


TARLETON STATE UNIVERSITY  
**CHEMICAL SAFETY PROGRAM**

Program Name: Chemical Safety  
Department Name: TSU Risk Management & Safety  
Doc. No.: ENVM-04-L2-S6-CH-001  
Rev. No.: 4

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	Risk Management & Safety	Program:	Chemical Safety
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	Level 2	Date:	2-1-2021
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**Concurrence and Approval**


This Environmental Management System Document was developed for use by all Tarleton State University Employees and has been reviewed and approved by the following approvers.

**Document Custodian:**

Hector C. Davis, Director, Risk Management and Safety


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Change History

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<b>Revision Number</b>	<b>Interim Change No.</b>	<b>Effective Date</b>	<b>Description of Change</b>
001	0	10-March-2014	Initial document release under new document and record control guidance
002	0	06-October-2016	Biannual review
003	0	31-August-2018	Additional information on MOU, eyewashes, and safety showers
004	0	19-October-2020	Post-reorganization update

1. GENERAL

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The following information is provided to assist Tarleton Departments in developing procedures to meet chemical safety requirements to protect students, employees, and the environment.

## 2. PURPOSE


This program sets forth recommended minimum requirements that need to be followed to maximize the safety of all workers handling chemicals.

## 3. RESPONSIBILITIES

- a. The Tarleton Department of Risk Management and Safety will:
  - i. assist in identifying safety procedures as necessary
  - ii. assist with training as appropriate
  - iii. monitor program compliance
  - iv. assist in the selection of atmospheric monitoring equipment, personal protective equipment, and other necessary equipment.
- b. The department/supervisor will:
  - i. identify personnel who may be handling chemicals and insure they receive proper training
  - ii. provide atmospheric monitoring equipment, personal protective equipment and all other necessary equipment
  - iii. provide proper training for persons authorized to handle chemicals
- c. The employee will:
  - i. follow guidelines described in this program and other required programs to assure safe chemical handling procedures.

Any pregnant students, or students planning to become pregnant, should consult their health care provider to determine what, if any, additional precautions are needed based on their individual situation. It is the responsibility of the student to communicate their needs to their immediate supervisor as soon as possible in order for risk-reduction to begin when it can be most effective, and to determine if additional modifications are necessary. While the university cannot mandate that the student notify it that she is pregnant or is planning to become pregnant, the university strongly recommends that students do provide notification so appropriate steps can be taken to ensure the health of both parent and child. To communicate health circumstances or to request additional information, please contact Tarleton's Title IX Coordinator within the Department of Employee Services at x9128.

## 4. SCOPE


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This program applies to all employees at Tarleton who handle chemicals in the workplace. The Chemical Safety Program provides information for the following:

- a. General Chemical Safety Guidelines;
- b. Hazard Communication Program;
- c. Corrosives;
- d. Flammables;
- e. Solvents;
- f. Toxic Chemicals;
- g. Reactives and Explosives;
- h. Cleaning Agents;
- i. Fume Hoods, Emergency Eye Wash Stations and Emergency Showers;
- j. Spill Response;
- k. Chemical Storage and Waste Disposal;
- l. Transportation of Chemicals

## 5. GENERAL CHEMICAL SAFETY GUIDELINES

- a. Always follow these general guidelines when working with chemicals:
  - i. Assume that any unfamiliar chemical is hazardous.
  - ii. Know all the hazards of the chemicals you are using (refer to MSDS).
  - iii. Consider any mixture to be at least as hazardous as its most hazardous component.
  - iv. Never use any substance that is not properly labeled.
  - v. Follow all chemical safety instructions precisely.
  - vi. Minimize your exposure to any chemical, regardless of its hazard rating.
  - vii. Use personal protective equipment.
  - viii. Use common sense at all times.
  
