Biological & Agricultural Engineering Department

Laboratory & Chemical Safety Training Packet

Created by
Anna C. Dugas

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Chemical Lab Safety Rules

Daily Procedures

- NO SMOKING in buildings or within 25 feet of lab or building exits.
- Food, drinks, and chewing gum are not advised in a chemical lab. Nothing should go into your mouth while in the lab.
- Wearing shorts or tight capris are discouraged when working with chemicals. COVERED SHOES ARE REQUIRED WHEN WORKING WITH CHEMICALS.
- Long hair should be pulled back around heat sources and moving parts.
- Clean up workspace in the lab.
- WASH YOUR HANDS before you leave, eat, or use the bathroom.
- No children in the lab when a hazardous chemical experiment is going on. And definitely NO UNATTENDED KIDS IN THE LAB!
- NO ADMITTANCE IN LAB AFTER HOURS WITHOUT SUPERVISION BY TRAINED LSU PERSONNEL (grad students, research associates, teaching lab coordinator, PI)!

General Safety

- Online safety training, safety consolations can be made with the LSU Environmental, Health and Safety Office (https://sites01.lsu.edu/wp/chs/)
- Be alert to unsafe conditions and reactions. Call attention to hazards so that corrections can be made ASAP. Contact your graduate advisor, the current lab manager, research associate, or the BAE main office.
- Use laboratory equipment only for its designed purposes.
- All equipment should be “off” when not in use unless specified.
- Avoid distracting or startling anyone working in the laboratory. Practical jokes or risky horseplay will not be tolerated at anytime in the lab.
- LABEL ALL CONTAINERS CLEARLY AND CORRECTLY!
  - NAME of Chemicals – spelled out (Ex: Water NOT H₂O)
  - DATE MADE
  - PERSON who made the solution
  - PERCENT make up of ingredients (Ex: 70% Ethanol, 0.01M Sodium Hydroxide, 1:4 Ethyl Acetate/Water)
- Know how to find and interpret material safety data sheets (MSDS).
- Know the hazardous material classification (NFPA).
  - Blue - Health
  - Red - Flammable
  - Yellow - Reactivity
  - White – Special Hazards
• Chemical Hazard Types:
  
  o TOXIC -- make you sick if you breathe, swallow or touch them
  
  o ACID -- burn or damage human skin, eyes, nose or lungs and dissolve metal pH 0-4
  
  o CORROSIVE -- dissolves metal; burn or damage human skin, eyes, nose or lungs (ex. ammonia)
  
  o FLAMMABLE -- burn or ignite easily
  
  o SOLVENTS -- removes protective oils or lubricants on skin and respiratory hazards
  
  o OXIDIZING -- produce oxygen when mixed with organics or solvents to create fire hazards; also irritating to skin, eyes, nose and lungs.
  
  o BASE or ALKALI or CAUSTIC -- burn the skin, eyes, nose, and respiratory tract
  
  o COMBUSTIBLE -- burn above 100°F or at FLASH POINT
  
  o ASPHYXIANT -- a non-toxic gas (like nitrogen) that replaces the oxygen in the air --> fainting or death
  
  o CYROGEN -- at very low temperature (LN2) and will freeze skin immediately
  
  o CARCINOGEN -- cancer risk increase
  
  o TERATOGEN -- birth defect increase
  
• Beware of incompatible chemical mixtures!

• Always ADD ACID TO WATER, WATER TO BASE!

• Chemical Storage:
  
  o Flammable/Solvent Chemicals should be stored in established Flammable Cabinets for overnight storage.
  
  o Acid and Caustic Chemicals should be stored in their respectively labeled cabinets.
  
  o General Storage Chemicals are to be placed in the general storage of cabinets, personal cabinets, and should not be left on the workbenches for extended time periods (days).
  
  o Hygroscopic chemicals should be stored in desiccators or air-tight/vacuum environment.
• Transporting Chemicals – If you must transport a chemical between buildings, place in a protective tote, box or bottle carrier.

• MAKE SURE GAS CYLINDERS ARE RESTRAINED TO WALL OR BENCH BRACKET. Make sure supply valves on the hood are shut off before leaving.

• Safety goggles should be worn:
  o when using hazardous chemicals/materials, especially chemicals requiring ventilation
  o when using the Instron, Vitrodyne and other tension or compression applying instruments at risk of creating projectiles
  o when working with power tools
  o when cutting wires or
  o when you feel you need to while in the lab.

• Pick the right glove for the job. If you don’t know which to choose ask!

• ASK BEFORE DOING IF YOU ARE REALLY UNSURE!!!!

