

6.0 LABORATORY SAFETY EQUIPMENT

The availability and use of a number of types of safety equipment is essential to the practice of safe science. Safety equipment should be present in well-marked, highly visible, and easily accessible locations in or near all laboratories that use hazardous chemicals. For more information regarding safety equipment or specific regulatory requirements, please call the University Office of Environmental Health and Safety (855-6311).

6.1 Chemical Fume Hoods

Chemical fume hoods are one of the most important items of equipment used for the protection of workers in the laboratory. A standard fume hood is a chemical and fire resistant enclosure with a movable window (sash) at the front to allow the user access to the interior. Chemical fume hoods capture, contain, and expel chemical emissions. In addition, chemical fume hoods (with the sash down) provide a protective barrier between laboratory personnel and chemicals or chemical processes. A properly functioning hood draws between 60-100 linear feet per minute of air at full-open sash. The storage of large numbers of chemical bottles or other items within the hood can dramatically impair this functioning. To ensure that fume hoods are operating properly, the University Office of Environmental Health and Safety conduct periodic inspections. IU Physical Plant services any hoods that are not functioning properly immediately. (See SOP 3.3 *Chemical Fume Hoods - Procedures for Proper and Safe Use.*)

6.2 Safety Showers

Safety showers are required in areas where hazardous chemicals are used. Safety showers provide an effective means of initial treatment in the event of chemical contamination of the skin or clothing. The shower area should be readily accessible, clear of obstructions, and clearly labeled. IU Physical Plant inspects safety showers annually to ensure that they are working properly. In the event of chemical contamination of an individual's body, immediately flush the body for 15 minutes under the shower, remove all clothing, and seek medical attention.

6.3 Eyewash Stations

Eyewash stations are required in areas where hazardous chemicals are used. Eyewashes should be easily accessible, unobstructed, and clearly labeled. The use of the hands should not be required to activate and maintain the water flow. Plumbed eyewash units are best and strongly recommended. Eyewashes should be inspected routinely by laboratory personnel to ensure that they are working properly. In the event of chemical contamination of the eyes or face, immediately flush the eyes/face for 15 minutes and seek medical attention.

6.4 Fire Extinguishers

Fires are one of the most common types of laboratory accidents. Laboratory personnel should know the locations of all fire extinguishers in the laboratory, the type of fires for which they are appropriate, and how to operate them correctly. The University Department of Risk Management, Bloomington (855-9758) provides free fire safety training to all IU employees.

Fire extinguishers in the laboratory should be the appropriate type for the expected fire emergency. Extinguishers are classified according to a particular fire type. Type A are used on combustible (wood, paper, rubber, plastic) fires, Type B are used on flammable liquid fires, Type C are used on energized electrical equipment fires, and Type D are used on combustible metal (lithium, sodium, magnesium, potassium) fires. Multipurpose (Type ABC and Type BC) extinguishers are also available. Fire extinguishers should be easily accessible, mounted properly on a wall, and unobstructed. The Department of Risk Management inspects fire extinguishers annually. Used fire extinguishers should be immediately serviced.

6.5 Fire Blankets

Fire blankets are recommended in all laboratories that use flammable liquids. Fire blankets should be easily accessible and unobstructed. In the event that a person's body or clothing catches fire, the person should immediately drop to the floor and roll to help extinguish the fire (STOP-DROP-and-ROLL method). A fire blanket should be used only as a last resort to help smother a body or clothing fire. Fire blankets can also be used to keep shock victims warm.

6.6 Flammable Liquid Storage Cabinets

Flammable liquids in quantities exceeding a total of 10 gallons in a laboratory must be stored in flammable liquid storage cabinets or safety cans. Flammable storage cabinets shall be designed to meet NFPA (National Fire Protection Agency) and Indiana's Fire Prevention Code guidelines. Cabinets are generally made from No. 18 gage sheet steel with double-walled construction or one-inch exterior grade plywood. Approved cabinets should be marked in conspicuous lettering "FLAMMABLE-KEEP FIRE AWAY." Fire cabinets are not required to be vented (cabinets are generally vented only if the flammable liquids generate noxious fumes), but if venting is desired it shall meet NFPA and Indiana's Fire Prevention Code requirements (call the IU Department of Risk Management at 855-9758 for details on venting requirements). Only flammable and combustible material should be stored in flammable storage cabinets.

6.7 Safety Cans

A safety can is a container of not more than five-gallon capacity, having a spring closed lid, spout cover, and flame arrestor and so designed that it will safely relieve internal pressure. Safety cans should be UL (Underwriters' Laboratories, Inc.) listed and should be compatible with the chemical that they are to contain.