- b. When working with chemicals, remember to do the following:
  - i. Remove and use only the amount of chemicals needed for the immediate job at hand.
  - ii. Properly seal, label, and store chemicals in compatible containers.
  - iii. Keep the containers in a well ventilated area.
  - iv. Check stored chemicals for deterioration and broken containers.
  - v. Do not store chemicals near heat or sunlight.
  - vi. Always use a secondary container when moving hazardous chemicals.
  - vii. Do not pour hazardous chemicals down any drain. Dispose of chemicals safely and legally. Refer to the Hazardous Waste Program.
  - viii. Know what to do in an emergency and know where emergency contact information is located.

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## 6. HAZARD COMMUNICATION PROGRAM

Tarleton State University has a written program (Hazard Communication Program) that complies with OSHA standards and the Texas Hazard Communication Act for hazardous chemicals. This program is available from the Department of Risk Management and Safety. It requires the following:

- a. Employee training (including recognition of signs of exposure)
- b. Labeling procedures
- c. MSDS's for chemicals at each workplace
- d. Instructions on how to read and interpret MSDS's
- e. Chemical inventory reporting procedures
- f. Recordkeeping requirements
- g. Emergency response procedures
- h. Hazard Communication training is available online through TrainTraQ.

## 7. CORROSIVES

- a. To ensure safe handling of corrosives, the following special handling procedures should be used:
  - i. Always store corrosives properly.
  - ii. Always wear gloves, face and eye protection when working with corrosives. Wear other personal protective equipment, as appropriate.
  - iii. To dilute acids, add the acid to the water, not the water to the acid.
  - iv. A continuous flow eye wash station should be in every work area where corrosives are present.
  - v. An emergency shower should also be within 100 feet of the area.
  - vi. Use a chemical fume hood when handling fuming acids or volatile irritants.
  - vii. Corrosives, especially inorganic bases, may be very slippery; handle these chemicals with care and clean any spills immediately.
- b. Perchloric acid is a corrosive oxidizer that can be dangerously reactive. At elevated temperatures it is a strong oxidizing agent and a strong dehydrating reagent. Perchloric acid reacts violently with organic materials. When combined with combustible material, heated perchloric acid may cause a fire or explosion.
  - i. If possible, purchase 60% perchloric acid instead of a more concentrated grade.
  - ii. Always wear gloves and goggles while using perchloric acid.
  - iii. Be thoroughly familiar with the special hazards associated with perchloric acid.

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- iv. Heated digestions containing perchloric acid require a special fume hood and wash-down system.

## 8. FLAMMABLES

A flammable chemical is any solid, liquid, vapor, or gas that ignites easily and burns rapidly in air. Consult the MSDS before beginning work with flammables. Flammable chemicals are classified according to flashpoint, boiling point, ignition temperature. Flammable liquids with low boiling points generally present special fire hazards. The flashpoints and boiling points of certain chemicals are closely linked to their ignition temperature—the lowest temperature at which a chemical will ignite and burn independently of its heat source.

Follow these guidelines when working with flammable chemicals:


- a. Handle flammable chemicals in areas free from ignition sources. Never use highly flammable solvents in a room with open flames.
- b. Never heat flammable chemicals with an open flame. Instead heat using a water bath, oil bath, heating mantle, hot air bath, etc.
- c. Use ground straps when transferring flammable chemicals between metal containers to avoid generating static sparks.
- d. Use a fume hood when there is a possibility of dangerous vapors. (Ventilation will help reduce dangerous vapor concentrations.)
- e. Restrict the amount of stored flammables, and minimize the amount of flammables in a work area.
- f. Remove from storage only the specific amount needed for a particular experiment or task.

Organic solvents are often the most hazardous flammables in the work place. Solvents such as ether, alcohols, and toluene, for example, are highly volatile or flammable. Chlorinated solvents such as chloroform are nonflammable, but when exposed to heat or flame, may produce carbon monoxide, chlorine, phosgene, or other highly toxic gases.

