

# Laboratory Safety Policy

Policy 303.29

## 1 Introduction

This policy establishes the University's standard for ensuring a safe laboratory work environment in accordance with applicable federal, state, local, and university regulations.

## 2 Scope

This policy applies to all Appalachian State University faculty, staff, and students utilizing research, teaching, clinical, and support laboratories, machine shops, studios, and workshops owned or leased by Appalachian State University.

## 3 Definitions

- 3.1. Chemical Hygiene Officer** means an employee who is designated to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan.
- 3.2. Director** means a person who is in charge of an activity, department, or organization.
- 3.3. Environmental Health, Safety & Emergency Management (EHS & EM) Office** holds the primary responsibility for environmental health, safety, and emergency management functions across campus.
- 3.4. Hazardous Waste** means a chemical, biological, radiological, or universal waste with properties that make it dangerous or capable of having a harmful effect on human health or the environment.
- 3.5. Laboratory** means a facility in which research, experiential learning, or diagnostic work occurs. It is a workspace where relatively small quantities of hazardous chemicals and/or biological agents are used on a non-production basis or hazardous processes occur.
- 3.6. Laboratory Manager** means an individual who supervises personnel and operations in a laboratory environment.
- 3.7. Laboratory Safety Committee** means a group comprised of departmental members from several academic departments that have the highest percentage of research/teaching labs, a member of the Research Protections office, and members of the EHS & EM office.
- 3.8. Minor** means any person under the age of 18.
- 3.9. Non-employee** means any person not employed by Appalachian State University.
- 3.10. Principle Investigator (PI)** means the individual responsible for the preparation, conduct, and administration of a research grant, laboratory course, cooperative agreement, training or public service project, contract, sponsored project, or internally funded research project.
- 3.11. Standard Operating Procedure (SOP)** means a set of written instructions that describes the controls that must be used to safely perform an activity.
- 3.12. Unit Leader** means a person who oversees a department or office that contains a research, teaching, and/or clinical lab.
- 3.13. Universal Waste** means hazardous wastes defined in [40 CFR 273](#).

## 4 Policy and procedure statements

### 4.1 University Employee and Student Responsibilities

#### 4.1.1. Department Chairs/Unit Leaders shall:

- 4.1.1.1.** Ensure compliance with all institutional, system-wide, federal, state, and local safety requirements within their departments as directed by the department of Environmental Health and Safety and Emergency Management (EHS&EM).
- 4.1.1.2.** Manage the organization of shared teaching labs within each department/unit and facilitate communication among faculty and staff to ensure shared laboratories have appropriate lab safety plans.
- 4.1.1.3.** Institute a departmental method of notifying EHS&EM of new, moving, or closing labs.

#### 4.1.2. Principal Investigators/Directors shall:

- 4.1.2.1.** Ensure compliance with all institutional, system-wide, federal, state, and local safety requirements within their laboratory or laboratories.
- 4.1.2.2.** Provide direction and support for the laboratory manager (if one is designated) or (if not) undertake the responsibilities of the laboratory manager.

**4.1.2.3.** Work in collaboration with EHS&EM to perform a risk assessment for procedures used in the lab and develop/approve standard operating procedures where required by the lab safety program.

**4.1.2.4.** Actively implement safety measures and best practices within the lab to maintain a safe and healthy work environment.

**4.1.3.** Directors and Managers of Shared Research Laboratories and/or Teaching Laboratories shall:

**4.1.3.1.** Work with EHS&EM to create and abide by a Laboratory Safety Plan that will delineate roles and responsibilities for all PIs and other lab workers for the shared research laboratory space.

**4.1.4.** Laboratory Managers shall:

**4.1.4.1.** Work with the Principal Investigator to develop and document necessary laboratory-specific safety plans and procedures.

**4.1.4.2.** Read and be familiar with the institutional lab safety policy and lab safety program.

**4.1.4.3.** Train laboratory employees, volunteers, and students when there is new lab-specific safety information or when they are newly assigned to a task. Ensure all lab personnel are up to date on recurring training requirements. All training must be documented.