• MAKE IT A POINT TO ONLY HANDLE DANGEROUS CHEMICALS WHEN ANOTHER TRAINED LAB PERSON IS WITHIN THE BUILDING!!

**Waste Disposal**

• Broken glass should be discarded into the proper bin (box) marked for glass disposal. When glass boxes are full, seal the lid and transport to dumpster. (Team lift)

• NEVER DUMP HAZARDOUS OR ACID WASTE INTO SINK! Consult the MSDS and PI/research associate on how to dispose of a chemical properly.

• Do not dump food or drink containers into lab trash cans, even if consumed outside the lab!

• For BIOHAZARD wastes, ask your graduate advisor, the current manager, research associate for proper disposal method. Common disposal methods are disinfection with bleach, autoclaving in bags, or pickup by the EHS.
Emergency Procedures

- INFORM current lab manager IMMEDIATELY of any injuries or spills.

- Know the location of:
  - Fire Extinguisher
  - Eyewashes
  - Shower
  - First Aid Kit
  - Phone
  - Brooms & Dust Pan

- EMERGENCY NUMBERS:

  911
  8-3153 BAE MAIN OFFICE
  8-3231 LSU POLICE
  8-6271 Student Health Center

- For Small ACID SPILL (<25ml):
  1. Make sure you have on gloves, glasses, coats, and respirator.
  2. Shake SPILL-X-A powder to surround and then onto the spill until the liquid is covered.
  3. Allow ~5 minutes to absorb acid and cool reaction. Should form a paste like solid. Test with pH paper strip or meter to confirm neutralization.
  4. Sweep remains into dustpan and dispose into trash.

- For Small CAUSTIC SPILL (<25ml):
  5. Make sure you have on gloves, glasses, coats, and respirator.
  6. Shake SPILL-X-C powder to surround and then onto the spill until the liquid is covered.
  7. Allow ~5 minutes to absorb caustic and cool reaction. Should form a paste like solid. Test with pH paper strip or meter to confirm neutralization.
  8. Sweep remains into dustpan and dispose into trash.
• For Small SOLVENT SPILL (<25ml):
  9. Make sure you have on gloves, glasses, coats, and respirator.
  10. Shake SPILL-X-S powder to surround and then onto the spill until the liquid is covered.
  11. Allow ~5 minutes to absorb solvent. Should leave a dry powdery residue.
  12. Sweep remains into dustpan and dispose into trash.

• For Small Mercury Spills (Thermometer):
  o Evacuate people out of the lab if they haven’t been in contact with the mercury and keep the area quarantined to reduce foot traffic. Notify Anna, the research associate, and your graduate advisor.
  o Close the interior and exterior doors and lower the hood glass.
  o Use gloves, lab coat and eyeglasses.
  o Contain the spill. Surround or block off the mercury to keep it from spreading onto sloped or porous surfaces. Divert all mercury away from floor drains, cracks, or crevices that may impact groundwater, surface water, and soils. Pushing the drops with a sheet of paper (that you are willing to dispose of) works well to consolidate the drops.
  o Use an eye dropper or transfer pipet to pick up the drops of mercury and place in a container for hazardous waste disposal. The eyedropper, sheet of paper and gloves are also considered hazardous waste and must also be collected and labeled for pick up. See lab manager or Anna for details.
  o Open the lab to ventilation and keep people away from the lab for a minimum of one hour. (DEQ regulations)

• Needle or Sharp Object Punctures:
  o Have someone notify current lab manager immediately
  o Bleed the puncture lightly if possible and wash area thoroughly with soap and water. Alcohol or Iodine pads are not suggested to use if the sharp object was in contact with chemicals reactive to alcohol or iodine.
  o Dispose of sharp object in biohazard sharps container.
  o Seek medical assistance if need be. (Student Health Center 8-6271)
  o Make sure your principal investigator is notified of incident.
• Blood Borne Pathogens and OPIMs:
  o Blood Borne Pathogens (BBP) are diseases that are transported in the blood and are readily transmittable if one is exposed to infected blood, bodily fluid containing blood, or tissue. OPIMs or Other Potential Infectious Materials also pose a risk of infection in the contact of blood, tissue, or bodily fluids.
  
  o OSHA Regulatory Standard 29 CFR 1910.1030 covers rules and you can find on LSU-OES website:

    https://sites01.lsu.edu/wp/ehs/biological-safety/

  o Routes of exposure:
    ▪ Needle sticks
    ▪ Skin abrasions
    ▪ Sexual interactions

  o RULES OF THUMB: Treat all tissue, bodily fluids (except for sweat) as potential carriers of BBPs or OPIMs! WASH HANDS FREQUENTLY!

