

Chemical Hygiene Plan

University of Central Arkansas



Developed by:

Department of Chemistry and Biochemistry

Manion 205

201 Donaghey Ave.

Conway, AR 72035

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Laboratory Safety Contacts

Department of Chemistry			
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Jamie Freeman	Chemical Hygiene Officer	(501) 743-0616	jfreeman5@uca.edu
Bill Taylor	Alternative Building Administrator	(501) 852-2529	billt@uca.edu
Chris Emmerling	Lab Coordinator	(501) 852-2617	
Nolan Carter	Safety Committee Member	(501) 450-5941	ncarter@uca.edu
Melissa Kelley	Safety Committee Member	(501) 450-5960	mkelley@uca.edu
Physical Plant			
Nelson Landers	EHS Manager	(501) 852-2323	nlanders@uca.edu
Michelle Ellington	Director of Energy and Sustainability	(501) 450-3610	mellington@uca.edu
Campus Contacts for Non-Emergencies			
UCA Police Dept		(501) 450-3111	
Student Health Center		(501) 450- 3136	
For Emergencies			
Fire, Conway Police, Hospital		911	



Purpose

This Chemical Hygiene Plan is a written program developed and implemented by the University of Central Arkansas Department of Chemistry to describe the procedures, equipment, personal protective equipment, and best work practices capable of protecting university employees and students from the health hazards presented by hazardous chemicals.

This document has been developed to meet the Occupational Safety and Health Administration's (OSHA) Laboratory Safety Standard 49 CFR 1910.1450 and the Arkansas Department of Labor regulations. Documentation related to the implementation of this plan will be found in appendices at the end of this document.

1. Scope

This plan applies to all faculty, staff, students within the department working either as a volunteer or a paid employee, and students within the instructional labs who use any quantity of chemicals for research or instruction.

It is the responsibility of the University of Central Arkansas Department of Chemistry and its employees to ensure that our programs and laboratory activities protect and promote the health and safety of our students, our employees, and the environment.

2. Responsibilities

2.1 Administration

- The provost and dean will require all department personnel and students to adhere to the CHP.
- The provost and dean will provide administrative and financial support for lab safety issues and equipment.

2.2 Department Chair

- Selecting competent people to carry out this plan.
- Provide administrative and financial support for lab safety issues and equipment as needed.
- Require all faculty, staff, and students to adhere to the CHP.
- Implement all provisions of the CHP.
- Act on recommendations submitted by the Chemical Hygiene Officer and/or the Department Safety Committee.
- Become a permanent member of the department safety committee.



2.3 Chemical Hygiene Officer

- Develop, coordinate, revise, and implement the CHP in collaboration with the Laboratory Coordinator and Department Chair
- Communicate with administration and other departments outside of Chemistry.
- Inventory and coordinate waste entering the chemical stockroom and coordinate chemical waste for disposal.
- Chair the departmental safety committee and be a member of the campus safety committee.
- Ensure that staff training and facilities are adequate for materials ordered.
- Determine the appropriate protective equipment required and ensure that it is available and in good working order.
- Conduct annual safety training for teaching assistants and research students.
- Know the current legal requirements concerning regulated substances.
- Serve as assistant building administrator.
- Maintain records: training, inspections, medical, inventory, accidents and spills.
- Provide regular, formal, chemical hygiene and housekeeping inspections of chemical stockrooms, equipment storerooms, teaching and research labs, and lab ventilation.

In the event the Chemical Hygiene Officer (CHO) position is unfilled, the Department Chair or elected personnel will serve as interim CHO until a dedicated staff or faculty member is hired to fill this position.

2.4 Departmental Safety Committee

- Reviews accident and near-miss reports and makes appropriate recommendations to the department regarding changes to the department safety program.
- Discusses and evaluates departmental safety policies, standard operating procedures, and department instruction, research, and outreach activities to make appropriate recommendations to the department regarding changes to the department safety program and implementing chemical hygiene best practices.

2.5 Laboratory Coordinator

- Work with CHO to implement all provisions of the Chemical Hygiene Plan.
- Work in concert with the CHO to conduct safety training for all teaching assistants and research students within the department.
- Know the current legal requirements concerning regulated substances.
- Serve as a permanent member of the departmental safety committee.
- Keep an undated list of student workers employed within the department.
- Ensure teaching labs are maintained and clean.



2.6 Faculty

- Implement all provisions of the Chemical Hygiene Plan for teaching and research labs.
- Ensure appropriate personal protective equipment is available within their lab
- Ensure preparation, maintenance and implementation of written standard operating procedures (SOP) regarding safety and health considerations for each hazardous procedure performed in the research lab.
- Train research students regarding the specific work practices, and procedures according to the provisions of their laboratory's SOPs.
- Maintain a chemical inventory for their research lab in the Department's Quartzzy and maintain a digital copy of the Safety Data Sheet (SDS) in their designated Quartzzy inventory.
- Maintain an organized and clean research lab space.
- Ensure research students are familiar with retrieving electronic SDS.
- Report all incidents, workplace accidents, chemical exposures, unsafe conditions, and near-misses to the Chemical Hygiene Officer.
- Contact the CHO with safety questions or issues arise.

2.7 Students

- Follow all provisions of the CHP, Standard Operating Procedures, and requirements of the Department.
- Complete research safety and teaching assistant safety training.
- Follow all
- Report all incidents, workplace accidents, chemical exposures, unsafe conditions, and near-misses to their instructor or Chemical Hygiene Officer.
- Assist in maintaining the chemical inventory and following chemical handling procedures.
- Contact the CHO with safety questions or as issues arise.

3. Emergency Information

3.1 Major Emergencies

In the event of an accident in the laboratory involving fire, explosion, or the large release of a hazardous chemical:

- Evacuate the building by using the nearest fire alarm or chemical spill emergency push button.
- Meet at the Emergency Assembly Area, the bike racks in front of Manion Annex.



- Call **911** to give details of the accident, the location, people involved, personal injuries, and the chemicals or hazardous materials involved.