6.8 Explosion-Proof and Laboratory-Safe Refrigeration Equipment

The use of domestic refrigeration equipment for the storage of flammable liquids presents a significant hazard to the laboratory work area. Refrigerator temperatures are commonly higher than the flash points of the flammable liquids stored in them. In addition, domestic refrigerators contain readily available and exposed ignition sources such as thermostats, lights, and heater strips. Flammable liquids should only be stored in two types of laboratory refrigerators: explosion-proof and laboratory-safe models. Explosion-proof refrigeration equipment is designed to protect against ignition of flammable vapors both inside and outside the refrigerated storage compartment. Laboratory-safe refrigeration equipment (also called explosion-safe) is designed to eliminate ignition of vapors on only the inside of the storage compartment, although other safety design features like self-closing doors, magnetic door gaskets, and compressors and circuits located at the top of the refrigeration unit have been incorporated. All flammable liquids that need to be stored in a cool environment should be stored in these types of approved refrigerators. Containers should be tightly closed to minimize the amount of vapor released. Every laboratory refrigerator should be clearly marked to indicate whether or not it is safe for the storage of flammable liquids. Although not considered optimum protection, it is possible to modify some domestic refrigerators to hold flammable liquids. Please call EH&S for more details.

6.9 First Aid Kits

First aid kits should be easily accessible to all laboratory personnel. First aid kits should be regularly inspected and restocked as necessary. As a general guideline, first aid kits should contain adhesive tape, bandages (small and large), pressure bandage compresses, premoistened cleansing wipes, antiseptic cream/spray, gauze pads, gauze wraps, latex gloves, and a CPR micro shield. First aid kits can be purchased through any laboratory safety supply vendor. The IU Office of Environmental Health and Safety (855-6311) or the IU Department of Risk Management (855-9758) provides free Red Cross-certified First Aid and CPR training to all IU employees.

6.10 Chemical Spill Kits

Every laboratory that uses hazardous chemicals should have access to a spill control kit. The keys to an effective spill kit are location and content. Spill kits should be strategically located around work areas in fixed spots so they will be easily accessible.

In general, a spill kit should contain absorbent material, appropriate personal protective equipment, a container for spill residue, and a plastic dustpan and scoop. Laboratories that use mercury or mercury filled thermometers and manometers should also have a mercury spill kit available. Once a spill kit has been used it should be immediately restocked.

Spill kits can be purchased through most vendors that sell chemicals or safety supplies.

In addition, spill kits can be purchased through the IU Department of Chemistry's Scientific Stores. The following is a list of recommended items that should be contained in a chemical spill kit. However, it is important that spill kits be tailored to meet the specific spill control needs of each laboratory.

Absorbents:

- Universal Spill Absorbent Material - 1:1:1 mixture of Flor-Dri (or unscented kitty litter):Sodium Bicarbonate:Sand. This all purpose absorbent material is good for most chemical spills including solvents, acids, and bases.
- Acid Spill - Sodium Bicarbonate, Sodium Carbonate, or Calcium Carbonate
- Alkali (Base) Spill - Sodium Bisulfate
- Solvents/Other Organic Liquids - Inert absorbents such as vermiculite, clay, sand, Flor-Dri, and Oil-Dri

Personal Protective Equipment:

- Goggles and Face Shield
- Plastic Vinyl Booties
- Disposable Coveralls and Apron
- Disposable Vinyl Gloves and Heavy Neoprene Gloves
- Dust Mask/Respirator (All laboratory personnel must be properly fit tested before using a respirator. Respirators are personal safety equipment and should not be shared between laboratory personnel. Contact EH&S for more information.)

Clean-Up Material:

- Plastic Dust Pan and Scoop
- Plastic Bags (30 gallon, 3 mil thick)
- One empty 5 gallon, plastic bucket with lid for spill and absorbent residues

Other:

- Hydrofluoric Acid Antidote Gel - Calcium Gluconate
- Mercury Spill Kit

6.11 Portable Safety Shields

Portable safety shields can provide limited protection against explosions, fires, and chemical splash hazards. When a hood sash cannot provide proper shielding, portable safety shields should be used. It should be noted that portable safety shields do not provide protection on the sides and back of equipment and therefore work best if used in conjunction with a fume hood. Laboratory equipment/chemical apparatus should be shielded on all sides so that there is no line-of-sight exposure to laboratory personnel.