## 9. SOLVENTS

Health hazards associated with solvents include exposure by the following routes:

- a. **Inhalation:** may cause bronchial irritation, dizziness, central nervous system depression, nausea, headache, coma, or death. Prolonged exposure to excessive concentrations of solvent vapors may cause liver or kidney damage.
- b. **Skin Contact:** may lead to defatting, drying, and skin irritation.
- c. **Ingestion:** may cause severe toxicological effects. Get medical attention immediately.

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#### Reducing Solvent Exposure:

To decrease the effect of solvent exposure, substitute hazardous solvents with less toxic or hazardous solvents whenever possible. For example, use hexane instead of diethyl ether, benzene or a chlorinated solvent. The best all-around solvent is water; use whenever possible.

The odor threshold for the following chemicals exceeds acceptable exposure limits. Therefore, if you can smell it, you may be overexposed---increase ventilation immediately for the following chemicals: Chloroform, Benzene, Carbon tetrachloride and Methylene chloride. However, do not depend on your sense of smell alone to know when hazardous vapors are present.

## 10. TOXIC CHEMICALS

The toxicity of a chemical refers to its ability to damage an organ system (kidneys, liver), disrupt a biochemical process (e.g., the blood-forming process) or disturb an enzyme system at some site remote from the site of contact. Any substance can be harmful to living things, but just as there are degrees of being harmful, there are also degrees of being safe. The biological effects (beneficial, indifferent or toxic) of all chemicals are dependent on a number of factors:


- a. dose (the amount of a substance to which one is exposed)
- b. time (how often, and for how long during a specific time, the exposure occurs)
- c. route of exposure (inhalation, ingestion, absorption through skin or eyes)
- d. Other factors (gender, reproductive status, age, general health, nutrition, lifestyle, sensitization, genetic disposition, and exposure to other chemicals).

The most important factor is the dose-time relationship. The dose-time relationship forms the basis for distinguishing between two types of toxicity: acute toxicity and chronic toxicity.

- i. Acute toxicity, a chemical's ability to inflict systemic damage as a result (in most cases) of a one-time exposure to relative large amounts of the chemical. In most cases, the exposure is sudden and results in an emergency situation. Some chemicals are extremely toxic and are known primarily as acute toxins (hydrogen cyanide).
- ii. Chronic toxicity, a chemical's ability to inflict systemic damage as a result of repeated exposures, over a prolonged time period, to relatively low levels of the chemical. Some chemicals are known primarily as chronic toxins (i.e., lead). Other chemicals, such as some of the chlorinated solvents, can cause either acute or chronic effects.

The toxic effects of chemicals can range from mild and reversible (e.g., a headache from a single episode of inhaling the vapors that disappears when the



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victim gets fresh air) to serious and irreversible (liver or kidney damage from excessive exposures to chlorinated solvents). Exposure to toxic chemicals can occur by: inhalation, skin absorption, ingestion, and injection.

Inhalation and skin absorption are the most common methods of chemical exposure in the workplace. Always minimize your exposure to any toxic chemical.

The following sections provide examples and safe handling guidelines for the following types of toxic chemicals:

- a) Toxins
- b) Carcinogens
- c) Reproductive Toxins
- d) Sensitizers
- e) Irritants

a) Toxins

Do not work alone when handling acute toxins. Use a fume hood to ensure proper ventilation. Acute toxins can cause severe injury or death as a result of short-term, high-level exposure. Examples of acute toxins include the following:

- i. Hydrogen cyanide
- ii. Hydrogen sulfide
- iii. Nitrogen dioxide
- iv. Ricin
- v. Organophosphate pesticides
- vi. Arsenic


Chronic toxins cause severe injury after repeated exposure. Examples of chronic toxins include the following: Mercury, Lead and Formaldehyde

b) Carcinogens

Carcinogens are materials that can cause cancer in humans or animals. Several agencies including OSHA, NIOSH, IARC, NTP and NIH are responsible for identifying carcinogens. There are very few chemicals known to cause cancer in humans, but there are many suspected carcinogens and many substances with properties similar to known carcinogens.

Zero exposure should be the goal when working with known or suspected carcinogens. Workers who are routinely exposed to carcinogens should undergo periodic medical examinations.