If the accident involves chemical exposure or contamination or severe personal injury such as excessive bleeding, unconsciousness, immobile person etc follow the steps above and those below:

- Move the injured person from the area of the accident whether fire, spill, or explosion. Only move the person away if it does not cause injuries to yourself or other persons.
- Remove contaminated clothing from the injured/contaminated person and flush the area of body contaminated with chemicals with water for approximately 15 minutes.
- Administer first aid as appropriate and wait for medical responders to arrive.

3.2 **Minor Emergencies**

If the accident involves minor injuries that require treatment, report the to the Student Health Center on campus.

- Administer first aid as appropriate and report the injury to the Chemical Hygiene Officer or office administrator in the department.
- Department personnel such as faculty, staff, or teaching assistants should assist the injured to the Student Health Clinic or other medical facilities or coordinate a method of transportation if necessary or upon request.
- Injuries involving faculty or staff must be reported to the Company Nurse Injury Hotline, **1-855-339-1893**.

If the accident involves a minor chemical spill or release with no personal injuries:

- Refer to the *Chemical Spill Response* Section
- For Assistance, contact the Chemical Hygiene Officer or Department Chair.

3.3 **Accident Reports**

All laboratory incidents must be reported:

- Report worker's compensation claims to the Human Resources
- Report all incidents and near-misses to the Chemical Hygiene Officer or using the online forms.
 - Incident Report Form: <https://www.uca.edu/web/forms/view.php?id=1437>
 - Near-Miss Report Form: <https://www.uca.edu/web/forms/view.php?id=1435>



3.4 ***Fires and Fire Alarms***

If a fire alarm sounds, faculty, staff, and students are to:

- Carefully extinguish any open flames and turn off any equipment so that no harm is caused to people nearby and to minimize damage to equipment.
- Close fume hood sash.
- Exit the building immediately using the closest exit.
- Meet at the Emergency Assembly Area (EAA), the bike racks in front of Manion Annex.

3.5 ***Tornado Warnings and Sirens***

A tornado warning means that a tornado has been sighted within the area and/or has a projected path towards the university. If a tornado warning is issued:

- Complete all experiments or come to a termination point. Do not start any new experiments.
- Close of chemical bottles, waste containers, and/or sample bottles to prevent any breakage or leaks.
- Extinguish any open flames and close all fume hood sashes.
- Shut down any equipment being used and perform shut down procedures for instruments or equipment that could be damaged during high winds or a power outage.
- Protect valuable files, research notebooks, and research data to a secure location.
- Gather your personal items and take them with you.
- Seek shelter immediately.

If a tornado siren is activated while in the laboratory:

- Seek shelter immediately by going to the designated tornado shelters in Manion 102 or 104.
- Stay away from windows and exterior doors.
- Protect yourself from flying debris.

More information regarding evacuation procedures in the event of a fire and shelter for tornadoes can be found in the [Manion Building Emergency Plan](#).

3.6 ***Chemical Spills***

In dealing with a chemical spill, the employee is to consider the properties of the chemical and use those clean-up methods that avoid unreasonable risk. Should adequate personal protective devices not be available, or should the employee not be knowledgeable in their use, the employee is to contact another member of the



department or a qualified professional (e.g. the Conway Fire Department). In accordance with US Code 40 CFR 261.3(a)(iv)(D) and APC&E Reg. 23 268.1(e)(4), wastewater spills from safety showers and eyewashes are considered *de minimis* allowed losses. As such, the fear of creating hazardous waste water runoff should never serve as deterrent for using safety equipment.

Spills are to be cleaned up using the procedure below and spill control items are to be replenished promptly. Procedures for cleaning up a small spill of a generally non- or low hazardous chemical of less than 50 milliliters are:

- Put on nitrile gloves.
- Use a neutralizer from the spill kit within the lab to neutralize the spill if it is an acid/base solution of greater than 1 M. If neutralized, use a pH test strip to test the pH of spill.
- Use a paper towel to wipe up the spill. If neutralization was required, use a paper towel or dust pan/broom to sweep up the clumps into the trash can.
- If an organic solvent was wiped up, place paper towel in the fume hood to allow the vapors to evaporate before placing into the trash can.

Procedures for cleaning up a spill of a generally non- or low hazardous chemical of greater than 50 milliliters but less than 4 liters are:

- Alert others working in the area of the spill to prevent spreading. Post a sign if needed.
- If your lab coat and gloves were contaminated in the spill immediately remove the coat and/or gloves, turning the exposed surface to the inside and place them aside. Thoroughly wash the affected area(s) with water and soap, if need be, in the lab sink, safety shower, or eye wash.
- Evacuate the immediate area to approximately a 10-foot radius of the spill for a minimum of 20 minutes. In some laboratories, this may be the entire laboratory space.
- Don clean and appropriate PPE before cleaning up the spill. Wear at least nitrile or heavy-duty gloves and safety glasses.
- Use pig pads and/or absorbent materials. Do not neglect furniture, equipment and vertical surfaces such as cabinets, walls, and doors.
- Starting at the perimeter, cover absorbent material with neutralizing agents or disinfectant in sufficient quantity as needed.
- Dispose of absorbent materials appropriately based on the hazards of the spilled material.
- Neutralize or disinfect spill area again to ensure it is properly cleaned. Do not neglect vertical surfaces. It might be prudent to mop the lab floor.



- Wash hands with soap and water when finished. Don clean PPE before continuing work.
- If broken glass is involved in a spill, remove visible pieces prior to covering the spill. Always handle glass indirectly using brooms, forceps, tongs or other devices. Place glass in rigid container and neutralize/decontaminate as needed. Once cleaned, transfer glass to broken glass box – again, do not handle glass with your hands.

In the event of a chemical spill which involves the release of a type or quantity of a chemical that poses an immediate risk to health, involves a fire hazard/explosion risk, involves a highly dangerous chemical, involves unknown or highly reactive chemical(s), or involves a large quantity of chemical, the following emergency procedure should be followed.

