

## Laboratory Safety Policy

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### POLICY STATEMENT

This Policy establishes the University's standards for ensuring a safe laboratory work environment, in accordance with applicable federal and state regulations. The Policy includes uniform procedures to help ensure that all University laboratories meet these safety standards and that individuals who work, teach, or learn in these areas are equipped to help prevent or deal with unsafe conditions.

Departments may establish more restrictive rules and regulations than those contained in this Policy.

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## **REASON FOR POLICY**

This Policy is intended to satisfy the Cal/OSHA requirements set forth in Title 8, Section 5191 of the California Code of Regulation. The Policy also is intended to provide guidance to employees on safe laboratory procedures in order to minimize laboratory incidents.

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## **WHO SHOULD READ THIS POLICY**

Any employee who is responsible for working with hazardous materials in a laboratory; the members of the Leadership Team, as well as individuals who supervise an employee with such responsibilities.

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## **POLICY TEXT**

In order to create the safest possible laboratory workplace, employees are responsible for reading the Chemical Hygiene Plan included in [Appendix A](#). Departments shall ensure that all laboratory personnel (e.g., Teaching Assistants, Adjunct Professors, Researchers, and Undergraduate Stock Room employees) have read the Chemical Hygiene Plan and signed a copy of the Chemical Hygiene Plan Flipchart.

The Chemical Hygiene Plan shall be reviewed annually and updated accordingly. If there are significant changes to the Plan, departments must document that employees have read the revised Chemical Hygiene Plan.

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## **PROCEDURES**

### **Authorization**

A request for an exception to this Policy must be submitted in advance to the Provost and Vice President for Academic Affairs for review and approval. The written request must describe the extenuating circumstances or other safety reasons necessitating the exception.

### **Chemical Hygiene Plan Flipchart**

A Chemical Hygiene Plan Flipchart (truncated version) with all applicable safety information, including emergency contacts and procedures, should be posted in each University laboratory. In addition, all laboratory employees shall sign a copy of the Chemical Hygiene Flipchart.

### **Violations**

A violation of any portion of this Policy may result in disciplinary action, up to and including termination of employment and/or legal action.

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## RELATED INFORMATION

Type	Name	URL
USF	Chemical Hygiene Plan	<a href="http://myusf.usfca.edu/arts-sciences/lab-safety">http://myusf.usfca.edu/arts-sciences/lab-safety</a>
External	Cal/OSHA Title 8, CCR Sec.5191	<a href="https://www.dir.ca.gov/title8/5191.html">https://www.dir.ca.gov/title8/5191.html</a>

## DEFINITIONS

Term	Definition
<b>Chemical Hygiene Plan</b>	A written plan required of laboratories that meet certain criteria; establishes safety standards for workers exposed to hazardous chemicals; used to implement control measures, training, and other protective measures.

## CONTACTS

Subject	Contact	Phone Number	E-mail or URL
Lab Safety Manager	Craig Conforti	415-422-6687	<a href="mailto:caconforti@usfca.edu">caconforti@usfca.edu</a>
Health and Safety	Joe Murphy	415-422-6464	<a href="mailto:murphyj@usfca.edu">murphyj@usfca.edu</a>

## FORMS

Form	Use	URL
(None)		

## RESPONSIBILITIES

### Employees

- Responsible for reading, understanding, and complying with the University's Chemical Hygiene Plan.
- Responsible for signing a copy of the Chemical Hygiene Plan Flipchart.

### **Departments**

- Responsible for ensuring that laboratory employees have read the Chemical Hygiene Plan / Chemical Hygiene Plan Flipchart and signed the Chemical Hygiene Plan Flipchart.
- Responsible for ensuring that department employees are in compliance with this Policy.

### **Dean, College of Arts and Sciences**

- Ensures that the Chemical Hygiene Plan is made available to all affected employees.
- Responsible for annual review and update, as needed, of the Chemical Hygiene Plan.

### **Provost and Vice President for Academic Affairs**

- Reviews and approves, as appropriate, requests for an exception to the requirements included in this Policy.

### **President, Vice Presidents, Vice Provosts, and Deans**

- Ensures that the Chemical Hygiene Plan is made available to all laboratory employees in his or her division.
- Ensures that such employees are in compliance with this Policy.