  o As a minimum, gloves, protective clothing (lab coats) and eye protection should be worn at all times when there is a reasonable potential for exposure to a BBP or an OPIM. Change PPE frequently or decontaminate frequently!

  o Notify current lab manager IMMEDIATELY if you are exposed.

  o If fluids or tissues potentially containing BBPs or OPIMs are spilled:
    ▪ Make sure you have your PPE on!
    ▪ Contain spill with absorbent materials.
    ▪ Place used absorbent materials and other contaminated disposable materials in appropriate biohazard bags (red usually) and do NOT dispose of in regular trash!
    ▪ Disinfect area of spill with Germicide or 10% bleach solution.
    ▪ Discard or decontaminate PPE

  o If expose is from a needle puncture, bleed the puncture lightly if possible and wash area thoroughly with soap and water. Alcohol pads are recommended to use if BBP can be damaged by alcohol and there is no apparent chemical interaction with the chemical that the BBP was suspended in.

  o Seek medical assistance if need be. (Student Health Center 8-6271)

  o Make sure your principal investigator is notified of incident. An incident report should be filed, and employer should be expected pay for blood testing after exposure events.
• In case of a bench top fire:
  1. ALERT people in lab.
  2. ACTIVATE alarm.
  3. USE fire extinguisher keeping you between the fire and the door.

DO NOT USE WATER ON CHEMICALS OR ELECTRONICS!

4. GET OUT IF IN DANGER and MEET group at either FRONT LAWN of E.B. Doran or BACK FENCE by P. Taylor Hall

5. CALL 9-911 on land-line phones or 911 on cell phone!

• In case of a large fire, fume problem or explosion:
  1. ALERT people in lab to evacuate.
  2. ACTIVATE alarm.
  3. EVACUATE closing door behind you.
  4. CALL 9-911 on land-line phones or 911 on cell phone.

5. MEET group at either FRONT LAWN of E.B. Doran or BACK FENCE by P. Taylor Hall

• Tornado Warnings:
  o Shelter in place or take shelter in the following shaded areas:

• Post Tornado Warning – LSU official will give the all clear to leave the shelter areas. Meet group at either FRONT LAWN of E.B. Doran or BACK FENCE by P. Taylor Hall if safe to do so.
• Hurricane Warnings:
The BAE departmental facilities are not deemed safe enough to be hurricane shelters. Please evacuate PRIOR to hurricane arrival. Contact LSU information for appropriate shelter areas on campus: 800-516-6444 or www.lsu.edu.

My Copy:

I, ______________________, have read, understood, and will follow the aforesaid Chemical Safety Rules for the Biological and Agricultural Engineering Department at LSU.

__________________________  ______________________
Trainee Signature            Date

__________________________  ______________________
Trained by -- Signature      Date
No Food or Drink in lab!
National Fire Protection Association - NFPA

**RED = FIRE**

Red Background

Flammability
4 - flash point < 73 °F
3 - flash point < 100 °F
2 - flash point 100 °F - 200 °F
1 - flash point > 200 °F
0 - will not burn

**BLUE = HEALTH**

Blue Background

Health Hazard
4 - deadly
3 - extreme danger
2 - hazardous
1 - slightly hazardous
0 - normal material

**YELLOW = EXPLOSIVE**

Yellow Background

Reactivity
4 - explosive at room temp
3 - shock and heat may detonate
2 - violent reaction with water
1 - unstable if heated, not violent
0 - not reactive with water

**White Background**

Specific Hazard
oxidizer OX
acid ACID
alkali ALK
corrosive CORR
use NO WATER
Chemical Labels

- All Chemical Containers must be Labeled with either the original label or a new label.
- Includes Transferred Chemicals and Solutions
- New Label must include:

  Chemical Name:
  Hazard(s):
  Date:
  Manufacturer or Lab Owner:
Acid (pH 0-4) into Water

Water into Base (pH 10-14)

Think Alphabetically! (A goes first, B goes second)
Do NOT
Discard Any Hazardous Chemicals into the Sink

Please Don’t Poison us!
Lab Bench FIRE!

1. Alert people in lab!

2. Activate Alarm!

3. Use Fire Extinguisher!
   
   DO NOT USE WATER ON CHEMICALS!!

4. GET OUT IF IN DANGER and Call 911!!
MAJOR FIRE!

Alert People in Lab to Evacuate

Activate Alarm

GET OUT!!  DO NOT TRY TO BE A HERO!

