Chemical Hygiene Plan
Clark University

Prepared for:

Jennifer A. Hanselman, Ph.D.
Associate Provost and Dean of Research
Clark University
950 Main Street
Worcester, MA 01610

May 2025

Prepared by:

Environmental Health & Engineering, Inc.

800-825-5343 www.eheinc.com

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF APPENDICES

TABLE OF CONTENTS (CONTINUED)

LIST OF ABBREVIATIONS AND ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
CAA	Central Accumulation Area
CFH	chemical fume hood
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CHO	Chemical Hygiene Officer
CHP	Chemical Hygiene Plan
CMR	Code of Massachusetts Regulations
ECEL	existing chemical exposure limit
EH&E	Environmental Health & Engineering, Inc.
EHS	Environmental Health and Safety
EPA	U.S. Environmental Protection Agency
HAZCOM	hazard communication
HF	hydrofluoric acid
IARC	International Agency for Research on Cancer (IARC)
LD50	median lethal dose
LSC	Laboratory Safety Committee
MADEP	Massachusetts Department of Environmental Protection
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	U.S. Occupational Safety and Health Administration
PEL	permissible exposure limit
PPE	personal protective equipment
RAMP	recognize hazards, access risks, minimize risks, prepare for emergencies
RCRA	Resource Conservation and Recovery Act
SAA	satellite accumulation area
SDS	safety data sheet (formerly material safety data sheet)
SOP	standard operating procedure
STEL	short-term exposure limit
TSCA	Toxic Substances Control Act
WCPP	Workplace Chemical Protection Program
°F	degrees Fahrenheit
≤	equal to or greater than
>	greater than

1.0 INTRODUCTION

Clark University (ClarkU) is committed to providing a safe working environment for employees and students. As part of this commitment, ClarkU developed this Chemical Hygiene Plan (CHP) in accordance with the U.S. Occupational Safety and Health Administration's (OSHA) regulation, Title 29 Code of Federal Regulations (CFR) Section 1910.1450, *Occupational exposure to hazardous chemicals in laboratories*, also known as the Laboratory Standard, Appendix A of the Laboratory Standard, *National Research Council Recommendations Concerning Chemical Hygiene in Laboratories*, and the following regulations and standards of care:

- Applicable subsections of OSHA 29 CFR 1910
  - 29 CFR Section 1910 Subpart H – Hazardous Materials
  - 29 CFR Section 1910 Subpart I – Personal Protective Equipment
  - 29 CFR Section 1910 Subpart M – Compressed Gas and Compressed Air Equipment
  - 29 CFR Section 1910 Subpart Z – Toxic and Hazardous Substances
- U.S. Environmental Protection Agency (EPA)
  - Toxic Substances Control Act's (TSCA) Methylene Chloride Standard
  - Resource Conservation and Recovery Act (RCRA)
  - 40 CFR Part 273 – Standards for Universal Waste Management
- Massachusetts Department of Environmental Protection (MADEP)
  - 310 Code of Massachusetts Regulations 30.00: Hazardous Waste
- City of Worcester Fire Department's Laboratory Using Chemicals Permit
- American Chemical Society
  - *Guidelines for Chemical Laboratory Safety in Academic Institutions*, 2016
  - Foundations of Chemical Safety and Risk Management Course
  - *Identifying and Evaluating Hazards in Research Laboratories*, 2015
  - Guide for Chemical Spill Response
  - Safety Tipsheets & Best Practices
  - RAMP,[1] which stands for
    - **R** – Recognize hazards
    - **A** – Assess risks
    - **M** – Minimize risks
    - **P** – Prepare for emergencies
- National Fire Protection Association (NFPA) Standards as they pertain to the OSHA and TSCA Regulations
  - NFPA 30 – Flammable and Combustible Liquids Code
  - NFPA 33 – Standard for Spray Application Using Flammables or Combustible Materials
  - NFPA 45 – Standard on Fire Protection for Laboratories Using Chemical

[1] https://institute.acs.org/acs-center/lab-safety/safety-basics-and-ramp/what-is-ramp.html

- NFPA 704 – Standard System for the Identification of the Hazards of Materials for Emergency Response
- Applicable standards published by the
  - Compressed Gas Association (CGA)
  - U.S. Centers for Disease Control and Prevention (CDC)
  - National Institute for Occupational Safety and Health (NIOSH)
  - American Conference of Governmental Industrial Hygienists (ACGIH)

1.1 PURPOSE

The purpose of this CHP is to provide guidance to ClarkU employees and students working in the laboratory environment (laboratorians/laboratory personnel) on how to work safely with chemicals in the laboratory environment. This CHP describes proper laboratory practices, procedures, protective equipment, and hazard identification. This CHP is available in the Environmental Health and Safety (EHS) office (Geography Building, Room 101) . A copy of this CHP should be maintained in the Safety Data Sheet (SDS) binder and be readily available to laboratorians.

In addition, this CHP serves as the ClarkU written Workplace Chemical Protection Program (WCPP) under EPA's Methylene Chloride Standard.

1.2 SCOPE

This CHP applies to all ClarkU laboratory personnel, other personnel who routinely visit or occasionally work in the laboratory, and all contractors who might be exposed to laboratory chemical hazards while at ClarkU.

The Chemical Hygiene Officer (CHO) and the Laboratory Safety Committee (LSC) will at least annually review this CHP for effectiveness and amend as necessary. Revisions will be documented in Appendix A of this document.

This CHP does not provide how ClarkU is adhering to other OSHA standards applicable chemical safety including but not limited to 29 CFR 1910.1200, Hazard Communication (HAZCOM), and the Upper Blackstone Clean Water Sewer and Pretreatment Regulations. In addition, the Laboratory Standard does not require laboratorians conducting certain activities (e.g., Dip and Read Test) to adhere to this CHP. However, ClarkU has decided that laboratory personnel working with chemicals in laboratories are required to follow the EHS practices and procedures outlined in this CHP.

This CHP does not discuss other hazardous materials associated with laboratories (e.g., biological materials, radioactive materials), which will be addressed in other safety plans (e.g., Biological Safety Manual, Radiation Safety Manual).

Definitions of uncommon words associated with this CHP are available in Appendix B.

2.0 ROLES AND RESPONSIBILITIES

Clear roles and responsibilities are essential for implementing and maintaining EHS protocols at ClarkU. Below are the specific responsibilities of ClarkU leadership, employees, and students in promoting safe laboratory environments. Each individual's responsibilities are crucial in minimizing hazards, ensuring compliance with regulatory requirements, and fostering a culture of safety at ClarkU. See Appendix C for an updated contact list and useful weblinks.

2.1 ASSOCIATE PROVOST AND DEAN OF RESEARCH

- Has the ultimate responsibility for chemical safety within the ClarkU laboratories and must provide continuing support for safety at all levels. Refer to Appendix C for contact information for the Associate Provost and Dean of Research.

2.2 DEPARTMENT HEADS/DEANS

- Responsible for chemical safety within their departments' laboratories.
- Providing the CHO with the support needed to implement and maintain this CHP.
- After receiving laboratory inspection reports from the CHO, meeting with Laboratory Supervisors to discuss non-compliance items and make sure they are addressed in a timely manner to protect laboratory personnel and facilities, and to ensure the department is in compliance with all applicable federal, state, and local regulations and standards of care.
- Providing budgetary arrangements to ensure the health and safety of the departmental personnel, visitors, and students.