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## **REVISION HISTORY**

09/19/2014	First publication of Policy.
01/20/2016	Updated web links and added Chemical Segregation Section in Appendix A

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## **APPENDICES**

<a href="#">Appendix A</a>	Chemical Hygiene Plan
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# CHEMICAL HYGIENE PLAN

## University of San Francisco

Updated 1/20/2016

Cal/OSHA ([Title 8 CCR Sec. 5191](#)) requires that all laboratories have a written Chemical Hygiene Plan as a fundamental chemical safety plan for the laboratory. All University of San Francisco laboratory personnel who work with laboratory chemicals must know and follow the guidance outlined in this online CHP. Every laboratory worker is responsible for following safe work practices. Practicing safe chemical hygiene protects you and other lab members.

**Contact Craig Conforti** ([caconforti@usfca.edu](mailto:caconforti@usfca.edu); 415-422-6687), the College of Arts and Sciences Lab Safety Manager, with any questions regarding the CHP or any lab safety issues.

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## Hazardous Chemicals/Materials

### Definitions of Hazardous Chemicals/Materials

**Hazardous chemical** means any chemical that is classified as a physical hazard or a health hazard, a simple asphyxiant, combustible dust, pyrophoric gas, or hazard not otherwise classified.

**Health hazard** means a chemical which is classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation;

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respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration hazard. The criteria for determining whether a chemical is classified as a health hazard are detailed in Appendix A to §1910.1200—Health Hazard Criteria.

[http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=10100](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10100)

Any substances that meet any of the following definitions are hazardous chemicals:

1. **Carcinogen:** Any substance that meets one of the following criteria:

(1) It is regulated by Cal/OSHA as a carcinogen <http://www.dir.ca.gov/title8/sb7g16a110.html> and <http://www.dir.ca.gov/title8/5209.html> ; or

(2) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (1985 edition); or

(3) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (Volumes 1-48 and Supplements 1-8); or

(4) It is listed as a carcinogen by California Proposition 65; or

(5) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

- A. After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m<sup>3</sup>;
- B. After repeated skin application of less than 300 mg/kg of body weight per week; or
- C. After oral dosages of less than 50 mg/kg of body weight per day.

2. **Corrosive:** A substance that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact. Common classes of corrosives include strong acids, strong bases, strong dehydrating agents and strong oxidizing agents.

3. **Flammable** (working with more than 1 liter): Any liquid having a flash point below 100 deg. F. (37.8 deg. C.), except any [mixture](#) having components with flash points of 100 deg. F. (37.8 deg. C.) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

4. **Highly toxic:** A substance falling within any of the following categories:

(a) A substance that has a median lethal dose (LD50) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

(b) A substance that has a median lethal dose (LD50) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.

(c) A substance that has a median lethal concentration (LC50) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by

continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

5. **Irritant:** A substance, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. A substance is a skin irritant if, when tested on the intact skin of albino rabbits by the methods of 16 CFR 1500.41 for 24 hours exposure or by other appropriate techniques, it results in an empirical score of five or more. A substance is an eye irritant if so determined under the procedure listed in 16 CFR 1500.42 or other appropriate techniques.

6. **Mutagen:** Chemicals that give rise to an increased occurrence of mutations in populations of cells and/or organisms. A *mutation* is defined as a permanent change in the amount or structure of the genetic material in a cell. The term *mutation* applies both to heritable genetic changes that may be manifested at the phenotypic level and to the underlying DNA modifications when known (including, for example, specific base pair changes and chromosomal translocations). The term *mutagenic* and *mutagen* will be used for agents giving rise to an increased occurrence of mutations in populations of cells and/or organisms. >

7. **Reactive** (any amount): Chemicals that react violently with water or air (also called pyrophoric).

8. **Reproductive toxins:** Chemicals that affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis). State of [California Prop 65 list of reproductive toxins](#) (and carcinogens).

9. **Sensitizer:** A substance that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the substance.

10. **Toxic.** A substance falling within any of the following categories:

(a) A substance that has a median lethal dose (LD50) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

(b) A substance that has a median lethal dose (LD50) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.

