

# Chemical Storage

1. All containers of chemicals must be properly identified by permanently affixed labels that include the full chemical name and associated hazards of the chemical.
2. Containers of non-flammable chemicals and reagents should be stored in cabinets or on shelves provided for that purpose. Reagent containers should not be routinely stored on bench tops.
3. All containers of flammable solvents larger than one liter should be stored in approved metal storage cabinets.
4. Proper, skid-proof footstools or stepladders should be used for reaching upper shelves. Do not stand on chairs or other easily movable objects.
5. Glass reagent containers should never be stored on the floor, particularly in traffic areas.

## Flammable and Hazardous Materials

1. The total inventory of flammable liquids in a laboratory must not be excessive. As a guide to acceptable quantities of stored chemicals, the National Fire Prevention Association (NFPA) has set the following limits for storage of flammable liquids in laboratories:
  - o Maximum individual container sizes for flammable liquids are: 1 gallon for unprotected (i.e., exposed glass) containers and 2 gallons for metal safety cans.
  - o No more than 10 gallons of flammable liquids may be stored in any individual laboratory in unprotected containers.
  - o No more than 25 gallons (total quantity in any type of container) may be kept outside of a flammable chemical storage cabinet.
  - o No more than 60 gallons (total quantity in containers of any type both inside and outside of storage cabinets) may be stored in any individual laboratory.
2. Flammable chemical storage cabinets should be double-walled metal cabinets whose backs are securely bolted to a masonry or brick wall, if possible, to prevent tipping. The doors of these cabinets should have positive-catch latches (i.e., a handle must be turned, not merely pulled, to open the door).
3. Flammable chemicals requiring refrigeration must be stored only in approved flammable material-storage refrigerators or freezers.
4. Substances with particularly noxious or toxic vapors must be stored inside a ventilated storage cabinet or, if necessary, in an operating fume hood. If the fume hood is also to be used for experimental work, then it should be provided with a separate metal cabinet for chemical storage.
5. Because of the possibility of formation of explosive peroxides, storage for longer than 30 days of opened containers of ethers, especially cyclic ethers and ethers derived from primary and secondary alcohols, is particularly hazardous. Containers of ethyl or isopropyl ether should be labeled with the date that they are first opened, and the entire contents should be either used or destroyed within one month after first opening the container.
6. Potential sources of ignition, such as flames or non-explosion-proof electrical motors, are not allowed in areas where flammable chemicals are used or stored.
7. Incompatible chemicals, such as strong acids and bases or strong acids and organic reagents, must not be stored in close proximity.
8. Rubber bottle carriers or carts (available from the research stockroom) are required for transporting glass containers of chemicals in building corridors.

## Waste Chemical Disposal

1. In research laboratories, where many unusual chemicals are used, the responsibility for disposal of unused reagents and waste reaction products is vested directly with the researcher and his faculty advisor because, in many cases, it is only the researcher who knows how to handle the materials safely.
2. Water-Soluble Wastes: In general, small quantities of water-soluble wastes which do not hydrolyze to form volatile, toxic, or malodorous materials may be flushed down the drain with copious quantities of water.
3. Flammable Liquid Wastes: Flammable liquids not miscible with water must not be poured into sinks or other sewer drains, but should be placed in glass containers that are stored in a ventilated storage cabinet or an operating fume hood. A waste disposal tag (available from the Stock Room) should be attached to the container with a list of the container's contents. Properly tagged waste containers should be periodically removed.
4. In laboratories that generate large volumes of water-insoluble waste solvents (exceeding 10-20 gallons per week), waste solvents should be stored in 5 gallon metal containers, rather than in 1 gallon glass containers, prior to disposal.
5. Before discarding, all empty chemical containers must be thoroughly rinsed. Organic reagent containers should be rinsed first with acetone and then with water.
6. Mercury:
  - All work involving metallic mercury should be performed over trays or pans with turned-up edges to confine any mercury spillage.
  - Mercury spills must be carefully cleaned with a trapped vacuuming device. For large mercury spills, an appropriate vacuuming device is available from the research stockroom (Room 014).
  - Contaminated mercury should be stored in tagged, stoppered bottles in operating fume hoods until a sufficient quantity has been accumulated, at which time it will be collected upon request, by Business Office personnel (845-3335).

# Compressed Gas Handling

## Securing Tanks

1. Tanks or cylinders of compressed gases must be properly secured at all times. This includes spare and empty tanks.
2. Empty tanks awaiting removal should NOT be left standing freely or without protective valve caps in corridors or laboratories.
3. Methods of Securement:
  - The preferred method of securing compressed gas cylinders is by enclosure with a length of chain firmly anchored at both ends to a stone or masonry wall.
  - An alternative method of securement is with a canvas tank strap securely clamped to an immovable table or bench top.
  - In either of the above methods, the anchor points of the chain or strap should be about two-thirds of the way up the tank.