- Immediately activate the nearest fire alarm and evacuate the building.
 - If possible to do so safely, hit the nearest “Emergency Spill” alarm button.
 - Direct people away from the area of the spill as you evacuate the building
- Call 911 and provide details and information of the accident including:
 - State clearly this is a “Hazmat Spill”.
 - Your name and phone number.
 - Location.
 - Class of hazardous materials involved (have the SDS available).
 - Size of spill.
 - Description of any personal injury.
 - Control measures already taken.
 - How you can be identified when emergency personnel arrive at the scene.
- Locate a UCAPD officer and relay this information to them as well.
- Call Environmental Health and Safety.
- If the accident involves personal injury or chemical contamination, follow the above steps as appropriate, and at the same time:
 - Move the victim from the immediate area of fire, explosion, or spill (if this can be done without further injury to the victim or you).
 - Locate nearest emergency eyewash or safety shower.
 - Remove any contaminated clothing from the victim and flush all areas of the body contacted by chemicals with copious amounts of water for 15 minutes.
 - Administer first aid as appropriate and seek medical attention.

4. Control Measures

4.1 Administrative Controls

Administrative controls are policies, rules, schedules, and trainings established by administration such as the department chair, department safety committee, chemical



hygiene officer, the principal investigator, and lab coordinator to promote safety within the laboratory and to reduce exposure to hazardous chemicals and situations. These controls include:

- Ensuring that all faculty, research assistants, and teaching assistants have been provided the necessary training to perform their job effectively and safely.
- Restricting access to areas where hazardous chemicals or equipment are used or stored.
- Posting signs that communicate hazards in each lab or area.
- Requiring the following of all standard safety practices for handling chemicals and equipment.
- Require good housekeeping and shared-space practices be observed at all times within the laboratory.

4.1.1 Laboratory Entrance Signs

Each laboratory where chemicals are used and stored will have a sign posted at each entrance indicating:

- the hazards associated and encountered in that lab,
- the names and phone numbers of the lab supervisor (or principal investigator), the department chair, the Chemical Hygiene Officer, the Lab Coordinator, and other designated personnel such as Physical Plant to be contact in the even of an emergency.

One example of such an entrance sign is given below:

CAUTION

NOTICE

PROTECTIVE EYEWEAR AND SHOES REQUIRED IN LABORATORY

ADMITTANCE TO AUTHORIZED PERSONNEL ONLY

EMERGENCY CONTACTS	NAME	LOCATION	PHONE	EMERGENCY PHONE
Department Chair	Patrick Desrochers	LAN 205	501-450-5936	501-339-6561
Chemical Hygiene Officer	Jamie Freeman	LAN 303A	501-743-0616	501-743-0616
PI	Richard Tarkka	LAN 203C	501-852-5137	50-733-2871
PI	Nolan Carter	LAN 201B	501-450-5941	
Physical Plant			501-450-3196	501-733-3506



4.2 Engineering Controls

Engineering controls are equipment or devices that aid in reducing or eliminating exposure to chemical or physical hazards. With this, tasks such as running a reaction, heating or evaporating solvents, and transferring chemicals that produce dust or vapors from one container to another should be carried out in a fume hood.

4.2.1 Fume Hoods

A Fume hood is to be used when there is possibility of chemical vapors, gases, dust of being released into the air causing exposure to those within the lab.

Before beginning reactions or setting up equipment in the hood, ensure that the hood is functioning properly. A properly functioning fume hood will have a face velocity of 100 ± 20 cfm. Additionally, the hood should maintain a face velocity when the sash is kept at a maximum height of 18".

A fume hood is to be completely cleared of clutter and void of unnecessary glassware and chemicals; only glassware and chemicals in current use are to be in the hood. Waste containers or chemicals are not to be stored in the fume hood long term. Chemicals and glassware in use will not be used within 6" of the front of the hood. Usage of chemicals within 6" of the front of the hood could cause vapors and dust to escape and expose those in front of the hood.

A hood is considered to be improperly functioning if the face velocity consistently falls outside the 100 ± 20 cfm range when the sash is kept below the maximum height of 18" or if the hood is not pulling any air at all.

In the event the fume hood fails, stop all experiments within the hood safely and if possible, completely lower the hood sash, and notify the Chemical Hygiene Officer. If there is the possibility of the release of hazardous vapors or chemicals or a health hazard, the building should be evacuated immediately.

The face velocity of each hood will be tested by the Chemical Hygiene Officer monthly to detect any obvious issues with the fume hood and annually by an outside vendor. All issues or failures will be reported to EH&S and a work order will be initiated to ensure the repair of the fume hood. If the hood is deemed to be improperly functioning or falls outside of the performance parameters, the hood can be taken out of commission until the necessary repairs are made and the performance parameters fall in the proper range.



4.2.2 Blast Shields

A blast shield is to be used when the reactants or products of a reaction have the potential to become explosive and/or conducted or capable of generating high pressure. There are two classes of explosive chemicals: known explosives (e.g. TNT, fireworks, etc) and potentially explosive chemicals (PECs). Most known explosives are created to be stable under normal handling conditions, however, PECs can become hazardous when exposed to external conditions such as light, heat, shock, or friction. To handle and dispose of PECs or explosive properly, contact the Chemical Hygiene Officer. The Chemical Hygiene Officer will contact a professional specializing in PECs to safely ship and dispose of the PEC. A list of PEC can be found in Appendix A under Prudent Practices in the Laboratory.

4.3 Procedural Controls

Procedural controls are written documents outlining the manner in which certain operations, chemicals, and equipment should be handled safely and minimize hazards. Procedural controls are presented in the form of a Standard Operating Procedure (SOP). SOPs within the Department can be found in the Department Google Drive Folder. It is the responsibility of each faculty member to develop and implement SOPs specific to their lab and instrumentation.

4.4 Personal Protective Equipment

Each laboratory within the department is required to have the appropriate personal protective equipment present within their laboratory as chemical hazards and exposure cannot be completely be eliminated through the use of administrative and procedural controls alone. With this, PPE should be used in conjunction with administrative and procedural controls. It is the responsibility of the principle investigator of the lab to ensure that every faculty and staff member and student under their supervision is equipped with the proper PPE to prevent exposure to the eyes, skin, and respiratory tract.

