Laboratory Safety Orientation

ENVIRONMENTAL HEALTH AND SAFETY
A DEPARTMENT OF ADMINISTRATIVE OPERATIONS
UNIVERSITY OF SOUTHERN CALIFORNIA
Purpose

The purpose of the Laboratory Safety Course is to engage the participant in thoughtful discourse on: identifying laboratory hazards; how to control the hazards; essential Right-to-Know information and where to obtain it; proper material storage, waste management, and disposal; and proper emergency response.

It accomplishes this by highlighting ten key objectives that the participant will meet at the conclusion of the course, namely:

1. Describe at least two key elements of the Hazard Communication Program.
2. Identify hazards commonly found in a laboratory.
3. Distinguish between an acute and chronic exposure.
4. Understand how hazardous substances can enter the body.
5. Access and interpret a MSDS.
6. Glean important information from hazardous materials labels.
7. Set up waste streams and use of proper containers.
8. Respond properly to lab and non-lab emergencies.
9. Utilize engineering and administrative controls.
10. Store hazardous materials compatibly.

Many components of this course and additional safety resources are located on the EH&S website:

Environmental Health and Safety

Overarching Goals

The key objectives discussed above bring into focus the distinct and much larger overarching goals of the course which are emphasized and articulated below.

Create a Safety Culture

To instill within each participant a safety philosophy that fosters a proactive attitude in the laboratory and directly influences the actions of colleagues in a positive way.

Comply With Regulations

To comply with Cal-OSHA initial training requirements in Hazard Communication, Laboratory Standard, Chemical Hygiene Plan, and Injury and Illness Prevention to name a few.

Eliminate Injuries

To eliminate injuries resulting from hazardous materials (chemicals, biohazardous agents, etc.) exposure, sharps, physical hazards, and the like.

Reduce Accidents

To reduce laboratory accidents and incidents caused by misuse of hazardous materials, malfunctioning equipment, and/or poor work practices.
Mitigate Infractions

To reduce the number of safety violations found during routine inspections by EH&S safety inspectors as well as local, state, and federal regulatory agencies.

And...Have Fun!

To make the participant’s experience in this course as informative and enjoyable as possible by utilizing case studies, group exercises, and hands-on demonstrations.

Respond Properly

To respond properly to emergencies involving fire, chemical or biological spill, injury, or exposure that may occur in the laboratory.

GROUP EXERCISE

A. ROUND OF INTRODUCTIONS

It is very helpful and advantageous to develop a good network of business and research contacts at USC, not to mention solid friendships. As part of your introduction to the other attendees, incorporate answers to the questions below:

What type of research or work are you performing?

Have you witnessed any workplace accidents?

What do you hope to gain from this safety course?
Jim, a new graduate student, recently began working in a lab on campus. However, he did not attend the General Laboratory Safety Class required for all new laboratory workers. His research advisor pressed him to begin his experimental set up, so he feverishly began gathering up chemicals. A bottle of ammonium dichromate he handled had a loose cap. Jim soon noticed an unpleasant feeling in his throat and began coughing but continued to work with the chemical for approximately half an hour to complete his experiment.

The symptoms got worse in the next few days. He had persistent coughing and a very sore throat. He went to his doctor, who diagnosed a chemical burn to the respiratory tract. He also saw a doctor at the USC Health Consultation Center. X-rays showed several ulcers of the mouth, throat and larynx resulting from corrosive burns to the respiratory tract.

NOTE: Excessive inhalation of ammonium dichromate causes irritation to mucous membranes and may be fatal according to its SDS.

DISCUSSION

What is an SDS?

Why did this happen to Jim?

Is this a work-related incident? Explain.

What must be done to prevent hazardous exposure?
What is a Hazard?

A hazard is a situation that poses a level of threat to life, health, property or environment. A hazard has the potential to become active and thereby creates a state of emergency.

Given the above definition, think of potential hazards that may be present in a laboratory setting. Use the Group Exercise space below to list these hazards.

Potential hazards in the workplace create conditions that may lead to serious injuries or death. Another equally important contributor is employee behavior. This potent combination ultimately leads to disastrous outcomes.

In the Group Exercise below, write down examples of hazards in the four categories, namely Biological, Chemical, Physical, and Other.

GROUP EXERCISE

Biological Hazards:

Chemical Hazards:

Physical Hazards:

Other Hazards:
Hazardous Materials

BIOHAZARDS
Biohazardous materials and organisms include all infectious agents or biologically derived infectious materials that present either a risk or a potential risk to the health of humans or animals, either directly through infection or indirectly through damage to the environment.

Biohazardous materials include the following:

- Recombinant DNA, such as plasmids or viral vectors
- Potentially infectious microorganisms such as viruses, bacteria, fungi, prions, etc.
- Biologically derived toxins, such as those classified as Select Agents
- Bloodborne pathogens (BBP)
- Human cell lines, tissue, blood, or other human/nonhuman primate materials

HAZARDOUS CHEMICALS
These generally fall into distinct hazard classes: Flammable, Corrosive, Reactive, and Toxic. They are summarily discussed below:

Flammable/Combustible - A flammable liquid has a flashpoint below 100 deg. F. (37.8 deg. C.); a combustible liquid has a flashpoint at or above 100 deg. F. (37.8 deg. C.)

Corrosive - a chemical that causes visible destruction of, or irreversible
alterations in, living tissue by chemical action at the site of contact.
29 CFR 1910.1200 App A

**Reactive (unstable)** - a chemical which is the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

**Toxicant (poison)** - any substance that, when relatively small amounts are ingested, inhaled, or absorbed, or applied to, injected into, or developed within the body, has chemical action that causes damage to structure or disturbance of function, producing symptoms, illness, or death. *Dorland's Medical Dictionary*

Below are examples of toxicants:

**Asphyxiant** - an agent that deprives bodily tissues of oxygen through disruption of cellular processes or simple displacement or dilution of atmospheric oxygen.

**Irritant** - a chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. 29 CFR 1910.1200 App A

**Potential Occupational Carcinogen** - any substance, or combination or mixture of substances, which causes an increased incidence of benign and/or malignant neoplasms, or a substantial decrease in the latency period between exposure and onset of neoplasms in humans or in one or more experimental mammalian species as the result of any oral, respiratory or dermal exposure, or any other exposure which results in the induction of tumors at a site other than the site of administration.

This definition also includes any substance which is metabolized into one or more potential occupational carcinogens by mammals. 29 CFR 1990.103

**Reproductive Toxicant** - A chemical which affects the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis). 29 CFR 1910.1200 App A

**Hazardous Exposure**

Hazardous materials may enter the body through the following routes of exposure:

- Absorption (skin, mucous membranes)
- Injection (e.g. parenteral inoculation, contaminated sharps, bites and scratches from infected animals, bites from arthropod vectors, paper cuts, etc.)
- Ingestion (solids, liquids, contaminated hand-to-mouth exposure)
- Inhalation (aerosols, vapor)

These materials can adversely affect the human host resulting in damage to organs, loss of organ function, and/or death.
Exposure risk with regard to hazardous chemicals depends on the intrinsic toxic potential of the chemical, its concentration, the duration of exposure, the health status of the person exposed, and the availability of effective treatment. Exposures to high concentration of even mildly toxic substances, however, can be dangerous.