Examples of known carcinogens include the following:

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- i. Asbestos
- ii. Benzene
- iii. Tobacco smoke
- iv. Chromium, hexavalent
- v. Aflatoxins

c) Reproductive Toxins

Reproductive toxins are chemicals that can produce adverse effects in parents and developing embryos. Chemicals including heavy metals, some aromatic solvents (benzene, toluene, xylenes, etc.), and some therapeutic drugs are capable of causing these effects. While some factors are known to affect human reproduction, knowledge in this field (especially related to the male) is not as broadly developed as other areas of toxicology. In addition, the developing embryo is most vulnerable during the time before the mother knows she is pregnant. Therefore, it is prudent for all persons with reproductive potential to minimize chemical exposure.

d) Sensitizers

Sensitizers may cause little or no reaction upon first exposure. Repeated exposures may result in severe allergic reactions. Examples of sensitizers include the following:


- i. Isocyanates
- ii. Nickel salts
- iii. Beryllium compounds
- iv. Formaldehyde
- v. Diazomethane

e) Irritants

Irritants cause reversible inflammation or irritation to the eyes, respiratory tract, skin, and mucous membranes. Irritants cause inflammation through long-term exposure or high concentration exposure. Examples of irritants include the following:

- i. Ammonia
- ii. Formaldehyde
- iii. Halogens
- iv. Sulfur dioxide


## 11. REACTIVES AND EXPLOSIVES

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Highly reactive chemicals include those which are inherently unstable and susceptible to rapid decomposition as well as chemicals which, under specific conditions, can react alone, or with other substances in a violent uncontrolled manner, liberating heat, toxic gases, or leading to an explosion. Reaction rates almost always increase dramatically as the temperature increases. Therefore, if heat evolved from a reaction is not dissipated, the reaction can accelerate out of control and possibly result in injuries or costly accidents. Air, light, heat, mechanical shock (when struck, vibrated or otherwise agitated), water, and certain catalysts can cause decomposition of some highly reactive chemicals, and initiate an explosive reaction. One must use specialized procedures and control equipment whenever working with reactive materials.

- a. Water reactives react violently with water. Many produce flammable hydrogen gas that can then ignite when mixed with air (alkali metals, organometallic compounds and some hydrides). Others give off large amounts of heat when mixed with water resulting in a violent reaction if the heat produced is not sufficiently dissipated.
- b. Pyrophoric materials ignite spontaneously when exposed to the oxygen and or moisture in air at or below 130°F. These must be stored under water, mineral oil or an inert dry atmosphere depending on the substance. Examples: phosphorus, titanium dichloride, tributylaluminum, sodium, and lithium hydride.
- c. An explosive material is substance or mixture of substances that when initiated by heat, light, friction, impact, or detonation undergoes a rapid chemical reaction giving off large volumes of hot gases. The reaction usually involves a decomposition of the substance(s) but may be caused by a rapid polymerization. Fires typically accompany an explosion.
- d. Oxidizing agents in addition to their corrosive properties, are powerful oxidizing agents and present fire and explosion hazards on contact with organic compounds and other oxidizable substances. Organic peroxides are among the most hazardous substances used in the laboratory – they are both fuels and oxidizers in one. They are typically low power explosives and very easy to initiate through sparks or shocks.

## 12. CLEANING AGENTS

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Many of the chemicals contained in cleaning agents are corrosive. Follow these guidelines when working with any cleaning agent:


- a. Always read and understand the label instructions or the MSDS before using any cleaning agent.
- b. Mix solutions to the recommended strength.
- c. When diluting acid with water, always add the acid to the water, not the water to the acid. (Concentrated acids may splatter when mixed improperly.)
- d. Wear appropriate eye protection and gloves for the job (e.g., neoprene, nitrile, or rubber).
- e. Do not leave aerosol cans in direct sunlight or areas where the temperature may exceed 120°F.
- f. Heated aerosol cans may explode.