**4.1.4.4.** Coordinate with EHS & EM, Facilities Operations, departmental staff, and emergency responders as necessary for lab inspections, facility maintenance, incident and injury investigations, emergency response, and equipment maintenance and certification.

**4.1.5.** Laboratory Employees and Students shall:

**4.1.5.1.** Plan and conduct laboratory operations in accordance with federal, state, local, and university regulations, and abide by all policies and procedures.

**4.1.5.2.** Report [injuries, incidents](#), or other [unsafe conditions](#) to their supervisor or PI, and to EHS & EM.

**4.1.6.** The Laboratory Safety Committee shall:

**4.1.6.1.** Identify resources that can assist PI's and labs in adhering to applicable safety regulations and guidelines.

**4.1.6.2.** Review incidents involving work-related injuries/illnesses and near misses in laboratories.

**4.1.6.3.** Review laboratory inspection data to identify areas of noncompliance and communicate findings to relevant PI's, lab managers, department chairs, deans, or senior leadership as applicable.

**4.1.7.** The Environmental Health, Safety, and Emergency Management (EHS & EM) Office shall:

**4.1.7.1.** Inform all lab users of policy updates.

**4.1.7.2.** Inform chairs, Deans, and PIs when labs are out of compliance.

**4.1.7.3.** Serve as occupational health and safety subject matter experts.

**4.1.7.4.** Develop and provide laboratory safety training and resources and maintain records of training completed by faculty, staff, and students.

**4.1.7.5.** Conduct periodic safety inspections of all laboratories, machine shops, studios, workshops, shared facilities, and lab-specific documentation.

**4.1.7.6.** Collect and report inspection data to the lab PI, the Laboratory Safety Committee, the Director of EHS & EM, and senior leadership.

**4.1.7.7.** Investigate all laboratory incidents and injuries.

**4.1.7.8.** Conduct exposure monitoring for physical, biological, and/or chemical agents where indicated by professional judgment.

**4.1.7.9.** Maintain records of laboratory safety training completed by faculty and staff.

**4.1.8.** Facilities Operations shall:

**4.1.8.1.** Respond to all safety-related work orders submitted by EHS & EM.

**4.1.8.2.** Schedule and maintain records for certifications of all chemical fume hoods on campus. Share all records with EHS & EM.

**4.1.8.3.** Perform annual testing on all eyewashes, drench hoses, and emergency showers.

## **4.2 General Lab Safety Practices**

**4.2.1.** Eating, drinking, applying cosmetics, and handling contact lenses are prohibited in laboratories unless there are clearly designated areas, protected from contamination with research materials and Personal Protective Equipment ("PPE"), for these activities.

**4.2.2.** Food/drink appliances must be clearly labeled to identify whether the appliance is for storing food/drinks that are fit for human consumption or research materials. Food/drinks for human consumption cannot be stored with research materials.