**Acute exposure** is defined as an exposure to a chemical for a duration of 14 days or less. Although the duration of exposure during an unscheduled chemical release may be brief, the chemical concentration may be high. The onset of health effects resulting from an acute exposure can be immediate or delayed.

**Chronic exposure** refers to repeated exposures to low concentrations over a long period of time. The resulting health effects often differ in type or degree from effects of acute exposure. Most information about chronic toxicity comes from epidemiologic studies and case reports of workplace exposures.

<table>
<thead>
<tr>
<th>Toxicity Rating</th>
<th>Animal LD\textsubscript{50} (per kg)</th>
<th>Lethal Dose When Ingested by 70 kg (150 lb) Human</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely toxic</td>
<td>Less than 5 mg</td>
<td>A taste (less than 7 drops)</td>
</tr>
<tr>
<td>Highly toxic</td>
<td>5 to 50 mg</td>
<td>Between 7 drops and 1 teaspoonful</td>
</tr>
<tr>
<td>Moderately toxic</td>
<td>50 to 500 mg</td>
<td>Between 1 teaspoonful and 1 ounce</td>
</tr>
<tr>
<td>Slightly toxic</td>
<td>500 mg to 5 g</td>
<td>Between 1 ounce and 1 pint</td>
</tr>
<tr>
<td>Practically non-toxic</td>
<td>Above 5 g</td>
<td>Above 1 pint</td>
</tr>
</tbody>
</table>


**Hazard Information**

The Cal-OSHA Hazard Communication Standard and Laboratory Standard (Chemical Hygiene Plan) each require employers to make available the written program to all employees that work with hazardous materials or are in areas where hazardous materials are used.

The programs outline responsibilities of employers and employees, protocols to be established and followed, and requirements for periodic safety training and safety meetings.

Hazard Communication Standard [http://adminopsnet.usc.edu/node/242](http://adminopsnet.usc.edu/node/242)

Chemical Hygiene Plan [http://adminopsnet.usc.edu/node/187](http://adminopsnet.usc.edu/node/187)

USC researchers who have the potential to be exposed to human or non-human primate blood, blood products, cell lines, bodily fluids, or other potentially infectious materials must have an Exposure Control Plan...
as required by the California OSHA Bloodborne Pathogens Standard (8CCR Sec. 5193). Additionally, they are offered the Hepatitis B vaccine series at no cost to themselves.

Bloodborne Pathogen Program and Exposure Control Plan

http://adminopsnet.usc.edu/node/214

Warning Labels

Labels on chemical bottles provide important safety information about the contents of the bottle, such as the hazard associated with the material, proper personal protective equipment, and storage information. Cal-OSHA regulations requires that ALL containers in a laboratory be labeled with the following information:

- The chemical identity
- Appropriate hazard warnings
- Target organs affected if the chemical is a health hazard

Transferring chemicals from a larger container to a smaller container is permitted as long as the smaller container is appropriate for the hazard and is properly labeled.

The U.S. Department of Transportation (DOT) requires all entities “who offer hazardous material[s] for transportation” to label packages with DOT identification numbers. Each number refers to the type of hazard the material presents: 1_Explosive, 2_Gas, 3_Flammable Liquid, 4_Flammable Solid, 5_Oxidizer, 6_Toxic (Poison), 7_Radioactive, and 8_Corrosive. These labels may also be used to identify storage areas (including cabinets) for hazardous materials.

Warning labels that denote radiation hazards, high magnetic fields, high voltage, etc. will appear on lab equipment and door entrances to rooms or laboratories with such equipment.

Building and Door Signs

All buildings that contain hazardous chemicals are required to display the National Fire Protection Association (NFPA) Fire Diamond. See diagram page 9. These are posted on the building’s exterior.

Every laboratory that houses chemicals and chemical storage room will have a door sign displayed on its exterior wall by the entrance(s). See diagram page 9. The sign will feature DOT labels and the NFPA fire diamond.
Chapter II. Identifying Hazards

IN CASE OF EMERGENCY: (213) 740-4321
AHF B9
EH&S, University of Southern California
3616 TROUSDALE PARKWAY 90089

 CONTACT INFORMATION (DURING BUSINESS HOURS)

NOT A VALID DOOR SIGN
(000) 000-0000 wk

FOR TRAINING PURPOSES ONLY
(111) 111-1111 cell

HAZARD INFORMATION

REVISED: Monday, January 12, 2015
Safety Data Sheet

A Safety Data Sheet (SDS; also known as Material Safety Data Sheet or MSDS) is designed to provide critical information to workers and emergency personnel about the hazards of a particular substance. It features health effects from acute and chronic exposure, first aid protocol, proper procedures for handling, spill/leak clean-up, stability information, storage/disposal requirements, and use of protective equipment. SDSs must be made readily available to all employees who work with hazardous materials either in a binder or electronic form (including on-line service). Important sections of an SDS are demarcated on the illustration on the next page.

Be proactive and review SDSs prior to use of hazardous materials rather than as a reaction to an exposure incident or fine.

Below are definitions of terms found on an SDS:

**CAS Registry Number** - A unique number assigned by CAS.

**Cal-OSHA PEL** - Permissible Exposure Limit: The maximum permitted 8-hour time-weighted average concentration of an airborne contaminant - measured in parts per million (ppm).

**ACGIH TLV** - Threshold Limit Value: the maximum average airborne concentration recommended over an 8-hour work period (TWA) as designated by the American Conference of Governmental Industrial Hygienists.

**Ceiling Limit** - The amount the average airborne concentration may NEVER exceed.

**IDLH** - Immediately Dangerous to Life and Health: the concentration determined to cause death or immediate or delayed permanent adverse health effects.

**LD 50** - The Lethal Dose that would kill 50% of a test animal population.

**LC 50** - The Lethal Concentration of a chemical in air that would kill 50% of a test animal population in one exposure.

**PROPOSITION 65** - The Safe Drinking Water and Toxic Enforcement Act of 1986: warning of substances that are known to cause cancer or reproductive harm.

---

**CONSIDER THIS...**

**MSDSs for all USC Chemicals under “Links”**

- [http://adminopsnet.usc.edu/department/environmental-health-safety](http://adminopsnet.usc.edu/department/environmental-health-safety)

**Hazardous Materials Information**


**Public Health Agency of Canada- Pathogen Safety Data Sheets (PSDS)**

The second most commonly cited OSHA violation in 2006 was failure to comply with the Hazard Communication Standard. Citations for non-compliance included:

- Failure to maintain Safety Data Sheets;
- Failure to provide safety training to workers;
- Failure to label containers correctly.

