

2 HAZARD CONTROL MEASURES

Laboratory personnel are required to implement appropriate control measures to ensure that exposure to hazardous chemicals is minimized and maintained below the allowed exposure limits and as low as reasonably achievable. Chemical exposure control can be achieved through administrative controls, engineering controls, procedural controls and use of appropriate personal protective equipment (PPE).

2.1 Administrative Controls

Administrative controls include established procedures and guidelines usually at an administrative level e.g. by the PI, department chair, lab manager, departmental safety committee or RMS to promote safety in the laboratory.

Examples of administrative controls are:

- Posting appropriate signs for identification of hazards within an area
- Prior approval/ additional control measures for certain hazardous operations
- Restricting access to areas where particularly hazardous chemicals are used
- Ensuring that all laboratory personnel have been trained before being allowed to handle chemicals and/or conduct experimental procedures

2.1.1 Prior Approval of Hazardous Operations and Procedural Controls

Sometimes hazards may exist that are not recognized or have not been fully evaluated. Certain indicators should cause the laboratory personnel to stop and conduct additional safety review.

These indicators include:

- New procedure, process or test even if it is very similar to older practices.
- A change or substitution of any of the ingredient chemicals in a procedure.
- A substantial change in the amount of chemicals used (scale up of experimental procedures) or experimental conditions.
- Failure of any of the equipment used in the process including chemical fume hoods.
- Unexpected experimental results (such as pressure increase, increased reaction rates, unanticipated products and byproducts).

Chemical odors, illness in the laboratory staff that may be related to chemical exposures or other indicators of a failure in engineered safeguards.

The occurrence of any of these conditions should cause the laboratory personnel to evaluate the safety implications of the observed changes or results with lab PI/supervisor, make changes as necessary and proceed cautiously. If needed, call RMS for assistance.

2.1.2 Laboratory Signage

Prominent signs of the following types should be posted in each laboratory or areas that the laboratory uses. Door signs are created in BioRAFT and must be placed outside each exit door of a laboratory listing the names and telephone numbers of the PI and other responsible personnel. These signs provide a general idea of some of the hazards present within the laboratory and they are used by emergency responders in the event of an off-hour emergency in the lab.

Signage is also used for:

- Identifying locations for safety showers, eyewash stations, other safety and first aid equipment
- Chemical storage (Flammable, acids, bases, toxic chemicals, biohazards, radioactive materials etc.)
- Warnings at areas or equipment where special or unusual hazards exist (magnetic fields, electrical shock, inhalation hazards)
- No food or drink signs on research refrigerators, ice machines, dishwashers, microwaves, ovens and incubators
- Emergency contact numbers prominently located near the exit or lab phone

Use this link to access more lab signs and labels: <https://cws.auburn.edu/rms/pm/chemguidestools>

2.2 Engineering Controls

Engineering controls are primary barriers used to reduce or eliminate a hazard at its source therefore they should be fully considered and utilized whenever possible as the *first* step in chemical hazard control within the laboratory. Examples of engineering controls are fume hoods, biosafety cabinets, glove boxes, ventilated gas cabinets and other ventilation systems for used for containment of airborne chemicals or enclosing potentially explosive reactions.

2.3 Personal Protective Equipment (PPE)

Personal protective clothing and equipment should be selected carefully and used after all feasible engineering and administrative controls have been put in place or while such controls are being established. These devices are viewed as less protective than other controls because they rely heavily on each lab personnel's work practices and training to be effective. Engineering and administrative controls should always be considered first when reducing or eliminating exposures to hazardous chemicals.

A laboratory coat, gloves, protective eyewear, and closed shoes that cover the foot (front, back and top) are required to be worn in Auburn University laboratories whenever handling hazardous chemicals. Additional or enhanced personal protective equipment, such as face shield, utility gloves, aprons, and respirators, may be necessary depending on risk assessment. Lab supervisors and RMS can assist in determining the appropriate PPE, Departments must provide appropriate personal protective equipment to employees.



2.3.1 Eye Protection

Eye protection is required for all laboratory personnel, including any visitors present in locations where chemicals are handled, and a chemical splash hazard exists. American National Standard Institute (ANSI) approved safety glasses, goggles and goggles with face shield should be worn in the laboratory based on the hazards that are present.

2.3.2 Skin and Body Protection

Skin and body protection involve wearing protective clothing over all parts of the body that could potentially become contaminated with hazardous chemicals. Personal protective equipment (PPE) should be selected on a task basis and checked to ensure it is in good condition prior to use (e.g. no pinholes in gloves).

Where there is no immediate danger to the skin from contact with a hazardous chemical it is still prudent to select clothing to minimize exposed skin surfaces in the laboratory. Laboratory personnel shall not wear shorts, short skirts or sandals in a laboratory. Closed shoes that cover the foot (front, back and top) should be worn in the laboratory at all times. A lab coat with cuffs at the sleeves should be worn over street clothes and be laundered regularly. RMS recommends the use of a flame-resistant lab coats when handling pyrophoric chemicals (may ignite on contact with air).

Additional protective clothing may be required for some types of procedures or with specific substances or operations; such as when carcinogens or large quantities of corrosives, oxidizing agents or organic solvents are handled. This clothing may include chemically resistant aprons and gloves as well as face shields, shoe covers, and arm sleeves. These should never be worn outside the laboratory. The choice of garment depends on the degree of protection required and the areas of the body that may become contaminated.

Disposable lab coats are recommended when working with substances of high acute or chronic toxicity. Evaluate the potential for exposing non-laboratory personnel when laundering non disposable lab coats, this will help in minimizing placing others at risk during the laundering process.

For work where contamination with highly hazardous chemicals is possible, special attention must be given to sealing all openings in the clothing. Tape can be utilized for this purpose. In these instances, caps should also be worn to protect hair and scalp from contamination.

2.3.3 Hand Protection

Chemical resistant gloves should be worn whenever handling hazardous chemicals or whenever there is a possibility of contact with hazardous materials. Gloves should be selected on the basis of the materials being handled, the particular hazard involved, and their suitability for the operation being conducted. It is important to follow the glove manufacturers' and chemical manufacturers' information on personal protective equipment selection. Before each use, gloves should be checked for integrity. Thin exam-style gloves are most commonly used for laboratory work and are disposed of in the regular trash after each use. In general, nitrile exam-style gloves offer better chemical protection than either latex or vinyl and all laboratories that use chemicals are strongly encouraged to stock and use nitrile gloves. Nitrile gloves do not provide adequate protection from all chemicals. It is important to follow the glove manufacturers' and chemical manufacturers' recommendations for glove selection. Latex gloves are discouraged not only because they do not hold up well to many chemicals, but also because of the potential for the user or other laboratory personnel to develop a sensitization to the latex.

A glove chart is available [here](#).

2.3.4 Respiratory Protection

The University attempts to minimize employee respiratory exposure to potentially hazardous chemical substances through engineering methods (such as local exhaust ventilation) or administrative controls. It is recognized, however, that for certain situations or operations, the use of these controls may not be feasible or practical. Under these circumstances, while such controls are being instituted, or in emergency situations, the use of respirators may be necessary. A sound and effective respiratory protection program is essential to assure that laboratory personnel using such equipment are adequately protected.

The University has a [Respiratory Protection Program](#) (RPP) covering the use of respirators on campus. Contact RMS if you are using a respirator and are not included in the University's Respiratory Protection Program, or for questions concerning the use of respirators or any of the program components.

