Chemical Hygiene Plan (CHP)

General Information & Standard Operating Procedures (SOPs)

for

MRL X-ray Facility Laboratories

(MRL 1012, CNSI 1409, 1415)

REV 04-2013

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UCSB Laboratory Safety Manual and Chemical Hygiene Plan

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Preface

All labs using chemicals are required by Cal-OSHA to have a written safety plan (Chemical Hygiene Plan, CHP) in place for chemical workers. It is the responsibility of the lab supervisor/PI to ensure that a complete Chemical Hygiene Plan is developed, implemented and shared with all affected workers. This CHP contains important, *lab-specific* safety information such as standard operating procedures (SOP) for common procedures done in the lab. The idea behind having these SOPs written out is to minimize exposure to hazardous chemicals for the people performing the procedures.

These pages should be filed under the "Chemical Hygiene Plan" tab of the lab's CHP binder. If you find pages or information missing from this binder, you do not understand parts of its content, or you need other help with chemical safety questions, contact

Youli Li	x 8104	youli@mrl.ucsb.edu
or		
Miguel Zepeda	x 7943,5726	miguelz@mrl.ucsb.edu
or		
UCSB EH&S	x 4899	http://ehs.ucsb.edu

Introduction

This is the Chemical Hygiene Plan (CHP) for Shared Experimental Facility for X-ray Diffraction of the Materials Research Laboratory. It consists of three main sections. The first is general information which applies to everyone working in the lab. The next section contains a number of "Standard Operating Procedures" (SOPs) for processes in the lab which involve safety hazards. These are intended to give the user an account both of the potential hazards of the process as well as how to avoid these. The last section is an appendix, containing a number of relevant documents, most prepared by UCSB EH&S.

The origin of the regulations requiring a CHP and SOPs assume an industrial production lab with fixed procedures. In academic research laboratories, however, procedures, materials and hazards are constantly changing. Therefore, this document can never fully cover all safety issues in our lab. Instead, it strives to lay the foundation for safety in the laboratory by providing a framework upon which each lab researcher can build as well as a collection of safe best practices for commonly used procedures.

Due to the changing nature of work in an academic laboratory, it is the responsibility of each and every person working in this lab to do the inquiry, the literature research, and the thought required to understand and mitigate the hazards of their experimental work before they proceed with it. A good starting point is to get educated about the chemical hazards of the materials to be used (see the resources provided in this document). In addition, lab members should consult other people who have done similar work and feel free to contact Miguel Zepeda (laboratory research associate) and Youli Li (technical director) with questions or concerns.

The XRD lab located in MRL room 1012 and CNSI room 1409 is shared between the research lab of Safinya group and x-ray facility. A separate CHP for the Safinya Lab is available near the entrance to MRL room 1012 with more detailed information about chemicals used in the lab. Please review this document before performing any experiments involving use of chemicals.

Everyone working in the x-ray lab needs to read this Chemical Hygiene Plan once and review it annually. Please document that you have fulfilled this requirement by signing a log sheet together with other relevant training forms to during the process to obtaining access to the x-ray facility.

Youli Li
Miguel Zepeda Rosales

April 2013

General Laboratory Information

Laboratory Supervisor (PI)

Cyrus R. Safinya (MRL room 2204, x 8635, safinya@mrl.ucsb.edu)

Laboratory Locations (Building /Rooms)

MRL (building 615), rooms 1012
CNSI (Elings Hall), room 1409, 1415

Laboratory Safety Coordinator

Youli Li (MRL room 2202, x 8104, youli@mrl.ucsb.edu)

Department Information (MRL)

Department Safety Representative / Hazard Communication Coordinator

Joe Doyle (room 2066F; x 7925, jdoyle@mrl.ucsb.edu)

For all safety matters that go beyond our lab or that can not be settled by talking to Miguel or Youli, you may want to contact Joe Doyle, the Safety Representative for the MRL. He is also in charge of the overall maintenance of the MRL and several of the instruments housed here. Thus, he's a good person to know.

Location of Department Safety Bulletin Board

MRL room 2042 (2^{nd} floor kitchen)

The MRL Safety Corner bulletin board is a place where safety and other important information concerning the whole MRL is posted. The next time you are waiting for your food to warm up in the microwave, check it out.

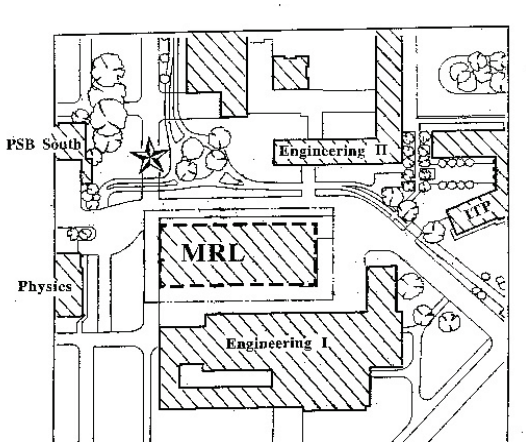
UCSB EH&S Chemical Hygiene Officer

David Vandenberg, Environmental Health and Safety, x5132, E-mail: david.vandenberg@ehs.ucsb.edu

Location of MRL Building Emergency Assembly Point (EAP)

The EAP is diagonally across the road from the main entrance of the MRL (in between Physics and Eng II) on the Isla Vista Side of the Eng II Building (marked by a star on the adjacent map)

Proceed to the EAP in the event of any evacuation or fire alarm, be it real, a drill, or a malfunction of the alarm system. Remain there until everyone is accounted for. Do not reenter the building until instructed to do so by authorized personnel.



Emergency Information

Emergency procedures

Campus EH&S has compiled helpful essential information on how to respond to a variety of emergencies and hazardous situations in a flip-chart type manual. A copy of this manual is posted next to each lab door. Contact Miguel Zepeda or Youli Li if you find one missing. More information on specific scenarios (fires, chemical spills, and earthquakes) is also provided in this CHP document (see below).

Remember that you need to dial 9-911 from campus phones for emergency calls. As soon as it is safe for you to do so, also notify Miguel Zepeda (campus extension x7943; mobile 831 840 6820 after hours) or Youli Li (x8104; 805 252 6315 after hours).

For emergency contact information regarding incidents in the lab, see the placards on the lab doors. If in doubt, contact Youli Li (x 8104) or Joe Doyle (x 7925).

Evacuation procedures

If evacuation is advised (most emergencies with the notable exception of earthquakes), leave the lab as quickly as possible through the closest door that is not obstructed. Then proceed to the East (main, Isla Vista side) exit of the MRL and the Emergency Assembly Point (EAP) on the Isla Vista side of Eng. II (see map above). If the East exit is blocked, use the West exit (ocean/KITP side). Emergency exit plans for all three floors of the MRL are posted on the Safety Corner bulletin board (see above). The MRL EOP (on the web, see below) also has this information. For evacuation of CNSI, leave the lab as quickly as possible through closest door and proceed to the South exit of the CNSI and the EAP on the grass lawn of KITP.

In the event of a fire, do not leave doors and windows open. If possible, operate the emergency power shutoffs before you leave the lab. If there is time to do so safely, take valuable personal property.

First-aid kit

A basic First Aid Kit is available next to the door in room 1012, on your left as you enter lab – behind the station with the MSDS. The kit is maintained by Dr. Youli Li (x 8104, youli@mrl.ucsb.edu) and Miguel Zepeda (miguelz@mrl.ucsb.edu) .

Spill cleanup materials

A spill cleanup kit is located under the sink in room 1012 (the sink adjacent to the fume hood) and in CNSI room 1409 (main x-ray lab, under the sink). EH&S should be contacted for any major or particularly hazardous cleanups (e.g. mercury spills from a thermometer) at x 3914. This phone number is available 24 hours a day. After hours,

emergency personnel can be paged through this number. A Standard Operating Procedure for handling chemical spills is provided in this CHP.

Laboratory monitors or alarms

The only lab monitors are low air flow monitors on the fume hoods. These are maintained by Campus Facility Management (x 2661).

Fires

Below you will find information concerning a fire in the lab or the building.

Fire alarm and Evacuation Guidelines

The fire alarm in the MRL and CNSI buildings consist of flashing strobe lights (these lights are mounted along the main hallways and also outside of the building) and an audible alarm. The audible alarm is a siren and a spoken message, notifying occupants of a fire and asking them to leave the building. If the fire alarm goes off, you must leave the building, no matter whether it is an actual alarm or a pre-announced test of the system. **Do not use the elevators**, leave the building through the nearest available exit and find your way to the Emergency Assembly Point at the SW corner of Engineering II (see above).

Reporting a fire

For reporting a fire, fire alarm pull stations are located on the walls of the main hallways of the MRL and CNSI. These should have been pointed out to you as part of your lab-specific safety training. Per SB County Fire and UCSB campus policy, **all fires must be reported to 9-911 immediately** – even if the fire is out. This is particularly true if there was use of an extinguisher (which always must be replaced, even if only used partially!); and injury; or property damage.

Fire Extinguishers

There are two types of fire extinguishers in the lab. The common standard are fire extinguishers that use powder. Each of the main rooms (MRL 1012 and CNSI 1409), have one of these, located next to the doors that lead to the hallway. These extinguishers can be used for any fire, including electrical fires. However, they make a gigantic mess and the fine powder that they dispense is not only hard to clean, it can also damage and destroy electrical equipment. Therefore, we also have an alternative, which is a CO2 extinguisher. This is located next to the door in room 1012 (Safinya and XRD lab). This is the type of extinguisher that you used in your lab safety training. Unless you are dealing with fire on electrical equipment, this is the preferred extinguisher to use.
If a fire extinguisher has been used, no matter for how brief, it must be replaced. Contact Youli Li or Joe Doyle to do this.

