



WESTERN CONNECTICUT STATE UNIVERSITY

CHEMICAL HYGIENE PLAN

PROCEDURE [S-101](#)

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Please direct any questions or comments about the applicability of this document to
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FOREWORD

Western Connecticut State University has numerous teaching and research laboratories, preparation rooms, and storage areas in which hazardous substances are used. Since University employees work in these areas, the University is required to have a Chemical Hygiene Plan in order to be in compliance with "The OSHA Laboratory Standard."

The OSHA Laboratory Standard, entitled "Occupational Exposure to Hazardous Chemicals in the Laboratory," was published as an amendment to 29CFR 1910.1450, Subpart Z. The effective date of the Laboratory Standard was May 1, 1990, and the required written chemical hygiene plan was to be developed and implemented by the affected institutions by January 31, 1991.

The Laboratory Standard supersedes all of Subpart Z of 29CFR 1910, which includes the Hazard Communication Standard. However, some of the provisions of the Hazard Communication Standard are retained in the Laboratory Standard, including the requirement for maintaining exposure limits below the Permissible Exposure Limits (PEL), the requirement for informing and training employees, the use of Material Safety Data Sheets (MSDS), the proper labeling of containers, and the institution of medical surveillance programs.

1.0 INTRODUCTION

The Chemical Hygiene Plan for Western Connecticut State University (WCSU) was developed to meet the guidelines of "Occupational Exposure to Hazardous Chemicals in Laboratories," a standard put out by the Occupational Safety and Health Administration (OSHA) and published under 29CFR 1910.1450.

The Chemical Hygiene Plan (CHP) will be accessible to all employees and employee representatives of the University who are involved in any way with a laboratory or other area in which hazardous materials are used on a laboratory scale, as well as to State OSHA inspectors.

The CHP places primary emphasis on engineering and administrative controls necessary to protect workers from overexposure to hazardous substances in laboratories, storage and work areas.

The WCSU CHP is comprised of the following elements:

- a. Standard operating procedures
- b. Engineering controls, personal protective equipment and hygiene practices
- c. Control equipment inspections and review
- d. Employee information and training
- e. Special or non-routine procedures
- f. Medical Surveillance Program/environmental monitoring
- g. Safe handling of particular hazardous substances

2.0 SUMMARY

WCSU will follow the National Research Council's general principles of CHEMICAL HYGIENE IN LABORATORIES. They are as follows:

- a. Minimize all chemical exposures
- b. Avoid underestimation of risk
- c. Provide adequate ventilation
- d. Institute a formal safety program
- e. Observe the OSHA Permissible Exposure Limits (PEL) and the
- f. ACGIH Threshold Limit Values (TLV)

3.0 SCOPE AND DEFINITIONS

The term *laboratory*, as defined by Occupational Safety and Health Administration (OSHA), is a facility where the use of hazardous substances/chemicals occurs in a nonproduction basis. Laboratory uses of chemicals are those which involve non-commercial quantities (i.e., small quantities) of materials. Laboratory scale procedures are those in which substance handling, including dispensing of materials from containers and transferring of substances to other containers and reaction vessels, can be accomplished easily and safely by one individual; where multiple chemical procedures are used; where the procedures used do not simulate a production process whose function is to produce commercial quantities of materials; and where protective laboratory practices and equipment are available and commonly used.

In the context of the document, the term *laboratory* shall refer to all teaching laboratories, research laboratories, chemical storage areas, art studios and all other places in which exposure to hazardous substances/chemicals on a laboratory scale is possible.

OSHA defines a hazardous chemical as a substance for which there is significant evidence based on at least one scientific study showing that acute or chronic harm may result from exposure to that chemical. WCSU will observe this definition and will also observe other applicable State and Federal regulations which define what constitutes a hazardous chemical.

WCSU clearly meets the criteria established under OSHA CFR1910.1450 and is therefore subject to the requirements of the laboratory standard.

4.0 WCSU RESPONSIBILITIES

WCSU is obligated to ensure chemical health and safety at all levels, including:

- a. President of the University is ultimately responsible for chemical safety on the campuses, who, with the University administration, must provide the support for implementation and maintenance of a chemical hygiene program.
- b. Deans are responsible for incorporating chemical safety and hygiene committees in appropriate departments within their respective schools.
- c. University Laboratory Health and Safety Oversight Committees are responsible for reviewing, recommending and developing policies and programs toward achieving safe work practices involving chemicals. Each affected department should designate at least one representative for this committee.