2.3 CHEMICAL HYGIENE OFFICER

The CHO is responsible for the following:

- Developing, maintaining, and updating this CHP.
- Drafting and revising safety policies and procedures
- Overseeing the procurement, handling, storage, use, and disposal of chemicals.
- Performing routine inspections of laboratories, preparation rooms, and chemical storage areas, and providing comprehensive inspection reports to ClarkU administration.
- Maintaining records of inspections, personnel training, and chemical inventories.
- Identifies ways to improve chemical hygiene at ClarkU.
- Conducting formal, documented chemical hygiene/housekeeping inspections of laboratories and safety equipment and assuring that follow-up items are addressed in a timely manner.
- Assisting laboratory supervisors in the design and development of safe facilities; working with the Facilities Department to ensure that safe facilities are maintained at all times.

- Knowing current legal requirements for regulated substances.
- Assisting Laboratory Supervisors in developing chemical safety policies and procedures specific to the work being conducted in their areas.
- Assisting Laboratory Supervisors in determining which personnel require medical consultations or personal protective equipment.
- Conducting accident and incident investigations and assisting Laboratory Supervisors, Department Heads, and Deans in their efforts to reduce the potential for recurrence of these events by using appropriate controls, protective equipment or changing work practices.
- Reviewing this CHP on an annual basis and making changes as needed.
- Assisting with the preparation of and/or submitting the applications for chemical permits, licenses, and/or registrations to the appropriate regulatory agencies (e.g., the City of Worcester Fire Department) when applicable.

NOTE: The CHO may ask ClarkU employees or an EHS subcontractor to assist with these responsibilities.

2.4 LABORATORY SUPERVISORS

For this CHP's purposes, the following ClarkU employees and students are considered Laboratory Supervisors:

- Principal Investigators
- Research Scientists
- Teaching Assistant
- Graduate Students

The Laboratory Supervisor holds the primary responsibility for chemical hygiene in their laboratory, including:

- Assuring that laboratory personnel and students comply with this CHP, and do not operate equipment or handle hazardous chemicals (see Appendix B for definition of hazardous chemicals) without proper training and authorization.
- Ensuring that appropriate proper personal protective equipment (PPE) is available, properly maintained, and compatible with the degree of hazard of the chemicals being handled.
- Making sure laboratory personnel, students, and visitors wear proper PPE at all times.
- Following all pertinent safety rules and policies when working in the laboratory to set an example for students and other laboratorians.

- Reviewing laboratory procedures for possible safety concerns prior to assigning them to other laboratory personnel or students.
- Assuming responsibility for all laboratory visitors and ensuring they follow all laboratory rules.
- Ensuring that all hazardous waste is disposed of in accordance with all municipal, state and federal regulations; this includes the segregation, containment, and labeling of materials generated in the laboratory.
- Defining "Designated Areas" (see Appendix B for definition of Designated Areas) within the laboratory space for work with highly toxic and potentially carcinogenic materials and ensuring that all such work is conducted in these areas.
- Performing regular, formal chemical hygiene and housekeeping inspections of all their laboratory areas, including routine inspections of emergency equipment.
- Monitoring the facilities and engineering controls including chemical fume hoods (CFH) (see Appendix B for definition of laboratory-type hood) to be sure they are maintained and function properly.
- Contacting the Facilities Department via their work order system to report problems with the facilities or CFHs. Visit https://www.clarku.edu/offices/facilities-management/facilities-work-order/ to submit a work order to the Facilities Department.
- Determining the need for medical surveillance for their staff.
- Reporting to the CHO any accident or spill occurring in the laboratory and instituting necessary procedures or work practices to prevent recurrence of such events; ensuring that any injured personnel receive appropriate medical attention.
- Becoming familiar with the EHS website located at: http://www.clarku.edu/offices/ehs/

NOTE: A Laboratory Supervisor may designate a Laboratory Technician or a contractor to assist with his/her/their responsibilities.

2.5 EMPLOYEES AND STUDENTS

- Reading, understanding, and following all safety rules and regulations that apply to the work area.
- Maintaining a clean and organized laboratory or work area by promoting proper housekeeping practices.
- Informing the Laboratory Supervisor of any hazardous conditions or unsafe practices observed in the work area.

- Using appropriate PPE and following safe work practices for each procedure that involves hazardous chemicals.
- Labeling and disposing of hazardous waste in compliance with ClarkU CHP.
- Notifying the Laboratory Supervisor of any incident or accident involving hazardous chemical substances.
- Informing the Laboratory Supervisor when equipment is malfunctioning, or appropriate PPE is not available.
- Planning and conducting each operation in accordance with this CHP; and, when required, obtaining prior approval from the CHO.
- Reviewing and understanding this CHP and applicable laboratory specific procedures in their entirety before beginning work in the laboratory or with hazardous chemicals.

2.6 SAFETY COMMITTEES

ClarkU has the following two committees, which assist with the implementation of this CHP.

- Safety and Risk Management Committee–The Safety and Risk Management Committee meets approximately once per month to discuss topics related to the safety of the ClarkU community with the goal of making ClarkU safer for its faculty, staff and students. Meeting topics have included emergency planning, worker safety, health issues, safety programs and inspections, etc.[2]
- Laboratory Safety Committee (LSC) –The LSC meets once per month to promote and ensure a culture of safety in the laboratory and to protect employees, students, visitors, and the environment from laboratory hazards. The LSC will participate in the annual review process of this CHP. The Chair of the LSC reports into the Safety and Risk Management Committee.

[2] https://www.clarku.edu/offices/risk-management/safety-and-risk-management-committee/

3.0 STANDARD OPERATING PROCEDURES

ClarkU supports the implementation of prudent laboratory practices when working with chemicals in a laboratory. These include general and laboratory-specific procedures for work with hazardous chemicals, emergency procedures, and laboratory waste procedures. Procedures have been put in place to protect personnel from health hazards and physical hazards (see Appendix B for definitions of health hazard and physical hazard) in the ClarkU laboratories.

3.1 LABORATORY GENERAL SAFETY PROCEDURES

ClarkU has established general laboratory procedures to ensure that laboratory personnel maintain healthy and safe work practices in the laboratory. All personnel working in laboratories must adhere to the following policies when laboratory work involves the use of hazardous chemicals. Failure to do so will be reported to the Laboratory Supervisor.

- Always read and understand the SDS for the chemicals you work with before handling.
- Do not use broken or chipped glassware and dispose of it in a designated marked container (e.g., broken glass only). See Figure 3.1 for an example of this box.

[3]

Figure 3.1 Example of Broken Glass Box

- Never pipette by mouth; always use a pipette aid or suction bulb.
- Do not apply cosmetics in the laboratory.

[3] from Fisher Scientific website.

- Wash hands and arms thoroughly with soap and water before leaving the laboratory, even if gloves have been worn.
- Food, drink, and their containers are forbidden in the laboratory.
- All chemical containers such as test tubes, beakers, and flasks must be labeled with the full chemical name or with an abbreviation that is explained on a poster on the wall within the laboratory, the date it was generated by a laboratorian, and the expiration date, if applicable
- Do not work alone in the laboratory if the procedures being conducted are hazardous without permission from the Department Chair and the University Police Department.
- Transport liquid chemical and chemical solution containers in secondary containment appropriate for the size of the container (e.g., bottle carrier or cart). Do not handle by the neck alone; support the weight of the bottle from the bottom when handling or pouring.
- Prepare Field Health and Safety Plans when working with chemicals in the field. Contact the CHO for details on how to prepare a Field Health and Safety Plan.

