

Eye Protection and Safer Practices FAQ

What is My Obligation?

Science teachers are obligated to provide students with the safest and most appropriate eye protection for the task that they are being asked to perform. School boards as the employer are required to purchase and teachers as employees to select eyewear that provides themselves, their students, other school employees, and visitors with the most suitable protection for the hazards they may encounter in the classroom, laboratory and field site. Teachers should review the Safety Data Sheets for all chemical hazards they use during the year to be certain that they have the proper eye protection available. In addition, physical hazards (e.g. projectiles, springs, etc.) and biological hazards (bacteria, specimens, etc.) require appropriate eye personal protective equipment (PPE).

How Do I Know Which Eye Protection to Purchase?

All safety goggles and safety glasses should comply with the ANSI/ISEA Z87.1 standard. ANSI stands for the American National Standards Institute, which is dedicated to the health and safety of consumers, workers and the protection of the environment. ISEA is the International Safety Equipment Association, this is the group that writes and develops the standards.

The Occupational and Educational Personal Eye and Face Protection Devices law is known as ANSI Z87.1. ANSI Z87.1-2015 is the latest version of the standard, employers have been required to comply with this version of the standard since November 25, 2016.

There are several markings that are used to indicate the type of eye protection that the goggles and/or glasses are designed for:

- Z87 indicates that eye protection provides basic impact protection
- Z87+ indicates high-velocity impact rating
- D3 is added to indicate splash and droplet protection
- D4 is for dust protection
- D5 is for fine dust protection
- W is for welding and will be accompanied by a scale number between 1.3 and 14
- R is for infrared light followed by a scale number between 1.3 to 10
- L is for visible light plus a scale number between 1.3 and 10
- U is for ultraviolet plus a scale number between 2 and 6

[Eye and Face Protection Tool Selection Guide](#)

When Should Students Wear Eye Protection?

Eye protection is essential in every laboratory activity. Eye protection is required for (but not limited to) the following instances:

- When using chemicals (including common household chemicals being used in schools) or glassware
- When working with heat sources (e.g. Bunsen burners, hot plates)
- When working with materials or equipment under stress, pressure, or force that might cause fragmentation or flying particles
- When an activity generates projectiles, uses elastic materials under stress (e.g. springs, wires, rubber, glass), or causes collisions
- When dust or fumes are present (eye protection reduces the dust or fumes reaching the eye)
- When working with biological specimens
- When using sharp cutting tools

Eye protection is necessary in all science classes in which there are biological, chemical and physical hazards present at the elementary, middle and high school level. Effective eye protection must include adequate instruction on the hazards of the activity and the precautions to be taken to reduce the risk of injury. Eye protection is to be worn during the demonstration and/or activity set up, hands-on portion and take down.

Eye protection is required for everyone present in the lab, students, teachers, assistants and aides as well as any visitors to the classroom. Teachers must model appropriate behavior by wearing eye protection. Students who refuse to wear eye protection should be told to leave the classroom or laboratory, with appropriate disciplinary consequences. Adult visitors who refuse to wear eye protection should be asked to return another day when eye protection is not needed.

What is the Best Eye Protection for Science Investigations?

Safety glasses with side shields and directly vented safety goggles that comply with Z87.1 2015 regulations provide adequate eye protection for laboratory or field activities involving solid materials, collisions, or projectiles.

Indirectly vented chemical splash goggles Z87.1-2015 + D3 are required when using laboratory hazards such as but not limited to hazardous chemicals, glassware, heating sources, preserved specimens or dust/solid particles. These goggles must fit snugly on the face surrounding the eyes, the soft, pliable flange seals should extend around the eyes. To provide the needed ventilation to reduce fogging, these goggles need to have hoods or caps over the vent openings to prevent chemical splashes from entering the goggle and causing injury to the eye. Vents are to be closed to prevent splash injuries.

What are the Regulations for Lasers in Educational Settings?

ANSI has published several standards that deal with laser safety. ANSI Z136.1-2007 addresses laser safety officer duties and laser hazard evaluations. ANSI Z136.5 addresses Safe Use of Lasers in Educational Environments, this document is currently being updated. This document provides guidance on laser safety from elementary to the undergraduate level.

ANSI Z136.5 is intended for faculty and students using lasers at the primary, secondary and college levels of education, not including graduate level research. The wavelength range includes ultraviolet, visible, and infrared regions of the electromagnetic spectrum, specifically the wavelength from 0.18 micrometers to 1.0 millimeter.

In any instance where a Class 3B and Class 4 laser is in use, a Laser Safety Officer must be designated. This person is charged with administering and managing the laser use at the facility, they should be knowledgeable of laser hazards and controls.

Signage is required outside any area where lasers are in use. Avoid staring into any laser or viewing it with optical instruments. Safety Glasses or Goggles rated with the proper rating for the type of laser in use can protect the eyes from hazardous reflected light, scattered laser light or direct exposure to a laser beam of Class 1, 1M, 2, 2M or 3R lasers:

- Class 1 - Safe, even for long term intentional exposure
- Class 1 M - Should not be used with optical instruments
- Class 2 - Safe for unintentional exposure of ¼ second or less
- Class 2 M - Should not be used with optical instruments
- Class 3R - Unintentional or accidental exposure to direct beam has a low risk but should be avoided.
- Class 4 - Severe eye hazard, avoid exposure to direct or reflected beam

Before using any laser, consult local rules and regulations. There are currently no marking designations for eye protection to lasers in the Z87.1-2015 standard.

