

THE OSHA LABORATORY STANDARD AND THE RICE UNIVERSITY CHEMICAL HYGIENE PLAN

THE OSHA LABORATORY STANDARD

Laboratories typically differ from industrial operations in their use and handling of hazardous chemicals. The Occupational Safety and Health Administration (OSHA) Laboratory Standard (29 CFR 1910.1450) defines a laboratory as a facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a nonproduction basis. As a requirement of the OSHA Laboratory Standard, each employer, department, or laboratory must formulate and implement 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).

Among other requirements, the final 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.

Employee information and training

Employer must provide employees with information and training to ensure that they are aware of chemical hazards present in their work area. Employees must also be informed of:

- The contents of the Laboratory Standard (29CFR 1910.1450) its appendices which shall be made available to employees
- The location and availability of the employer's Chemical Hygiene Plan
- The permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard
- Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory
- The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the

laboratory including, but not limited to, Safety Data Sheets received from the chemical supplier.

Employee training shall include:

- Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.)
- The physical and health hazards of chemicals in the work area
- The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.
- The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.

HAZARDOUS CHEMICALS

The Laboratory Standard defines a hazardous chemical as any element, chemical compound, or 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, an explosive, an 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
- reproductive toxins
- sensitizers
- neurotoxins (nerve)
- hepatotoxins (liver)
- agents that act on the hematopoietic system (blood)
- irritants
- corrosives
- radioactive material
- biohazards
- nephrotoxins (kidney)
- agents that damage the lungs, skin, eyes, or mucous membranes

In most cases, the label will indicate if the chemical is hazardous. Look for key words like **caution, hazardous, toxic, dangerous, corrosive, irritant, carcinogen**, etc. Older containers of hazardous chemicals (before 1985) may not contain hazard warnings.

If you are not sure a chemical you are using is hazardous, review the **Safety Data Sheet (SDS)** or contact your supervisor, instructor, or the Department of Environmental Health and Safety.

Designated areas must be established and posted for work with certain chemicals and mixtures, which include **select carcinogens, reproductive toxins**, and/or substances which have a **high degree of acute toxicity**. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

SAFETY DATA SHEETS (SDSs)

A Safety Data Sheet (SDS, also known as Material Safety Data Sheet) 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 SDS the first time a hazardous chemical is shipped to a facility. However, you can request a SDS for any laboratory chemical from the manufacturer or distributor.

CHEMICAL INVENTORIES

The OSHA Laboratory Standard does not require chemical inventories; however, it is prudent to adopt this practice. Maintaining and annually reviewing a chemical inventory can reduce the number of unknowns and the tendency to stockpile chemicals. The Department of Environmental Health and Safety may require that a chemical inventory for particular hazardous chemicals including acute toxins and flammable materials for reporting purposes.

THE RICE UNIVERSITY CHEMICAL HYGIENE PLAN

The *Rice University Chemical Hygiene Plan and Hazardous Materials Safety Manual* serves as the written Chemical Hygiene Plan (CHP) for laboratories using chemicals at Rice University. The CHP is an ongoing process requiring at least annual revisions and revisions as hazards and personnel change. **Departments, individual laboratories, or other work units engaged in laboratory work whose hazards are not sufficiently covered in this written manual must customize it by adding their own sections as appropriate (e.g. standard operating procedures, emergency procedures, and identifying activities requiring prior approval).**

ROLES AND RESPONSIBILITIES

Rice Policy No. 313 Laboratory Safety Policy States the following:

Faculty, students, staff and visiting scholars have various responsibilities to assure their own safety and for the safety of others. They also must comply with federal, state, local and University regulations.

Environmental Health & Safety (EH&S). Rice EH&S shall assist the deans, department chairs and PIs with the implementation of this policy. EH&S is responsible for reviewing federal, state and local laws and regulations pertaining

to laboratory safety and for recommending appropriate policy and procedural changes. EH&S shall establish and monitor safety practices, training programs and review mechanisms that support safe laboratory practices. EH&S will support the PIs in the preparation of training materials, safety plans and monitoring as requested. To this end, EH&S shall provide guidance and technical assistance to deans, department chairs and PIs in identifying, evaluating and correcting health and safety hazards.

On an ongoing basis EH&S shall develop programs for the safe use of hazardous radiological, biological and chemical substances and radiation producing devices. EH&S shall also oversee and manage hazardous waste disposal services.