- d. Department Chairpersons of affected departments are designated to act as the Department Chemical Hygiene Officers (DCHO). The DCHO is responsible for conducting regular laboratory inspections and locally enforcing compliance with this document. The DCHO may appoint a departmental safety committee to provide these functions.
- e. Departmental Safety Committees/Building Safety Committees assist the University Chemical Hygiene Officer (see #8) in implementing this plan. These committees may develop additional policies with the intent to set forth prudent safety and hygiene practices applicable to specific work areas and special circumstances within their building or department.
- f. Principal Investigator (PI)/Instructor is responsible for chemical hygiene in laboratory/laboratories assigned to him/her. The PI/Instructor must maintain chemical inventory in the laboratory, as well as provide Material Safety Data Sheets (MSDS). MSDS's must be available to all employees, 24 hours a day. The PI/Instructor is responsible for knowing physical and health hazards and how to control hazards through the proper selection of laboratory techniques and engineering controls. The PI/Instructor must inform all employees working in the laboratory of the hazards associated with the chemicals present, ensure safe techniques, and detail emergency response procedures. The PI/Instructor must communicate with all the parties mentioned above, as well as the University Chemical Hygiene Officer (see #8) for assistance in monitoring environmental controls (ventilation), indoor air quality, waste disposal and chemical inventory maintenance. The PI/Instructor must acquire permission from the DCHO to obtain chemicals which OSHA defines as requiring a designated work area, and must understand the legal requirements associated with all aspects of chemical usage, storage and disposal in the laboratory.
- g. Laboratory Workers, as employees of the University, are obligated to understand the CHP and to report any unsafe practices or conditions to any of the aforementioned parties. They should develop good laboratory habits in conducting any procedures involving the use of chemicals, and must know the proper means of disposal for waste chemicals. With the PI/Instructor, the laboratory worker is responsible for dating incoming chemicals, properly storing them, labeling containers holding chemicals or intermediates of reactions, and for informing visitors to the laboratory of the potential hazards within the associated rules. This information can be displayed using signs and symbols.
- h. Chemical Hygiene Officer (CHO) is the Coordinator of Health, Safety, and Environmental Affairs and is designated as the University CHO for WCSU. The University CHO is responsible for ensuring that all portions of this document are adhered to. The University CHO will provide all appropriate chemical monitoring, recommend the usage of personal protective apparel, recommend the appropriate environmental controls, provide all appropriate training, maintain records and ensure that WCSU and all employees are in compliance with all applicable Local, State, and Federal regulations.

The University CHO will serve as a member of the University Laboratory Health and Safety Committee (#3) and will be available for annual laboratory inspections.

5.0 STANDARD OPERATING PROCEDURES

5.1 GENERAL RULES

- 5.1.1 Faculty and staff should avoid working alone in the laboratory if the procedures being conducted are hazardous. Student assistants must work under the direct supervision of a faculty/staff member.
- 5.1.2 All persons must wear appropriate eye protection in the laboratory at all times while laboratory procedures are being performed; this also applies to visitors.
- 5.1.3 Liquids with a flash point of less than 141° F are defined as flammable liquids. Flammable liquids must be isolated from points of ignition, such as flames, sparks, or electrical sources while in use.
- 5.1.4 All employees should know and constantly be aware of the following for the chemicals with which they are working:
 - a. Chemical hazards, as determined from the MSDS and other appropriate references
 - b. Location and proper use of emergency equipment
 - c. Appropriate safeguards for using a chemical, including personal protective equipment
 - d. How and where to properly store the chemical when not in use
 - e. Proper personal hygiene practices
 - f. Proper methods of transporting chemicals within a facility
 - g. Appropriate procedures for emergencies, including evacuation routes, spill clean up procedures and proper waste disposal

Personal hygiene includes the following:

- a. Wash promptly whenever a chemical has come in contact with skin
- b. Avoid inhalation of chemicals; do not “sniff” to test chemicals
- c. Do not mouth pipette
- d. Wash well with soap and water before leaving the laboratory; do not wash with solvents
- e. Do not drink, eat, smoke or apply cosmetics in the laboratory

5.3 PROTECTIVE CLOTHING AND EQUIPMENT

Eye protection should meet the requirements of the American National Standards Institute (ANSI) A87.1. Also, a face shield large enough to protect the chin, neck and ears, as well as the face, should be worn in situations where large quantities of chemicals may cause splashing or where reactions may sputter. When working with corrosives, sensitizers, carcinogens, mutagens, or teratogens, wear appropriate personal protective apparel. Personal protective apparel usage and permeation guidelines will be provided by the University CHO upon request.

