

# Laboratory Safety and Chemical Hygiene Plan



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## **Section I**

### **ISU Laboratory Safety and Chemical Hygiene Plan**

## OSHA LABORATORY STANDARD

The Occupational Safety and Health Administration (OSHA) published the final rule for [Occupational Exposure to Hazardous Chemicals in Laboratories \(29CFR 1910.1450\)](#) on January 31, 1990 (Appendix A). The basis for this standard is the determination that laboratories differ from industrial operations in their use and handling of hazardous chemicals. The final standard applies to all laboratories that use hazardous chemicals in accordance with the definitions of laboratory use and laboratory scale provided in the standard. Generally, where this standard applies it supersedes the provisions of all other standards in 29 CFR, part 1910, subpart Z, except in specific instances identified by this standard.

For laboratories covered by this standard, the obligation to maintain employee exposures at or below the permissible exposure limits (PELs) specified in 29 CFR, part 1910, subpart Z is retained. However, the manner in which this obligation is achieved will be determined by each employer through the formulation and implementation of a Chemical Hygiene Plan (CHP). The CHP must include the necessary work practices, procedures and policies to ensure that employees are protected from all potentially hazardous chemicals used or stored in their work area. Hazardous chemicals as defined by the final standard include not only chemicals regulated in 29 CFR part 1910, subpart Z, but also any chemical meeting the definition of hazardous chemical with respect to health hazards as defined in [OSHA's Hazard Communication Standard, 29 CFR 1910.1200\(c\)](#). (Appendix B)

The standard provides for employee training and information, medical consultation and examination, hazard identification, respirator use and record keeping. To the extent possible, the standard allows a large measure of flexibility in compliance methods. Employees have the right per OSHA to be informed about the known physical and health hazards of the chemical substances in their work areas and to be trained appropriately to work safely with these materials.

Indiana State University Office of Environmental Safety (OES) has developed the Laboratory Safety and Chemical Hygiene Plan to meet these compliance requirements.

### APPLICABILITY

The OSHA Lab Standard applies to all employers and employees engaged in the laboratory use of hazardous chemicals. OSHA defines "laboratory use" as the handling or use of hazardous chemicals in which the following conditions are met:

1. Chemical manipulations are carried out on a "laboratory scale". Laboratory scale is defined as work with substances in which the containers used for reactions, transfers, and other handling of substances is designed to be easily and safely manipulated by one person.
2. Multiple chemical procedures or chemicals are used.
3. The procedures used are not part of a production process nor in any way simulate a production process.

The OSHA lab standard does not apply to the following:

1. Use of hazardous chemicals that do not meet the definition of laboratory use. In such cases the employer shall comply with the corresponding standard in [1910 Subpart Z - Toxic and Hazardous Substances](#), even if such use occurs in the laboratory.
2. Laboratory uses of hazardous chemicals that provide no potential for employee exposure. Examples of such uses might include:
  - a. Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip, and
  - b. Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

In situations where the standard does apply, it shall supersede, for laboratories, the requirements of all other OSHA health standards in 29 CFR part 1910, subpart Z, except as follows:

1. For any OSHA health standard, only the requirement to limit employee exposure to the specific permissible exposure limit (PEL) shall apply for laboratories, unless that particular standard states otherwise.
2. Prohibition of eye and skin contact where specified by any OSHA health standard shall be observed.
3. When the action level or PEL is routinely exceeded for an OSHA regulated substance with exposure monitoring and medical surveillance requirements.

## EXPOSURE LIMITS

For laboratory uses of hazardous substances, departments must ensure that laboratory employees' exposures to such substances do not exceed either the permissible exposure limits (PELs) specified in 29 CFR 1910, subpart Z, which are set by the Occupational Safety and Health Administration (OSHA), or the Threshold Limit Values (TLVs) published by the American Conference of Governmental Industrial Hygienists (ACGIH), whichever is lower.

## HAZARDOUS CHEMICALS

The Laboratory Standard defines a hazardous chemical as any element, chemical compound, mixture of elements, and/or compounds which is a physical or health hazard.

A chemical is a **physical hazard** if there is scientifically valid evidence that it is a flammable, a combustible liquid, a compressed gas, explosive, organic peroxide, an oxidizer,

pyrophoric, unstable material (reactive), or water-reactive.

A chemical is a **health hazard** if there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. Included are:

- Carcinogens
- Irritants
- Hepatotoxins (liver)
- Reproductive toxins
- Corrosives
- Nephrotoxins (kidney)
- Sensitizers
- Radioactive materials
- Neurotoxins (nerve)
- Biohazards
- Agents that act on the hematopoietic system (blood)
- Agents that damage the lungs, skin, eyes, or mucous membranes

In most cases, the container label will indicate if the chemical is hazardous. Look for key words like **caution, hazardous, toxic, dangerous, corrosive, irritant, carcinogen**, etc. Chemicals manufactured prior to 1985 may not contain hazard warnings.

If you are not sure a chemical you are using is hazardous, review the **Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS is the new format under the revised Hazard Communication Standard which will be phased in beginning in 2013)**. The OES will be providing information and training explaining the changes as they become available.

#### **MATERIAL SAFETY DATA SHEET (MSDS)/SAFETY DATA SHEET (SDS)**

A Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) is a document containing chemical hazard and safe handling information prepared in accordance with the OSHA Hazard Communication Standard.

Chemical manufacturers and distributors must provide a MSDS/SDS the first time a hazardous chemical or product is shipped to a facility.

## **ISU LABORATORY SAFETY AND CHEMICAL HYGIENE PLAN**

The Laboratory Safety and Chemical Hygiene Plan (LSCHP) is the written program that contains procedures for the safe use of hazardous chemicals in the laboratory. Major components of the plan include:

- Standard operating procedures
- Employer/Employee responsibility, information and training
- Hazard identification
- Personal protective equipment and personal exposure monitoring
- Medical surveillance
- Containment and engineering control procedures

The plan is general in nature and should be adapted and expanded upon by individual departments and research groups to meet their specific needs.

## RESPONSIBILITIES

Indiana State University is committed to ensuring the safety of its employees, students and visitors and to complying with all regulatory requirements. The University also recognizes and supports the use of chemicals and other potentially hazardous materials for the purposes of research and teaching. The University has designated the following areas with specific responsibilities for developing and implementing the campus Laboratory Safety and Chemical Hygiene Plan.

### **Laboratory Safety Committee** (This is a proposed committee and has not been created yet)

The Laboratory Safety Committee is comprised of the designated Laboratory Safety Officers for the various departments affected by the Lab Standard, a representative from the OES, and two graduate students. The committee reviews and approves policies and programs developed by the Office of Environmental Safety.

### **Office of Sponsored Programs**

The Office of Sponsored Programs assists the OES to ensure that all grant research applicants and recipients are in compliance with this and other health and safety requirements.

### **Office of Environmental Safety**

The OES is responsible for providing overall administrative guidance and supervision of the Laboratory Safety and Chemical Hygiene Plan. The OES reports to the Vice President for Business Affairs. The Director of the Office of Environmental Safety will serve as the Chemical Hygiene Officer for the University.

OES responsibilities include:

1. Provide information to department heads, lab safety officers, professors and researchers concerning requirements of the program and their responsibilities.
2. Provide guidance for the preparation and maintenance of procedures, chemical inventories and training programs required by the LSCHP.
3. Validate all training records.
4. Maintain appropriate documentation and records associated with the LSCHP, including training records, personal exposure reports, medical surveillance reports, chemical inventories and Safety Data Sheets.
5. Assist with Safety Data Sheet program requirements.
6. Establish the need for employee exposure determinations and conduct or arrange for required evaluations and notify employees of monitoring results.
7. Perform annual laboratory safety audits and chemical storage area inspections.



8. Assist in determining the proper level of personal protective equipment required.
9. Provide chemical waste collection services.
  