## Handling Precautions

1. Proper precautions should always be observed when using or moving compressed gas cylinders.
  - Each tank must be properly and permanently identified when received. Never accept a cylinder on which the name of the contents is not clearly legible. Do not rely on color codes for tank identifications.
  - Proper cylinder carts should always be used for moving or relocating tanks. Tank carts are available for temporary use from the departmental research stockroom. Do not roll cylinders.
  - The protective valve cap should be left in place until after the cylinder has been secured in its eventual location.
  - The CGA classifications of regulator fittings must match those of the tanks on which they are used. Makeshift arrangements are hazardous and are not allowed. Required CGA classifications for most gases are provided in compressed gas catalogs that are available in the departmental Business Office, Room 119.
  - Proper traps should always be provided when gases are bubbled into liquids or reaction mixtures to prevent possible backflow of the liquid into the gas cylinder. In addition, check valves are recommended for all compressed gas supply lines.
2. Metal cylinders of flammable gases must be properly connected to an earth ground.
3. Properly designed tank trucks should be used for transporting large cryogenic containers of liquid nitrogen. In order to prevent tampering by unauthorized personnel, cryogenic containers should not be left unattended in the corridor outside the departmental liquid nitrogen dispensing facility (Room 36.)

# Fire Prevention

## Fire Hazards

- Flammable and combustible liquids: All flammable and combustible liquids in excess of 1 gallon are to be stored in spring sealing safety containers no more than 2 gallons each. In no case should there be in excess of 35 gallons stored in any one laboratory or room unless it is in flammable solvent storage cabinets.
- Beware of ignition sources in areas where combustibles are used and stored. Remove all open flame devices. Provide grounded electrical devices in good service condition. Be very careful of open flames (e.g., glassblowing torches).

If there is a problem with fire alarms, fire extinguishers or other built-in fire protection, call the Business Office at 5-3335.

## If You See a Fire

1. Alert others in the building and the College Station Fire Department by pulling the fire alarm. Pull boxes are located near most main building exits.
2. Assist handicapped or injured persons to evacuate the area.
3. Telephone 9-911 or 5-4311 (Physical Plant Radio Room) and calmly and clearly:
  - Give location of the fire.
  - Give the extent of the fire.
  - Give special circumstances for hazards, such as chemicals, valuable equipment, etc.
4. During normal working hours, notify the Business Office at 5-3335. At other times, contact the Physical Plant Radio Room, 5-4311.
5. Account for each person in your work area. Report all unaccounted for persons to the building coordinator and/or University Police Department.
6. If the fire occurs in any area where radiation, chemicals, or any other hazardous substances or operations exist, advise the University Police Department of the exact location and nature of the hazard. The University Police Department will notify the Health and Safety Office or emergency clean-up contractors.

## Fighting a Fire

It is not the responsibility of our students or employees to fight fires. However, if you are trained in using a fire extinguisher and are sure that there are no hazards from which you are not protected, you may prevent further injury or damage by taking the following steps:

1. Select the proper fire extinguisher:
  - For ordinary combustibles, such as paper or wood, use a pressurized water extinguisher, located in fire hose cabinets.
  - For flammable liquids, use a CO<sub>2</sub> extinguisher located in the corridors and near exit doors inside laboratories.
  - For electrical fires, cut the power source at the main electrical panel, if possible, and extinguish with a dry chemical or CO<sub>2</sub> extinguisher.

- For combustible metals (sodium, potassium, etc.): Do not attempt to extinguish with an ordinary fire extinguisher. Use a metal x (dry chemical) extinguisher labeled "For Metal Fires Only".
- 2. Before entering an area that is on fire or contains burning material:
  - Make sure that the fire does not produce toxic gases.
  - Feel the closed door near the top. If the door is hot, DO NOT OPEN IT!
  - If the door is cool, open it a crack to see if the fire is still confined and small. If not, close the door.
  - If the fire is small and you elect to enter the room, keep yourself between the fire and the door.
  - If the fire enlarges suddenly, exit the room and close the door.
  - If the fire remains small, direct the contents of the appropriate extinguisher at the base of the fire.

FOR EMERGENCIES CALL 9-911

# Flooding

It is an unfortunate fact that floods do occasionally occur in our buildings. This is a common occurrence in most laboratory buildings where water is used extensively for cooling instruments, condensers, etc. As with most accidental incidents, preventive measures are best. Make sure that you know how to prevent them and what to do if they occur.

