

Department of Petroleum and Geosystems Engineering

APPROVED SAFETY REGULATIONS (March, 2014)

1. All laboratories must have a designated safety supervisor, with the name and contact phone number clearly posted on the laboratory door. The supervisor will be responsible for the implementation and observance of all the safety regulations itemized in this document.
2. All persons in experimental wet laboratories must wear safety glasses. Safety goggles or a face shield with safety glasses are recommended when working with high-temperature or high-pressure fluids, or with corrosive or toxic materials.
3. Protective gloves must be worn when handling hazardous chemicals, oils or high temperature containers.
4. Long pants and closed toed shoes must be worn while conducting experiments in a laboratory. Laboratory coats are highly recommended and flame resistant laboratory coats are required when working with an open flame.
5. A respirator must be used when handling volatile organic solvents or similar materials with a high vapor pressure.
6. Exit doors must remain unobstructed.
7. Paths and aisles in the laboratory must remain unobstructed.
8. Bicycles are not allowed in laboratories. Skateboards are allowed only if stored properly.
9. Everyone who enters a laboratory must be informed about safety procedures specific to that laboratory, or accompanied by someone with such training, and must abide by all safety regulations. Children and pets are not allowed in laboratories. PGE GRA's or visitors not assigned to the same laboratory are allowed to be present in the laboratory only with the permission and supervision of those responsible for the safety of the laboratory.
10. Food is not allowed in refrigerators containing chemicals. There is a locking refrigerator in corridor 4.100, adjacent to the northwest stairwell, for food items.
11. Flammable chemicals are not allowed in non-explosion-proof refrigerators.
12. Flammable chemicals must be stored in flammable storage cabinets.
13. All laboratories must have a clear and accessible chemical inventory management exhibit.
14. The laboratory Safety Notebook and Chemical Log must be easily accessible and kept up to date.
15. Laboratory personnel must attend training on how to operate the equipment they will be using in the laboratory before they begin work.

16. Eyewashes must remain operational and unobstructed.
17. Emergency showers must remain operational and unobstructed.
18. Fire extinguishers must have pin-installed with their seal intact.
19. Fire extinguishers must remain unobstructed.
20. Fume hoods must remain unobstructed and cannot be used for storage. The sash must be down except when access is needed. The fume hood must normally be turned on.
21. EHS regulations must be followed with respect to MSDS documents.
22. All chemical containers must be labeled.
23. All chemicals must be stored in a safe manner.
24. Gas cylinders must be properly secured.
25. Nothing other than gas cylinders should be stored in utility corridors.
26. Laboratory users of compressed gas cylinders must initial the tag hanging around the neck of the gas cylinder every time they open the valve to use the gas. Monthly, all gas cylinders in the department, either in storage or in the utility corridors, will be reviewed for usage. Any cylinder that has not been used in 90 days will be returned to the gas cylinder vendor.
27. Caps or regulators must be affixed to gas cylinders. Regulator gauge guards, used to protect regulator gauges from breakage, must be included on all flammable gas cylinders. Gas valves and attached tubing must be labeled appropriately (e.g. O₂, CO₂).
28. Only technical staff with approved cylinders carts may handle moving gas cylinders.
29. Chemical waste containers must be properly labeled.
30. Waste materials that contain hazardous or toxic vapors must be kept separate.
31. No excess chemical waste must be present at any time.
32. All laboratory personnel must be familiar with UT laboratory safety policy on handling chemical spill procedures.
33. There must be a container for sharp objects in all laboratories.
34. All laboratories must include a record of the students' safety training history in the Laboratory Safety Notebook.
35. All tubes and hoses used for experimental setups must be appropriately and structurally secured to the ceiling grid, the wall, or specifically designed structure, not hanging.
36. Do not perform pressurized experiments in low pressure graded glass tubes.