10. Review LSCHP annually.

### **Department Heads**

The department head shall have the following responsibilities:

1. Implement and maintain the LSCHP in their respective departments.
2. Provide support and motivation to enable all supervisors and employees to comply with occupational safety regulations.
3. Notify OES when renovations or alterations of laboratory use or design take place.
4. Notify OES when laboratory is being vacated so a check out inspection can be conducted prior to the occupant's exit from the university.
5. Provide OES with an annual inventory of all hazardous materials within the department, including an inventory of all p-listed chemicals. [EPA P and U listed chemicals](#) (Appendix C)
6. Appoint a department laboratory safety officer (LSO) to act as liaison between the department and the OES.

Department safety and health committees may also assume some of these responsibilities.

### **Department Laboratory Safety Officer**

The designated employee should be qualified by education, training and experience in working with chemicals/hazardous materials and be able to lead by example regarding safety compliance.

Responsibilities include:

1. Serve as liaison between the department and the Office of Environmental Safety.
2. Assist the OES with laboratory safety audits and as needed.
3. Assist stockroom and laboratory personnel with chemical procurement, use, storage and disposal procedures.
4. Work with the OES to ensure that facilities, equipment and training information are adequate for the chemicals being used.

## Principal Investigator or Lab Supervisor

Each PI or lab supervisor is responsible for the safety of individuals working in or visiting their lab areas. These responsibilities include:

1. Ensure that all individuals working in the laboratory are provided with appropriate training on all laboratory safety and regulatory requirements and that the rules are followed.
2. Complete Lab Specific Emergency Response Plan and ensure that all occupants are informed of the plan. (An example plan is included in Appendix D)
3. Conduct Hazard Assessment to determine PPE requirements for lab procedures (experiments/protocols). Post assessment document in lab and include copy with the lab's copy of the LSCHP. (An example assessment form is included in Appendix E )
4. Ensure that the facility, equipment and training programs are adequate for the chemicals being used.
5. Ensure that all safety and personal protective equipment (PPE) are provided, maintained and used correctly.
6. Ensure that the LSCHP is customized for their lab and incorporated into routine training sessions for their employees and students. This information must be provided to laboratory personnel and include the standard operating procedures for the laboratory. *Any additions/changes to the ISU LSCHP must not omit or weaken the provisions of the plan.*
7. Perform regular inspections of their facilities and equipment to ensure ongoing compliance with the requirements of the OSHA Lab Standard/ISU LSCHP.
8. Be knowledgeable of current legal and University requirements regarding regulated substances. Comply with all legal reporting requirements regarding regulated substances.
9. Work with OES and Department Safety Committee to ensure compliance.
10. Provide training on the hazardous chemicals used by lab personnel in their area. This training must be provided and documented at the time of the employee's initial assignment to the work area, whenever a new hazard is introduced to the area or when the employee is reassigned to an area using new or different materials and or procedures. (Training documentation form Appendix F)
11. Provide information about chemical hazards to contract employees or ISU Facilities Management staff working in the area.
12. Provide the Department Chairperson with an annual inventory of chemicals in their laboratories.

13. Ensure that all chemicals and chemical wastes are properly identified and inventoried for collection by the OES. (Hazardous Chemical Waste Form, Appendix G )
14. Maintain current SDS of all chemicals in the laboratory. Options: Hard Copy, WEB (MSDS Online), Manufacturer website). Information must be easily accessible by employee.
15. Ensure that all eyewash stations are flushed weekly by laboratory personnel. Document test on inspection log posted by eyewash.
16. Submit an ISU Laboratory Incident Report to OES in the event of a lab accident/chemical/biological exposure.

### **Laboratory Workers**

All laboratory occupants have the following responsibilities:

1. Laboratory workers are responsible for planning and conducting each operation in accordance with the ISU LSCHP rules and procedures and for developing good personal safety and chemical hygiene work habits.
2. Follow all lab specific standard operation procedures.
3. Wear prescribed personal protective equipment and use appropriate engineering controls such as fume hoods.
4. Know location and proper use of safety equipment.
5. Refrain from operating equipment or conducting experiments without proper training or approval.
6. Report all hazardous conditions to supervisor.
7. Report any work-related injuries or illnesses to the supervisor and seek treatment immediately.
8. Attend all training sessions. Request information and training if unsure how to handle a hazardous chemical or procedure.
9. Avoid practical jokes and behaviors that might distract another worker.

### **Facilities Management**

Facilities Management staff support the ISU LSCHP by providing proper maintenance and operation of building facilities. Responsibilities include:

1. Inform laboratory occupants through the Building Coordinator or Department Head of any actions that could impact laboratory safety.( Examples: Utility Loss and contractor activities)
2. Consult with OES to review any safety concerns regarding modification, alteration or construction of any laboratory.
3. Require Facilities Management staff working in laboratory area to coordinate their activities with laboratory personnel and follow established safety procedures, rules and regulations.
4. Require contractors to be briefed on laboratory safety and lab specific considerations prior to the start of any work in or adjacent to laboratories and ensure contractor compliance with safety rules and regulations.

### **Students**

While students are not covered under the provisions of the OSHA Laboratory Standard, they should be informed of chemical health and safety hazards in classroom and research lab situations, and should be provided with information and equipment to protect themselves from those hazards.

Students in class and student workers are required to follow the health and safety rules and guidelines as required by ISU, course instructors and work supervisors.

### **EMPLOYEE INFORMATION, TRAINING AND DOCUMENTATION**

Departments and individual research groups must provide employees with information and training to ensure that they are apprised of the chemical hazards present in their work area and the steps they should take to protect themselves from these hazards.

This information must be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignment involving new exposure situations. Employees should receive periodic refresher information and training.

Professors/Instructors shall provide student training at the beginning of each course in which hazardous chemicals are used. Specific safety instructions shall be provided at the beginning of each class period.

Students working in Research labs shall receive same training as lab employees. Training must be documented and kept on file in the department office. These records will be reviewed by OES annually.

Although the length of training is not specified in the OSHA regulations, effective training generally will take at least 2 hours for most laboratory scale operations. The frequency of periodic refresher information and training will vary with the hazard.

Training options are individual instruction, group seminars, audio-visual/web-based presentations, handout material, or any combination of these.

Training must include the specific hazards associated with the chemicals in the work area when generic training is insufficient (e.g., extremely toxic materials, carcinogens and reproductive hazards) to address specific hazards.

### **Training Information and Content:**

Information provided by departments to employees must include:

1. contents of the OSHA standard 29 CFR 1910.1450 and appendices;
2. permissible exposure limits for OSHA regulated substances or published exposure limits for other hazardous chemicals not regulated by OSHA which are present in the laboratory;
3. physical and health hazards of chemicals in the work area;
4. methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by OES, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
5. signs and symptoms associated with exposure to chemicals present in the laboratory;
6. location and availability of the ISU Laboratory Safety and Chemical Hygiene Plan and other reference materials, including Safety Data Sheets);
7. measures employees can take to protect themselves from these hazards, including specific procedures the University or department has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used;
8. criteria for selection and use of personal protective equipment and the limits of its protection;
9. emergency procedures and the location of emergency equipment and supplies;
10. procedure for handling of hazardous materials from acquisition to disposal.

### **Documentation**

All training is to be documented by the person providing the training. The following forms should be completed and held in a central department administrative location (e.g., by Department Laboratory Safety Officer or in Department Chairperson's Administrative Office). The records should be organized in a way (by individual, research group, or department) to provide immediate access during an OSHA inspection.

1. Laboratory Safety and Chemical Hygiene Plan Awareness Certification - Individual Documentation (Appendix H)
2. Laboratory Specific Training documents– for individual or group documentation (Appendix F)

**Availability**

The ISU Laboratory Safety and Chemical Hygiene Plan must be readily available to employees or their representative.