In the Event of an Injury

Per campus policy, all **significant injuries must be documented** via the *UCSB Report of Injury to Employee/Student* form as soon as possible. This is necessary for potential reimbursement for personal medical costs, or Worker's Compensation Claims. A copy of this reporting form is the appendix. It also is available (as of 9/9/09) at

http://www.busserv.ucsb.edu/Forms/SB_Incident_Report.pdf

Serious Injuries

If the situation is **immediately threatening to life or limb**, get emergency care, e.g. by calling 9-911 from any campus phone. This is preferred to taking an injured person directly to the Goleta Valley Cottage Hospital Emergency Room, where they may not be seen or treated for a long time if they don't arrive in an ambulance.

Other Injuries

Students – For serious injuries not threatening to life or limb, undergraduates and graduate students who are not "employed" by UCSB, may be treated at Student Health Services. There is a map at:

http://studenthealth.sa.ucsb.edu/GeneralInformation/MapOfUCSB.aspx

UCSB Employees – Staff, Faculty, Graduate Student employees, undergraduate employees, Post Doc, and other UCSB employees with serious work related injuries, which are not threatening to life or limb, should use one of these Urgent Care Facilities (that UC has contracted with) for walk-in treatment:

	Days	**Hours**
Occupational Medicine Center 101 S. Patterson, Goleta	Mon – Fri	8:00 am - 6:00 pm
Urgent Care/Hitchcock Branch 51 Hitchcock, Santa Barbara	Sat & Sun	9:00 am - 6:00 pm

Maps for the above are available at:

http://www.busserv.ucsb.edu/workerscompensation/mtaf.htm

It is important that all work related injuries be reported for authorization immediately. During regular business hours, contact your Cyrus, Youli, Kai or Maureen Evans right away to report injuries and to obtain an authorization for initial medical treatment. If a work-related injury occurs outside of normal work hours, contact the Workers' Compensation office at 893-8050 within one business day and report to Maureen on the next work day.

Health & Safety References

NOTE: Material Safety Data Sheets (MSDS):

Per OSHA regulations, all lab chemical users must know: a) what an MSDS is, b) MSDS relevance to their health and safety, c) how to readily access them. These issues are all covered in the EH&S lab safety orientation program. In brief, an MSDS is a compilation of hazard/safety information for a given chemical or mixture, provided by the manufacturer. MSDS often are your first and best source of information about potential hazards of the chemicals you are working with. See below for sources of MSDS and further information.

Written Safety Resources & References

Reference	Location
Lab Chemical Hygiene Plan aka the Black Binder	MRL 1012, CNSI 1409 (near door)
Yellow binder with Material Safety Data Sheets (This is where MSDS for routinely used chemicals should be kept)	MRL 1012, CNSI 1409 (near door)
Merck Index	MRL 1012 (near door)
Biosafety in Microbiological and Biomedical Laboratories	MRL 1012 (near door)
Prudent Practices for Handling Hazardous Chemicals in Laboratories	MRL 1012 (near door)
Prudent Practices for Disposal of Chemicals from Laboratories	MRL 1012 (near door)
Dangerous Properties of Industrial Materials, 8th Ed.	Joe Doyle (MRL 2066F)
Health And Safety Binder (aka The Green Binder)	Joe Doyle (MRL 2066F) and online (see below)

Electronic Safety Resources & References

Reference and Location

Shortcut to electronic MSDS resources

On desktop of shared lab computers

MRL Safety webpage
(has links to MSDS and LCSS sources and other useful information)

http://www.mrl.ucsb.edu/mrl/info/administration/mrlsafety.html

UCSB Environmental Health and Safety (EH&S) website
(has links to MSDS resources and a lot of other safety information)

http://ehs.ucsb.edu

Comment: UCSB EH&S has posted vast amounts of useful safety information on their web page, but it is not always easy to locate. Some subjects covered (use the Search function on the site to find it) are listed below (see also the following references)

- Introduction to Campus Procedures and Resources
- Personal Protective Equipment in UCSB Storerooms
- Eyewear Policy and Selection
- Selecting the Proper Gloves
- Chemical Spill Cleanup Procedures
- Hazardous Waste Disposal Procedures
- Fire Fighting and Extinguishers
- EH&S Lab Safety Class Descriptions
- Laboratory Self-Inspection Checklist (see Appendix E)

Health And Safety Binder (aka The Green Binder)

http://ehs.ucsb.edu/units/iipp/iipprsc/greenbook.htm

Lab Safety Info at UCSB EH&S website

http://www.ehs.ucsb.edu/units/labsfty/labsafety.html

Emergency Assistance Info

http://ehs.ucsb.edu/units/emplan/eprsc/emergphone.htm

Lab Safety Fact Sheets (one page summaries of important safety issues by UCSB EH&S and links to similar resources on other campuses)

http://ehs.ucsb.edu/units/labsfty/labrsc/factsheets/lsfacsheets.htm

Comment: **These are a good first stop for safety information** and are available on a wide range of lab safety subjects including chemicals and chemical safety, lab equipment safety, and hazardous waste handling and disposal procedures.

NOTE: The list is provided below for general information.
The x-ray facility does permit the use and storage of any chemicals beyond commonly used alcohol based cleaning solvants.

Hazardous Waste Refresher (online course)

http://ehs.ucsb.edu/4DAction/WebCourseDescription/100696/1

Accident Descriptions on the EH&S website

http://www.ehs.ucsb.edu/units/labsfty/labrsc/Incidents.htm

Comment: Every accident has a lesson to teach.

Online source for LCSS of some common chemicals (from "Prudent Practices in the Laboratory: Handling and Disposal of Chemicals" (National Academies Press, 1995))

http://www.hhmi.org/about/labsafe/lcss.html

The book ("Prudent Practices in the Laboratory: Handling and Disposal of Chemicals" (National Academies Press, 1995) itself (on the web as an online "open book")

http://newton.nap.edu/books/0309052297/html

Important Phone Numbers and Contact List

Emergency phone numbers

Call

911	**from payphones, residence hall phones**
9 911	**from campus phones**
805 893 3446	**from cell phones (when on campus)**

- Also consult the flip-chart manual posted next to every lab and office door

Other important phone numbers

Joe Doyle		x 7925
Youli Li		x 8104
Miguel Zepeda-Rosales		x 7943
Maureen Evans		x 8519
Facilities management		x 2661
For fire extinguisher recharge		x 3305
Student Health Services		x 3371
EH&S 24-hour hotline		x 3194
Campus emergency information	(55c / call or min)	(900) 200 8272
Highway information (Caltrans)		(800) 427 7623
UCSB Emergency Operations Center campus status		x 8690

Earthquake Safety

There will be a big earthquake in Santa Barbara. The only question is when.

All storage, especially of heavy objects, chemicals and glass, must to be done so that the materials will not fall and become a hazard, obstruct escape routes or injure someone in a large earthquake. All gas cylinders need to be secured with a welded link metal chain. Furniture taller than 42 inches must be secured to the walls. While you should normally not have to do this yourself, notify Joe Doyle, Youli Li or Miguel Zepeda if you notice unsecured furniture.

During an earthquake, you should try to stand in a doorframe until all shaking has stopped and only then evacuate the building. Another option, especially if you are in an office, is to seek shelter under a desk.

Lab Safety

Introduction

Welcome to the MRL X-ray Diffraction Facility!

This document intends to provide you with some essential information that will help you work more efficiently and safely in our lab. In addition, it aims to give you a central repository of useful information, such as contact info for lab members etc. If you have suggestions on what else to include, please let Youli Li or Miguel Zepeda know.

If there is any safety-pertaining information in this document that you do not understand completely, seek clarification from Miguel Zepeda or Youli Li (contact information at the beginning of this document).

It almost goes without saying that doing your work in the lab in a way that is professional, safe, environmentally responsible and respectful of the needs of others is the basis for everyone working successfully while at the same time enjoying it. As the central facility of the MRL, the x-ray lab has a large number (>400) of active users. We have students and postdocs from a variety of backgrounds in the lab. Many of them will work in areas new to them. This poses a particular challenge for working safely, be it with x-ray radiation or hazardous chemicals. Thus it is important for more experienced lab members to share their knowledge of how to work safely and efficiently. Everyone needs to work in the safest possible manner, not only to ensure their own and their coworkers' safety, but also to comply with the many laws and regulations about safe work practices that apply to the university environment. In the interest of everyone's safety, it is further

important for all lab workers to be aware not only of the hazards and safety requirements of their own work, but also of that of their coworkers.

It is the responsibility of each and every person working in this lab to do the inquiry, the literature research, and the thought required to understand the hazards of their experimental work before they begin it.

To be allowed to work in the lab, you must complete the required safety training (see below) and complete and file the MRL Participant Form with Sylvia Vogel. This form directs participants to the required safety training beyond laboratory issues including fire, earthquake, ergonomics and more.

Safety Training Requirements for Laboratory Access

In order to become an authorized user of the x-ray laboratory, the individual must fulfill ALL the requirements listed below

1. Complete EHS general laboratory safety training
2. Review MRL general safety documents
3. Watch the radiation safety video "The Double Edged Sword"
4. Be trained to operate the x-ray instruments in a safe manner
5. Review the laboratory specific Chemical Hygiene Plan (this document)
6. Document all above steps and submit records to appropriate personnel

The training steps will be described in detail below

EH&S General Lab Safety Training

Every person working in the lab is required to take the in-person EH&S Laboratory Safety class before starting any work in the laboratory. No lab keys will be issued to you unless you have taken this class and this has been documented.

