5 LABORATORY SAFETY EQUIPMENT

5.1 Chemical Fume Hoods

In the laboratory the chemical fume hood is the primary means of controlling inhalation exposures. It is the responsibility of the Principal Investigator and/or laboratory supervisor to ensure that personnel receive proper training on the use of fume hood(s) available in their laboratory prior to beginning work with any hazardous materials. It should be noted that not all chemical fume hoods function the same. Personnel must be trained on the specific chemical fume hoods that they will be using in order to best protect themselves. Hoods are designed to retain vapors and gases released within them, protecting t h e laboratory worker's breathing zone from the contaminant. Chemical fume hoods can also be used to isolate apparatus or chemicals that may present physical hazards to laboratory personnel. The closed sash on a hood serves as an effective barrier to fires, flying objects, chemical splashes or spattering and small implosions and explosions. Auburn University standards require that there be a face velocity of 100 fpm (+/- 20) at the sash opening to adequately control vapors and gases within. All fume hoods are tested by RMS on an annual basis to verify that this face velocity is maintained. Fume hoods will be tagged Approved (image I), Limited Used (image II), or Do Not Use (III). Fume hoods that have been approved will also have the sash height indicated with an arrow.

Do not use a chemical fume that has not been tested and approved for use or limited use.

Image I

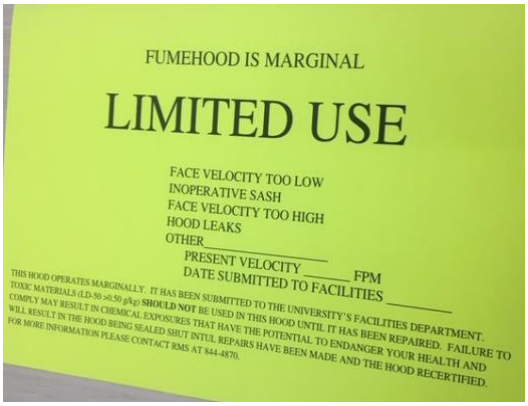

Image II

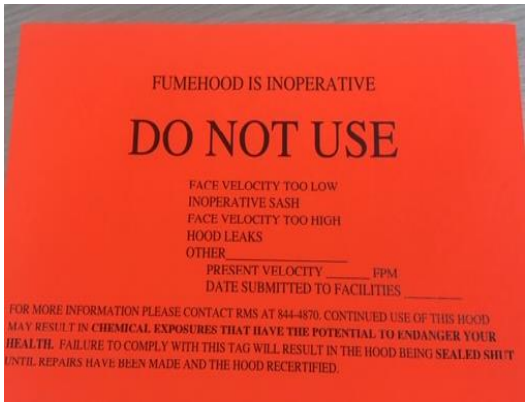

Image III

In general, chemical fume hood sash heights shall maintain at 18 inches or less unless otherwise specified by the chemical fume hood manufacturer.

When using a chemical fume hood keep the following principles of safe operation in mind:

- Keep all chemicals and apparatus at least six inches inside the hood behind the sash.
- Hoods are not intended for storage of chemicals and materials stored in them should be kept to a minimum. Stored chemicals should not block vents or alter airflow patterns.
- Fume hood should remain unobstructed.
- Large equipment should be raised up with breaks on each end to allow airflow to pass underneath the equipment.
- When **not in use**, the **sash** should be kept **closed**
- Report any hood not functioning properly to RMS or AU Facilities work management by submitting a work order.

5.2 Use of Ductless Chemical Fume Hoods

Ductless fume hoods are not connected to an exhaust system and rely on a fan to draw air into a chamber where filters trap vapors and fumes before the air is recirculated back into the lab. The filters are usually made of specially treated or activated charcoal media that treat or adsorb chemical fumes including certain organic solvents, ammonia, acids and formaldehyde.

A concern with these devices is their filtering mechanism. Users must select the appropriate filter for the chemicals in use. Filters are not 100% efficient at removing organic vapors and some organic vapor will always be returned to the laboratory atmosphere. Filters have a limited ability to adsorb organic vapors and can quickly become saturated. Most hoods do not have a method of detecting when the filters are saturated, and breakthrough of organic vapors begins. Some substances will not be detected. Once the breakthrough of vapor begins, lab personnel are exposed to the vapors due to the recirculating nature of ductless fume hoods. Regular monitoring of the hood as well as frequent replacement and rotation of the filters is essential to provide maximum protection and help ensure safe operation. Since these enclosures recirculate filtered air back into labs, ductless fume hoods are strongly discouraged.