**EXPOSURE EVALUATION****Suspected Exposures to Hazardous Substances**

There may be occasions when employees or supervisors suspect that an exposure to a hazardous chemical has occurred that may have caused harm to the person (s) exposed. If the circumstances suggest a reasonable suspicion of exposure, the victim (s) is encouraged to undergo a medical evaluation at Union Hospital Center for Occupational Health. The consultation and related medical examination shall be provided at no cost and without loss of workday time attributed to the employee. An incident report form must also be completed.

*If the exposure involves a student, they would be sent to the Student Health Center.*

**Criteria for Reasonable Suspicion of Exposure**

The Office of Environmental Safety investigates all employee and student related incidents where there is or may be overexposure to a hazardous substance. The following are examples of the types of events or circumstances that might constitute overexposure:

1. Victim had direct skin or eye contact with a chemical substance.
2. An odor was noticeable, especially if the person was working with any chemical that has a lower PEL than odor threshold.
3. A hazardous chemical leaked, spilled, or was otherwise rapidly released in an uncontrolled manner.
4. Person exhibits symptoms such as eye, nose or throat irritation, dizziness, respiratory problems, impaired or loss of motor dexterity or judgment.
5. Some or all symptoms disappear when the person is removed from the chemical area and into an area with fresh air.
6. Symptoms return soon after the person begins working with the same chemicals again.
7. Complaints are received from more than one person in the same work area.

## Evaluation of Exposure Incident

Once a possible exposure complaint is received, the OES will investigate the situation. Unless circumstances require other additional steps, the following steps will be taken to conduct an exposure assessment:

1. Interview person reporting exposure and the victim if not the same person
2. List pertinent information about the circumstances of the complaint, including:
  - Identification of chemical of concern
  - Identification of all chemicals being used by others in the immediate area
  - Identification of other chemicals stored in the area
  - Symptoms exhibited or claimed by the victim
  - Review SDS (MSDS) information
  - Review control measures. Were appropriate PPE and Engineering controls such as fume hoods used and used properly?
  - Assess any air sampling or monitoring devices in place or that were available. If used, were the measurements obtained from these devices consistent with other information?
  - Perform air sampling in the area for suspect chemicals
  - Determine whether the victim's symptoms compare to the symptoms described in the SDS (MSDS) or other pertinent scientific literature
  - Review the adequacy of current control measures and safety procedures
  - Notify employee(s) of the results of air sampling within 15 working days of receipt of the results

## MEDICAL CONSULTATION AND EXAMINATIONS

ISU provides all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations, which the examining physician determines to be necessary. The following guidelines apply to medical consultations and examinations:

1. All employees who work with hazardous chemical must be provided an opportunity to receive medical consultations and examinations when:
  - The employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory
  - Monitoring, routine or otherwise, suggests that there could have been an exposure above the action level (or PEL if there is no action level) for which a substance-specific standard has been established
  - There is a spill, leak, or other uncontrolled release of a hazardous chemical

2. The physician is to be provided the following information:
  - The identity of the hazardous chemical or chemicals to which the employee may have been exposed
  - The description of the conditions under which the exposure occurred including quantitative exposure data
  - The signs and symptoms of exposure the victim is experiencing, if any.
  
3. The Physician is to furnish the Workers Compensation Administrator the following written information:
  - Identification of diagnosis related to chemical exposure
  - Recommendations for follow-up, if necessary
  - A record of the results of the consultation and any associated tests that were conducted
  - Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace
  - A statement that the employee has been informed both of the results of the consultation or examination and of any medical condition that may require further examination or treatment

*These written statements and records should not reveal specific findings not related to an occupational exposure.*

The following is information from ISU Workers Compensation web site. <http://www.indstate.edu/workcomp/index.htm>

**Workers Compensation**

**Work Comp Info**

**TREATMENT:**

The first priority is always to get the appropriate medical attention.

For first treatment, go to the Center for Occupational Health at 4001 Wabash Avenue, Terre Haute, IN, Phone# 812-238-7788. (Hours are Monday thru Friday from 8:00 am until 5:00 pm). For your first visit **only**, take a [3-WC Admittance Form](#) to the Center for Occupational Health. This authorizes them to treat you and bill Indiana State University for any charges.

If the Center for Occupational Health is not available, go to the Ambucare Clinic or the Emergency Room. In the event treatment is sought at either Ambucare or the Emergency Room, the employee should notify the Workers Compensation Office as soon as possible. Following employee treatment at either of these facilities, the Workers Compensation Office normally advocates the employee visit the Center for Occupational Health for a follow up evaluation at the employee's earliest convenience.

If the injury is severe, then the employee should be taken to the Emergency Room.

All injuries should be reported regardless of extent of injury.



## FORMS

### [Admittance Form \(3-WC\)](#)

This form is to be filled in by the supervisor and taken to the Center for Occupational Health by the employee for the first visit only.

### [Employee Incident Report \(5-WC\)](#)

To be filled in by employee and supervisor within 24 hours of an accident or injury.

### [OSHA Form 301](#)

This form helps the employer and OSHA develop a picture of the extent and severity of work-related incidents, ***file this report if the doctor has you off work or on restricted duty due to the injury.***

All medical examinations and consultations must be performed by or under the direct supervision of a licensed physician and must be provided without cost to the employee, without loss of pay and at a reasonable time and place.

## Documentation and Notification

The Office of Environmental Safety will maintain records of all air monitoring exposure evaluations. Medical consultation and examination records will be maintained by the Workers Compensation Administrator. The employee will be notified of the results of any medical consultation or examination with regard to any medical condition that exists or might exist as a result of exposure to a hazardous chemical.

## HAZARD IDENTIFICATION

### Labels and Safety Data Sheets of Commercially Obtained Chemicals

1. Departments must ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.
2. Departments must ensure that laboratory containers of chemicals are labeled where required. Laboratory containers, including bottles, flasks, sample vials, etc., must be marked, labeled, or coded **in all cases**. (If codes or markings other than chemical names are used, a code key or legend must be available in the workplace where it may be found quickly and easily by emergency responders or other interested parties.) Containers should indicate a date of receipt and should identify the owner of the materials.
3. Departments must maintain any Safety Data Sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees and other occupants.

## Chemical Substance Developed in the Laboratory

1. If the composition of the chemical substance is produced exclusively for the laboratory's use is known, the employer (PI) shall determine if it is a hazardous chemical as defined in the Lab Standard:

*Hazardous Chemical: "A chemical for which there is significant statistical evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees."*

If the chemical is determined to be hazardous, the principal investigator must provide appropriate training to protect employees.

2. If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and comply with all applicable sections of the Lab Standard/ISU LSCHP.
3. If the chemical substance is produced for another user outside of the laboratory, the employer (PI) must comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of a SDS (MSDS) and labeling.

## CONTROL MEASURES

The OSHA Lab Standard requires that laboratory personnel implement appropriate control measures to ensure that chemical exposures are maintained below regulatory limits and as low as reasonably achievable. In general, control measures can be categorized as administrative controls, engineering controls, procedural controls or personal protection.

### Administrative Controls

Administrative controls consist of various policies and requirements, which are established at an administrative level (e.g. University Environmental Safety Committee, Department Chairperson or PI) to promote safety in the laboratory. They may include the following:

1. Ensure that all laboratory personnel are provided with adequate training to enable them to conduct their work safely.
2. Restrict access to area in which particularly hazardous chemicals/materials are used.
3. Post appropriate signs to identify specific hazards within an area or piece of equipment.

4. Require that standard practices for chemical safety and good housekeeping be observed at all times in the laboratory.
5. Plan experiments and procedures with safety in mind. Planning includes the development of written work procedures for safe performance of the work.
6. Label all hazardous material containers.
7. Substitute less toxic materials for toxic materials.
8. Practice good housekeeping.
9. Practice good hygiene (e.g., washing hands and other areas of possible chemical contact).
10. Prohibit the storage and preparation of food in areas where chemicals are used or stored.
11. Prohibit eating, drinking, and smoking where chemicals are used or stored. Provide break areas for this purpose.
12. Do not pipette by mouth.
13. Add acid to water.
14. Ensure that employees are provided adequate training for safe work with hazardous materials.

