes from UV light sources. However, in order for any type of eyewear to be considered safety eyewear the glasses must meet the ANSI Z87.1 certification and meet the criteria for their specialized use.

### **Safety Eyewear Material Considerations**

Polycarbonate materials are the recommended lens material because they provide the best impact resistance to flying objects. This lightweight plastic absorbs 99% of UV light, can be purchased in welding shades and is highly impact-resistant. Glass lenses are also available. Glass offers a higher resistance to chemicals and solvents used for cleaning, so it may be a better choice in situations where repetitive cleaning is required, such as paint spray booths. **HOWEVER**, even though glass lenses can be made to pass ANSI requirements, they offer much less impact resistance than polycarbonate lenses.

Protective eyewear is available in several sizes and may be either single or double lens. Fit of the eyewear is very important. The closer the eyewear fits to the person's face, the less chance of an object getting in around the edge of the eyewear and striking the eye. A good fit is also important because if the eyewear is uncomfortable, workers will be less likely to wear it.

Safety eyewear is available in a wide variety of styles and colors to fit almost anyone's taste. Allowing workers to choose eyewear they like will increase their acceptance and wear time. And if your workers wear their eye protection regularly, they'll be less likely to suffer an eye injury.



## **First Aid for Eye Injuries**

### Specks in the Eye

- Do not rub the eye.
- Flush the eye with large amounts of water.
- See a doctor if the speck does not wash out or if pain or redness continues.

### Cuts, Punctures, and Foreign Objects in the Eye

- Do not wash out the eye.
- Do not try to remove a foreign object stuck in the eye.
- Seek immediate medical attention.

### Chemical Burns

- Immediately flush the eye with water or any drinkable liquid. Open the eye as wide as possible. Continue flushing for at least 15 minutes. For caustic or basic solutions, continue flushing while on the way to medical care.
- If a contact lens is in the eye, begin flushing over the lens immediately. Flushing may dislodge the lens.
- Seek immediate medical attention.

### Blows to the Eye

- Apply a cold compress without pressure, or tape crushed ice in a plastic bag to the forehead and allow it to rest gently on the injured eye.
- Seek immediate medical attention if pain continues, if vision is reduced, or if blood or discoloration appears in the eye.

### **Sources for More Information**

- OSHA Regulation 29 CFR 1910.132, General Requirements.
- OSHA Regulation 29 CFR 1910.133, Eye and Face Protection.
- **American National Standard Institute (ANSI)**  
11 W. 42nd St.  
New York, NY 10036  
(212) 642-4900

### **Examples of Vendors that supply eye safety protection supplies:**

- 3M - [http://solutions.3m.com/en\\_US/index.html](http://solutions.3m.com/en_US/index.html)
- Conney Safety - <http://www.conney.com/>
- Fisher Scientific - <http://www.fishersci.com>



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- Grainger - <http://www.grainger.com>
- VWR - <https://us.vwr.com/>

**NOTIFICATION**

**According to OSHA, all protective eye and face devices purchased after July 5, 1994 must comply with ANSI Z87.1-1989, American National Standard Practice for Occupational and Educational Eye and Face Protection, or shall be demonstrated by the employer to be equally effective.**