3.2 ACCIDENT, INCIDENT, AND NEAR MISS REPORTING

All accidents, incidents, and near misses (definitions provided in Appendix B) that result in personal injury or illness, damage, and a potential for significant injury or property loss to ClarkU property shall be properly reported and investigated. All accidents/ incidents shall be reported to the CHO via a ClarkU *Accident Report*. This report is attached as Appendix D. All accidents, incidents, or near misses involving chemical use in a laboratory should be carefully investigated by the CHO, the laboratorians, who were involved in the accident or near miss, and the Laboratory Supervisor , who oversees the laboratory with the results distributed to appropriate ClarkU representatives and the LSC. Section 3.9 provides the emergency response procedures associated with this CHP.

3.3 CHEMICAL STORAGE

- All chemical containers in the laboratory should have a designated storage area and should be returned to this storage area after each use.

- Chemicals must be segregated by general hazard class (see Appendix B for definition of hazard class), not alphabetically. If storing alphabetically, segregate the hazardous chemicals by hazard class within the letter group.

- If a chemical within a container has hazardous properties, which warrant an expiration date, the date of receipt and the date when it was opened must be recorded on each container to assist with inventory management and to avoid a high hazard condition. NOTE: This is a requirement for peroxide-forming hazardous chemicals due to their potential explosive hazard.

- Chemical containers should not be stored on floors and/or in the means of egress for an area/room (e.g., traffic aisles) to avoid slip, trip, and fall hazards and chemical spills.

- Storage trays or secondary containers should be used to minimize spillage of material if a container breaks or leaks.

- Chemical containers should not be stored in a CFH after they have been used because containers and equipment can interfere with airflow and clutter the workspace. If based on the chemical's hazardous properties, the chemical's container must be stored in a CFH, use a shelf or store in a manner that ensures the baffles are not blocked so there is proper air flow. The chemical containers stored in CFHs must be present when the CFH is tested and certified.

- Chemicals must not be stored in direct sunlight or near a heat source. Incompatible chemicals should be physically separated using a secondary containment bin or tray or stored at another designated location.

- All chemical primary containers must be properly labeled with a HAZCOM label from the manufacturer and stored in labeled storage areas.

- Secondary containers of chemical and chemical solutions must be labeled with a HAZCOM label and dated with the date that an employee or a student first prepared them and if appropriate, the expiration date.

- Chemical containers should be inspected periodically, at a minimum annually, for deterioration and container integrity.

- Access to chemical storage areas must be restricted by some means of control (e.g., lock or card access).

- Limit the number of chemicals stored above eye level (specifically glass). It is recommended that chemical containers not be stored on the top shelf because placing them too high above eye level increases the risk of accidents, including spills, injuries from falling containers, and misidentification due to difficulty reading labels when reaching to retrieve them. If storing chemical containers above eye level, then place in secondary containment or on a shelf with a storage wire or "lip" to prevent them from falling from the higher location. Use "Just-in-Time" ordering, when possible.

- Refrigerators used for storage of flammable chemicals must be explosion-proof, laboratory-safe units. A "No Food or Beverage" label should be placed onto refrigerator. See Figure 3.2 for an example of this label.

[4]

Figure 3.2 Example of No Food or Beverage Label

- Volatile chemicals (e.g., dry ice,) should not be stored in a cold room or other storage area with re-circulating ventilation. Ideally, chemical storage in these locations should be avoided if possible.
- Liquid containers must be stored in unbreakable or double-contained packaging, or the storage cabinet tray should have the capacity to hold the contents if the container breaks or leaks.
- Flammable and combustible materials must be stored in a compliant flammable cabinet. Cabinet doors must be kept closed when not in use.
- Acids are to be stored in a dedicated compliant acid or corrosive resistant cabinet. Nitric acid, sulfuric acid, perchloric acid, and chromic acid are strong oxidizers. They may be stored within the same acid cabinet only if they are kept isolated from other acids.
- Bases (e.g., sodium hydroxide) should be stored in a dedicated base or corrosive resistant cabinet.

  NOTE: If storing acids and bases in the same corrosive cabinet, then use secondary containment as a means to segregate them within the cabinet.
- Chemicals must not be stored under a sink, except for water-soluble cleaning solutions. Leaks or spills under the sink can easily contaminate chemicals, with the potential to cause a dangerous reaction.

3.4 HAZARDOUS WASTE MANAGEMENT AND DISPOSAL

3.4.1 Hazardous Waste Management

Hazardous waste chemicals regulated by the EPA and MADEP must be collected, labeled, packaged, and disposed of according to federal and state hazardous waste regulations.

---

[4] from Compliance Signs website.

It is the responsibility of the waste generator to adhere to proper waste management and disposal policies. When hazardous waste is generated, the laboratorian must place it in a properly labeled and appropriate container, then transport the waste directly to the Satellite Accumulation Area (SAA) nearest to the point of generation. For information on how to request chemical waste removal, please send an email to ehs@clarku.edu. Within three business days, The ClarkU waste vendor, the department's trained staff member, or EHS contractor will move the waste containers from the SAA to the Central Accumulation Area (CAA) for hazardous chemical waste.

3.4.2 General Procedures for Disposal

- Any material that meets the criteria of hazardous waste shall not be treated or otherwise changed to alter its characteristics as a hazardous waste.
- Empty containers of P-listed waste shall be disposed of as hazardous waste.
- Dispose of all waste in designated, labeled containers. Any questions about proper disposal methods should be directed at the CHO, waste vendor, or EHS contractor.
- Ensure waste containers are closed when not actively adding waste to the containers.
- Do not combine different waste streams (i.e., incompatible hazardous chemicals).
- Do not overfill containers.
- Manage common laboratory waste (uncontaminated gloves, paper towels, etc.) in the general trash.

3.4.3 Storage and Handling for Hazardous Waste

- All hazardous waste generated at ClarkU must be accumulated and stored in a SAA before being transferred to the CAA.

- The SAAs are marked by a sign defining the SAA. The area is used for the accumulation of waste generated at the point of generation.

- Hazardous waste containers within the SAA must be properly and clearly labeled in English, and must include the following:

  - The words "Hazardous Waste" along with the contents of the container, with the approximate percentages (ranges such as 10-25% are which) of the waste components if possible. If the contents of the container are unknown, write "PENDING ANALYSIS"; never write "unknown". NOTE: No abbreviations, formulas, or trade names may be used on the label.
  - The appropriate hazards are associated with the waste. If the hazardous waste label has the option to check off the hazards, please do so.

- When an SAA waste container has been filled to 80% capacity or the waste is no longer being generated in the laboratory, date (MM/DD/YYYY) the label or the container (full date).

- SAA containers can remain in the SAA until they become full or are no longer being used by the laboratorian(s). Once dated, the containers must be moved into the CAA within three business days of the full date.

- All waste containers must be properly closed when not in use. If using a funnel, confirm that the lid for the funnel is closed when not actively adding waste to the container. Covering containers with foil or any object other than a correctly- fitting cap does not constitute proper closure.

- Waste must be stored in containers compatible with the constituents of the waste.

- The CAA must remain locked when not actively adding waste containers to it.

- Waste containers must be stored by hazard class or compatibility and within secondary containment bins must be used to prevent mixing of incompatible waste streams.

3.4.4 Lab-Pack Chemicals

Unwanted chemicals should not remain in chemical stock areas; they should be moved to the SAA and managed as hazardous waste.