Source: National Safety Council, Safety + Health magazine, December 2006

---

**Safety Data Sheet**

<table>
<thead>
<tr>
<th>NFPA</th>
<th>HMD</th>
<th>Personal Protective Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5</td>
<td>See Section 15</td>
</tr>
</tbody>
</table>

**Section 1. Chemical Product and Company Identification**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Trade Name</th>
<th>CAS Number</th>
<th>REACH Chemical Identity Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picric acid</td>
<td>P1180, P1148</td>
<td>88-89-1</td>
<td>1.07973000</td>
</tr>
</tbody>
</table>

**Manufacturer/Supplier**

- SPECTRUM LABORATORY PRODUCTS INC.
- 14422 S. SAN PEDRO STREET
- GARDENA, CA 90248

**Synonyms**

- 2,4,6-trinitrophenol (TNP)
- 2,4,6-Trinitrophenol (TNP)

**Chemical Name**

- Picric Acid

**Chemical Formula**

- C8H4N3O7

**Toxicological Information**

- **Health Effects**
  - Potentially hazardous to the body:
  - Inhalation: May cause irritation of the nose, throat, and upper respiratory tract. Inhalation of high levels of picric acid dust may cause coughing, shortness of breath, and wheezing. Inhalation of contaminated air may cause central nervous system depression, drowsiness, and headache.
  - Skin: May cause irritation, redness, and swelling. Contact with picric acid may cause sensitization and immune responses.
  - Eyes: May cause irritation, redness, and swelling.

---

Continued on Next Page
<table>
<thead>
<tr>
<th>MSDS EXERCISE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CHEMICAL NAME:</td>
</tr>
<tr>
<td>2. What is the issue/revision date of this SDS?</td>
</tr>
<tr>
<td>3. What is the hazard class of this chemical substance? Can a substance fall under more than one hazard class?</td>
</tr>
<tr>
<td>4. List the symptoms of acute exposure and First Aid measures for one of the routes of entry listed below.</td>
</tr>
<tr>
<td>Inhalation, Ingestion, or Contact (circle one)</td>
</tr>
<tr>
<td>•</td>
</tr>
<tr>
<td>•</td>
</tr>
<tr>
<td>•</td>
</tr>
<tr>
<td>•</td>
</tr>
<tr>
<td>•</td>
</tr>
<tr>
<td>•</td>
</tr>
<tr>
<td>5. List the lower of the two regulatory exposure limits (in ppm):</td>
</tr>
<tr>
<td>6. What is the LD50 or LC50 for this material?</td>
</tr>
<tr>
<td>7. What precautions are required to avoid hazardous exposure?</td>
</tr>
</tbody>
</table>
Surgical Tools Washed With Hydraulic Fluid

By ESTES THOMPSON, Associated Press Writer Tue Jun 14, 2005

RALEIGH, N.C. - Doctors at two North Carolina hospitals unwittingly used surgical instruments that were cleaned with hydraulic fluid instead of detergent, a mistake that affected nearly 4,000 patients.

Toward the end of last year, elevator workers at Duke Health Raleigh Hospital and Durham Regional Hospital drained hydraulic fluid into empty soap containers and capped them without changing the labels.

Not long afterward, medical staff complained that some of their surgical tools felt slick. But it was not until January that the patients affected learned that for two months their surgeons had unknowingly used instruments washed in the fluid. The instruments also had been run through a steam bath for sterilization.

Duke University Health System assured patients that the mix-up created little chance of medical problems. The hospital said it monitored infection rates and found no increase for the time the hydraulic fluid was used.

But a federal agency determined both hospitals had endangered patients.

“It should be pretty easy to see when you start to wash something that detergent is different from hydraulic fluid,” said Dr. Michael Grodin, director of medical ethics at the Boston University School of Medicine. He said the two fluids normally have different colors and textures.

There is little data on how hydraulic fluids — made of many kinds of chemicals that are used in cars, industrial machinery and airplanes — affect humans. In studies, rabbits that inhaled the fluid had trouble breathing and other animals experienced nervous-system tremors as well as diarrhea and breathing problems.

“It’s pretty toxic stuff,” Grodin said.

Associated Press Writer Valerie Bauman in Raleigh contributed to this story.
Assignment 2.1

Refer to the Mallinckrodt SAFE-T-DATA Guide provided at the end of the chapter to answer the following questions.

A. List the NFPA- and SAFE-T-DATA system values for Nitric Acid.

B. What hazard code do you need to look at if you want to find the danger of Nitric Acid when exposed to skin?

C. Find CAS number for Nitric Acid

D. Describe three basic personal protective equipment needed when working with Nitric Acid?

E. What is the primary hazard of Nitric Acid?

Assignment 2.2

Answer the following questions:

A. Chemicals produce both local and systemic effects. T F

B. Define Risk Group 4 agents. What virus is in this category? (go to EH&S’ Biosafety web page and click on “potentially infectious organisms”).

C. What rights are employees guaranteed under the Hazard Communication Standard?
   1. Access to SDSs for chemicals in the work area
   2. To be instructed on proper use of protective equipment
   3. Access to test results from area monitoring
   4. To be informed of hazards associated with new chemicals before working with them
   5. All of the above

D. Refer to the PSDS for Salmonella choleraesuis (see URL on page 11) to answer the following:

   1. Infectious dose:
   2. Pathogenicity:
   3. Containment requirements:
   4. Survival outside host:
SAF-T-DATA
Safety Labeling System

The SAF-T-DATA labeling system is an easy-to-understand chemical hazard classification system that appears prominently on the new Mallinckrodt Laboratory Chemical label. The SAF-T-DATA label information:

- Allows you to quickly assess the hazards a substance presents to your health and safety
- Recommends personal laboratory protective equipment for safe handling
- Identifies storage compatibility of products by color code

A Numeric Hazard Ratings for Quick Assessment of Relative Hazard

An easily understood numeric rating system allows the chemist and non-technical user to instantly assess the relative hazard of the product they are handling. On a scale of 0 to 4, with 4 being extremely hazardous, the product is rated in four hazard categories: health, flammability, reactivity, and contact. The scale is as follows:

0  1  2  3  4
NONE SLIGHT MODERATE SEVERE EXTREME

*No scientific data in standard references suggest the substance is hazardous.

Hazard categories

Health The danger or toxicity the substance presents if inhaled, ingested, or absorbed, including the potential effect on human/animal reproductive processes.

Flammability The tendency of the substance to burn.

Reactivity The potential of the substance to explode or react violently with air, water or other substances.

Contact The danger the substance presents when exposed to skin, eyes, and mucous membranes.

Hazard symbols

A substance in any hazard category may also display a hazard symbol. These easy-to-understand pictograms emphasize the serious hazards related to a substance:

B Laboratory Protective Equipment

This series of pictograms suggests the personal protective clothing and equipment recommended for use when handling the substance in a laboratory situation.

C Storage Color Coding

The SAF-T-DATA label suggests a method for setting up your chemical storage area. The background color indicates the type of storage required. Simply store products with the same color together and follow the recommendations for appropriate storage:

Blue Health hazard — Store in a secure poison area.

Red Flammable hazard — Store in a flammable liquid storage area.

Yellow Reactivity hazard — Store separately and away from flammable or combustible materials.

White Contact hazard — Store in a corrosion-proof area.

Green Store in a general chemical storage area.

Striped Assess storage individually — A striped label indicates material incompatible with other materials in the same color class.

To aid the color-blind, the name of the storage color is printed in the lower border of the SAF-T-DATA block.
1. Color coded Header Bar identifies major corrosives

2. Written hazard warning

3. Special information

4. Product specifications or actual lot analysis

5. Storage color code

6. SAF-T-DATA Label

7. Bar codes (HIBC)

8. NFPA diamond
Chapter III. Controlling Laboratory Hazards

Controlling Hazards

Potential hazards in the workplace can be negated or minimized via effective, instituted controls. These controls (or levels of control) are:

• Engineering
• Administrative
• Personal Protective Equipment (PPE)

The diagram below illustrates the weight or significance these controls have in relation to one another and to mitigating hazards.

