

SHOP SAFETY MANUAL

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USC University of
Southern California

Office of
Environmental
Health and Safety



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Table of Contents

1.0	Purpose and Scope	1.1
	<i>Definition of a Shop and Applicability</i>	<i>1.1</i>
2.0	Regulations and Policies	2.1
3.0	Roles and Responsibilities	3.1
	<i>Shop Safety Committee</i>	<i>3.1</i>
	<i>Office of Environmental Health & Safety</i>	<i>3.1</i>
	<i>Responsible Schools and/or Departments</i>	<i>3.1</i>
4.0	Universal Shop Safety Rules	4.1
	<i>Shop-Specific Operational Rules</i>	<i>4.1</i>
5.0	Hazard Assessment and Mitigation	5.1
6.0	Personal Protective Equipment	6.1
	<i>Types of PPE</i>	<i>6.2</i>
7.0	Training and Certifications	7.1
	<i>Training Requirements</i>	<i>7.1</i>
8.0	Machines, Power Tools, and Other Shop Equipment	8.1
	<i>Training Materials and Instruction</i>	<i>8.1</i>
	<i>General Power Tool Safety</i>	<i>8.2</i>
9.0	Materials Handling	9.1
	<i>What to Look for</i>	<i>9.1</i>
	<i>Making Materials Handling Safer</i>	<i>9.1</i>
10.0	Chemical Inventory, Storage, and Transport	10.1
	<i>Importance and Scope</i>	<i>10.1</i>
	<i>Inventory Records</i>	<i>10.1</i>
	<i>Physical Inventory: Storage and Segregation of Chemicals</i>	<i>10.3</i>
	<i>Transportation of Hazardous Materials</i>	<i>10.12</i>

11.0	Waste Management	11.1
	<i>Types of Hazardous Waste</i>	<i>11.1</i>
12.0	Self-Inspections	12.1
	<i>Self-Inspection Frequency</i>	<i>12.1</i>
	<i>Corrective Actions</i>	<i>12.2</i>
	<i>Self-Inspection Records</i>	<i>12.2</i>
13.0	Recordkeeping	13.1
14.0	First Aid & Safety Equipment	14.1
	<i>First Aid</i>	<i>14.1</i>
	<i>Emergency Safety Equipment</i>	<i>14.1</i>
15.0	Emergency Planning & Response	15.1
	<i>Emergency Response Plan</i>	<i>15.1</i>
	<i>Incident Reporting</i>	<i>15.2</i>
	<i>Incident Investigation</i>	<i>15.3</i>
	<i>Emergency Response: Chemical Exposure</i>	<i>15.5</i>



1.0 Purpose and Scope

The USC Shop Safety Manual is intended to be used as a guide for ensuring that all university shops and university shop activities are injury-free and accident-free. While the guidance and information contained within reflects the regulatory requirements and standards of Cal-OSHA, ANSI, NFPA, university policies and standards as well as widely accepted general industry best work practices, this manual should not be viewed as and is not intended to be a legal interpretation of any regulation or standard. Because the nature and scope of the work conducted in university shops are wide and varied, the information contained within may not address every shop activity and function.

All questions, concerns or safety related issues not addressed in this manual should be directed to the shop's manager, faculty advisor, or the Office of Environmental Health & Safety for clarification and guidance before proceeding further. All students, staff, faculty, guests, volunteers, and contract workers working in university shops must be familiar with and conduct themselves along with all activities in a manner consistent with the information contained within and as directed by the shop's manager or faculty advisor.

Definition of a Shop and Applicability

The USC Shop Safety Program provides guidance and oversight for the safe operation of university academic and work locations where one or more of the following activities are conducted:

- **Metal Work** - sheet metal forming, machining, grinding, riveting, cutting, threading, casting, forging, heat-treating, quenching, welding, brazing, soldering, drilling, etc.
- **Plumbing Work** - water delivery and distribution, pneumatics, hydraulics, or any other installation or maintenance activities involving liquids, gases or waste flowing through pipes, etc.
- **Carpentry or Woodworking Work** - cutting, drilling, sanding, carving, routing, grinding, planing, gluing, bonding, fastening, etc.
- **Surface Modification or Treatment Work** - sandblasting, painting, surface preparation, laminating, burning, etching, masking, etc.
- **Glass Work** - glass blowing, glazing, annealing, tempering, bonding, grinding, drilling, hot-work with glass materials, etc.
- **Electrical or Electronic Work** - circuit design and building, maintaining building systems or equipment, installing, testing, repairing or replacing components, etc.
- **Materials Work** - machining, bending, burning, bonding, chopping, cutting, sewing, drilling, gluing, melting, forming, etc.
- **Equipment Development, Modification or Testing Work** - model building, research equipment development, testing and certification work, machine building, hydraulics building, destructive testing, stress testing, equipment repair and maintenance, etc.
- **Materials Handling Work** - including craning, hoisting, rigging, lifting, transporting, carrying, sorting or otherwise moving any materials / equipment from one location to another.

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2.0 Regulations and Policies



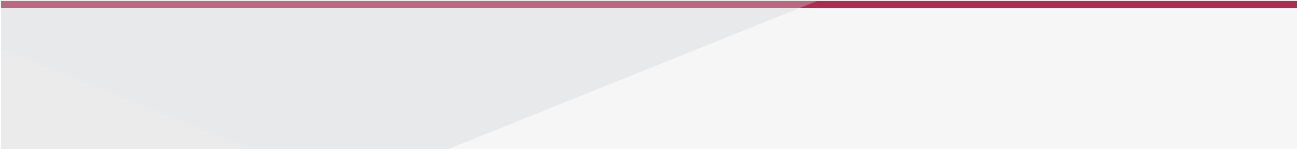
State

Injury and Illness Prevention Program

Title 8, Section 3203 of the California Code of Regulations requires every California employer to have an effective Injury and Illness Prevention Program (IIPP). The purpose of an IIPP is to establish a framework for identifying and correcting workplace hazards, ensuring employee training and compliance, and communicating information related to employee safety and health.

The university has developed over 110 individual IIPPs - each created to address the needs of a specific school or division. An effective IIPP requires the support and participation of all stakeholders - employees, supervisors and management – and must be reviewed regularly and updated (if necessary) to reflect the current work environment. This manual is intended to be used as a guide for ensuring that all university shops and all university shop activities are injury and accident free. The information contained within should be viewed and applied in a manner that supports and respects the IIPP of the responsible school or department.

Insert your Department's IIPP on the next page.



School/Department IIPP (Insert here)



Federal

Several federal regulations are incorporated by reference in:



The following university policies and standards have been established to create a safe and productive working and learning environment and ensure compliance with all regulatory requirements. **If you are faculty, employee, student worker, or volunteer working in a university shop, it is your responsibility to familiarize yourself with these policies and adhere to them at all times.** Questions or concerns about individual policies should be directed to the "Responsible Office" listed at the end of each policy. The university reserves the right to revise the following policies at any time:

- Injury and Illness Prevention <https://policy.usc.edu/injury-prevention/>
- Hazardous Waste Management <https://policy.usc.edu/hazardous-waste-management/>
- Training Requirements and Opportunities <https://policy.usc.edu/training-requirements-and-opportunities/>
- Vehicle/Driver Requirements <https://policy.usc.edu/vehicle-driver-requirements/>
- Protecting Minors <https://policy.usc.edu/protecting-minors/>
- Smoke Free <https://policy.usc.edu/smoke-free/>
- USC Drug-Free <https://policy.usc.edu/drug-free/>
- Personal Protective Equipment Standard <https://ehs.usc.edu/research/manage/ppe/>

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3.0 Roles and Responsibilities

Clearly defined roles and responsibilities serve to help one more fully understand their own role and responsibilities as well as that of others in the management structure. Having clearly defined roles minimizes confusion by making expectations known ahead of any problems that might arise. While the expectations are understandably different for every party involved, one that is shared by all is to always ***Make Safety Your 1st Operational Thought!***

Shop Safety Committee

A USC Shop Safety Committee is not yet established.

Office of Environmental Health & Safety

The objective of the Office of Environmental Health and Safety (EH&S) is to provide a safety and health work environment that reduces the number of injuries and illnesses to an absolute minimum, not merely in keeping with, but surpassing, the best experience of operations similar to USC. EH&S' goal is zero accidents and injuries.

EH&S will:

- Assist the shop in advancing safety in an effort to minimize the risk of injury and illness.
- Promote the importance of incorporating safety into all disciplines.
- Identify safety deficiencies as part of on-the-spot and routine inspections.
- Investigate injuries and near-misses and recommend corrective action(s).
- Manage the Shop Safety Program in a manner that respects Cal-OSHA requirements.

Responsible Schools and/or Departments

Declaration of the Responsible School and/or Department:

"The personal safety and health of the Shop Manager(s), Faculty Advisor(s), Instructional Supervisor(s) and Authorized Shop Users of _____ *Shop Name* _____ is of primary importance. Prevention of occupationally-induced injuries and illnesses is of such consequence that it will be given precedence over operating productivity, whenever necessary. To the greatest degree possible, management will provide all mechanical and physical activities required for personal safety and health, in keeping with the highest standards."

The Responsible School and/or Department will:

- Manage the risks inherent to the shops stated function.
- Provide for adequate supervision in all shops.

- Provide resources necessary to insure all shop operations are Cal-OSHA compliant.
- Correct or control all identified and reported safety deficiencies.
- Make no distinction in terms of the degree of safety afforded all Authorized Shop Users.
- Require faculty to inform shop management in advance of assigning work to ensure labs and facilities can safely accommodate student projects.

Shop Manager

Declaration by the Shop Manager:

"The personal safety and health of the Shop Manager(s), Faculty Advisor(s), Instructional Supervisor(s) and Authorized Shop Users of Shop Name is of primary importance. Prevention of occupationally-induced injuries and illnesses is of such consequence that it will be given precedence over operating productivity, whenever necessary. To the greatest degree possible, management will provide all mechanical and physical activities required for personal safety and health, in keeping with the highest standards."

The Shop Manager will:

- Establish and post a set of rules to ensure an injury-free and illness-free shop.
- Serve as the example for shop appropriate behavior and work practices.
- Ensure all required PPE is worn in the shop.
- Exercise control over all shop activities.
- Ensure Safety Data Sheets (SDS) are readily available.
- Ensure all authorized shop users are appropriately trained.
- Record all trainings and maintain records.
- Deny unauthorized individuals entry into the shop.
- Report uncorrected safety deficiencies in writing to management.
- Revoke shop privileges for repeatedly unsafe authorized users.
- Develop and promote emergency and medical response protocols.
- Conduct routine safety related self-inspections.
- Immediately remove from service all broken or inoperable equipment.
- Develop a mechanism to ensure that all waste material is disposed of properly.

Faculty Advisor and/or Instructional Supervisor

Declaration by Faculty Advisor and/or Instructional Supervisor

"The personal safety and health of the Shop Manager(s), Faculty Advisor(s), Instructional Supervisor(s) and Authorized Shop Users of Shop Name are of primary importance. Prevention of occupationally-induced injuries and illnesses is of such consequence that it will be given precedence over operating productivity, whenever necessary. To the greatest degree possible, management will provide all mechanical and physical activities required for personal safety and health, in keeping with the highest standards."