3.4.5 Broken Glass Disposal

- Clean broken glass and sharp objects shall never be disposed of in general trash receptacles or recycling bins to prevent an exposure to sharps.
- Glass bottles (not eligible for recycling) shall be emptied and their labels defaced before discarding into a broken glass container.
- Glass bottles or broken glass must be disposed of in cardboard “Deposit Glass Here” boxes. These boxes are available throughout the laboratories.
- Seal the top of the box closed with tape when it is full and label it as “trash”.
- Contact the Facilities Department to dispose of the broken glass containers.

3.4.6 Universal Waste Management

As described in 40 CFR Part 273 and 310 CMR Section 30.1010, universal waste means any of the following hazardous wastes that are managed under the universal waste requirements of 310 CMR 30.1000 and 40 CFR Part 273 Subpart B:

- Batteries: devices consisting of one or more electrically connected electrochemical cells which are designed to receive, store, and deliver electric energy. An electrochemical cell is a system consisting of an anode, cathode, and an electrolyte, plus such connections (electrical and mechanical) as may be needed to allow the cell to deliver or receive electrical energy. The term battery also includes an intact unbroken battery from which the electrolyte has been removed. Some battery types include nickel-cadmium batteries, mercury containing batteries, lithium-ion batteries, lithium, and lead-acid batteries.

- Pesticides: means a substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, and any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant; provided that the term "Pesticide" shall not include any article that is a "new animal drug" within the meaning of § 201(w) of the Federal Food, Drug and Cosmetic Act, or that has been determined by the Secretary of the United States Department of Health, Education and Welfare not to be a new animal drug by a regulation establishing conditions of use for the article, or that is an animal feed within the meaning of § 201(x) of the Federal Food, Drug and Cosmetic Act.

- Mercury-containing devices: any electrical product or component (excluding batteries, lamps and thermostats) which contain elemental mercury that is necessary for its operation and is housed within an outer metal, glass or plastic casing. Mercury-containing devices include, but are not limited to, thermocouples, thermometers, manometers, barometers, sphygmomanometers, electrical switches and relays, as well as certain gas flow regulators and water meters.

- Mercury-containing lamps: any bulb or tube portion of an electric lighting device specifically designed to produce radiant energy including, but not limited to, incandescent, fluorescent, high intensity discharge, and neon lamps in which mercury is purposefully introduced by the manufacturer for the operation of the lamp.

- Aerosol cans: a non-refillable receptacle containing a gas compressed, liquefied, or dissolved under pressure, the sole purpose of which is to expel a liquid, paste, or powder and fitted with a self-closing release device allowing the contents to be ejected by the gas.

NOTE: Not all batteries, pesticides, lamps and aerosol cans are hazardous wastes, and therefore, they do not all qualify as universal wastes; such wastes may instead be managed as non-hazardous solid wastes.

3.5 HAZARDOUS NON-DOT REGULATED WASTE

Waste that poses a threat to human health or the environment and does not meet the definition of hazardous by the U.S. Department of Transportation (DOT) is considered hazardous non-DOT regulated waste. This waste will be treated the same as hazardous waste.

3.6 CHEMICAL PROCUREMENT

Before a new chemical is received that is not currently in the ClarkU current inventory, information on proper handling, storage, and disposal will be reviewed by the CHO. Check the ClarkU chemical inventory database to see if the chemical has been approved by ClarkU prior to ordering. See Section 3.7 for details. No container should be accepted without a compliant HAZCOM label from the manufacturer or provider. All laboratory chemicals will be received in the ClarkU mail room and then forwarded to the CHO or the designated department representative approved to receive chemicals.

3.7 CHEMICAL INVENTORY CONTROL

ClarkU uses an online chemical inventory system to track their chemical inventory. The only administrator for the database is the CHO. This system allows ClarkU laboratorians to search for the location and/or quantity of a specific chemical. The system will also prevent orders of chemicals that will exceed ClarkU chemical storage limits.

3.8 HOUSEKEEPING

- CFHs and work areas should be kept clean and free of debris at all times.
- Do not allow trash to accumulate in any area. It can be a fire hazard and/or obstruct emergency equipment and means of egress.
- Do not store food or drink in any chemical laboratory.
- Access to exits, emergency equipment, and utility controls should never be blocked.

3.9 EMERGENCY PROCEDURES

In the event of an emergency, all personnel are trained to exit the building immediately and meet outside at their designated assembly area. Upon meeting, personnel are to let their professor know they are accounted for. Personnel should not enter the building until they have received notification to do so from the Incident Commander, who may be a representative from a regulatory agency or ClarkU Police Department.

Upon discovery of an emergency, the ClarkU community member will notify the ClarkU Police Department, who are trained to take the appropriate response actions. Below are the emergency response procedures for chemical spills and exposures. For more information about other emergencies, please refer to the ClarkU webpage outlining how to respond to various types of emergencies.

3.9.1. Chemical Spill Response

Prior to responding to a chemical spill, ClarkU employees and students should ask themselves the following questions. If the answer to all of the question is "Yes", then the laboratorian is authorized to clean up the chemical spill.

1. Do you know the hazards and/or exposure routes associated with the chemical?
2. Were you trained/do you know on how to clean up and dispose of the chemical?
3. Do you feel comfortable cleaning up the chemical?
4. Do you have the appropriate PPE and spill kit to clean up the chemical and you know how to use the PPE and spill kit?

Type of Spill	Characteristics
Minor	Does not pose an immediate fire, safety, environmental, or health hazard. Can be readily contained and cleaned up within the room Does not pose a fire or explosion hazard Does not require outside medical attention
Major	Is not contained within the laboratory Poses an immediate fire, safety, environmental, or health hazard Poses a fire or explosion hazard Requires outside medical attention

3.9.1.1 Minor Chemical Spill Response

A minor chemical spill is one that the laboratory staff is capable of cleaning up safely without the assistance of EHS and emergency response personnel.

1. Notify all individuals in the general vicinity that a spill has occurred.
2. Ask someone to notify the ClarkU Police Department and ask the dispatcher to notify the Laboratory Supervisor and CHO.
3. Isolate the area and keep other personnel out of the contaminated area.
4. If spilled material is flammable, turn off ignition and heat sources. WARNING: Do not light Bunsen burners or turn on other switches.
5. Avoid breathing vapors from spill, and if possible, increase airflow to the area by turning on the CFH or contacting the Facilities Department
6. Put on protective equipment, including:
    a. Safety goggles
    b. Gloves

   c. Long-sleeve laboratory coat
7. Confine spill to as small an area as possible. CAUTION: Do NOT wash spill down the drain.
8. Use appropriate spill kits or sorbents to neutralize corrosives, absorb the spill, or both. NOTE: For powdered chemicals, use one of the following methods to clean up the spill:
   a. Sweep carefully to avoid generation of dust
   b. Use moist sorbent pads
   c. Wet the powder with a suitable solvent and then wipe with a dry cloth
9. Collect contaminated materials and residues and place in a chemical compatible waste container.
10. Clean the spill area with water.
11. Label waste container and put in the SAA for waste.

3.9.1.2 Major Chemical Spill Response

A major chemical spill is one that staff is NOT able to clean up safely without the assistance of EHS and emergency response personnel.

1. Attend to injured or contaminated personnel and remove them from exposure.
2. Notify all individuals in the general vicinity that a spill has occurred.
3. If spilled material is flammable, turn off ignition and heat sources. WARNING: Do not light Bunsen burners or turn on other switches.
4. Evacuate the area.
5. Close doors to affected areas and post "DO NOT ENTER" sign on door as you are leaving the room if it can be done safely.
6. Call ClarkU Police Department then 911.
7. If it is safe to do so, post warnings to keep personnel from entering the area.
8. Have a person with knowledge of the incident and area available to assist emergency personnel.
9. Complete and submit the ClarkU Incident Report.

