CHEMICAL HYGIENE PLAN FOR CLEMSON UNIVERSITY

2018

THE OSHA LABORATORY STANDARD

The basis for this standard (29 CFR 1910.1450) is a determination by the Occupational Safety and Health Administration (OSHA), after careful review of the complete rule-making record, that laboratories typically differ from industrial operations in their use and handling of hazardous chemicals and that a different approach than that found in OSHA's substance specific health standards is warranted to protect workers. 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).

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.

Effective Date of 1910.1450: May 1, 1990. Compliance Date: Employers shall have completed an appropriate Chemical Hygiene Plan and commenced carrying out its provisions by January 31, 1991.

The Occupational Safety and Health Administration (OSHA) requires that laboratory employees be made aware of the Chemical Hygiene Plan at their place of employment (29 CFR 1910.1450).

This document serves as the written Chemical Hygiene Plan (CHP) for laboratories using chemicals at Clemson University. The CHP and University Laboratory Safety Manual are a regular, continuing effort, not a standby or short-term activity. Departments, divisions, sections, or other work units engaged in laboratory work whose hazards are not sufficiently covered in this written manual must customize the Laboratory Safety Manual by adding their own sections as appropriate (e.g. standard operating procedures, emergency procedures, identifying activities requiring prior approval).

After reading the Clemson University Chemical Hygiene Plan, complete and return a copy of this form to your supervisor. By signing below you acknowledge that you have read and understand the Chemical Hygiene Plan and the policies and procedures applicable to the OSHA standard (29 CFR 1910.1450). The Chemical Hygiene Standard (Lab Standard) 29CFR1910.1450 can be accessed at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10106

Your supervisor will provide additional information and training as appropriate.

The latest revision of the Chemical Hygiene Plan can be accessed at: http://www.clemson.edu/research/safety/manuals/index.html

Please type or print legibly. **Signature**

Name:_____ _____

Student or staff ID number:_____

Department:_____

Job Classification (if employee):_____

Supervisor/PI

Name	Signature	Date
_____	_____	_____
_____	_____	_____

Completed CHP Awareness Certifications are to be kept in the CHP binder or in a labeled binder if a hard copy of the CHP is not kept in the laboratory. These, and all safety training records, should be organized in a way that allows original records to be retrieved quickly and efficiently on request by an OSHA inspector or an Office of Research Safety (ORS) staff member, and to be retrieved for a single staff member or for an entire work group (identified by supervisor).

It is the policy of Clemson University to take every reasonable precaution to provide a work environment that is free from recognized hazards for its employees in accordance with the General Duty clause of the OSHA Act (Public Law 91-596, Section 5(a)(l)). Clemson University is also required by the OSHA Laboratory Standard (29CFR 1910.1450) to ensure that the necessary work practices, procedures and policies are implemented to protect laboratory employees from all potentially hazardous chemicals in use in their work area.

Although not explicitly covered by the OSHA standard, undergraduate students working with hazardous chemicals in teaching or research laboratories are expected to practice good chemical hygiene at all times. Clemson University prioritizes the safety of it's students and the elements of this plan may be used as a guide to ensure their safety when working with hazardous chemicals.

SCOPE AND APPLICATION

1. The CHP applies to all Clemson University personnel engaged in the laboratory use of hazardous chemicals. The laboratory use of hazardous chemicals means handling or use of such chemicals to which all of the following conditions are met:
    a. Chemical manipulations are carried out on a “laboratory scale.”
    b. The procedures involved are not part of a production process, nor in any way simulate a production process; and
    c. “Protective laboratory practices and equipment” are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

*Laboratory scale means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person.

The CHP does not apply to:

a. Uses of hazardous chemicals that do not meet the definition of laboratory use.
b. Laboratory uses of hazardous chemicals that provide no potential for employee exposure. Examples of such conditions 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.

Laboratory uses of chemicals not covered by the CHP are subject to the full provisions of the OSHA Hazard Communication Standard. Contact the Chemical Hygiene Officer in the Office of Research Safety for additional information.