The Faculty Advisor and/or Instructional Supervisor will:

- Adhere to and enforce shop rules as determined by the Shop Manager.
- Serve as the example for shop appropriate behavior and work practices.
- Ensure all required PPE is worn in the shop.
- Exercise control over all shop activities.
- Ensure Safety Data Sheets (SDS) are readily available.
- Ensure all authorized shop users are appropriately trained.
- Record all trainings and maintain records.
- Deny unauthorized individuals entry into the shop.
- Report uncorrected safety deficiencies in writing to management.
- Revoke shop privileges for repeatedly unsafe authorized users.
- Promote emergency and medical response protocols.
- Conduct routine safety related self-inspections.
- Immediately remove from service all broken or inoperable equipment.
- Ensure that all waste material is disposed of properly.

Authorized Shop User

The Authorized Shop User will:

- Report any health issue or limitation that might challenge your ability to work safely.
- Receive training for all shop activities before beginning work.
- Always don required and prescribed PPE.
- Not use broken or damaged PPE.
- Not use any tool without first receiving training and authorization.
- Perform only those activities within the shop that are authorized.
- Abide by all shop operational conditions and rules.
- Never work while under the influence or in a manner that is impaired in any way.
- Ask the shop manager for assistance with any uncertainty.
- Not use broken, damaged or inoperable equipment.
- Report all broken or malfunctioning equipment.
- Report all accidents and near misses to Shop Manager immediately.
- Be familiar with SDS information.

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4.0 Universal Shop Safety Rules

The following universal shop operating rules apply to all university shops and have been established to ensure both a safe and productive working and learning environment and compliance with all regulatory requirements. Individual shops may modify this list to include additional requirements.

Important: These rules must be posted prominently in the shop. All authorized shop users must read and acknowledge receipt of the Shop Safety Rules prior to working in the shop.

- Make SAFETY your 1st Priority.
- No Food or Drink in the Shop.
- Eye Protection Required.
- Wear Personal Protective Equipment as required.
- No Loose Fitting Clothing/Jewelry.
- No Dangling Strings, Ties or Scarfs.
- Tie Long Hair Back and Up.
- Closed Toe Footwear Required.
- No Bicycles, Skateboards or Scooters.
- No Head Phones, Earbuds or Loud Music.
- Do Not Use Equipment without Training and Authorization.
- Do Not Operate Equipment without Guards in Place.
- Keep Fingers Clear of Cutting Devices.
- Never Turn Away from Moving/Rotating Equipment.
- Make Adjustments When Equipment is Fully Stopped.
- Secure Work with Clamps or a Vise.
- Report Damaged Equipment Immediately.
- Do Not Use Damaged or "Out of Service" Equipment.
- Return Equipment/Tools to Proper Storage Locations.

- Do Not Bring Outside Equipment/Tools into Shop.
- Do Not Remove Equipment/Tools w/o Authorization.
- Do Not Work Alone.
- Never Work While Impaired.
- Do Not Distract Equipment Operators.
- No Horseplay or Disruptive Behavior.
- Keep Work Areas Clean and Clutter-Free.
- No Unauthorized Work is Permitted.
- Dispose of Waste Material Properly.
- Ask for Help if Uncertain.
- Know how to Respond to an Emergency.
- Report all Safety Concerns to the Shop Manager.
- Report All Injuries/Accidents Promptly.

Shop-Specific Operational Rules

Every shop must define and prominently post its operational rules. The operational rules posting must be displayed at all shop entry points. At a minimum, the operational rules posting must include the following information:

- Shop Name
- Address of Shop
- Building / Room #
- "Authorized Users Only"
- PPE Required for Entry
- Primary Shop Hazards
- Emergency Contact Information
- Shop Hours of Operation

Insert your Shop Specific Operational Rules Posting on the following page.

IN CASE OF EMERGENCY:**213.740.4321**

EH&S Design Shop

CAL 1203434 S. GRAND AVE
LOS ANGELES CA

90089



Revised: 9/28/2018

CONTACT INFORMATION

EH&S OHS Specialist 1	(323) 442-2200	(323) 442-2200
EH&S OHS Specialist 2	(323) 442-2200	(323) 442-2200
EH&S OHS Specialist 3	(323) 442-2200	(323) 442-2200
EH&S OHS Specialist 4	(323) 442-2200	(323) 442-2200

HAZARD INFORMATION**PPE (required depending on activity) / Notice****RULES**

No Food or Drink
Do Not Use Damaged Equipment
Keep Work Areas Clean and Clutter Free
No Loud Music
No Smoking

Eye Protection Required
Do Not Use Equipment without Training and Authoriz
Closed-Toe Footwear Required
Do Not Work Alone
Ensure machine guards are in place

OFFICE OF ENVIRONMENTAL HEALTH SAFETY
10/28/2021 10:00 AM



5.0 Hazard Assessment and Mitigation

Title 8, Section 3203 of the California Code of Regulations requires every employer to identify potential hazards in the workplace, evaluate those hazards, then remove the hazards or implement controls -- the purpose of which is to prevent employee injury and illness. All shop processes and operations must be viewed in terms of their potential hazards and the identified hazards addressed in manner that would most effectively prevent a workplace injury and/or illness from occurring.

Hazard Assessment

A Hazard Assessment is a systematic approach to address that which has the potential to cause injury and illness in the workplace by looking at a task and focusing on the relationship between the shop worker, the task, the tools, and the work environment to identify the hazards and reduce the risks.

All shops must complete a [Shop Safety Risk Assessment \(SSRA\)](#) - see Figure 5.1 - initially to identify possible hazards and annually thereafter to reflect any changes in the shop to include equipment, operations or processes.

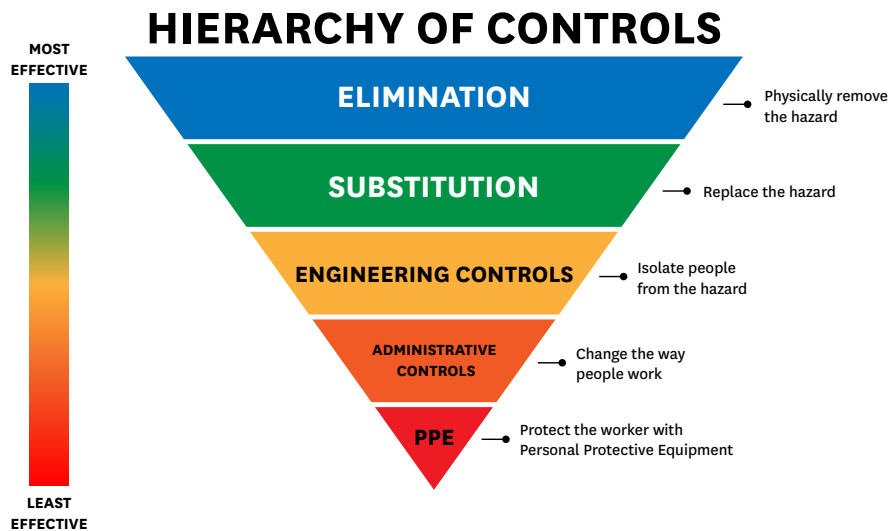
A hazard assessment of the shop's adjacent areas including the shop's exterior and the administrative and support areas can be performed using the [Cal-OSHA Hazard Assessment Checklist](#) (see Figure 5.2). This assessment must be completed initially and annually thereafter, as well.

Figure 5.1 | Shop Safety Risk Assessment Tool

<http://tiny.cc/usc-ssra-form>

Figure 5.2 | Cal-OSHA Hazard Assessment Checklist

Figure 5.2 | Hierarchy of Controls



Hazard Mitigation

A Hazard Mitigation is any action taken to reduce or eliminate identified hazards with elimination of the hazard being most preferred and the issuance of PPE the least preferred and option of last resort (see Figure 5.2 Hierarchy of Controls).

- **Elimination:** remove the hazard from the workplace.
- **Substitution:** replace the hazardous material or machine with one less hazardous.
- **Engineering Controls:** modify the work site, equipment, ventilation system and/or process in a manner that reduces the level of exposure.
- **Administrative Controls:** alter the way the work is done, including timing of task, policies and other rules, work practices such as standard operating procedures.
- **Personal Protective Equipment:** issue devices to be donned by individuals to reduce exposure such as a respirator, safety goggles or ear plugs.



6.0 Personal Protective Equipment

Personal protective equipment (PPE) when used properly minimizes one's exposure to hazards in the workplace. PPE must be used where other types of exposure controls (e.g., administrative and engineering controls) are not feasible or to augment controls to minimize exposures. **PPE should be viewed as the control of last resort and should be worn only after every reasonable effort to mitigate a hazard has been considered.**

All protective measures (including PPE) that are required or recommended by a manufacturer of equipment, machines, tools or hazardous materials must be both respected, donned and/or in place prior to use.

Title 8, section 3380 of the California Code of Regulations requires every California employer to assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of personal protective equipment (PPE) and if such hazards are present, or likely to be present, the employer will:

- Select and have each affected employee use the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment.
- Communicate selection decisions to each affected employee and Select PPE that properly fits each affected employee.
- Assure that the employee is instructed and uses protective equipment in accordance with the manufacturer's instructions.
- Assure that all required safety devices and safeguards, whether employer or employee provided, including personal

protective equipment for the eyes, face, head, hand, foot, and extremities (limbs), protective clothing, respiratory protection, protective shields and barriers, comply with the applicable Title 8 standards and are maintained in a safe, sanitary condition.

- Ensure that protectors will be of such design, fit and durability as to provide adequate protection against the hazards for which they are designed. Protectors will be reasonably comfortable and will not unduly encumber the employee's movements necessary to perform his or her work.
- Verify that the required workplace hazard assessment was performed through a written certification that identifies: (a) the workplace evaluated, (b) person certifying that the evaluation was performed, and (c) date(s) of the hazard assessment. This document will be entitled "Certification of Hazard Assessment."
- Ensure that defective or damaged personal protective equipment will not be used.
- Provide training to each employee who is required by this section to use PPE. Each such employee will be trained to know at least the following:
 - When PPE is necessary
 - What PPE is necessary
 - How to properly don, doff, adjust, and wear PPE
 - The limitations of the PPE
 - The proper care, maintenance, useful life and disposal of the PPE.
- Ensure that each affected employee will demonstrate an understanding of the training and the ability to use

PPE properly, before being allowed to perform work requiring the use of PPE.

- Retrain any employee that the employer has reason to believe does not have the understanding and skill required even though (s)he has completed training. Circumstances where retraining is required include, but are not limited to, situations where:
 - In the workplace render previous training obsolete; or
 - Changes in the types of PPE to be used render previous training obsolete; or Inadequacies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill.
- Verify that each affected employee has received and understood the required training through a written certification that contains the name of each employee trained, the date(s) of training, and that identifies the subject of the certification.