Chemical Fume Hood and Local Exhaust

The chemical fume hood plays a key role in removing hazardous vapor, fumes, and particulates away from the researcher by continually moving air to the exterior (roof) of the building. If the fume hood is not used or maintained properly, it may potentially subject the researcher to undue risks. There are several safety issues that may be identified in the fume hood on the opposite page. Write down the safety issues in the space provided below.

Chemical Fume Hood and Local Exhaust

Along with removing hazardous airborne material from the work environment, the fume hood also provides a contained work area that offers additional protection, including:

• A well-defined work environment.
• Containment in the event of a fire.
• Face protection when the sash is lowered.
• Storage of hazardous chemicals in cabinets below.

Other engineering controls include ventilated gas and liquid flammable storage cabinets, inert atmosphere chambers (dry boxes), and explosion-proof refrigerators.
Biological Safety Cabinets
Biological Safety Cabinets (BSCs) are among the most effective and the most commonly used primary containment devices in laboratories for working with infectious agents. The three general types available (Class I, II, III) are specific for certain biohazards and applications and have distinct performance characteristics. Each utilizes High Efficiency Particulate Air (HEPA) filters that filter out 99.97% of all particles at 0.3 um.

Sample illustrations of two different types of BSCs are depicted on the ensuing page.

NOTE: Biological safety cabinets must be certified annually by an approved, licensed vendor.

Remote Handling Tools and Animal Restainers
Animal restrainers reduce the risk of animal bites, protect against accidental self injection when administering an injection to an animal, and help protect the animal from harm.

Engineered Sharps
Engineered sharps were instituted to reduce the large number of injuries from needlesticks. These prevail as needleless systems that replace needle use where appropriate or as added protective devices to needle systems.

Needle systems used to withdraw body fluids, access veins or arteries, or administer medication/fluids are equipped with a built-in safety mechanism that effectively reduces
Class II Type A2 Biosafety Cabinet

FEATURES:

Offers personnel, environmental, and product protection.

HEPA filtered air exhausted back into laboratory or to exterior of building via a “thimble” connection to exhaust ductwork.

Exhaust/Recirculation ratio: 30%/70%

Not approved for open flames.

Approved for work with low levels of solvent chemicals.

Approved for work with trace amounts of radionuclides.

Class II Type B2 Biosafety Cabinet

FEATURES:

Offers personnel, environmental, and product protection.

HEPA filtered air exhausted to exterior of building via building exhaust ductwork.

Exhaust/Recirculation ratio: 100%/0%

Not approved for open flames.

Approved for work with solvent chemicals.

Approved for work with radionuclides.
the risk of self injury. The safety feature is either a sliding sheath that covers the needle after use or a retractable needle that is jettisoned into the barrel of a syringe.

**Administrative Controls**

Administrative controls are the written policies and programs that directly govern the employee’s behavior in the workplace to effect high safety performance. Standard operating procedures (SOP), training, safety meetings, and oversight committees fall into this category as well.

**Safety Policy/Program**

The University’s safety policies and programs that the researcher/laboratory employee must be in compliance with include the Hazardous Materials Management Program, Chemical Hygiene Plan, Radiation Safety Program, Bloodborne Pathogens, and Biosafety in Microbiological and Biomedical Laboratories (BMBL). These are available on-line at:

[http://adminopsnet.usc.edu/department/environmental-health-safety](http://adminopsnet.usc.edu/department/environmental-health-safety)

**Safety Training**

Initial safety training is available to all laboratory staff, visiting scholars, and volunteers and provided by Environmental Health and Safety. These are the: Laboratory Safety Orientation, Radiation Safety Class, and Bloodborne Pathogens (BBP). Additional instruction will come from the Principal Investigator, Lab Manager, or Designee in the form of: Annual Lab Refresher Training, BBP Refresher, Standard Operating Procedure training, or other specific training. NOTE: It is important for

---

**Engineered Sharps Guide for Retractable Needles**

**1 - Aspiration**

Draw up medication in accordance with established protocol.

**2 - Injection**

Administer medication in accordance with established protocol, making sure that all medication has been dispensed.

**3 - Activation**

Push plunger rod to activate the safety mechanism.

* Activation can occur before or after the needle is withdrawn from the patient or research animal.

**4 - Needle Retraction**

Depress the plunger until the needle disappears into the syringe.

**5 - Disposal**

Discard immediately in nearest sharps container.

Source: Becton, Dickinson and Company [www.bd.com](http://www.bd.com)
Chapter III. Controlling Laboratory Hazards

the Instructor to document the date, subject matter, and attendance of employees.

An example of where specific training of lab personnel is crucial is the operation of high-speed centrifuge and ultracentrifuge units. Mechanical stress, improper loading, and improper balancing of rotors can result in rotor failure. See photo below.

The above photo shows a Beckman L2-65B ultracentrifuge that failed during use. Flying metal fragments damaged walls, the ceiling and other equipment and the shock wave blew out the laboratory’s windows and knocked down shelves.

To avoid injury or death and catastrophic damage, operators must be trained in (a) proper operating procedures specific to the unit, (b) selection, care, and use of rotors, and (c) maintenance of a comprehensive use log for each rotor.

Safety Meeting

The safety meeting provides a forum for the research staff to discuss new or recurrent safety issues that plague the laboratory, office, or storage spaces. It is important to document the safety meeting by maintaining a log with the date of the meeting, names of the attendees, topics discussed, and actions taken. The safety meeting log is available at:

http://adminopsnet.usc.edu/sites/default/files/all_departments/EHS/IIPPAppendixBSafetyMeetingLog.pdf

Safety Inspection

Periodic self-inspection of laboratory and hazardous materials storage spaces is another proactive safety measure that reduces occupational and regulatory exposure. Research groups are encouraged to conduct them. NOTE: High hazard areas are inspected by EH&S biannually; all others are inspected annually.

Oversight Committee

Oversight committees review research protocols submitted by each Principal Investigator to ensure compliance with University policy and state and federal laws. The committees are summarized below.

Animal Care and Use Committee (IACUC) - The IACUC reviews and approves research that includes live vertebrate animals.

http://www.usc.edu/hsc/dar/iacuc

Institutional Biosafety Committee (IBC) - The IBC is responsible for approving research that involves infectious agents, human and non-human primate material (including
established cell lines), regulated carcinogens, recombinant DNA, human gene transfer, CDC select agents, carcinogenic/highly toxic materials and chemical precursors.

http://adminopsnet.usc.edu/node/192

Institutional Review Board (IRB) - The IRB reviews and approves all studies involving human subjects.

http://www.usc.edu/admin/provost/oprs

Radioactive Drug Research Committee (RDRC) - The RDRC reviews and approves the human use of radioactive drugs that have not been approved by the FDA.

Radiation Safety Committee (RSC) - The RSC is responsible for approving all uses of radioactive materials and radiation producing equipment.

http://adminopsnet.usc.edu/department/environmental-health-safety/radiation-safety-committee

Personal Protective Equipment

The third control or line of defense for the lab worker is personal protective equipment (PPE). Proper selection of PPE is crucial since one type of PPE will not work with all types of hazards.