(c) A substance that has a median lethal concentration (LC50) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

Following is general hazard information:

Chemical Class	Physical and Health Hazards	Protective Measures
Acids	<ul style="list-style-type: none"><li>Acids are corrosive. Contact with skin or eyes may cause</li></ul>	<ul style="list-style-type: none"><li>Wear adequate Personal Protective Equipment (PPE)</li></ul>

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	<p>disfigurement or blindness.</p> <ul style="list-style-type: none"> <li>• Contact with bases may result in a violent reaction and generate heat, pressure, and toxic byproducts.</li> </ul>	<p>including eye and skin protection.</p> <ul style="list-style-type: none"> <li>• Store away from bases and below eye level.</li> <li>• Flush exposed skin or eyes with water for 15 minutes.</li> <li>• Seek medical help immediately.</li> </ul>
Bases	<ul style="list-style-type: none"> <li>• Bases are corrosive. Contact with skin or eyes may cause disfigurement or blindness.</li> <li>• Contact with acids may result in a violent reaction and generate heat, pressure, and toxic byproducts.</li> </ul>	<ul style="list-style-type: none"> <li>• Wear adequate PPE, including eye and skin protection.</li> <li>• Flush exposed skin or eyes with water for 15 minutes.</li> <li>• Seek medical help immediately.</li> </ul>
Carcinogens	<ul style="list-style-type: none"> <li>• Can cause cancer in humans or animals.</li> </ul>	<ul style="list-style-type: none"> <li>• Wear adequate PPE, including eye and skin protection.</li> <li>• Use appropriate engineering controls, such as fume hoods.</li> </ul>
Compressed Gases	<ul style="list-style-type: none"> <li>• High pressure release can result in injuries.</li> <li>• Damaged cylinders or regulators may vent or violently rupture.</li> </ul>	<ul style="list-style-type: none"> <li>• Secure gas cylinders in place, with two points of attachment.</li> <li>• Cap cylinders when not in use.</li> </ul>
Explosives	<ul style="list-style-type: none"> <li>• May violently explode if subjected to heat, shock, or other energy sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Notify Environmental Safety Office or the Lab Safety Manager when purchased.</li> <li>• Store in a secured area, limiting access to trained individuals only. Contact Joe Murphy (Environmental Safety) for special storage requirements.</li> <li>• Keep away from energy sources.</li> </ul>
Flammable Liquids	<ul style="list-style-type: none"> <li>• Liquid and/or vapors may burn or explode if exposed to an ignition source.</li> <li>• Contact with oxidizers may cause fire or explosion.</li> <li>• Vapors are usually toxic.</li> </ul>	<ul style="list-style-type: none"> <li>• Store in an approved flammable materials cabinet or a flame rated refrigerator.</li> <li>• Keep away from ignition sources and oxidizers.</li> <li>• Use appropriate engineering controls, such as fume hoods.</li> </ul>
Mutagens	<ul style="list-style-type: none"> <li>• Can cause mutations in humans</li> </ul>	<ul style="list-style-type: none"> <li>• Wear adequate PPE, including</li> </ul>



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	or animals.	<p>eye and skin protection.</p> <ul style="list-style-type: none"> <li>• Use appropriate engineering controls, such as fume hoods.</li> <li>• Establish a designated area for use of the material.</li> </ul>
Oxidizers	<ul style="list-style-type: none"> <li>• Contact with flammable or combustible material may cause fires, explosions, or violent reactions.</li> </ul>	<ul style="list-style-type: none"> <li>• Keep away from flammable or combustible materials.</li> </ul>
Poisons (Toxics)	<ul style="list-style-type: none"> <li>• Inhalation, skin contact, or ingestion can cause poisoning or local or systemic health effects.</li> </ul>	<ul style="list-style-type: none"> <li>• Wear adequate PPE, including skin and eye protection.</li> <li>• Use appropriate engineering controls, such as fume hoods.</li> <li>• Flush exposed skin or eyes with water and seek medical attention.</li> </ul>
Teratogens	<ul style="list-style-type: none"> <li>• Can cause birth defects if exposure occurs to pregnant women.</li> <li>• Inhalation, skin contact, or ingestion may cause other adverse health effects.</li> </ul>	<ul style="list-style-type: none"> <li>• Wear adequate PPE, including eye and skin protection.</li> <li>• Use appropriate engineering controls, such as fume hoods.</li> <li>• Establish a designated area for use of the material.</li> </ul>
Toxic Gases	<ul style="list-style-type: none"> <li>• Release of toxic gas into occupant breathing space may cause adverse health effects or death.</li> </ul>	<ul style="list-style-type: none"> <li>• Notify Environmental Safety Office or the Lab Safety Manager when purchased.</li> <li>• Only use in a fume hood.</li> </ul>