37. Do not block electrical panels with equipment.
38. Do not connect power strips in series.
39. All laboratory occupants must stop working immediately when their safety is at risk or when a safety violation takes place.
40. Laboratory occupants should share “lessons learned” at periodic safety meetings with staff and faculty anytime a safety related incident takes place.
41. All laboratory occupants must be trained for and display proficiency at response to 1st and 2nd level alarms activated by the building gas alarm system.
42. All laboratory occupants must know how to operate a fire extinguisher.
43. All laboratory occupants must know how to respond to the fire alarm system and know what safety procedures to follow in the event of alarm activation.
44. When an injury occurs in a laboratory, occupants should dial 911 immediately.
45. All laboratory personnel must provide their contact information for after-hours safety incidents.
46. Glen Baum must be notified regarding any plans to make changes to the laboratory benches, shelves, cabinets and other similar laboratory structures and fixtures. He is authorized to approve such changes if he does not see any safety problems associated with them. If he has concerns about such proposed changes to the laboratory, he will notify the laboratory committee and they will meet with the PI in charge of the laboratory to determine how to resolve the issue consistent with all safety regulations and good practices. Modifications will not be made until the committee has determined that such proposed changes are safe.
47. A hazard assessment and SOP is required when a new or modified experiment with significant and potentially hazardous procedures is planned by the PI of any laboratory.

Appendix: Laboratory Safety Guidelines and Best Practices

Safety should be the number one priority of all research laboratories, and a culture of safety should permeate the entire department. The principal investigator (PI, normally a faculty member) has the primary responsibility for safety in the laboratories where his or her research is being conducted. The PI can assign responsibility for the safety, cleanliness, waste disposal and organization of a specific laboratory to someone on his or her staff, but everyone working in the laboratory is responsible for their personal safety and for reporting anyone who is not following the safety procedures. The PI can delegate enforcement of these matters in a particular laboratory to the professional staff member, but is still ultimately responsible. Safety policies should be in accordance with UT EHS safety guidelines. UT EHS guidelines can be found here:

<http://www.utexas.edu/safety/ehs/lab/manual/documents/LabManualEdit2010Ver16.pdf>

It is the responsibility of either the PI or his or her designated research staff to provide safety information to everyone working in his or her laboratory, including authorized visiting researchers who may not be familiar with all of the safety policies. Responsible staff should immediately address all safety issues and take corrective action. Staff members have the right and the obligation to correct any situations they deem to be unsafe. If corrective actions cannot be immediately taken or if a safety issue is seriously endangering the health of laboratory workers, they have the obligation to stop the laboratory work in question.

The laboratories are for engineering research. Use the scientific and engineering knowledge you have accumulated to think through what you are doing. Pay attention to all of the safety rules in place in the laboratories. This is the best way to keep everyone safe.

All new students, staff, and visitors must be trained in proper laboratory procedures including waste disposal, broken glass boxes, safety shower/eye wash use, and hood use, cleaning procedures, location of safety equipment (spill kit, first aid kit, and fire extinguisher), emergency procedures, laboratory rules/regulations and laboratory procedures. Experienced staff should always supervise new laboratory personnel. Staff should provide all students with high expectations for the laboratory in terms of cleanliness, safety and organization. For experiments where there is a potential for danger to the health of laboratory personnel, training must be provided by experienced full-time staff. Hazardous chemicals are defined here as chemicals that could cause injury or damage to the laboratory personnel, equipment and facilities or the environment. All laboratory personnel have the right to know the chemicals used in their laboratories that could affect their safety or well-being. Laboratory supervisors have immediate responsibility to keep all laboratory personnel informed about the hazardous chemicals. Laboratory supervisors are required to develop written hazard communication documents for specific chemicals used in each laboratory, train employees and make material safety data sheets of globally harmonized system of classification of chemicals (MSDS or GSH) accessible to everyone in the laboratory. A complete list of chemicals used in the laboratory must be developed and maintained. The laboratory supervisor should assign qualified and trained staff to train new laboratory personnel. The hazards must be clearly expressed to the trainee, along with all special safety precautions/rules, handling/storage of chemicals, emergency procedures, and

any special conditions to avoid. Undergraduate Research Assistants URAs, are never allowed to train others on hazardous chemicals with a NFPA 704 (National Fire Protection Association) rating of 3 or above.