The SDS for a particular hazardous material will usually cite general PPE requirements. Information on PPE compatibility with certain chemicals and/or breakthrough times may be found in some cases at the manufacturer’s web site. Always check that the PPE is in good condition before wearing it.

Eye and Face Protection

Eye and face protection consists of American National Standards Institute (ANSI) approved:

- Safety glasses
- Safety goggles
- Face shields; used as supplemental equipment with safety glasses or goggles

Skin and Body Protection

- 100% cotton, Flame Resistant (FR) Laboratory coats
- Nomex® Laboratory coats
- Long pants
- Loose, long-sleeved shirt
- Closed-toe shoes; steel-toe work boots are ideal
- Aprons (as necessary)

Hand Protection

- Thermal (hot and cryogenic work)
- Sharps
- Small animals
- Chemical
- Bulk chemical
- Biological

Avoid using the following apparel when working in the laboratory:

- Open-toe shoes (e.g. sandals, huaraches, flip-flops, etc.)
- Open-back shoes (e.g. mules, clogs)
- Skirts/dresses
- Shorts
- Tight-fitting clothes
- Polyester shirt
On August 4, 1996, Dr. Karen Wetterhahn, a senior researcher at Dartmouth College, was performing an experiment and transferred dimethylmercury from one container to another. A drop or two of the dense liquid fell onto her latex glove near her thumb. She completed one more step and removed her glove and washed her hands afterwards.

Five months later, her gait began to falter and her words slurred. Tests showed that her body contained more than 80 times the lethal dose of mercury. Her vision narrowed to a pencil’s thinness and winked out; she lost her hearing and speech; and she died in June 1997.

Unfortunately, the hazards of dimethylmercury were not fully understood in 1996, but most chemicals used at USC have extensive information available.

DISCUSSION

What crucial factor did Dr. Wetterhahn not know when handling this deadly toxic agent?

What have you learned from this incident?

What is USC’s policy concerning Personal Protective Equipment?
Assignment 3.1

Go to the following website and select the recommended gloves for the following hazardous materials.

http://www.showabestglove.com/site/default.aspx

A. Aromatic Solvents

B. Blood Drawing

C. Cold Environment

D. Caustics

E. Acids

Assignment 3.2

For the following two questions refer to the Chemical Safety section of USC’s Hazardous Materials Management Program at:

http://adminopsnet.usc.edu/node/5484

A. List 5 considerations in the proper storage of chemicals in your laboratory.

B. How many times a year are fume hoods inspected and certified by EH&S?
Assignment 3.3

For the following questions, refer to the USC Hazardous Materials Management Program at the following website:

http://adminopsnet.usc.edu/node/5484

A. List 5 precautions to take before starting an experiment that involves handling hazardous

B. Proper use of a fume hood includes all of the following except:
   a. Keep the sash at or below the height marked on the label
   b. Keep the hood clean and uncluttered.
   c. Execute laboratory procedures as close to the front of the hood as possible.
   d. Wear safety glasses with side shields or goggles.

Assignment 3.4

What is the Administrative Operations website address for requesting hazardous waste pick ups? Hint: Check the Environmental Health & Safety (EH&S) website.
Inventory Management and Storage

There are several important components to a complete inventory management system. They are:

- Security of chemicals, radioactive materials, biological agents, drugs, and research animals.
- An accurate chemical, biohazardous agents, and radioactive materials inventory. NOTE: Researchers are required to maintain an accurate chemical and radioisotope inventory. Researchers may input their chemical inventory initially and then update it annually or when significant changes in chemical volume or type occur.
- Proper segregation and storage of all materials.
- Labeling of all materials with expiration dates, as necessary
- Disposal of unwanted, expired, or suspect materials.
- Regular checks of container integrity. Ensure that container lids and caps are attached and secured.
- Maintaining only materials needed.
- Good housekeeping of storage areas

In addition to the above, every effort must be made to keep quantities of hazardous materials to a minimum.

Safe Storage of Chemicals

All chemicals on site must be first segregated into their organic and inorganic families (Prudent Practices in the Laboratory  http://www.nap.edu/openbook.php?isbn=0309052297). Once that is accomplished, they may then be segregated based on their hazard classes, namely, flammables, corrosives, reactives, and toxics. Note, however, that incompatibilities may exist within the same hazard class and, hence, those chemicals must be stored away from each other. Acids and bases are an example.

Refer to the chart illustrated on page 34 for hazardous materials storage compatibilities (and incompatibilities).

Flammable/Combustibles

Use approved flammable storage cabinets to store these materials and isolate from other hazard classes. If low temperature storage is necessary, place in explosion-proof refrigerators or freezers.

Flammable/combustible liquids storage rooms must comply with stringent UFC, NFPA, and municipal building codes (e.g. installation of a fire suppression system and proper ventilation to remove vapors that may arise from container leaks or spills) in order to store sizeable volumes.

Ensure that accidental contact with incompatible agents is not possible and that sources of ignition are removed.
### Water-Reactives

Water-reactive chemicals may produce flammable or corrosive gases when combined with water. Such exothermic reactions may generate enough heat to ignite any flammable gas evolved.

Do not store water-reactive materials in areas where accidental contact with water is possible, for instance, under sinks or next to water pipes.

### Corrosives

Corrosive chemicals are typically mineral and organic acids, bases, dehydrating agents, and certain oxidizers. To be earthquake safe and prevent corrosion of metal cabinets from leaking bottles, place all corrosive liquids in a HDPE tub.

Corrosives may also be stored in special corrosives cabinets equipped with a polyethylene spill catcher.

NOTE: Store acids separately from bases.

### Highly Toxic Chemicals

Highly toxic chemicals must be stored in areas where ventilation is adequate particularly if the material has a high vapor pressure or is a gas.
Chapter IV. Storage and Disposal

Storage containers and work areas must carry an appropriate warning label such as the DOT placard to the left.

Usage of highly toxic chemicals in the work area must be restricted to very small, workable quantities to safeguard against the threat of deadly exposure.

Compressed Gases

Compressed gases that are corrosive, toxic, flammable, or reactive must be segregated from each other by a minimum of 20 feet if not stored in a ventilated gas cabinet. Dissimilar materials stored in separate, ventilated gas cabinets may be stored side by side.

Each gas cylinder must be restrained individually by two non-combustible straps, metal cable, or metal chain and secured to a wall or immobile structure.
EPA seeks $171,050 from Plymouth State University, Plymouth, NH for Hazardous Waste Violations

For Immediate Release March 3, 2005; Press Release #sr050301

The U.S. Environmental Protection Agency announced today that it has proposed a $171,050 penalty against Plymouth State University, in Plymouth, NH for violations of hazardous waste laws. The proposed penalty stems from violations found during an EPA inspection at the college’s campus in June 2003.

According to the complaint, the university violated both state and federal hazardous waste requirements. Specifically, EPA claims that the University failed to:

- Make hazardous waste determinations;
- Properly store hazardous waste;
- Maintain spill and fire control equipment;
- Post “no smoking” signs;
- Post emergency telephone numbers and locations of emergency equipment;
- Keep hazardous waste containers closed;
- Mark hazardous waste containers with accumulation dates and other important information; and
- Conduct inspections of hazardous waste storage areas.

“Plymouth State failed to follow basic hazardous waste regulations and put its students and employees at risk,” said Robert W. Varney, regional administrator of EPA’s New England Office. “The public and the environment will be safer when all schools are in compliance with our nation’s environmental laws.”

