TEXAS A&M UNIVERSITY
SAN ANTONIO

LABORATORY SAFETY PROGRAM GUIDELINE

TEXAS A&M UNIVERSITY-SAN ANTONIO
February 19, 2020

1. GENERAL SAFETY GUIDELINES

Texas A&M University-San Antonio (A&M-San Antonio) lab managers have ultimate responsibility for ensuring proper training and safety associated with University laboratories. Because laboratories involve numerous chemicals, procedures, and operations, they require extensive safety precautions. Laboratory safety involves chemical safety, fire safety, electrical safety, proper hazardous waste management, and other safety issues. Follow the guidelines in this program for general laboratory safety, but refer to other programs for specific information. This section discusses the following:

a. Common Laboratory Hazards

Examples of common hazards include the following:

i. Chemical hazards: Toxins, corrosives, flammables, and reactives
ii. Biological hazards: Microbes, animals, plants, and genetically modified agents
iii. Radiation hazards: Ionizing and non-ionizing radiation
iv. Physical hazards: Heating devices, noise, projectiles, fire, cold, etc.
v. Electrical hazards: Fire and shock
vi. Mechanical hazards: Moving machinery
vii. Airborne hazardous materials: Vapors, dust, etc.
viii. Ergonomic factors: Standing for long periods of time, repetitive motion

b. Controlling Laboratory Risks

Safety conscious workers using good laboratory practices are the most important component of laboratory safety. The following factors are important for safe laboratory operations:

i. Adequate facilities must have:
    a) Proper ventilation
    b) Nonslip surfaces
    c) Hand washing facilities
ii. Available and appropriate safety equipment:
    a) Personal protective equipment (gloves, goggles, lab coat, etc.)
    b) Laboratory equipment
    c) Safety devices on laboratory equipment, machines, devices, and instruments
iii. Appropriate emergency equipment:
    a) Fire extinguishers
    b) Emergency showers
    c) Eye wash stations
iv. Appropriate procedures:
    a) Good housekeeping
    b) Personal hygiene (proper hand washing, etc.)
v. Knowledgeable workers:
    a) Experienced
    b) Properly trained and retrained as needed

Properly trained and experienced workers have the greatest ability to control laboratory risks. By using good laboratory practices and training, workers can minimize hazards, exposure, contamination, and workplace accidents.

c. Safe Laboratory Practices

To ensure laboratory safety, follow safe laboratory practices, including the following:

i. Know the chemicals and hazards in your laboratory.
ii. Know what to do an emergency situation.
iii. Know how to read and interpret Safety Data Sheets (SDSs).
iv. Wear personal protective equipment, as appropriate.
v. Follow safe practices for working with chemicals.
vi. Ice from a laboratory ice machine is not for human consumption.
vii. Designate microwave ovens and other heating devices exclusively for food or laboratory operations, not both. Ensure ovens are clearly labeled to indicate their function.
viii. Protect unattended operations from utility failures and other potential problems that could lead to overheating or other hazardous events.
ix. Avoid working alone in a laboratory.
x. Avoid producing aerosols.
xi. Use extreme care when working with needles, blades, and glass.
xii. Do not eat, drink, or use tobacco products in the laboratory.
xiii. Never pipette by mouth.
xiv. Clean contaminated equipment and spills immediately if properly trained using the appropriate equipment.
xv. In the event of a mercury spill, avoid contaminating equipment. Clean mercury spills immediately with an appropriate spill kit.
xvi. Do not allow children in the laboratory. It is a violation of state law for a child to be unattended in a place that presents a risk of harm.
xvii. Keep laboratory doors closed.
xviii. Decontaminate all affected equipment after use.
xix. Always handle dry ice with care: Avoid using dry ice in enclosed areas since dry ice can produce elevated carbon dioxide levels and displace oxygen; dry ice mixed with isopropanol or ethanol may cause frost bite; ensure to use proper personal protective equipment when handling dry ice to avoid skin from freezing and causing injury similar to a burn.
xx. Hallways, corridors, emergency equipment, electrical panels, and exit ways must be kept clear of obstructions. Do not relocate (even temporarily) laboratory equipment to these areas and block them.
xxi. Never underestimate the hazards associated with a laboratory. If unsure, get assistance.

