



A group of diverse students wearing safety goggles are working in a science laboratory. A female student in the center, wearing a green and grey striped shirt, is using a Bunsen burner to heat a test tube held by a clamp. Other students are visible in the background, also wearing safety goggles and looking at their work. The image is partially obscured by a yellow and red geometric graphic at the bottom.

Maryland Science Safety Manual PK-12

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required support related to the students' egress from the laboratory and building in case of an emergency. A student's IEP or 504 plan will note if a student requires specific accommodations in the event of an emergency evacuation.

C. FIRE SAFETY AND FIRE CONTROL

In the event of a fire, remember that the personal safety of the building's occupants must always be the priority. The teacher should know the location and how to use the nearest fire alarm box, as well as follow school system procedures for the use of (or direction of emergency personnel to use) any fire extinguishers, fire blankets, or other firefighting aids that may have available in the classroom. If a person's clothing or hair catches on fire, have the person stop, drop, and roll on the floor to suffocate the flame or use a safety shower. Do not use fire extinguishers on people.

D. SAFETY EQUIPMENT

1. Eyewash Stations

Eyewash stations are essential in areas where chemicals are used. Caustic chemicals can damage the eye within seconds of contact. Based on the American National Standards Institute (ANSI Z358.1-2014) eyewash stations should:

- treat both eyes simultaneously.
- provide a minimum flow of water of 0.40 gallons per minute at 30 pounds per square inch for at least 15 minutes.
- be accessible within 10 seconds (55 feet) from the time of injury.
- be capable of being activated in 1 second or less.
- accommodate hands-free rinsing to hold eyelids open.
- have dust caps or dust covers installed to protect the unit from contamination.
- have spray heads positioned between 33" and 45" from the floor.

ANZI also recommends that all plumbed eyewashes be activated weekly for a period long enough to verify operation and ensure that flushing fluid is available (approximately 3 minutes) and inspected once a year for compliance with standards. A maintenance record should be maintained.

The [2010 ADA 602: Drinking Fountains](#) requires newly designed and constructed or altered schools to have clear space for wheelchair approach to drinking fountains, which serves as a guide for eye wash station approach requirements. Additionally, the controls and operating mechanisms for the eye wash station must be within the appropriate reach range identified in [2010 ADA 308: Reach Ranges](#).

Portable eyewash squeeze bottles are not an acceptable alternative because they can treat only one eye, provide an inadequate water supply, are susceptible to contamination, and provide a good environment for the growth of microorganisms.

4. First Aid

- a. Every school should have a safety and first aid plan.
- b. Each school should have a first aid station for providing basic first aid and stabilizing students who will be transported to a medical facility.
- c. Each laboratory should have a standard first aid kit stocked according to school policy and recommendations of the school nurse.

5. Safety Shields

Portable safety shields should be used for protection against hazards of limited severity, such as small splashes, heat, and fires. Use these shields with the knowledge that they do not protect the back and sides. If possible, the shield should be attached to the surface on which it is placed (by clamps).

6. Safety Showers

A safety shower should be available in every laboratory where chemicals are used. The shower is used to wash hazardous chemicals from the skin and clothes. Based on the American National Standards Institute ([ANSI Z358.1-2014](#)) safety showers should:

- be accessible in no more than 10 seconds (about 55 feet) from the site of the emergency.
- provide a minimum flow of 20 gallons per minute for up to 15 minutes.
- be capable of being activated in 1 second or less.
- be designed so that valves remain open without the use of hands until intentionally closed.
- have a control to operate no more than 69 inches above the standing surface.

The safety shower should be tested, and the tests recorded periodically following the school safety plan or as directed by the manufacturer.

Dimensional parameters for accessible safety showers can also be determined from the 2010 ADA Standards considering protruding objects ([2010 ADA 307](#)) and reach range ([2010 ADA 308](#)) guidelines.

A hand-held sprayer with a six-foot hose is a viable alternative for small spills that frequently occur in the teaching laboratory. Such a sprayer should be a supplement and not a replacement for a plumbed safety shower.

7. Spill Kits

A spill kit should be accessible in each science classroom or laboratory. The kit might include:

- spill control pillows (which are commercially available)
- inert absorbents such as vermiculite, clay, sand, or kitty litter
- neutralizing agents for acid spills such as sodium carbonate and sodium hydrogen carbonate
- neutralizing agents for alkali spills such as sodium hydrogen sulfate and citric acid
- large plastic scoops and other equipment such as brooms, buckets, bags, and dust pans
- appropriate personal protective equipment (PPE)

E. VENTILATION

1. Room Ventilation

Adequate ventilation is important in any room in which chemicals are used or stored. According to the *NSTA Guide to Planning School Science Facilities* (2007), the air in a science laboratory should be changed a minimum of eight times per hour. Chemical storerooms or animal storage areas should have ventilation adequate to change the air twelve times per hour. NFTA 45-2019 also indicates that exhaust from chemical storerooms and fume hoods should not be recirculated and should be continuously ventilated under normal operating conditions.

2. Fume Hood

Fume hoods are the most important equipment used to protect teachers and students from exposure to hazardous chemicals and agents used in the laboratory. Review the [2010 ADA Standards](#) to ensure that the hood and its operable parts are accessible to students and teachers with disabilities.