Close Lab Doors Behind You

Call 911

Meet Up with Your Group Outside!
When in doubt **ASK!!**

It is a lot more fun than a trip to the Emergency room,

I promise!
## OSU Chemical Guide and Permeation Chart

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<th>DOT Class</th>
<th>Waste Codes</th>
<th>Category</th>
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<th>Neoprene</th>
<th>Latex</th>
<th>Tyvek (PEM)</th>
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Breakthrough time, totally immersed at room temperature, in minutes:

- **<14.9 minutes**
- **15 but <179.9 minutes**
- **>179 minutes**

8/20/2013 3:21 PM
<p>| Substance                        | UN# | UN#2 | UN#3 | UN#4 | UN#5 | UN#6 | UN#7 | UN#8 | UN#9 | UN#10 | UN#11 | UN#12 | UN#13 | UN#14 | UN#15 | UN#16 | UN#17 | UN#18 | UN#19 | UN#20 | UN#21 | UN#22 | UN#23 | UN#24 | UN#25 | UN#26 | UN#27 | UN#28 | UN#29 | UN#30 | UN#31 | UN#32 | UN#33 | UN#34 | UN#35 | UN#36 | UN#37 | UN#38 | UN#39 | UN#40 | UN#41 | UN#42 | UN#43 | UN#44 | UN#45 | UN#46 | UN#47 | UN#48 | UN#49 | UN#50 | UN#51 | UN#52 | UN#53 | UN#54 | UN#55 | UN#56 | UN#57 | UN#58 | UN#59 | UN#60 | UN#61 | UN#62 | UN#63 | UN#64 | UN#65 | UN#66 | UN#67 | UN#68 | UN#69 | UN#70 | UN#71 | UN#72 | UN#73 | UN#74 | UN#75 | UN#76 | UN#77 | UN#78 | UN#79 | UN#80 | UN#81 | UN#82 | UN#83 | UN#84 | UN#85 | UN#86 | UN#87 | UN#88 | UN#89 | UN#90 | UN#91 | UN#92 | UN#93 | UN#94 | UN#95 | UN#96 | UN#97 | UN#98 | UN#99 | UN#100 |</p>
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<th>Code 3</th>
<th>Code 4</th>
<th>Code 5</th>
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<tr>
<td>Explosive 1.7</td>
<td>Corrosive - Bases</td>
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<tr>
<td>Flammable Gas</td>
<td>Explosive</td>
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<tr>
<td>Nonflammable Gas</td>
<td>Flammable</td>
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<tr>
<td>Poison Gas Toxic Gas</td>
<td>Keep under Fume Hood</td>
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<tr>
<td>Flammable Liquid</td>
<td>Keep for other cases</td>
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<tr>
<td>Flammable Solid</td>
<td>Motor Pool Recycling</td>
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<tr>
<td>Spontaneously Combustible</td>
<td>Non-Regulated</td>
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<tr>
<td>Dangerous when Wet</td>
<td>Non-Regulated</td>
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<td>Oxidizer</td>
<td>Organic Peroxide</td>
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<td>Organic Peroxide</td>
<td>Oxidizer</td>
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<tr>
<td>Poison Toxic</td>
<td>Poison</td>
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<tr>
<td>Infectious Substance</td>
<td>Poison - Cyanide</td>
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<tr>
<td>Radioactive Material</td>
<td>Poison - Mercury</td>
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<tr>
<td>Corrosive Material</td>
<td>Poison - Heavy Metal</td>
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<td></td>
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<tr>
<td>Misc. Hazards/Materials</td>
<td>Water Reactive</td>
<td></td>
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</tr>
</tbody>
</table>

The permeation times are based on the lowest common denominator of the following sources. They are intended only as a guide. The suitability of each product must be determined by the user through their own testing. Neither this guide nor any statement made by Oklahoma State University should be construed as a warranty or that any product is fit for a particular purpose.

References:
- Chemical Protection Guide, p. 87
- OSHA Guidelines for the Selection of Chemical Protective Clothing, 3rd ed., Feb. '87
- Defense & Safety Data Sheets
- Hazards Data by Material
- PPE Materials Catalog, p. 76
- Hazardous Materials
- EHS Material Safety Data Sheets
- OSHA
- http://www.dhs.md.edu/hazlives.html
- OSHA - EHS
- http://www.ohs.okstate.edu/hazmatperm.htm
- p. 87

author:
- Theresa Becker

Haz-Mat Inspector, OSU - EHS

Contact EHS

Last Update: 11 20 98
## PARTIAL LIST OF INCOMPATIBLE CHEMICALS (REACTIVE HAZARDS)

Too often chemicals are stored alphabetically. This can lead to explosive or toxic alphabet soup.