- 4.2.3.** Laboratories must be kept clean, organized, and free of debris. Access to exits and emergency equipment must always be unobstructed.
- 4.2.4.** Working alone is permitted only when the conditions laid out in the lab's Lab Safety Plan are met and the operations defined within a PI's SOP determine it is appropriate. The Lab Safety Plan, SOPs, and training documentation must be on file with EHS & EM.
- 4.2.5.** Except for containers with ambient air, all other containers filled with a substance must be labeled with the name of the substance in English as well as any hazards associated with the substance. The name must be specific enough for an unaffiliated person to be able to identify the substance. "Cleaning Solution" is an inadequate label whereas "10% Bleach Solution, Corrosive" would be a clear description.
- 4.2.6.** All chemical stock must be inventoried and reasonably secured to prevent theft or misuse. Controlled substances have additional storage and licensing requirements (see [Policy 303.28 Controlled Substances Research Policy](#)), and prescription medication must be secured and inventoried according to Policy 303.28 requirements.
- 4.2.7.** Emergency eyewashes and safety showers must be close enough to the work area to be administered within 10 seconds of exposure, and must be located not more than 75 feet along an unobstructed path, and on the same level as work areas where injurious corrosive chemicals are used.
- 4.2.8.** Mouth pipetting is prohibited.
- 4.2.9.** Compressed gases must be labeled with their contents and stored away from incompatibles. Compressed gas cylinders (excluding aerosol cans) must be stored with chains, belts, wall anchors, or bench mounted clips installed between the midpoint and shoulder to prevent tipping. Valve protection caps must be in place when cylinders are not in use and when regulators are not attached.
- 4.2.10.** Labs must use plastic in place of glass and safety engineered sharps in place of conventional sharps wherever practicable.
- 4.2.11.** Disposable needles must never be recapped, bent, or broken. Discard needles into an appropriately labeled puncture resistant container (either biohazard or uncontaminated). Reusable needles must never be bent, or broken and must be stored in puncture-resistant containers.
- 4.2.12.** High voltage/current equipment must be plugged directly into the wall, not a power strip or extension cord.
- 4.2.13.** In areas with sprinklers, materials must not be stored above a horizontal plane 18" from the sprinkler heads. In areas without sprinklers, materials must not be stored above a horizontal plane 24" from the ceiling.
- 4.2.14.** The storage of flammable liquids is not permitted in refrigerators not rated for such storage.
- 4.2.15.** Disposable and/or contaminated PPE must not be worn outside of the laboratory. In some cases approved by EHS & EM, one glove may be worn provided the glove is not used to touch common surfaces.
- 4.2.16.** Any material leaving a laboratory must be properly decontaminated or placed in secondary containment that has been decontaminated prior to transport. Containers must be labeled appropriately according to the chemical, biological, and/or physical hazards contained within.

## **4.3 Laboratory Equipment**

### **4.3.1. Chemical Fume Hoods**

- 4.3.1.1.** Chemical fume hoods must be used whenever indicated by a Standard Operating Procedure including but not limited to the manipulation of chemicals that are volatile, toxic, sensitizing, or irritating unless an exception is made by EHS&EM due to minimal volumes present.
- 4.3.1.2.** Chemical fume hoods must be certified annually or whenever serviced, whichever is more frequent.
- 4.3.1.3.** Chemical fume hoods must have a face velocity between 80 and 120 feet per minute. This face velocity must be displayed by a digital or magnehelic gauge on the front of the unit or a low-flow/high-flow alarm system must be present.
- 4.3.1.4.** Ductless chemical fume hoods are discouraged but may offer sufficient protection under certain circumstances and with proper care and maintenance. Ductless fume hoods should not be used unless expressly permitted by a risk assessment performed by EHS & EM.
- 4.3.1.5.** Work in a chemical fume hood must be performed with the sash closed as much as practicable and with materials placed with sufficient space at the back of the hood and the front of the hood to not interfere with the intended air flow.
- 4.3.1.6.** Large equipment should not be stored in a chemical fume hood. If this is unavoidable, raise the piece of equipment 1-2" off the floor of the hood and keep the sash completely closed when the equipment is being used.
- 4.3.1.7.** As a general rule, chemical fume hood sashes should remain closed when not in use as a sustainability and containment practice.
- 4.3.1.8.** Research materials should not be stored in a chemical fume hood as long term storage nor used for evaporating chemicals as a means of waste management.

### **4.3.2. Biosafety Cabinets**

- 4.3.2.1.** Biosafety cabinets must be used to handle biological agents and certain aerosol-generating procedures whenever a risk assessment performed by EHS & EM, the Biosafety in Microbiological and Biomedical Laboratories ("BMBL") guide, or the National Institutes of Health Guidelines for Research Involving Recombinant or Synthetic

Nucleic Acid Molecules ("NIH guidelines") indicate.

**4.3.2.2.** The appropriate class of biosafety cabinet to be used with a particular agent is determined by EHS & EM, the BMBL, and/or the NIH Guidelines. Laminar flow hoods and chemical fume hoods are not acceptable replacements for a biosafety cabinet.

**4.3.2.3.** Biosafety cabinets must be decontaminated after each use with a chemical disinfectant. Ultraviolet light should not be used as the primary method of decontamination.