Each laboratory must have a complete list of safety guidelines tailored to that specific laboratory. The following list is an example that applies to laboratories conducting chemical EOR research:

1. PPE (Personal Protective Equipment):

a. Eye protection:

- Everyone in the laboratory (including visitors) is required to wear safety glasses or goggles unless they are using computers that do not require safety glasses (i.e. no orange note on monitor). The UT EHS policy states: “Remember, prescription glasses do not provide adequate protection in a laboratory setting. Prescription safety glasses can be purchased from most opticians.” Safety glasses must meet ANSI standards whenever handling hazardous chemicals in order to be considered appropriate for laboratory safety. These guidelines are available from many sources. For reference:
<http://www.safetyeyeglass.com/ansiz8712003.html>
- Safety goggles or a face shield with safety glasses are required when
 - Filtering oil.
 - Working with corrosive material.
 - Working with high temperature fluids at elevated pressure.
 - Using highly corrosive materials and highly toxic materials (A health hazard level of 3 or above on the NFPA 704 Rating; check health hazard level chart). All compounds for which the hazards are unknown will be considered a hazard rating of 3 in all hazard categories.

A face shield with tinted safety glasses (or the equivalent) is required at all times when using an open flame.

b. Proper attire:

- Laboratory coats must be worn by everyone working in the laboratory.
- Flame resistant laboratory coats must be worn when working with an open flame.
- Long pants that adequately cover the legs and closed-toe shoes must be worn in the laboratory at all times.
- Check to be sure there is no exposed skin when wearing laboratory attire.
- Laboratory supervisors are required to check the laboratory coats of laboratory personnel regularly to ensure that they are clean and well maintained.

- Laboratory coats and gloves should not be worn in the hallways or elevators. The point of laboratory coats and gloves is to keep chemicals from contacting skin, which means that coats and gloves should be considered contaminated if the wearer has handled chemicals in them, and therefore should not be exposed to anything outside of the laboratory.
- Flame resistant laboratory coats must be worn when working with an open flame.
- Long pants that adequately cover the legs, no exposed skin, and closed-toe shoes must be worn in the laboratory all the time.

c. Respirators/ Face Mask:

- Respirators must be used when handling volatile organic solvents or other materials that produce unpleasant or harmful fumes.
- Check respirators for a proper seal before usage by using the positive pressure check or the negative pressure check outlined in this link:

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARD_S&p_id=9781

- Respirators must be fitted according to UT EHS guidelines.
- If you are in the laboratory and need a respirator because of fumes, provide everyone in the room with a respirator. Do not fill a laboratory room with fumes unless everyone in the room is wearing proper protection.
- Work in a fume hood as much as possible.
- If you routinely need a respirator to do your work and cannot work in a fume hood, get an air filtration system like one of these:

<http://www.sentryair.com/>

d. Nitrile gloves/ thermal utility gloves/ PVC/butyl gloves:

- Everyone is required to wear proper protective gloves whenever handling chemicals, oils or high temperature containers.
- At a minimum, nitrile gloves should be worn when in the laboratories. Gloves should be changed between tasks.

2. Safety kits & items required in each laboratory:

a. First Aid Kit:

- Every laboratory must have a well-stocked first aid kit. Supplies such as Kimwipes, WypAlls, paper towels, hand soap, Gojo, safety glasses, antiseptic/alcohol wipes, heat gloves, and nitrile gloves (all sizes) should also be stocked in every room. Quick access to these items is required for emergency and safety reasons. Laboratory supervisors are responsible for immediately replacing items when they run out.
- Spill kits:
 - Spill kits need to be readily available in all laboratories. If a spill occurs where the safety of laboratory personnel is in question, evacuate the room and turn off the electricity (when possible).
 - If spill material is flammable, call UTPD at 911 to request EHS assistance with clean-up, and inform the PI responsible for the laboratory. All “safe” spills (as designated on the MSDS) should be cleaned up immediately in order to prevent slipping and falling incidents.
- Eye wash, shower and fire extinguisher:
 - Ensure that eyewash stations are inspected for cleanliness and function. Record the inspection every month.