Types of PPE

Head Protection

PPE includes hard hats and headgears. These should be required for tasks that can cause any force or object falling onto the head.



HARD HAT

When performing head protection safety checks, ensure that there are no dents or deformities on the shell and that connections are tightened inside. Do not store in direct sunlight and always replace a hard hat if it underwent any kind of impact, even if damage is unnoticeable.

Face and Eye Protection

PPE includes safety goggles and face shields and should be used for tasks that can cause loss of vision, burns, splashes, sprays of toxic liquids etc. When conducting equipment safety checks, ensure that there are no cracks or deformities on the lenses, ensure the strap is in good working order and is firmly sealed to the cheek and forehead.



SAFETY GOGGLES

Foot Protection

PPE includes knee pads and safety boots and should be used for tasks that can cause serious foot and leg injuries from falling or rolling objects, hot substances, electrical hazards and slippery surfaces. Use boots with slip-resistant soles that protect against compression and impact.



SAFETY SHOES

Hands Protection

PPE includes safety gloves and should be used for tasks that can cause hand and skin burns, absorption of harmful substances, cuts, fractures or amputations. When inspecting hand protection equipment, ensure that they fit well with no spaces and are free from cuts, burns and chemical residue.



PROTECTIVE GLOVES

Always replace gloves if any sign of contamination was observed.

Body Protection

PPE includes safety vests and suits. These should be used for tasks that can cause body injuries from extreme temperatures, flames and sparks, toxic chemicals, insect bites and radiation. Ensure that they are clean and free from cuts and burns. Always get a good fit to ensure full body protection.



SAFETY CLOTHING

To wear a respirator, an employee must be enrolled in the Respiratory Protection Program and have obtained medical clearance to wear one.



RESPIRATOR

Contact injuryprevention@usc.edu or (323) 442-2200 for more information.

Hearing Protection

PPE includes ear muffs and plugs. These should be used for tasks that can cause hearing problems and loss of hearing. When ensuring hearing safety, the equipment must fit the ear canal perfectly. Recommended types include formable earplugs to fit on different sizes of ear canals.



HEARING PROTECT

Fall Protection

PPE includes safety harnesses and lanyards. These should be strictly used for tasks that can cause falling from heights and serious injury or death. When inspecting equipment, ensure that the straps are free from tears, deformities and burn marks and buckles are connected securely and tightly. It is very important to dispose them if used after a falling incident.



SAFETY HARNESS

Respiratory Protection

PPE includes respirators and should be used for task that can cause inhalation of harmful materials to enter the body.

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7.0 Training and Certifications

Education and training are important tools for informing individuals about their roles and responsibilities as well as any hazards and controls so they can work more safely and be more productive in the shop. While safety training and education can be provided in a shop or a classroom setting, other training methods such as peer-to-peer and on-the-job training, as well as worksite demonstrations can be just as effective when it comes to conveying principals of health and safety and promoting good work practices.

Regardless of the method used, message conveyed, duration or audience, all trainings must be documented with instructor's name(s), attendee names or other identifiers, subject matter covered and training date(s). Whenever possible, it is a good idea to attach a copy of the curriculum or outline to the record of training as well.



Training Requirements

Individuals who have been assigned the task of providing training for authorized shop users must be both qualified and competent and authorized by the employer.

An **Authorized User** is a person approved or designated by the employer to perform a specific duty or job function.

A **Qualified User** is a person who by reason of training, experience, or instruction has demonstrated the ability to perform safely all assigned duties; and, when required is properly licensed in accordance with federal, state, or local laws and regulations.

A **Competent User** is a person who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees. The competent person has the authority to impose prompt corrective measures to eliminate these hazards.

Training

It is the responsibility of every shop to train its authorized users. It is recommended that training consist of the following three (3) elements:

1. Classroom instruction to include dissemination of shop rules, shop safety, policies, and procedures.

2. "Show and Tell" to include methodical demonstrations of equipment and safety devices.
3. Demonstration of proficiency and/or exam.

An essential part of the Injury and Illness Prevention Program and a required element in the safe operation of all university shops is worker safety training.

Title 8, section 3203(a)(7)(A) - (F) of the California Code of Regulations states, in part, that training and instruction must be provided:

- To all new employees;
- To employees given new job assignments who have not previously been trained;
- Whenever new substances, processes, procedures or equipment are introduced into the workplace and represent a new hazard;
- Whenever the employer is made aware of a new or previously unrecognized hazard; and
- For supervisors to familiarize themselves with hazards to which employees under their immediate direction and control may be exposed.

Documentation of Training

All training regardless of the method used, message conveyed, duration, or audience must be documented with instructor's name(s), attendee names or other identifiers, subject matter covered and training date(s). Whenever possible, it is a good idea to attach a copy of the curriculum or outline to the record of training as well.

NOTE: According to Cal-OSHA: Training did not occur if it was not documented in writing!



8.0 Machines, Power Tools, and Other Shop Equipment

Shop safety, particularly when powered tools and equipment are involved, can be a challenge for shop managers as well as those working in the shop. Authorized shop users come in all shapes and sizes and have varying degrees of experience and comfort levels when it comes to working in a shop and working around and with powered equipment and tools. Ensuring a safe, productive, and educational experience for all authorized shop users is a serious responsibility requiring knowledge, vigilance, and a dedication to the principles of safety. The information in this section is intended to provide a basis for understanding the hazards involved when using powered tools and equipment. The information is not meant to be, nor should it be considered, an absolute or complete presentation of the safety measures and procedures that must be adhered to when using powered tools and equipment in every shop setting.

Note that every possible application cannot be addressed. **Ultimately, the responsibility for ensuring that the equipment, machines and powered tools used in a shop are used safely falls on the shop manager.**

Hands on instruction by the shop manager followed by a demonstration of proficiency by the authorized shop user is a must. In addition to hands on training, individual manufacturers' owner/user manuals and literature (provided with tools and accessories when purchased), must be read and followed for proper procedures on specific tool usage.

Therefore, **every effort must be made to have the manufacturers' owner/user manuals for every powered tool and equipment in a shop readily available as a reference for review at any time.**

Training Materials and Instruction

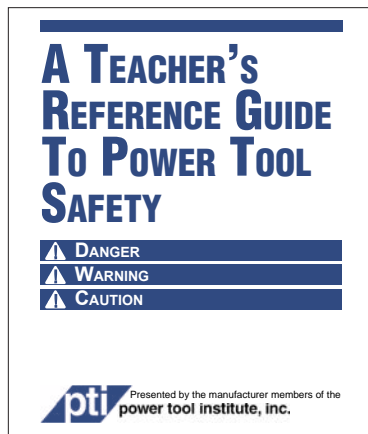
To supplement hands-on instruction in the shop as well as individual manufacturers' owner / user manuals, the Power Tool Institute - an organization of manufacturers of market leading brands of portable and stationary power tools - provides a wealth of information (downloadable) on their website <http://www.powertoolinstitute.com> and is a great resource for all things related to the safe use of power tools and related instructional materials.

"[Safety is Specific](#)" is a 50-page illustrated brochure that includes a straightforward compilation of rules and safe practices for each category of power tool use (specific cautions, warnings and dangers). The guidelines discuss the safe operation of widely used portable and stationary tools.



["A Teacher's Reference Guide to Power Tool Safety"](http://www.powertoolinstitute.com) provides lesson plans, student activities and quizzes, support materials, and references to additional information on each power tool category. Both publications, as well as other training resources are available for download on the Power Tool Institute's website <http://www.powertoolinstitute.com>.

When looking for training materials for tools and



equipment not listed on the Power Tool Institute's website, research related trade industry resources and/or contact the manufacturer for guidance and suggestions. An online search for training materials may also yield some results. Be certain that all instructional material is Cal-OSHA and not Federal OSHA compliant. The USC Shop Safety Program manager can also assist you in this effort.

General Power Tool Safety

- Both training and authorization are required before using any tool.
- Always read, understand, and follow the instruction manual and any warning labels.
- Always wear safety goggles or safety glasses with side shields.
- Use a dust mask for dusty operations.
- Wear hearing protection if using a tool for an extended period of time.
- No loose-fitting clothing, neckties, jewelry or dangling objects of any kind.
- Long hair must be tied back and up out of your way.
- Non-slip footwear is recommended.
- Never use power tools if you are tired, sick, distracted or impaired in any way.
- Make sure your work area is neat and clean and free of debris.
- Make sure your work area has plenty of bright, shadow-free light.
- Before you plug in any power tool, make sure the power switch is off.
- Be sure all appropriate guards are in place and working.
- Always turn off and unplug the tool, and/or remove the battery pack (if detachable) before you make any adjustments or change accessories.
- Only use accessories specifically supplied or recommended by the manufacturer as described in the tool's instruction manual.
- Use a GFCI outlet when working outdoors, in damp areas or near water.
- Never use a tool that is damaged or malfunctioning in any way.
- Make sure extension cords are rated as "heavy duty".
- If the tool has a three-pronged plug, use a three-pronged extension cord plugged into a three-pronged outlet.
- Make sure cutters or blades are clean, sharp and securely in place.
- Never use bent, broken, or warped blades or cutters.
- Never overreach when using a power tool. Stay firmly planted on both feet.
- When using hand-held power tools, always keep a firm grip with both hands.
- Do not use any tool that is too heavy and/or not easy to control.
- Always use the right tool for the right job.
- Always unplug, clean and store tools in a safe, dry place.
- Never rush. Pay close attention. Avoid distractions. Think ahead!



9.0 Materials Handling

Materials handling means moving or handling things by lifting, lowering, pushing, pulling, carrying, holding, or restraining. Manual materials handling is also the most common cause of occupational fatigue, low back pain and lower back injuries.

Title 8, Section 3203(a)(4) of the California Code of Regulations states that “every employer shall establish, implement and maintain an effective Injury and Illness Prevention Program (Program). The Program shall be in writing and, shall, at a minimum: Include procedures for identifying and evaluating work place hazards...”

Manual handling of containers may expose workers to physical conditions that can lead to injuries, wasted energy and wasted time. To avoid these problems, shops must review work processes and look for ways to improve the fit between the demands of work and the capabilities of the workers. A worker’s ability to perform work tasks varies depending on age, physical condition, strength, gender, stature and other factors.

Changing your shop by improving how it fits the worker will benefit the shop by:

- Reducing or preventing injuries.
- Reducing workers’ efforts by decreasing forces in lifting, handling, pushing and pulling materials.
- Reducing risk factors for musculoskeletal disorders.
- Increasing productivity, product and service quality and worker morale.

- Lowering costs by reducing or eliminating production bottlenecks, error rates or rejects, use of medical services because of musculoskeletal disorders, workers’ compensation claims, excessive worker turnover, absenteeism and retraining.