This action is the latest of numerous enforcement actions EPA’s New England Office has filed against colleges and universities as part of its College and University Initiative. Launched in 1999, the initiative has also included enforcement actions against Boston University, the Massachusetts Institute of Technology and the University of Massachusetts-Amherst, as well as other colleges and universities in the region.
Storage of Infectious or Potentially Infectious Agents

Biological agents that can metastasize infection in humans must be stored in a safe manner to eliminate the possibility of exposure. This is accomplished by:

- Storing materials in approved, cabinets or refrigerators in a secure laboratory.
- Using a container-within-a-container for double protection
- Using warning signs on storage and work areas.

Some chemicals may become unstable and dangerous if stored over a long period of time.

Transporting Hazardous Materials

Transporting hazardous materials is strictly regulated by the Department of Transportation (DOT) and is subject to rigid requirements. To transport or ship hazardous materials (for instance, samples, specimens, products, new materials, articles, or equipment) to domestic or international locations must be first reviewed and approved by EH&S. A hazardous materials declaration (shipment of hazardous goods) must be signed by an authorized representative of EH&S and must accompany the material to be shipped.

Waste Disposal

Responsibility of Waste Generator

Researchers that generate hazardous waste are responsible for the proper handling, containment, and storage of such wastes in accordance with all regulatory requirements. Every researcher is required to follow USC protocol for waste management and is empowered to
Procedural elements are listed below:

- Select less toxic or green chemicals to reduce employee exposure and environmental impact.
- Properly identify, segregate and collect all waste products.
- Ensure that all hazardous waste is properly labeled.
- Ensure that different waste streams are not mixed together.
- Notify EH&S for collection and disposal.

Waste Segregation

Proper segregation of hazardous waste is one of the most common sources of violation imposed by regulatory agencies.

There are four major categories of waste generated at USC:

- Hazardous wastes must be segregated by physical form.
- Hazardous wastes that are incompatible must be segregated from each other.
- Waste streams may be treated or disposed of differently and require segregation at the point of generation.

Each waste class has its own unique requirements for segregation, but these issues are common to all classes.

Chemical Waste

Chemical waste is typically channeled into the streams described below:

1. Flammable/combustible solvents e.g. acetone, xylene, methanol;
2. Halogenated solvents e.g. chloroform, methylene chloride;
3. Nitrogenous hydrocarbon e.g. trimethylamine, diisopropylamine;
4. Sulfurous hydrocarbon e.g. dimethylsulfoxide, dimethylsulfate;
5. Corrosives. A separate stream must be started for each of the following:
   a. Mineral acids e.g. hydrochloric acid, sulfuric acid
   b. Organic acids e.g. trichloroacetic acid, formic acid
   c. Bases e.g. calcium oxide, sodium hydroxide
6. Aqueous solutions e.g. metal salts, ethidium bromide; and
7. Oils e.g. vacuum pump oil, motor oil.

Refer to the Containers for Waste Disposal diagram at the end of the chapter for selecting the proper waste container. Refer to the brochure for proper waste disposal procedures.

**Labeling and Documentation**

Each container must be labeled using hazardous waste labels or tags. Attach the label or tag to the container as soon as it is used for collection. Record the starting date when the first waste is placed in the container, listing the components by name. Do not use structural formulas or abbreviations.

Fill out a Chemical Waste Disposal Form (see below). It must accompany all chemical waste containers.

The form is available at: http://adminopsnet.usc.edu/department/environmental-health-safety/request-hazmat-pick

As a steward of the environment, USC is responsible for hazardous materials from the time of receipt through the time of treatment and disposal. This is referred to as cradle-to-grave management. The university is liable for waste long after it is sent off for disposal.

It is imperative that the researcher properly identify, characterize, and quantify his/her waste. Unlabeled waste (or unknowns) is costly to the university both in terms of disposal operations and liability.

**Bio-Medical Waste**

Biological waste contains pathogens with sufficient virulence and quantity that exposure to this waste could result in an infectious disease. The types of biohazardous waste include:

- Solids
- Liquid waste
- Sharps
- Outdated pharmaceuticals
- Chemotherapeutic waste
- Pathological waste
- Contaminated glass

Any waste that appears to be biological is considered medical waste and should be disposed of in an appropriate manner.
Universal Waste

In 2001, the California Department of Toxic Substances Control enacted emergency regulations that classified computer monitors and televisions as hazardous waste and disposal of these items into landfills was immediately banned.

Hazardous materials such as lead, mercury, hexavalent chromium are found in circuit boards, batteries, and cathode ray tubes (CRTs). A typical TV or CRT monitor may contain 4 pounds of lead.

The term “universal waste” is applied to consumer products and business equipment that are near or at the end of their useful life.

Universal waste includes:

- Computers and computer monitors
- Old laboratory equipment
- Batteries
- Copy toner cartridges
- Light bulbs
- Old office equipment

USC is committed to collect and manage e-waste in an efficient and environmentally responsible manner.
**GROUP EXERCISE**

Determine which type of waste container the following hazardous waste would be placed in.

1. Syringe with residual saline
2. Nitrile gloves with HIV-contaminated blood
3. Plastic pipettes with cell culture
4. Plastic pipette tips with phenol
5. Acrylamide gel with ethidium bromide
6. Radioactive animal carcass
7. Broken glass pharmaceutical ampule
8. 10% acid bath
9. Uncontaminated broken beaker
10. Specimens in formaldehyde

What type of waste do you put in bleach solution?

How often should you dispose of it?

[http://adminopsnet.usc.edu/sites/default/files/all_departments/EHS/wastecontainerflowchartver2.png](http://adminopsnet.usc.edu/sites/default/files/all_departments/EHS/wastecontainerflowchartver2.png)
**Chapter IV. Storage and Disposal**

---

**CHEMICAL**

- NEEDLE
- Razor blades, scalpels
- Microscope slides
- Glass pipettes
- Dental wires
- Glass Pasteur pipettes
- Blood vials (glass Vacutainer tubes)
- Live or attenuated vaccines
- Gloves and other Personal Protective Equipment worn while working with biohazardous material or animals

**Liquid:**
- Aqueous solutions containing toxic metals
- Concentrated acidic solutions (place in thick glass or plastic containers)
- Concentrated alkaline solutions (place in plastic containers)
- Mercury
- Ag salts (recycled)
- Used vacuum pump oil (recycled)

**Gross solid:**
- Silica and alumina gels

**Solid:**
- Contaminated PPE
- Kimwipes
- Chemicals no longer needed or wanted may remain in their original containers

**Recycle:**
- Organic solvents
- Halogenated organic solvents

---

**CHEMOTHERAPY**

- Outdated and/or empty vials, broken ampoules, etc.