d. Equipment Safety

There are four fundamental elements of equipment safety:

i. Use the correct equipment: Use the equipment for its intended purpose only. Do not modify equipment without guidance from the equipment manufacturer. Do NOT remove or override equipment safety devices.
ii. Know how to operate the equipment: Working in the laboratory requires various types of equipment. To ensure equipment safety, you must be familiar with:
    a. Equipment operation
    b. Applicable safeguards
    c. Maintenance requirements
iii. Inspect the equipment regularly. Always inspect equipment to ensure it meets the following requirements before use:
    a. Controls and safeguards are adequate and functional.
    b. Location is safe (and well-ventilated, if necessary).
    c. Equipment works properly.
iv. Use the equipment properly

IMPORTANT: Disconnect any equipment that is unsafe or does not work properly, and remove it from service. Notify others of the problem and have the equipment repaired or replaced.

Refer to other sections in this document for specific information on operating laboratory equipment, such as fume hoods, heating devices, vacuums, etc.

2. AEROSOL PRODUCTION

a. The term "aerosol" refers to the physical state of liquid or solid particles suspended in the air. Aerosols containing infectious agents and hazardous materials can pose a serious risk because:
    i. Small aerosol particles can readily penetrate and remain deep in the respiratory tract, if inhaled.
    ii. Aerosols may remain suspended in the air for long periods of time.
    iii. Aerosol particles can easily contaminate equipment, ventilation systems, and human skin.

b. The following equipment may produce aerosols: centrifuges, blenders, shakers, magnetic stirrers, sonicators, pipettes, vortex mixers, syringes and needles, vacuum-sealed ampoules, grinders, mortar and pestles, test tubes, culture tubes, and heated-inoculating loop funnels.

c. Follow these guidelines to eliminate or reduce the hazards associated with aerosols:
    i. Conduct procedures that may produce aerosols in a biological safety cabinet or a chemical fume hood.

ii. Keep the stoppers inside tube when in a vortex or centrifuge.
iii. Allow aerosols to settle for one to five minutes before opening a centrifuge, blender, or tube.
iv. Place a cloth soaked with disinfectant over the work surface to kill any biohazardous agents.
v. Slowly reconstitute or dilute the contents of an ampoule.
vi. When combining liquids, discharge the secondary material down the side of the container or as close to the surface of the primary liquid as possible.
vii. Avoid splattering by allowing inoculating loops or needles to cool before touching biological specimens.
viii. Use a mechanical pipetting device.

3. ANIMALS AND HAZARDOUS MATERIALS

a. Animals and Toxic Chemicals: Any research, teaching or testing with vertebrate animals requires the submission of an Animal Use Protocol to an Institutional Animal Care and Use Committee. The Protocol must be fully approved and the Risk & Compliance Coordinator advised before any researcher may acquire, house, or use animals.

IMPORTANT: With the increasing prevalence of animal testing comes a greater need to protect researchers. Consider both the direct hazards associated with research animals and the hazardous metabolic byproducts produced by research animals.

4. CENTRIGUGES

a. Centrifuging presents the possibility of two serious hazards: mechanical failure and aerosols. The most common hazard associated with centrifuging is a broken tube. To ensure safety when operating a centrifuge, take precautions to ensure the following:
   i. Proper loading (accurate balancing)
   ii. Safe operating speeds (do not exceed manufacturer recommendations)
   iii. Safe stopping
   iv. Complete removal of materials
   v. Proper cleanup

b. Follow these guidelines when working with a centrifuge:
   i. When loading the rotor, examine tubes for signs of stress, and discard tubes that are damaged.
   ii. Inspect the inside of each tube cavity. Remove any glass or other debris from the rubber cushion.
   iii. Ensure the centrifuge has adequate shielding to guard against accidental flyaways.
   iv. Use a centrifuge only if it has a disconnect switch that deactivates the rotor when the lid is open.

v. Do not overfill a centrifuge tube to the point where the rim, cap, or cotton plug becomes wet.
vi. Always keep the lid closed during operation and shut down. Do not open the lid until the rotor is completely stopped.
vii. Do not break the head rotation by hand.
viii. Do not use aluminum foil to cap a centrifuge tube. Foil may rupture or detach.
ix. When balancing the rotors, consider the tubes, buckets, adapters, inserts, and any added solution.
x. Stop the rotor and discontinue operation if you notice anything abnormal such as noise or vibration.
xi. Rotor heads, buckets, adapters, tubes, and plastic inserts must match.

c. Low-speed and small portable centrifuges that do not have aerosol-tight chambers may allow aerosols to escape. Use a safety bucket to prevent aerosols from escaping. High-speed centrifuges pose additional hazards due to the higher stress and force applied to their rotors and tubes. In addition to the safety guidelines outlined above, follow these guidelines for high-speed centrifuges:
    i. Filter the air exhausted from the vacuum lines.
    ii. Keep a record of rotor usage, in order to avoid the hazard of metal fatigue.
    iii. Frequently inspect, clean, and dry rotors to prevent corrosion or other damage.
    iv. Follow the manufacturer's operating instructions.