4.4.1 Eye Protection

Appropriate PPE for the eyes is **required** for all persons in the Department when there is a possibility the eyes could be exposed to chemicals. This includes performing work within the lab or walking through the lab actively handling chemicals. Indirectly vented splash goggles are highly recommended but safety glasses that have side and top shields are also acceptable. At no point are prescription glasses to be substituted for safety goggles or glasses. **Safety goggles or glasses are to be worn over the prescription glasses.**



Regardless of the eye protection chosen, it must bear the Z.87 stamp which indicates that the goggles or glasses meet the performance standards established by the American National Standards Institute (ANSI) in the ANSI Z87.1 for “Occupational and Educational Personal Eye and Face Protection Devices” standard.

4.4.2 Face Protection

A face shield is **required** when there is a potential for chemical exposure from splashes, fumes, or explosions. A face shield alone does not provide protection for the eyes; therefore, it must be worn in conjunction with safety goggles/glasses. Our department has two face shields and these are located in the stockroom (1) and in LM 304 (1).

4.4.3 Hand Protection

Each glove material is designed to resist only certain types of chemicals; no one glove can resist every chemical. Therefore, the appropriate gloves must be selected and worn for the chemicals being handled. Consult a glove selection chart online by several manufacturers before choosing a particular glove for your work or laboratory.

4.4.4 Foot Protection

Specialty foot protection is not required for the laboratory. However, shoes must completely cover the entire foot with no exposed skin when entering or working in a laboratory where chemicals are being used or stored. Sandals and open -toed shoes are prohibited in laboratory.

4.4.5 Body Protection

To minimize or delay exposure through absorption through the skin, it is **required** that faculty, staff, and students wear clothes that cover as much skin as possible. At a minimum, long pants that completely cover from the waist to the top of the foot and shirts such as a T-shirt that completely cover the torso from the collar bone to the waist are to be worn when entering or working in a laboratory where chemicals are being used or stored. Shorts, short skirts, tank tops, and crop tops are prohibited in the laboratory.



5. Standard Operating Procedures

General Laboratory Safety Standard Operating Procedures

Chemical Handling and Storage

- Keep all work areas free of clutter. Items that are not in use are to be returned to their storage sites.
- Chemicals are to be returned to their assigned storage areas when laboratory work with them is completed.
- Chemicals must not be stored on the floor, aisles, hallways, or stairs.
- Chemicals that have been used as teaching laboratory unknowns are to be identified as to their composition before storage.
- Chemicals designated for disposal must have the identities and amounts labeled on the containers and labeled as either waste or unwanted chemicals.

Personal Hygiene

- Experiments will be designed to minimize exposure to large quantities of hazardous chemicals.
- Do not eat, drink, smoke, or apply cosmetics in the laboratory. All food and drink will be disposed of outside of the lab.
- Wash well with soap and water before leaving the laboratory. Wash promptly whenever a chemical has contacted the skin.
- Do not use mouth suction to pipet anything.
- Avoid contact with irritating vapors. If it is necessary to check the contents of a container by smell, gently waft the vapor toward your nose.
- Working alone in a lab is prohibited unless another person is notified of the activity.

Personal Protection

- Eye protection must be worn by all persons in a lab at any time a chemical or piece of glassware is being handled. If there is the likelihood of expulsion of hot or corrosive material or spattering, additional protection such as a face shield or desk shield must be used.
- Long legged clothing, or similar length apron or laboratory coat, must be worn to prevent direct exposure to skin when handling glassware or chemicals. Clothing that leaves exposed skin above the ankle is not allowed unless additional clothing is worn to fully cover any exposed skin.
- A lab coat, lab apron, or shirt that covers the full torso must be worn to prevent direct exposure to skin when handling glassware or chemicals.
- Low-heeled shoes with fully-covered uppers must be worn.
- Gloves should be worn when appropriate. Remove gloves prior to leaving the laboratory.



Proper Labelling, Storage, and Management of Chemicals

It is essential in fostering and maintaining a laboratory safety culture and safe work environment that chemicals are properly labelled and stored. Improperly labelled and stored chemicals can lead to unknown or incompatible chemicals coming into contact and cause fires, explosions, or release of toxic gas. To prevent and minimize such hazards, the labelling and storage procedures below were developed to provide additional information to that given on the chemical's manufacturer label, the Safety Data Sheets (SDSs), and other official reference material. For more information on the storage of chemicals, contact the Chemical Hygiene Officer.

Labelling

- The original manufacturer label should never be altered or defaced as long as the original chemical is in the container. The label can only be removed once the chemical is completely gone.
- All secondary chemical containers **must** be labelled with the full chemical name (no formulas or abbreviations unless supplementing the full name), the concentration if applicable, the initials of the person who transferred the material, and the date in which the chemical was transferred. Because small containers and vials are difficult to label, there may be a shorthand notation or abbreviation used. However, there must be a key close the vials fully indicating its contents. Unattended glassware and equipment containing chemicals used during prep or experiments should be labelled with the full chemical name.
- All procured chemicals **must** be labelled with the "Date Received" and the "Date Opened."
- All hazardous waste containers **must** be labelled as "hazardous waste."
- All hazardous waste containers **must** be labelled with the date the container was started, the date the container became full, the instructor's name, the room number, all of the contents in the container and their approximate amounts or concentrations. The waste container should not be filled more than 90% of its capacity. All full waste containers must be disposed of promptly.
- All chemical storage areas should be labelled to identify the hazards associated with the chemicals stored in that area such as Oxidizers, Flammables, etc. All signs should be legible and clearly placed.



Safety Data Sheets

Safety Data Sheets (SDSs) for all chemicals in each instructional or research laboratory must be available online or in the laboratory. SDSs are available on the manufacturer website and on the Quartzzy inventory system.