You must wear “closed-toe” shoes. Long hair should be constrained (fire hazard). Avoid loose, readily flammable clothing. Lab coats, aprons, gloves, etc. are recommended.

Whenever exposure by inhalation is likely to exceed the threshold limits described in an MSDS, use a hood. Carefully inspect all protective equipment before using.

5.4 HOUSEKEEPING/LABORATORY INSPECTION

- 5.4.1 Emergency equipment, showers, eyewashes, fire extinguishers and exits must be accessible at all times. Eyewashes and safety showers must have at minimum a 3 square foot clearance. Eyewashes should be regularly checked for functionality; code requires a monthly inspection. Showers shall be tested annually for flow and capacity by the CHO or a designee.
 - 5.4.2 All chemicals must have a LABEL. Purchased chemicals must have labels affixed by the manufacturer and convey the hazard information available at the time of preparation. However, the label should be considered only a starting point for gathering hazard information about a chemical.
 - 5.4.3 Keep all aisles, hallways, and stairs clear of all chemicals or other obstructions.
 - 5.4.4 Promptly clean up all spills; properly dispose of the spilled chemicals and clean up materials.
 - 5.4.5 Waste should be properly labeled and dated and kept in appropriate containers in a designated storage area.
 - 5.4.6 At the end of each workday, laboratories must be left in a clean, orderly condition. Bench tops should be washed, all chemicals should be properly secured and the contents of all containers should be labeled.
 - 5.4.7 The department chairperson (or a designee) or the department safety committee shall conduct laboratory inspections on a regular basis.
- 5.5 LABORATORY PROCEDURES INVOLVING SPECIAL CIRCUMSTANCES
- 5.5.1 Insofar as possible, employees should obtain prior approval to proceed with a laboratory task from their supervisor (DCHO) whenever the following conditions exist:
 - a. An unfamiliar laboratory procedure or test is to be carried out.
 - b. It is likely that the permissible exposure limit (PEL) could be exceeded or that other hazards are possible.
 - c. There is a change in a procedure or test, even if it is very similar to prior practices. A change in a procedure or test constitutes:
 - A substantial increase or decrease in the amount of one or more chemicals used.
 - A substitution or deletion of any of the chemicals in a procedure
 - Any change in other condition under which the procedure is to be conducted.
 - d. There is a failure of any of the equipment used in the process, especially of safeguards such as fume hoods or clamped apparatus.
 - e. The results of the experiment are unpredictable.
 - f. Members of the laboratory staff become ill, suspect that they or others have been exposed or otherwise suspect failure of any safeguards.

In the event of major spills of toxic substances or major accidents involving any hazardous chemicals, immediately contact the WCSU Police Department at 911.

5.6 PROCEDURE-SPECIFIC SAFETY PROCEDURES

5.6.1 PROCEDURES INVOLVING CHEMICALS REQUIRING A DESIGNATED USE AREA

MSDS's for all of the chemicals used in the laboratory will state recommended exposure limits. Limits are typically listed for broadly used chemicals. Since limits are not to be exceeded, action levels have been established to prevent exposure. Limits and action levels will be used to assess exposure, recommend precautions, control measures and safety apparel.

- a. If a TLV, PEL, or comparable value is not available for a particular substance, the animal or human median inhalation lethal concentration information, LC₅₀ (listed on the MSDS) should be reviewed, if available. If that value is less than 2000 mg/m³ (when administered continuously for one hour or less), then the chemical should be used in an operating fume hood, glove box, vacuum line, or similar device.
- b. Whenever toxic substances with vapor pressures likely to exceed air concentration limits are handled, laboratory work with such liquids and solids should be conducted in a fume hood, glove box, vacuum line, or similar device.