5. COMPRESSED GASES

a. Compressed gases in the laboratory present chemical and physical hazards. If compressed gases are accidentally released, they may cause the following:
    i. Depleted oxygen atmosphere
    ii. Fire
    iii. Adverse health effects

b. Cylinders that are knocked over or dropped can be very dangerous and can cause serious injuries. If a valve is knocked off a compressed gas cylinder, the cylinder can become a lethal projectile. Because disposal of compressed gas cylinders is difficult and expensive, be sure to arrange a return agreement with suppliers prior to purchase.

c. Cylinders can travel through walls much like a torpedo travels through water. They can cause structural damage, severe injury, and death. Follow these guidelines to ensure safe storage of gas cylinders:
    i. Secure all cylinders in racks, holders, or clamping devices. Fasten cylinders individually (not ganged) in a well-ventilated area.
    ii. Do not rely on color to identify container contents. Check the label.
    iii. Close valves, and release pressure on the regulators when cylinders are not in use.
    iv. Consult with the Risk & Compliance Coordinator with ample notice so an assessment may be done to ensure the room volume is able to support the addition of a gas cylinder from a safety and fire protection perspective.
    v. Keep heat, sparks, flames, and electrical circuits away from gas cylinders.
    vi. Store cylinders of flammable and oxidizing agents at least 20 feet apart, or separate these items with a fire wall.
    vii. Do not store gas cylinders in hallways or public areas.

d. When working with compressed gas cylinders, remember the following:
    i. Never move a gas cylinder unless the cylinder cap is in place and the cylinder is chained or otherwise secured to a cart.

ii. Do not move a cylinder by rolling it on its base.
iii. Only use regulators approved for the type of gas in the cylinder.
iv. Do not use adapters to interchange regulators.
v. When operating a cylinder valve, follow these guidelines:
a) Direct the cylinder opening away from people.
b) Open the valve slowly.
c) If a cylinder leaks, carefully move the cylinder to an open space outdoors. Have the supplier pick up the cyclinder.
vi. Do not use oil or other lubricant on valves and fittings.
vii. Do not use oxygen as a substitute for compressed air.
viii. Do not lift cylinders by the cap.
ix. Do not tamper with the safety devices on a cylinder. Have the manufacturer or supplier handle cylinder repairs.
x. Do not change a cylinder's label or color. Do not refill cylinders yourself.
xi. Do not heat cylinders to raise internal pressure.
xii. Do not use compressed gas to clean your skin or clothing.
xiii. Do not completely empty cylinders. Maintain at least 30 psi.
xiv. Do not use copper (>65% copper) connectors or tubing with acetylene. Acetylene can form explosive compounds with silver, copper, and mercury.
xv. Always wear impact resistant glasses or goggles when working with compressed gases.

6. CRYOGENIC LIQUIDS

a. Cryogenic fluids, such as liquid air, liquid nitrogen, or liquid oxygen, are used to obtain extremely cold temperatures. Most cryogenic liquids are odorless, colorless, and tasteless when vaporized. When cryogenic liquids are exposed to the atmosphere, however, they create a highly visible and dense fog. All cryogens other than oxygen can displace breathable air and can cause asphyxiation. Cryogens can also cause frostbite on exposed skin and eye tissue.

b. Cryogens pose numerous hazards. For example, cryogenic vapors from liquid oxygen or liquid hydrogen may cause a fire or explosion if ignited. Materials that are normally noncombustible (e.g. carbon steel) may ignite if coated with an oxygen-rich condensate.

c. Liquified inert gases, such as liquid nitrogen or liquid helium, are capable of condensing atmospheric oxygen and causing oxygen entrapment or enrichment in unsuspected areas. Extremely cold metal surfaces are also capable of entrapping atmospheric oxygen. The hazards associated with cryogenic liquids are displayed in Table 1.