An in-person class is held at the start of each quarter. In the fall the class is provided for incoming graduate students at several science departments and at the College of Engineering. In summer there is a special class just for interns.

The in-person quarterly training schedule is announced by e-mail one to two weeks before the class and is posted online. Make sure you are on the MRL email lists so you get this and other important announcements.

In addition, there is an online lab safety course available for undergraduates. Lab users may get **temporary** lab access, until the next in-person class, by completing the **online training course and test** for undergraduates (see below). They must attend the next available in-person class to retain lab access privileges. Undergraduate lab researchers who work in the lab one quarter or less are only required to take the online lab safety class.

The Online training is available at:

http://ehs.ucsb.edu/4DAction/WebCourseSessionList

Documentation of the training will be provided by EH&S as a certificate.

Review MRL Specific Safety Documents

All lab users are required to **read the safety-related documents listed below** and document that they have read them within 2 weeks of starting work in the lab:

- The Chemical Hygiene Plan (CHP) for the X-ray Lab (this document). This is meant to be the main safety resource for the X-ray Lab.

- The MRL and CNSI Emergency Operations Plan (also Emergency Action Plan & Fire Prevention Plan) (see Appendix C) available at

  http://www.mrl.ucsb.edu/mrl/info/administration/eop.html

- The MRL and CNSI Combined Injury & Illness Prevention Plan and Hazard Communication Plan available at

  http://www.mrl.ucsb.edu/mrl/info/administration/iipp.html

To document the completiong of this training step, please fill out the form below

http://www.mrl.ucsb.edu/sites/default/files/mrl_docs/forms/safety_training_form.pdf

Lab Specific Training for X-ray Safety

In addition to the EH&S class(es), every person working in the lab also has to go through a **lab-specific training**, which includes watching a radiation safety video "The Doubled Edged Sword" online at

http://www.mrl.ucsb.edu/centralfacilities/x-ray/access-training

Instrument Specific Training

This training will cover hands-on training to operate x-ray instruments and introduction to the safety features built-into the equipment. Important radiation safety procedures are stressed. This training can be conducted by facility staff or an existing authorized user.

Documentation for the above two steps are combined in the training record form from EH&S (Training Record for Radiation Producing Machines)

http://www.ehs.ucsb.edu/units/rad/radrsc/radsaftypdfs/b12trainexpradpromch.pdf

Review Lab-specific Chemical Hygiene Plan (CHP)

All facility users must review the CHP (this document) and sign off on the sheet provided at the beginning of this document.

Submit Training Documentation

All safety training needs to be documented. Please submit to Youli Li (youli@mrl.ucsb.edu, x8104) any records or certificates of safety trainings that you have completed. Training forms can be sent via campus mail to Youli LI, MRL 5121 or dropped off in the drop box in MRL room 2202.

As much as it may seem, all of the above is just the foundation of the laboratory safety training. Everyone working in the lab must do the appropriate inquiry, literature research, and thought to insure that the specific lab work they do is performed safely. The actual preparation will vary depending on what the project will be, but will certainly include studying the chemical hazards of the materials to be used and speaking with people who have done similar work. More work may be necessary, such as reviewing any physical or electrical hazards and considering if specialized personal protective equipment is required. Consult the information below as well as the SOP on "Preparing for a New Project" for more guidance on how to go about this and what resources are available.

Basic Lab Safety Rules and Precautions

In addition to the guidelines provided below, it is recommended that you go over the Laboratory Safety Self-Checklist in Appendix E. This document is also available on the web at via http://www.ehs.ucsb.edu/units/labsfty/labrsc/inspection/Lab_Self_Inspection_web.pdf

General

No storage of food and drinks in the MRL lab 1012 which has extensive list of chemicals.

Smoking is prohibited anywhere in the lab.

Do not block lab aisles with chairs, stools, or equipment.

Observe all posted signs and instructions

Electrical Safety: Do not use damaged electrical cords. Do not chain extension cords / power strips. Do not leave extension outlets or power strips on the floor where it may be flooded.

Gas cylinder handling

All gas cylinders need to be secured with welded link metal chain so they do not fall over in an earthquake. When moving a gas cylinder, place the safety cap over the valve before undoing the chain securing the cylinder. Use the special dolly for gas cylinders that is kept in the MRL gas cage (across the little parking lot on the ocean side of the building).

Chemical Safety

For transport of larger (> 1 L) glass bottles with chemicals, use designated carriers or plastic buckets.

Always keep fume hood sashes as low as possible. For additional information on fume hood usage, see the corresponding EH&S fact sheet in Appendix A. The fact sheet is also available on the web at

http://ehs.ucsb.edu/units/labsfty/labrsc/factsheets/factsht2fumehoods.pdf

No hazardous chemicals are allowed in the x-ray lab in CNSI 1409. Only small (1L) squirt bottles for cleaning samples are allowed in the lab and they should be used and stored inside the hood. Users of the ultra-SAXS instrument in MRL 1012 must obtain permission from Youli Li before bringing chemicals into the lab.

Identifying Chemical Hazards

Every lab worker has the responsibility to learn about and understand the hazards of the chemicals they use **before** starting to use those chemicals. Do not assume that a material is harmless just because you haven't heard otherwise. Many chemicals are harmful, and some chemicals are mostly harmless by themselves but very dangerous in combination with certain other chemicals.
Besides talking to other people in the lab that use these materials (but don't assume that they have done their homework, even if they are senior to you!!), these are some resources:

- Material Safety Data Sheets (MSDS). Widely available online (see the Resources section of this CHP), they are especially useful for mixtures, but also for reagents. MSDS were intended to be a one-stop source of chemical hazard information, but they frequently are not very specific, not as succinct as one would like, and make everything sound extremely hazardous because they err on the side of caution e.g. for personal protective measures.
- Laboratory Chemical Safety Summaries (LCSS) are available for far fewer compounds, but more succinct and useful. Sources for LCSS are on the MRL Safety webpage (see the Resources section of this CHP).
- The Merck Index is a compendium that has relevant information for many common chemicals. A copy of the Merck Index is kept in room 1012 next to the door.
- see also the Resources section of this CHP

Communicating Safety and other Lab Issues

You should report any procedure, condition or situation that you consider to be unsafe, or potentially unsafe. Except for an actual emergency, the best way to communicate a safety problem is to write an email to Youli Li and Miguel Zepeda (or Joe Doyle), depending on the nature of the problem. Forms for anonymously reporting a hazardous condition or practice (Hazard reporting forms) are available at the MRL Safety Corner bulletin board in room 2042 if you feel that reporting the hazard in the usual manner would jeopardize you in some way.

If supplies are missing, a hazardous waste pickup needs to be arranged, or a piece of equipment is not working, contact the laboratory staff (Youli Li and Miguel Zepeda)

Personal Protective Equipment

The following provides some basic rules and information about personal equipment designed to protect workers from laboratory hazards.

Closed-Toe Footwear

Closed-toe footwear must be worn in the lab in MRL 1012 at all times.

Safety Glasses and Other Eye Protection

Safety glasses must be worn at all times when working in an MRL laboratory. Even if you are not working with hazardous materials, someone else in the lab probably is.

Each member of the lab should have their own, personal pair of safety glasses. Regular corrective lenses or sunglasses are NOT safety glasses. Nor do contact lenses provide any sort of adequate protection. Increase the likelihood of wanting to wear your safety glasses by getting a pair that is comfortable and keeping them clean and scratch-free, so your vision is as good with as without them. Safety glasses are available from the store rooms, or by ordering from Fisher. Or you can take one of the spare pairs (see below).

Spare / extra safety glasses and some specialty safety glasses are in the top drawer of the cabinets located on your left as you enter room 1012.

Lab coats and Clothing

The MRL recommends that lab users wear non-synthetic clothing and appropriate lab coats. Lab coats made from different materials are available. It is imperative to consider the nature of the work performed when choosing a lab coat. Anyone working with highly flammable materials must use a lab coat made either from pure cotton or a fire retardant Nomex labcoat. Most “standard” labcoats are made from a polyester/cotton mix and are not suitable for work with flammables and particularly pyrophorics.

Each person requiring one should have their personal lab coat. Lab coats are available from the stock rooms or from Fisher (e.g. if special sizes are required). Fire-retardant laboratory coats are now available in both the Physics and Chemistry stockrooms.

Lab coats must not be cleaned at home. Rather, a professional cleaning service must be used. See the EH&S fact sheet for more information.

For additional information on lab coats, see the corresponding EH&S fact sheet in Appendix A. The fact sheet is also available on the web at

http://ehs.ucsb.edu/units/labsfty/labrsc/factsheets/Lab_Coats_FS35.pdf

Gloves

Most lab users wear gloves to protect their hands from hazardous chemicals. Educate yourself as to which chemicals the gloves you are using are resistant and (im)permeable to. You may be unpleasantly surprised. However, there is a tradeoff between chemical resistance of gloves and the dexterity they allow. The increased dexterity offered by thinner gloves may offset their poorer chemical resistance. After all, the main idea is for you to not spill anything in the first place!