Storage

HAZARD CATEGORIES

A – Organic Bases	GO – Generally Non-Reactive Organics
B – Pyrophorics and Water-Reactives	GI – Generally Non-Reactive Inorganics
C – Inorganic Bases	I – Strong, Oxidizing Acids
D – Organic Acids	L – Flammable, Combustible, and Organic Solvents
E – Oxidizers and Peroxides	X – Incompatible with all other Chemicals
F – Inorganic Acids	

These storage guidelines are established by Stanford University in *Prudent Practices in the Laboratory, National Research Council 2011*.

- All chemicals are to be stored in a well-defined spot and are according to their hazard class. Each chemical should be returned to their designated location after use. Some chemicals and chemical waste may be incompatible with others in their hazard class, consult the SDS to ensure no incompatible chemicals are stored together.
- Chemicals should be separated by physical distance through the use of shelves, cabinets, or secondary containers to prevent incompatible chemicals from coming into contact in the event of an accidental release or spill.
- It is recommended that liquids be stored in a secondary container such as a bowl or spill tray. The bowl or spill tray should be made of material that is not reactive with the chemical being stored.
- Chemical containers must be in good condition where there are no cracks in the container or lid and no faded labels before they are stored.
- Liquids should not be stored above dry chemicals. If they are, they should be in a secondary container.
- Chemicals are not be stored or on the lab bench long term. Chemicals stored in the hood or on the bench should only be temporary and for the current project.



- Chemicals should be stored on shelving or cabinets that are secure to prevent tipping or collapsing. All shelving should be equipped with a 2" front-edge lip or doors to prevent chemicals from falling.
- Liquids must be stored below eye level of the shortest permanent employee to avoid accidental spills.
- Chemicals should not be stored in aisles, walkways, floors, or edges of benches where accidental spills or breaks can occur or obstruct exits or emergency equipment.
- Do not hoard chemicals or purchase excessive quantities requiring extensive and long-term storage.

Chemical Inventory Management

All chemicals in the department are to be inventoried. An accurate inventory allows the Department to keep track of chemicals for ordering and reordering, waste disposal, and complying with regulations established by the building and fire codes, the Laboratory Safety Standard, and tracking highly hazardous and time-sensitive chemicals for safety and security reasons.

All inventories should include the following information:

- Chemical name (full name on the bottle and matches the SDS).
- Amount in Stock – the current amount in the bottle on the shelf.
- Unit size – The size of the bottle.
- URL to the manufacturer SDS.
- A PDF version of the SDS.
- The primary location – the lab in which the chemical is located.
- Date Opened.
- Date Received.
- Key Hazard Statement – these are the hazard statements on the SDS.
- Physical state – Solid, Liquid, Gas, etc.
- Storage Classification – The Standard Storage Classification letter.
- Storage Considerations – Whether special instructions are needed for storage such as light, air, or moisture sensitive etc.
- Expiration Dates, if applicable.
- Chemical Abstract Service (CAS) number.

Other information such as the NFPA ratings, sub-locations, synonyms, and cost can be included in the inventory.



Chemical Transportation Between Laboratories

The following procedure outlines the safe removal, transportation, and storage of the chemicals during the movement between laboratories.

- Be sure to wear the appropriate personal protective equipment (PPE) when handling the chemicals to minimize exposure when transporting. The minimum PPE that is required to transport chemicals is goggles/glasses, gloves, and proper lab attire.
 - It should be noted, that gloves should not be worn in the hallways, elevators, etc as this can result in chemical transfer on common surfaces. When using gloves in the hallway, the hand transporting the chemical should be gloved, however, there should be one ungloved hand using the door knobs and pushing the elevator buttons.
- Before transporting any chemicals, be sure that all bottles are neatly labelled with the full chemical name if they are in secondary containers.
- To prepare chemicals for transportation, separate chemicals based on their hazard class described in the **Storage** section. It is best to separate chemicals and incompatibles by using Nalgene spill trays or plastic bowls and tubs.
- Place the segregated chemicals onto a cart. The cart must have sides that are 2-3" in height to prevent chemicals from rolling off of the cart or tipping over the side.
 - When transporting a single bottle or a few smaller bottles, the plastic bins and bowls provided at the checkout station in the front of the stockroom or the solvent carriers in the stockroom and research labs can be used.
- Be careful not to overload the cart and do not stack bins or trays.
- If you are transporting chemicals through doorway, be mindful of bumps, obstacles, persons walking through the lab or hallway.
 - If possible, use the dumbwaiter to transport chemicals between floors. This is to prevent any accidental spills or releases in the elevator and inadvertently exposing faculty, staff, and students.
- To unload or even load chemical containers, do so slowly and with care. Unload bottles one at a time and do not try to unload multiple at once. Use two hands to unload bottles and grasp bottles firmly. Do not pick up bottles by the lid and use handles as provided.

Chemical Waste Disposal

Before using any chemicals for an experiment, the instructor and/or principal investigator must determine the disposal procedures for all chemicals used. All chemicals and compounds synthesized must be disposed of according to its hazards



and characteristics. Both plastic and glass bottles are available in the department for waste containers.

All waste containers **must** be clearly labelled as *Hazardous Waste* along with its contents, amounts/volumes, the start date of the container, the date the container was filled, the location, and the instructor's name. A Hazardous Waste label can be found in Appendix B.

All full waste containers are to be picked-up and cataloged by the Chemical Hygiene Officer. No full waste containers are to be stored long term in research labs or in fume hoods.

6. Training and Information

The OSHA Laboratory Standard (CFR 1910.1450) requires employers to provide adequate training to employees to perform their work safely. With this, training must be provided prior to the employee performing their duties of handling chemicals and whenever the hazards or quantities change. It is the responsibility of the Department and the principal investigator that each member whether faculty, staff, or student has been adequately trained.

6.1 Students Enrolled in Courses

Students enrolled in a chemistry course are required to be trained in basic laboratory safety by the lab instructor and must sign the laboratory safety agreement as found in Appendix D before entering the lab.