3.9.2 Chemical Exposure

In case of chemical contact with skin or eyes or via inhalation or absorption, proceed to the nearest safety drench shower or eyewash station and flush the affected area for at least 15 minutes. Seek medical attention immediately and bring a copy of the chemical's SDS, which are available in the SDS binder in the areas where hazardous chemicals are used by laboratorians, or the chemical manufacturer's webpage.

3.9.3 Emergency Equipment

ClarkU laboratorians should be familiar with the locations and proper use of emergency equipment, including eyewash stations, safety drench showers, and chemical spill kits. Appendix E provides a list of items, which should be included in a chemical spill kit. If it is safe to do so and you are trained on how to use them, use these as needed or if instructed to do so.

3.10 HAZARD ASSESSMENT

A hazardous chemical means a chemical for which there is statistically significant evidence that acute or chronic health effects may occur in exposed laboratory personnel. An acute health effect is an adverse health effect characterized by severe symptoms that develop rapidly. A chronic health effect is an adverse health effect with symptoms that develop slowly over a relatively long period of time.

As indicated in Section 3.12., when a new chemical, which warrants additional controls not outlined in this CHP, or a change in an existing chemical process occurs that would change the controls applicable to the chemical process, a hazard assessment must be completed to identify the physical and health hazards of chemicals used in the laboratory, assess the risk of exposure, and determine appropriate controls. A physical chemical hazard is a chemical that is proven to be a combustible liquid, flammable, a compressed gas, explosive, an organic peroxide, an oxidizer, pyrophoric, unstable or water reactive. A health hazard means a chemical for which there is statistically significant evidence that acute or chronic health effects may occur in exposed personnel. Chemicals that are health hazards include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents that act on the hematopoietic system, and agents that damage the lungs, skin, eyes, or mucous membranes (see Appendix B for definitions).

A hazard assessment should include identifying the chemicals to be used, their amounts, and the circumstances of use, considering any special conditions that may increase the hazard. The assessment should evaluate toxic, physical, reactive, flammable, explosive, radiation, and biological hazards, as well as other risks, and must address special risks associated with reaction scale-ups. Controls to minimize risk should include engineering controls, administrative controls, and PPE to ensure compliance with OSHA's Permissible Exposure Limits (PELs). Laboratory personnel must be trained on hazard recognition, emergency procedures, and spill/decontamination protocols. A risk assessment approach can be structured by answering five key questions: What are the hazards? What is the worst outcome? What can prevent this? How can we protect against it? What should we do if something goes wrong?

3.11 BONDING AND GROUNDING

Bonding and grounding refers to the safety practice of connecting all conductive parts of a container or system holding flammable materials together (bonding) and then connecting that combined system to the earth (grounding), which helps prevent static electricity buildup that could potentially ignite flammable vapors by providing a path for the electrical charge to dissipate safely. Bonding and grounding shall be used when transferring NFPA Class I flammable liquids, those with a flash point below 100 degrees Fahrenheit (°F) (ethyl ether, benzene, xylene, and acetone) in order to avoid static generated sparks.

3.12 PROCEDURES FOR PRIOR APPROVAL

There will be times when there is a significant change in chemical amounts, new equipment, process, or a situation where one may work alone with highly hazardous chemicals. Highly hazardous are substances that have toxic, reactive, flammable, or explosive properties and have the potential to cause a catastrophic event when handled improperly. These chemicals are regulated under the Process Safety Management Standard (§1910.119), which includes a list of specific highly hazardous chemicals with threshold quantities and covers those chemicals that may present a significant risk to workers due to their inherent properties or large-scale use. Examples include chemicals with acute toxicity, high flammability, or explosive reactivity, such as chlorine, ammonia, hydrogen sulfide, and flammable gases or liquid.[5]

It is recommended that laboratory personnel communicate these changes to their coworkers and check-in with the ClarkU Police Department before conducting the work and after completing the work. General safety considerations include:

- Experimental design
- Equipment design
- Workspace adequacy
- Development of a chemical-specific standard operating procedure (SOP), which is a specific set of procedures relevant to safety and health considerations that must be followed when laboratory work involves the use of a particular hazardous chemical
- Work preparedness
- Hazard assessment
- Use in a designated area (e.g., CFH or a specific area within a laboratory designated with a sign and tape or just a sign.)

[5] https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.119.

3.13 PROCEDURES FOR PARTICULARLY HAZARDOUS SUBSTANCES (CARCINOGENS, REPRODUCTIVE TOXINS, HIGHLY TOXIC CHEMICALS, AND CHEMICALS OF UNKNOWN TOXICITY)

The following procedures must be followed when performing laboratory work with particularly hazardous substances :

- These substances must be used and stored only in areas with restricted access.
- Designated areas may be used for work with these materials and may be the entire laboratory, an engineering controls (e.g., glove box, CFH), or an area of a laboratory. The designated area must be clearly posted with signs that:
  - Identify the hazards
  - When the hazardous material is in use
  - No untrained personnel allowed in the work area
  - Clearly define the designated area via tape and signage
- Only the smallest amount of a chemical required by the procedure shall be used or stored.
- When possible, only order the required amounts to avoid unnecessary decanting or weighing out the material.
- Specific spill procedures for the hazardous chemicals must be developed and posted in the designated area.
- All laboratory personnel working with these chemicals shall be familiar with the hazards and proper procedures for accidental release.
- General PPE, at a minimum, to be worn at all times when working with these materials are safety glasses, gloves, long sleeve laboratory coats, and no open-toed shoes.
- The designated work area shall always be decontaminated after each process, experiment, or when the work is completed. Refer to OSHA's hazardous waste decontamination webpage for more information on decontaminating designated areas. Decontamination plans will be developed by the staff or faculty member overseeing the work and submitted to the CHO for approval prior to using the chemical.
- All waste products from the process shall be managed in a compatible container. Refer to Section 3.4 for information on hazardous waste management and disposal procedures.

3.14 CHEMICAL SUBSTANCES DEVELOPED IN THE LABORATORY

If the composition of the chemical substance produced for the laboratory's use is known, the laboratory personnel shall determine if it is a hazardous chemical. If the chemical is determined to be hazardous, the laboratory personnel shall wear the appropriate PPE and use proper safety precautions and controls. If the chemical produced is a byproduct whose composition is not known, the laboratory personnel shall assume that the substance is hazardous. If the chemical substance is produced for another user outside of the laboratory or its container will be left behind in the laboratory, the laboratory personnel shall comply with the HAZCOM Standard including the requirements for preparation of a SDS and HAZCOM labeling. Refer to The ClarkU HAZCOM program for additional information.

4.0 SPECIAL PROCEDURES FOR HANDLING HAZARDOUS CHEMICALS

The Laboratory Supervisor shall ensure that all laboratory personnel are aware of the locations, hazards, and appropriate control measures for work involving hazardous chemicals. In some cases, laboratory-specific procedures may be required for working with highly-hazardous chemicals. Review the SDS for specific handling and storage requirements of hazardous chemicals. Some specific hazards that may be present in various laboratories at ClarkU are listed below.

4.1 ASPHYXIANTS

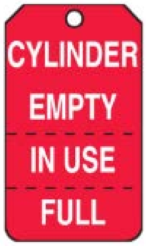
Asphyxiants are substances that interfere with the transport of an adequate supply of oxygen to the vital organs of the body. Simple asphyxiants are substances that displace oxygen from the air being breathed to such an extent that adverse effects result. Acetylene, carbon dioxide, argon, helium, ethane, nitrogen, and methane are common asphyxiants. It is important to recognize that even chemically inert and biologically benign substances can be extremely dangerous under certain circumstances.