### 13. FUME HOODS, EMERGENCY EYE WASH STATIONS AND EMERGENCY SHOWERS

Fume hoods provide primary confinement in a chemical laboratory. They exhaust toxic, flammable, noxious, or hazardous fumes and vapors by capturing, diluting, and removing these materials. Fume hoods also provide the best protection when the fume hood sash is in the closed position. All chemical fume hoods must be ducted to the outside of the building.

The potential for glass breakage, spills, fires, and explosions is great within a fume hood. Due to the chance for fires or explosions, fume hoods should be located towards the back of a laboratory, away from primary and secondary exits. Practice safe work habits when working with fume hoods, including the following:

- a. **Air Flow and Ventilation:** Employee traffic in front of a fume hood or opening/closing laboratory doors can interfere with hood performance. Ensure that there is sufficient aisle space in front of fume hoods.
- b. **Fume Hood Type:** All fume hoods are not appropriate for all types of work. Ensure that hazardous chemicals are used in the proper type or class of hood. For example, use perchloric acid only in fume hoods specifically designed for perchloric acid.
- c. **Fume Hood Use and Care**  
To ensure safety and proper fume hood performance, follow these guidelines:
  - i. Use a fume hood when working with chemicals or procedures that may produce hazardous fumes or vapors.
  - ii. Know how to properly operate a fume hood before beginning work. Inspect the fume hood before starting each operation.
  - iii. Place equipment and chemicals at least six inches behind the fume hood sash. This practice reduces the chance of exposure to hazardous vapors.

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- iv. Do not allow paper or other debris to enter the exhaust duct of the hood.
- v. Do not store excess chemicals or equipment in fume hoods.
- vi. Do not block the baffle area of the fume hood.
- vii. Elevate any large equipment within the hood at least three inches to allow proper ventilation around the equipment.
- viii. When working in a fume hood, set the sash at the height indicated by the arrow on the inspection sticker. The only time the sash should be completely open is while setting up equipment.
- ix. Wear personal protective equipment, as appropriate.
- x. Do not alter/modify the fume hood or associated duct work.
- xi. Clean up spills in the hood immediately.

**IMPORTANT:** If a power failure or other emergency occurs (e.g., building fire or fire within the fume hood), close the fume hood sash and call for emergency assistance.

d. Fume Hood Inspections

Fume hoods should be tested annually. Fume hoods should also be tested in the following circumstances:


- i. When an employee requests an inspection
- ii. When a procedural change requires a hood classification upgrade
- iii. After major repair work
- iv. After a fume hood is moved

The Department of Risk Management and Safety oversees fume hood inspections and testing. The test includes an inspection of the hood system, airflow measurements, and an assessment of the use of the fume hood. If you suspect a problem with your fume hood, please contact the Department of Risk Management and Safety for more information.

Where the eyes or body of any person may be exposed to injurious corrosive or infectious materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use. Emergency eyewash stations and emergency showers shall be kept in good working order and free of all obstructions.

Faculty and instructors should ensure that all students have received instruction regarding location and operation of eyewashes and showers.

Any malfunctioning or damaged equipment should be reported to facilities services immediately for repair.

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## 14. SPILL RESPONSE

Spills are likely whenever chemicals are used. Personnel should be trained and equipped to handle most of the spills in their work area. Contact the Department of Risk Management and Safety for assistance or advice about a chemical spill.

### a. Spill Prevention and Planning

Prevention is the best safety strategy for any environment. Use safe handling procedures and be aware of the potential hazards associated with chemicals. For example, before working with any chemicals, review the appropriate MSDSs. Be prepared to respond to a chemical spill. To prepare for a potential spill, follow these guidelines:

- i. Develop and periodically review written procedures for an emergency response plan.
- ii. Keep a fully stocked chemical spill response kit available.
- iii. Know the location and proper use of cleanup materials.
- iv. Know how to turn off equipment, heat sources, electrical panels, etc.
- v. Review appropriate MSDSs before beginning any project.