CHEMICAL HYGIENE RESPONSIBILITIES:

UNIVERSITY PRESIDENT:

Has ultimate responsibility for overall safety within the institution and must, with other administrators, provide continuing support for institutional health and safety programs.

DEPARTMENT CHAIR/DIRECTOR RESPONSIBILITIES:

- Working with the Chemical Hygiene Officer, administrators, and other employees to develop and implement appropriate chemical hygiene practices and policies.
- Ensuring that appropriate lab audits are conducted
- Working with PIs to develop precautions and provide adequate facilities for research being conducted
- Ensure that policies and regulations are enforced

CHEMICAL HYGIENE OFFICER RESPONSIBLIITIES:

- Work with administrators and other employees to develop and implement appropriate lab safety policies and procedures.
- Conduct laboratory inspections/audits of laboratories where hazardous materials are used to assess hazards in the labs and convey deficiencies and violations to laboratory personnel
- Assist laboratory personnel in assessment and selection of Personal Protective Equipment when assistance is needed
- Provide technical expertise to help departments develop Standard Operating Procedures for laboratory operations for particularly high hazard operations that might include explosives, select carcinogens, highly reactive materials, etc.
- Seek ways to improve the Chemical Hygiene Program
- Review and, if necessary, update or revise the Chemical Hygiene Plan annually.
- Develop and maintain a laboratory safety training program.
- Maintain knowledge of the current legal requirements concerning regulated substances by attending annual training conferences/courses and reading/reviewing necessary publications.
- Review reports of lab accidents, incidents, chemical spills, and near misses and make recommendations to help reduce or eliminate these events.
- Conduct in lab training and encourage the use of self-inspections.
- Participate in the review of new construction and laboratory renovations and provide technical assistance.
- Assist with the close-out process for laboratories

- Assist Department Chairs and PIs in the development of proper precautions and adequate facilities
- Provide customer oriented resources and tools to enhance laboratory staff

PI/LABORATORY SUPERVISOR RESPONSIBILITIES:

- Work with the Chemical Hygiene Officers, administrators, and other employees to develop and implement appropriate chemical hygiene policies and practices.
- Ensure that workers know and follow the chemical hygiene/lab safety rules
- Conduct hazard assessments and determine the required levels of protective apparel and equipment for lab workers beyond minimum requirements established by RS
- Ensure that protective equipment is available and in working order and that appropriate training has been provided.
- Provide regular, lab safety and housekeeping inspections including routine inspections of emergency equipment.
- Know the current legal requirements concerning regulated substances they are using in their research. ORS is available for assistance with information and resources.
- Ensure that lab personnel have access to, understand, and are able to comply with the information provided on Safety Data Sheets (SDS) and other sources of information on the hazards of lab chemicals.
- Ensure that facilities and training are adequate for all research conducted and materials being used
- Ensure that any necessary Hazard Assessments have been conducted and recorded
- Ensure that they and their employees have received required Chemical Hygiene and Hazardous Waste Management training

*For more efficient implementation of the CHP, department heads should select one or more individuals to serve as departmental safety coordinators. Department safety committees can also assume these responsibilities.

EMPLOYEE RESPONSIBILITIES:

- Complete required training on the Lab Standard, either on-line or in person and to stay informed about the chemicals used in their work areas.
- Follow the Institutional Chemical Hygiene Plan and Lab Safety Manual policies and procedures
- Use safe work practices and use protective equipment required for safe performance of their job.
- Plan and conduct each experiment/process in accordance with the lab specific rules and any University Chemical Hygiene procedures.
- Know the location of and how to use emergency equipment
- Inform their supervisors of accidents and conditions or work practices they believe to be a hazard to their safety or health or to the safety or health of others.
- Know the location of the Chemical Hygiene Plan and how to access SDS for chemicals used

EMPLOYEE RIGHTS

Employees have the right to be informed about the known physical and health hazards of the chemical substances in their work areas and to be properly trained to work safely with these substances.

HAZARDOUS CHEMICALS

The Laboratory Standard defines a hazardous chemical as any element, chemical compound, or mixture of elements and/or compounds that are 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.