A reference chart with compiled data on chemical resistance of lab gloves can be found at

http://ehs.ucsb.edu/units/labsfty/labrsc/lsglove.htm

There are several places in the lab where we keep latex and nitrile single use examination gloves. While impermeable to water, buffers, acids and bases, none of these are very impermeable to most solvents. This means that you should *immediately* and *quickly* remove the gloves if you spill solvent on them. For increased safety, you might want to wear two pairs of gloves on top of each other. This will slow the permeation through the gloves down significantly. Extremely impermeable (and clumsy) gloves are stored in the storage cabinet in 1032. The single use gloves are available from the store rooms or via Fisher.

If you are handling hazardous chemicals, you must take off your gloves as soon as you are no longer working with the chemicals, e.g. when you answer the telephone, operate a door handle or use a computer keyboard in the lab.

Some people wear gloves to protect their samples from skin oils and salts. These people, too, should not touch door handles, keyboards, etc. with gloves on in order not to contaminate the gloves.

Gloves for protection from heat and cold are also available in the lab, usually next to the ovens and the -70 °C freezer.

Some Best Lab Practices

These make the lab a better place to work for everybody:

- Return all squirt bottles for sample cleaning to inside the hood after usage
- Put your reagents back in the proper cabinet at the end of every workday
- Refill squirt bottles when they are nearly empty. Get new solvent bottles from the store room before running out
- Don’t leave samples, lab supply, personal effects, glassware, books or papers out in the lab except when you are actually using them
- Wash and put away your glassware everyday

Lab Safety Equipment

Below are the locations of emergency showers and eyewash stations in the lab as well as basic directions for their use.

Emergency Showers and Eyewash Stations

Outside of the doors of rooms 1012 and 1024 are emergency showers with eyewash stations and inside of XRD lab in CNSI room 1409. Most of the sinks also have some setup that may be used for an improvised eyewash station. Don't use these showers unless there is an emergency. Facilities management (x 2661) needs to be called to turn them off once activated.

If a chemical splashes in someone's eye, rinse with copious amounts of water **for a minimum of 5 minutes**. Small burns or splashes with corrosive chemicals on the skin are also flushed with water for five minutes. Use the emergency showers if a person's hair or clothing has caught fire (rolling the person on the floor is another option for extinguishing flames) or in the event of a larger spill of a hazardous chemical on skin or clothing.

Spills and Exposure to Hazardous Chemicals

For all incidents in which injury has occurred or may be imminent, follow the steps below.

Emergency procedure

- Administer First Aid as needed
- Warn people in the area
- Evacuate the area if needed
- Notify 9-911
- Notify Kai Ewert as soon as feasible

Exposure to Chemicals First Aid

If a chemical splashes in someone's eye, rinse with copious amounts of water **for a minimum of 5 minutes**. Small burns or splashes with corrosive chemicals on the skin are also flushed with water for five minutes. Use the emergency showers if a person's hair or clothing has caught fire (rolling the person on the floor is another option for extinguishing flames) or in the event of a larger spill of a hazardous chemical on skin or clothing.

Spill Cleanup

See the SOP on Chemical Spill Cleanup for information on when and how to clean up a chemical spill (page 59).

Disposal of Hazardous Waste

To prevent injury, minimize environmental health hazards, and meet regulatory requirements, all hazardous waste must be disposed of in compliance with UCSB chemical waste disposal procedures. Individuals may be held criminally liable for violations of applicable laws and regulations.

For additional information, see the EH&S fact sheets on Chemical Waste Disposal and Sharps Disposal in Appendix A. These fact sheets are also available on the web at

http://ehs.ucsb.edu/units/labsfty/labrsc/factsheets/lsfacsheets.htm

An online refresher course on hazardous waste is available at

http://ehs.ucsb.edu/4DAction/WebCourseDescription/100696/0

Chemical Waste Disposal

Do not dump any hazardous substances down the drain!!! Do not dispose of chemicals via sink or trash cans.

No chemical and hazardous waste storage and disposal is allowed in CNSI lab 1409. For chemical usage and disposal in MRL labs 1012-1032, please follow instructions and guidelines contained in the Chemical Hygiene Plan for Safinya Lab (located in MRL 1012) or contact Dr. Kai Ewert. Do not leave chemical waste in open containers in the fume hood. Waste containers must be capped if not in use. Do not use fume hoods to intentionally evaporate chemicals.

Proper Hazardous Waste Segregation

Not applicable for CNSI 1409. See Safinya Lab CHP for MRL 1012.

Collecting and Storing Hazardous Waste

Not applicable for CNSI 1409. See Safinya Lab CHP for MRL 1012.

Labeling Hazardous Waste

Not applicable for CNSI 1409. See Safinya Lab CHP for MRL 1012.

Proper Waste Disposal / EH&S Pickup

Not applicable for CNSI 1409. See Safinya Lab CHP for MRL 1012.

Whenever a waste container is about 75% full, notify the group member responsible for waste disposal (Rahau or Kai) so pickup by EH&S can be arranged.

Briefly, here is how to arrange for pickup of the waste by EH&S:

- Fill out a UCSB Waste Pickup Request Form (link to PDF) and send it to EH&S via campus mail or fax it to 893-7259 (please do not call EH&S). To electronically send a waste pickup request, visit http://ehs.ucsb.edu/hazwasterequest
  Note: Although a continuation sheet is provided, one-page pickups are desired
- EH&S cannot accept responsibility for improperly labeled, packaged, and/or segregated chemicals, and **will not pick them up**
- Waste containers become the property of EH&S and will not be returned

Sharps disposal

Sharp materials like broken glass, razor blades, or hypodermic needles; may not be placed in the regular lab trash as this could injure the custodian. See below for proper disposal procedures. Depending on their size, other sharp materials may be disposed as described for broken glass (large items) or needles and razorblades (small items).

Glass Disposal

All glass (except recycling) must go into the designated glass disposal containers in the lab. These are white and blue cardboard boxes with a plastic lining.

When the container is full: take the lid off, flip the cover over the opening and place the lid back on the container. Then use duct tape to secure the lid and to prevent the container from rupturing during handling. Finally, dispose of the container in any UCSB dumpster (e.g. the dumpster behind the CNSI near the gas cages or the one in front of the MRL, opposite of the Physics machine shop). New glass disposal containers are available from e.g. the physics stock room.

Disposal of Razor Blades, Needles, etc.

Our lab has a supply of plastic containers specifically designed for the disposal of razor blades and hypodermic needles. Typically, one of these is available in the hood next to the sink in room 1012 and CNSI 1409 near the hood. A supply of them is in a drawer next to the sink in 1024. When the container is full, close the lid tightly (it should snap into place) and discard the container into a glass trash bin.

Twelve Commandments for Lab Safety

(in place of a summary)

1. **Wear your safety glasses in the lab. Wear closed toe shoes. Wear gloves, lab coat, etc. as required.**
2. **Never touch doorknobs, phones, computers, ... with gloved hands.**
3. **Do not pour waste down the drain. Use the appropriate collection bottle. All sharps (glass, needles, blades) need to go into designated containers.**
4. **No food, drink, smoking in the lab.**
5. **You must not work in the lab before completing your safety trainings.**
6. **Know what you are doing and the hazards of your work. Know this for your neighbors work, too.**
7. **Do not store or use chemicals in CNSI labs in 1409**
8. **Label your samples with your name and the appropriate chemical names.**
9. **Secure gas cylinders to the wall with metal chains.**
10. **Do not block lab aisles with chairs, stools, or equipment.**
11. **Do not use damaged electrical cords. Do not chain extension cords / power strips.**
12. **Always keep fume hood sashes as low as possible.**

Standard Operating Procedures (SOPs)

Chemicals are generally not used during x-ray diffraction measurements. All SOP for operating the x-ray diffraction instruments are posted adjacent to the instruments. All users must be familiar with instrument operation and safety instructions before access is permitted.

Background: Standard Operating Procedures

Per the OSHA Standard, a complete CHP includes **Standard Operating Procedures (SOP)** to aid workers in minimizing chemical exposures in the lab**.** This is generally interpreted to mean SOPs for the following – **not** for all possible chemical operations:

- Operations involving Particularly Hazardous Substances (PHS), namely, **"Select" Carcinogens**, **Highly acute toxins**, and **Reproductive toxins** (for a list, see http://ehs.ucsb.edu/units/labsfty/labrsc/chemistry/lschphazsubstance.htm)

- Other "high-hazard" chemical operations

It is the responsibility of lab supervisors to develop new SOPs (or augment the generic PHS SOP) if needed to protect their workers. The decision on whether a specific SOP is required is the prerogative, but also the responsibility, of the lab supervisor.

NOTE: NO HAZARDOUS CHEMICALS ARE STORED AND ALLOWED IN THE X-RAY DIFFRACTION LABS IN MRL 1012 AND CNSI 1409

SOP Template: High Hazard Lab Operations

This blank template is for developing SOPs for any "high-hazard" chemical operations not covered by the template for Use of PHS. **The development of lab-specific SOPs for high hazard operations is the responsibility and determination of the supervisor.** OSHA does not have specific requirements for SOP content. EH&S recommends that the following elements be considered in SOP development, but supervisors should expand on as appropriate.

Date of last revision to SOP:

Scope of SOP

SOPs can be based on a specific chemical; a class of chemicals; a specific or set of lab procedures; a specific piece of equipment, etc.

Approval Required

Discuss any circumstances under which this operation requires prior approval. E.g."undergraduates can not do this operation without my specific consent".