Substances in the left column should be stored and handled so that they cannot accidentally contact corresponding substances in the right column under uncontrolled conditions.


<table>
<thead>
<tr>
<th>CHEMICAL</th>
<th>INCOMPATIBILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid</td>
<td>Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates</td>
</tr>
<tr>
<td>Acetone</td>
<td>Concentrated nitric and sulfur acid mixtures</td>
</tr>
<tr>
<td>Acetylene</td>
<td>Chlorine, bromine, copper, fluorine, silver, mercury</td>
</tr>
<tr>
<td>Alkali and alkaline earth metals (lithium, sodium, potassium)</td>
<td>Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens, powdered metals (e.g., aluminum or magnesium)</td>
</tr>
<tr>
<td>Ammonia (anhydrous)</td>
<td>Mercury (e.g., in manometers), chlorine, calcium hypochlorite, iodicine, bromine, hydrofluoric acid (anhydrous)</td>
</tr>
<tr>
<td>Ammonium nitrate</td>
<td>Acids, powdered metals, flammable liquids, chlorates, nitrates, sulfur, finely divided organic or combustible materials</td>
</tr>
<tr>
<td>Aniline</td>
<td>Nitric acid, hydrogen peroxide</td>
</tr>
<tr>
<td>Arsenical materials</td>
<td>Any reducing agent</td>
</tr>
<tr>
<td>Azides</td>
<td>Acids</td>
</tr>
<tr>
<td>Bromine</td>
<td>See Chlorine</td>
</tr>
<tr>
<td>Calcium oxide</td>
<td>Water</td>
</tr>
<tr>
<td>Carbon (activated)</td>
<td>Calcium hypochlorite, all oxidizing agents</td>
</tr>
</tbody>
</table>
Carbon tetrachloride

Sodium, Chlorates, Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials

Chlorine

Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine

Chlorine dioxide

Ammonia, methane, phosphine, hydrogen sulfide

Chromic acid and chromium

Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general

Copper

Acetylene, hydrogen peroxide

Cumene hydroperoxide

Acids (organic or inorganic)

Cyanides

Acids

Flammable liquids

Ammonium nitrate, chromatic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens

Fluorine

Isolate from everything

Hydrocarbons (e.g., butane, propane, benzene)

Fluorine, chlorine, bromine, chromic acid, sodium peroxide

Hydrocyanic acid

Nitric acid, alkali

Hydrofluoric acid (anhydrous)

Ammonia (aqueous or anhydrous)

Hydrogen peroxide

Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane, combustible materials

Hydrogen sulfide

Fuming nitric acid, oxidizing gases

Hypochlorites

Acids, activated carbon

Iodine

Acetylene, ammonia (aqueous or anhydrous), hydrogen

Mercury

Acetylene, fulminic acid, ammonia

Nitrites

Sulfuric acid

Nitric acid (concentrated)

Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy metals

Nitrosamines

Potassium or sodium cyanide.

Nitroparaffins

Inorganic bases, amines

Oxalic acid

Silver, mercury

Oxygen

Oils, grease, hydrogen, flammable liquids, solids, or gases

Perchloric acid

Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides, Organic
Acids (organic or mineral), avoid friction, store cold

Phosphorus (white)
Air, oxygen, alkalis, reducing agents

Phosphorus pentoxide
Water

Potassium
Carbon tetrachloride, carbon dioxide, water

Potassium chlorate
Sulfuric and other acids
(see Sulfuric and other acids also chlorates)

Potassium perchlorate
Glycerol, ethylene glycol, benzaldehyde, sulfuric acid

Potassium permanganate
Reducing agents

Selenides
Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid

Silver
Carbon tetrachloride, carbon dioxide, water

Sodium
Acids, ammonium salts, oxidizable materials, sulfur

Sodium Chlorate
Ammonium nitrate and other ammonium salts

Sodium nitrite
Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural

Sodium peroxide
Acids

Sulfides
Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals, such as sodium, lithium)

Sulfuric acid
Reducing agents

Tellurides
Acetyl chloride, alkaline and alkaline earth metals, their hydrides and oxides, barium peroxide, carbides, chromic acid, phosphorous oxychloride, phosphorous pentachloride, phosphorous pentoxide, sulfuric acid, sulfur trioxide

Water

15 Reasons Not to Store Your Chemicals Alphabetically

INCOMPATABLE CHEMICALS

Acetic Acid - Acetaldehyde

Acetic Anhydride - Acetaldehyde

Aluminum Metal - Ammonium Nitrate

Aluminum - Bromine Vapor

Ammonium Nitrate - Acetic Acid

POSSIBLE REACTIONS

Small amounts of acetic acid will cause the acetaldehyde to polymerize releasing great quantities of heat.