4.2 COMPRESSED GAS AND CRYOGENICS

4.2.1 Compressed Gas

Gas cylinders contain either compressed liquids or gases. Gas cylinders represent the most insidious hazard, as puncture, heat, faulty valves, pressure or regulators may result in a rapid release of the entire contents. OSHA refers to CGA on how to handle compressed gas cylinders. The following safety considerations should be implemented where applicable:

- Train compressed gas users on the proper procedures for storing and using specific compressed gases associated with the laboratory. General compressed gas training is part of the Academic Initial/Annual Refresher EHS Training.
- Ensure the cylinder contents must be clearly identifiable. Refer to the compressed gases manufacturer's cylinder identification for more information. An example from Airgas is provided here: https://www.airgas.com/airgascatalog/catalog/ap005.pdf .
- Attach a status tag, which is provided by the compressed gas vendor, to each cylinder. See Figure 4.1 for an example. The compressed gas user will rip off the corresponding status.



[6]

Figure 4.1 Example of Compressed Gas Status Tag

- Handle cylinders carefully and do not roll, slide, or drop. Use a compressed gas cylinder cart or hand truck to transport.
- Do not lift a cylinder by its cap.
- Secure all cylinders via a chain (preferably) or strap while in storage, transport, or use.
- Never tamper with cylinder valves, force connections, or use homemade adapters. Use only approved equipment. Never repair or alter cylinders, valves, or safety relief devices.
- Only use a regulator compatible with the cylinder contents.
- Close the cylinder valve when not in use.
- When empty, turn off the cylinder valve and label the cylinder as empty. Store separately from full cylinders.
- Store cylinders in a well-ventilated area away from ignition sources, heat, flames, and flammable chemicals.
- Keep the protective caps on the cylinders at all times except when the cylinders are in active use.
- Check for gas leaks using soapy water around the connections after installation and use.
- Do not store flammable gas cylinders with oxidizers such as nitrous oxide or oxygen. They must be separated by a minimum of 20 feet, or by a non-combustible partition extending at least 18 inches above and to the sides of the stored materials, with a fire-resistance rating of at least half an hour; essentially, they should never be stored directly next to each other due to the high risk of fire or explosion if they come into contact.
- Ensure a flash arrestor to stop the flame or reverse flow of gas back up into the equipment or supply line is installed for compressed gases, which have the potential to product flashback (e.g., acetylene, oxygen, hydrogen, propane, propylene, and butane). It protects the compressed gas user and equipment from damage or explosions.

---

[6] from Airgas website.

4.2.2 Cryogenics

- Ensure containers/Dewars have hazard communication labels on them.
- Handle cryogenics in well-ventilated areas.
- Handle the liquid slowly to minimize boiling and splashing. Use tongs to withdraw objects immersed in a cryogenic liquid - Boiling and splashing always occur when charging or filling a warm container with cryogenic liquid or when inserting objects into these liquids.
- Do not transport cryogenics in wide-mouthed glass Dewars or Dewars not protected with safety tape.
- Use only approved containers. Impact resistant containers that can withstand the extremely low temperatures should be used. Materials such as carbon steel, plastic and rubber become brittle at these temperatures.
- Only store cryogenics in containers with loose fitting lids (Never seal liquid nitrogen in a container). A tightly sealed container will build up pressure as the liquid boils and may explode after a short time.
- Never touch non-insulated vessels containing cryogenic liquids. Flesh will stick to extremely cold materials. Even nonmetallic materials are dangerous to touch at low temperatures.
- Never tamper or modify safety devices such as cylinder valve or regulator of the tank.
- Store cryogenics in well-ventilated areas (do not store in a confined space).
- Do not store cryogenics for long periods in an uncovered container.
- Do not fill cylinders and Dewars to more than 80% of capacity, since expansion of gases during warming may cause excessive pressure buildup.
- Wear the appropriate PPE:
  - Eye/face protection -A full face shield over safety glasses or chemical splash goggles are recommended during transfer and handling of cryogenic liquids to minimize injuries associated with splash or explosion.
  - Skin protection -Cryogenic apron (splash hazards), laboratory coat, impervious cryogenic gloves

Special note on cryogenic gloves: Gloves should be loose-fitting, so they are able to be quickly removed if cryogenic liquid is spilled on them. Insulated gloves are not made to permit the hands to be put into a cryogenic liquid. They will only provide short-term protection from accidental contact with the liquid.

4.3 CORROSIVE CHEMICALS

RCRA defines a corrosive chemical as a liquid with a pH ≤ 2 or >12.5. Acids and bases can cause severe tissue damage depending on the corrosivity of the chemical. The primary means of protection from corrosive chemicals is the use of gloves, goggles, face shields, aprons, lab coats, and other chemical resistant clothing. Exercise extreme caution when handling corrosive chemicals. The following safety considerations should be implemented where applicable:

- Do not store acid and bases with flammable liquids or oxidizing chemicals.
- Store perchloric acid by itself. Perchloric acid is a powerful oxidizer that can react violently and explosively with many other chemicals, particularly organic materials, making it extremely dangerous to store near combustible substances like paper, wood, or even some solvents; essentially, storing it alone prevents potential fire and explosion hazards.
- Isolate corrosive chemicals from incompatible chemicals.
- Reference the chemical's SDS for proper handling, PPE, and storage requirements.
- If an acid or base comes in contact with your skin or clothing, thoroughly wash the affected areas utilizing the safety drench showers and/or eyewash units.

4.3.1 Hydrofluoric acid

Hydrofluoric acid (HF) has a number of chemical, physical and toxicological properties that make handling this material particularly hazardous. HF solutions are clear, colorless and have a density similar to water. Exposure to concentrated (>50%) HF solutions will cause immediate, severe, penetrating burns. Exposure to less concentrated solutions can also have serious effects, but the appearance of symptoms can be delayed for up to 24 hours. ClarkU personnel exposed to HF must seek immediate medical attention, even if they do not feel pain.

When working with HF, laboratory personnel must wear the appropriate PPE (safety glasses, lab coat, and nitrile gloves) and conduct all work in an approved fume hood because HF vapors can also cause serious burns. HF must be used and stored in polyethylene, polypropylene, Teflon, wax, lead or platinum containers.

There is no antidote for HF toxicity. Calcium- or magnesium-containing antacids (which bind fluoride ion) have been suggested for use in the treatment of ingestion exposure. Quaternary ammonium compounds or calcium-containing gels may be used topically in the treatment of skin burns.[7] Based on this information, ClarkU requires laboratorians, who are working with HF, to have the treatment gel available in the areas where HF is used in the laboratories.

4.3.2 Nitric acid

Nitric acid, which is greater than 70% in water, is corrosive, toxic, and flammable. It can cause severe burns to the skin and eyes and can be fatal if ingested. It produces toxic and irritating fumes and gases including nitrogen oxides. The substance is a strong oxidant. It reacts violently

[7] https://www.cdc.gov/niosh/ershdb/emergencyresponsecard_29750030.html#:~:text=There%20is%20no%20antidote%20for,the%20treatment%20of%20skin%20burns

with combustible and reducing materials, such as turpentine, charcoal and alcohol. The substance is a strong acid.[8] As a result, nitric acid should be stored by itself, if possible. If not, it should be stored only with compatible oxidizing acids.[9]

4.3.3 Hydroxides

Hydroxides, like sodium hydroxide (lye) and potassium hydroxide, are highly corrosive substances that can cause severe burns to skin and eyes upon contact, making them significant hazards; proper storage requires keeping them in tightly sealed containers, in a cool, well-ventilated area, away from acids, water, and incompatible materials, and always using appropriate PPE when handling them.