#### Spill Response Kit


Work areas that contain potentially hazardous chemicals should have a chemical spill response kit. This kit should include the following:

- a) Disposable laboratory/surgical gloves
- b) Disposable vinyl gloves
- c) Safety goggles
- d) Absorbents (e.g., spill pillows, vermiculite, litter box filler, etc.)
- e) Plastic scoop
- f) Plastic trash bags

### b. Responding to Chemical Spills

The following sequence provides a brief overview of proper chemical response procedures:

- i. Notify others in the immediate area that a spill has occurred. Evacuate the area if necessary.
- ii. Attend to injured and exposed people.
- iii. Identify the spilled chemical(s).
- iv. Based on the hazards and the personal protective equipment needed (e.g., respiratory protection), determine if you can safely clean the spill or if assistance is necessary. If you determine that you CAN safely clean the spill without emergency assistance, follow these guidelines:
  1. Wear appropriate protective clothing and equipment.

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2. Have another person stand by during the cleanup.
3. Clean up the spill and collect all wastes for proper disposal.
4. Ventilate the area, as necessary, before it is reoccupied.
5. Decontaminate reusable cleanup supplies (i.e. scoops, rubber boots, etc.)
6. Restock the chemical spill kit and return it to the normal storage location.

Do not take unnecessary risks with chemical spills. Call the Department of Risk Management and Safety immediately whenever a spill involves the following:

- a) Large volume of spilled material
- b) Very hazardous material
- c) Very hazardous conditions (e.g., fire, explosion, toxicity, etc.)
- d) Strong odor
- e) Personnel injury or exposure

## 15. CHEMICAL STORAGE AND WASTE DISPOSAL

### a. Chemical Storage Guidelines

Proper chemical storage is as important to safety as proper chemical handling.


The following guidelines are for safe chemical storage:

- i. Read chemical labels and MSDSs for specific storage instructions.
- ii. Store chemicals in a well-ventilated area; however, do not store chemicals in a fume hood.
- iii. Storage in direct heat or sunlight should be avoided.
- iv. Maintain an inventory of all chemicals in storage.
- v. Return chemical containers to their proper storage location after use.
- vi. Store glass chemical containers so that they are unlikely to be broken.
- vii. Store all hazardous chemicals below eye level.
- viii. Never store hazardous chemicals in a public area or corridor.

### b. Separating Hazardous Chemicals

Accidental contact of incompatible chemicals can result in:

- i. Generation of heat (mixing acids & bases)
- ii. Violent reaction (mixing acrolein & acids or other catalyst)
- iii. Formation of toxic vapors or gases (mixing cyanide salt & acid)
- iv. Formation of a flammable gas (mixing alkali metal & water)
- v. Fire or Explosion (mixing perchloric acid & acetic anhydride)

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Incompatible materials should be sufficiently segregated in storage to prevent mixing during fires, explosions, and natural disasters. Accidents with incompatible materials often occur during the commingling of wastes in laboratories.

c. Container Compatibility

The container used for hazardous waste collection must be compatible with the waste and must not contain residues of incompatible materials. The following table shows general chemical categories and compatible container types.

Take special care in choosing containers for the following wastes:

- i. Nitric Acid: reacts with organics (including acetic acid) to produce heat and gas. If product containers for organics are used to collect nitric acid, be sure to rinse thoroughly to avoid potential over-pressurization and subsequent burst of the container.
- ii. Perchloric Acid and Organic Peroxides: highly reactive with organics and organic material, such as wood. May also react with metals.
- iii. Hydrofluoric Acid: Dissolves glass containers

d. Hazardous Chemical Waste Disposal

All generators of hazardous chemical wastes are required to:


Chemical Category	Container Type
Mineral Acids	Plastic
Bases	Plastic
Oxidizers	Glass
Organics, including acetic acid	Glass

- i. comply with Tarleton State University hazardous waste disposal procedures,
- ii. assure their employees are trained in proper disposal procedures, and
- iii. properly identify and label all hazardous wastes generated.
- iv. Refer to the Hazardous Waste Management Program or contact the Department of Risk Management and Safety for more information.