What to Look for

Manual material handling tasks may expose workers to physical risk factors. If these tasks are performed repeatedly or over long periods of time, they can lead to fatigue and injury. The main risk factors, or conditions, associated with the development of injuries in manual material handling tasks include:

- Awkward postures (e.g., bending, twisting)
- Repetitive motions (e.g., frequent reaching, lifting, carrying)
- Forceful exertions (e.g., carrying or lifting heavy loads)
- Pressure points (e.g., grasping loads, leaning against parts that are hard)
- Static postures (e.g., maintaining fixed positions for a long time)

Making Materials Handling Safer

In general, ergonomic improvements are changes made to improve the fit between the demands of work tasks and the capabilities of your workers. There are two types of ergonomic improvements:

- Engineering improvements
- Administrative improvements

Engineering Improvements

Examples of engineering improvements include rearranging, modifying, redesigning, providing or replacing tools, equipment, workstations, packaging, parts, processes, products or materials.

Lifting, Lowering, Filling, or Emptying Containers

Consider options that will:

- Reduce reaching and bending.
- Reduce the stress on your back and shoulders.
- Reduce the effort and force needed to perform work tasks.

Carrying Containers

Consider options that will:

- Improve your grip.
- Reduce stress on your back and shoulders.
- Reduce contact pressure on your shoulders and hands.
- Reduce the effort and force needed to perform work tasks.

Handling of Individual Containers

Consider the following alternatives:

- Change the container.
- Use a tool.
- Use non-powered equipment.
- Use powered equipment.

Administrative Improvements

Observe how different workers perform the same tasks to get ideas for improving work practices or organizing the work. Then consider the following improvements:

- Alternate heavy tasks with light tasks.
- Provide variety in jobs to eliminate or reduce repetition.
- Adjust work schedules, work pace or work practices.

- Provide recovery time.
- Modify work practices so that workers perform work within their power zone.
- Rotate workers through jobs that use different muscles, body parts or postures.

Administrative improvements, such as job rotation, can help reduce workers' exposures to risk factors by limiting the amount of time workers spend on repetitive or hazardous tasks. However, these measures may still expose workers to risk factors that can lead to injuries. For these reasons, the most effective way to eliminate "problem jobs" is to change them. This can be done by putting into place the appropriate engineering improvements and modifying work practices accordingly.

Training

Training alone is not an ergonomic improvement. That said, training should be used in conjunction with any workplace changes that are made. Workers need training and hands-on practice with new tools, equipment or work practices to make sure they have the skills necessary to work safely. Training is most effective when it is interactive and fully involves the workers for example:

- Provide hands-on training when new tools, equipment or procedures are introduced to the shop.
- Use several types of visual aids (e.g., pictures, charts, videos) of actual tasks performed in the shop.
- Hold small-group discussions and problem-solving sessions with shop workers and/or authorized shop users.



10.0 Chemical Inventory, Storage, and Transport

Importance and Scope

Hazardous substances may pose a wide range of health and physical hazards. This section provides guidance on appropriately and safely managing these hazards during storage and transport of hazardous materials.

This section covers:

- Chemical inventory
- Appropriate storage of hazardous materials.
- Transportation of hazardous materials.

Inventory Records

Importance

Keeping of accurate chemical inventory records is required for the following reasons:

- 8 CCR §5194 (e) (1) (A): “[Employers shall develop, implement, and maintain at the workplace a written hazard communication program... which also includes the following:] - A list of the hazardous chemicals¹ known to be present using a product identifier that is referenced on the appropriate safety data sheet (the list may be compiled for the workplace as a whole or for individual work areas)”
- USC (via EH&S, Fire Safety and Emergency Planning, and other offices) must access inventories in order to:
 - Assess building compliance with [LA Fire Code](#) maximum allowable quantities (MAQs)¹.
 - Prepare disclosures to the City of Los Angeles Department of Building and Safety (LADBS) for plan check and construction/renovation permitting.
 - Prepare [Hazardous Materials Inventory Statements \(HMIS\)](#) and other disclosures required under California Law.
 - Assess compliance with US Department of Homeland Security Chemical Facility chemicals reporting and security requirements (<https://www.dhs.gov/appendix-a-chemicals-interest-list>)
- EH&S requires inventory access in order to provide appropriate NFPA Fire Diamond Signage for shop or laboratory entrances.
- Chemical inventory is required for advance emergency planning, and may be required by personnel responding to an incident.

¹ This and the following reasons require both health and physically hazardous chemicals to be inventoried.

- Accurate chemical inventory records minimize duplicate purchasing within research groups, and across groups if PIs share inventory (which is recommended where possible).
 - Saves money.
 - Promotes safety by reducing total inventory, and reducing over-storage of time sensitive chemicals.

Requirements

At USC, research groups shall:

- Maintain a chemical inventory, which should be regularly updated as inventory changes.
- Enter inventory records into a centralized system approved by EH&S; currently the systems are:
 - [EHSA](#)
 - Bruno² (<https://chemmac1.usc.edu/inventory/>, USC Chemistry Department)

All hazardous chemicals shall be entered in the inventory, including:

- Any chemical which falls into one or more OSHA/ GHS health or physical hazard classes according to its labeling and safety data sheet.
- Any compressed, liquefied, or frozen gas (including inert gases).

PIs are ultimately responsible for compliance with chemical inventory record requirements. Inventory accuracy will be assessed during safety inspections. Inventory omissions and inaccuracies will be cited as a finding.



Exceptions

For shops and/or labs which are not using a bar coding inventory system, the following practices are acceptable to make inventory keeping more practical:

- In the case of shops and/or labs which have a rapid turnover of cylinders of the same type of gas, or of liquid nitrogen Dewars or dry ice, it is acceptable for the inventory to list the maximum quantity which is ever stored at one time. (This should be explicitly noted in the inventory.) Update the inventory if the type of gas changes, or if gas or liquid nitrogen usage permanently increases or decreases.

² Bruno is the name of an advanced barcoding chemical inventory system developed within the USC Department of Chemistry

- In the case of shops and/or labs which have a rapid turnover of non-peroxide-forming solvents it is acceptable for the inventory to list the maximum quantity which is ever stored at one time (this should be explicitly noted in the inventory). This is acceptable for pentane, hexane(s), cyclohexane, toluene, xylenes, methanol, ethanol, propanol, isopropanol³, butanol, acetone, petroleum ether, naphtha, other petroleum distillates, dichloromethane, ethyl acetate. Individual containers should still be dated when received and when opened.

Physical Inventory: Storage and Segregation of Chemicals

Secondary Containment

Secondary containment means any container which holds one or more smaller containers. Secondary containment is an important factor in safe storage of hazardous materials to:

1. Localize and contain spillage from defective or broken chemical containers.
2. Prevent incompatible materials from mixing.
3. Minimize spread of contamination from highly health hazardous materials.

Secondary containment is particularly important in earthquake zones such as Southern California. In a substantial earthquake, a significant proportion of chemical bottles within storage cabinets could break. Appropriate provision of secondary containment would markedly reduce the quantity of spilled chemical which would escape from cabinets, and would make the subsequent cleanup by Hazmat teams much safer, and faster, and would therefore potentially allow buildings to reopen sooner.

Secondary containment (see Figure 10.1) is frequently open-topped (e.g., polypropylene tub) with bottles standing in it. This is satisfactory for most hazardous materials. The secondary containment volume must exceed the combined volume of stored containers by at least 10 %.

Closed secondary containment should be used to isolate materials exhibiting potent health hazards. The secondary containment shall be clearly labelled with the hazards. It shall also be clearly labeled with the identity of the chemical or group of chemicals being segregated, for example, cyanides or mercury compounds.

Figure 10.1. Secondary Containment



³ Isopropanol is reported to be peroxide forming, but only to a minimal extent, and only under extremely long storage (years). <http://cen.acs.org/articles/94/i31/Chemical-safety-peroxide-formation-isopropanol.html> and <http://pubs.acs.org/doi/abs/10.1021/ed065pA226>

When storage space is restricted, it may be necessary to use separate secondary containment to segregate limited quantities of moderately incompatible chemicals within the same chemical storage cabinet. In such cases, the secondary containment shall be clearly labeled with the contents (e.g. inorganic oxidizers), and preferably also with hazard warning pictograms. The labeling must be sufficient that shop/laboratory personnel can readily match up hazardous materials with the appropriate secondary containment, avoiding mix-ups, and enabling appropriate segregation to be maintained over time.

Secondary containment shall not be used as a substitute for separate chemical storage cabinets for the segregation of severely incompatible materials, for example acids and alkali metals, pyrophorics and flammable liquids, or flammable liquids and oxidizers.

Secondary containment need not be individually labeled when used for general storage, and NOT for isolating highly health-hazardous materials, or for segregating incompatibles within the same cabinet.

Secondary Containment and Pyrophorics

Non-combustible secondary containment is recommended for storage of pyrophoric materials. It is recommended that steel cans, which chemical suppliers often use as secondary packaging on their products, be retained for this purpose. If the pyrophoric is in a breakable vessel, it is recommended to pack the space between the vessel and the can with vermiculite to provide padding⁴. Vermiculite may also reduce the intensity of a fire if the layer is thick enough to completely contain and cover the liquid in the event of breakage (<http://www.sciencedirect.com/science/article/pii/S0022024806010189>).

Individual containers of pyrophoric materials should have their own secondary containment. The secondary containment shall be clearly labelled with the contents and the hazard.

Seismic Safety

Store hazardous materials in accordance with [Chemical Hygiene Plan](#), Section 4, subsection Seismic Safety and Hazardous Materials Storage.

Basic Considerations

Priorities for storage areas organization are:

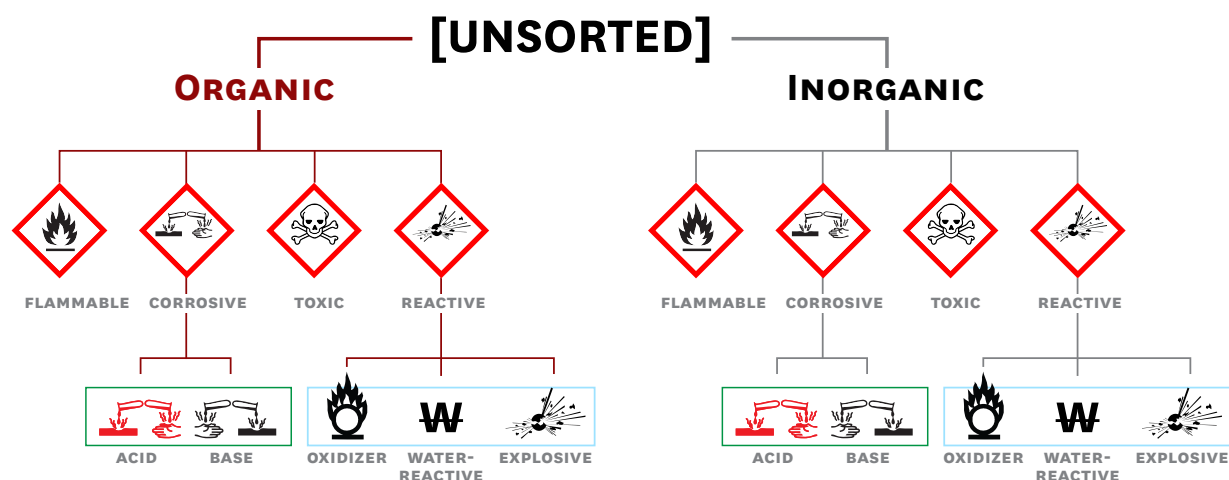
- **Flammability.** When establishing a storage scheme, a major consideration should be the flammability characteristics of the material. If the material is flammable, it should be stored in a flammable cabinet (with narrow exceptions), or refrigerator approved for flammable storage by the manufacturer. Materials which burn very hot and cannot be extinguished with usual extinguishers (e.g. flammable metals) should be segregated into a separate cabinet from flammable liquids.