Certain lab activities and procedures present foreseeable and specific hazards for laboratories and their users and may require prior approval from the department chairperson and/or the principal investigator. Some of the activities are:

1. **Working Alone in the lab** during non-business hours (evenings, weekends, holidays and campus breaks).  
If it is absolutely necessary for a person to work alone, then the PI or lab supervisor is responsible for arranging for periodic checks in person or via phone call on that person by someone from the lab, another person in the building at the same time or by Public Safety.
2. **Hazardous Operations/Experiments**

All hazardous operations should be performed when at least two people are present in the laboratory. Not under any circumstance should a hazardous procedure be performed while a worker is alone in the laboratory. A determination of whether a

procedure is hazardous will be determined by the lab supervisor and in some cases, the Offices of Risk Management and Environmental Safety.

### 3. Unattended Operations/Experiments

When laboratory procedures or experiments are unattended for overnight or continuous operation the following procedures are to be adhered to:

1. The laboratory supervisor is to review the work protocol to ensure the safe completion of the procedure.
2. Laboratory lights are to be left on.
3. An appropriate sign is to be posted at each entrance identifying the operation and emergency contact numbers.
4. Precautions should be taken in case of interruption of utility services. Check with Facilities Management for any scheduled interruptions.
5. Arrange for containment in case of release of the hazardous material (or any material).
6. Ensure that any tubing used (e.g. for running water) is in good condition and that the connections are secure.
7. Inform Public Safety of work and location.

### 4. Laboratory Entrance Signage

The entrances to each laboratory in which chemicals are used or stored shall be posted with the names and phone numbers of the principal investigator or laboratory supervisor and any other designated personnel who can be contacted in the event of an emergency. In addition, the postings should indicate the presence of specific hazards. (Chemical, Biohazard, Radiation). A sample sign is in Appendix I.

**Restricted access areas:** Facilities placarded with any of the following or similar warning signs are to be regarded as restricted access areas:

- CAUTION - BIOHAZARD
- CAUTION - CARCINOGENS, REPRODUCTIVE TOXINS, OR OTHER  
EXTREMELY TOXIC CHEMICALS
- CAUTION - RADIOACTIVE MATERIAL
- CAUTION - RADIATION AREA
- CAUTION - X-RAY
- CAUTION - LASER

Restricted areas are not to be entered except by authorized users of the facility and those having permission from authorized users.

Children are not permitted in restricted access areas.

Custodians are permitted to enter restricted areas to perform routine tasks. Custodians should not touch containers of chemicals (including waste) or other research equipment or materials.

Other support personnel, such as University Police and Facilities Management are permitted to enter restricted areas provided the work to be performed does not involve disturbing a use area within the facility, equipment, or materials. Examples include:

- fume hoods
- sinks
- chemical or materials in lab
- biological safety cabinets
- placarded equipment
- benches

Support personnel should contact an authorized user of the facility or the Office of Environmental Safety before performing work which may involve any of the above items. Public Safety and Office of Environmental Safety should be notified of any emergency or unusual conditions such as:

- Spills
- Contamination
- Leaks
- Injury
- Fire

### **Engineering Controls**

Engineering controls consist of various measures for reducing a hazard at its source or for separating personnel from the hazard. In the laboratory, examples of engineering controls include the substitution of less hazardous chemicals in an experiment, enclosing a potentially explosive reaction, or utilizing local exhaust such as a fume hood or snorkel for an operation which produces airborne chemicals/particulates. Because engineering controls function to reduce or eliminate a hazard at its source **before** it is created, they should be fully considered and utilized whenever possible as the **first** step of chemical hazard control within the laboratory.

NO modification of engineering controls will occur unless testing indicates worker protection will continue to be adequate.

Improper function of engineering controls must be reported immediately to Facilities Management. Fume Hood problems should be reported to OES. OES will determine if there should be work limitations on the unit or if the unit cannot be used until repairs are made.

## **Ventilation Controls:**

To determine ventilation requirements, check the SDS.

The following wording used in a SDS indicates the need for ventilation:

- use adequate ventilation
- avoid vapor inhalation
- use a fume hood
- provide local exhaust ventilation

Ventilation recommendations must be adapted to the worksite and the specific process. For assistance in determining specific ventilation requirements for your work situation, contact OES.

## **Proper Use of Ventilation Systems**

As a rule of thumb, use a hood or other local ventilation device when working with any volatile substance.

Once a ventilation system is installed in a work area, it must be used properly to be effective. The objective of a local exhaust ventilation system is to draw hazardous materials in the air away from the breathing zone of the employee. The system must be checked prior to each use to determine that it is operating. If the system is not working, it will be posted “out of order”, and Facilities Management and the Office of Environmental Safety should be contacted to have the system repaired.

### **Do not work with hazardous materials if the required ventilation system is not working.**

Ventilation systems must be properly configured. Be sure you know how to properly use the system in your area for the work you are doing. For use of laboratory fume hoods, the following guidelines should be followed:

- Fume hoods should be marked to indicate proper sash position for optimum hood performance. The hood sash should be set at this point for procedures which could generate toxic aerosols, gases or vapors. If it is not possible to do work with the sash height set at the point marked, or if there is no marking on the hood, contact OES. In general, the sash height should be set at a level where the operator is shielded to some degree from any explosions or violent reactions which could occur and where optimum air flow dynamics are achieved. Most fume hoods are not intended to be used with the sash fully open.
- Fume hoods should be equipped with a manometer or other continuous reading monitoring device to indicate adequacy of flow. Learn how to read and interpret this gauge, and check it daily. If the gauge indicates a reduced flow in the hood, post the unit as “out of order” and contact Facilities Management and the Office of Environmental Safety to have the hood repaired.

- Only apparatus and chemicals essential to the specific procedure or process should be placed in the hood. Extraneous materials from previous experiments or procedures should be removed and stored in a safe location outside the hood. Hoods used for experimental work should not be used for chemical or material storage. Hoods used for chemical storage should be dedicated to chemical storage. No experimental work should be conducted in these hoods.

If there are any questions concerning the adequacy of a fume hood or the procedures for safe use of a fume hood, contact OES.

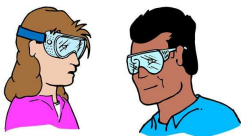
### **Work Practice Controls**

Work practice controls are typically in the form of standard operating procedures (SOPs) which define the manner in which certain types of chemicals are to be handled, or the manner in which specific operations involving chemicals are to be conducted, in order to minimize hazards. Section II of this plan contains a number of SOPs which are generally applicable to all laboratories. It is the responsibility of lab personnel to develop and incorporate specific procedures which reflect the operations and experimental protocols performed in their laboratory.

### **Personal Protective Equipment**

For many laboratory protocols, the risk of chemical exposure cannot be totally eliminated through the use of engineering and work practice control measures. For this reason, it is necessary to supplement such measures with the use of personal protective equipment (PPE) and apparel. Because PPE functions as a barrier between the worker and the chemical hazard, rather than by actually reducing or eliminating the hazard, its use should always be ***in addition*** to appropriate engineering and work practice controls. It is the responsibility of the PI or supervisor to ensure that appropriate PPE is provided to and used by, all laboratory occupants. Such equipment should be adequate to ensure personnel are protected from chemical exposure to the eyes, skin and respiratory tract. PPE requirements can be found in the chemical's safety data sheet (MSDS).

The laboratory PI or Supervisor should conduct a Hazard Assessment to determine PPE required in the laboratory. (Appendix E )



## Eye Protection

Appropriate PPE for the eyes is **required** by the OSHA Eye and Face Protection Standard (1910.133) whenever there is a reasonable probability that the eyes could be exposed to chemicals. Vented safety goggles are the preferred eye protection to be worn when chemicals are handled in the laboratory and there is potential for splash. These should be worn over prescription glasses. Contact OES if you are having difficulty finding goggles to fit properly.