## 16. TRANSPORTATION OF CHEMICALS

The U.S. Department of Transportation regulates the shipment of hazardous materials. Anyone who packages, receives, unpacks, signs for, or transports hazardous chemicals must be trained and certified in Hazardous Materials Transportation. Warehouse personnel, shipping and receiving clerks, truck drivers, and other employees who pack or



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unpack hazardous materials must receive this training. Contact the Department of Risk Management & Safety for more information on shipping or receiving hazardous chemicals.


## 17. CONTROLLED SUBSTANCES AND PRECURSOR CHEMICALS/GLASSWARE

In 1989, the Texas legislature enacted a bill requiring control of chemical precursors and laboratory apparatus. Codified in the Health & Safety Code, Subtitle C, Chapter 481, chemical precursor and chemical laboratory apparatus are defined in §481.002 DEFINITIONS. The law then provides exceptions for higher education in §481.0621 but requires that the Texas Higher Education Coordinating Board (THECB) adopt a memorandum of understanding that establishes the responsibilities of higher education. The MOU is renewed every 10 years, with the latest MOU signed June 13, 2006.

The table below lists controlled chemicals and apparatus:

Precursor Chemicals	Laboratory Apparatus
1. Methylamine	A. Condensers
2. Ethylamine	B. Distilling apparatus
3. D-lysergic acid	C. Vacuum dryers
4. Ergotamine tartrate	D. Three-necked flasks
5. Diethyl malonate	E. Distilling flasks
6. Malonic acid	F. Tableting machines
7. Ethyl malonate	G. Encapsulating machines
8. Barbituric acid	H. Filter funnels, buchner funnels, and separatory funnels
9. Piperidine	I. Erlenmyer flasks, two-necked flasks, single neck flasks, round-bottom flasks, Florence flasks, thermometer flasks, and filtering flasks
10. N-acetylanthranilic acid	J. Soxhlet extractors
11. Pyrrolidine	K. Transformers
12. Phenylacetic acid	L. Flask heaters
13. Anthranilic acid	M. Heating mantles
14. Hypophosphorus acid	N. Adapter tubes
15. Ephedrine	
16. Pseudoephedrine	
17. Norpseudoephedrine	
18. Phenylpropanolamine	
19. Red phosphorus	

Any controlled substances or precursor chemicals should be stored in a secured area. Usage logs should be employed to track the quantity of the materials. Any evidence of pilferage should be reported immediately.

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This affects all individuals who order, purchase, receive, deliver, manage, use, store, dispose, or sell the items in question. Key locations include, but are not limited to:

- Purchasing
- Receiving and stores
- Laboratories and stockrooms in all science and engineering departments
- Surplus


The legal basis for the requirements covered by this guide is:

- Texas Health & Safety Code, Subtitle C, Chapter 481
- Controlled Substances, Controlled Substance Analogues, Chemical Precursors, and Chemical Laboratory Apparatus MOU between the Texas Department of Public Safety (DPS) and the Texas Higher Education Coordinating Board (THECB).

Based on review by the A&M System Office of General Council, it has been determined that inventory requirements listed in the MOU pertain to chemical substances but not to apparatus.

Licenses are required for anyone who possesses controlled substances. Those licenses and the administrative procedures of both the member and the individual licensees are covered in a separate administrative procedure or protocol.

Compliance with this MOU does require broad-based awareness training of any and all employees and even students who use or come into contact with chemical precursors and chemical laboratory apparatus. Responsible persons may require a greater level of training in order to successfully administer the program.

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## REFERENCES

- Chemical Safety Standard, Texas A&M University System
- Compliance Guide – Controlled Substances, Controlled Substance Analogues, Chemical Precursors, and Chemical Laboratory Apparatus MOU

Tarleton State University:

- Laboratory Safety Program,
- Hazardous Waste Management Program
- Hazard Communication Program
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