⁴ Vermiculite is a type of expanded mica (<http://www.dupreminerals.com/vermiculite/>) which most shops and/or labs have easy access to as chemical suppliers frequently use it as a packaging material inside boxes and cans. It is non-combustible.

- **Reactivity.** If the material may start a fire (pyrophorics, self-heating chemicals, water reactive), or contribute significantly to a fire (oxidizer, organic peroxide, explosive, self-reactive material), it should not be stored with flammables. Materials which are water reactive should be isolated from possible water sources and leaks. Acids and bases are reactive with each other, and with many other materials, and should be segregated.
- **Corrosiveness.** Next look at the corrosiveness of the material, and store in secondary containers that are resistant to corrosion. Note that a number of corrosives are also oxidizers (e.g. nitric acid, perchloric acid) or flammable/combustible (e.g., acetic acid, acetic anhydride) and need to be segregated from each other.
- **Toxicity.** Finally, consider the toxicity of the material, with particular attention paid to regulated materials. In some cases, this may mean that certain chemicals will be isolated within a storage area. For example, a material that is highly acutely toxic but is also flammable may be stored inside sealed secondary containment in the flammable storage cabinet to protect it against accidental release. Segregation of very toxic materials in secondary containment within a dedicated poisons cabinet may also be appropriate.
- **Physical Security.** Extra physical security such as locked cabinets or restricted room access should be considered for highly potent health-hazardous materials (e.g. cyanides, potent carcinogens), and materials of extreme monetary or scientific value. Approved physical security is required for storage of controlled substances (CS; i.e. DEA controlled drugs).

There are a number of schemes for safely segregating chemicals in storage; one such scheme is shown in Figure 10.2. PIs shall ensure their hazardous materials are segregated in a manner which appropriately reduces the possibility of hazardous interaction between incompatible materials.

Figure 10.2. A simple scheme for safe segregation of hazardous chemicals in storage



Acceptable chemical storage locations may include corrosive cabinets, code-compliant flammable cabinets, shop/laboratory shelves with earthquake lip, or refrigerators or freezers. Note that flammables shall not be stored in refrigerators or freezers unless approved for flammable storage by the manufacturer.

Fume hoods should not be used as general storage areas for chemicals, as overcrowding may seriously impair the ventilating capacity of the hood. Chemicals should not be routinely stored on bench tops or stored on the floor.

Additionally, bulk quantities of chemicals (i.e., larger than one-gallon) should be stored in a separate storage area such as a stockroom or supply room, whenever possible. Shop/laboratory shelves should have a raised lip along the outer edge to prevent containers from falling. Hazardous liquids or corrosive chemicals should not be stored on shelves above eye level. Chemicals which are highly toxic or corrosive should be in unbreakable secondary containers. Refer to [Chemical Hygiene Plan](#), Section 4, subsection Seismic Safety and Hazardous Materials Storage for more information on shelf storage of hazardous materials.

Incompatible materials should be stored in separate cabinets, whenever possible. If these chemicals must be stored in one cabinet due to space limitations, adequate segregation and secondary containment must be ensured to prevent adverse reactions. All stored containers and research samples must be appropriately labeled and tightly capped to prevent vapor interactions and to alleviate nuisance odors. Flasks with cork, rubber or glass stoppers should be avoided because of the potential for leaking. Laboratory refrigerators and freezers must be labeled appropriately with "No Food/Drink" (see Figure 10.4) and shall not be used for the storage of consumables. Freezers should be defrosted periodically so that chemicals do not become trapped in ice formations.

Maximum Allowable Quantities (MAQs)

Maximum allowable quantities (MAQs) are the maximum amount of a hazardous material allowed to be stored or used within a defined area⁵ inside or outside a building. The Los Angeles Fire Code has determined different MAQs for flammable solids/liquids/gases, oxidizers, toxic substances, pyrophoric materials, and other hazardous materials based on the hazard, the occupancy classification given to the specific building, the number of the floor, and other factors. MAQ compliance is assessed by USC EH&S and Fire Safety based on chemical inventory records. The following are considered best practices to stay in compliance with MAQs:

- Chemicals should be stored in approved cabinets (e.g. flammable/gas cabinets).
- Purchase appropriate quantities and limit accumulation.
- Properly dispose of unused or out-of-date chemicals.
- Contact EH&S and Fire Safety before ordering containers with volumes greater than 5 gallons.
- Maintain chemical inventory in [EHSA](#) or [Bruno](#).

Flammable Cabinets

The flammable cabinet is designed to store flammable materials while minimizing the risk of spread of fire (see Figure 10.3). Flammable cabinets are also required to comply with construction specifications of the Los Angeles Fire Code (§5704.3.2) in addition to Cal-OSHA regulations (§5533).

⁵ In buildings, MAQs are defined per control area. A building floor may be one control area, or it may be split into more than one control area by walls of specified fire resistance.

The flammable cabinet:

- Must have self-closing doors.⁶
- Must have doors with a three-point latch (LA Fire Code).
- Must be liquid tight to a height of 2 inches at the bottom of the cabinet.

The aforementioned construction specifications will allow increases in MAQ per Los Angeles Fire Code.

Additional provisions.

- Store flammable and combustible liquids in flammable cabinets.
- The maximum combined quantity of flammables and combustible liquids that can be stored in an individual flammable cabinet is 60 gallons.
- The maximum amount allowed stored outside a flammable storage cabinet, safety can or approved refrigerator or freezer is 10 gallons of combined flammables, with no individual container being larger than 1 gallon ([8 CCR §5538](#)).
- Flammables that are not being used should be stored in a flammable storage cabinet, or approved refrigerator or freezer.
- Flammable cabinets have a catch tray built into the base which acts as secondary containment. Given the high earthquake risk and hazard in the Los Angeles area, it is strongly recommended to provide additional secondary containment for all glass bottles stored above the base.
- Flammable cabinets must be labeled "FLAMMABLE - KEEP FIRE AWAY" in red letters on a contrasting background (Los Angeles Fire Code §5704.3.2).
- Cabinets shall be placed so that they do not block or impede egress.

Figure 10.3. Flammable Cabinet



Source: Justrite

Refrigerators and Freezers

All chemicals should be stored with consideration to incompatibilities so that if a container breaks, reactive materials do not mix and react violently. Within refrigerators and freezers, appropriately labelled secondary containment should be used to separate incompatible chemicals. It is highly recommended that all glass containers in refrigerators and freezers be placed in secondary containment.

Shop or laboratory refrigerators and freezers shall **NEVER** be used to store food or beverages for human consumption. They shall have permanent labels warning against the storage of food and beverages for human consumption (see Figure 10.4).

Figure 10.4. No Food or Drink Label



⁶ Older flammable cabinets may not have a self-closing door. This is acceptable for Cal-OSHA, but not for the LA Fire Code. Storage in fire code compliant flammable cabinets allows for doubling of MAQ. If storage quantities are such that MAQ doubling is not required, older cabinets with non-self-closing doors may continue to be used. This will be assessed by EH&S and Fire Safety on a case-by-case basis. All newly purchased flammable cabinets should have self-closing doors.

Flammable materials are a hazard in ordinary refrigerators due to the presence of potential ignition sources, such as switches, relays, and sparking fan motors; therefore, ordinary refrigerators shall **NEVER** be used for storing flammable chemicals.

General Considerations

Shop and laboratory refrigerators and freezers designed for safe storage of flammables must be externally labelled as such by the manufacturer. They must meet NFPA and OSHA requirements for flammables materials storage. Laboratory refrigerators and freezers should always be operated in accordance with manufacturers' instructions and recommendations. Instruction manuals should be kept for future reference.

All refrigerators or freezers not positively identifiable as approved units shall be considered non-approved, and shall be clearly labelled "Not approved for the storage of flammables", or word to that effect.

Flammables stored in refrigerators and freezers are considered to be stored outside a flammable cabinet. Flammables stored in a non-approved refrigerator or freezer will be cited as a finding during safety inspections.

Flammable Chemicals

Flammable liquids must not be kept on the floor or in non-approved refrigerators or freezers. All storage areas containing flammables should be labeled with appropriate labels containing the word "flammable". At all times flammables must be segregated from oxidizing, pyrophoric and water reactive chemicals.



A maximum of ten (10) gallons of flammable liquids may be stored outside of approved flammable storage cabinets (<https://www.dir.ca.gov/Title8/5538.html>). In order to qualify for increased MAQs, flammable cabinets must have self-closing doors with a three point latch per LA Fire Code, Section 5704.3.2. OSHA compliant flammable storage cabinets (without self-closing doors) may be used when a laboratory doesn't need MAQ doubling. This will be assessed by Fire Safety and EH&S on a case-by-case basis.

Oxidizing Chemicals

Oxidizers should be segregated from flammable, combustible, pyrophoric, water reactive, and reducing materials. Small quantities of inorganic solid oxidizers may be in the same cabinet as general inorganic storage, but should be segregated in separate secondary containment and should be clearly marked "oxidizer". If large quantities of oxidant are required to be stored, a dedicated noncombustible steel cabinet is recommended.



Perchloric acid and fuming nitric acid shall NOT be kept in wooden cabinets due to the possibility of spontaneous ignition or explosion.

Corrosive Chemicals

Corrosives include a wide range of organic and inorganic acids/bases, as well as many compounds which can hydrolyze to form acids (e.g. aluminum chloride), as well as many organic compounds which corrode living tissue through local toxicity mechanisms (e.g. phenol, iodomethane, dimethyl sulfate). All corrosives should be stored below eye level.



Acids and Bases

Acids and bases should be stored in dedicated cabinets conspicuously identified as to the hazard class by the word “corrosive” (see Figure 10.5) and either “acid” or “base”, as appropriate. Separate secondary containment or separate cabinets should be used to segregate organic from inorganic acids, segregate oxidizing acids from other acids, and segregate organic from inorganic bases. The cabinets and/or secondary containment shall be clearly labelled to identify the contents and ensure continued correct segregation.