Table 1: Cryogenic Hazards

Cryogenic Hazard Source	Hazard
Hydrogen, methane, and acetylene	Gases are flammable.
Oxygen	Increases the flammability of combustibles.
Liquefied inert gases	Possible oxygen entrapment.
Extremely cold surfaces	Oxygen atmosphere may condense.

d. Because the low temperatures of cryogenic liquids may affect material properties, take care to select equipment materials accordingly. Follow these guidelines when working with cryogenic liquids:
   i. Before working with cryogenic liquids, acquire a thorough knowledge of cryogenic procedures, equipment operation, safety devices, material properties and protective equipment usage.
   ii. Keep equipment and systems extremely clean.
   iii. Avoid skin and eye contact with cryogenic liquids. Do not inhale cryogenic vapors.
   iv. Pre-cool receiving vessels to avoid thermal shock and splashing.
   v. Use tongs to place and remove items in cryogenic liquid.
   vi. When discharging cryogenic liquids, purge the line slowly. Only use transfer lines specifically designed for cryogenic liquids.
   vii. Rubber and plastic may become very brittle in extreme cold. Handle these items carefully when removing them from cryogenic liquid.
   viii. Store cryogenic liquids in double-walled, insulated containers (e.g. Dewar flasks).
   ix. To protect yourself from broken glass if the container breaks or implodes, tape the exposed glass on cryogenic containers.
   x. Do not store cylinders of cryogenic liquids in hallways or other public areas.

IMPORTANT: Be aware of the tremendous expansion and threat of asphyxiation when a cryogenic liquid vaporizes at room temperature.

7. ELECTROPHORESIS

a. Electrophoresis equipment may be a major source of electrical hazard in the laboratory. The presence of high voltage and conductive fluid in this apparatus presents a potentially lethal combination. Many people are unaware of the hazards associated with this apparatus; even a standard electrophoresis operating at 100 volts can deliver a lethal shock at 25 milliamps. In addition, even a slight leak in the device tank can result in a serious shock.

b. Protect yourself from the hazards of electrophoresis and electrical shock by taking these precautions:
    i. Use physical barriers to prevent inadvertent contact with the apparatus.
    ii. Use electrical interlocks.
    iii. Frequently check the physical integrity of the electrophoresis equipment.
    iv. Use warning signs to alert others of the potential electrical hazard.
    v. Use only insulated lead connectors.
    vi. Turn the power off before connecting the electrical leads.
    vii. Connect one lead at a time using one hand only.
    viii. Ensure that your hands are dry when connecting the leads.
    ix. Keep the apparatus away from water and water sources.
    x. Turn the power off before opening the lid or reaching into the chamber.
    xi. Do not disable safety devices.
    xii. Follow the equipment operating instructions.

8. GLASSWARE

a. Accidents involving glassware are the leading cause of laboratory injuries. To reduce the chance of cuts or punctures, use common sense when working with glassware and follow special safety precautions for tasks that involve unusual risks. Guidelines for laboratory glassware safety:
    i. Inspect glassware before and after each use. Discard or repair any cracked, broken, or damaged glassware.
    ii. Thoroughly clean and decontaminate glassware after each use.
    iii. When inserting glass tubing into rubber stoppers, corks, or tubing, you must:
        a) Use adequate hand protection.
        b) Lubricate the tubing.
        c) Hold hands close together to minimize movement if the glass breaks.
    iv. When possible, substitute plastic or metal connectors for glass connectors.
    v. Large glass containers are highly susceptible to thermal shock. Heat and cool large glass containers slowly. Use Pyrex or heat-treated glass for heating operations.
    vi. Leave at least 10 percent air space in containers with positive closures.
    vii. Never use laboratory glassware to serve food or drinks.
    viii. Use thick-walled glassware for vacuum operation.
    ix. Use round-bottomed glassware for vacuum operations. Flat-bottomed glassware is not as strong as round-bottomed glassware.

b. Do not use chromic acid to clean glassware. Chromic acid is extremely corrosive and expensive to dispose of.

c. Follow these safety guidelines for handling glassware:
    i. When handling cool flasks, grasp the neck with one hand and support the bottom with the other hand.

ii. Lift cool beakers by grasping the sides just below the rim. For large beakers, use two hands: one on the side and one supporting the bottom.
iii. Never carry bottles by their necks.
iv. Use a cart to transport large bottles of dense liquid.

d. Follow these guidelines for handling and disposing of broken glass:
   i. Do not pick up broken glass with bare or unprotected hands. Use a brush and dust pan to clean up broken glass. Remove broken glass in sinks by using tongs for large pieces and cotton held by tongs for small pieces and slivers.
   ii. Glass contaminated with biological or chemical materials must be decontaminated before disposal or be disposed of as hazardous waste.
   iii. Before disposing of clean and/or decontaminated broken glass in a trash can, place the glass in a rigid container such as cardboard and mark it "Broken Glass".