## **The following measures can be taken to prevent floods:**

1. Be certain that all hoses are fastened properly. Use hose clamps (available in our stockrooms) at all connections between the hose and the apparatus or water outlet. Wire can be used for this purpose, but it is not as secure and can eventually the hose. Be aware that overtightening wire can cause it to break at the point where it is twisted, rendering it totally ineffective.
2. Plastic "quick-connect" fittings have sometimes caused floods. While they are a convenience, make certain that they are fastened properly to the hoses, and ensure that the friction connection is made firmly. If they pull apart easily (do not test this with the water running!!), they should be replaced or eliminated.
3. Water monitors are available from laboratory supply houses. They are expensive, but very effective. These monitors measure the flow after it leaves the instrument being cooled. If the flow stops (e.g., if a hose ahead of the flow detector comes loose), the monitor activates a solenoid that turns the water off and also turns off the instrument or heat source. This prevents overheating, an additional hazard in these cases.
4. Do not allow corks, glass, or other solid material to go down the sink drain. (Most of the blockages in our drains are caused by these materials.) Use screens to trap solids before they are washed down. Clogged drains can cause back-ups from floor drains as well as in sinks. In many cases, the only way to stop this type of flood is to turn off all the water feeding into drains above the blockage.
5. When flushing anything down the drain, use an abundant amount of water. Satisfy yourself that whatever was flushed down the drain will be so diluted that it cannot corrode the drains or harm the environment.

## **What to do when a flood has occurred:**

1. Whenever possible, locate and stop the flow of water. (Learn where the shut-off valves for your laboratory are located, so that you can find them quickly in an emergency.) Be very cautious about turning off water at a valve that controls the flow of water to an area for which you are not responsible. Turning off water to instruments or experiments that require cooling can easily be more harmful than the flooding you are trying to stop. You should be thoroughly familiar with the area that a valve controls before you shut it off.
2. During normal working hours call the Business Office at 5-3335 to get help. At other times, call the Physical Plant Radio Room at 5-4311 to report the problem. If it is serious, be sure to make this clear to the person answering the call. A casual, nonchalant request elicits a casual response.

# Hazardous Waste

The TAMU Hazardous Waste Management Program is administered by the University's Environmental Health and Safety Department (EHSD). TAMU is not permitted to treat or dispose of hazardous waste locally. Information on specific responsibilities and procedures may be obtained by calling EHSD at 845-2132. EHSD collects hazardous waste from Room 001G in the Chemistry Building, transports it, and properly stores it until it is shipped for disposal and maintains permanent records of all disposed waste. Generators of hazardous chemical are responsible for following University disposal procedures, for assuring that their employees are trained in proper disposal procedures, and for properly identifying the hazardous chemical waste generated. The following procedures are intended to assure compliance with applicable Federal and State regulations for the proper management of hazardous chemical waste and to reduce adverse effects to human health and the environment.

## General

1. A material becomes "waste" when the individual generator determines that it is no longer useful and should be discarded. A material is "hazardous chemical waste" if it listed in the Federal Regulations(40CFR, Subpart D) or it meets the definition of one of the following:
  - o Ignitability (flash point < 60 C or supports combustion)
  - o Reactivity (e.g., explosives, unstable chemicals, responds violently to air or water)
  - o Corrosivity (pH <4 or >10)
  - o EP toxicity (e.g., pesticides, heavy metals, poisons)
  - o Material is not excluded from regulations.
2. Hazardous chemicals can be treated to reduce the hazard or the quantity of waste in the laboratory if the treatment procedure is included in the experimental protocol.
3. Empty compressed gas cylinders should be returned to the manufacturer or distributor whenever possible. Non-returnable cylinders should be labeled as hazardous waste.
4. "Mixed Waste" (includes both radioactive material and hazardous chemicals) should be initially routed through EHSD.
5. Chemical waste whose identity is unknown will be picked up by EHSD; however, generators will be charged for the cost of the analysis necessary to determine the chemical identity for proper disposal. In such cases, use "unknown" for the chemical description on the disposal tag.

For additional information about hazardous or non-hazardous chemicals, contact the Environmental Safety Health Department, 845-2132.

## Classification and Segregation of Hazardous Chemical Waste

1. Hazardous chemical waste is categorized into the following hazard classes:
  - o halogenated solvents
  - o non-halogenated solvents
  - o acids (inorganic or organic)
  - o bases (inorganic or organic)
  - o heavy metals (silver, cadmium, lead, mercury, etc.)
  - o poisons (inorganic or organic)

- reactives (cyanides, sulfides, water reactive chemicals, peroxides, etc.)
- 2. Different classes of hazardous chemical waste must not to be co-mingled in the same waste container. Do not combine inorganic heavy metal compounds and organic waste solvents. Do not combine non-hazardous waste (e.g., a mixture of water, dilute acetic acid, and sodium bicarbonate) with hazardous chemical waste, since this then requires that the entire container of otherwise non-hazardous waste be treated as hazardous waste.
- 3. Dry material (paper, rag, towels, gloves, Kim-Wipes, etc.) That is contaminated with flammable or extremely toxic chemicals must be treated as hazardous chemical waste.
- 4. Sharps (needles, razor blades, etc.) must be encapsulated (Place the sharps in a "puncture resistant" container or a plastic/metal container, and then fill it with paraffin or plaster of Paris.). Discard the containers of encapsulated sharps as non-hazardous trash.