---

**PATHOLOGICAL**

- Organs, tissues, and body parts removed by trauma, surgery, autopsy, or other medical procedure
- Animal carcasses contaminated with infectious materials
- Place materials in leak-proof bag

---

**SHARPS**

- Needles
- Razor blades, scalpels
- Microscope slides
- Glass pipettes
- Dental wires
- Glass Pasteur pipettes
- Blood vials (glass Vacutainer tubes)
- Any contaminated material which can puncture or penetrate the skin or a Red Bag

---

**BIOMEDICAL**

**Solid Material:**
- Contaminated with human/animal fluids/blood or other biohazards e.g. gauze, paper towels, plastic-backed absorbents or bench coat, etc.
- Petri dishes
- Plastic pipettes
- Plastic pipette tips
- Plastic Vacutainer tubes
- Culture vials
- Live or attenuated vaccines
- Gloves and other Personal Protective Equipment worn while working with biohazardous material or animals

**Tabletop container:**
- All items may be placed in small tabletop container, EXCEPT serological pipets.
- Place smaller waste bags into larger biohazardous waste can
- Do not overfill! NO SHARPS!

**Liquids:**
- Decontaminate by an approved method (e.g. 10% bleach, 20 minute contact time), dispose down sink

---

**CLEAN GLASS**

- Intact or broken glass NOT CONTAMINATED with chemical or biological agents
- Rinse 3 times and deface label before disposal
- Use heavy, puncture-resistant cardboard lined with plastic bag

**CONTAMINATED GLASS**

- Glass contaminated with chemicals only
- Use HDPE container or heavy, puncture-resistant cardboard lined with plastic bag
- Label box “Contaminated Glass”
- No microscope slides

---

Request a hazardous materials pick-up on-line:

http://adminopsnet.usc.edu/node/322

---

© 2007-2015 USC – design by A. Bouziane

Revised 1-12-2015
## USC Biohazardous Waste Disposal Procedures

<table>
<thead>
<tr>
<th>SOLID WASTE</th>
<th>SHARPS</th>
<th>PATHOLOGICAL</th>
<th>PHARMACEUTICAL</th>
<th>CLEAN ITEMS</th>
</tr>
</thead>
</table>
| **Common Examples of Material** | All contaminated gloves, kim wipes, absorbents, petri dishes, gauze, culture vials, plastic pipettes and plastic pipette tips, plastic vacutainers, stocks, lab equipment | All needles, syringes, blades, scalpels, razors, root canal files, glass pipettes, glass vacutainers, capillary tubes, slides & cover slips, contaminated broken glassware | • Animal carcasses suspected to be potentially infected  
• Recognizable human tissue, organs & body parts | • Pharmaceuticals or over the counter human or animal medication including vaccines, antigens, serums, and anti-toxins.  
• Expired Pharmaceuticals  
• Empty vials  
• Broken ampoules | • Non-contaminated glass, plastic items with a sharp end that may puncture a regular trash bag (i.e. plastic pipette tips, serological pipettes)  
• NO RAD, CHEM, or BIO contaminated items |
| **Container** | **Biohazardous Waste Container**  
• EH&S will provide  
• Puncture-proof, leak-proof container  
• Line with a red biohazard bag  
• Lids snapped on at all times  
• Label with: “BIOHAZARD” stickers on all visible sides | **Sharps Container**  
• EH&S will provide  
• Rigid, puncture-proof, and leak-proof container  
• Label with: “BIOHAZARD SHARPS” sticker | **Pathological Waste Container**  
• EH&S will provide  
• Puncture-proof, leak-proof container  
• Label with: “BIOHAZARD” and “PATHOLOGICAL WASTE” stickers | **Pharmaceutical Waste Container**  
• EH&S will provide  
• Blue and white  
• Label with: “PHARMACEUTICAL WASTE, FOR INCINERATION ONLY” stickers | **Clean Glass Cardboard Box**  
• Lab must supply  
• Cardboard box lined with plastic, labeled “CLEAN GLASS” |
| **Disposal** | • Keep container clean at all times  
• Do not remove red bag from container  
• Contact EH&S for pickup when full | • Seal the sharps container when the “Full Line” is reached  
• Contact EH&S for pickup when full | • Contact EH&S for pickup when full | • Seal the blue and white pharmaceutical container when the “Full Line” is reached, or  
• Contact EH&S for pickup when full | • Before it gets heavy or when full, tape shut and place next to regular trash for pick up by janitor  
• If container gets wet or damaged, encase in plastic bag and a larger box. |

Contact EH&S for biohazardous waste containers or pickups: [http://adminopsnet.usc.edu/node/322](http://adminopsnet.usc.edu/node/322) Updated 3.11.2013
Safety Equipment

Laboratories have a variety of safety equipment that may be employed to reduce hazardous exposure and manage an emergency. Know how to use the equipment properly and its location in the laboratory, building, etc. This equipment includes safety showers, eyewash fountains, fire extinguishers and automated fire sprinkler systems, first aid kits, and spill clean up kits.

Each building has posted evacuation routes and it is very important to become familiar with them.

General Information

In the event of an emergency, follow established procedures. When helping another person, evaluate the potential danger to yourself before taking action. When an emergency occurs, the following actions are recommended:

- Report the nature and location of the emergency to the acting supervisor, EH&S, and the Department of Public Safety, as necessary.
- Inform others in the area of the emergency.
- Do not move injured persons unless they are in immediate danger from chemical exposure or fire.
- Have someone meet emergency response personnel to direct them to the location of the emergency.

Fires

Fires can be prevented and their severity considerably reduced by good housekeeping and thoughtful reflection on current actions. This includes: prompt removal of waste; separation of flammable liquids from combustible material such as cardboard boxes and paper towels; limited storage quantities of flammable chemicals; and, maintaining aisles and exits free of obstructions.

How to Respond to a Fire

A fire requires three components to exist. These components include oxygen, a fuel source, and heat.

![Fire Triangle](image)

When a fire occurs, the following actions are recommended:

- A fire contained in a small vessel can usually be suffocated by covering the vessel. Do not pick up the vessel. Do not cover it with combustible materials.
- If the fire starts inside a fume hood, close the hood sash if possible and move away.
- If the fire is burning over an area too large to be suffocated quickly and simply, all persons should evacuate to their designated...
meeting area. Do not use elevators to leave the building; use the stairs.

- Activate the fire alarm. Notify co-workers and DPS.
- If you have been trained to use a fire extinguisher and are comfortable using it, fight the fire from a position that allows you a safe emergency exit.
- Once outside the building, report to DPS and the responding fire fighters the nature of the fire i.e. whether it started from experimental processes, an electrical short, etc. Also, provide a chemical inventory if possible.

**How to Use a Fire Extinguisher**

Fire extinguishers work by removing one or more components of the fire triangle and are classified based on the type of fire they can arrest. These are discussed below.

Class A - Wood, paper, cloth, trash, plastics

Class B – Flammable liquids and gases: gasoline, oil, grease, acetone

Class C - Electrical: energized electrical equipment

Class D - Reactives metals

Combination ABC fire extinguishers (dry chemical) are most commonly found in USC buildings and usually located near the entrances of rooms/laboratories. Ensure that the extinguisher is compatible with the type of fire.

Never attempt to use a fire extinguisher to extinguish a large or rapidly spreading fire.

The PASS procedure is employed when operating a fire extinguisher. Remember that fire extinguishers generally only last around 30 seconds.

**NOTE**: Never re-hang a spent fire extinguisher back on the wall.
Injuries from a Fire

If a person’s clothing is on fire, get them to **stop, drop, and roll** to extinguish the fire.

Once the fire is extinguished, clothing contaminated with hazardous materials should be removed. To prevent contamination of the eyes, use caution when removing pullover shirts or sweaters. However, do not attempt to remove clothing that has adhered to burn wounds.