9. HEATING SYSTEMS

a. Some laboratory heating procedures involve an open flame. Common hazards associated with laboratory heating devices include electrical hazards, fire hazards, and hot surfaces. Heated chemicals can cause more damage more quickly. Reaction rates double for each 10°C increase in temperature. Devices that supply heat for reactions or separations include the following:
   i. Open flame burners
   ii. Hot plates
   iii. Heating mantles
   iv. Oil and air baths
   v. Hot air guns
   vi. Ovens
   vii. Furnaces
   viii. Ashing systems

b. Before using any electrical heating device, follow these guidelines:
   i. Ensure that heating units have an automatic shut off.
   ii. Ensure that heating devices and all connecting components are in good working condition.
   iii. Heating baths should be equipped with timers to ensure that they turn on and off at appropriate times.
   iv. Use a chemical fume hood when heating flammable or combustible solvents. Arrange the equipment so that escaping vapors do not contact heated or sparking surfaces.
   v. Use non-asbestos thermal-heat resistant gloves to handle heated materials and equipment.
   vi. Perchloric acid digestions must be conducted in a perchloric fume hood.
   vii. Minimize the use of open flames.

viii. Never leave an open flame unattended.

10. PRESSURIZED SYSTEMS

a. Do not conduct a reaction in, or apply heat to, a closed system apparatus unless the equipment is designed and tested to withstand pressure. Pressurized systems should have an appropriate relief valve, be fully shielded and be conducted in an occupied space. Until safe operation is assured, remote operation is mandatory. Safety points to remember:
   i. Minimize risk and exposure.
   ii. Identify and assess all hazards and consequences.
   iii. Use remote manipulations whenever possible.
   iv. Minimize pressure, volume, and temperature.
   v. Design conservatively.
   vi. Use material with a predictably safe failure mode.
   vii. Ensure that the components of the pressurized system will maintain structural integrity at the maximum allowable working pressure. Avoid material that may become brittle.
   viii. Operate within the original design parameters.
   ix. Provide backup protection (i.e. pressure relief valves, fail-safe devices).
   x. Use quality hardware.
   xi. Use protective shield or enclosures provided.
   xii. Use tie-downs to secure tubing and other equipment.
   xiii. Do not leave a pressurized system unattended.

b. Normally pressurized systems should not include glass components unless they are specially designed and intended for that purpose.

11. REFRIGERATOR/FREEZERS

a. Using a household refrigerator to store laboratory chemicals is extremely hazardous for several reasons:
   i. Many flammable solvents are still volatile at refrigerator temperatures.
   ii. Refrigerator temperatures are typically higher than the flashpoint of most flammable liquids.
   iii. The storage compartment of a household refrigerator contains numerous ignition sources including thermostats, light switches, and heater strips.
   iv. The compressor and electrical circuits, at the bottom of the unit (where chemical vapors are likely to accumulate) are not sealed.

b. Laboratory-safe and explosion-proof refrigerators typically provide adequate protection for chemical storage in the laboratory. Laboratory-safe refrigerators, for example, are

specifically designed for use with flammables since the sparking components are located on the exterior of the refrigerator. Explosion-proof refrigerators are required in areas that may contain high levels of flammable vapors (i.e. chemical storage rooms with large quantities of flammables). Follow these rules for using refrigerators in the laboratory:

i. Never store flammable chemicals in a household refrigerator.
ii. Do not store food or drink in a laboratory refrigerator/freezer.
iii. Ensure that all refrigerators are clearly labeled to indicate suitable usage.
iv. Laboratory-safe and explosion-proof refrigerators should be identified by the manufacturer's label.
v. "Not Safe for Flammable Storage" labels are available from the Risk & Compliance Coordinator.
vi. Refrigerators used to store food should be labeled "For Food Only".