### Containment and Storage of Hazardous Chemical Waste

1. Individual waste generators (i.e., teaching and research laboratories) must assure that their hazardous chemical wastes are accumulated in safe, transportable containers and are stored properly to prevent human exposure or environmental release to the waste materials.
2. Containers must be closed or sealed to prevent leakage.
3. Waste generators must use waste containers that are compatible with the chemical contents (i.e., do not use metal containers for corrosive waste or plastic containers for organic solvents). Containers must be in good condition and not leak. All containers must have suitable screw caps or other means of secure closure.
4. Never overfill hazardous waste containers. Expansion and excess weight can lead to spills, explosions, and extensive environmental exposure.
  - Containers of solids must not be filled beyond their weight and volume capacity.
  - Jugs and bottles should not be filled above the shoulder of the container.
  - Closed head cans (5 gallons or less) should have at least two inches of head space between the liquid level and the head of the container.

All waste collection containers must be kept closed, except when adding or removing material.

### Labels and Labeling

1. The original chemical label on containers used for waste accumulation must be destroyed or defaced.
2. EPA regulations require that waste containers be labeled with the accumulation start date, content identity, and the words "Hazardous Waste" **when the chemical waste is first added**.
3. Using string, attach a completed **Hazardous Waste Disposal Tag** (available from the Chemistry Stockroom, Room 014) to each new waste container when the first chemical is added.

**Print the information on the tag legibly.**

### Disposal

1. It is illegal to dispose of hazardous chemicals in any of the following ways:
  - Disposal down the drain.
  - Intentional evaporation in a fume hood.

- Disposal in the regular trash.
- 2. Empty chemical containers may be disposed with other non-hazardous trash, provided that the following requirements are satisfied. EPA regulations stipulate that an **empty chemical container must:**
  - not contain free liquid or solid residue,
  - be triple rinsed,
  - have the label removed or defaced,
  - have the lid or cap removed, and
  - have a hole punched in the bottom (metal or plastic containers).
- 3. It is not necessary to break empty glass containers when placing them in a dumpster. Empty chemical containers not handled in this manner must be treated as hazardous chemical waste (very expensive).
- 4. EHSD will not pickup containers with improper caps, leaks, outside contamination, or improper labeling.
- 5. The Chemistry Department maintains a hazardous chemical waste satellite accumulation area in Room 001G. The hours that this room is open to accept hazardous waste deliveries change periodically and are posted on the door to the room, as well as on the "Safety Information" bulletin board adjacent to Room 124. When hazardous waste containers are full or ready for disposal, the tagged container(s) should be brought to Room 001G during the designated waste receiving hours. After the staff member in the room confirms that they are properly labeled, the containers will be stored in Room 001G and await collection by EHSD.

**Follow the example below to properly complete hazardous waste disposal tags.**

**Please note:**

- Attach a separate Hazardous Waste Disposal Tag to each waste container.
- Both upper and lower sections of the tag must be filled out completely and legibly (for record keeping).
- Secure the top part of the tag to the container with a string that encircles the top of the container. Rubber bands, tape, and wire are not acceptable.
- List all of the chemical components in a waste container (including water). Lists may be continued on the back of the tag.
- Tags for containers of potentially explosive materials such as picric acid, silanes, nitro compounds, and ethers must indicate the percentage concentrations of these chemicals.

*Upper Hazardous Waste Disposal Tag*

Requestor

John Doe

Dept/Part

Chemistry

Phone

5-4130

Chemicals

Methylene Chloride  
Toluene

*Lower Hazardous Waste Disposal Tag*

Accumulation Start Date

5/22/2015

Requestor

John Doe

Dept/Part

Chemistrv

Building Name & Number

Chemistrv-376

Room

2002

Phone

5-3140

Chemicals

Methylene Chloride  
Toluene

Physical Property

Liquid  Solid  Gas

Quantity

Pint  Quart  Gallon  5 Gallon  Other

Container Type

Glass  Metal  Other

#### Reacts With

None  Air  Water  Other

#### Hazards

Flammable  Explosive  Carcinogen  Toxic  Corrosive  Other

#### Remarks

#### Hazardous Waste Minimization

The U.S. Congress has made waste minimization a national policy and the goal of each waste generator. The following practices will help to reduce the volume and toxicity of hazardous waste, benefitting everyone's health and safety, protecting the environment, and reducing disposal costs:

##### Substitute

Use non-hazardous or less toxic materials in your process, e.g.,

1. use "No-Chromix", detergents, or enzymatic cleaners instead of chromic acid; or
2. use non-hazardous scintillation cocktails instead of xylene or toluene based cocktails.