Figure 10.5. Corrosives Cabinet



Source: Eagle

Further storage requirements for acids and bases:

- Store in cool, dry well-ventilated areas, away from sunlight. The storage area should not be subject to rapid temperature change.
- Store corrosive liquid containers in secondary containment such as a high density polyethylene tub. The secondary containment volume must exceed the combined volume of stored containers by at least 10 %.
- Consider the potential impact of corrosive vapors. Acid vapors, especially from hydrohalic acids (e.g., hydrochloric, hydrobromic, and hydroiodic) and nitric acid, will corrode many metals. Ammonia and amine vapors may corrode copper and copper-based alloys.
 - Volatile strong acids will corrode most metal cabinets and metal hinges on wooden cabinets. Corrosion resistant acid cabinets are available which will provide a better service life.
 - Do NOT store acids, amines, or ammonia with electrical equipment.
 - Do NOT store hazardous materials in steel cans or drums in the same cupboard as acids.
 - Do NOT store acids, amines, or ammonia under sinks due to risk of corroding the plumbing.
 - Non-volatile, non-water-reactive inorganic bases (i.e. sodium/potassium hydroxide) may be stored under a sink only if no other location is available.

- Solid inorganic bases (sodium/potassium hydroxide) may be stored in labelled secondary containment on open shelving if:
 - Material is in non-breakable plastic containers.
 - Material is not stored above eye level, or stored in a location where it may be knocked by feet.

Health Hazardous Materials

Particularly Hazardous Substances (PHS) storage areas and work locations are required to be conspicuously identified as to the hazard class by the words "[acute toxicant](#)", "[carcinogen](#)" and/or "[reproductive toxicant](#)" (see Figure 10.6), as appropriate. PHS shall not be stored under sinks. PHS is preferably stored in labeled secondary containment, except for the following for which labeled secondary containment is required:

- Liquid PHS in glass bottles.
- Very highly health hazardous PHS (e.g. potent acute toxicants such as cyanides, mercury compounds, thallium compounds)
 - Secondary containment should preferably be closed by a tight fitting lid for very highly health hazardous PHS.

Figure 10.6. Health Hazard Labels



Highly toxic chemicals (e.g. cyanides) should be stored under conditions of satisfactory physical security, preferably in a locked cabinet in a restricted access room. Unauthorized personnel should not have ready access to highly toxic chemicals. An access and usage log for highly toxic chemicals is recommended.

Inventories of very highly health hazardous chemicals should be kept to a minimum. Unused inventory should be disposed of as hazardous waste at the end of research projects, unless there is reasonable probability that the material will be required again within the next 6-12 months. Contact [HazMat](#) to schedule pick up of hazardous materials for disposal.

Compressed Gases

Compressed gas cylinders shall be stored in accordance with the seismic restraint requirements detailed in the [Chemical Hygiene Plan](#), Section 4, subsection Seismic Safety and Hazardous Materials Storage. In addition:

- Cylinders in use shall be fitted with a regulator compatible with the cylinder fitting, the type of gas, and the pressure of the full cylinder. Gas pipework and valves shall be chemically compatible with the gas and shall be appropriate for the hazards.
 - Always follow manufacturer's/supplier's compatibility information.
 - NEVER use oil, grease, or PTFE tape on cylinder fittings.
- "All cylinders which are designed to accept valve protection devices [protective cap] shall be equipped with such devices when the cylinders are not in use or connected for use." - [8 CCR §4650](#).

Note that certain cylinders are not designed to be fitted with a protective cap, which is the case for some small cylinders or relatively low pressure cylinders.

- Cylinders shall be legibly labeled with the contents chemical name and hazard symbols.
- Compressed gas cylinders shall be tagged as full, in use, or empty, as appropriate.
 - Use removable tags provided by vendor, or shops and/or labs may write their own tags.
- Cylinders are to be protected from temperature extremes.
- Cylinders shall not be stored where they are liable to corrode.

Do not store cylinders on mobile carts. If there is an overriding reason why a cylinder must be stored on a mobile cart (e.g., the cylinder is part of a welding set), the cylinder shall be restrained to the cart by noncombustible restraints, and when not in active use, the cart shall be restrained to a non-movable, non-combustible fixture such that it cannot fall over in an earthquake. For example, the cart can be chained to the wall using steel chain and spring-loaded hooks.

Furthermore:

- "Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials (especially oil or grease) a minimum distance of 20 feet or by a non-combustible barrier at least 5 feet high, or a minimum of 18 inches (46 centimeters) above the tallest cylinder and having a fire-resistance rating of at least one hour." ([8 CCR §4650](#))
- All gas cylinders should be stored in well ventilated areas.
- Toxic or corrosive gases may have special safety requirements, including cross-purging facilities. Contact labsafety@usc.edu for guidance.
- Pyrophoric (phosphine, arsine, diborane, silane, germane etc.) and highly toxic gases (e.g. phosphine, arsine) must be stored and used in enclosed, exhausted cabinets equipped with alarms. Contact shops and/or labsafety@usc.edu for more information.
- Gas cylinders are to be transported by freight elevators when available. Restrain cylinders to prevent falling, or preferably have cylinders secured to a stable cart. Prevent people from entering the elevator while transporting the cylinder (e.g. by using signage of the type "Hazardous Materials: No Entry").
- Gas feeds to oxy-fuel combustion apparatus shall have adequate provision against backflow ([8 CCR §4845](#)).
 - Use flashback arrestors designed for the particular oxy-fuel combinations (see Figure 10.7).
- Shop/laboratory personnel shall NOT refill gas cylinders, or attempt to prepare gas mixtures within cylinders.
 - Cylinders are ONLY to be refilled by a professional gas vendor.
- Care must be taken to avoid internal contamination or corrosion of cylinders.
 - Take steps to prevent backflow of liquid into cylinders.
 - Cylinders are considered empty when their internal pressure is still slightly above atmospheric.

Figure 10.7. Flashback Arrestors



Source: Harris

- Do NOT empty cylinders to below atmospheric pressure.
- Keep cylinder valve closed on empty cylinders.

Cryogenic Liquids

Cryogenic liquids (liquid nitrogen, liquid helium) shall be stored in accordance with the seismic restraint requirements given in [Chemical Hygiene Plan](#), Section 4, subsection Seismic Safety and Hazardous Materials Storage. Cryogenic liquids shall be stored in areas of adequate ventilation.

Low oxygen alarms (oxygen deficiency monitors; see Figure 10.8) are recommended and may be required in cases where the cryogen quantity is significant in relation to the size of the room and/or available ventilation. EH&S will advise on a case-by-case basis.



Source: Analox

Transportation of Hazardous Materials

Hand Transportation

Hand transportation (i.e. walking while carrying chemicals, or pushing them on a hand cart) is appropriate within buildings, and between buildings within the boundaries of a controlled property or a USC campus.

Packaging/Secondary Containment

Hazardous chemicals still in the unopened DOT-approved packaging in which they were originally delivered to USC may be carried by hand or transported on a hand cart.

Hazardous chemicals not in DOT-approved packaging may be placed in robust secondary containment and carried by hand or pushed on a hand cart. Secondary containment should have a lid and be large enough to hold the contents of the chemical container in the event of breakage. The exterior of the secondary containment should be free from contamination and safe to the touch. Items which are not safe to handle without PPE are NOT permitted to exit a shop/laboratory and may NOT be transported outside of a shop/laboratory.

Bottle Carriers

Glass bottles of any significant size (\geq approx. 500 mL) shall be transported in a purpose built bottle carrier with a firmly attached handle. Bottle carriers with a secure lid designed to prevent spillage in the event of dropping the carrier are to be preferred (see Figure 10.9).

Figure 10.9. Bottle Carrier with Lid



Source: Nalgene

All newly purchased bottle carriers must have lids or caps. Open-topped bottle carriers should be retired as they become old, or be relegated to the transport of non-hazardous materials such as distilled water.

Hand Carts

Hand carts should be constructed from a non-corrodible, non-porous polymer and have deep lips (preferably >2 inches deep) to prevent items from falling (see Figure 10.10). Hand carts should not be overloaded. Highly-hazardous, easily breakable, or large items should be transported on the lower shelf. Chemicals transported on hand carts should be in secondary containment the same as for hazardous materials carried by hand.



Figure 10.10. Hand Cart

Source: Rubbermaid

Transportation and PPE

Reminder: Items which are not safe to handle without PPE are NOT permitted to exit a shop/laboratory and may NOT be transported outside of a shop/laboratory.

Transportation of Gas Cylinders

All hand transportation of gas cylinders (with the exception of very small cylinders light enough to be easily carried) is to be by wheeled cylinder cart (see Figure 10.11), not carrying more cylinders than designed for, and with the cylinder(s) securely fastened to the cart and the safety caps on. Compressed gas cylinders may not be “milk churned” (or spun) on their ends more than a short distance within rooms, and only then by personnel with sufficient physical strength in order to maintain control of the cylinder. NOTE: Ensure that compressed gas cylinders have safety caps before transporting.

Compressed gas cylinders are not normally permitted to be stored on carts (see previous subsection on compressed gas storage).

Figure 10.11. Gas Cylinder Cart



Source: Airgas

Vehicular Transport

Transport of hazardous materials in motor vehicles is strictly regulated by the US Department of Transport (DOT; [CCR Title 49 Subtitle B Chapter I](#)). Transport of hazardous materials by USC laboratory personnel using motor vehicles is NOT allowed, except under the limited conditions specified in [49 CCR § 173.6](#) “Materials of trade exceptions” (MOTs).

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11.0 Waste Management

All waste generated at USC - both hazardous and nonhazardous - must be segregated into proper waste streams prior to disposal. Many products and materials that are used frequently in shops contain potentially hazardous ingredients and require special care when being disposed of. Hazardous waste that is disposed of improperly will eventually find its way into the environment. **Remember, it is illegal to dispose of hazardous waste in the garbage, down storm drains, or onto the ground.**



Shops are strongly encouraged to integrate the EPA's Reduce, Reuse, Recycle model (<https://www.epa.gov/recycle>) into those operations where it is feasible.



As a responsible environmental steward, USC's [Waste Management Program](#) offers guidance on the proper disposal of all hazardous waste. **NOTE:** Section 9.0 of the [Chemical Hygiene Plan](#) outlines steps for managing and disposing of hazardous chemical waste.

Request hazardous waste disposal via [EHSA](#), hazmat@usc.edu, or (323) 442-2200.

Types of Hazardous Waste

Household and Landscape Chemicals

- Flammables and poisons. Includes solvent-based (oil) paints and reactive and explosive materials.
- Acids, oxidizers, and bases. Includes some pool chemicals and cleaners.
- Pesticides and herbicides. Many pesticides and herbicides cannot be disposed in the trash. Consult the product label or check with your local household hazardous waste agency.

Paints and Solvents

- Latex paint.
- Oil-based paint.
- Nonempty aerosol paint or solvent cans (all nonempty aerosol cans are banned from the trash).
- Solvents. Includes materials such as paint thinners, finger nail polish remover, etc.

Building Materials

- Asbestos. Includes some older kinds of cement, roofing, flooring and siding.
- Treated Wood. Includes wood that is treated with chromium copper arsenate (CCA).

Lights, Batteries, and Electronics

- Fluorescent lamps and tubes. Includes fluorescent tubes, compact fluorescent lamps, metal halide lamps and sodium vapor lamps.