Reaction can be violently explosive.

A Potential Explosive

Unstable nitrogen tribromide is formed: explosion may result.

Mixture may result in ignition, especially if acetic acid in concentrated.
Cupric Sulfide - Cadmium Chlorate
Hydrogen Peroxide - Ferrous Sulfide
Hydrogen Peroxide - Lead II or IV Oxide
Lead Sulfide - Hydrogen Peroxide
Lead Perchlorate - Methyl Alcohol
Mercury II Nitrate - Methanol
Nitric Acid - Phosphorous
Potassium Cyanide - Potassium Peroxide
Sodium Nitrate - Sodium Thiosulfate.

Will explode on contact.
A vigorous, highly exothermic reaction.
A violent, possibly explosive reaction.
Vigorous, potentially explosive reaction.
An explosive mixture when agitated.
May form Hg fulminate - an explosive.
Phosphorous aburns spontaneously in presence of nitric acid.
A potentially explosive mixture if heated.
A mixture of the dry materials may result in explosion.
III. SAFETY PLAN

Overview of Safety Plan:

Description of departmental safety topics and issues of safety concern within unit

Strategies for safe practices and training

Strategies for immediate events and emergencies

Description of departmental safety topics and issues of safety concern within unit:

The Biological and Agricultural Engineering Department is contained in a 4-building complex at the corner of South Stadium Road and Tower Drive on the LSU-Baton Rouge campus (see Figure 1), along with the Wilson Laboratories (western half of 2nd floor) and the LA House complex on Gourrier Lane between Nicholson Drive and River Road.

Departmental Map:

![Departmental Map]

Figure 1: Biological and Agricultural Engineering Department Building Layout

People involved with the department:

Faculty – Research and Extension
Staff – Administrative, Research and Teaching
Students – Graduate and Undergraduate

High priority safety concerns:

Emergency egress strategy
Security issues - controlled access after hours
Employee and student safety education
Chemical safety
Shop safety
Annual internal review of laboratories
**Emergency Exit or Egress Strategy:** The departmental calling tree (see below) will be activated in emergencies where building evacuations is necessary. The persons appointed below are responsible to relay the message to evacuate, as long as they are able to do so without risk of serious injury.

In an Emergency

1. Activate Fire alarm
2. Call LSU Emergency 911
3. Call Main Office 225—578-3153
   a. Angela Singleton
   b. Donna Elsas
   c. David Constant

Priority #1 – North Wing – Angela Singleton – Contact Maurice Wolcott – 578-8291
Priority #2 – Ag Metals Building – Angela Singleton - Contact Tom McClure – 578-1078
Priority #3 – Lab Buildings 287b and 289 - Donna Elsas – Contact Tom McClure – 578-1078
Priority #4 – Office Wing - David Constant – 578-1062 - Contact all office wing personnel
Priority #5 – Outside – Angela Singleton or Donna Elsas – Contact AgCenter

**Evacuation Routes:** The following figure shows the paths of evacuation from the BAE campus facilities. Maps of the evacuation routes will be posted in each laboratory and hallway within the department facilities.

![Evacuation Routes Diagram]

Figure 2: Evacuation Routes for the Biological and Agricultural Engineering Campus Facilities
Security issues:
Exterior doors will be locked at 4:30pm on the weekdays by Tom McClure, Angela Singleton or appointed person. Exterior doors will remain locked during the weekends. (Weekdays: 4:30pm – 7:30am and weekends will be called “After Hours” from here throughout.) Windows are to be closed during After Hours. The responsibility of closing windows falls to individual room managers or stewards.

After Hours Policy for Undergraduate Students:
The Department of Biological and Agricultural Engineering (BAE) recognizes the demands of an undergraduate education in engineering and realizes that project work within the department is critical to the future success of our graduates. Therefore the department personnel believe that undergraduate students majoring in Biological Engineering should have access to the departmental facilities during after-hours. The undergraduate students of the department should realize, though, that admittance into the BAE facilities “after hours” is a privilege, which will be revoked if the guidelines in Table 3 are violated. The following rules have been established for the safety of undergraduate students and departmental personnel during after-hours: (policy is subject to change without notice)