##### Scale Down

Take a look at your process. Micro techniques will decrease the amount of solvent or reagent needed, thus decreasing the amount of waste generated.

##### Recycle

If you have reagents that are no longer needed, ask your colleagues if they may find them useful. Redistill your solvents when possible.

##### Neutralize

Chemically neutralize dilute acids and bases not contaminated by other chemicals in the lab to reduce their hazard.

##### Manage

Purchase only the amount of chemical actually needed for the experiment. Dispose of old reagents that are no longer needed. Keep track of the chemical inventory. When purchasing new equipment or developing new experiments, keep the type of waste generated in mind.

##### Training

Train everyone in waste minimization practices and correct waste disposal procedures.

# **Initiatives** New Initiatives by the Departmental Safety Committee

## Peer to Peer Safety Review Program

### *Student Initiators*

- Greg Waetzig
- Thomas Malinski
- Mario Cosio

### *Faculty Initiators*

- Dr. Michael Nippe
- Dr. Michael P. Rosynek

We are dedicated to the implementation and improvement of a departmental safety culture. One of the latest initiatives in the department is the biannual departmental Peer to Peer Safety Review program. Currently, this program involves twenty volunteering research groups (see below). In the initial phase, these twenty research groups are paired up into ten teams based on similarities in research background and experimental techniques ("cold eyes" reviews will be implemented at a later stage). Within each team, volunteering students of each research group inspect each other's laboratories and discuss potentials for improvements as well as highlight exemplary safety procedures. The results from the student inspections are communicated during group meetings and initiate discussions about safety procedures. Furthermore, this program offers a facile route for different groups to communicate about safety and, importantly, learn best practices from each other.

### *Participating research groups 2018*

- Banerjee
- Batteas
- Bergbreiter
- Bluemel
- Darensbourg
- Dunbar
- Fang
- Gabbai
- Gladysz
- Nippe
- North
- Ozerov
- Powers
- Szczepanski
- Sheldon
- Singleton
- Son
- Watanabe

- Wooley
- Zhou

# Miscellaneous

## Ventilation

- Fume hoods in all laboratories should provide adequate air movement, and should be fitted with movable sashes.
- At least one fume hood in each laboratory should run continuously.
- To prevent entry of sewer gases into laboratories, traps in floor drains and in cup sinks on laboratory benches and fume hoods should be kept full by pouring one liter of water into the drain at least once a month.

## Electrical

- Adequate electrical outlets should be provided in each laboratory to prevent circuit overloading.
- Electrical cords and cables should be examined periodically for signs of wear or fraying, and replaced if necessary.
- Electrical cords and instrument cables must not be located near potential heat sources, in locations where they may be subject to wear by friction, or on floors in traffic areas.
- In laboratories where large numbers of electrical outlets are in permanent use, each outlet should be labeled with the name of the piece of equipment it services.
- Circuit breaker panels in laboratories must remain unobstructed at all times.

## Vacuum Equipment

- All glass vacuum vessels larger than 100 cm<sup>3</sup> must be taped or enclosed within explosion-proof shields. This includes all Dewar flasks and vacuum desiccators.
- All belt-driven rotary vacuum pumps must be fitted with belt guards.
- Vacuum pumps should not be located inside cabinets or under low bench tops where excessive heat build-up may occur.

## Other

- Exposed heat sources (e.g., flames or open elements) should never be left unattended, even for short periods of time.
- To prevent injuries to custodial personnel, hypodermic syringe needles and other waste "sharps" (e.g., broken glass) to be discarded MUST be properly boxed and/or encapsulated before disposal.
- Rubber or plastic tubing used to conduct cooling water to devices such as condensers must be tightly clamped or wired to the apparatus to prevent accidental dislodgement of the tubing and potential flooding of the laboratory floor.
- Because of the importance of being able to hear fire alarms and other emergency signals, the use of stereo headsets, earbuds, etc. in laboratories is inadvisable.