Hazardous Chemicals

List chemicals and their hazard class, e.g.,"carcinogenic, highly toxic, flammable, teratogen, corrosive, etc." Better yet, print and attach LCSS or MSDS (see above for sources)

Chemical Name	Hazard Class

Personal Protective Equipment

List specific personal protective equipment needed, e.g., gloves, coats, eyewear. If a respirator is needed, contact EH&S (x8787).

EH&S webpage with Glove Reference Chart to Identify the Proper Gloves:
http://ehs.ucsb.edu/units/labsfty/labrsc/lsglove.htm

Engineering/Ventilation Controls

Describe required engineering controls. Examples: fume hoods glove boxes, biosafety cabinets, pressure relief valves, leak detection systems, auto-shut off valves, etc.

Any Special Chemical Handling, Storage, Cleanup or Disposal Requirements

Other

SOP: Chemical Spill Cleanup

NOTE: This SOP only applies to facility users who need to access MRL room 1012 which is shared with the Safinya laboratory.

Date of last revision to SOP: Sept. 2009 (Kai Ewert)

Call 9-911 if there is a fire, personal injury, or danger to life or property.

Chemical Spill Cleanup Procedure

You should **NOT** clean up a spill if:

- The spill presents an immediate fire hazard
- You don't know what the spilled material is
- You are unsure about your ability to clean up the spill
- You lack the necessary skills, protection or equipment to clean the spill safely
- The spill is too large to contain
- The spilled material is highly toxic
- Exposure to fumes would result in physical injury
- You feel any symptoms of exposure

(An example would be a mercury spill from a thermomether that has dropped to the floor)

Instead, do the following in these cases

- alert other workers in the lab
- evacuate the area
- Call 9-911 if spill is immediately health-threatening
  or else
- Call x 3194 **(**EH&S 24 hr assistance line; you may have to wait up to 15 min for a call back if it is after regular work hours)
- Notify Kai Ewert

If it is safe to clean up the spill then follow the steps below for cleanup

Evaluate and Notify

- Assess the toxicity, flammability, and other hazardous properties of the spilled material (if necessary, see labels and / or MSDS – safety information resources are provided in this CHP)

- For flammables, remove or turn off all ignition sources such as open flames, motors, pumps, fridges
- Notify other workers in the area
- Notify Kai Ewert or Youli Li as soon as safely possible

Contain and Clean Up

- Wear two layers of gloves, eye protection, and a lab coat. Wear a face shield if you deem it necessary
- Protect floor drains from contamination, by putting absorbents or barriers around them
- Contain and absorb spill using absorbents appropriate for the material (e.g. paper towels, kim wipes, or materials from the spill kit located in room 1012, under the sink)
- For volatile materials, focus on minimizing the generation of vapors by transferring soaked adsorbents and adsorbed materials into a fume hood as quickly as possible
- Package waste in a tight-closing container and label it. Include contaminated gloves, clothes, rags, equipment, etc. Store the container with the chemical waste or temporarily in a separate fume hood if necessary.

Followup

- Arrange for the waste to be picked up by EH&S as soon as practical. Contact the lab member responsible for chemical waste disposal or Kai Ewert if you are unfamiliar with the procedure
- Reorder and restock the used cleanup materials if necessary
- Inform EH&S if there were any personnel exposures, or release to the drain system
- If there was a significant injury, fill out a *UCSB Report of Injury to Employee/Student* form. This form is available in Appendix B or on the web at

  http://www.busserv.ucsb.edu/Forms/SB_Incident_Report.pdf

NOTE: This is a EH&S provided list used to identify potential hazards in the lab. There are NO chemicals permitted in the lab located in CNSI 1409. For chemicals used in MRL 1012, consult the Safinya Lab CHP.

Appendix A: EH&S laboratory safety fact sheets

The following EH&S laboratory safety fact sheets are attached (accessed on 9/15/09 via http://ehs.ucsb.edu/units/labsfty/labrsc/factsheets/lsfacsheets.htm):

- Acrylamide
- Autoclaves
- Azides, Handling Organic
- Benzene
- Biological Waste Disposal
- Carcinogen Control
- Centrifuge
- Chemical Storage
- Chemical Waste Disposal
- Chlorinated Solvents
- Compressed Gas Cylinders
- Corrosives
- Cryogens
- Dichloromethane (also known as methylene chloride)
- Electrophoresis Equipment
- Ethidium Bromide Safety
- Formaldehyde
- Fume Hood Usage Guidelines
- Housekeeping Guide for labs
- Lab Coats
- Phenol
- Power Failures Guide
- Refrigerator & Freezers in Lab
- Seismic Hazard Reduction
- Sharps Disposal
- Time-Sensitive Chemicals

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Appendix B: Injury Reporting Form

This appendix reproduces the *UCSB Report of Injury to Employee/Student* form (accessed via http://www.busserv.ucsb.edu/Forms/SB_Incident_Report.pdf on 9/18/09)

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Appendix C: MRL Emergency Operations Plan

This appendix reproduces the MRL Emergency Operations Plan (also Emergency Action Plan & Fire Prevention Plan), accessed on 9/18/09 via

http://www.mrl.ucsb.edu/mrl/info/administration/eop.html

Materials Research Laboratory
UCSB Building 615
Emergency Operations Plan
AKA Emergency Action Plan & Fire Prevention Plan

This plan is adopted by the MRL on June 17, 1998
Craig Hawker, Director

SUMMARY

In the event of a fire alarm or other emergency evacuation, all persons are to leave the MRL Building and to assemble on the sidewalk at the southwest corner of Engineering II. See area map for location. In the event of a major earthquake, all persons are to seek shelter in a door frame or other protected space. After the earthquake stops, and as soon as it is safe, all persons are to exit the building and to assemble on the sidewalk at the southwest corner of Engineering II. See area map.

MRL EMERGENCY PERSONNEL

Joe Doyle is the Hazard Communication Coordinator (HCC) for the MRL. He is also a member of the campus Emergency Response Team (ERT) and responsible for most utility and construction issues affecting the MRL Building. He can be reached at x7925 or by e-mail at jdoyle@mrl.ucsb.edu. His office in on the first floor in room 1043b. Maureen Evans is the Management Services Officer for the MRL as well as the Alternate HCC. She can be reached at x8519 or by e-mail at maureen@mrl.ucsb.edu. Her office is located on the third floor in room 3008.

PREPARATIONS

The MRL shall maintain an Emergency Response Kit and it shall be stored in room 3026. This kit shall contain at least an AM-FM portable radio, a flashlight, extra batteries, and a first aid kit. First aid kits shall be kept in two or more of the laboratories, including rooms 1023 and 1137. Chemical spill cleanup kits shall be kept in room 1051. Laboratories, offices, and storage areas are to be kept in a safe fashion and in compliance with all environmental and safety regulations and good practice. All tall furniture is to be secured so that is will not fall over in an earthquake. All chemicals are to be stored in an appropriate and compatible manner. Chemical bottles are to be secured against falling

during an earthquake. Researchers and other individuals are strongly encouraged to have copies of valuable and irreplaceable information stored away from campus, so that it is both safe and accessible if a building is temporarily or permanently closed. At least one member of the MRL technical staff should be a member of the campus Emergency Response Team (ERT). This person will receive training in hazardous materials, drill with the campus team, an person will receive training in hazardous materials, drill with the campus team, and may be called upon to assist the team in a campus emergency. An up to date home telephone list is to be maintained and distributed to key MRL personnel. All MRL personnel are expected to be familiar with their role as stated in this document.

INFORMATION SOURCES IN AN EMERGENCY

In many emergencies, the campus will send a message to every voice mailbox on campus with a report about the status of the campus and any expectations about whether employees are expected to come to work. The procedure to check one's voice mailbox from off campus is to call 893-8800, enter one's 7 digit campus phone number when prompted for the mailbox number, and then to enter the 4 digit password when prompted. The following radio stations should have information about emergency conditions: KCSB 91.9 FM, KTMS 1250 AM, KUHL 1440 AM Santa Maria, and KVEN 1450 AM Ventura. KEYT Channel 3 and KCOY Channel 12 may have information on TV. The campus has set up an out of area telephone line for emergency information that is expected to survive a regional disaster. Calls are 55¢. The number is (900) 200-8272. Conditions of state highways is provided by Cal Trans at (800) 427-7623. If the Emergency Operations Center is operational, they may have a recorded message about campus status at 893-8690. See also Campus Emergency Information

EMERGENCY DURING WORKING HOURS

Emergency Affecting the Entire Campus

If there is an emergency that affects the entire campus, but the MRL seems relatively safe, such as an earthquake, brush fire, or flood. The first duty would be to determine the actual status of the MRL building. Is anyone injured? Were any chemicals released? Is the any obvious damage to the building? Are communications functional? If there is no compelling reason to leave, personnel should stay at work keeping out of other hazardous areas, staying out of gridlocked traffic, and staying out of the way of emergency workers. The HCC or Alternate should determine if the Emergency Operations Center (EOC) has been activated. If it has, the HCC should see to it that a Departmental Emergency Status Report is filled out and delivered to the EOC. It should be faxed to x8659, if possible. If fax is not possible, it should be carried to the EH&S Building, Bldg. 565, room 1045. This building is on the north side of campus between the Facilities Yard and the Rec-Cen on Mesa Road. The HCC should then check for any additional information and let the rest of the department know about the status of the campus and community. As a member of the ERT, the HCC may be called to work with the ERT during a campus emergency; if this happens, the Alternate HCC will assume all HCC duties at the MRL Building.