- Batteries. Includes all batteries, AAA, AA, C, D, button cell, 9-volt, and all others, both rechargeable and single use. Also lead-acid batteries such as car batteries.
- Computer and television monitors. Most monitors are currently considered hazardous waste when they have lived their life and are ready for recycling or disposal, including cathode ray tube (CRT), liquid crystal diode (LCD) and plasma monitors. Learn about the State program to offset the cost of proper television and monitor recycling.
- Electronic devices. Includes computers, printers, VCRs, cell phones, telephones, radios and microwave ovens.

Mercury-Containing Items

- Electrical switches and relays. These typically contain about 3.5 grams of mercury each. Mercury switches can be found in some chest freezers, pre-1972 washing machines, sump pumps, electric space heaters, clothes irons, silent light switches, automobile hood and trunk lights and ABS brakes.
- Thermostats that contain mercury. There is a mercury inside the sealed glass "tilt switch" of the old style thermostats (not the newer electronic kind).
- Pilot light sensors. Mercury-containing switches are found in some gas appliances such as stoves, ovens, clothes dryers, water heaters, furnaces and space heaters.
- Mercury gauges. Some gauges, such as barometers, manometers, blood pressure and vacuum gauges contain mercury.
- Mercury thermometers. Mercury thermometers typically contain about a half gram of mercury. Replace mercury thermometers with digital thermometers.

- Mercury-added novelties. Examples include greeting cards that play music when opened; athletic shoes (made before 1997) with flashing lights in soles and mercury maze games.

Automobile-Related

- Antifreeze
- Batteries
- Motor oil and filters
- Tires (Note that tires are not considered hazardous, but automotive tires are banned from the trash for other reasons)

Other

- Compressed gas cylinders. Includes propane tanks used for BBQ or plumbing.
- Needles and sharps. Includes hypodermic needles, hypodermic needles with syringes, blades, needles with attached tubing, syringes contaminated with biohazardous waste, acupuncture needles, root canal files, broken glass items such as Pasteur pipettes and blood vials.
- PCB-containing materials. Includes paint and ballasts that contain polychlorinated biphenyls (PCB)
- Photo waste (silver bearing).
- Nonempty aerosol cans that contain hazardous materials. Many products in aerosol cans are toxic. And many aerosol cans contain flammables, like butane, as propellants for products like paint. If your aerosol can is labeled with words like TOXIC or FLAMMABLE don't put it in the trash unless it is completely empty.



12.0 Self-Inspections

Self-inspections are an essential part of the health and safety program within the shop because they get workers involved in injury prevention efforts, uncover unsafe conditions and practices, and increase morale when items are corrected.

Title 8, Section 3203 of the California Code of Regulations states that, *“every employer shall establish, implement, and maintain an effective [Injury and Illness Prevention Program \(IIPP\)](#). The program shall be in writing and, shall, at a minimum: Include procedures for identifying and evaluating work place hazards including scheduled periodic inspections to identify unsafe conditions and work practices.”*

Conducting periodic self-inspections allows time for a shop to detect and correct unsafe conditions before someone is injured. It is recommended that a self-inspection regimen involve all shop employees and occur at different times during the working day or shift taking into consideration activity and occupancy as well as at different times during the month.

Self-Inspection Frequency

Daily. Shop managers should inspect their work areas, tools, and equipment at the beginning of each workday. Employees, supervisors and others whose duties take them into the shop area, should be constantly checking for unsafe actions and conditions. In all cases where remedial action is needed, the problem(s) should be reported and corrected as soon as possible.

Monthly (or more frequently depending on the work performed and the current injury rate). The shop manager or designated competent person should inspect the shop in a thorough manner taking into consideration not only the tools and equipment used, but records and shop facilities as well. The occasional participation of top management in these inspections helps keeps them familiar with your shop’s operation and cements their support for the important work performed and any safety improvements – should they be needed.

Background Information		Inspector	Inspector's Name
Name			
Building			
Safety Officer or Shop Manager	School & Department		
	Name		
	Email and phone		
Inspector Accompanied by:	Safety Officer		
	Shop Manager		
	Other (specify)		

Inspection Items	Y	N	Corrective Action	Completed or Inspected	Date Completed
Emergency and First Aid					
1. Are emergency phone numbers (including fire, police, hospital) posted near a phone?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
2. Do employees know where to go in case of an emergency?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
3. Do employees know where and how to receive first aid?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
4. Are signs posted for emergency safety equipment (showers, eyewash)?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
5. Are eyewash and showers accessible?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
6. Are all exits and paths free from obstructions?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
7. Are first aid kits stocked/replenished monthly?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
8. Are first aid kits present and inspected within the year?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
9. Are emergency evacuation drills conducted at least annually?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Safety Administration					
1. Have all employees received general safety training (OSHA, fire and shop safety, etc.)?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
2. Have all employees been trained on the equipment that they operate?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
3. Are all employees trained with the following (select all that apply):	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
• Fall Protection	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
• First Aid	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
• Lockout/Tagout	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
• Lifting	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
• Material Handling	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
• Respirators	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
• Safe Work Practices	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
4. Are all safety training documented and filed?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
5. Are regular scheduled safety meetings conducted in the shop?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
6. Are safety meeting minutes posted and maintained?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
7. Do all employees have access to the shop safety folder?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
8. Are all records and used whenever necessary?	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	

Prior to conducting an inspection, consider the following:

- Review previous inspections to ensure that recommendations have been completed
- Review accident records. Information as to how a particular accident occurred often will reveal hazards that need to be corrected.
- Always wear all required personal protective equipment.
- Think through and plan out the inspection ahead of time. This ensures that all areas will be inspected completely and thoroughly.

Corrective Actions

Inspection reports must prompt corrective action(s).

Inform employees of unsafe acts and conditions when observed during inspections.

When the authority exists to correct or minimize a problem or hazard within the shop, do it immediately. Convey conditions that cannot be corrected immediately or within a reasonable amount of time to the responsible department person in a written report. If the authority needed to correct a deficiency is beyond the shop manager, make certain the concern is brought to the attention of the person who has the authority. The department must advise the shop manager in writing of any actions that are planned in response to the inspection findings or the reasons why corrective actions will not be taken.

Self-Inspection Records

Accurate inspection records serve as evidence of the program, provide documentation of necessary corrective actions and provide a method of follow-up to assure completion. Checklists have several advantages, but should be used as an aid to the inspection process, not as an end in itself. Checklists are especially helpful when periodic inspections are required for certain equipment. Be mindful that some equipment should be inspected by qualified persons on a schedule designed to ensure compliance. Consult with the equipment or power tool's manufacturer for guidance.

Insert Shop's Self-Inspection Form here.



13.0 Recordkeeping

Cal-OSHA requires employers to keep records related to all aspects of safety in the workplace. Required records include documents about safety hazard analysis, inspections, accident investigations, and trainings. Cal/OSHA also requires employers to keep records on hazard evaluations and the corrective actions taken to reduce or control safety risks in the workplace. **Maintaining good safety records along with a clean and orderly work space is an effective way of demonstrating that worker safety and health is taken seriously and a priority in your shop!**

Required Records

- Workplace safety inspections (include any findings and corrective actions taken)
- Workplace safety trainings to include PPE, task specific work practices, equipment or machine, general safety, Hazard Communication, Injury and Illness Prevention efforts, etc.
- Accident, incident and near miss investigations to include a root cause analysis
- Maintenance records (machines, equipment, facilities, etc.)
- Calibration records

Requirements for maintaining records range from one to five years. As a best practice and to be on the safe side, keep all safety and training records for 5 years. Some regulations have additional or separate recordkeeping requirements and timelines. For example, employee medical records must be kept for the length of employment plus 30 years. If you have questions related to record keeping requirements, consult with your HR Partner or contact EH&S.

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14.0 First Aid & Safety Equipment

First Aid

First aid is any one-time treatment, and any follow-up visit for the purpose of observation of minor scratches, cuts, burns, splinters, or other minor industrial injury, which do not ordinarily require medical care. The first-aid provider in the workplace is someone who is trained in the delivery of initial medical emergency procedures, using a limited amount of equipment to perform a primary assessment and intervention while awaiting arrival of emergency medical service (EMS) personnel, if needed.



Title 8, Section 3400 of the California Code of Regulations requires every employer to ensure the ready availability of (c) adequate first-aid materials, approved by the consulting physician, readily available for employees on every job. Such materials shall be kept in a sanitary and usable condition. A frequent inspection shall be made of all first-aid materials, which shall be replenished as necessary.

A properly stocked and maintained first aid kit along with prompt and properly administered first aid may mean the difference between rapid or prolonged recovery, temporary or permanent disability, and even life or death! Refer to the First Aid Kits Guide Sheet for more information.

Basic First Aid Checklist for Shops

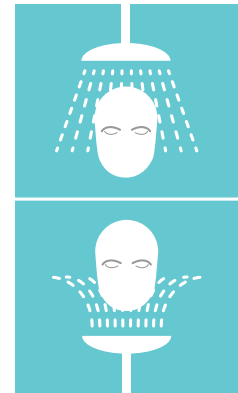
- First aid supplies are approved by the employer's physician.
- As many workers as possible have been trained in first aid and CPR.
- First aid kits are available, well stocked, clean, and easily accessible.
- Workers are trained in procedures to follow in case of a serious injury or illness.
- Appropriately trained personnel are available to provide first aid or there is a designated medical clinic nearby (within 4 minutes).

Emergency Safety Equipment

Emergency Safety Equipment are devices that are designed to provide emergency lifesaving assistance or summon emergency fire or medical services. As such, all Emergency Safety Equipment must be current in certification or calibration, unobstructed, readily accessible, identified by a highly visible sign and their use – promoted! All Authorized Shop Users should be shown the location of these devices, instructed on when and how to activate them including their proper use.

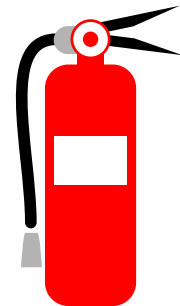
Emergency Eyewash and Safety Showers

Title 8, Section 3400 of the California Code of Regulations requires that (d) where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.



Fire Extinguishers

Title 8, Section 6151 of the California Code of Regulations requires that (c)(1) the employer shall provide portable fire extinguishers and shall mount, locate and identify them so that they are readily accessible to employees without subjecting the employees to possible injury and (g)(1) where the employer has provided portable fire extinguishers for employee use in the workplace, the employer shall also provide an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient stage fire fighting.



Fire Pull Stations

Title 8, Section 6184 of the California Code of Regulations requires that (b)(5) all employees shall be made aware of means and methods of reporting emergencies. These methods may be, but are not limited to, manual pull box alarms, public address systems, radio or telephones. When telephones are used as a means of reporting an emergency, telephone numbers shall be conspicuously posted nearby.