- Consequences for After Hours Violations by Undergraduate Students:
  - First offense: The first time a student has violated one of the five after hours guidelines will merit a warning. A warning will consist of a memorandum naming the student and briefly describing the violation. This memorandum will be given to the BAE departmental office to add to the student’s records.
  - Second offense: After the first offense, if the student violates one of the five after hours guidelines again, the student will be banned from after-hours admittance except for circumstances where a supervisor from the departmental personnel is willing to usher the student around. A list of banned from after-hours students will be distributed to departmental personnel to assist in enforcing this policy.
  - Keys are to be returned to the key master Angela Singleton, upon the termination of employment of departmental personnel (faculty, associates, graduate students, staff, and student workers).
  - Safety for labs managed by absent professors:
    - Should the principal investigator of a BAE research lab be absent from the facilities for more than two weeks, a temporary lab manager should be appointed by the faculty member to observe daily safety functions in his/her lab. The BAE departmental office should be notified of the person appointed in case changes to the emergency procedures need to be modified.

Table 3 - After Hours Guidelines for Undergraduate Students of Biological Engineering

1. No undergraduate students in the building after hours (Weekdays: 4:30 pm – 7:30am and weekends) without the “in- facility” supervision from departmental personnel unless written consent by faculty member is provided. (Departmental personnel consist of BAE employed faculty, graduate students, research associates, staff, and student workers. “In-facility” supervision means the supervisor must be located within departmental facilities.)

2. No chemical laboratory access should be granted to undergraduate students without “in- facility” supervision from trained departmental personnel. (Chemical safety training will be performed within the department.)

3. No shop access should be granted to undergraduate students without “in-room” supervision from trained departmental personnel. (“In-room” supervision means the supervisor must be located within the room of the shop during use of tools. Supervisor should also be trained on tools that will be used.)
4. No student is allowed to be in the departmental buildings alone. A “buddy system” with other BAE students or departmental personnel is encouraged. 5. Keys may be loaned to undergraduate students through their respective BAE faculty supervisor. An Operations List will be distributed along with the keys describing responsibilities of building security required to practice when in possession of departmental keys. 6. Exterior doors will NOT be propped open or unlocked and left unattended by anyone “after hours.”

Safety Training for Employees and Students:

- Upon initiating employment, an employee of the Biological and Agricultural Engineering Department should complete the new employee orientation form from LSU Office of Occupational and Environmental Safety with their supervisor.
- The departmental personnel are encouraged to attend CPR and first aid training if they are medically able and willing.
- Graduate students, as departmental personnel, should complete the new employees orientation form (website link above) with their respective supervisors. The completed form should be submitted to the BAE main office so it may be added to the graduate student’s records. Additional training recommended:
  - General security issues addressed previously in this BAE safety plan
  - Shop training (see below)
  - Chemical safety training (see below)
  - Undergraduate students training:
  - General security issues addressed previously in this BAE safety plan
  - Shop training (see below)
  - Chemical safety training (see below)

Chemical Safety

- The department chemical safety plan should fall in accordance with the LSU Chemical Safety Hygiene Plan and the Standard Operating Procedures of Chemical Safety.
- General chemical safety should be discussed with approved chemical lab trainer and departmental safety form signed before trainee is allowed use of chemicals. (Approved chemical lab trainers: Dr. Dorin Boldor, Ms. Anna Dugas, Dr. Steven Hall, Dr. Daniel Hayes, Dr. Todd Monroe, Dr. Cristina Sabliov, and Dr. Chandra Theegala)
- Signed chemical safety forms should be turned into the research lab manager. Chemical safety forms can be accessed on (W:/) departmental drive under the Safety folder.
- Material Safety Data Sheet (MSDS) can be found on the departmental drive (W:/), at the LSU Office of Occupational and Environmental Safety, and a printed copy of commonly used chemicals should be on hand in the laboratories within the BAE department.
- ALL mixed chemicals not in their original containers should be labeled with:
  - NAME of Chemicals – spelled out (Ex: Water NOT H2O)
  - DATE MADE
  - PERSON who made the solution
  - PERCENT make up of ingredients (Ex: 70% Ethanol, 0.01M Sodium Hydroxide, 1:4 Ethyl Acetate/Water)
- ALL gas cylinders will be restrained securely to wall or bench-top as described by the LSU Office of Occupational and Environmental Safety (www.oes.lsu.edu).
- Students are not to use the chemicals without training or without supervision from trained departmental personnel.
Shop Safety
  o General shop safety should be discussed with approved shop trainer and departmental safety form signed before trainee is allowed use of equipment. (Approved shop trainer: Tom McClure)
  o Signed safety forms should be turned into Tom McClure.
  o Proper use of shop equipment should be demonstrated by an approved shop trainer on an individual or small group basis.
  o Students are not to use the shop equipment without training or without supervision from trained departmental personnel at any time!