**4.3.2.4.** Biosafety cabinets must be professionally decontaminated prior to being relocated unless a risk assessment performed by EHS & EM indicates otherwise. App State employees will not be permitted to move a biosafety cabinet unless a [Notice of Decontamination form](#) is affixed to the equipment.

**4.3.2.5.** Biosafety cabinets must be certified annually or whenever serviced or moved to a new location, whichever is most frequent.

**4.3.2.6.** Volatile and/or toxic chemicals should not be used in a biosafety cabinet unless the cabinet is ducted to the exhaust system for the building and is rated for such use.

#### **4.3.3. Incubators**

**4.3.3.1.** Incubators must be marked with the biohazard symbol if they contain biological agents.

**4.3.3.2.** Incubators must be plugged directly into the wall.

#### **4.3.4. Refrigerators**

**4.3.4.1.** Refrigerators must be marked as rated or not rated for the storage of flammable chemicals. This is a rating indicated by the manufacturer.

**4.3.4.2.** Refrigerators must be marked with the biohazard symbol if they contain biological agents.

**4.3.4.3.** If procedures involve the consumption of food or drink by a participant, the food or drink should be stored in a separate refrigerator.

**4.3.4.4.** Refrigerators must be plugged directly into the wall.

#### **4.3.5. Ovens**

**4.3.5.1.** Explosive materials may not be used in an oven.

**4.3.5.2.** Ovens must not be left unattended for more than 30 minutes, except for drying of non-combustible and non-flammable materials at 100°C or below.

**4.3.5.2.1.** For projects and procedures involving combustible and/or flammable materials and/or temperatures above 100°C, users must have a plan in place to be notified of adverse events associated with unattended oven use.

#### **4.3.6. Eyewashes, Drench Hoses, and Emergency Showers:**

**4.3.6.1.** All emergency eyewashes, drench hoses, and emergency showers must be plumbed directly to the building systems. No portable eyewash/flushing stations are permissible as the primary means of decontamination in the event of exposure.

**4.3.6.2.** Eyewashes, drench hoses, and emergency showers must follow the ANSI Z358 standard.

**4.3.6.3.** Eyewashes are required wherever injurious corrosives and/or risk group 2 biological materials are used.

**4.3.6.4.** Emergency showers and/or drench hose stations are required wherever injurious corrosives are used.

### **4.4 Waste**

#### **4.4.1. Biological**

**4.4.1.1.** All potentially infectious biological wastes must be rendered non-infectious via steam sterilization or chemical disinfection prior to disposal unless a contracted treatment facility is used.

**4.4.1.2.** Chemical treatment consists of sufficient contact time with an [EPA-registered disinfectant that is effective against the agent in question](#).

**4.4.1.2.1.** This includes a freshly prepared 1:10 bleach/water solution (0.562% final concentration of sodium hypochlorite) for 60 minutes.

**4.4.1.3.** Steam sterilization consists of steam under pressure that has maintained a temperature of 121 degrees Celsius (250 degrees Fahrenheit) or more for at least 45 minutes at 15 pounds per square inch of gauge pressure.

**4.4.1.3.1.** Autoclaves used for this type of waste treatment must be tested weekly or by batch, whichever is less frequent, using a biological indicator of \*Geobacillus stearothermophilus\*.

**4.4.1.3.2.** Autoclave tape that does not contain lead must be used for each cycle to indicate whether or not the steam sterilization was successful.

**4.4.1.4.** All animal carcasses, tissues, and contaminated bedding must be disposed of through a contracted vendor or through another method explicitly approved by EHS & EM.

#### **4.4.2. Chemical**

**4.4.2.1.** The following are prohibited from drain disposal and must be collected as waste for disposal through EHS & EM:

1. Wastes exhibiting a hazardous characteristic, as defined in [40 CFR 261](#).
2. Wastes with a flashpoint less than 140 degrees Fahrenheit/60 degrees Celsius.
3. Wastes with a pH below 5 or above 11.
4. Carcinogens, mutagens, and teratogens.
5. Radioactive material.
6. Wastes with a temperature above 302 degrees Fahrenheit/150 degrees Celsius.
7. Cryogens.
8. Oxygen depleting agents.
9. Concentrated detergents or agents that may cause excessive foaming in the publicly owned treatment works.
10. Dyes, stains, and any other agents that impart color.
11. Malodorous/noxious agents.
12. Solid or viscous substances capable of causing an obstruction.