5.6.2 PROCEDURES INVOLVING FLAMMABLE CHEMICALS

The flammability of a chemical is determined by its flash point, the lowest temperature at which an ignition source will cause chemical vapors to ignite spontaneously.

- a. Chemicals with a flash point below 140° F are considered flammable.
- b. OSHA standards and the National Fire Protection Association (NFPA) guidelines on when a chemical is considered flammable apply to the use of flammable chemicals in the laboratory.
- c. Flammable chemicals should be stored in a flammable-solvent storage area or in storage cabinets designed for flammable materials.
- d. Flammable chemicals should be used only in vented hoods and away from sources of ignition.

5.6.3 PROCEDURES INVOLVING REACTIVE CHEMICALS

A reactive chemical is one that:

- a. Is described as such in the MSDS
- b. Is ranged by the NFPA as 3 or 4 for reactivity
- c. Is identified by the DOT as
 - an oxidizer
 - an organic peroxide, or
 - an explosive (Class A, B, or C)
- d. Fits the EPA definition of reactive in 40CFR 261.23
- e. Fits the OSHA definition of unstable in 29CFR 1910.1450
- f. Is known or found to be reactive with other substances

All reactive chemicals must be handled with all proper safety precautions, including segregation in storage.

5.7 PROCEDURES INVOLVING CORROSIVE CHEMICALS AND CONTACT-HAZARD CHEMICALS

Corrosivity, allergenic and sensitizer information is sometimes given in manufacturers' MSDS's and on labels. Also, guidelines by which chemicals are considered corrosive can be found in other OSHA standards and in regulations promulgated by DOT in 49CFR and the EPA in 40CFR.

- 5.7.1 A corrosive chemical is one that:
 - a. Fits the OSHA definition of corrosive in 29CFR 1910.1200
 - b. Fits the EPA definition of corrosive in 40CFR 261.22 (has a pH greater than 12.5 or less than 2.0)
 - c. Is known or found to be corrosive to living tissue
- 5.7.2 A contact-hazard chemical is an allergen or sensitizer that:
 - a. Is so identified or described in the MSDS or on the label
 - b. Is so identified or described in the medical or industrial hygiene literature
- 5.7.3 Handle corrosive chemicals with all proper safety precautions, including wearing safety goggles and/or a face shield, gloves tested and known to be resistant to permeation or penetration, and a laboratory apron or laboratory coat.

5.8 PROCEDURES INVOLVING CARCINOGENS, REPRODUCTIVE TOXINS AND SUBSTANCES WITH ACUTE TOXICITY

5.8.1 Follow the procedures described in this section when performing laboratory work with any select carcinogen, reproductive toxin, substance that has a high degree of acute toxicity, or a chemical whose toxic properties are unknown.

5.8.2 The following definitions will apply:

Carcinogen - Any substance defined as such in 29CFR 1910.1450 and any other substance described as such in the applicable MSDS.

Reproductive Toxin - Any substance described as such in the applicable MSDS.

Substance with a high degree of acute toxicity - Any substance for which the LD₅₀ data described in the applicable MSDS cause the substance to be classified as a "highly toxic chemical" as defined in ANSI Z129.1.

Chemical whose toxic properties are unknown.

For the purposes of this Chemical Hygiene Plan, chemicals identified under 5.8.2 "definitions" will be considered hazardous.

Designated area - A hood, glove box, portion of a laboratory, or an entire laboratory room designated as the only area where work with quantities of the above chemicals in excess of the specified limit shall be conducted.

- 5.8.3 Designated areas shall be posted and their boundaries clearly marked. Only those persons trained to work with these hazardous chemicals will work in the designated area. All such persons should:
 - a. Use the smallest amount of chemical that is consistent with the requirements of the work to be done.
 - b. Clean the designated area to an appropriate degree when work is completed.
 - c. Prepare wastes from work with these chemicals for waste disposal

in accordance with specific disposal procedures consistent with the Resource Conservation and Recovery Act (RCRA).

5.8.4 Store all hazardous chemicals in designated storage areas.

5.9 CONTROL MEASURES AND EQUIPMENT

Control safety is achieved through a continual awareness of your surroundings. Chemical hazards can be limited by using engineering controls such as chemical fume hoods and other local exhaust systems. Laboratory personnel must be familiar with the hazards of all materials they are working with, including the proper use of engineering controls. The PI/Instructor is responsible for the detection of malfunctions of engineering systems and should ensure that all systems are properly maintained and inspected. Ventilation systems are to be used in accordance with the manufacturer's recommendations.