Comprehensive health and safety information about the chemicals present in the laboratory, such as exposure limits, physical and health hazards, signs and symptoms associated with overexposure, appropriate work practices, equipment for preventing exposure to hazardous chemicals, and proper storage and disposal of hazardous substances can be found at the following links:

- [Chemical Hazard Information](#)
- [Safety Data Sheets \(SDS\)](#) Contact the Environmental Safety Office for Password x6464
- [NIOSH Chemical Hazards Guide](#)
- [Permissible Exposure Limits](#)

If a new chemical is synthesized in the lab, to the best extent possible, all the same information and training is required as for any other hazardous material.

Contact the Environmental Safety Office when synthesizing new chemicals. (Joe Murphy, murphyj@usfca.edu, 415-422-6464).

## Controlling Exposures

### Consulting, Monitoring, and Inspections

The Environmental Safety office provides chemical exposure monitoring, laboratory safety consulting, and regulatory compliance inspections for all laboratories on campus. To schedule these services, contact Joe Murphy, murphyj@usfca.edu, 415-422-6464. Food and drink are prohibited in all teaching labs with hazardous materials present.

### Self-Assessment Program

Annual workplace inspections are required by each department's Injury and Illness Protection Program. Completing a Laboratory Self-Assessment Form fulfills this requirement. Assign individuals to correct any deficiencies and retain copies of the completed inspection forms in the laboratory in case of an inspection by a regulatory agency. A copy of this form should be given to the Lab Safety Manager in 404 Harney Science Center. The Laboratory assessment form can be found at <http://myusf.usfca.edu/arts-sciences/lab-safety>.

### Safety Data Sheets (SDSs)

SDSs (formerly called Material Safety Data Sheet or MSDS) can be obtained online at msdsonline.com (contact the Environmental Safety Office for additional information: Joe Murphy, murphyj@usfca.edu, 415-422-6464). If an SDS is not available online and the manufacturer did not provide one with the chemical when it was purchased, contact the manufacturer to obtain a copy of the SDS. Laboratories that keep copies Safety Data Sheets (SDSs) that are received with shipments of incoming hazardous chemicals should organize them in binders so that they are readily accessible and can be used as a training resource.

### Emergency Eyewash/Showers

Cal/OSHA requires that all emergency eyewashes be tested monthly to ensure operation and to flush out contamination. The Environmental Safety Office is responsible for testing of emergency eyewashes and safety showers, documenting each test. If your emergency shower has not been inspected within the last month, request service from Facilities (422-6464).

### Chemical Inventory Program

By law USF must send the city of San Francisco an updated Chemical Inventory Annually. This is necessary to comply with local regulations, including community right-to-know regulations, and provides vital information for emergency responders such as the San Francisco Fire Department. The Environmental Safety office coordinates the campus Chemical Inventory Program and submits copies to regulatory agencies. All new incoming chemicals must receive a barcode sticker and be entered into the Chemical Inventory. This allows the location of all chemicals to be entered and found. If you have questions about or do not have access to the Chemical Inventory Program, call Joe Murphy at 422-6464.

(Note: This program excludes radioactive materials, which are inventoried under the Radiation Safety program)

### Portable Fire Extinguishers

The California Code of Regulations, Title 19 requires that all fire extinguishers be inspected monthly and serviced annually. The Facilities Department is responsible for performing these tasks. If you notice that the fire extinguisher in your lab hasn't been serviced in the last year (as noted by the punch card attached to the Fire Extinguisher), contact Facilities at 422-6464.

### **Unwanted Chemicals**

Do not dispose of unwanted chemicals down a drain or by evaporation.

- Hazardous waste must be disposed of through the Environmental Safety Office. The Waste Disposal Guidelines can be found at <http://myusf.usfca.edu/arts-sciences/lab-safety>.

### **Chemical Fume Hoods**

Use a chemical fume hood when working with hazardous chemicals that can volatilize or aerosolize. The Environmental Safety Office provides the following services:

- Testing hoods annually to confirm they comply with Cal/OSHA requirements.
- Tagging or marking hoods that do not meet Cal/OSHA requirements. Hoods marked "unsatisfactory" must never be used for handling hazardous chemicals.
- Providing additional fume hood evaluations upon request.