All protective equipment for the eyes must bear the stamp "Z87", which indicates that it meets the performance guidelines established by the American National Standards Institute in ANSI Z87.1-2003 "American National standard Practice for Occupational and Educational Eye and Face Protection".



## Face Protection

A face shield is **required** whenever there is a potential for severe chemical exposure from splashes, fumes, or explosions. Because a face shield alone does not adequately protect the eyes, it must be worn over safety goggles. In general, any operation that requires a face shield should be conducted inside a hood with the sash down as an additional barrier.



## Hand Protection

Because the hands are typically the part of the body in closest contact with the chemicals in the laboratory, they are particularly vulnerable to chemical exposures. It is essential that laboratory personnel select appropriate protective gloves and wear them whenever handling chemicals. Because different glove materials resist different chemicals, no one glove is suited for all chemical exposures (Appendix Article: "An Avoidable Tragedy"). Glove selection guides are available from most manufacturers and should be consulted before choosing a glove. (Appendix J [University of Utah Glove selection guide](#))





## Foot Protection

Footwear, which completely covers the skin of the feet, must be worn whenever chemicals are being used. Sandals and open-toed shoes are not allowed in the laboratory.



## Body Protection

The skin, with its large surface area, is at considerable risk of exposure to chemicals in the laboratory. To lessen the risk, it is essential that laboratory personnel wear clothing which, to the extent possible, covers all skin surfaces. (Shorts and most skirts are not suitable attire for laboratory work). A lab coat should be worn for all chemical manipulations. Clothing and lab coats should be regarded, not as a means of preventing exposure, but as a means of lessening or delaying exposure. The effectiveness of clothing as a protective barrier for the skin depends upon its prompt removal in the event that it becomes contaminated. Lab coats and or aprons should be used.



## Respiratory Protection

The implementation of appropriate engineering and administrative controls should always be the preferred strategy for ensuring that any airborne levels of chemicals within the laboratory are well below regulatory limits. In situations where these control measures are not sufficient, laboratory personnel may need to utilize respirators for a particular procedure. Respirator usage must be approved by the Office of Environmental Safety comply with the OSHA Respiratory Protection Standard (29CFR1910.134) and the ISU Respiratory Protection Plan. Training, a physical exam and fit testing is mandatory before respirator use. Contact OES for more information.

## **Contaminated Clothing and Protective Equipment**

Where splash or spill of hazardous chemicals on clothing or protective equipment occurs, the clothing/equipment should be removed and placed in a closed container which prevents dispersion of the hazardous chemical. The clothing/equipment should be disposed of, cleaned, or laundered as appropriate. **Employees should not take contaminated clothing/equipment home for cleaning or laundering.** Persons or companies cleaning or laundering contaminated clothing or equipment must be informed of the potentially harmful effects of exposure to the chemical contaminant and must be advised of the measures necessary to protect themselves.

## **RECORDKEEPING**

OSHA requires maintenance of air monitoring results, exposure assessments and medical consultations and examinations for at least 30 years. Records must be made accessible to employees or their representatives. The following record keeping requirements are required by either OSHA or ISU.

### **Department/Laboratory**

1. Laboratory Safety and Chemical Hygiene Plan Awareness training attendance records and signed Laboratory Safety and Chemical Hygiene Plan Awareness Certification form
2. Current chemical inventory
3. Safety Data Sheet access for chemicals in inventory
4. Lab Specific Standard Operating Procedures
5. Incident/Accident Reports for Employees and Students

### **Office of Environmental Safety**

1. Area and personal air monitoring results
2. Exposure Assessments
3. Laboratory safety inspection results
4. Safety Data Sheet Master File (MSDS On-Line)
5. Laboratory Safety and Chemical Hygiene Plan Awareness Training attendance records.
6. Incident (Accident) reports

### **Union Hospital Center for Occupational Health**

1. Medical Records regarding exposure
2. Records for Respirator Use Physical Exams

## **UAP Clinic - ISU Health Center**

1. Medical records for incidents involving students

## **Laboratory Safety and Chemical Hygiene Plan Review**

The Office of Environmental Safety, together with the departmental laboratory safety officers, will conduct an annual review of the LSCHP. Changes to the LSCHP will be distributed to all laboratories using or storing hazardous chemicals.

## **Section II**

### **General Standard Operating Procedures**

These standard operating procedures are fundamental safety precautions which should be familiar to all laboratory personnel. These work practices should be followed at all times. Laboratories may also have additional procedures and precautions pertinent to their areas. These additional procedures and precautions should be included in their Laboratory Specific LSCHP.

## Chemical Procurement

1. Consult with stockroom personnel or lab supervisor to see if the chemical is already available for use and suitable for your application. Ordering of chemicals already on hand is wasteful.
2. Acceptance of any “donated” chemical materials requires approval by the Office of Environmental Safety **prior** to the material’s arrival on campus. “Free” chemicals often become very expensive items for disposal later.
3. The decision to purchase a chemical is a commitment to handle and use the chemical properly from initial receipt to final disposal.
4. Before a chemical is ordered, the user must determine that appropriate containment, storage and personal protective equipment are available for use.
5. Personnel responsible for receiving chemical shipments should be knowledgeable of the proper procedures for receiving chemicals. Packages should not be accepted without proper identifying labels, safety data sheets (initial shipments of an item should include an SDS. Subsequent shipments may or may not include an SDS) and packaging in accordance with all appropriate shipping and packaging regulations. ***Date all containers upon receipt.***
6. Enter chemical identification into inventory and ensure that the safety data sheet is available to laboratory staff.

## Chemical Storage

1. Carefully read the label before storing a hazardous chemical. Consult the SDS to determine any special storage information and incompatibilities.
2. Ensure all containers are in good condition and **properly labeled**.
3. Storerooms should be properly designed, ventilated and illuminated. Large bottles should be stored no more than two feet from ground level.
4. Do not store non-segregated chemicals in alphabetical order.
5. Do not store incompatible chemicals in close proximity to each other.

Examples:     Separate inorganic acids from bases, flammables, and combustible materials.  
                  Store amines away from oxidizers  
                  Store ammonium hydroxide away from hypochlorites  
                  Separate cyanides and sulfides from acids

6. Whenever possible, separate chemicals into the following general hazard classes:

- Flammable/combustible liquids
- Flammable solids
- Mineral acids
- Organic acids (liquid)
- Caustics
- Oxidizers
- Perchloric acid
- Water-reactive
- Air-reactive
- Heat-reactive (require refrigeration)
- Unstable (shock-sensitive, explosive)
- Gases:
  - Toxic
  - Flammable
  - Oxidizers
  - Inert

NOTE: Chemicals within the same hazard group can be incompatible and there are chemicals that can be classified into two or more hazard groups.

Example: Acetic acid and acetic anhydride are both corrosive and flammable. Perchloric acid is both corrosive and a strong oxidizer. Always consult the SDS.

Appendix L contains a partial list of incompatible chemicals.

7. Once separated into hazard classes, chemicals may be stored alphabetically.
8. Highly toxic chemicals and water reactive chemicals should be segregated from other substances and stored in unbreakable secondary containers.
9. Except when material is being transferred, keep chemical containers tightly closed.
10. Use approved storage cabinets, containers, and safety cans for flammable liquids.
11. Flammables requiring refrigeration or freezing must be stored in an explosion-proof or laboratory-safe rated unit.
12. Regular residential refrigerators and freezers used for the storage of non-flammable chemicals or other laboratory supplies must be posted "No Flammable Storage".
13. Refrigerators for storage of food (for staff lunches, etc.) must be marked "FOOD ONLY, NO CHEMICALS OR LAB SUPPLIES". These units should be located outside of the laboratory in a break area.
14. Flammable liquids stored in glass containers shall not exceed 1 quart (liter). Exception: For conditions where chemical purity must be protected, flammable liquids stored in glass containers shall not exceed 1 gallon (4 liters).
15. **Flammable liquids in quantities exceeding a total of 10 gallons (38 liters) in a laboratory must be stored in an approved flammable storage cabinet.**

#### Flammable Storage Cabinet:

Cabinets designed for the safe storage of flammable chemicals only work if used and maintained properly. Cabinets are generally constructed of double-walled construction and are made with 18 gauge steel. The doors are two inches above the base and the cabinet is liquid proof to that point. Two vents are located on opposite sides of the cabinet are equipped with flame-arrestor screens. Most of the flammable cabinets at ISU are vented.