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. Old containers of hazardous chemicals (before 1985) may not contain hazard warnings.

SAFETY DATA SHEETS (SDSs)

A 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 SDS the first time a hazardous chemical/product is shipped to a facility.

The location and availability of 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 (now Safety Data Sheets) received from the chemical supplier must be made known to employees. Links to SDSs and other reference materials can be found on our web site: http://www.clemson.edu/research/safety/.

SDSs should be reviewed for each chemical before the chemical is used.

Laboratory workers are responsible for planning and conducting each operation in accordance with University chemical hygiene procedures and for developing good personal chemical hygiene habits.

While students are not covered under the provisions of the OSHA Laboratory Standard, students should be made aware of chemical health and safety hazards in classroom situations, and should be provided with information and equipment to protect themselves from those hazards. Departments should provide student training at the beginning of each course in which hazardous chemicals are used. Specific safety instructions should be provided at the beginning of each class period.

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.

EMPLOYEE INFORMATION AND TRAINING

Departments must provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area and 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.

Information. Information provided by departments to employees must include:

The contents of the OSHA standard 29 CFR 1910.1450 and its appendices which shall be available to employees.
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10106

1. The location and availability of the University Chemical Hygiene Plan
2. 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 SDSs or ORS);
3. Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory (available on container labels and Safety Data Sheets);
4. The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory (i.e., Safety Data Sheets as well as other sources of information). Also, see applicable sections of the University Lab Safety Manual.

Training. Training provided by departments to employees must include:

1. Methods and observations that may be used to detect the presence or release of a hazardous chemical (i.e., monitoring conducted by the University, continuous monitoring devices, etc.) Also, 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, engineering controls, emergency procedures, and personal protective equipment to be used;
4. The applicable details of the University Chemical Hygiene Plan.

Documentation. Awareness of the University CHP should be documented using the form on page 2 of this document. Appendix J of the Lab Safety Manual contains a generic form that may be used to document many different types of safety training. All CHP training records belonging to a

department or other administrative unit should be held in a central administrative location (e.g., by Safety Committee Chair or in Department Head or Business Office), organized in any convenient manner provided the training record(s) for an individual, a research group, or department can be made immediately available during an ORS or an inspection involving an outside regulatory agency. Copies of training records should also be submitted to the ORS training coordinator.

Training provided by ORS. ORS offers online Chemical Hygiene and Lab Safety Training. The ORS website can be accessed from http://www.clemson.edu/research/safety/. ORS will also provide live training sessions upon request. Send an email to researchsafety@clemson.edu to schedule live training.

MEDICAL CONSULTATIONS AND EXAMINATIONS

All employees who work with hazardous chemicals must be provided an opportunity to receive medical attention, including any follow-up examinations that 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 required medical examinations and consultations must be performed by or under the direct supervision of a licensed physician through the Redfern Health Center. Medical examinations and consultations must be provided at no cost to the employee. If medical examinations are required outside of normal hours of operation for Redfern, employees should be taken to

Clemson Health Center or an area hospital emergency room. For emergencies, call 911.

HAZARD IDENTIFICATION

With respect to labels and Safety Data Sheets:

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 and log book must be available in the workplace where it may be found quickly and easily by emergency responders, ORS personnel, etc.) Labels should bear a date of receipt and should identify the owner of the material.
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.

Safety Data Sheets are available from the supplier and online. Safety Data Sheets for chemicals in use must be readily accessible at all times.

CHEMICALS DEVELOPED IN THE LABORATORY

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

1. If the composition of the chemical substance that 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 Safety Data Sheets and labeling.

USE OF RESPIRATORS

The use of engineering controls such as chemical hoods and other containment devices should be used whenever possible to prevent inhalation exposure to hazardous chemicals. Therefore, it is not normally necessary to use respirators in laboratory operations. However, if a lab operation is being conducted where lab personnel believe they need a respirator for protection, the Chemical Hygiene Officer should be contacted to conduct a workplace assessment. If the CHO recommends respiratory protection, then the individual or individuals will need to comply with the University Respiratory Protection Program.