Evacuation of MRL Building

If it becomes necessary to evacuate the building or if any building alarm calls for evacuation, then every person should do so as quickly as possible. Even if the alarm is known to be a test or an exercise, all persons are required to exit the building. No one is assigned the duty of forcing anyone else to leave. If possible, people should bring their valuables and lock their doors behind them as they leave the building All people leaving the building from the upper floors should use the stairs and not use the elevator. At this time, there are no disabled persons working in the MRL Building that would require assistance leaving the building. Should a disabled person begin working at the MRL, someone will be assigned to assist them in an emergency evacuation. After leaving the building, all people should assemble at the Emergency Assembly Point (EAP) which is on the sidewalk at the southwest corner of Engineering II, see area map for location. Should it be unsafe to assemble there, then people should assemble at the courtyard in front of (north of) the Geology Building. If possible, the Emergency Response Kit should be brought to the EAP by Sylvia Vogel or, if she cannot, by Pam Wilkinson. No one is to re-enter the building until authorized to do so by County Fire or by UCSB Emergency Personnel. After a big earthquake or other severe incident, the building may be closed for several days or longer. At the EAP, each person working in each area of the building should gather with the other people from that area to determine if there is anyone missing. Building areas would include the third floor, the second floor, the team room, the Chemistry lab, the Polymers lab, the Spectroscopy lab, and the X-Ray lab. A personnel status report should be passed on to the HCC or the MSO as soon as possible. If the Fire Department or other Emergency Responders are called to the MRL Building, the HCC or MSO will meet them at the MRL Building Fire Alarm Panel Box as soon as possible after an alarm and will then inform them about the status of the building and especially its personnel. The Fire Alarm Panel Box is located on the first floor, just outside the building on the south side, near the door to room 1278. In a campus wide incident, the HCC will see to it that a Departmental Emergency Status Report is filled out and delivered to the EOC as described above in **Emergency Affecting the Entire Campus**.

EMERGENCY AFTER HOURS

In the event of an emergency when people are not at work, people should come to work at the usual time, provided it is reasonably safe to do so and provided that roads are passable. Each individual needs to take personal responsibility for their decision about whether it is possible to come to work or not. News about campus status, road conditions, ect. may be found through sources listed above under "INFORMATION SOURCES IN AN EMERGENCY". HCC and laboratory Development Engineers should attempt to come to the MRL to determine the status of the building and its laboratories.

EMERGENCY MANAGEMENT

Additional details about how to deal with the problems that follow are provided in the UCSB Laboratory Safety Program-Chemical Hygiene Plan black 3-ring binder in the section under Emergency Management. This binder should be available in every MRL

laboratory and is accessible on-line at:
http://ehs.ucsb.edu

During an Earthquake
Do not rush outdoors. Most injuries occur from falling glass, plaster, bricks, debris, and electrical lines as people are leaving the building. Stay put during the initial shaking. Protect yourself. If possible sit or stand against a wall or doorway, If possible get under a fixed object (desk, table, etc.), otherwise cover your head and protect your body until the shaking stops. Stay away from all glass surfaces and windowed hallways (windows, mirrors, etc.) and cabinets and bookshelves. ABOVE ALL, REMAIN CALM. Think before you act and resist the urge to panic.

After an Earthquake
Remember aftershocks may occur at any moment with nearly the same force as the original quake -- so be prepared. After the initial shock, and only after the shaking stops, survey your area for damage and trapped persons. If severe building damage has occurred or if life-threatening conditions are observed, evacuate the building as described above and go to the EAP, on the sidewalk at the southwest corner of Engineering II. Do not use the elevators for evacuation. Once outside the building, move into the open areas. Do not stand under overhangs on the outside of a building. They are usually the most structurally unsound part of the building, and the first to collapse or fall. Move away from power lines, and stay away from all structures.

Discovery of a Fire
Upon initial discovery of a fire, alert personnel in the immediate vicinity. If possible, put the fire out by covering it or using a fire extinguisher. If there is time or it would be helpful, ask someone to get the HCC for assistance. After the fire is out, let the HCC know what happened as soon as possible. Anytime a fire extinguisher is used it must be recharged; call x3305 to have it recharged. If the fire cannot be put out, evacuate the area, close the doors to the room where the fire is located, and activate a Fire Alarm Pull Station or call 9-911 to report the fire. Once outside, let the HCC and MSO know what happened as soon as possible. Any fire in the MRL Building may contain hazardous materials along with any smoke. Stay upwind from any smoke or fire and avoid breathing any fumes. Any fire must be reported to the campus Fire Marshall. Usually the HCC will make this report.

Hazardous Chemical Release
If possible, a small and not too harmful chemical spill should be cleaned up immediately by the person who caused the spill. Appropriate personal protective equipment must be used. If there is any doubt about what to do, contact the HCC and/or the Development Engineer for that lab. Spill cleanup kits are available in a cabinet over the sink in the Team Room, room 1051. After the spill is cleaned up, let both the HCC and the lab Development Engineer know what occurred. In the event of a larger or more hazardous chemical release, evacuate the area immediately. Close off the room where the spill occurred. Contact the HCC or the lab Development Engineer immediately. For outside assistance, call the EH&S 24 hour hotline at x3194. For a very large or very hazardous

spill call x3194 and contact the HCC IMMEDIATELY. Every chemical spill must be reported to EH&S within one day of the spill. Usually the HCC will make this report.

Utility Failure
Natural Gas Leak: If a strong leak of natural gas is detected, cease all operations; evacuate the area, and call the Campus Emergency Number, 9-911. DO NOT do anything that might cause a spark, such as turning a light switch or any electrical equipment on or off. Notify the HCC. Ventilation Problem: If odors come from the ventilation system, notify Facilities Management Dispatch at x2661, EH&S at x3194, and the HCC. If the odor seems as if it may be harmful, evacuate the area until it is investigated. If the odor suggests that a fire is in progress, activate the nearest Fire Alarm Pull Station or call 9-911. Other non hazardous utility failures should be reported to FM at x2661 or to Joe Doyle.

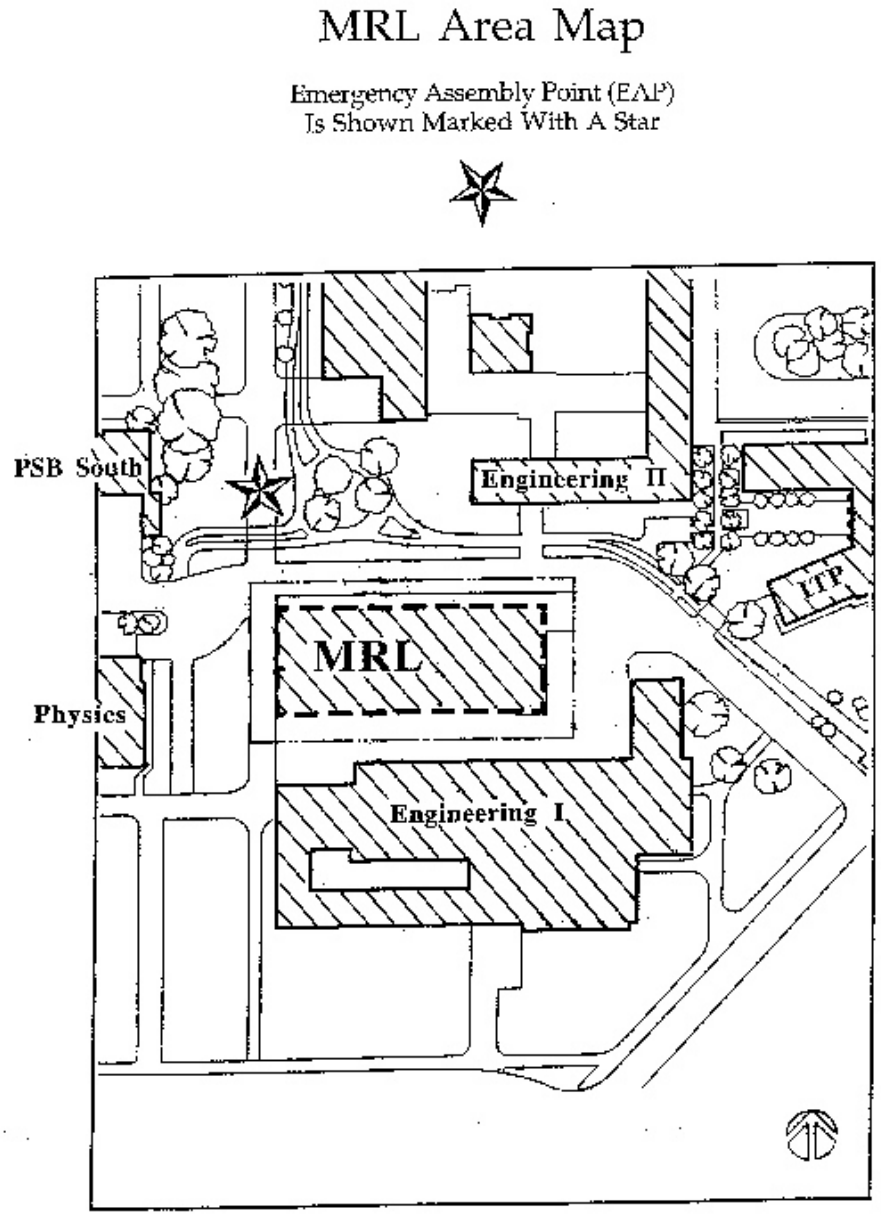
Medical Emergency
People with serious medical problems need professional help immediately. In the worst cases, call 9-911 for paramedics or an ambulance. If the sick or injured person can travel: students may be taken to Student Health Services during working hours, x3371; and anyone may be taken to the Emergency Room at Goleta Valley Hospital on Patterson Road, just south of Hollister in Goleta. Employees injured on the job may be covered by Worker's Compensation. Campus Business Services guidelines about how medical service is to be provided in such cases has been inconsistent. Information about current policy for non emergency treatment can be obtained by calling Lorena Torres at Business Services at x8050. Any employee injured while working at or for UCSB is responsible to report the injury to the HCC or MSO as soon as possible. The term "employee" includes graduate students and anyone getting any kind of paycheck. California law requires that the "Employee Claim for Worker's Compensation Benefits" be given to any injured employee within one working day from the time the injury was reported to the employer.

