Introduction

In 1990, the Occupational Safety and Health Administration (OSHA) issued a regulation entitled Occupational Exposure to Hazardous Chemicals in Laboratories, otherwise known as the Laboratory Standard, to address the differences between chemical use in laboratories versus other workplaces.

The goal of the Laboratory Standard is to ensure that laboratory workers are informed about the hazards of chemicals in their workplace and are protected from chemical exposures exceeding allowable levels (e.g., exceeding OSHA Permissible Exposure Limits). This goal is achieved by establishing safe work practices in the laboratories through the implementation of a Chemical Hygiene Plan (safety manual) and the appointment of departmental Chemical Hygiene Officers.

Scope and Application

The Laboratory Standard applies to all individuals who work with hazardous chemicals in science and engineering laboratories. Work with hazardous chemicals outside of laboratories is covered by the Hazard Communication Standard.

Program Description

The Laboratory Standard consists of five major elements: information and training, medical consultations and exams, hazard identification, exposure monitoring, and the Chemical Hygiene Plan.

In accordance with the Laboratory Standard, each science and engineering department has appointed a Chemical Hygiene Officer to develop and implement a departmental Chemical Hygiene Plan. The Chemical Hygiene Officer is the primary liaison for laboratory chemical safety issues between the department and the EHS.

Exposure Determination

OSHA has established permissible exposure limits (PELs) for hundreds of chemical substances. The PEL is the concentration in inhaled air that the average, healthy worker may be exposed to daily for a lifetime of work without significant adverse health effects. The PEL is usually expressed as an eight hour time weighted average concentration.
Laboratory workers must be protected from exposure above PELs. Exposure monitoring, through air sampling, is conducted if there is reason to believe that exposure may exceed exposure limits, or upon request. Individuals who have been monitored will receive sampling results within 15 days of receipt by EHS. Periodic monitoring will be conducted as needed.

**Chemical Hygiene Plan**

The purpose of the Chemical Hygiene Plan is to provide guidelines for prudent practices and procedures for the laboratory use of chemicals. The Laboratory Standard stipulates that the Chemical Hygiene Plan set forth procedures, equipment, personal protective equipment and work practices capable of protecting workers from the health hazards presented by the hazardous chemicals used in the particular workplace.

Each science and engineering department at the University of South Carolina has developed a Chemical Hygiene Plan (CHP), based on a model plan prepared by EHS. Copies of the CHP are available in each laboratory and to laboratory workers at all times.

The following information may be found in each departmental Chemical Hygiene Plan:

- **Standard Operating Procedures** – prudent laboratory practices to be followed when working with chemicals in a laboratory to include general and laboratory-specific procedures for work with several categories of chemicals, emergency procedures, and laboratory waste procedures.
- **Chemical Exposure Control** – criteria to define when chemical exposure monitoring will be conducted to determine whether exposure limits are exceeded. It also outlines what control measures (e.g., engineering controls, personal protective equipment) will be used to assure exposure does not exceed exposure limits.
- **Function of Engineering Controls** – description of programs in place to ensure laboratory fume hoods and other engineering controls function properly.
- **Information and Training** – outline of general and specific training required and what information must be available and communicated to all laboratory workers.
- **Criteria for Prior Approval of Laboratory Procedures** – Written approval must be obtained from the principal investigator before beginning work with particularly hazardous substances, including select carcinogens, reproductive toxins, embryotoxins, materials exhibiting a high degree of acute toxicity and materials of unknown toxicity.
- **Medical Consultations and Examinations** – provisions for medical consultation or examination when exposure to a hazardous chemical takes place.
- **Chemical Hygiene Officer Designation** – identity of the departmental Chemical Hygiene Officer and outline of his or her role and responsibilities.
Particularly Hazardous Substances – outlines special procedures and safe work practices for work with chemicals requiring prior approval.

Information and Training

Laboratory workers are provided with information and training to become knowledgeable of the hazards present in their laboratory. The training is provided at the time of initial assignment to a laboratory and prior to tasks involving new exposure situations.

EHS provides general training, while the department provides specific training on particularly hazardous materials or operations in the workplace.