Each fume hood is equipped with a mechanical or electronic airflow sensor and/or alarms. Confirm that the hood is operating properly before using it by looking at the fume hood airflow sensor or alarm (some hoods have a device with a green light on them). Contact the Facilities Office at 422-6464 if there is no flow-monitoring device installed or if you want confirmation that your existing airflow monitor is accurate. If your fume hood is not working properly, you can directly contact the College of Arts and Sciences Lab Safety Manager [caconforti@usfca.edu](mailto:caconforti@usfca.edu) (422-6687) to initiate repairs by Facilities.

### **Respiratory Protection**

Fume hoods typically provide adequate respiratory protection for most hazardous materials used in a laboratory. If you are unsure whether your fume hood will provide adequate protection for the work you plan to perform, contact The Environmental Safety Office about possible use of a respirator.

All respirator users on campus must be part of the Campus Respiratory Protection Program. The Environmental Safety Office administers this program. Required elements of the program include:

- Evaluation of the workplace to ensure the respirator will provide adequate protection. If you believe that your work requires a respirator or have questions about respirator use, The Environmental Safety Office at 422-6464.
- Medical screening of respirator users to ensure user safety.
- Fit testing, training, and respirator selection to ensure that respirators will be effective.

### **Hazard Identification (Labels)**

Cal/OSHA requires that labels on incoming containers of hazardous chemicals not be removed or defaced. Should a label become damaged, re-label the container. Be sure that all labels are readable, list the chemical components and concentration, and have appropriate health hazard warnings such as "corrosive," or "carcinogen." If you have questions about labeling requirements, contact the Environmental Safety Office at 422-6464 or the College of Arts and Sciences Lab Safety Manager [caconforti@usfca.edu](mailto:caconforti@usfca.edu) (422-6687).

## **Chemical Segregation**

All chemicals must be stored according to chemical compatibility. Once segregated by chemical compatibility, they can then be stored alphabetically. Information regarding chemical compatibility can be found in the SDS, primarily in Section 7, "Handling and Storage" and Section 10, "Stability and Reactivity". If unsure of proper segregation procedures, contact the Laboratory Safety Manager or ESO manager for

assistance. Chemical segregation can be achieved by either isolation (e.g., organic solvents stored in a flammable cabinet), physical distance (e.g., acids and bases are stored on opposite sides of a chemical storage room), or secondary containment (e.g., placing oxidizing acids such as nitric acid into a secondary containment to segregate from organic acids such as formic acid as shown in Figure 5.7). In the most general terms, proper segregation can be achieved by:

- Storing acids away from bases and toxics;
- Storing oxidizers away from organic chemicals; and
- Storing reactive and acutely toxic materials away from all other chemicals.

Table 5.1 illustrates a more detailed chemical compatibility logic that can be used for chemical storage. Hazard classes marked by an X need to be segregated from each other (e.g., Acid, inorganic must be segregated from Base, inorganic). Contact the Lab Safety Manager at x6687 with questions regarding chemical segregation.

**Table 1-Chemical Compatibility Chart**

	Acid, inorganic	Acid, organic	Acid, oxidizer	Base, inorganic	Base, organic	Oxidizer	Toxic, inorganic	Toxic, organic	Reactive	Organic Solvent
Acid, inorganic				X	X		X	X	X	
Acid, organic			X	X	X	X	X	X	X	
Acid, oxidizer		X		X	X		X	X	X	X
Base, inorganic	X	X	X						X	
Base, organic	X	X	X			X			X	
Oxidizer		X			X			X	X	X
Toxic, inorganic	X	X	X						X	
Toxic, organic	X	X	X			X			X	
Reactive	X	X	X	X	X	X	X	X		X
Organic solvent			X			X			X	

### Chemical Storage Requirements

Proper storage of chemicals is an essential component to a laboratory safety program. Improper chemical storage practices can cause undesired chemical reactions, which may form hazardous products that can lead to employee exposure or possibly fires and property damage. All lab employees should carefully read each chemical's SDS and container label before deciding how to store a chemical, as these will often indicate any special storage requirements that may be necessary. The following subsections describe chemical storage requirements in more detail.