6.2 Student Workers and Researchers

The Chemical Hygiene Officer provides general *Laboratory Safety* training to all student workers. Student workers in the lab (Teaching Assistants) are required to receive laboratory safety training upon hiring and once every academic year after their initial hiring. Topics covered include:

- The location, availability, and content of the Chemical Hygiene Plan
- A general description of the physical and health hazards of chemicals in the work area.
- Methods that may be used to detect the presence of hazardous chemicals in the laboratory.
- Personal protective equipment and procedures for handling emergencies will be covered.
- The location of references for safe handling of chemicals, particularly SDS.



- An explanation of the labeling system and means of identifying hazards will be communicated.
- Procedures to follow in the event of exposure to hazardous chemicals.
- Handling, cleanup, and disposal procedures.

Students who are required to conduct research for credit toward their degree must abide by the following American Chemical Society requirement: “A student using research to meet the ACS certification requirements must prepare a well-written, comprehensive, and well-documented research report including safety considerations.”

The Chemical Hygiene Officer and principal investigators are responsible for documenting any safety training provided to faculty, staff, and students. Documentation can be recorded electronically or with hardcopies.

6.3 Chemical Hygiene Officer and Laboratory Coordinator

According to Act 1172 of the 1991 Arkansas Legislature and the associated Safety Code No. 12 of the Arkansas Department of Labor, there is no requirement for training faculty members in chemistry. However, annual laboratory safety training and/or conferences will be **required** of the Chemical Hygiene Officer and Laboratory Coordinator.

7. Medical Consultations and Examinations

The University of Central Arkansas provides health services to all faculty, staff, and students regardless of their occupation at the Student Health Center. Licensed physicians and professionals are available to provide medical consultations and examinations. Medical services can be provided at no cost to the employee, without loss of pay, and at a reasonable time. Injuries involving faculty or staff must also be reported to the Company Nurse Injury Hotline, **1-855-339-1893** and to the Chemical Hygiene Officer.

The instructor, principal investigator, or student worker must complete an Incident Report Form upon the injury and submit it to the Chemical Hygiene Officer.

7.1 Medical Examination Criteria

Medical examinations are to be provided for the following:

- Exposure monitoring shows that permissible exposure limits (PELs) are above the action level of an OSHA regulated substance.
- An employee displays signs of chemical exposure while working in the laboratory. Exposure signs include but are not limited to: headache, rash, nausea, coughing, tearing, eye irritation, dizziness, loss of dexterity or judgment.



- An employee is exposed to hazardous chemicals as a result of a spill, leak, or explosion.

Upon receiving a medical examination, the licensed physicians will determine what services or additional medical treatment or examination is required.

7.2 Medical Examination Information

The employee's Department, instructor, or principal investigator will need to provide the following information to the physician regarding the employee's exposure or injury:

- The identity of the chemical the employee may have been potentially exposed.
- The safety data sheet (SDS) of the chemical, only if it does not delay the employee from seeking medical attention.
- The conditions in which the exposure occurred.
- The symptoms exhibited by the employee.

7.3 Medical Examination Results

Upon the completion of a medical examination or consultation, a written opinion of the examination or consultation from the examining physician must be provided to the Department or principal investigator with the following information:

- Recommendations for further medical examination or consultations;
- The results of the consultation or examination and any tests performed;
- Any medical conditions revealed from the examination that could cause the employee to have an increased risk from chemical exposure in the lab; and
- A statement indicating that the employee had been informed of the findings of the examination or consultation.

In this written opinion, the physician must not reveal any conditions or diagnoses found that were not as result of the exposure.

8. Laboratory Safety Equipment

The Department has several types of safety equipment available. The safety equipment should be clearly marked, highly visible, and easily accessible in every location or laboratory that uses hazardous chemicals. For more information regarding the safety equipment, please contact the Chemical Hygiene Officer.

8.1 Chemical Fume Hoods

Chemical fume hoods are the most common and important equipment used in the teaching and research laboratories. Fume hoods protect the user from exposure to



hazardous chemicals, vapors, and dusts. A fume hood is a chemical and fire-resistant enclosure with a movable sash (window) in the front to allow the user easy access to and viewing of the inside. More information can be found in *Section 4.2.1 Fume Hoods*.

8.2 Safety Showers

Safety showers are required in all locations where hazardous chemicals are used and stored. In the event of chemical contamination to the skin or clothing, the safety shower provides a readily available initial treatment. Every safety shower must be easily accessible with no obstacles and clearly labelled. The Chemical Hygiene Officer tests the showers once a month to ensure that the showers are working properly.

In the event a safety shower is needed due to chemical contamination to the skin or clothes, place the person directly under the shower and flush the body for 15 minutes while removing the all clothing and seek medical attention.

8.3 Eyewashes

Eyewashes are required in all locations where hazardous chemicals are used and stored. Every eyewash must be easily accessible with no obstacles and clearly labelled. The Chemical Hygiene Officer tests the eyewashes weekly to ensure the eyewashes are working properly.

In the event an eyewash is needed due to chemical contamination to the skin or clothes, place the person directly under the shower and flush the eyes for 15 minutes while removing the all clothing and seek medical attention.

8.4 Fire Extinguishers

Fire extinguishers are required for all research and teaching laboratories due to fires being one the most common type of laboratory accident. All faculty, staff, and students must know the locations of fire extinguishers and how to use them properly.

There are four types of fire extinguishers. Therefore, it is important the correct type of extinguisher be used to extinguish a fire. The types are:

- A – Combustibles such as wood, paper, rubber, or plastics.
- B – Flammable liquids or solvents
- C – energized electrical equipment
- D – Combustible metals such as sodium and potassium

Multipurpose extinguishers such as ABC and BC are available to cover multiple types of fires. All teaching and research laboratories have ABC extinguishers and Manion 304 and 402 and Prince 201 have Class D extinguishers.



All fire extinguishers are to be easily accessible with no obstacles and mounted to the wall. The Environmental Health and Safety Department will inspect the fire extinguishers monthly.