4.4 FLAMMABLE AND COMBUSTIBLE CHEMICALS

Flammable and combustible liquids are defined differently by OSHA and NFPA based on flash points, and NFPA considers both flash points and boiling points (see Appendix B for definitions of NFPA flammable and combustible liquids, OSHA flammable and combustible liquids, flash point, and boiling point).

Despite the differences between OSHA and NFPA definitions, similar safety procedures. apply and are outlined as follows.

- Do not allow smoking or other sources of open flames in areas where flammable chemicals are used.
- Know the location of fire extinguishers, fire alarms, and emergency exits in the laboratory.
- Do not store flammable liquids in domestic-type refrigerators. Use only refrigerators rated for flammables.
- Do not store flammables with oxidizing agents (e.g., nitric, perchloric, and sulfuric acids).
- Do not expose flammable liquids to potential sources of ignition such as electrical equipment, heat, burners, or open flames.
- To prevent accidental electrical charge, the use of bonding and grounding equipment should be used whenever applicable. The use of non-sparking tools can prevent an ignition source.
- Store flammable liquids in an approved fire rated flammable storage cabinet.
- Do not store flammable liquids on the floor, unless protected by secondary containment.
- Minimize the amount of flammable liquids that are in use, being stored, and that are generated as wastes.

---

8 https://www.inchem.org/documents/icsc/icsc/eics0183.htm#:~:text=Chemical%20dangers,-Decomposes%20on%20warming&text=This%20produces%20toxic%20and%20irritating,substance%20is%20a%20strong%20acid

9 https://essr.umd.edu/sites/default/files/2021-10/NitricAcidFactSheet.pdf

- Storage of flammable liquids greater than 10 gallons within a laboratory fire area must be in an approved and labeled flammable storage cabinet.
- The SDS shall be reviewed by the owner/user of the materials for additional safety requirements and precautions.

4.5 IRRITANTS

An irritant is a chemical that is not corrosive but causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. A wide variety of organic and inorganic chemicals are irritants; thus, skin contact with all laboratory chemicals should be avoided. Use a properly functioning CFH when handling irritants that can be inhaled. At minimum, safety glasses, laboratory coat, long pants, protective gloves, and closed toed shoes should be worn.

4.6 ORGANIC PEROXIDES

Organic peroxides are hazardous because of their extreme sensitivity to shock, sparks, heat, light, strong oxidizing and reducing agents, and other forms of detonation. Organic peroxides may cause fire, create explosion hazards, and may be toxic or corrosive. Some organic peroxides are dangerously reactive, decomposing very rapidly or explosively if they are exposed to only slight heat, friction, mechanical shock or contamination with incompatible materials. Precautions for handling peroxides should include the following:

- Limit the quantity of peroxides.
- Do not return unused peroxides to the container.
- Clean up all spills immediately. Solutions of peroxides can be absorbed using vermiculite or other absorbing material.
- Do not permit smoking, open flames, and other sources of heat near peroxides. Areas should be labeled that contain peroxides so that this hazard is evident.
- Avoid friction, grinding, and other forms of impact near peroxides, especially solid peroxides. Glass containers that have screw-cap lids or glass stoppers should not be used. Polyethylene bottles that have screw-cap lids may be used.
- Isolate from incompatible materials such as strong acids and bases, flammable and combustible liquids, and reducing agents.

4.7 OXIDIZERS

Oxidizers are chemicals other than a blasting agent or explosive as defined in §1910.109(a), that initiate or promote combustion in other materials, causing fire either of itself or through the release of oxygen or other gases. Examples include perchloric acid, potassium persulfate, and lead nitrate. Precautions for handling oxidizers should include the following:

- Minimize the amount of oxidizers used and stored.
- Isolate from incompatible chemicals (e.g., organics, flammable, dehydrating, or reducing agents).
- Do not store oxidizers in wooden cabinets or on wooden shelves.
- Do not return unused material to the original container.
- Store in a tightly closed container and in a cool, dry, ventilated area.
- Perchloric acid may not be used in any fume hood except those specifically designed for perchloric acid use.

4.8 PYROPHORIC CHEMICALS

Pyrophoric chemicals are extremely reactive toward oxygen and water and must never be exposed to the atmosphere. Examples include Sodium Hydride and Lithium Aluminum Hydride. Exposure of these chemicals to the air could result in spontaneous combustion, which could cause serious burns or other injuries to the person handling the chemical or others in the immediate area. In addition, all combustible materials, including paper products, should not be allowed to come in contact with any pyrophorics at any time. Pyrophorics can be handled and stored safely as long as all exposure to atmospheric oxygen and moisture is avoided. Solids must be transferred under an inert atmosphere in an efficient glove box. Glass bottles of pyrophorics should not be handled or stored unprotected. The metal container shipped with each bottle should be retained as a protective container for each bottle for transporting and storage.

4.9 REPRODUCTIVE TOXINS

Reproductive toxins are chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis). Reproductive toxins have adverse effects on various aspects of reproduction, including fertility, gestation, lactation, and general reproductive performance. Reproductive toxins can affect both men and women. Male reproductive toxins can in some cases lead to sterility. Two well-known male reproductive toxins are ethylene dibromide and dibromochloropropane. When a pregnant woman is exposed to a chemical, generally the fetus is exposed as well because the placenta is an extremely poor barrier to chemicals.

4.10 SELECT CARCINOGENS

A carcinogen is a substance capable of causing cancer. Carcinogens are particularly insidious toxins because they may have no immediate apparent harmful effects. Carcinogens should be handled using prudent practices. A chemical is considered to be a carcinogen if:

- It has been evaluated by the International Agency for Research on Cancer (IARC), and found to be a carcinogen or potential carcinogen; or
- It is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or
- It is regulated by OSHA as a carcinogen.

4.11 TOXIC CHEMICALS

A toxic chemical is defined by OSHA 29 CFR 1910.1200 as a chemical that falls in any of these three categories:

- A chemical that has a median lethal dose (LD50) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

- A chemical that has a LD50 of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.

- A chemical that has a LC50 in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

4.12 WATER-REACTIVE CHEMICALS

Water-reactive chemicals are likely to become spontaneously flammable or give off flammable or toxic gas when in contact with water. Examples include aluminum powder, sodium and potassium metal, and sodium borohydride. Protect from moisture and separate from incompatibles. Store these chemicals in accordance with manufacturer or applicable SDS requirements.

4.13 METHYLENE CHLORIDE

Methylene chloride – also called dichloromethane or DCM – is a colorless liquid and a volatile chemical with a sweet odor. The solvent is used in a variety of consumer and commercial applications, including adhesives and sealants, automotive products, and paint and coating removers. It can cause cancer, skin and eye irritation, and central nervous system (CNS) effects.

It can be inhaled, absorbed through the skin, or ingested. In accordance with EPA's Methylene Chloride Standard, ClarkU will conduct the following:

- Initial assessment and periodic (at least annual) assessment of methylene chloride use by employees and students at ClarkU.
- Initial exposure monitoring, continuous monitoring every three months or five years, or additional monitoring, as needed.
- Implement controls (See Section 5.0) to reduce exposures to below EPA existing chemical exposure limit (ECEL) and EPA short term exposure limit (EPA STEL).
- Provide ClarkU employees access to this CHP, which acts as the EPA's WCPP.
- Conduct a review of this CHP at least every five years (per 29 CFR 1910.1450, this CHP will be reviewed at least annually).