12. VACUUM SYSTEMS

a. Vacuum systems pose severe implosion hazards. Follow these guidelines and requirements to ensure system safety:
   i. Ensure that pumps have belt guards in place during operation.
   ii. Ensure that service cords and switches are free from defects.
   iii. Always use a trap on vacuum lines to prevent liquids from being drawn into the pump, house vacuum line, or water drain.
   iv. Replace and properly dispose of vacuum pump oil that is contaminated with condensate. Used pump oil must be disposed as hazardous waste.
   v. Place a pan under pumps to catch oil drips.
   vi. Do not operate pumps near containers of flammable chemicals.
   vii. Do not place pumps in an enclosed, unventilated cabinet.

b. IMPORTANT: All vacuum equipment is subject to possible implosion. Conduct all vacuum operations behind a table shield or in a fume hood. Do not underestimate the pressure differential across the walls of glassware that can be created by a water aspirator.

c. Glassware Vacuum Operations. Glassware used with vacuum operations must meet the following requirements:
   i. Only heavy-walled round-bottomed glassware should be used for vacuum operations. The only exception to this rule is glassware specifically designed for vacuum operations, such as an Erlenmeyer filtration flask.
   ii. Wrap exposed glass with tape to prevent flying glass if an implosion occurs. Carefully inspect vacuum glassware before and after each use. Discard any glass that is chipped, scratched, broken, or otherwise stressed.

d. Glass Desiccators. Glass desiccators often have a slight vacuum due to contents cooling. When using desiccators, follow these guidelines:
   i. Use molded plastic desiccators with high tensile strength.

ii. For glass desiccators, use a perforated metal desiccator guard.

e. Cold Trap. A cold trap is a condensing device to prevent moisture contamination in a vacuum line. Guidelines for using a cold trap include:
   i. Locate the cold trap between the system and vacuum pump.
   ii. Ensure that the cold trap is of sufficient size and cold enough to condense vapors present.
   iii. Check frequently for blockages in the cold trap.
   iv. Use isopropanol/dry ice or ethanol/dry ice instead of acetone/dry ice to create a cold trap. Isopropanol and ethanol are cheaper, less toxic, and less prone to foam.
   v. Do not use dry ice or liquefied gas refrigerant bath as a closed system. These can create uncontrolled and dangerously high pressures.
   vi. A disinfectant trap should be used in-line when a vacuum is used with hazardous biological materials.

13. TRAINING AND INSPECTIONS

a. Training Requirements
   i. Administrative and engineering controls help minimize laboratory risks. Before using a lab, new employees and students must be trained by their respective supervisor/instructor on the proper use of laboratory equipment, personal protective equipment, chemicals, and SDS. Hazard Communications training is available online through TrainTraq (Course# 11020):

   https://apps6.system.tamus.edu/TrainTraq/web/CourseDetails.aspx?cnum=11020

   ii. New employees and students must be instructed on the location of all emergency facilities and contact information by the lab manager. Lab managers must ensure all laboratories are labeled with emergency contact information. If an incident occurs during off-hours, responders need to know the names and telephone numbers of the people responsible for laboratory operations. Lab managers must keep this information current, accurate and available. Emergency contact signage is available from the Risk & Compliance Coordinator.

b. Lab Inspections. It is important that laboratories are inspected by the personnel/ department using them on a regular basis. Discovery of any safety hazards or concerns must be reported to the Risk & Compliance Coordinator immediately. Annual lab safety audits will be conducted on all Texas A&M University-San Antonio laboratories by the Risk & Compliance Coordinator. Refer to Appendix A, for a sample of the content that will be included in a Lab Safety Inspection.

14. REFERENCES

a. For more information on lab safety, refer to the following safety programs available through the Risk & Compliance Coordinator:
    i. Chemical Safety Program
    ii. Hazard Communication Program
    iii. Bloodborne Pathogens Exposure Control Plan

Review history

The following information lists at least the last two reviews to this document, and all reviews that were done in the last 12 months.

Date	Reviewed By	Comments
07/11/2016	Rita Sue Arredondo	Updated with current reference to Risk & Safety Support Specialist and revision year; updated Section 5d: to consult with the Risk & Safety Support Specialist to complete an assessment if hazardous gas cylinders are planning to be procured.
2/19/2020	Rita Sue Arredondo	Updated title for the Risk and Compliance Coordinator. Updated frequency of lab inspections.