5.9.1 Ventilation - Laboratory ventilation is in place to limit or prevent exposure to chemical vapors. Whenever possible, chemical work should be conducted in a chemical fume hood. Fume hoods shall provide at minimum 100 linear feet per minute of air across the face of a single side opening hood. The CHO or representative will evaluate annually and upon request.

- A fume hood is a safety backup for condensers, traps, or other devices that collect vapors and fumes.
- The apparatus inside the hood shall be at least six inches from the plane of the hoods sash or baffle plate in the back of the hood.
- When a hood is in use, sashes shall be placed to the indicated level at all times except when necessary to make adjustments to the apparatus or when setting up or dismantling equipment.
- The hood fan should be kept "on" whenever volatile chemicals are inside the hood, whether or not any work is being done in the hood.
- Chemical fume hoods are not to be used for storage of chemicals, chemical containers, or waste.

5.9.2 Flammable Liquid Storage - If metal safety cans are used for fire hazard chemicals, they should be used only as recommended by the manufacturer, including the following safety practices:

- Never disable the spring-loaded closure
- Always keep the flame-arrester screen in place; replace if punctured or damaged.

Cabinets designated for the storage of flammable materials should be properly used and maintained. It is recommended that chemical storage cabinets be vented in accordance with the WCSU Waste Management Guidelines.

- Store only compatible materials inside a cabinet.
- Do not store paper or cardboard or other combustible packaging material in a flammable-liquid storage cabinet.
- The manufacturer establishes quantity limits for various sizes of flammable liquid storage cabinets; do not overload a cabinet.

5.9.3 Eyewash Fountains and Safety Showers - Eyewashes and Safety showers must be present in all areas where corrosive chemicals are used and/or stored. It is desirable for eyewashes and safety showers to be plumbed. These

must be located so they can be reached from any point in the laboratory within 10 seconds or located within 100 feet. Safety showers are tested on an annual basis for proper functioning (including flow). Inspection records are maintained electronically at the Public Safety Office, Old Main 014. Eyewash stations are tested on a monthly basis. Inspection records are also kept electronically in the Public Safety Office, Old Main 014. Lab occupants are encouraged to check and test eyewash stations daily. Be sure that access to eyewash fountains and safety showers is not restricted or blocked by the temporary storage of objects or in any other way, and that the shower pull rod/chain is accessible.

- 5.9.4 Vapor Detection/Environmental Monitoring - Do not use odor as a means of assessing exposure. Whenever there is reason to suspect that a TLV might be exceeded, whether or not suspicious odor is noticed, notify the PI/Instructor, the department chair or the CHO. The CHO will provide industrial hygiene consultation, as well as air monitoring and sample analysis upon request.

6.0 RECORDS AND RECORD KEEPING

This section deals with documenting the employer's compliance with the laboratory standard which is required by 29CFR 1910.20.

The laboratory standard requires that records of air concentration monitoring results, exposure assessments, medical consultations and examinations be maintained for at least 30 years and that they be accessible to employees or their representatives. Air monitoring records are on file with the CHO. MSDS's are available on-line, in laboratories and work places, and in the CHO's office. Records are kept pertaining to safety training of affected employees in the CHO's office.

7.0 CHEMICAL INVENTORY PROCEDURE

7.1 CHEMICAL PROCUREMENT

When placing an order for any chemical, information on proper handling, storage, and disposal should be obtained also from the supplier. This can be in the form of the MSDS. Be sure to request that the MSDS be sent to your department, or to you specifically and the Chemical Hygiene Officer (CHO). This information shall be made readily accessible to all potential handlers and users. It is the responsibility of the PI of the laboratory in which the chemical is to be used to ensure that these conditions are met, including any training. It is the policy of the University that procurement of chemicals be done on a minimum quantity basis: large quantity discounts should not be an incentive in purchasing chemicals that are not used extensively. No containers should be accepted without adequate identifying labels. It is a good idea to review chemical stockrooms and inventory and the chemicals – minimize quantities by eliminating duplicates and seldom used chemicals. Laboratory chemicals shall not be purchased in containers larger than 4 liters if liquid or 5 kg if solid.