**4.4.2.2.** Chemical waste must be properly labeled with the contents, any associated hazards, and the date the waste container was started.

**4.4.2.3.** Chemical waste must be segregated according to hazard type.

**4.4.2.4.** Chemical waste must be securely closed.

**4.4.2.5.** Chemical waste must be in sufficient secondary containment.

**4.4.2.6.** Chemical waste must be submitted for disposal within 180 days of the start date for the container.

#### **4.4.3. Radiological**

**4.4.3.1.** All radiological waste must be disposed of through EHS & EM.

#### **4.4.4. Universal**

**4.4.4.1.** Universal waste must be appropriately labeled and submitted to EHS & EM within one year of the beginning of accumulation.

### **4.5 Documentation**

**4.5.1.** All labs are required to have a Lab Safety Plan available in the lab and on file with EHS & EM.

**4.5.1.1.** Labs can opt to use the [Lab Safety Plan template](#) available online or use their own documentation provided it covers everything applicable to the lab's work in the published template.

**4.5.1.2.** The door sign on the final page of the Lab Safety Plan template must be completed and posted on exterior doors to lab spaces. Multiple labs can share one door sign if desired.

**4.5.2.** Labs working with Risk Group 2 biological agents must perform their work at Biosafety Level 2 (BSL2) and have a BSL2 SOP available in the lab and on file with EHS & EM. This SOP requires approval by EHS & EM prior to the start of work. In the event these requirements conflict with University policies pertaining to Use of Recombinant DNA in Research and Teaching Laboratories, the most restrictive policy shall prevail.

**4.5.2.1.** Labs can opt to use the [BSL2 SOP template](#) available online or use their own documentation provided it covers everything applicable to the lab's work in the published template.

**4.5.2.2.** The door sign on the final page of the BSL2 SOP template must be completed and posted on exterior doors to lab spaces.

**4.5.3.** Labs working with chemicals (other than chemicals for cleaning only) must have chemical SOP's sufficient for the chemical's hazard class and Globally Harmonized System (GHS) category available in the lab and on file with EHS & EM.

**4.5.3.1.** EHS & EM offers [generic and customizable SOP's](#) for different hazard classes of chemicals. Labs can use the [Chemical Hazard Category Table](#) to identify which chemicals require a customized and approved SOP, a customized SOP, a generic SOP representing the chemical's hazard class, or no SOP.

**4.5.4.** Labs are required to maintain an accurate chemical inventory. This can be an excel file or the university provided inventory service [ChemInventory](#).



## 4.6 Training

- 4.6.1. EHS & EM provides general lab safety training for the handling, storage, and waste of biological, chemical, and physical materials.
- 4.6.2. Labs are responsible for providing hands-on training to lab personnel regarding procedures specific to their lab.
- 4.6.3. No person shall work in a lab using a procedure or piece of equipment they have not been trained to use.

## 4.7 Inspections

- 4.7.1. A general lab safety inspection checklist is available on the EHS & EM website. This checklist serves as the basis for lab inspections, but observations and specific equipment/processes may lead to lines of questioning not included in the checklist.
- 4.7.2. Inspections will be performed annually unless a risk assessment performed by EHS & EM indicates an alternative schedule is prudent. Alternative schedules can include every 6 months, two years, or three years.
- 4.7.3. At the conclusion of the inspection, a memorandum will be prepared by EHS & EM and sent to all inspection attendees and anyone else indicated by the EHS & EM inspector or lab safety contact.
- 4.7.4. Inspection memorandums will detail critical action items that must be resolved within two weeks from the memorandum date unless otherwise specified, continuing action items that should be resolved over the course of the inspection cycle, and informational items that do not require any action.
- 4.7.5. All memorandum items requiring action will have a reference detailing the source of the requirement (law, policy, or best practice).