Revision history

The following information documents at least the last 3 changes to this document, with all the changes listed for the last 6 months.

Date	Revised By	Changes
7/5/2011	Damon Shodrock	Drafted TAMU-SA Lab Safety Program from Tarleton State University published Lab Safety Program.
8/3/2011	Damon Shodrock	Updated cover page with new TAMU-SA logo. Removed references to Office of Safety and Risk Management and replaced with Safety, Risk and Emergency Management.
9/14/2011	Damon Shodrock	Finalized and posted Lab Safety Program on the Safety, Risk and Emergency Management intranet page.
1/11/2012	Damon Shodrock	Added Student Lab Safety Acknowledgement Form as Appendix B.
12/16/2013	Mercedes Florez	Reviewed and revised with assistance from the Laboratory Manager and University Compliance. This manual will be an appendix to the TAMU-SA Procedure 24.01.01.O1.10, Laboratory Safety & Health Management.
1/22/2014	Mercedes Florez	Reviewed, finalized and distributed for immediate application.
07/05/2016	Rita Sue Arredondo	Updated with current reference to Risk & Safety Support Specialist and revision year; updated Section 5d: to consult with the Risk & Safety Support Specialist to complete an assessment if hazardous gas cylinders are planning to be procured.

APPENDIX A

LABORATORY SAFETY INSPECTION FORM

Building: **Room #:** **Date:**	**PASS**	**FAIL**	**N/A**	**COMMENTS/ACTION NEEDED**
InsdInstructor: _____ Auditor: _____				
Lab Safety Training				
Student Lab Safety Acknowledgement Form is completed				
Fire Safety				
Exits, aisles, fire extinguishers, fire alarm pull stations, eye wash and safety shower are unobstructed				
Fire extinguishers are available and monthly service date is current				
Eye wash and safety shower are tested monthly & operable				
Electrical Safety				
Electrical panels are not blocked and have at least a 36” clearance in front				
Electrical cords and extension cords are in good working condition				
Extension cords are not used as a means of permanent wiring				
Outlets near water source have ground fault circuit interrupter				
First Aid Kit/Spill Clean-Up Kit				
First Aid Kit/Spill Clean-Up Kit are available and stocked				
Fume Hood				
Fume Hood tested annually and their performance certified and current				
No equipment/tools or chemicals/hazardous waste stored in fume hood without EHS approval				
Apparel & Safety Equipment				
Long pants, closed-toe shoes, and no loose hair				
Appropriate PPE (gloves, splash goggles, etc...) available and being used properly				
Compressed Gas Cylinders				
Cylinders are firmly secured, contents clearly identified, and when not in use the valve is closed and safety cap is on				

Chemical Safety				
Gloves are removed and hands washed before leaving the lab				
Chemical Hygiene Plan available in lab				
Chemical Inventory is current showing date of last review				
Safety Data Sheets are readily accessible				
Chemical containers are properly labeled with chemical identity, appropriate hazard warnings, name & address of manufacturer				
Secondary chemical containers are labeled with name as listed on the Safety Data Sheet, hazard warnings, and identifying information such as CAS # or manufacturer				
Refrigerator/ice machines have “NO FOOD or NO DRINK” labels				
Chemicals segregated to avoid incompatibilities				
No open containers				
Chemicals are within the expiration date				
Toxic, flammables, irritant, and corrosive chemicals are stored below eye level				
Highly toxic gases stored in ventilated cabinet				
Chemical storage cabinets properly labeled				
Flammables separated from oxidizers				
General Lab Safety				
Emergency Contact List-Safety Binder in place				
Lab is clean, organized, and has good housekeeping practices				
Sharps disposal containers are available for proper sharps disposal and labeled as such				

Additional Recommendations/Observations:

_____

_____

_____

_____

_____

Follow-Up Needed: ☐ Within: 7 Days ☐ 30 Days ☐ Immediately Special Conditions: _____ Days

☐ F/U Completed/Date: _____

Additional Comments/Status Updates

_____
_____
_____
_____
_____
_____

Report Sent To Principal Investigator/Lab Manager (Yes or No):_____

Date

APPENDIX B

STUDENT LABORATORY SAFETY ACKNOWLEDGEMENT FORM

Course Name _____ Course Number _____

Student's Name _____Semester_____ 20_____

Student's UIN _____

Safety in Laboratory Courses

To the student: You are required to read, understand and implement the safety precautions indicated in your laboratory manual or laboratory handouts, which are summarized below. Your signature on the attached sheet indicates your awareness of safety issues in the laboratory and your willingness to abide by these precautions while you are in the laboratory.