The following information is available to all laboratory workers:

- Full text of the OSHA Laboratory Standard
- Location and availability of the departmental Chemical Hygiene Plan
- Permissible exposure limits for OSHA Regulated Substances (available through EHS)
- Signs and symptoms associated with exposure to hazardous chemicals in the laboratory
- The location and availability of reference materials on the hazards, safe handling, storage and disposal of hazardous chemicals in the laboratory, including, but not limited to, MSDS's.

Training includes at least the following:

- Methods and observations that may be used to detect the presence or release of a hazardous chemical. This may include monitoring devices, as appropriate, and familiarity with the appearance and odor of the chemicals;
- The physical and health hazards of chemicals in the laboratory;
- The measures that workers can take to protect themselves from these hazards, including protective equipment, appropriate work practices, and emergency procedures.
Medical Consultations and Examinations

The University of South Carolina provides medical consultation with a licensed physician for the purpose of determining what medical examinations or procedures are appropriate in cases where a significant exposure to a hazardous substance may have taken place, including:

- Whenever an individual develops signs or symptoms associated with a hazardous chemical to which he or she may have been exposed in the laboratory
- Whenever exposure monitoring reveals exposure levels routinely exceeding the OSHA action level or permissible exposure limit, as appropriate
- Whenever a spill, leak, explosion or other occurrence results in the likelihood of a laboratory worker experiencing a hazardous exposure
- The laboratory worker or his/her supervisor provides the examining physician with the identity of the hazardous chemical encountered in the laboratory and the conditions under which the individual may have been exposed.

The examining physician completes a written opinion that includes the following information:

- Recommendations for further medical follow-up;
- The results of the medical examination and any associated tests;
- Any medical condition which may be revealed in the course of the examination that may place the individual at increased risk as a result of exposure to a hazardous chemical in the workplace.

A copy of the written opinion is provided to the laboratory worker, the departmental Chemical Hygiene Officer and EHS. Further details on the policy and procedures may be found in the departmental Chemical Hygiene Plan.

Hazard Identification

Chemical containers must be labeled with the identity of the product, the chemical constituents, and any appropriate hazard warnings. Labels must not be removed or defaced.

Material Safety Data Sheets (MSDSs) received by the laboratory must be maintained and be available to laboratory workers during work hours. The location of the central departmental location for MSDSs may be found in the Chemical Hygiene Plan. In addition
to the MSDSs received with chemical shipments, hundreds of MSDSs are available through EHS.

**Recordkeeping**

Departments must keep records of attendance at EHS general training and departmental training, exposure monitoring, medical consultation, and examinations. Such records may be transferred to an individual's physician or made available to the laboratory worker upon request.

**Roles and Responsibilities**

**Department**

- Maintain records of training, exposure monitoring and medical examinations.
- Provide chemical and procedure-specific training.

**Chemical Hygiene Officer**

- Develop and implement a departmental Chemical Hygiene Plan.
- Review and update the Chemical Hygiene Plan at least annually.
- Investigate accidents and chemical exposures.

**Supervisors**

- Ensure laboratory workers attend training.
- Ensure laboratory workers use personal protective equipment, as needed.

**Environmental Health and Safety**

- Conduct exposure monitoring, as needed.
- Provide general training.
- Audit departmental program periodically.

**Individual**

- Attend training.
- Review the departmental Chemical Hygiene Plan.
- Follow procedures and laboratory practices outlined in the Chemical Hygiene Plan.
- Use engineering controls and personal protective equipment, as appropriate.
- Report all accidents and potential chemical exposures.
For More Information

- Contact the Hazard Communications Manager at 777-5269.
- Boilerplate Chemical Hygiene Plans are available for download.
- A Laboratory Health and Safety Self–Audit Checklist is available through EHS. The checklist and key, both in Microsoft Word, may be downloaded and either printed as is or customized to meet the needs of the particular user. The following references are available through EHS:

  - American Chemical Society, Safety in Academic Chemistry Laboratories, 5th ed., 1990
  - Clayton, George and F. Clayton, editors, Patty's Industrial Hygiene and Toxicology, Wiley, Interscience, 1991
  - U.S. Department of Health and Human Services, Occupational Health Guidelines for Chemical Hazards, NIOSH/OSHA