Exposure and Contamination

**Chemical Exposure**

If exposed to a harmful chemical (or chemicals), immediately seek the nearest eyewash/shower station and flush exposed areas with flowing water for no less than 15 minutes. Remove all contaminated clothing, shoes, and jewelry so that it is no longer in contact with exposed skin. Continue flushing with copious amounts of water. Do not use creams, lotions, or salves to treat exposed areas.

Review the MSDS of the material for health effects due to exposure. Report the incident to the acting supervisor and seek medical attention.

For splashes to the eyes, immediately flush with water from an eyewash fountain for at least 15 minutes. Hold the eyelids open and away from the eyeball. Move the eye up and down and side to side to wash thoroughly around the eye.

Earthquake

Whenever an earthquake occurs, it is important to stay calm and remember to drop, cover, and hold on.

Take shelter under a sturdy table or near an interior wall away from windows and heavy objects. Do not stand in a doorway. The door will swing during the shaking and strike you.

If outside, move to an open area away from buildings.
Biohazard Exposure

Wash the exposed area with soap and water. Do not scrub the area. Do not use bleach.

Flush mucous membranes (eyes, mouth) with water or saline for a minimum of 15 minutes.

Reporting Injuries

Any USC employee who sustains a job-related injury while performing work must report the injury immediately to their acting supervisor. The supervisor must then fill out and submit a Supervisor’s Report of Incident to USC’s Workers’ Compensation Office. A copy must be retained in the home department.

A Workers’ Compensation form must be completed by the injured party or their representative and submitted to the Workers’ Compensation Office within 24 hours of the date of injury to activate worker coverage.

All forms regarding Workers’ Compensation can be obtained at the following website:

http://benefits.usc.edu/timeoff/workers-comp/

Medical attention for WC-related incidents is available at:

- USC Department of Internal Medicine
  Health Care Consultation II
  1520 San Pablo Street
  (323) 442-5100

- Engemann Student Health Center
  University Park Campus
  1031 West 34th St, 1st Floor
  (213) 740-9355

If the incident occurs before or after business hours, contact USC’s Department of Public Safety (DPS) for transport to off-campus medical facilities that USC has contracted with to treat such emergencies.

Warn others of emergencies.

Contain spills.

Notify EH&S and/or DPS immediately.

Evacuate the area when necessary.

Chemical Exposure Monitoring

Workers that may have potential exposure to airborne hazardous materials due to the nature of their work, are candidates for personal air monitoring to determine exposure levels. If the level is above regulatory
limits, control measures are established to lower exposures below ACGIH TLV’s.

EH&S will provide an evaluation upon request and will assist the employee/department in developing plans to control exposure.

To request chemical exposure monitoring, go to:

http://adminopsnet.usc.edu/node/321

**Hazardous Materials Spills**

In the event of a spill, notify everyone in the laboratory. Small spills may be addressed by laboratory personnel if effective spill kits are available. Large spills (2 or more liters) may require evacuation of the area. If evacuating, ensure that the lab is locked. Post caution signs if possible and/or deny entry.

**Chemical Spills**

Refer to the MSDS to obtain clean-up procedures and instructions. Ensure that a chemical spill kit is available. Always wear appropriate protective clothing including safety glasses or goggles.

Prevent the spill from spreading and contaminating a larger area by applying absorbent material or dikes.

Use a dustpan and brush to sweep up any absorbed material or contaminated broken glass.

Place all absorbent material, gloves, paper towels, etc. contaminated with hazardous chemicals in a Ziploc bag. Apply a hazardous waste label to the bag and list the contaminants.

NOTE: Absorbent material that is saturated with flammable liquid still presents a fire hazard.

Contact DPS and/or EH&S if the spill is large. Shut down all equipment before exiting if possible. Leave the area until decontamination is completed by EH&S and re-entry is authorized.

**Chemical Spill Kit**

Below is a list of recommended items for a chemical spill kit:

1. Neutralizers. 2% hydrochloric acid for caustic spills and sodium bicarbonate for acid spills;

2. pH paper;

3. Absorbents. pillows, sheets and pads, Super Fine, cat litter, vermiculite;
4. Chelating agents;

5. Residue management:
   a. whisk broom or hand-held brush
   b. plastic dust pan
   c. large, sealable plastic bags
   d. 5-gallon plastic drum liners
   e. 5-gallon waste disposal container with lid; and

6. Personal protective equipment (PPE):
   a. chemical splash goggles
   b. gloves
   c. aprons
   d. close-toed shoes

   Allow disinfectant to act for a minimum of 15 minutes then pick up and discard spill and absorbent materials in a biohazard waste bag.

   Clean and disinfect residual area using disinfectant-soaked paper towels.
   Place disposable PPE and towels in a biohazard waste container.

   Decontaminate reusable PPE such as utility gloves, goggles and tongs

   A larger spill is a release of blood or OPIM which is not readily confined, such as a splatter over a large area, or consisting of quantities larger than the small spill as identified above, such as a unit of blood.

   Notify EH&S during business hours or as soon as possible. Use a blood spill kit to clean up and decontaminate area. Follow procedures for a small spill.

**Biological/Medical Spills**

A small spill is a release of blood or OPIM which is confined to a small area. The quantity is approximately that of a small specimen container, test tube, or syringe. Wear appropriate PPE (goggles, gloves, gown/lab coat) prior to clean-up. Assemble absorbent material, biohazard waste container, and disinfectant solution.

Place absorbent material on spill. (paper towel, gauze pads, etc) and cover with disinfectant solution. Start from the outer edge of the spill and allow disinfectant to flow inward.
TROJANSALENDAR is an alert system that allows University Officials to contact you during an emergency by sending text messages to your: E-mail account (school, home, office, etc); Cell phone, pager; Smart Phones and handheld devices; and Land Lines. You may register your cellular device at:

https://trojansalert.usc.edu

For campus-wide emergencies, call 213.740.9233 or go to:
http://emergency.usc.edu

Fire Safety and Emergency Planning:
http://adminopsnet.usc.edu/department/fire-safety-and-emergency-planning

Hazardous Waste pick-up:
http://adminopsnet.usc.edu/node/322

Department of Animal Resources and Institutional Animal Care and Use Committee (IACUC)
http://www.usc.edu/hsc/dar/iacuc/

<table>
<thead>
<tr>
<th>University Park Campus</th>
<th>Health Science Campus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Public Safety (DPS)</td>
<td>Department of Public Safety (DPS)</td>
</tr>
<tr>
<td>(213) 740-4321</td>
<td>(323) 442-1000</td>
</tr>
<tr>
<td>Environmental Health &amp; Safety</td>
<td>Environmental Health &amp; Safety</td>
</tr>
<tr>
<td>(323) 442-2200</td>
<td>(323) 442-2200</td>
</tr>
<tr>
<td>Hazardous Materials Spill</td>
<td>Hazardous Materials Spill</td>
</tr>
<tr>
<td>(213) 740-4321</td>
<td>(323) 442-1000</td>
</tr>
<tr>
<td>Radioactive Materials Information</td>
<td>Radioactive Materials Information</td>
</tr>
<tr>
<td>(323) 442-2200, Press “3”</td>
<td>(323) 442-2200, Press “3”</td>
</tr>
</tbody>
</table>