1. Work in the laboratory only as authorized by your instructor. Do not perform unauthorized experiments.
2. Only use materials provided to you by the instructor or the lab manager. Do not take items from the drawers, cabinets or prep room without asking permission first.
3. You are required to wear ANSI 87.1 approved safety glasses as directed during some laboratory sessions. Nitrile gloves are also provided for protection when using chemicals, handling microorganisms, or when otherwise specified.
4. Learn emergency procedures, and be aware of the location of the eye washes, emergency showers, fire extinguisher and emergency call box in the main hallway.
5. If you are injured or if any type of accident occurs, IMMEDIATELY call UPD (University Police Department) through the emergency call box or dial (210)784-1911 from a mobile phone. Call 911 if necessary. Then ensure to notify your instructor of the accident; the instructor and/or Lab Manager will then notify the Risk & Compliance Coordinator of the incident to report.
6. Carefully read all instructions prior to the lab and thoroughly plan your work. Be aware of what chemicals you are using, what chemicals will be produced, and the hazards these different chemicals present.
7. Wear appropriate clothing and shoes in the lab and while in the field. In the lab, this means you **must** wear long pants and closed-toe shoes. If you arrive for your lab period in shorts, you will be required to wear the scrub pants provided or you must leave the lab and take a zero for the day. If you arrive in open-toe shoes (flip flops or any type of sandal), you will be provided with lab shoe covers to wear during the class period. NO EXCEPTIONS. This also includes a lab coat when required by the course instructor. Lab coats will be available to rent for $2 if forgotten.
8. Confine long hair so that it does not get tangled in equipment, or come in contact with chemicals or the flame of the alcohol burners. Do not wear dangling jewelry.
9. Place personal items in the area designated for backpacks. Backpacks are not permitted at the bench.
10. Do not eat, drink or smoke in the laboratory. This includes no water bottles at the bench or gum chewing in the lab. Also do not apply makeup or lip balm in the lab.
11. Practice good housekeeping procedures and keep clutter at the bench to a minimum. This includes proper disposal of laboratory waste and rinsing glassware used. Ask before pouring anything down a drain or throwing in the regular trash can.
12. Ensure all laboratory equipment (i.e., computers, electrical components, mechanical and rotary devices) are inspected for proper operation prior to use and that you understand how to operate them safely (i.e. balance items in centrifuge).
13. Wipe down your bench area with 70% ethanol or isopropanol after each lab period.
14. Wash your hands with soap prior to leaving at the end of your lab period.

Potential risks for field work

I understand that working in the field may expose me to risks and dangers, including but not limited to the following:

15. Travel – walking or driving to field lab sites.

16. Outdoors --hidden or unseen obstacles, holes or tripping hazards, physical exertion, sun, weather hazards such as rain or cold.

17. Animals -- including snakes, mice, rats and birds and/or insects.

18. Equipment -- including glassware, sharps (e.g., razor blades and scalpels), high voltage sources, microwaves, and UV light sources.

19. Chemicals -- including acids, bases, salts, alcohols, corrosives, and fixatives (e.g., formaldehyde, glutaraldehyde). Some chemicals may be neurotoxic, caustic, carcinogenic and/or highly flammable.

I have read carefully and understand all of the safety rules contained on this sheet. I also agree to read all rules for specific exercises contained in the laboratory manual or laboratory handouts required for this course. I will wear appropriate clothing (long pants, closed shoes) for the lab or the field (if the course includes field work). I recognize that it is my responsibility to use common sense and caution at all times, and to obey all instructions.

I understand that my adherence to the safety rules will be reflected in the grade I receive for this course. The consequence for not following the instructions of the laboratory session or failure to adhere to the safety rules will result in immediate dismissal from the laboratory period and a grade of zero given for that session.

I FURTHER UNDERSTAND THAT I AM PERMITTED TO WORK IN THE LABORATORY ONLY WHEN IT IS UNDER THE SUPERVISION OF A LABORATORY INSTRUCTOR, UNLESS SPECIFICALLY INFORMED OTHERWISE.

Signature _____Date _____

Printed Name:_____

Lab Instructor Name (print) _____