#### Safety Practices when using flammable storage cabinets:

1. Store only compatible materials inside the cabinet.
2. Store chemicals of similar vapor density together when using mechanical ventilation. Heavier than air vapors are vented through the bottom vent and lighter than air vapors through the top vent.
3. Do not store paper or cardboard inside or near cabinets with the chemicals.
4. Do not overload the cabinet.

16. Corrosion resistant cabinets are recommended for storage of corrosives.
17. Use spill trays under containers of reagents which can cause spill problems.
18. DO NOT STORE chemicals in fume hoods.

## Chemical Handling

All laboratory personnel with training, education, and the appropriate resources, are expected to develop and implement work habits consistent with the LSCHP to minimize personal and co-worker exposure to the chemicals in the laboratory.

Precautions to be taken when handling and using any chemical:

1. Avoid all skin contact with chemicals. Employees and students are to wash all areas of exposed skin prior to leaving the laboratory.
2. Never pipet by mouth.
3. Eating, drinking, smoking, chewing gum or tobacco, or application of cosmetics where chemicals are present is not allowed.
4. Food or beverage storage, handling, or consumption is prohibited in chemical storage areas or refrigerator/freezer units. Glassware and utensils used for lab work are not to be used for food or drink preparation or consumption.
5. Chemical mixtures are assumed to be at least as toxic as its most toxic component.
6. Substances of unknown toxicity shall be assumed to be toxic.

7. Laboratory staff should be familiar with the symptoms of exposure for the chemicals they are working with and follow the required precautions necessary to prevent exposure.
8. In all cases of chemical exposure, neither the Permissible Exposure Limits nor the Threshold Limit values (ACGIH) shall be exceeded.



## Chemical Labeling Requirements

The OSHA Hazard Communication Standard addresses labeling requirements for chemical products and labeling of secondary containers. New changes to the Hazcom Standard are bringing the United States into alignment with the Globally Harmonized System of classification and Labeling of Chemicals (GHS). The updated standard still requires chemical manufacturers and importers to evaluate the chemicals they produce or import and provide hazard information to employers and workers by putting labels on containers and preparing safety data sheets. However, the old standard allowed chemical manufacturers and importers to convey hazard information on labels and material safety data sheets in whatever format they chose. The modified standard provides a single set of harmonized criteria for classifying chemicals according to their health and physical hazards and specifies hazard communication elements for labeling and safety data sheets.

### Major changes to the **Hazard Communication Standard**:

- **Hazard classification:** Chemical manufacturers and importers are required to determine the hazards of the chemicals they produce or imports. Hazard classification under the new, updated standard provides specific criteria to address health and physical hazards as well as classification of chemical mixtures.
- **Labels:** Chemical manufacturers and importers must provide a label that includes a signal word, pictogram, hazard statement, and precautionary statement for each hazard class and category.
- **Safety Data Sheets:** The new format requires 16 specific sections, ensuring consistency in presentation of important protection information.
- **Information and training:** To facilitate understanding of the new system, the new standard requires that workers be trained by December 1, 2013 on the new label elements and safety data sheet format, in addition to the current training requirements.



## GHS : Sample Product Label

### Product Identifier

CODE \_\_\_\_\_

Product Name \_\_\_\_\_

### Supplier Identification

Company Name \_\_\_\_\_

Street Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

Postal Code \_\_\_\_\_ Country \_\_\_\_\_

Emergency Phone Number \_\_\_\_\_

### Precautionary Statements

Keep container tightly closed. Store in cool, well ventilated place that is locked.

Keep away from heat/sparks/open flame. No smoking.

Only use non-sparking tools.

Use explosion-proof electrical equipment.

Take precautionary measure against static discharge.

Ground and bond container and receiving equipment.

Do not breathe vapors.

Wear Protective gloves.

Do not eat, drink or smoke when using this product.

Wash hands thoroughly after handling.

Dispose of in accordance with local, regional, national, international regulations as specified.

**In Case of Fire:** use dry chemical (BC) or Carbon dioxide (CO<sub>2</sub>) fire extinguisher to extinguish.

### First Aid

If exposed call Poison Center.

If on skin (on hair): Take off immediately any contaminated clothing. Rinse skin with water.

### Hazard Pictograms



### Signal Word

**Danger**

### Hazard Statement

**Highly flammable liquid and vapor.  
May cause liver and kidney damage.**

### Supplemental Information

#### Directions for use

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Fill weight: \_\_\_\_\_ Lot Number \_\_\_\_\_

Gross weight: \_\_\_\_\_ Fill Date: \_\_\_\_\_

Expiration Date: \_\_\_\_\_

## Hazard Communication Safety Data Sheets

The Hazard Communication Standard (HCS) requires chemical manufacturers, distributors, or importers to provide Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets or MSDSs) to communicate the hazards of hazardous chemical products. As of June 1, 2015, the HCS will require new SDSs to be in a uniform format, and include the section numbers, the headings, and associated information under the headings below:

**Section 1, Identification** includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

**Section 2, Hazard(s) identification** includes all hazards regarding the chemical; required label elements.

**Section 3, Composition/information on ingredients** includes information on chemical ingredients; trade secret claims.

**Section 4, First-aid measures** includes important symptoms/ effects, acute, delayed; required treatment.

**Section 5, Fire-fighting measures** lists suitable extinguishing techniques, equipment; chemical hazards from fire.

**Section 6, Accidental release measures** lists emergency procedures; protective equipment; proper methods of containment and cleanup.

**Section 7, Handling and storage** lists precautions for safe handling and storage, including incompatibilities.

**Section 8, Exposure controls/personal protection** lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).

**Section 9, Physical and chemical properties** lists the chemical's characteristics.

**Section 10, Stability and reactivity** lists chemical stability and possibility of hazardous reactions.

**Section 11, Toxicological information** includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.

Section 12, Ecological information\*

Section 13, Disposal considerations\*

Section 14, Transport information\*

Section 15, Regulatory information\*

**Section 16, Other information**, includes the date of preparation or last revision.

\*Note: Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15(29 CFR 1910.1200(g)(2)).

**Employers must ensure that SDSs are readily accessible to employees.**

See Appendix D of 1910.1200 for a detailed description of SDS contents.

## HAZARD COMMUNICATION STANDARD PICTOGRAMS and HAZARDS

|   |   |   |
|---|---|---|
| <p><b>Health Hazard</b></p>  <ul style="list-style-type: none"> <li>•Carcinogen</li> <li>•Mutagenicity</li> <li>•Reproductive toxicity</li> <li>•Respiratory sensitizer</li> <li>•Target organ toxicity</li> <li>•Aspiration Toxicity</li> </ul> | <p><b>Flame</b></p>  <ul style="list-style-type: none"> <li>•Flammables</li> <li>•Pyrophorics</li> <li>•Self-Heating</li> <li>•Emits Flammable Gas</li> <li>•Self-Reactives</li> <li>•Organic Peroxides</li> </ul> | <p><b>Exclamation Mark</b></p>  <ul style="list-style-type: none"> <li>•Irritant (skin and eye)</li> <li>•Skin sensitizer</li> <li>•Acute Toxicity</li> <li>•Narcotic Effects</li> <li>•Respiratory Tract Irritant</li> <li>•Hazardous to Ozone Layer (Non-Mandatory)</li> </ul> |
| <p><b>Gas Cylinder</b></p>  <ul style="list-style-type: none"> <li>•Gases Under Pressure</li> </ul>  | <p><b>Corrosion</b></p>  <ul style="list-style-type: none"> <li>•Skin Corrosion/Burns</li> <li>•Eye Damage</li> <li>•Corrosive to Metals</li> </ul>  | <p><b>Exploding Bomb</b></p>  <ul style="list-style-type: none"> <li>•Explosives</li> <li>•Self-Reactives</li> <li>•Organic Peroxides</li> </ul>   |
| <p><b>Flame Over Circle</b></p>  <ul style="list-style-type: none"> <li>•Oxidizers</li> </ul>  | <p><b>Environment<br/>(Non-Mandatory)</b></p>  <ul style="list-style-type: none"> <li>•Aquatic Toxicity</li> </ul>   | <p><b>Skull and Crossbones</b></p>  <ul style="list-style-type: none"> <li>•Acute toxicity (fatal or toxic)</li> </ul>   |

As of June 1, 2015, the Hazard Communication Standard (HCS) will require pictograms on labels to alert users of the chemical hazards to which they may be exposed. Each pictogram consists of a symbol on a white background framed within a red border and represents a distinct hazard(s). The pictogram on the label is determined by the chemical hazard classification.