- Location – Hoods and the safety shower/eye wash stations in the laboratory should be separated by 15 to 20 feet to allow the safety equipment to be used in the case of accidental discharge of fumes from the hood. To maintain the effectiveness of the hood avoid locating it in proximity of foot traffic, particularly at the entrances or exits to the laboratory.
- Velocity - A face velocity of 60-120 fpm (the average velocity of air drawn through the face of the hood with the sash open 6 inches) should effectively remove fumes produced within the hood, conditional on proper placement and use.
- Use – Hoods are only effective in removing contaminants situated directly under the hood. They do not serve to clean the air in the general environment of the laboratory.

- never return excess chemicals to the stock bottle; discard any excess according to approved procedures.
- never mix chemicals unless the teacher or experiment directions instruct you to do so.
- never taste chemicals.
- always add acid to water (with vigorous stirring), not vice versa.

See [Appendix A, Safety Rules Agreement](#), for a more complete list of rules. See also [Chapter 4, Personal Protective Equipment](#), [Chapter 5, Safety Strategies in the Classroom](#), and [Chapter 6, Safe Handling of Equipment](#), for specific laboratory and equipment handling rules.

C. RESPONSE TO INJURIES

1. General Procedures

Emergency procedures should be established at the beginning of the school year and conspicuously posted in your classroom. Teachers must follow emergency policies and procedures established by their LEA. Below is a sample of some general procedures:

- a. In the event of a student injury, the established emergency procedure should direct teachers to:
 - contact the school nurse or other school staff trained in emergency medical treatment or outside medical personnel.
 - call 911 as needed for additional medical assistance.
 - notify the school administration.
 - keep the injured student calm and comfortable while awaiting the arrival of medical assistance.
 - notify the injured student's parents or guardians immediately according to the school system's procedures.
- b. School administrators should strongly encourage parents or guardians of injured students to seek follow-up care for the student from medical specialists.
- c. Safety equipment should be located in a prominent place and clearly identified with signs.

See [Chapter 3.B, Facilities](#), and [Appendix C, Hazard Communications Standard](#), for additional information on emergency procedures.

2. Responses to Specific Types of Injuries

Follow the school or school system's safety or first aid plan for specific injuries. Below are several possible injuries that could occur in the lab and school personnel should have training for initial first aid until trained medical personnel arrives on the scene.

- a. *Bleeding.* After putting on a pair of nitrile gloves or the equivalent, hold a clean cloth pad directly over the wound and apply hand pressure. A tourniquet should not be applied.
- b. *Chemical Burns.* A chemical burn is a severe injury involving the destruction of tissue following contact with strong acids, alkalis, or oxidizing materials. Affected areas of skin should be promptly and freely flushed with water for at least 15 minutes. Contaminated clothing should be promptly removed. Copious flushing with water is necessary to remove (mechanically or by dilution) all injurious materials. Do not consider chemical antidotes as the reactions could produce further injury. Check the SDS sheet for possible delayed effects.
- c. *Clothing Fire.* The student whose clothing is on fire should drop to the floor and roll. If the safety shower is immediately available, it may be used to douse the flames. The teacher should calm the student since running in panic fans the flames and can result in more serious burns.
- d. *Eye Injuries.* Splashes of chemicals or exposure to vapors of some chemicals should be thoroughly flushed with an eye wash. Eyelids should be held apart so the entire surface of the eye may be flushed. Flushing should be continuous for at least fifteen minutes. Contact lenses, if worn, should be removed prior to flushing the eyes. See [Chapter 4.A. Eye Protection](#).
- e. *Poisoning by Inhalation.* Certain vapors, fumes, mists, or dusts can cause injury if inhaled. If such an injury occurs, remove the student from exposure as quickly as possible and move him or her to fresh air. If breathing has stopped, begin artificial respiration.
- f. *Swallowed Poisons.* If a student swallows an acid or base, quickly give the student copious amounts of water to drink to dilute the substance. For other materials, follow the instructions on the label. Never give liquids to an unconscious person.
- g. *Thermal Burns.* Immerse the burned area in cool water. Continue immersion until the pain is relieved and does not return when the burn is removed from the water. Prompt application of cold eases the pain and tends to reduce the severity of the burn. In the case of serious burns, cover the burned area with sterile gauze or a clean sheet until medical personnel arrive.
- h. *Allergic Reactions.* Contact emergency personnel. If the student has a known allergy see if they have an epinephrine (adrenaline) auto injector and help them with it if needed. Lie the student down on their back. Raise their feet about 12 inches and cover

them with a blanket. Turn the student to their side if they are vomiting or bleeding. Make sure their clothing around the neck and chest is loose so they can breathe.

D. STUDENT SCIENCE LABORATORY AIDES

Teachers are responsible for the well-being of students assigned to them as aides. A student should not be accepted in this role unless the teacher knows the student to be responsible and trustworthy. Students selected to serve as aides should complete all required safety training and sign safety rules agreements before beginning work as aides. In assigning tasks to an aide, the teacher should alert the aide to potential hazards and how to avoid them. It is suggested that the teacher maintain a log of each student aide's assignments. In addition, a chart of general safety regulations should be posted in the preparation room for aides to follow. At no time can an aide substitute for a teacher, nor should an aide work unsupervised. The teacher has the same responsibilities in supervising an aide as in supervising other students.