8.5 Fire Blankets

Fire blankets are recommended to be in all laboratories that use flammable liquids and materials but are not required. Fire blankets should be easily accessible with no obstacles. In the event that a person's clothing or body is on fire, the person should STOP-DROP-and ROLL to extinguish the fire. The fire blanket is to be used as a last resort to help smother or put out a fire.

Fire blankets can also be used to as a blanket to keep shock victims warm or as a shower curtain for when the safety shower is employed.

8.6 Flammable Solvent Cabinets

Flammable liquids in excess of 10 gallons must be stored in a flammable solvent cabinet. All flammable cabinets must meet the specifications given by the NFPA (National Fire Protection Agency) and labelled with "FLAMMABLE KEEP FIRE AWAY." The flammables cabinet is not required to be vented as this should be done when the flammable liquids generate noxious fumes or gases. Only flammable or combustible materials should be stored in a flammables cabinet.

8.7 Flammable and Explosion Proof Refrigerator

Domestic refrigerators are not to be used to store chemicals as these refrigerators' temperatures are above the flash points of the chemicals inside. In addition, domestic refrigerators have ignition sources in the thermostats, the lights, and even the heater strips inside. Chemicals and flammables required to be stored in the refrigerator must be stored in a flammable and explosion proof refrigerator. Flammable and explosion proof refrigerators are designed to eliminate ignition sources that could cause the vapors of flammable materials to ignite inside the refrigerator. With this, all electrical components are outside of the refrigerator. In addition, some flammable and explosion-proof refrigerators may include other safety features such as magnetic door gaskets, self-closing doors, and special inner shell that limit or control the damage in the event a reaction or spill should occur inside the refrigerator.

Any chemicals stored in this refrigerator should be tightly closed to minimize the release of vapors and according to their hazard classification.

8.8 First Aid Kits

First aid kits are located in every laboratory and should be easily accessible to anyone in the laboratory. The first aid kits are inspected by the Chemical Hygiene Officer every month to ensure all supplies are present. Each first aid kits includes: bandages (finger,



knuckle, and various sizes of regular), gauze, burns pads, adhesive tape, alcohol pads, gloves, and a space blanket. If more first aid supplies are needed, contact the Chemical Hygiene Officer.

8.9 Chemical Spill Kits

Every laboratory that has access or uses hazardous chemicals should have direct access to a chemical spill kit. These kits are located in fixed areas so that any person can easily access them.

Once a spill kit is used, it should be immediately restocked or replaced. All supplies can be obtained or purchased at most supermarkets. If the spill kits need to be restocked or replaced, contact the Chemical Hygiene Officer.

Spill kit contents:

- Absorbents: Baking soda (sodium bicarbonate) – acid neutralizer; Citric acid – base neutralizer; Cat litter – absorbent; (1) Absorbent pad
- Personal Protective Equipment: (2 pairs) Nitrile Gloves; (1) Dust Mask
- Clean-Up Material: (1) 5-gallon bucket with lid; (2) Plastic bag for waste and/or contaminated PPE; (1) Plastic dust pan and broom; (1 vial) pH test strips; (1) Plastic Container (Organic)
- (2) Waste labels
- (1) Incident report form
- (1) Pen

8.10 Portable Blast Shields

Blast shields provide limited protection against materials that pose a fire, explosion, or chemical splash hazard. Blast shields should be used in conjunction with a fume hood as the sash can provide another layer of protection. It should be noted that, even though a blast shield is used, damage can still occur on the sides and back of the fume hood or equipment.



Appendix A. Occupational Safety and Health Administration References

- [Laboratory Standard - 29 CFR 1910.1450](#)
- [OSHA Permissible Exposure Limits \(PEL\) – 29 CFR 1910.1450 subpart Z](#)
- [Limits for Air Contaminants – 29 CFR 1910.1000](#)
 - [TABLE Z-2 – 29 CFR 1910.1000 TABLE Z-2](#)
 - [TABLE Z-3 Mineral Dusts – 29 CFR 1910.1000 TABLE Z-3](#)
- List of Substances Known to be Human Carcinogens, Reasonably Anticipated to be Human Carcinogens and Highly Toxic Substances
 - [National Toxicology Program \(NTP\)](#)
 - [International Agency for research on Cancer Monographs \(IARC\)](#)
- [Prudent Practices in the Laboratory](#)

Appendix B. Hazardous Waste Label

Hazardous Waste Identification

Start Date: _____ Room #: _____ PI(s)/Lab Manager: _____

Fill Date: _____

☐ Corrosive

☐ Halogenated

☐ Non-Halogenated

☐ Flammable

☐ Oxidant

☐ Toxic

☐ Other _____

Contents (do not use formulas or abbreviations)

Amount Percentage/Volume/Concentration



Appendix C. Stanford Compatible Storage Group Guide

STANFORD COMPATIBLE STORAGE GROUP GUIDE

Effective segregation in chemical storage reduces the risk of dangerous chemical reactions.

This guide must be used in conjunction with information from the manufacturer's safety data sheets and chemical-specific expert knowledge.

This storage group system is intended to be used in research settings to store laboratory-scale quantities of chemicals.

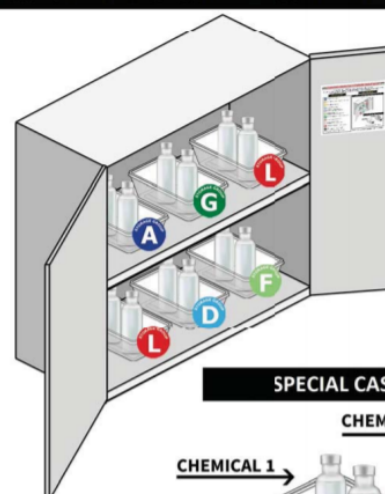
What to Segregate

- A** Compatible Organic Bases
- B** Compatible Pyrophoric & Water-Reactive Materials *
- C** Compatible Inorganic Bases
- D** Compatible Organic Acids
- E** Compatible Oxidizers & Peroxides (not including Strong, Oxidizing Acids) *
- F** Compatible Inorganic Acids (not including Oxidizers or Combustibles)
- G** Not Intrinsically Reactive, Flammable, or Combustible
- I** Compatible Strong, Oxidizing Acids
- K** Compatible Stable Explosives (not including Oxidizing Explosives) *
- L** Flammables, Combustibles, & Organic Solvents
- X** Incompatible with ALL Other Chemicals (including other chemicals within X) *

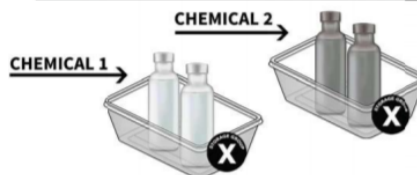
* These materials are likely to require special handling & storage conditions. Use extreme caution.