Principal Investigator (PI). The PI is a faculty member or research scientist overseeing a research laboratory and has the primary responsibility for maintaining a safe laboratory environment. The PI shall ensure that faculty, students, staff and visiting scholars receive the appropriate training, instruction and mentorship necessary to work safely in his/her laboratory. In addition, the PI shall ensure that equipment and supplies are in place so that research can be conducted safely. Moreover, the PI is responsible for taking the actions necessary for his/her laboratory to comply with Rice Policy as well as with all federal, state and local regulations.

The PI, with assistance from EH&S, shall ensure that the training programs available to people under his/her supervision address the hazards posed by the specific materials and equipment in his/her laboratory.

Safety Committee(s). Rice will maintain safety committees to review and monitor the use of recombinant DNA (rDNA), bio-hazardous agents, select agents, controlled substances, and other hazardous materials proposed for use in PI laboratories or shared laboratory spaces. The safety committee(s) will work with EH&S to review and refine procedures associated with this policy; ensure checklists and templates are useful and appropriate; interactions with faculty are constructive and enhance compliance with this policy; and safety issues arising through new facility construction and building remodeling as well as through changing federal, state and local safety guidelines and requirements are addressed.

Faculty, students, staff and visiting scholars are responsible for promptly notifying and reporting potentially unsafe conditions and environmental health hazards, as well as injuries and illnesses in the laboratory, to the PI or to the PI's designated laboratory representative.

For a full listing of roles and responsibilities, see the Rice University Laboratory Safety Policy (No. 313) on the EH&S website at <http://safety.rice.edu>

EXPOSURE LIMITS

For laboratory uses of hazardous substances, employers must ensure that laboratory employees' exposures to these substances do not exceed either the permissible exposure limits (PELs) specified in OSHA regulation 29 CFR 1910, subpart Z, or the Threshold Limit Values (TLVs) published by the American Conference of Governmental Industrial Hygienists (ACGIH), whichever is lower.

EMPLOYEE INFORMATION AND TRAINING

Employers must provide employees with information and training to ensure that they are aware of the hazards of chemicals present in their work area including the steps they should take to protect themselves from these hazards. Training may take the form of individual instruction, group seminars, audio-visual presentations, handout material, or any combination of the above. However, the 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, reproductive hazards) to address specific hazards.

Such 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.

Information provided by employers to employees must include:

1. The contents of the OSHA standard 29 CFR 1910.1450 and its appendices which shall be available to employees (available from EH&S and at www.osha.gov)
2. The location and availability of the Rice University Chemical Hygiene Plan (available from EH&S)
3. The permissible exposure limits for OSHA regulated substances or published exposure limits for other hazardous chemicals where there is no applicable OSHA standard (available from EH&S)
4. Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory (available on container labels and Material Safety Data Sheets)
5. The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets received from the supplier.

Training provided to employees must include:

1. Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the University, continuous

monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

2. The physical and health hazards of chemicals in the work area;
3. The 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;
4. The applicable details of the Rice University Chemical Hygiene Plan.

MEDICAL CONSULTATIONS AND EXAMINATIONS

Employers must provide 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, under the following circumstances:

1. Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee must be provided an opportunity to receive an appropriate examination.
2. Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.
3. Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. Such consultations shall be for the purpose of determining the need for a medical examination.

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.

HAZARD IDENTIFICATION

With respect to labels and Material Safety Data Sheets:

1. Employers must ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.
2. Employers 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.)

3. Employers must maintain any Material Safety Data Sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.

Note: Material Safety Data Sheets are available from the supplier. Material Safety Data Sheets for chemicals in use should be maintained in the laboratory on in an online form that is readily accessible in the event of an emergency.

CHEMICALS DEVELOPED IN THE LABORATORY

The following requirements apply to chemical substances developed in the laboratory:

1. If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the principal investigator must determine if it is a hazardous chemical (e.g., by literature search). 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 by-product whose composition is not known, the principal investigator must assume that the substance is hazardous and must comply with the requirements of the CHP.
3. If the chemical substance is produced for another user outside of the laboratory, the principal investigator must comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of Material Safety Data Sheets and labeling.

Note: Item 1 does not require the principal investigator to conduct toxicological testing. However, if a Material Safety Data Sheet or hazard information is available for the chemical, the information must be made available to employees.

USE OF RESPIRATORS

Where the use of respirators is necessary to maintain exposure below permissible exposure limits (PELs) or the Threshold Value Limits (TLVs), whichever is lower, the employer must provide, at no cost to the employee, the proper respiratory protective equipment. Respirators must be fit tested and the appropriate cartridges maintained.