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 department must provide, at no cost to the employee, the proper respiratory protective equipment. Respirators must be selected and used in accordance with the requirements of the Clemson University Respiratory Protection Program. Respirator users must be enrolled in the University Medical Surveillance Program and must be fit-tested for the respirator they are assigned. To obtain more information on the Respirator Program visit https://www.clemson.edu/research/safety/ppe/.

STANDARD OPERATING PROCEDURES

Laboratory safety procedures for general laboratory operations can be found in the University Laboratory Safety Manual and Chemical Hygiene Plan. However, protocols for specific laboratory operations must be provided by departmental personnel.

Departments, departmental safety and health committees, and PIs/ supervisors will develop written standard operating procedures for work area specific operations. Standard operating procedures must be provided to affected employees.

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 chemical hoods or glove boxes;
3. Procedures for safe collection of contaminated waste; and
4. Decontamination procedures.

ORS will assist laboratory personnel in developing general and specific standard operating procedures for chemical use in laboratories. Due to the diversity of research and the number of labs involved, it will be the responsibility of each laboratory, department, or college to ensure that their practices and procedures are adequate to protect their workers who use hazardous chemicals.

It will be up to the Principal Investigator or Department Chair to ensure that written safety procedures are developed for work in their labs, and that controls and protective equipment are adequate to prevent overexposure. Guidance provided by ORS in the Lab Safety Manual may be helpful or adopted as a lab's standard operating procedure.

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 department 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

Chemical hoods are an important engineering control to limit exposure to laboratory chemicals. Chemical hood commissioning and annual testing are the responsibility of the Office of Research Safety (RS) will coordinate chemical hood inspections. As hoods are tested annually, a sticker will be placed on each hood to indicate whether the hood passed or failed testing requirements. Hoods that pass inspection will have a sticker showing the test date, average velocity rates, etc. If the hood fails inspection, it will be posted with a Failed/Out of Service notice. Hoods that fail testing/certification must be repaired and re-tested before further use is allowed. The University Chemical Hygiene Officer is responsible for reporting and scheduling hoods for repair (submitting work order to Facilities). Once repairs have been made, Research Safety will re-test the hood.
If you determine that a hood in your lab is not functioning properly, contact the Research Safety at researchsafety@clemson.edu to get the hood scheduled for repair.

Chemical hoods should be equipped with a continuous monitoring device. Hood users should check to ensure the device is functioning before using the hood. If the monitor/alarm is not functional, the Chemical Hygiene Research Safety should be contacted to schedule repair or calibration, or for installation of a monitor for any hood that does not have one installed. All new hood installations must be equipped with a monitoring device. This must be specified in the purchase order.
Information and training on the proper use of a chemical hood is provided in the Lab Safety Manual and online Chemical Hygiene Training. In person training will also be provided by ORS upon request.

The selection of other protective equipment (i.e., safety glasses, goggles, lab coats, gloves, etc.) used in the lab is the responsibility of the Principal Investigator or department chair. The proper function and maintenance of lab safety equipment such as eyewash/shower units, spill response equipment, fire extinguishers, etc., is also the responsibility of the Department Chair or Principal Investigator. General guidance for the selection and use of PPE is provided in the Lab Safety Manual. The Chemical/Lab Safety Manager is available to provide technical assistance.

It is the responsibility of the user to ensure that their personal protective equipment is functioning properly and is properly maintained.

SPECIAL HAZARDS

Except for activities identified by ORS as requiring Committee approval, "employer approval" will occur at the local level (e.g., Supervisor, Department Head, Department Safety and Health Committee). The Chemical Hygiene Officer is available for assistance.

AVAILABILITY

The Chemical Hygiene Plan is available in pdf on the ORS website:

http://www.clemson.edu/research/safety/chemsafety

The Chemical Hygiene Standard (Lab Standard) 29CFR1910.1450 can be accessed at:
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10106

ANNUAL REVIEW

The Chemical Hygiene Plan will be reviewed annually to identify deficiencies and revised as necessary to reflect findings.