How to Segregate

USE SEPARATE SECONDARY CONTAINERS FOR EACH GROUP



SPECIAL CASE FOR GROUP X



NOTE: Different chemicals within Storage Group X must be segregated from each other.

Questions? Contact the EH&S Lab Safety Program at 723-0448

Use ChemTracker to find a chemical's Storage Group - stanford.chemtracker.org



Appendix D. Laboratory Safety Agreement for Students

Laboratory Safety Agreement

As a student at the University of Central Arkansas, I understand the importance of and agree to follow the following safety guidelines while in any chemistry laboratory:

Personal Protective Equipment (PPE):

1. I will wear ANSI Z87-approved safety glasses or goggles at all times while in the lab except during pre-lab lecture or when the lab instructor informs me that it is safe to remove them.
2. I will wear gloves to handle hazardous chemicals or when instructed by the lab instructor. I will not wear my gloves outside of the lab unless instructed to do so by the professor. If so, I will have one ungloved hand or be accompanied by an ungloved person. I will not touch my face, eyes, mouth, exposed or phone when wearing gloves.
3. I will wear clothing that is conducive to lab work: closed-toe shoes that cover the entire foot, pants that completely cover all of my legs and ankles, and shirts that completely cover the torso such as a T-shirt. No bare midriffs or ankles, tank tops or low-cut tops, open back shirts, shorts or cropped pants, or sandals.
4. I will not wear loose fitting or bulky clothing. If I am, I will confine or remove any loose fitting clothing.
5. I will tie back hair, if longer than shoulder length, as a way to keep away from flames, chemicals, and equipment.

General Lab Safety:

6. I will know where safety equipment is located and how to use it including the fume hoods, safety showers, eyewash stations, spill kits, fire blankets, and fire extinguishers.
7. I will know the building emergency plans in the event of a fire, tornado, or active shooter.
8. I will become familiar with the Chemical Hygiene Plan (CHP).
9. I will read and understand the lab material and complete any pre-lab assignments before I come to lab. If I have any questions regarding the lab, safety, or course material, I will ask the professor prior to lab.
10. I will inform my instructor prior to the first lab session if I have any particular allergy to a chemical or if I have a medical condition that might need to be considered while in the lab.
11. I will be aware of others around me in the lab and on alert for unsafe conditions. I will inform the professor and the teaching assistant (TA) of unsafe conditions so these actions can be corrected as soon as possible.
12. I will immediately report any injury, physical or chemical, to my lab instructor or TA, no matter how minor it might seem at the time.
13. I will not work by myself in the lab without the knowledge of a faculty member.
14. I will keep my hands, pens and pencils, and phones/electronics away from my face, mouth, and eyes while chemicals and equipment within the lab.
15. I will wash my hands whether chemicals were used or not before I leave the lab.
16. I will avoid touching hot objects and will label hot objects as such to notify others. I will be aware that hot glass looks the same as cold glass.



17. I will strive to maintain a clean lab by cleaning up any spills of liquids or solids, returning equipment and chemicals to the proper place, and keeping common work areas such as the balances and fume hoods clean.
18. I will keep the laboratory bench and aisles free of purses, backpacks, and other personal items that could present a tripping hazard.

Chemical Safety, Spills, and Waste Disposal:

19. I will not conduct any unauthorized experiments.
20. I will know where the SDSs (Safety Data Sheets) for chemicals used are located and how to effectively use them.
21. I will not eat, chew gum, or drink while in the lab.
22. I will not use tobacco products while in the lab.
23. I will not taste any chemical while in the laboratory.
24. I will avoid inhaling fumes and I will use the fume hood when directed to do so. If I need to check odors, I will waft vapors toward me.
25. I will read labels on reagent and chemical containers before I use them. I will read them 3 times: when I pick it up, before I use it, and after I am finished using the chemicals.
26. I will label all secondary containers and waste containers with the full chemical name (no formulas), the date dispensed or collected, the course, and the instructor's name.
27. I will never return unused chemicals/reagents to original bottles. I will dispose of unused chemicals as directed by the professor, Lab Coordinator, and/or Chemical Hygiene Officer.
28. I will recap all reagent bottles and waste containers when they are not in use.
29. I will keep all flammable solvents away from open flames and ignition sources.
30. I will transport all chemicals in a secondary container and handle all chemicals with care and as direct by faculty and staff.
31. At the end of lab, I will follow the waste disposal procedures set forth by the instructor, Lab Coordinator, and/or Chemical Hygiene Officer.
32. I will not dispose of anything in the sink unless directed by the instructor, Lab Coordinator, and/or Chemical Hygiene Officer
33. I will report any chemical spills to my instructor immediately.

Equipment:

34. I will report any glassware that is cracked or chipped to my instructor.
35. I will dispose of broken glass in broken glass containers, no other trash. If the broken glass container is full, I will notify the instructor.
36. I will make sure that gas jets are turned off when I am finished with them.
37. I will turn off all equipment before unplugging it. When unplugging equipment, I will grasp the plug, not the electrical cord.
38. I will not use damaged equipment. I will report any equipment that looks damaged, has frayed or melted cords, exposed wires, or loose connections.
39. I will not use equipment or special apparatuses until I am trained by a faculty or staff member.
40. I will be mindful of all equipment and handle them with care as all of the equipment is expensive.