7.2 CHEMICAL STOCKROOMS/STORAGE

Suggestions with regard to storage of chemicals are as follows:

- a. Avoid chemical storage (even temporary) on the floor.

- b. Storage above eye level should be avoided
- c. Make sure shelf assemblies are firmly secured to walls; avoid island shelf assemblies
- d. Store acids in a dedicated acid cabinet. Store nitric acid in the same cabinet only if isolated from other acids.
- e. Store flammables in a dedicated flammables cabinet
- f. Particular cautions should be displayed in storing unstable, incompatible or peroxidizable compounds
- g. Temperature sensitive materials can be stored in explosion proof refrigerators. Refrigerators and freezers used for the storage of laboratory materials must not be used for the storage of food or drinks

7.3 LABORATORY STORAGE OF CHEMICALS

When individual laboratories require their own chemical storage areas, amounts permitted should be as small as practical. The PI should inspect and review such storage areas periodically to remove any old and never used chemicals. Exposure to heat and direct sunlight should be avoided.

8.0 EMPLOYEE INFORMATION AND TRAINING

8.1 TRAINING FREQUENCY

Information and training will be provided to employees about hazardous chemicals in their work areas:

- a. At the time of their initial assignment to WCSU and to the specific laboratory.
- b. At the time of transfer from one laboratory assignment to another.
- c. Whenever a new hazard is introduced into their work area. A new hazard refers to a different chemical hazard class, e.g., flammables, corrosives, poisons or a new process involving the use of chemicals.

8.2 TRAINING INFORMATION

The department chair, a designee, or the PI/Instructor is to ensure that all employees receive the following information and training:

- a. The requirements of the OSHA lab standard and how to request a copy for a review.
- b. The location and availability of the Chemical Hygiene Plan.
- c. The permissible exposure limits (PEL's) for OSHA regulated substances or recommended exposure limits for other hazardous chemicals without OSHA PEL's.
- d. Signs and symptoms associated with exposure to hazardous chemicals used in the laboratory.
- e. Methods and observations that may be used to detect the presence or release of a hazardous chemical.
- f. The location and availability of known reference material which describes the hazard, safe handling, storage and disposal of hazardous materials found in the laboratory, including but not limited to, MSDS received from the distributor or supplier.
- g. The physical and health hazards of chemicals in the work area.

- h. The measures employees can take to protect themselves from these hazards.
- i. The applicable details of the written Chemical Hygiene Plan, including an explanation and interpretation of what an MSDS is and how employees can obtain/use the appropriate hazard information.

8.3 NEW EMPLOYEE TRAINING

In order to fulfill these requirements, all new employees must attend a new employee safety orientation session. During this session, the CHO or designee will describe the following:

- a. OSHA lab standard: content and availability
- b. Chemical exposure limits: OSHA regulated materials
- c. Chemical Hygiene Plan: content and availability
- d. General hazard communication: MSDS availability and location, emergency procedures

Attendance records will be maintained.

8.4 LABORATORY SPECIFIC TRAINING

PI/Instructors will train all employees about specific lab practices that include:

- a. Identification of hazardous materials in a work area and operation in which they are present.
- b. Special work procedures to follow when handling hazardous chemicals and related equipment.
- c. Potential emergencies specific to work areas, alarms and response to alarms.
- d. Personal protective equipment to be used during specific process.
- e. Specific exposure control devices to be used during specific processes in work area (exhaust and ventilation).
- f. Emergency response procedures.

9.0 MEDICAL CONSULTATION/EXAMINATION

All University laboratory employees who work with hazardous chemicals will be provided the opportunity to receive medical attention and follow-up examinations by, or under the supervision of, a licensed physician. This medical consultation will be provided at no cost to the employee and will be provided to the employee under the following circumstances:

- a. Whenever signs and symptoms develop that are associated with exposure to a chemical.
- b. When air monitoring results reveal that chemical exposures are routinely over the action levels.
- c. Whenever exposures result from leaks, spills or any other form of unplanned chemical release.
- d. When requested by an employee following potential exposure to a hazardous material.
- e. When requested by an employee if a suspected exposure situation exists