# Protective Equipment

## Safety Glasses and Protective Clothing

1. Safety glasses of an approved type **MUST** be worn by all persons in all laboratories at all times. Light-weight "visitors' shields" are acceptable only for laboratory visitors, but are not suitable for routine laboratory work.
  - For general laboratory work, the glasses should have shatterproof safety lenses. Most prescription glasses are constructed with safety lenses. However, side shields afford added protection and should be considered a necessary feature of acceptable safety glasses.
  - For work with hazardous materials, such as strong acids and alkalis or other corrosives, face shields or wrap-around, ventilated goggles with safety lenses should be used.
  - When possible, entire experimental set-ups (e.g., a bench-top distillation apparatus) should be enclosed within a Plexiglas shield.
2. Proper protective clothing should be worn at all times whenever handling potentially hazardous chemicals.
3. Exposed skin on arms, legs, and feet is particularly susceptible to injury by spattering of hot, caustic, or flammable liquids.
  - Shorts and sleeveless garments are generally not suitable laboratory attire, unless covered by a laboratory apron or coat.
  - Sandals and open-toed shoes are similarly inadvisable. Bare feet are never allowed in a laboratory.

## Safety Showers

1. The 3 ft. x 3 ft. floor area beneath each safety shower must be kept clear of equipment and other obstructions at all times.
2. Safety showers should be tested only by qualified personnel. Articles of clothing (e.g., coats, jackets, sweaters, etc.) or other objects must not be hung from safety showers.

## Fire Extinguishers

1. Each person that works in a laboratory should know the location and method of use of each fire extinguisher. The department will arrange for demonstrations of proper fire extinguisher usage, as needed.
2. Articles of clothing (coats, jackets, sweaters, etc.) or other objects should never be hung on fire extinguishers.
3. Each use of a fire extinguisher, no matter how brief, should be reported to the Business Office, Room 119 (5-3335).
4. Fire extinguishers should be tested only by qualified personnel.

## Emergency Procedures

1. For the benefit of maintenance and emergency personnel, a sign bearing the name(s) and telephone number(s) of laboratory personnel to be contacted in the event of an emergency must be posted outside of each laboratory.
2. A description of emergency shutdown procedures for major laboratory instruments and equipment should be posted, if necessary, outside the entrance to each laboratory.
3. Material Safety Data Sheets (MSDS's) for each laboratory should be accessible at all times to laboratory personnel, either in printed form or via ready access to on-line versions.
4. All occupants of each laboratory should know the location(s) of the nearest building exit(s), and should familiarize themselves with alternative building evacuation routes.

# Radiation Hazards

- Warning signs of an approved type must be conspicuously posted outside entrance doors to rooms that contain strong magnetic fields, lasers, x-rays, high voltage devices, or other potentially hazardous radiation or equipment. Separate warning signs must be displayed outside rooms containing equipment, such as microwave sources, that could adversely affect pacemaker devices.
- Careful attempts should be made to shield any experiment in which ultraviolet radiation is used, in order to prevent escape of the direct beam or significant amounts of scattered radiation.
- Lasers:
  - Laser relays must be shielded to prevent accidental exposure.
  - Warning signs must be posted at entrances to laser laboratories, including, if possible, a flashing light to indicate that a laser experiment is in progress.
  - Lasers should be operated in well-lighted laboratories.
  - Laser goggles should be available to all personnel working in laser laboratories. The goggles should have a sufficiently high optical density to reduce the energy reaching the retina to a safe level.
- In the event of any radiation-related accident or exposure, Radiological Safety personnel at the TAMU Environmental Health and Safety Office (5-2132) should be notified immediately.

## Regulations

- All Department of Chemistry faculty, staff, and students who work in laboratories, chemical storage areas, preparation rooms, instrumentation facilities, or shops should familiarize themselves with Texas A&M's Environmental Health and Safety [Laboratory Safety Manual](#) which serves as a guide to generally accepted safety practices in all University research and instructional laboratories.
- All personnel in each laboratory should become familiar with simple emergency first aid methods. The department will arrange for periodic first aid training sessions, as needed.
- No individual may perform unusually hazardous experimental work (e.g., handling potentially explosive materials or large quantities of flammable compounds) unless a second person is present in the same laboratory or within calling distance.
- Windows on all laboratory doors must be unobstructed at all times. An exception to this regulation will exist for laboratories in which high-intensity radiation sources, such as lasers or x-ray generators, are used.
- Interior connecting doors between laboratories must be unobstructed and unlocked at all times. The floor area beneath the arc of swing of each laboratory door should also be unobstructed.
- Consumption of food or beverages is not allowed in laboratories that contain hazardous chemicals.

# Safety Procedures

Many operations in chemical laboratories involve dangerous materials. The well-being of an individual as well as of those around him/her demands that careful attention be given to safety. It is tragically true that the results of a moment's carelessness or thoughtlessness can cost a life, or a lifetime of disability. Equipment which operates unattended must be posted with emergency shut-down procedures. It must be interlocked to be fail-safe in the event of failure of utility service such as power, water, compressed air, etc.