Safety Committee Reviews - Annual checks of individual labs for:
  o MSDS printed copies of commonly used chemicals
  o Evidence of chemical training of students
  o Labeled chemicals
  o Currently calibrated ventilation hoods
  o Gas cylinders correctly restrained

Other Strategies for Safe Practices:
  o Locations of first aid kits, fire extinguishers/blankets, eye washes, showers, and security alarm shut offs will be mapped out on facility layout. Maps will be dispensed to departmental personnel once completed.
  o Departmental safety meeting once a semester to reassess safety plan and its enforcement.

Strategies for immediate events and emergencies:

LSU emergency text message is recommended for faculty and staff cell phone users.

Exit or Egress Strategy: The departmental calling tree (see above) will be activated in emergencies where building evacuations is necessary. The persons appointed on the calling tree are responsible to relay the message to evacuate, as long as they are able to do so without risk of serious injury. Evacuation routes will be posted in laboratories and hallways of the departmental facilities (see Figure 2 previously).

Fire Drills and Warnings:
  o Activate departmental calling tree (above)
  o Activate nearest fire alarm
  o In case of a bench top fire:
    1. ALERT people in lab.
    2. ACTIVATE alarm.
    3. USE fire extinguisher keeping you between the fire and the door. Do not use water on chemicals or electronics!
    4. GET OUT IF IN DANGER and CALL 9-911!
  o In case of a large fire, fume problem or explosion:
    1. ALERT people in lab to evacuate.
    2. ACTIVATE alarm.
    3. EVACUATE closing door behind you. (see Figure 3)
    4. CALL 9-911.
    5. MEET group at either FRONT LAWN of E.B. Doran or BACK FENCE by P. Taylor Hall
**Tornado Warnings:**

- Departmental calling tree should be activated (see above).
- Possible shelter areas shown in Figure 3:

![Diagram of shelter areas and routes](image)

**Figure 3: Shelter Areas and Routes for the Biological and Agricultural Engineering Campus Facilities**

- Post Tornado Warning – LSU official will give the all clear to leave the shelter areas. Meet group at either FRONT LAWN of E.B. Doran or BACK FENCE by P. Taylor Hall if safe to do so.

**Hurricane Warnings:**

- The campus departmental facilities are not deemed safe enough to be hurricane shelters. Please evacuate PRIOR to hurricane arrival. Contact LSU information for appropriate shelter areas on campus: 800-516-6444 or www.lsu.edu.

**Emergency Shutdown Plan:**

- In the event of a hurricane warning, a few emergency shutdown procedures will be performed in order to minimize damage and to increase the speed of restoring operations.

1. Emergency Shutdown Managers:
   - E. B. Doran – Donna Elsar and Angela Singleton
   - Ag Metals, Building 289 – Tom McClure
• Building 287b – Tom McClure
• LaHouse – Claudette Reichel and Kyle Huffstickler

2. Responsibilities include:
   o Proper equipment shutdown including freezers and incubators, if power outage is likely
   o Water, gas and heat sources shut off
   o Removal of Laptops, PC external hard drives or backup discs
   o Windows and doors locked with security alarms activated, unless a fire emergency

   o LSU and AgCenter officials must okay the admittance into the BAE departmental facilities after the hurricane.

Power outages:
   o Remain calm and stay where you are, if you can do so safely.
   o Switch off equipment, like centrifuges and shop equipment to prevent sudden turn on when power is resumed.
   o Keep temperature controlled units, like incubators, refrigerators, and freezers closed.
   o Call of the BAE main office, especially if the power outage is local to your location.

Hazardous materials spills – campus wide:
   o Exit and Egress Strategy activated (Figures 2 and 3)

Terrorist or evil intent events:
   o Take responsibility of reporting unusual behavior observed.
   o Contact BAE main office if you are suspicious of person(s) roaming the department facilities.
   o Contact 911 if suspicious person(s) appear to be malicious (e.g., carrying weapon, aggressive or angry, etc.)

Biological Threats:
   • Contact 911 and BAE main office
   • Quarantine the exposure area – do not let anyone other than emergency officials to enter the area of exposure.

Bomb Threats:
   • By phone:
     o Write down everything that is said
     o Note exact time of call: Listen for background noises, Determine characteristics of caller (age, gender, accent, vocal tone)
     o Call 911 immediately after call
   • Suspicious object:
     o Do NOT handle object (bag, letter, parcel, etc)
     o Call BAE main office and 911
     o Evacuate the area