### General Chemical Storage

The following general chemical storage guidelines must be followed in all laboratories:

- Each chemical in the laboratory must be stored in a specific location and returned there after each use. Acceptable chemical storage locations may include flammable cabinets, corrosive cabinets, fume hood cabinets, secure laboratory shelves, or appropriate laboratory refrigerators or freezers.
- Chemical containers must be in good condition and appropriate for the chemical that they contain and be free from exterior contamination.
- Chemical fume hoods should not be used as permanent chemical storage areas, unless designated as such. Not only does this create potentially unsafe conditions by having extraneous chemicals stored near chemical reactions and processes, excess chemical bottles in the hood may also seriously impair the ventilating capacity of the fume hood. Only chemicals being used in the process or experiment being conducted in the fume hood are allowed to be stored in the fume hood and should be removed when the process or experiment is complete.
- Chemicals should not be permanently stored on bench tops. Avoid storing any chemical containers on the floor. Under no circumstance should chemical containers, or anything else, be stored in aisle ways, corridors, or in front of doors.
- Chemicals should be stored at an appropriate temperature and humidity level and never be stored in direct sunlight.
- Periodic cleanouts of expired or unneeded chemicals should be conducted to minimize the volume of hazardous chemicals stored in the laboratory.
- Always follow the chemical manufacturer's storage instructions, if provided.

### **Flammable Liquids Storage**

Most regulatory agencies classify liquids with a flash point as either a flammable or Combustible Liquid. To be classified as a Flammable liquid, the material must have a flash point below 100 °F (37.8 °C). To be classified as a Combustible Liquid, the material would have a flash point at or above 100 °F. The following guidelines for storing flammable liquids must be followed in all laboratories:

- Flammable and combustible liquids should be stored in flammable storage cabinets whenever possible.
- Domestic refrigerators or freezers must never be used to store flammable liquids. Flammable liquids can only be stored in refrigerators or freezers that are designed for flammable materials (Note: most refrigerators and freezers are not intended for flammable storage).
- Flammable liquids must be stored in well-ventilated areas free from ignition sources.
- Some organic solvents (e.g., diethyl ether, tetrahydrofuran) have a shelf-life and can form organic peroxides over time while in storage. These "peroxide formers" must be dated when received from the chemical manufacturer and disposed of once expired. If any time-sensitive chemicals are found to be past the manufacturer's expiration date, they must be submitted to the Environmental Safety Office for hazardous waste disposal immediately.

### **Compressed Gases Storage**

Compressed gases are defined as gases that are contained in a receptacle at a pressure not less than 280 kPA at 20 °C or as a refrigerated liquid. The following guidelines for storing compressed gases must be followed in all laboratories:

- Cylinders must be secured with two points of attachment.
- Compressed gas cylinders (cylinders) must be stored in a secure, well-ventilated location, and in an upright position at all times. Small cylinders such as lecture bottles are not required to be stored in the upright position; they can be safely laid down in a chemical cabinet. However, when

lecture bottles are in use they should be secured and stored in an upright position if at all possible.

- All cylinders should be handled as if full and should never be completely emptied.
- Cylinders that are not in use (meaning that the cap is on) must be secured and have the safety cap. Multiple cylinders may be secured together, only if they are capped (not in use).
- Cylinders that are in use, meaning there is a regulator attached, must be individually secured by a chain or strap. Cylinder valves and regulators should be protected from impact or damage.

### **Reactive Materials Storage**

Reactive materials include explosives, pyrophorics, self-heating and self-reacting compounds, and water reactives. Many reactive materials are also toxic and are dissolved or immersed in a flammable solvent (e.g., lithium alkyl compounds dissolved in diethyl ether, sodium metal immersed in mineral oil). Other common hazards often associated with reactive chemicals include corrosivity, teratogenicity, or organic peroxide formation. The following guidelines for storing reactive materials must be followed in all laboratories:

- The amount of reactive materials stored in the lab must be kept to a minimum. Any expired or unnecessary reactive materials must be properly disposed of as hazardous waste.
- All reactive materials must be clearly labeled with the original manufacturer's label, which should have the chemical name, hazard labels, and pictograms. The label should not be defaced in any way.
- All reactive materials should be placed into secondary containment as a best management practice.
- Suitable storage locations for reactive materials include inert gas-filled desiccators or glove boxes, flammable storage cabinets that do not contain aqueous or other incompatible chemicals, or intrinsically safe refrigerators or freezers that also do not contain aqueous or other incompatible chemicals. If possible, store all reactive chemicals in a small flammable cabinet (such as a cabinet underneath a fume hood) dedicated only for reactives. Signs should be posted to indicate their presence and unique hazards.