FULL EH&S MODEL EMERGENCY OPERATION PLAN AVAILABLE

The UCSB EH&S has written a model department EOP that contains a wealth of information and is very comprehensive. In the interest of brevity and with the expectation that MRL personnel will actually read it, this MRL EOP has been made as short as possible. Copies of the Model EOP are available at the MRL Safety Bulletin Board, from the HCC and from the MSO. In addition, it can be found on-line at:

http://ehs.ucsb.edu/

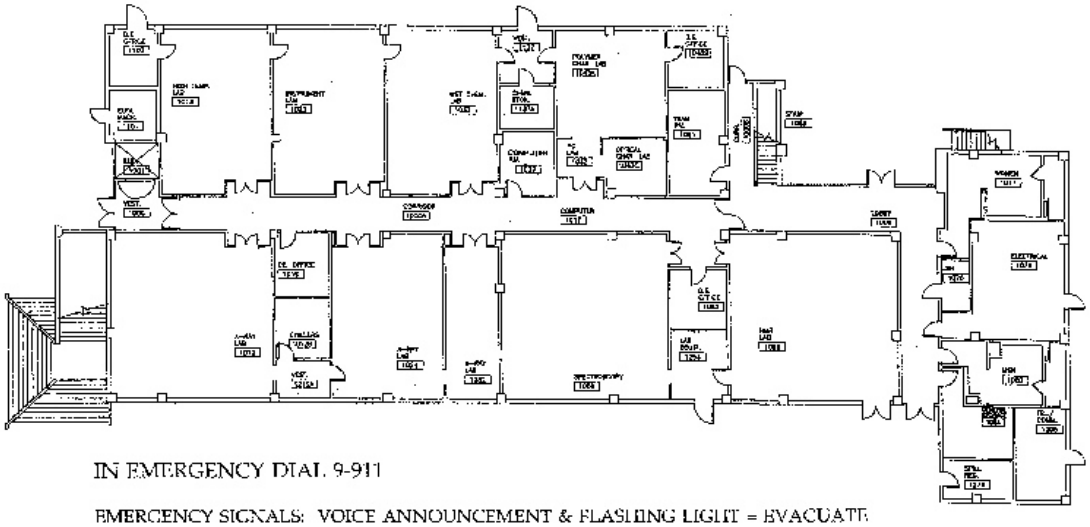
MRL Area Map


MRL Area Map
Emergency Assembly Point (EAP)
Is Shown Marked With A Star
PSB South
Engineering II
ITP
MRL
Physics
Engineering I

Emergency exit plans for floors 1 through 3

EMERGENCY EXIT PLAN

MRL FIRST FLOOR



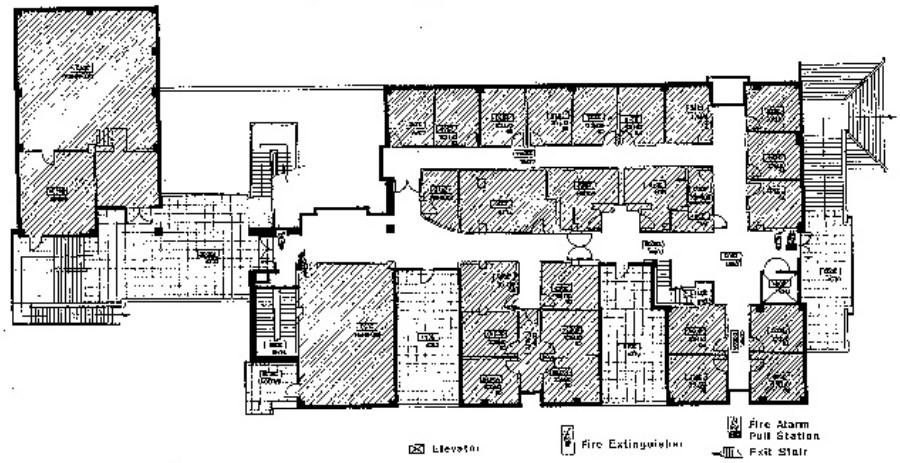
IN EMERGENCY DIAL 9-911

EMERGENCY SIGNALS: VOICE ANNOUNCEMENT & FLASHING LIGHT = EVACUATE

IN CASE OF FIRE USE STAIRWAY FOR EXIT
DO NOT USE ELEVATOR

EMERGENCY EXIT PLAN

MRL SECOND FLOOR



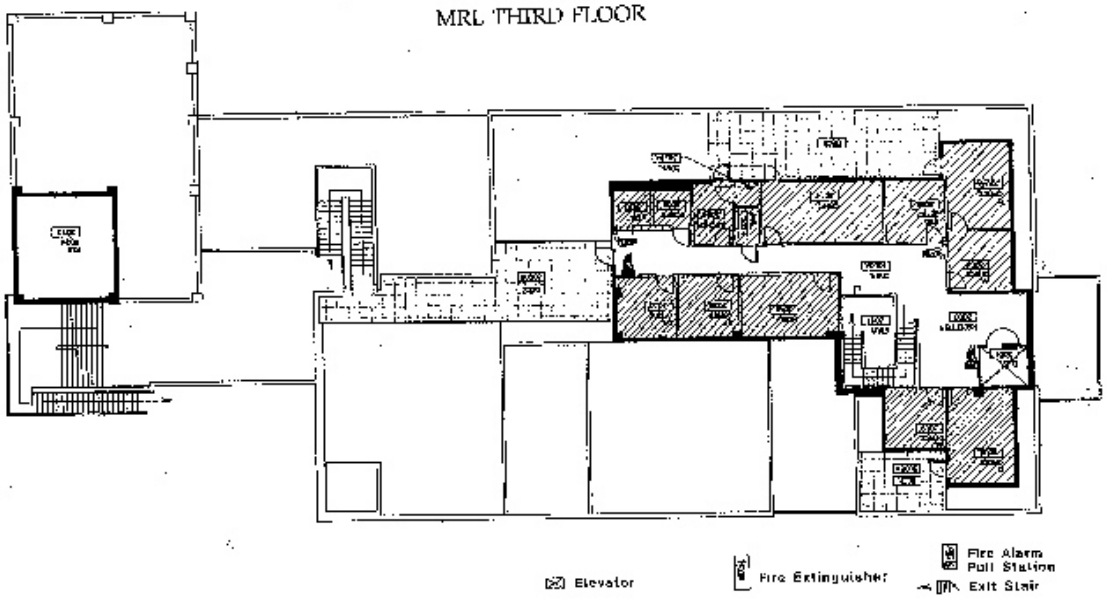
IN EMERGENCY DIAL 9-911

EMERGENCY SIGNALS: VOICE ANNOUNCEMENT & FLASHING LIGHT – EVACUATE

IN CASE OF FIRE USE STAIRWAY FOR EXIT
DO NOT USE ELEVATOR

EMERGENCY EXIT PLAN

MRL THIRD FLOOR



IN EMERGENCY DIAL 9-911

EMERGENCY SIGNALS: VOICE ANNOUNCEMENT & FLASHING LIGHT = EVACUATE

IN CASE OF FIRE USE STAIRWAY FOR EXIT
DO NOT USE ELEVATOR

CNSI Area Map (EAP)

Appendix D: MRL Combined Injury & Illness Prevention Plan and Hazard Communication Plan

This appendix reproduces the MRL Combined Injury & Illness Prevention Plan and Hazard Communication Plan, accessed on 9/18/09 via

http://www.mrl.ucsb.edu/mrl/info/administration/iipp.html

Materials Research Laboratory Combined
Injury & Illness Prevention Plan and
Hazard Communication Plan

Prepared by Joe Doyle

This document is formally adopted by the Materials Research Laboratory.

Dr. Philip Pincus
Acting Director
January 20, 1998

It is the policy of the Materials Research Laboratory (MRL) that all persons working under our auspices are entitled to as safe a work environment as possible. It is also our policy that all health, safety, and environmental protection regulations and good practice are to be followed by all persons working within the MRL.

This combined Injury & Illness Prevention Plan (IIPP) and Hazard Communication Plan (HCP) spell out our specific commitments to this goal.

The following policies apply to all persons working in the MRL Building and otherwise working under the auspices of the MRL, including Faculty, Staff, Post Doctoral Researchers, Graduate Students, Undergraduate Researchers, Summer Interns, and paid student helpers. All of these people will be referred to as employees.

The following people hold the offices specified in this document.

- Director: Dr. Anthony Cheetham
- Acting Director: Dr. Philip Pincus
- Hazard Communication Coordinator(HCC): Joe Doyle
- Management Services Officer (MSO) & Alternate Hazard Communication Coordinator: Maureen Evans
- Chemistry Laboratory Development Engineer: Joe Doyle
- Spectroscopy Laboratory Development Engineer: Joe Sachleben
- X-Ray Laboratory Development Engineer: Youli Li

Injury & Illness Prevention Plan

Title 8 of the California Code of Regulations specifies eight specific topics that must be addressed by every employer in California as part of the required IIPP. In the following the MRL adopts specific policies to meet the demands of Title 8 and to protect the people working under the MRL.