Discuss every hazardous procedure with your research director, with your supervisor, or with persons knowledgeable in the field. Any occurrence, even though improbable, that produces a highly dangerous situation must be anticipated (e.g., pressure vessels must be equipped with safety valves; highly toxic materials being processed in a glass equipment train or vacuum line will be released if the train breaks; therefore, the operation must be carried out in a suitable hood, etc.)

Reports of unsafe conditions should be brought to the attention of your supervisor, the Department Head's Office, or the departmental Business Office.

A written report on every accident involving a fire or personal injury must be filed with Judy Ludwig in Room 121, in order that procedures to replenish all fire extinguisher and to secure Workers' Compensation coverage for injured individuals will be activated. Standard forms on which these reports must be written are available from Judy Ludwig in Room 121.

## Evacuation of Buildings

Because of the complexity of the Chemistry Building, it is impractical to assign evacuation routes. Plan your evacuation route before it becomes necessary to use it. Be familiar with it, and always have an alternative route in mind. As a rule, **DO NOT USE THE ELEVATORS**. (If fire alarms have been activated, elevators will not operate.) Persons who are unable to walk should be carried. All personnel should assemble in the following areas after evacuating the building:

### 1928 Wing

Across Ross Street in front of Reed McDonald Building

### 1932 Wing

On the mall west of the building by the water fountain

### 1959 Wing

In the plaza area south of the building between Chemistry and Francis Hall; Parking Lot 23

### 1972 Wing

In Parking Lot 23 south of the building

### 1986 Wing

Across the street in front of the Halbouty Geosciences Building or Doherty Petroleum Engineering

#### Communications

It is imperative that any emergency be reported quickly and precisely.

Call 9-911 or 5-2345 to notify the University Police on a 24-hour basis.

Call 5-3335 to notify the departmental Business Office during regular working hours.

Outside normal business hours, contact the Physical Plant Radio Room at 5-4311.

In the event that it is necessary to evacuate part of or the entire Chemistry Building complex, each research group and instructional laboratory will be notified by a designated contact person.

#### General Emergency Procedures

##### *Minor Emergency*

Not Life Threatening (e.g., electrical power failure, water failure, nontoxic chemical spill).

1. Report the emergency to the departmental Business Office (5-3335). Outside regular working hours, report the emergency to the Physical Plant Radio Room 5-4311. The nature of the emergency will be assessed and reported to the University Police.
2. Notify all people in the immediate area affected by the emergency.

##### *Major Emergency*

Life Threatening (e.g., fire, toxic chemical spill, bomb scare)

1. If fire, sound the fire alarm.
2. Call the University Police, (9-911 or 5-2345); identify yourself, and give the location and nature of the accident.
3. Call the departmental Business Office (5-3335) and report the emergency. Outside regular working hours, report the emergency to the Physical Plant Radio Room (5-4311).
4. Notify people in the immediate vicinity.
5. Provide assistance, if possible.
6. If it is necessary to evacuate the immediate area or the entire building, you will be contacted and instructed to go to the evacuation area.
7. Chemical Spill/Exposure: For any chemical spill which results in skin or eye contact, immediately flood the affected area using an emergency eye wash or shower. If possible, clothes should be removed when using the shower, since they can keep toxic chemical in contact with the skin and reduce the effectiveness of the shower. After thorough irrigation, treatment should be sought at the Beutel Health Center. Detailed information on toxicity (MSDS's) and proper response to exposure for most chemicals is available in the Business Office, Room 119. MSDS information is also available on-line. If there is severe personal injury, the University Police or Beutel Health Center will provide transportation for the injured to St. Joseph's Hospital or Brazos Valley

Medical Hospital, as appropriate, where full emergency facilities are available. Call 9-911 or 5-2345 to alert the University Police Department. If there is a fire, the College Station Fire Department will provide assistance.

## Personal Injury Emergency Procedures

### *Minor Personal Injury*

If minor injury occurs, employees should see a healthcare provider or medical center of their choice. For workers' compensation coverage employees should, upon check-in, report their visit as a work-related injury. Non-employee students and visiting scholars who are not covered under the Texas A&M University System Workers' Compensation Insurance Program can see a healthcare provider or medical center of their choice.

Non-employee students can visit the Beutel Health Center.

**IN THE CASE OF BURNS, ANY BURN COVERING AN AREA LARGER THAN THE PALM OF A HAND OR ANY BURN WHICH OCCURS AROUND THE FACE OR HEAD SHOULD BE TREATED AS A SERIOUS INJURY.**

### *Serious Personal Injury*

For serious injuries, such as the burns described above or any injury where there is the possibility of traumatic shock, the following procedures should be followed:

1. Call the University Police (9-911 or 5-2345); identify yourself and give the location and nature of the injury.
2. Call the departmental Business Office (5-3335) and report the injury.