15.0 Emergency Planning & Response

Emergency Response Plan

An emergency is a sudden unforeseen crisis, usually involving danger, which calls for immediate action. Emergencies can happen before, during or after work hours and be caused by a range of events and hazards involving both nature and people. Each shop shall develop an Emergency Action Plan (EAP) that provides contact information and procedures to be followed in the event of an emergency such as:

- Natural disasters (earthquakes, floods)
- Extreme weather (storms, heat)
- Fires (building fires, wildfires)
- Chemical or hazardous material spills or releases
- Incidents of violence
- Bomb threats
- Medical emergencies
- Acts of terror
- Utility outage
- Employee deaths (suicide, homicide, unintentional or natural)
- Major transportation or vehicle accidents (involving trucks, buses, cars, forklifts, etc.)

Title 8, Section 3220 of the California Code of Regulations states that every employer shall create an emergency action plan *"in writing, except as provided in the last sentence of subsection (e)(3) of this section, and shall cover those designated actions employers and employees must take to ensure employee safety from fire and other emergencies."*

The following elements, at a minimum, shall be included in the plan:

- Procedures for emergency evacuation, including type of evacuation and exit routes;
- Procedures to be followed by employees who remain to operate critical plant operations before they evacuate;
- Procedures to account for all employees after emergency evacuation has been completed;
- Procedures to be followed by employees performing rescue or medical duties;
- The preferred means of reporting fires and other emergencies; and
- Names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan.

Before implementing the EAP, the employer shall designate and train a sufficient number of persons to assist in the safe and orderly emergency evacuation of employees. The employer shall advise each employee of his/her responsibility under the plan.

Post a copy of the shop specific EAP near the shop exit(s) for easy access during an emergency. The plan should be reviewed and updated annually. All authorized shop users must be trained on the EAP to include their roles and responsibilities as part of the shop's site specific training.

Incident Reporting

Serious Injury or Illness Reporting

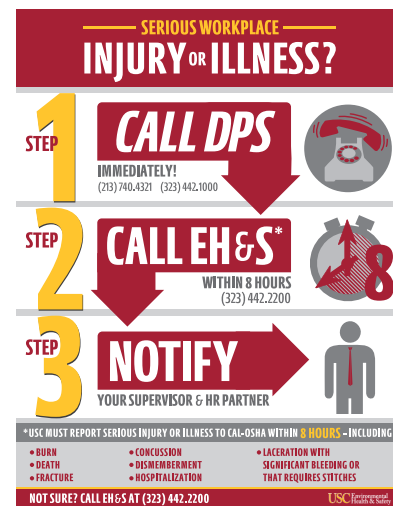
Employers in the State of California are required to notify Cal-OSHA within 8 hours of all serious occupational injuries and illnesses, or any workplace injury or medical event which results in an employee staying in hospital overnight or longer.

EH&S investigates and records incidents at USC and determines if Cal-OSHA notification is required, or if other actions are needed. Employers who fail to report serious occupational injury or illness within eight hours are subject to a \$5,000 penalty.

It is essential for Shop Managers and HR Partners to notify EH&S as soon as possible in the event of the following:

- Eye injury or exposure, regardless of how minor it may appear.
- Chemical or thermal burn
- Cuts or lacerations, if there is significant bleeding, stitches are required, or there are complications such as hazardous materials contamination or embedded broken glass.
- Concussion (actual or suspected)
- Fracture
- Dismemberment
- Death
- Any event requiring transport to hospital, e.g. sudden illness

For a work-related injury or illness that requires emergency response, follow the procedures on the [Emergency Notification Protocol](#) web page. Post the [1-2-3 Serious Injury Reporting](#) flier in a conspicuous area of the shop to help the research group become familiar with the process. It is also recommended to also post the 1-2-3 flyer in offices and common areas. Contact EHS@usc.edu for printed copies of the poster.



NOTE: Work-related injuries and illnesses may be treated at [USC-Approved Medical Facilities](#).

Manager's Report of Incident

The manager or supervisor of the injured worker must complete a Manager's Report of Incident Form for all work-related incidents whether the individual seeks medical care or not. Each question must be answered fully and the entire form completed in a timely manner. Send the completed form to your HR Partner and copies of the same to your home department files and the Office of Environmental Health & Safety / Shop Safety Program Manager.

Non-Serious Injury or Illness Reporting

Even if an injury or illness does not meet the requirements for Cal-OSHA reporting, it is important that the affected employee receives proper care. Review the [Injury and Illness: Seeking Medical Attention Fact Sheet](#) for the full process.



Minor Incidents/Near Misses

Non-emergency shop safety incidents/near misses which do not result in injury or harmful materials exposure should still be reported to EH&S. If the incident occurs after hours, reporting may be left until the next business day. EH&S will assess the incident and determine if an investigation is warranted.

How to Report

The USC Department of Public Safety (DPS) has continuous access to EH&S via a rotating 24-hour EH&S on-call personnel. DPS is also the contact between USC and emergency services (fire, ambulance, etc.). Therefore, **DPS should be the first contact in an emergency situation, or when a significant incident needs to be reported outside normal working hours.** DPS may be reached as follows:

- DPS Emergency Numbers: 213.740.4321 (UPC) and 323.442.1000 (HSC)
- DPS Non-Emergency Numbers: 213-740-6000 (UPC) and 323-442-1200 (HSC)

NOTE: Work sites outside the DPS response area should contact the local emergency service provider.

It is strongly recommended that all shop managers and shop personnel have DPS emergency and non-emergency numbers pre-programmed into their mobile phones. It is also recommended for the numbers to be displayed adjacent to fixed-line phones in shops, labs, and offices.

Within normal working hours, and in the absence of an emergency, EH&S should be contacted directly on (323) 442-2200 to report safety incidents. Further information on emergency notification and incident reporting may be found on the EH&S website (<https://ehs.usc.edu/occhealth/injury-prevention/incident-reporting/>).

Incident Investigation

Upon being notified of a shop safety incident, EH&S will assess whether further investigation is required. In general, all except the most minor and straightforward incidents will be investigated by EH&S safety specialists, who will gather information by interviewing shop personnel and PIs, and by viewing physical evidence.

An incident report will be generated which will, at a minimum, be sent to the PI and shop personnel who were directly involved in the incident, and to key EH&S personnel.

If an incident results in a significant injury, a "near miss" (i.e. could easily have been much more severe), or reveals systemic problems in safety management and culture within a research group, then the report may be circulated more widely, with appropriate recipients potentially including:

- Department/School
 - Safety Officer/Coordinator (when position exists)

- Senior management (Head of Department, Dean, Vice Deans)
- Safety committee chairperson
- USC Senior Management (Associate Senior Vice President for Administrative Operations, Senior Vice President for Administration, Vice President of Research)
- USC-wide safety committee chairpersons and members (CCSC, RSOC, others as appropriate)

The purpose of EH&S investigations is to clarify what happened and to identify contributing factors, in order to learn lessons and thereby improve future safety. Incident reports will normally contain specific recommendations for addressing any safety deficiencies or contributing factors identified during the investigation. It is important for PIs and shop personnel to understand that EH&S incident investigations are not intended to be punitive or to apportion blame.

Personnel are expected to cooperate fully with EH&S incident investigations by providing full and accurate information, in accordance with USC policy (<https://policy.usc.edu/cooperation-with-compliance-investigations/>).

Minor Chemical Spill

A minor chemical spill is generally considered less than one liter and contaminates small areas or equipment, but DOES NOT result in external or internal contamination of personnel or serious delay in work procedures.

- Small volume
- Accessible location
- No inhalation hazard (i.e., no toxic vapor or toxic dust)
- Not highly health hazardous by skin contact

- Does NOT require respiratory protection

Minor Spill Clean-up

1. Notify all personnel that a spill has occurred and evacuate non-essential personnel from spill area.
2. Clean the spill ONLY if you have suitable training, PPE, spill cleanup supplies, and feel comfortable.
 - Do NOT attempt to clean up any spill that requires respiratory protection.
3. Wear PPE appropriate for the chemical.
4. Follow spill cleanup instructions provided at: http://ehs.usc.edu/hazmat/spill-cleanup/Hazardous_Material_Spill_Clean-Up_Guide_Sheet, or provided by the manufacturer of a professional spill kit.

Spill Kits

It is strongly recommended for shops to possess a spill kit. Detailed information on how to construct or purchase a spill kit may be found on the [Chemical Spill Kit Guide Sheet](#).



Emergency Response: Chemical Exposure

Table 12.1. Types of chemical exposure and appropriate responses

Chemical Exposure	Response
Eye/Skin Contact	<ol style="list-style-type: none"> 1. Immediately go to the emergency shower/eye wash station and flush affected body area with water for at least fifteen (15) minutes while removing all contaminated clothing and jewelry. If the eyes have been contaminated, forcibly hold them open and flush for at least fifteen (15) minutes. Roll eyeballs around to ensure they are completely washed. <ol style="list-style-type: none"> a. If goggles are worn and face is splashed with hazardous material, close eyes, put face under shower, then remove goggles. This prevents accidental transference of contamination to eyes. 2. Hand soap may be used to aid removal of difficultly-soluble organic materials from skin. If soap is used, rub gently; vigorous rubbing may damage skin. 3. Do not use neutralizing chemicals, creams, lotions or salves unless specifically called for (e.g. see phenol and HF fact sheets). 4. While individual is washing, other personnel should notify DPS. Request emergency medical assistance (ambulance) if needed, e.g. because exposure was large, victim is showing symptoms, or substance is highly health hazardous (e.g. phenol, hydrofluoric acid). <ol style="list-style-type: none"> a. Err on the side of caution – request emergency medical assistance if not sure. b. If not transported by ambulance, affected individual should still seek medical evaluation as soon as possible. 5. Resume flushing area with water if pain continues. 6. Provide copy of SDS to emergency responders.
Inhalation	<ol style="list-style-type: none"> 1. Unless fully trained and equipped with appropriate respiratory protection, do NOT enter a potentially toxic or oxygen-deficient atmosphere in order to attempt a rescue! 2. Move exposed person to fresh air if safe to do so. 3. If victim is breathing, loosen victim's clothing and maintain the airway. <ol style="list-style-type: none"> a. Contact DPS and request medical assistance if needed. b. If not transported by ambulance, affected individual should still seek medical evaluation as soon as possible. 4. If the victim is not breathing, contact DPS and perform CPR (if certified) until medical assistance arrives. Be careful to avoid secondary exposure to chemical contamination via mouth-to-mouth resuscitation. <ol style="list-style-type: none"> a. Provide copy of SDS to emergency responders.
Ingestion	<ol style="list-style-type: none"> 1. Contact DPS and request urgent medical assistance. Provide copy of SDS to emergency responders. 2. If possible, determine what material was ingested by victim. 3. If victim begins to vomit, turn head or entire body to avoid choking. 4. Do not induce the victim to vomit or drink any beverage unless instructed by qualified medical personnel. 5. If victim stops breathing, see inhalation, step 4.
Injection	<p>Contact DPS and request urgent medical assistance</p> <p>Provide copy of SDS to emergency responders.</p>

Immediate expert guidance on first aid treatment for hazardous chemical exposures may be obtained free from the California Poison Control System (CPCS), 1-800-222-1222, at any time (<http://www.calpoison.org/>).