### Labeling of Secondary Containers:

1. Original Product transferred to a secondary container for lab use should be labeled with the GHS label format.

**Example: Ethanol transferred from a stockroom drum into a 2 liter bottle for placement in a lab.**

2. Lab stock solutions and preparations should be labeled to identify the contents of the container, preparation date, initials of preparer, hazard information.

**Example:**

**Contents: 9 M Sulfuric acid H<sub>2</sub>SO<sub>4</sub>**

**Prepared by: Jane Doe**

**Date: 1-5-12**

**Hazard information: Corrosive, H<sub>2</sub>O reactive**

3. Existing labels on original containers should not be removed or defaced unless appropriately re-labeled immediately with the required GHS label format.
4. Provisions for chemical substances developed in the laboratory:
  1. If the composition of the chemical substance or mixture is known, the employer shall determine if it is a hazardous chemical as defined by the standard and determine training and proper labeling requirements.
  2. If the chemical substance produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and implement the appropriate training and labeling requirements.

### Labeling of Chemical Storage areas:

1. All chemical storage areas such as cabinets, shelves and refrigerators/freezers should be labeled to identify the hazardous nature of the chemicals stored within the area.



## Chemical Waste

1. Chemical waste should be segregated by class and compatibility.
2. All hazardous waste containers must be labeled with the words “**hazardous waste**”. Identify the waste classification or exact contents. “Metal” waste containers should have the metals and solvent identified on the label.
3. All hazardous waste containers must be marked with an accumulation date. The accumulation date represents the date that the container becomes full (waste containers should NOT be filled to more than 90% of their capacity). All waste containers must be compatible with their contents and securely capped.
4. A Hazardous Chemical Waste Routing Form (Appendix G) is to be filled out prior to waste collection.
5. The Office of Environmental Safety is to be contacted for waste chemical collection. Unlabeled items and items not indicated on the routing form **will not** be collected.

## Chemical Spill Response Information

Accidents resulting in the release of chemicals in the laboratory can occur despite efforts of workers to work safely. Generally, most spills can be cleaned up by the person involved in the spill. It is required that laboratory personnel have a spill response plan that includes appropriate procedures and materials to adequately contain and clean-up a spill. Basic Spill kits are available from the Office of Environmental Safety or can be purchased through most supply vendors that sell chemicals or safety supplies. The Office of Environmental Safety may need to be contacted to manage other spills and arrange for response from Local Emergency Responders or Contractors.

### When to report a spill:

***All spills greater than 1 quart/1 liter must be reported to OES at 237-4022 during regular business hours or to Public Safety at 237-5555 or 911.***

The following types of spills must be reported, regardless of the amount spilled:

- **Extremely flammable materials (Flash point < 20 degrees F)**
- **Extremely toxic materials (5mg/kg LD50)**
- **Mercury spills**
- **Personal incidences of contamination or exposure**
- **Leaking containers**
- **Uncontrolled compressed gas releases**

### Laboratory Spill Clean-Up Procedure:

#### **Major Spill Event:**

In the event of a spill which:

- 1) Involves the release of a type or quantity of chemical which poses an immediate risk to health;

- 2) Involves an uncontrolled fire or explosion or;
  - 3) Involves serious personal injury chemical contamination,
- Move the victim from the immediate area of the spill (if this can be done without injury to you or the victim)
  - Locate the nearest emergency eyewash or safety shower. Remove any contaminated clothing from the victim and flush all areas of the body exposed to chemicals with copious amounts of water for at least 15 minutes.
  - Follow ISU Emergency Response Procedure 704.00

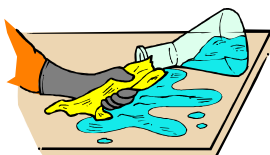
### **ISU EMERGENCY RESPONSE INFORMATION:**

#### **704.00 CHEMICAL, RADIATION LEAK OR SPILL**

- A. Any unscheduled release (spill) of a hazardous chemical or radioactive material is reported immediately to Public Safety at 911 or (812) 237-5555.
- B. When reporting, be specific about the nature of the involved material, quantity, and exact location. Public Safety will contact the necessary specialized authorities and medical personnel. NOTE: Laboratory personnel should consult the ISU Laboratory Chemical Safety Plan to determine appropriate response for laboratory chemical spills.
- C. The responsible person on site should vacate the affected area at once and seal it off to prevent further contamination of other areas until the arrival of ISU Environmental Safety personnel.
- D. Anyone who may be contaminated by the spill is to avoid contact with others as much as possible, remain in the immediate vicinity, and give their name(s) to Public Safety. Required first aid and cleanup by specialized authorities should be started at once.
- E. If an emergency exists, evacuate the building. You must also report the emergency by phone to Public Safety at **911** or **(812) 237-5555**.
- F. When the fire alarm is sounded, an emergency exists. Walk quickly to the nearest marked EXIT and alert others to do the same.
- G. Remember that elevators are reserved for emergency response personnel ONLY. DO NOT PANIC.
- H. Once outside, move to the building's evacuation assembly point at least 200 feet away from the affected building(s). Keep streets, fire lanes, hydrants and walkways clear for emergency vehicles and crews.
- I. If requested, assist emergency crews as necessary.
- J. A Field Command Post may be set up near the emergency site. Keep clear of the Command Post unless you have official business.

- K. DO NOT RETURN TO AN EVACUATED BUILDING unless told to do so by a designated official.

IMPORTANT: After any evacuation report to your designated building evacuation assembly point. Stay there until an accurate HEADCOUNT is taken. The Building Safety Officer will take attendance and assist in accounting for all building occupants.



### Spill Response for Minor Spills

In the event of a spill involving the release of a type or quantity of chemical that does not pose an immediate risk to health, follow the following procedures:

- 1) Notify all other laboratory personnel of the accident.
- 2) Isolate the area. Close laboratory doors and evacuate the immediate area if necessary.
- 3) Remove all ignition sources and unplug nearby electrical equipment.
- 4) Establish exhaust ventilation if possible.
- 5) Locate spill kit and read the SDS.
- 6) If glass is involved, use a mechanical means to pick it up.
- 7) Choose appropriate personal protective equipment for chemical(s) involved in spill:
  - Chemical Safety Goggles
  - Lab coat
  - Chemically Resistant Apron if needed
  - Nitrile or Neoprene gloves or other glove material if specified

*Additional PPE (respirators and special suits might be required for response to certain chemical releases or situations to prevent exposure. These situations would be handled by the OES, Emergency Responders or Independent Contractors.)*

- 8) Contain the spill. Neutralize any acid/base materials prior to cleanup. Cover with appropriate absorbent material. Sweep the solid material into a plastic dustpan and place in a sealed container/waste bag.
- 9) Wet mop spill area. Be sure to decontaminate broom, dustpan and other reusable items. Put all contaminated items (gloves, clothing, etc...) into a labeled and sealed container or plastic waste bag. **Contact the Office of Environmental Safety for pickup.**
- 10) Notify the principle investigator or laboratory supervisor of the spill (OES if reportable quantity and type) and complete any necessary documentation.