### **Corrosive Materials**

Storage Corrosive materials are defined as substances that cause destruction of living tissue by chemical corrosion at the site of contact and can be either acidic or basic (caustic). The best storage method for corrosive materials is inside of a corrosive storage cabinet or lab cabinet where acids and bases are segregated at all times. Acids must also be segregated from chemicals where a toxic gas would be generated upon contact with an acid (e.g., cyanide or sulfide compounds). Organic acids (e.g., acetic acid, formic acid) must be stored away from oxidizing acids (e.g., nitric acid, perchloric acid), as these types of acids are incompatible with each other. Segregation can be achieved either by physical distance (preferred method) or by secondary containment.

### **Oxidizers and Organic Peroxide Storage**

Oxidizing materials are defined as substances that, while not necessarily combustible, by yielding oxygen can cause or contribute to the combustion of other material. An organic peroxide is an organic substance which contains the bivalent -O-O- structure and may be considered a derivative of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals. The following guidelines for storing oxidizers and organic peroxides must be followed in all laboratories:

- Oxidizers (e.g., hydrogen peroxide, sodium nitrate) and organic peroxides (e.g., methyl ethyl ketone peroxide, benzoyl peroxide) must be stored in a cool, dry location and kept away from combustible materials such as wood, pressboard, paper, and organic chemicals (e.g., organic solvents and organic acids).

- If possible, store all strong oxidizing agents in a chemical cabinet dedicated only for oxidizers.
- The amount of oxidizers and organic peroxides stored in the lab should be kept at a minimum.
- All material must be clearly labeled; the original manufacturer's label with the chemical name, hazard labels, and pictograms should not be defaced or covered.

## Required Personal Protective Equipment (PPE)

Professors and Laboratory Supervisors are responsible for assessing and providing PPE needed to perform work safely. The following general guidance applies to all operations where hazardous chemicals are used. The Environmental Safety Office must approve exceptions to the PPE requirements in this section. Laboratory space that is designated or posted as a hazardous material free area is not subject to these requirements.

When entering a lab that contains any hazardous materials – full-length pants and shirt or equivalent, closed toed/heeled shoes must be worn at all times.

In addition, lab coats, safety glasses, and protective gloves are required to be worn when working with hazardous materials. This also applies to nearby personnel wherever there is potential exposure to hazardous materials.

Keep long hair tied back when working with hazardous materials or performing hazardous tasks.

Additional PPE requirements are incorporated in your lab specific SOPs or Job Hazard Analysis (JHA).

Chemical Resistance Guide to Glove Permeation and Degradation:  
([Ansell Chemical Resistance Guide – 8<sup>th</sup> Edition](#)).

Also view SpecWare's [Chemical Application & Recommendation Guide](#)

### **PPE Training:**

Lab personnel are required to be trained on proper PPE use by their supervisor. This training includes: when PPE is necessary; what PPE is necessary; how to properly don, doff, adjust, and wear PPE; limitations of PPE; proper care, maintenance, useful life, and disposal of PPE; demonstration of ability to use PPE. Contact the Environmental Safety Office at 422-6464 or the College of Arts and Sciences Lab Safety Manager [caconforti@usfca.edu](mailto:caconforti@usfca.edu) (422-6687) if you have not received Laboratory General Awareness training.

### **PPE Exemptions:**

The PPE requirement will not apply to laboratories/technical areas that have been designated and posted as hazardous materials free areas. To obtain this designation, contact the Environmental Safety Office at 422-6464 or the College of Arts and Sciences Lab Safety Manager [caconforti@usfca.edu](mailto:caconforti@usfca.edu) (422-6687).

## Site Safety Orientation

The Laboratory Site Safety Orientation will be provided to each lab worker on the first day he/she is granted access to or assigned work activities in the laboratory. Fill in the left column with lab-specific information and train all personnel on the topics below.