Applications where ductless chemical fume hoods might be appropriate include the control of nuisance particulates and odors. Ductless hoods should not be used to protect laboratory workers from toxicologically significant concentrations of hazardous chemicals. These hoods are mainly used for applications involving small quantities of chemicals.

Ductless fume hoods should only be considered for temporary projects and under the following circumstances:

- A ducted fume hood system is not feasible in the lab space
- The project cannot be moved to a laboratory with an externally exhausted fume hood
- The project is limited to a consistent process that involves only small quantities of a fixed group of known (not synthesized) chemicals. These chemicals should NOT be reactive, pyrophoric, highly toxic, carcinogenic, corrosive, or flammable.
- A preventative maintenance program must be implemented, including filter changes and an inspection of the system that follows the manufacturer's guidelines and recommendations.
- A written SOP should be submitted to RMS for all processes to be completed in the ductless fume hood prior to use.

Where ductless hoods are installed, their use must be monitored to ensure that flow rates, capture effectiveness, and procedures using hazardous chemicals do not change over time. Please consult with RMS before purchasing or beginning a project in a ductless fume hood.

These recommendations follow Prudent Practices in the Laboratory, American National Standards Institute (ANSI), and National Fire Protection Association (NFPA) standards. According to the NFPA Appendix A (A6.4.1-2000) "Ductless laboratory hoods that pass air from the hood interior through an absorption filter and then discharge the air into the laboratory are only applicable for use with nuisance vapors and dusts that do not present a fire or toxicity hazard." ANSI standard (Z.9.5-2003) specifies that ductless fume hoods must have prominently displayed signage that informs lab personnel of the allowable chemicals in the hood, the limitations of the filters, the maintenance schedule, and a warning that the hood recirculates air back into the laboratory.

5.3 Other Ventilation Systems

Work with hazardous materials must be conducted using appropriate ventilation equipment to minimize exposures to laboratory personnel. Examples of potentially hazardous materials encountered in laboratories are chemicals, radioactive materials and infectious biological agents. Work with hazardous biological agents must be done in approved biological safety cabinets. Other examples of ventilation equipment include gas cabinets, gloveboxes, canopy hoods, laminar benches, snorkels and downdraft tables. Each of this equipment has their own purpose and should be used for work suited for their intended purpose. Contact RMS for more information on other ventilation systems.

5.4 Eyewashes and Safety Showers

Whenever chemicals have the possibility of damaging the skin or eyes, an emergency supply of water must be available. All laboratories in which hazardous chemicals are handled and could contact the eyes or skin resulting in injury should have ready access to plumbed eyewash stations and safety showers.

To ensure easy access and safe use of eyewashes and safety showers:

- Keep all passageways to eyewashes and safety showers clear of any obstacle. This includes temporary storage of supplies, carts, etc.
- Ensure that you and all laboratory personnel know the location of the nearest eyewashes and safety showers, and how to operate them.
- Eyewashes should be checked routinely by laboratory personnel to be certain that water flows through it. Allow them to run for several minutes once per week to clear out the supply lines. Record testing on tags provided by RMS.
- Showers should be checked routinely by laboratory personnel to assure that access is not restricted and that the start chain or lever is within reach.
- The safety showers are tested annually by RMS to ensure proper operation and sufficient flow rates. Eyewash stations that are not equipped with drain are tested by RMS to verify functionality.

5.5 Fire Extinguishers

Fires are one of the most common types of laboratory accidents. Laboratory personnel should know the location, type of fire extinguishers present in the lab and type of extinguisher appropriate for the emergency. RMS provides hands on training on how to use fire extinguishers upon request. You can contact RMS at 844-4870 for more information on fire safety training. Laboratory personnel should be trained on how to use all fire extinguishers present in their labs; this includes knowledge of the type of fires for which a particular extinguisher is appropriate for and how to properly operate them. 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.

5.6 Chemical Spill kits and First Aid Kits

It is important for a laboratory to have first aid supplies and spill kits on hand. Laboratories will need to make decisions of first aid supplies (i.e. bandages, calcium gluconate paste, etc.) that should be readily available in case of emergency. Principal Investigators and Laboratory Supervisors should make decisions on first aid training that is needed for laboratory personnel. Chemical spill kits must also be present, lab personnel should be trained on how to respond to chemical spills. Spill kits should be appropriate for the expected spill.