The University Police or an ambulance will transport the injured person to the nearest off-campus medical center.

**N THE EVENT OF ANY INJURY, WHETHER MINOR OR SERIOUS, A WRITTEN INJURY REPORT FORM MUST BE FILED WITH JUDY LUDWIG IN ROOM 122.**

## Laboratory Safety References

The following is a list of recommended manuals and handbooks dealing with safety in the laboratory. They are available in the Business Office, Room 119.

- "Chemical Hazards of the Workplace", Proctor and Hughes
- "CRC Handbook of Laboratory Safety" 2<sup>nd</sup> edition
- "Effects of Exposure to Toxic Gases - First Aid and Medical Treatment"; 2<sup>nd</sup> edition, Matheson Gas Products
- "Handbook of Reactive Chemical Hazards"; 3<sup>rd</sup> edition, Bretherick
- "Patty's Industrial Hygiene and Toxicology" Volumes 1-3B

- "Prudent Practices for Disposal of Chemicals in the Laboratory"; National Research Council, National Academy Press
- "Prudent Practices for Handling Hazardous Chemicals in Laboratories"; National Research Council, National Academy Press
- "Rapid Guide to Hazardous Chemicals in the Workplace", N. Irving Sax and Richard J. Lewis "Safety", 2nd edition, Volumes 1 & 2

## Laboratory Fume Hoods

The chemical fume hoods in our laboratories are designed to protect you from toxic and noxious vapors. They are the most important item of safety equipment in your laboratory. In order to gain the full protection these hoods afford, the following operating procedures should always be observed:

1. Call the Business Office at 5-3335 if you have any reason to suspect that your fume hood is not operating properly.
2. Never change the position of the flutes that control the exhaust in your hood. These exhaust systems are very delicately balanced, and adjusting the exhaust on one hood affects every other hood on the same system.
3. Be aware that very high face velocities will not provide a safer hood. Velocities much above 100 ft. per minute generate turbulence at the face of the hood, causing puffs of air from within the hood to contaminate the room.
4. Do not block the ventilation slots at the back of the hood. This adversely affects the operation of the hood.
5. Set up your apparatus as close to the center of the hood working surface as is practical.
6. Avoid putting your head inside the hood and stand a few inches back from the hood sashes when the experiment or reaction is in progress.
7. The vertical sliding sashes in most of our fume hoods are intended to be used as safety shields. Maximum protection is provided when the sashes are fully closed.
8. Keep hood sashes closed whenever you do not need immediate access.
9. Do not impede movement of sashes. You should be able to completely close the front of your fume hood. If sashes are missing or damaged, call the Business Office at 5-3335.
10. It is wasteful to use fume hoods as storage cabinets for noxious chemicals. Try to use ventilated storage cabinets instead.
11. Walk-in fume hoods are intended for large set-ups and you should only be inside the hood while assembling or making adjustments to your equipment. They offer no protection if you stand inside the hood.

## Waste Mercury

Mercury spills should be cleaned up immediately. A vacuum cleaner for picking up mercury is available from the stockroom in Room 014. This unit has a special cell to trap the mercury and has a filtered exhaust that prevents mercury vapor from being expelled into the atmosphere and is to be used exclusively on mercury.

Use of the Mercury Vacuum:

**PLEASE READ THE INSTRUCTIONS ATTACHED TO THE UNIT FOR OPERATION PROCEDURES.**

To check out the unit, contact the stockroom personnel, Room 014. Sign out in the "Mercury Vacuum Log Book". A clean bag is inside the unit; please replace it with a new one (available next to the vacuum) after use. Seal the paper vacuum cleaner bag in the plastic bag provided and bring it back to the research stockroom with the vacuum during business hours, 8:00 a.m. - 5:00 p.m. Gloves are available in the research stockroom.

If you suspect the presence of mercury vapor in your area, call Ronald G. Carter at 845-3335.

# **Texas Hazard Communication Act**

The term "flammable" is defined to be any substance having a flash point of 30 C or lower (e.g., all Class I-A and I-B liquids).

## Training

Texas A&M University's implementation of the Texas Hazard Communication Act requires that all employees attend a general orientation session at least once during their employment, during which the purpose of the Act and employee's rights under it will be explained. The Chemistry Department periodically arranges training sessions throughout the year, as needed.

All personnel who routinely use or handle hazardous chemicals must also undergo annual work area-specific training conducted by their supervisor. This training provides additional assistance and practice, as needed, in interpreting Material Safety Data Sheets (MSDS's) and labels on chemical containers and in proper handling of hazardous chemicals and disposal of chemical wastes.