### Absorb/Remove Liquids

#### **Acid, Caustic and other Non-Flammable Liquids:**

These materials can be absorbed with polypropylene absorbent pads and socks. Neutralizing powders such as Oil-Dri and Zorb-All are available.

### **Flammable Liquids:**

Flammable liquids can be absorbed on activated carbon or absorbent polypropylene pads and socks. Use 2 pounds of activated carbon per pint (0.5 liters) of liquid. Use a spatula to mix the carbon with the liquid. Sweep up material and continue following spill clean-up procedures.

### **General Liquid Clean-Up:**

Cover spill with vermiculite (*NOTE: Do not use vermiculite for hydrofluoric acid spills*) or similar material to contain and absorb the spill. A 1:1:1 mixture by weight of sodium carbonate, clay cat litter and sand is effective in absorbing liquids, neutralizing acids and moderating the hazard of reactive materials.

### **Special Spill Procedures**

#### **Acid Chlorides:**

1. Use Oil-Dri, Zorb-All, or dry sand
2. Avoid water and sodium bicarbonate

#### **Alkali Metals** (lithium, sodium, magnesium, potassium)

1. Smother with dry sand
2. Avoid contact with water

#### **White or Yellow Phosphorous**

1. Blanket with wet sand or wet absorbent

#### **Bromine**

1. Neutralize spill with a 5% solution of sodium thiosulfate
2. Absorb with inert absorbent material

#### **Mercury**

1. The Biology and Chemistry Department Stockrooms should have commercial mercury spill kits available. The Office of Environmental Safety also has kits available. DO NOT use a vacuum cleaner. An aspirator bulb or suction device can be used to collect the beads of mercury.
2. Spills of more than the contents of a thermometer should be cleaned up by the Office of Environmental Safety staff.
3. The use of non-mercury thermometers is highly recommended.



## Hydrofluoric Acid

1. Neutralize with soda ash or lime (or absorb spill with special HF spill pillow)
2. Absorb with an inert absorbent material (DO NOT USE VERMICULITE)

**IF SPILL INVOLVES CONTAMINATION OF PERSONNEL CALL 911 AND IMMEDIATELY BEGIN THE EMERGENCY STEPS OUTLINED IN THE HF ACID SAFETY GUIDELINE IN SECTION III.**

## Safety and Emergency Equipment

The availability and use of safety equipment is essential to the practice of safe and responsible science. Safety equipment should be present in well-marked, highly visible, and easily accessible locations in or near all laboratories that use hazardous chemicals. Emergency telephone numbers of emergency personnel, supervisors and other appropriate parties shall be posted.

### Chemical Fume Hoods

Chemical fume hoods are one of the most important items of equipment used for the protection of laboratory personnel and students. These units capture, contain and expel chemical emissions. In addition, chemical fume hoods (with the sash lowered) provide a protective barrier between laboratory personnel and chemicals or chemical processes.

A properly functioning hood draws between 80-120 linear feet per minute of air at a sash height of 14"-18". The storage of large amounts of chemicals and other items in the fume hood can impair the hood's operation.

To ensure that fume hoods are operating properly, periodic inspections are conducted by the Office of Environmental Safety. Any hood that is not functioning properly should be reported to the lab supervisor immediately. The OES should be notified of the problem.

### Eyewash Stations

Eyewash stations are required in areas where hazardous chemicals are used. Eyewashes should be easily accessible, unobstructed, and clearly labeled. The use of hands should not be required to maintain the water flow after initial operation (Hands Free). The ANSI standard (**ANSI Eyewash Z358.1-2009**) states that all flushing equipment must be located in areas that are accessible within 10 seconds (roughly 55 feet).

Bottled Eyewash or other Personal Wash Units such as single head Drench Hoses are considered to be supplemental equipment only. These types of flushing units do not meet ANSI's requirements for Eyewash and/or Drench Shower stations and should not be used as an alternative to a 15 minute flushing station. The ANSI Z358.1-2009 standard states, "*A personal wash unit may be kept in the immediate vicinity of employees working in a potentially hazardous area. The main purpose of these units is to supply immediate flushing. With this accomplished, the injured individual should then proceed to a plumbed or self contained Eyewash and flush the eyes for the required 15-minute period.*"

Eyewashes are to be inspected and flushed for 5 minutes weekly by laboratory personnel to ensure that they are working properly. An inspection sheet for each eyewash should be posted near the unit.

In the event of a chemical splash to the eye/face, immediately flush the eyes and face for 15 minutes and seek medical attention. Remember to remove contacts.

### **Safety Showers**

Safety showers are required in areas where hazardous chemicals are used. These units provide an effective means of initial treatment in the event of chemical contamination of the skin or clothing. The shower area should be readily accessible, clear of obstructions, and clearly labeled. In the event of chemical contamination of an individual's body, immediately flush the body for 15 minutes under the shower while removing clothing, and seek medical attention.

### **Fire Extinguishers**

Fire extinguishers are located in each lab. In the event of a fire it is ISU policy for building occupants to evacuate IMMEDIATELY.

### **Flammable Liquid Storage Cabinets**

Flammable liquids in quantities exceeding a total of 10 gallons in a laboratory must be stored in a flammable liquid storage room, cabinets or safety cans. Flammable storage cabinets shall be designed to meet NFPA (National Fire Protection Agency) and Indiana's Fire Prevention Code guidelines. Approved cabinets should be marked with conspicuous lettering "Flammable-Keep Fire Away". Only flammable and combustible material should be stored in flammable storage cabinets.

### **Safety Cans**

A safety can is a container with a capacity of 5 gallons or less, having a spring closed lid, spout cover, and flame arrestor, designed to safely relieve internal pressure. Safety cans should be

UL (Underwriters' Laboratories, Inc.) listed and should be compatible with the chemical that they are to contain.

### **Explosion-Proof and Laboratory-Safe Refrigeration Equipment**

The use of domestic refrigeration equipment for the storage of flammable liquids presents a significant hazard for the laboratory. Refrigerator temperatures are commonly higher than the flash points of the flammable liquids stored in them.

Flammable liquids should only be stored in two types of laboratory refrigerators: explosion-proof and laboratory-safe models. **Explosion-proof** refrigeration equipment is designed to protect against ignition of flammable vapors both inside and outside the refrigerated storage compartment. **Laboratory-safe** refrigeration equipment is designed to eliminate ignition of vapors only in the inside of the storage compartment.

Containers should be tightly closed to minimize the amount of vapor released. Every laboratory refrigerator and freezer should be clearly marked to indicate whether or not it is safe for the storage of flammable liquids.

### **Portable Safety Shields**

Portable safety shields can provide limited protection against explosions, fires, and chemical splash hazards. When a hood sash cannot provide proper shielding, portable safety shields should be used. It should be noted that portable safety shields do not provide protection on the sides and back of equipment and therefore work best if used in conjunction with a fume hood. Laboratory equipment or chemical apparatus should be shielded on all sides so that there is no line-of-sight exposure to laboratory personnel.

### **First Aid Kits**

First aid kits should be easily accessible to laboratory personnel. The kits should be regularly inspected and restocked as necessary. **All accidents/injuries must be reported to instructor or supervisor.**

**Section III**  
**Appendices**

# Appendices

- A** OSHA Laboratory Standard
- B** OSHA Hazard Communication Standard
- C** EPA P and U Listed Chemicals
- D** Example Laboratory Specific Emergency Information
- E** Example Hazard Assessment Form
- F** Lab specific Documentation Form
- G** Hazardous Chemical Waste Pick-Up Form
- H** Laboratory Safety and Chemical Hygiene Plan Awareness
- I** Certification Form
- J** Sample Laboratory Entrance Signage
- K** University of Utah Glove Selection Guide
- L** Incompatible Chemical List