LABORATORY SITE SAFETY ORIENTATION	
Training Topic	Training Content
<b>Emergency Procedures</b>	
Fire alarm pull station <i>Nearest Location:</i> _____	Location of and demonstrate how to activate
Eye wash/ safety shower <i>Nearest Location:</i> _____	Location of and demonstrate how to activate
First aid kits <i>Nearest Location:</i> _____	Location and contents
Phone: _____ <i>Nearest Location:</i> _____	Locations of phone dialing instructions and posting of '2-911' dialing
Emergency Assembly Area	Review Lab evacuation procedures and gathering points
Primary and Secondary routes of Egress	Describe pathways to Emergency Assembly Area. Review evacuation procedures for disabled employees.
<b>Engineering Controls</b>	
Chemical Fume Hoods	Demonstration of proper use and instruction on adjustable controls
Biological Safety Cabinets	Demonstration of proper use and instruction on adjustable controls
Chemical Storage Locations and Segregation Guidelines	Locations and segregation rules
Other Engineering Controls (i.e. glove-box, gas cabinet)	Demonstration of proper use and instruction on adjustable controls
<b>Waste disposal</b>	
Hazardous Waste Accumulation Area <i>Location:</i> _____	Demonstrate Location, proper labeling, proper storage requirements, and process to request pick-up
<b>Other</b>	
Describe: _____ _____ _____	Demonstrate safety procedures for specific operations

## Lab Safety Resources

The following forms can be found at <http://myusf.usfca.edu/arts-sciences/lab-safety>.



- The Chemical Hygiene Plan
- Incident Report
- Record of Safety Training
- Waste Guidelines
- Laboratory Self-Assessment
- Anonymous Health and Safety Report Form

## Campus Safety Resources

- The [Office of Public Safety](#) oversees disaster preparedness.
- USF Emergency Procedures can be found at [http://www.usfca.edu/Public\\_Safety/Disaster\\_Programs/](http://www.usfca.edu/Public_Safety/Disaster_Programs/)
- USF disaster preparedness resources can be found at [http://www.usfca.edu/Public\\_Safety/Disaster\\_Preparedness/](http://www.usfca.edu/Public_Safety/Disaster_Preparedness/)

## Training

### HEALTH AND SAFETY TRAINING

#### Safety Training Requirement

The law requires laboratory personnel must be trained on the contents of the CHP (reading the CHP constitutes training only if documented on a training form). This training must be documented before starting work in the laboratory. Whenever the CHP is revised, training must be provided on the changes and documented.

All lab workers are required to take a General Safety Awareness Training, which is offered at the beginning of each semester. Refresher training is required at a minimum of every three (3) years. The Environmental Safety Office along with the Lab Safety Manager will coordinate this training.

The University is committed to providing thorough and effective training for all its staff and faculty. Staff and faculty are not allowed to perform any task for which they have not been trained. This training shall include an understanding, by the trainee, of the potential job hazards as well as the safe job practice(s). An effective safety training program will benefit the staff, faculty and University by; reducing bodily injuries and damage to property and equipment, reducing the time needed to retrain, increasing staff and faculty safety awareness, increasing efficiency, increasing morale, and decreasing absenteeism.

#### Scheduled Periodic Training

For new staff and faculty, the first Scheduled Periodic Training occurs following their Initial Orientation Training. The purpose of the Scheduled Periodic Training is to provide the staff or faculty member training specific for their work assignment. Subsequent safety training is continued through regular Scheduled Periodic Training sessions. Periodic Training is also conducted when new substances,

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processes, procedures, or equipment are introduced into the workplace. Subsequent Scheduled Periodic Training includes the following elements:

- A. Review the established Safe Job Procedures
- B. Identify hazards associated with new substances, processes, or equipment.
- C. Review the causes of recent injuries and their remediating measures.
- D. Provide any safety information that might be beneficial to the staff or faculty member.

Scheduled Periodic Training must be documented in order to complete the training. The staff or faculty member in attendance must sign a training form. A copy will be maintained in the Program Monitor's IIPP binder and a copy will be sent to the Environmental Safety Manager.

**Hazard Specific Training**

Hazard Specific Training is required for staff and faculty who work with hazardous materials, machinery, or equipment. For example, if personal protective equipment (PPE) is required to perform the job, instructions will be given on its proper use and care. When appropriate this training should include the use of other University safety documents, such as the Hazard Communication Plan, Hazardous Spill Response Protocol, Hearing Conservation Program or Respiratory Protection Program.

Hazard Specific Training is administered by the Supervisor, Program Monitor, or a qualified third party and must be documented a training form in order to be complete. The staff and faculty in attendance must sign this form. A copy will be maintained in the Program Monitor's IIPP binder and a copy will be sent to the Environmental Safety Manager