3. Labeling, Handling and Disposing Chemicals

a. Labeling Chemicals:

- Write the receiving date on the label upon receiving a chemical.
- The researcher must initial and record the date on the label when a container is first opened.

b. Handling Chemicals:

- Know and understand the physical and health hazards associated with the chemicals you are using. Inform people in your area about potential chemical hazards and be aware of what other chemicals are being used around you.
- Carefully read the label and Material Safety Data Sheet (MSDS) before using a chemical for the first time. Also review the appropriate Standard Operating Procedure.
- A copy of the MSDS/SDS for all chemicals is required to be located 1) as a hard copy in the binders (alphabetized) and 2) as an electronic copy in the MSDS folder.
- Keep the following guidelines in mind when handling chemicals:
 - Use required personal protective equipment (laboratory coats, gloves, goggles, long pants, appropriate shoes). Eye protection is always appropriate.
 - Keep your hands clean. Wash thoroughly with soap and water after handling any chemical and whenever you leave the laboratory.

- Avoid direct contact with all chemicals. Always wear safety glasses, gloves, and a laboratory coat when working with chemicals.
- Keep chemicals off your hands, face and clothing, including shoes.
- Never smell, intentionally inhale or taste a chemical.
- Smoking, drinking, eating, chewing gum and applying cosmetics is forbidden in all laboratories.
- Always use chemicals with adequate ventilation or in a chemical fume hood. Refer to the MSDS and the Standard Operating Procedure to determine what type of ventilation is needed.
- Do NOT work alone in the laboratory unless specified by SOPs. If you must work alone, notify someone as to where you will be and when.
- Use hazardous chemicals only as directed and for their intended purpose.
- Inspect equipment or apparatus for damage before adding a hazardous chemical. Never use damaged equipment.
- **Never** use mouth suction to fill a pipette. Use a pipette bulb or other pipette-filling device.
- Every chemical container in the laboratory will have a definite storage place and must be returned to that location after each use. Containers should not be left on bench tops or in the fume hood overnight.
- Do not store chemicals on desks, bench tops, or in hoods that are used for chemical manipulations.
- Only minimum working quantities of chemicals should be present in the work area.
- Containers of suspected carcinogens or acutely toxic chemicals will bear a label such as the following: "CAUTION - Carcinogen or CAUTION - Highly Toxic."
- Chemicals should be stored by hazard class, not alphabetically. Acids must be separated from bases and flammables will be separated from oxidizers. Flammables need a special container and nitric acid needs to be stored alone.
- Highly flammable chemicals should not be used near an open flame or other ignition sources (electrical equipment, static build-up, etc.).
- All secondary containers must be labeled at all times, including soap and DI water. Hazards should be included on the label for any highly toxic, highly flammable, known carcinogens, where high adsorption through skin is possible, special gloves or PPE are required, etc.
- Use of highly toxic, highly dangerous, reproductive toxins, and select carcinogens should be minimized. Only persons specifically trained to use the chemical in question are allowed to do so. Keep chemicals of this type away from others, where accidental use or exposure will not occur.
- Do not stack chemical containers.

c. Disposing of Chemicals:

- Do not dispose of chemical waste down the drain or with regular garbage (except uncontaminated DI water and low salinity brine).

- All chemical waste must be handled with appropriate PPE. Any transfer of volatile organic waste between vessels must be done in a fume hood.
- Do not over fill waste containers or EHS will not pick them up.
- Keep the liquid level well below the spout.
- Do not pack solid containers so tight that the lid pops off.
- Waste containers must be stored in a secondary container while they are active (i.e. not yet full). The outside of waste containers should be wiped clean when there are spills or drips. Secondary containment of waste containers should also remain clean. Residue and/or spilled waste are common fire hazards (for flammable waste) as well as an inhalation hazard (with volatile waste).
- Waste containers must be labeled with a waste tag at all times. Fill out waste tag completely (incomplete waste tags are a yellow tag violation) when the first drop of waste is added to the container.
- Mark out any old label information on the container when an empty container is used as a waste container.
- Empty solvent bottles should be rinsed with water at least three times, dried completely and have any chemical information marked out. These bottles should be kept in the designated area.
- Do not allow chemical waste to accumulate in the laboratories. The exterior of full waste containers must be cleaned and transferred to the chemical waste storage area.
- Fax a pick-up sheet (found at this link:
<http://www.utexas.edu/safety/ehs/forms/chemrfd2.pdf>)

to EHS to have full waste containers removed from the laboratory. It is suggested that waste be picked up every 1-2 weeks.