## 4.8 Program Oversight

- 4.8.1. EHS & EM will serve as an advocate for both the PI and the health and safety of university personnel and property by escalating compliance issues to the next level of leadership until a satisfactory resolution is reached.
- 4.8.2. PI's and Departments are invited to actively engage with the inspection resolution process in dialogue with EHS & EM.

## 4.9 New/Moving/Closing Labs

- 4.9.1. New, moving, or closing labs must submit notification in advance (60+ days) of the anticipated start date of work, moving date, or final date of work respectively.
- 4.9.2. Upon notification, EHS & EM will meet with the PI and any department representatives to discuss the lab space and any materials contained therein.
- 4.9.3. PI's are responsible for the final disposition of their research materials, the proper decontamination of equipment and surfaces, and waste disposal upon closure of their lab.
- 4.9.4. PI's are responsible for applying for and maintaining any licenses or registrations relevant to their work including IBC registrations, IRB registrations, IACUC protocols, controlled substance registrations, and radiation user approvals.

## 4.10 Minors/Non-employees in Labs

- 4.10.1. Minors below the age of 13 are not permitted in laboratories except by written authorization from EHS&EM, department chair, and supervising faculty.
- 4.10.2. Minors aged 13-17 are not permitted in the laboratory until written approval has been obtained from EHS & EM by the laboratory manager, principle investigator, department chair, or laboratory director. This written approval is obtained by submitting a [Minor/Non-employee in the Workplace form](#) to EHS & EM.
- 4.10.3. Non-employees who are not enrolled students at Appalachian State University are not permitted in the laboratory until written approval has been obtained from EHS & EM by the laboratory manager, principle investigator, department chair, or laboratory director. This written approval is obtained by submitting a [Minor/Non-employee in the Workplace Form](#) to EHS & EM.

## 4.11 Laboratory Safety Committee

- 4.11.1. The laboratory safety committee is comprised of a departmental member from several academic departments, a member of the research protections office, and members of the EHS & EM office.
- 4.11.2. Departmental members of the laboratory safety committee will be designated by their respective department chairs.
- 4.11.3. Departments seeking representation on the committee must contact EHS & EM to communicate their needs and appoint a member.
- 4.11.4. The laboratory safety committee reviews data gathered during inspections, incidents in labs on campus and

at other institutions, and discusses education, training, and awareness projects that highlight good lab safety practices.

## 5 Additional references

- 5.1. [Prudent Practices for Handling Chemicals in Laboratories](#)
- 5.2. [Biosafety in Microbiological and Biomedical Laboratories \(6th Edition\)](#)
- 5.3. NFPA 45 – Fire Protection for Laboratories Using Chemicals
- 5.4. [NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules](#)
- 5.5. [Guide for the Care and Use of Laboratory Animals](#)
- 5.6. [Use of Recombinant DNA in Research and Teaching Laboratories; Institutional Biosafety Council](#)
- 5.7. [Care and Use of Animals for Research, Teaching, and Demonstration; Institutional Animal Care and Use Committee \(IACUC\)](#)
- 5.8. [Review of Research Involving Human Subjects; Institutional Review Board \(IRB\)](#)
- 5.9. [Controlled Substances in Research Policy](#)
- 5.10. [EHS&EM website](#)

## 6 Authority

- 6.1. [29 CFR § 1910.1450 Occupational exposure to hazardous chemicals in laboratories.](#)
- 6.2. [15A NCAC 13B.1200 Medical Waste Management](#)
- 6.3. [Town of Boone Code & Ordinances](#)

## 7 Contact information

- 7.1. [Industrial Hygiene Manager, EHS & EM](#)
- 7.2. [Environmental Affairs Manager, EHS & EM](#)
- 7.3. [Lab Safety Specialist, EHS & EM](#)

## 8 Administrative Unit Contact

- 8.1 Environmental Health, Safety and Emergency Management – 828-262-4008 – [Environmental Health, Safety and Emergency Management](#)

## 9 Original Effective Date

May 15, 2023

## 10 Revision Dates

Renumbered from 224 to 303.29.