Authority & Responsibility

The Director of the MRL has the authority and responsibility to carry out the terms of this plan. The Director delegates authority for implementation of this plan to the departmental Hazard Communication Coordinator (HCC) and the departmental Management Service Officer (MSO).

Compliance with Safe Work Practices

The Director, the HCC, and the MSO are responsible to see to it that all safe work practices are followed at the MRL.

The Principal Investigators and laboratory Development Engineers are responsible to see to it that work within their laboratories follow safe work practice.

Each person working at the MRL is responsible to understand the nature and hazards of their work and to take all necessary and prudent precautions.

Communicating Safety Issues

The MRL will make sure that employees become knowledgeable about health and safety issues, practices, and protections through the following practices:

1. A Safety Bulletin Board will be maintained in Room 2042 on the second floor of the MRL Building.
2. All persons working within MRL laboratories are required to attend the EH&S Laboratory Safety Class at least once while at UCSB.
3. Employees are required to read the Material Safety Data Sheets (MSDS) and/or other references for all potential hazardous materials that they may come in contact with. The HCC will maintain reference materials including **Sax's Dangerous Properties of Industrial Materials**, the **Merck Index**, and hard copies of some MSDS. Computers for the downloading of MSDS are available to everyone. MSDS may be found on the Internet at http://ehs.ucsb.edu/units/labsfty/labrsc/chemistry/lschemmsds.htm
4. Research group meetings should address safety issues whenever helpful.
5. New employees shall be introduced to the MRL laboratories by more senior employees.
6. New or continuing employees are not to begin new procedures until they have been checked out on the apparatus or process by a more experienced team

member and/or they have comprehensively studied the required operation and its hazards.

Identifying Work Place Hazards

Whenever a unsafe situation is discovered it should be reported to the Laboratory Development Engineer, the Principal Investigator, and/or the HCC.

Campus EH&S is to periodically inspect each MRL Laboratory and work place for hazards. The results of these inspections will be transmitted in written form to the MRL MSO, HCC, and Principal Investigators by EH&S.

Laboratory Development Engineers are to review laboratory safety practice and hardware periodically.

Hazard Report Forms are to be available on the Safety Bulletin Board in Room 2042 of the MRL Building. These forms may be used anonymously.

Procedures for Investigating Injuries and Illness

Any injury to an employee requires the following response:

1. Any employee injured on the job must report the injury to their supervisor, the MSO, or the HCC as soon as possible after the injury.
2. The HCC is to investigate the nature and cause of the injury.
3. EH&S may also investigate the nature and cause of the injury.
4. The "Employee Claim for Worker's Compensation Benefits Form" must be given or mailed to the injured employee within one working day from the time when the injury is reported to the employer. The employee has the option of filling out and returning this form to the MSO.
5. The injured employee's supervisor, usually the Principal Investigator or the MSO, is required to complete the "Report of Injury to Employee Form" within 24 hours of the injury and give it to the MSO.
6. The MSO will forward all injury report forms to the Campus Business Services Office and EH&S as specified in the Worker's Compensation Claim Report Procedure.

All forms may be obtained from the Campus Business Service Office at x4440, from the HCC, or from the MSO.

Procedures for Correcting Unsafe or Unhealthy Conditions

Whenever an unsafe condition is discovered the Laboratory Development Engineer, the Principal Investigator, and/or the HCC should take timely steps to mitigate or eliminate the hazard.

If the unsafe condition poses an immediate hazard to life or health the affected area must be evacuated.

If the unsafe condition does not pose an immediate threat, it should be mitigated through improved training, improved procedures, engineering controls, alternative materials, administrative controls, and/or personal protective devices.

Safety & Health Training

Each supervisor is responsible to see to it that all employees under their direction have received appropriate training for the assigned tasks. Each supervisor must also document that such training has occurred.

It is most important that each employee hear their supervisor say that they truly expect the employee to work in a safe and environmentally responsible way even if that requires that work will take more time and/or cost more money.

Record Keeping & Documentation

The MRL HCC and MSO will see to it that records are kept of safety training, laboratory inspection, and actions taken in response to laboratory inspections.

Hazard Communication Program

Most of the requirements for the HCP are covered in the IIPP above. Additional policies of the MRL follow.

Individual supervisors have the primary responsibility for implementing and assuring compliance with the HCP within their work areas. Usually the supervisor will be the Principal Investigator.

The primary focus of the program is to identify all hazardous substances used in the workplace and to identify those employees who may be exposed to hazardous substances so that appropriate training and mitigation occurs and accidents are avoided.

Each supervisor is responsible to identify those work areas and procedures which involve the potential use of or exposure to hazardous substances; and ensure that all employees in those areas are fully aware of the specific hazards and mitigation measures.

All hazardous substances used in each work area are to be identified and inventoried. A paper copy of the full inventory will be posted on or near the Safety Bulletin Board. Digital copies will be available from the HCC to MRL personnel or other responsible parties on request.

Material Safety Data Sheets for all chemicals used in the workplace are to be available for any employee to review at the Hazard Communication Coordinator's office. Such

review may be over the Internet. The MRL acknowledges that MSDSs are required by law and **are often technically deficient**, therefore, other chemical safety reference data shall be kept at the HCC's office.

All employees using or potentially exposed to hazardous substances shall be trained in working safely with those hazards. New employees must be trained prior to their beginning work with the materials. Existing employees must be trained regarding the introduction of new hazardous materials into the workplace prior to using new hazardous materials. Such training may consist of verbal instructions, safety classes, reading assignments, group discussions, or other activity as assigned by the supervisor. The training shall include the following:

1. That the Department's written Hazard Communication Program, Injury and Illness Prevention Program, and Emergency Action Plan are posted near the Safety Bulletin Board and that they may be obtained from the HCC.
2. Physical and health effects of the hazardous substances to which employees may be exposed.
3. Methods and techniques (e.g., instrumentation) used to determine the presence of hazardous substances.
4. Protective measures to be implemented (e.g., work practices, personal protective equipment).
5. Emergency and first aid procedures.
6. How to read and evaluate an MSDS or labels to properly understand appropriate hazard information. How to find and use other chemical safety references.
7. Requirements of the Hazard Communication Regulation (California Code of Regulations Title 8, General Industry Safety Order 5194). Employees shall learn about this when attending EH&S's Laboratory Safety Training.

There shall be no unlabeled containers of chemical substances allowed in the workplace. All containers must be labeled minimally with the following:

1. Name of the contents in written English, chemical symbols are not enough
2. Appropriate hazard warnings
3. The name of the person who purchased or uses the chemical
4. The expiration and target disposal date, if appropriate.

Likewise any tubing or piping carrying hazardous materials must be labeled with at least the name of the material.

Outside contractors working at the MRL must be informed about any potential chemical or physical hazards to which their workers may be exposed.

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Appendix E: Laboratory Self-Inspection Checklist

This appendix contains the EH&S Laboratory Self-Inspection Checklist, accessed on 9/15/09 via

http://www.ehs.ucsb.edu/units/labsfty/labrsc/inspection/Lab_Self_Inspection_web.pdf

UCSB Laboratory Safety Manual and Chemical Hygiene Plan
Prepared by UCSB Environmental Health & Safety

SECTION II (2):
UCSB POLCIES, PROCEDURES AND RESOURCES
(revised March 2013)

Directions to Laboratory Personnel

This section of the document is now provided to laboratories in an electronic version only, rather than a hard copy – Web address provided below. Please remove older versions of Sec. II from your binder and replace with this single page. In contrast, Section I of the document (lab-specific portion) will temporarily remain as hard copies within the binder.

Web address for Section II:
http://ehs.ucsb.edu/units/labsfty/labrsc/chemistry/CHP%20Pages/Sec.II.2013.pdf

*Per Cal-OSHA requirements, this document needs to be reviewed and updated **annually**. Therefore, we ask that this section NOT be printed out as a hard copy, as it becomes very difficult to locate hundreds of hard copies across the campus when the next update needs to occur. Questions can be directed to David.Vandenberg@ehs.ucsb.edu, or for the following departments to Moretto@chem.ucsb.edu : Chemistry & Biochemistry, Materials, Electrical and Computer Engineering, Chemical Engineering*

UCSB Laboratory Safety Manual and Chemical Hygiene Plan
Prepared by UCSB Environmental Health & Safety

SECTION III (3): REGULATORY FRAMEWORK (revised March 2013)

Directions to the Laboratory

This section of the document is now provided to laboratories only in an electronic version, rather than a hard copy – Web address provided below. Please remove older versions of Sec. III from your binder and replace with this single page. In contrast, Section I of the document (lab-specific portion) will temporarily remain as hard copies within the binder.

Web address for Section III:

http://www.ehs.ucsb.edu/units/labsfty/labrsc/manuals/section_III.pdf

*Per Cal-OSHA requirements, this document needs to be reviewed and updated **annually**. Therefore, we ask that this section NOT be printed out as a hard copy, as it becomes very difficult to locate hundreds of hard copies across the campus when the next update needs to occur. Questions can be directed to David.Vandenberg@ehs.ucsb.edu, or for the following departments to Moretto@chem.ucsb.edu : Chemistry & Biochemistry, Materials, Electrical and Computer Engineering, Chemical Engineering*

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