- All **trash** and **waste** products should be disposed of properly and not left on laboratory benches, tables, floors, or anywhere else. This includes Kimwipes, paper towels, transfer pipettes, weigh boats, leftover chemicals, etc.
- Have any small liquid containers of core flood effluent from bleeding lines (or other such unwanted fluids) emptied after operation is concluded for the day. NO container of chemicals (even waste fluids or DI water) should be left without a lid. No exceptions.

4. If an accident occurs:

a. EMERGENCY MEDICAL ATTENTION REQUIRED:

- CALL 911
- Call other people in the area for help.
- Make sure that the area is safe.
- Stop the bleeding.
- Apply First Aid.
- Follow the directions of the 911 operators.
- Notify the laboratory manager and the PI.
- Notify appropriate personnel.

b. Non-emergency medical attention required:

- Apply First Aid.
- Staff: go the staff nurse in NOA 3.302
- Notify the laboratory manager and the PI.
- Notify appropriate personnel.
- For accidents that occur after hours that require minor medical attention contact a St. David's affiliate's hospital.
http://www.utexas.edu/hr/documents/StDavids_OHS_Directions.pdf

c. Chemical Exposure

- Seek medical attention as needed per the MSDS.
- Take the MSDS with the injured person to the medical professional.
- Report exposure as required.
- Notify the laboratory manager and the PI.
- Notify appropriate personnel.

d. For accidents that occur after hours that require minor medical attention contact a St. David's affiliate's hospital.

http://www.utexas.edu/hr/documents/StDavids_OHS_Directions.pdf

5. Other Important Safety Rules:

- Food and drink are not allowed in the laboratories at any time.

- Keep door and exits clear at all times.
- Lock laboratory doors after normal working hours (6 pm).
- Only authorized personnel may enter the laboratories. If you see someone you do not know in the laboratory, ask why they are there/who they work for/who gave them permission to enter. Politely ask them to leave if they do not have appropriate permission. If they do have permission, make sure they follow all laboratory rules at all times. Failure to follow the rules will result in loss of laboratory privileges.
- Beware of all tripping hazards. Tubing, cords, etc. should never block walkways or exits. They must go **over** walkways by attaching to the ceiling.
- Any electrical equipment or parts (wires, circuits etc.), stainless steel tubing or metal parts are not acceptable in the regular waste and will be not be taken by custodians.
- Never use extension cords, power supply cords or surge protectors in series. Whenever possible plug power cords directly into the wall socket. Keep in mind the amp load that devices place on the cord. Remember extension cords are for temporary use only. Put them away when you are finished using them.
- Submit requests for work on any electrical issues (sockets not working, etc.) to the laboratory manager for that specific laboratory. If there isn't a manager for the laboratory you are working in, submit the request to Glen Baum or Gary Miscoe. Do not put tape or labels over socket openings.
- Submit requests for work orders to the laboratory manager or Glen Baum and Gary Miscoe for anything dealing with the laboratory. This includes fume hoods, lights, AC/Heat, electrical issues, eye-wash/shower, fire extinguisher, laboratory benches/drawers/cabinets, built-in desks or islands, installing (nailing/screwing) anything on the walls, leaks, sink issues, plumbing, doors, etc. This does not include the equipment or supplies that belong to the laboratory research project.
- Contact Gary Miscoe or Custodial Services for issues with regular trash, paper recycling, glass recycling/broken glass boxes, flooding of the laboratory, mopping, wet/dry vacuum needs, etc.
- Contact EHS for issues with waste disposal, waste tags, waste containers, sharp disposal, waste questions, chemical handling/use questions, safety issues, PPE (personal protective equipment), etc. Gary Miscoe may be able to help with some safety issues, PPE, etc.
- Clean oil off of surfaces and equipment such as oven doors, door knobs, stir-plates, cabinets, etc. Oil residue on surfaces presents a safety hazard to researchers and visitors who may accidentally come into contact with the oil either on their skin or on their clothing.