STANDARD OPERATING PROCEDURES

Standard Operating Procedures (SOP's) must be written and maintained as a part of the laboratory chemical hygiene plan. Provide copies of the SOP's for each hazardous procedure in the laboratory. Examples include, but are not limited to chemical storage methods, waste disposal procedures, and SOP's regarding work with hazardous chemicals. Each SOP should describe any necessary control measures including the use of Personal Protective Equipment (PPE), the use of control measures such as fume hoods or localized exhaust, laboratory safe refrigerators, and good hygiene practices for the use of hazardous materials. An SOP template is available for modification as necessary on the EH&S website, <http://safety.rice.edu>.

For work involving extremely toxic chemicals, select carcinogens, and reproductive toxins, standard operating procedures must include the following provisions where appropriate:

1. Establishment of a designated area;
2. Use of containment devices such as fume hoods or glove boxes;
3. Procedures for safe removal of contaminated waste
4. Decontamination procedures.

CONTROL MEASURES

Whenever employee exposures exceed the action level (or in the absence of an action level, the lower of the PEL or TLV), the employer must implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices. Exposures to extremely toxic materials, select carcinogens, and reproductive toxins must be maintained as low as reasonably achievable.

PROTECTIVE EQUIPMENT

Fume Hoods/Ventilation Systems

Every laboratory ventilation hood used for the control of air contaminants shall be monitored to assure that adequate airflow is being maintained in order to provide continued protection against employee over-exposure. Laboratory hood airflow shall be considered adequate when the average face velocity equals a minimum of a 60-80 feet/minute with the hood sash at a working height (14 to 18 inches).

Other local exhaust ventilation, such as instrument vents, will also be tested. The criteria for minimal acceptable flow shall be determined by the Office of Environmental Health and Safety. **All hoods should be inspected and tested at a minimum of every three years.** Check date of last inspection (sticker placed on front of hood) and call Facilities and Engineering (713-348-2485) or the Office of Environmental Health and Safety at (713-348-4444) to schedule a hood inspection.

If fume hood is malfunctioning call Facilities and Engineering (713-348-2485).

Personal Protective Equipment

Personal protective equipment (PPE) is specialized equipment meant to protect researchers from hazards in the laboratory. PPE begins with the right type of clothing for the laboratory. Long pants and closed toed shoes are required when working with hazardous materials. Avoid clothing that is too loose and can knock items over. Clothing should fit well and be made of sturdy natural fabrics such as cotton or wool. Long hair should also be tied back when working with open flames such as a Bunsen burner.

Eye protection must be worn upon entering the laboratory where hazards are present. Safety glasses, goggles and goggles with face shield should be worn in the laboratory based upon the physical state, the operation or the level of toxicity of the chemical used. Safety glasses effectively protect the eye from solid materials (dusts and flying objects) but are less effective at protecting the eyes from chemical splash to the face. Goggles should be worn in situations where bulk quantities of chemicals are handled and chemical splashes to the face are possible. Goggles form a liquid proof seal around the eyes, protecting them from a splash. When handling highly reactive substances or large quantities of hazardous chemicals, corrosives, poisons, and hot chemicals, goggles with face shield should be worn. Prescription glasses are not always impact resistant so safety glasses are required to be worn over these glasses. Contact lenses can increase the risk of eye injury if worn in the laboratory - particularly if they are of the gas permeable variety. Gases and vapors can be concentrated under such lenses and cause permanent eye damage. Chemical splashes to the eye can get behind all types of lenses. Once behind a lens the chemical is difficult to remove with a typical eye wash. For these reasons it is recommended that contact lenses not be worn in laboratories.

A laboratory coat should be worn over street clothes and be laundered regularly. Laboratory coats are intended to prevent contact with dirt, chemical dusts and minor chemical splashes or spills. If it becomes contaminated, it should be removed immediately and affected skin surface washed thoroughly.

Gloves should be worn when working with hazardous materials such as hazardous chemicals, mutagens, carcinogens, and toxins. Before working with these materials, a chemical compatibility chart should be consulted to ensure protection. Gloves should be removed before exiting the lab. Never touch common surfaces such as door handles or elevator buttons with gloved hands. Gloves should never be reused once removed.

SPECIAL HAZARDS

The Laboratory Supervisor or Principal Investigator will define which if any activities, operations, or procedures constitute circumstances under which prior approval must be obtained by employees before implementation.

ANNUAL REVIEW

The employer must review and evaluate the effectiveness of the Chemical Hygiene Plan at least annually and update it as necessary.