Laser class 3B and Class 4 should not be used at the K-12 academic level, given their potential hazards and risks. Also be aware that some states ban the use of lasers and laser pointers at the K-8 levels. Teacher need to check with their state departments of education for additional information.

When Should I Use a Face Shield?

Face shields are used to protect the wearer's entire face from flying fragments, splashes, droplets and sprays from chemicals and molten metals. Face shields are not a substitute for indirectly vented chemical splash goggles which must be worn with the face shield. Face shields are marked with ANSI/ISEA Z87 for basic impact and ANSI/ISEA Z87+ for high impact use.

What Are the Current Recommendations for Contact Lens Use?

Traditionally, contact lenses were prohibited from laboratory settings. The prohibition was based on concerns related to the absorption and adsorption of chemicals to the contact lens surface in the event of a chemical splash. The National Institute for Occupational Safety and Health (NIOSH) reviewed this topic and came to the recommendation that laboratory workers be permitted to wear contact lenses in the laboratory because there was no evidence to support the previous concerns.

Contact lenses may be worn in the laboratory, provided appropriate eye protection is worn over the contact lenses. Contact lenses are not eye protection devices. Wearing contact lenses does not reduce or alter the requirements for eye and face protection necessary for the assigned task.

- Individuals who wear contact lenses in the laboratory must also wear suitable eye and face protection over the contact lenses (e.g. safety glasses with side shields, chemical splash goggles, and/or face shields).
- In the event of a chemical or biological exposure to the eye or any type of eye irritation, do not delay eye washing due to lens removal. Rinse eyes with tepid water for a minimum of 15 minutes immediately upon chemical splash to the eyes.
- Never handle contact lenses in the laboratory. Contact lenses should be inserted or removed in a clean environment outside the laboratory.

How Should Eyewear be Cleaned and Sanitized?

Protective eyewear, including safety glasses and chemical splash goggles, should be cleaned after each use. Cleaning is necessary after exposure to chemicals and physical materials (dirt and grime). Eyewear that has been exposed to biological materials must be sanitized or disinfected.

Cleaning removes microorganisms, dirt, and impurities from surfaces or objects. Cleaning works by using soap (or detergent) and water to physically remove germs from surfaces. This process does not necessarily kill microorganisms, but by removing them, it lowers their numbers and the risk of spreading infection.

Disinfecting kills microorganisms on surfaces or objects. Disinfecting works by using chemicals to kill microorganisms on surfaces or objects. This process does not necessarily clean dirty surfaces or remove microorganisms, but by killing them on a surface after cleaning, it can further lower the risk of spreading infection.

Sanitizing lowers the number of microorganisms on surfaces or objects to a safe level, as judged by public health standards or requirements. This process works by either cleaning or disinfecting surfaces or objects to lower the risk of spreading infection.

Eyewear can be sanitized or disinfected with soap, chemicals (chlorine or alcohol) or UV light. Goggles and straps should be washed in soap and water and allowed to dry before the next use. Sanitizing using a freshly prepared mild solution such as 2 teaspoons of bleach per 1 gallon of water, a stronger solution (½ tablespoon of bleach per pint of water) is needed to disinfect and requires the eyewear to remain in solution for 10 minutes. Consult manufacturer's directions before cleaning goggles.

A UV sanitizing cabinet can be used for a minimum of 5 minutes to kill 99% of bacteria. This will sanitize, not disinfect the eyewear. The cabinet must automatically shut off the UV light source if the door is opened while it is operational. The UV sanitizing cabinet does not remove physical or chemical hazards from the eyewear.

Eyewear is available with latex free straps and will be necessary for students with latex allergies.

Safety Shield

Whenever demonstrations are being conducted in the classroom, a safety shield should be placed between the demonstration and the observers. The shield should be made of plastic such as polycarbonate and should be attached to a mounting that is sturdy enough to prevent it from tipping over. The shield should be large enough to protect students and staff from potential splashes. A safety shield is not intended to replace indirectly vented chemical safety goggles for the teachers or the students. A viable alternative to the safety shield is a fume hood with the sash pulled down. This is especially critical and necessary when dealing with demonstrations producing toxic and/or flammable vapors, particulate, etc.

Resources

Eye and Face Protection Selection Tool, International Safety Equipment Association, <https://safetyequipment.org/wp-content/uploads/2015/06/Eye-and-Face-Selection-Guide-tool1.pdf>

ANSI/ISEA Z87.1 Eye and Face Protection Standards, www.coopersafety.com/ansiz87-1/ ANSI Laser Standards, Education (Z136.5), Research, Development or Testing (Z136.8), K. Barat, Laser Safety Solutions, 2013

ANSI - American National Safety Institute, www.ansi.org

OSHA Eye Protection Standards, <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.133>