- Dirty bench-covers should be replaced, especially if there are oil spills or stains, solvent spills or splashes, spills of volatile liquids or liquids with an odor, acid or base spills, reactive chemical spills, spills of peroxidizable chemicals, spills of toxic or carcinogenic chemicals, and whenever there are spills larger than a silver dollar of any kind.
- Empty small liquid containers from bleeding lines (or other such unwanted fluids) after operations are concluded for the day. NO container of chemicals (even waste fluids or DI water) should be left without a lid after use. No exceptions.
- Make sure to have SOPs written and that the SOPs are followed by all researchers when handling specialized hazards (Ex: radioactive or biological hazards).

There is a direct correlation between cleanliness and safety. The assigned staff members are responsible for making sure the laboratory remains in a clean and organized manner at all times. Be sure researchers are adequately cleaning up after themselves after each task. At the end of the day, if researchers have cleaned up after themselves, the laboratory should be clean. Correct the actions of others if they are leaving a mess or not adequately cleaning up after their work. If someone has left the laboratory for the day without proper clean-up, do the cleaning yourself and take it up with the individual upon his or her return the next day.

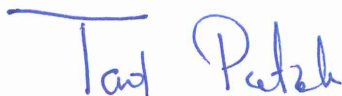
House-keeping rules and tips include the following:

- Make sure that all dishes are washed every day before researchers leave. This does not simply mean the dishes left by the sink, but it also means dishes left around the laboratory. Have cleaned dried dishes put away in the correct place.
- Make sure all equipment is cleaned and put away after use.
- Have oil wiped/cleaned off of surfaces and equipment such as oven doors, door knobs, stir-plates, cabinets, etc.
- The outside of waste containers should be wiped clean when there are spills or drips. Secondary containment of waste containers should also remain clean.
- Replace dirty bench-cover, especially if there are oil spills or stains, solvent spills or splashes, spills of volatile liquids or liquids with an odor, acid or base spills, reactive chemical spills, spills of oxidizable chemicals with potential for producing peroxides, spills of toxic or carcinogenic chemicals, and whenever there are spills larger than a silver dollar of any kind.
- Clean up spills on the floor immediately to prevent slipping and falling incidents.
- Dispose of all trash and waste products. Do not leave trash on laboratory benches, tables, floors, or anywhere else.
- Label drawers, cabinets, and storage locations accurately so it is clear to all researchers where items should reside when not being used.

- Keep items (laboratory coats, supplies, equipment) off the floor. Beware of tripping hazards.
- Backpacks should be put in lockers while students are working. Large bags may be placed on top of the lockers. Keep the laboratory and hallways clear. Lockers are reserved for students and staff without an office. Lockers may be located in the hallway ONLY if we keep the area clean and organized, including keeping items off the floor.
- Conduct locker clean-out each semester. Assign shared lockers or lockers only during work hours if the 30 lockers are not sufficient for the number of students working.
- PPE (laboratory coats, gloves, glasses, etc.) should be put away after each use (hang laboratory coats, put glasses in the case on the wall, etc.). Remove those items that are dirty, broken, scratched, or have holes in them. Laboratory supervisors should fix or replace these items and dispose of the old ones properly.
- Surplus old, broken, useless equipment after receiving permission from the laboratory manager. Items with a UT Tag items must be surplusd differently than non-tag items.
- Clean out/recycle old papers, folders, data sheets, copies, presentations, notes, etc. from drawers, file cabinets, and desk drawers and desk cabinets. REMEMBER to KEEP all laboratory notebooks.
- Surplus file cabinets that are not in use.
- Clearly label drawers and cabinets that are in use.
- Organize necessary documents and folders for future use. Label folders or binders so information is easy to find. For example: “work orders” or “purchase orders” or “surfactant details from manufacturers
- Clean out the ovens regularly. Ovens should not be over-filled with stacked samples as falling samples are a safety concern. Remove old/bad samples. Discuss issues with ovens with the laboratory supervisor as needed.
- Clean out old samples stored around the laboratory regularly.
- Clean out old chemicals regularly (from cabinets, flammables, shelving, etc.)
- Clean out drawers/bench tops/cabinets and organize them to maximize usable space for equipment, supplies, and chemicals.
- Keep the supply storage room clean and organized.
- Chemical and flammable inventory should be updated monthly.

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This document was approved by the PGE Faculty for enforcement on March 3, 2014.



Tad Patzek, PGE Chairman



**Carlos Torres-Verdín
Chairman of PGE's Laboratory and Space Committee**