4.14 SODIUM DODECYL SULFATE

Sodium dodecyl sulfate has the following hazards:

- Flammable solid.
- Harmful if swallowed or inhaled.
- Causes skin irritation.
- May be absorbed through the skin.
- Causes eye irritation and may cause serious eye damage.
- May cause respiratory irritation.
- Inhalation of dust may produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing, and coughing.

Below are the precautions when working with sodium dodecyl sulfate

- Wear nitrile rubber gloves, chemical splash goggles, and a fully buttoned laboratory coat.
- Wash hands after removing gloves.
- Work within a properly functioning certified laboratory CFH.
- Use in a designated area.
- Store in a cool, dry, well-ventilated area away from sources of sunlight, heat, sparks, flame, or other sources of ignition.
- Keep the container tightly closed.
- Material is Hygroscopic. Keep from getting wet.
- Avoid dust formation.
- Keep away from incompatibles such as oxidizers.

4.15 ACRYLAMIDES

Acrylamide may polymerize violently when heated to its melting point 183°F (84°C), when exposed to ultraviolet light, or when exposed to strong bases (e.g., potassium or sodium hydroxide), or oxidizing agents (e.g., perchlorates, peroxides, permanganates, chlorates, nitrates, chlorine, bromine, and fluorine).

- If possible, use pre-made acrylamide in solution rather than creating dilutions from pure powder in the lab.
- If aerosols or airborne may be produced (e.g., weighing powder), acrylamide and any suspensions of acrylamide must be handled in a CFH, a certified, hard ducted biological safety cabinet, or other exhausted enclosure. Aerosols may be produced during any open handling of dry powder, and during open or pressurized manipulations of suspensions.
- Consider using an electrostatic device to minimize dust in the air
- Avoid inhalation - Perform all operations in a certified CFH. Sash lowered as much as possible.
- Avoid contact - Use appropriate PPE and wear proper attire.
- Keep all containers tightly closed when not in use and during transport.
- Acrylamide is not compatible with mineral acids (e.g., hydrochloric, sulfuric, nitric acid), oleum, ammonia, isocyanates, and compounds containing hydroxyl-, amino-, and sulfhydryl groups.
- Periodically wipe down the area where acrylamide is used with 1.6% potassium persulfate, followed by 1.6% sodium metabisulfite. This causes any surface residue to polymerize so that it is no longer hazardous. If you cannot do this, at minimum, clean the area with soap and water

4.16 ETHIDIUM BROMIDE

Ethidium bromide is highly toxic as a mutagen. It may potentially cause carcinogenic or teratogenic effects, although no scientific evidence showing either health effect has been found. Exposure routes of ethidium bromide are inhalation, ingestion, and skin absorption. An acute exposure to ethidium bromide causes irritation of the mouth, upper respiratory tract, skin, and eyes.

- Avoid inhalation - Perform all operations in a certified CFH. Sash lowered as much as possible.
- Avoid contact - Use appropriate PPE and wear proper attire.
- Wear gloves made of nitrile rubber are protective; surgical-style latex gloves are not recommended. When working with high concentrations or for a prolonged period of time, double gloving can further reduce the risk of exposure, especially if the outer glove is replaced when contaminated. Users should wash their hands after removing their gloves,

even if the gloves are not torn or punctured, to remove any residue that may have contacted the skin.

- Use in a designated area.

5.0 CONTROL MEASURES

The hierarchy of controls is based on the premise that the best way to control a hazard is to remove it from the situation, rather than relying on employees or students to reduce their exposure. Below is a traditional hierarchy of controls (listed from most effective to least effective) developed by CDC/NIOSH.

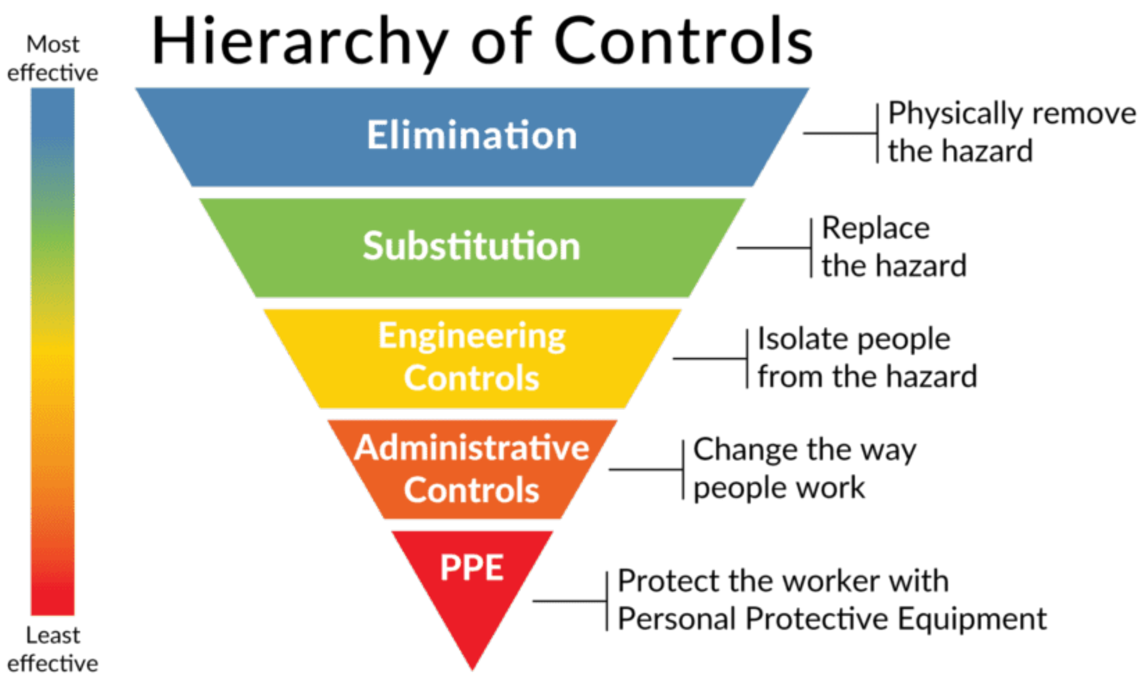


Figure 5.1 Hierarchy of Controls[10]

For the laboratory use of OSHA regulated substances, ClarkU shall assure that laboratory personnel exposure to such substances do not exceed the permissible exposure limits (PEL) specified in 29 CFR 1910, subpart Z or occupational exposure limit (OEL) developed by NIOSH or ACGIH, whichever is lower. To minimize personnel exposure to hazardous chemicals, ClarkU implements the following controls. Each are described in detail in Sections 5.1 to 5.4.

- Elimination of the hazardous chemical(s)
- Substitution for a less hazardous chemical, piece of equipment, or process
- Engineering controls
- Administrative controls
- PPE

[10] https://www.cdc.gov/niosh/hierarchy-of-controls/about/index.html

Elimination, substitution, engineering controls, administrative controls, and PPE are basic principles used to control hazards and exposures. Before the proper control(s) can be selected, a hazard assessment of the process, activity, or material should be conducted.

5.1 ELIMINATION/SUBSTITUTION

Every hazard assessment should first determine if the hazardous conditions can be prevented by eliminating or substituting with a less hazardous chemicals or process. Elimination and/or substitution are the most effective ways to minimize risk for exposures because they remove or replace hazards at the source.

5.2 ENGINEERING CONTROLS

Engineering controls eliminate or reduce exposure to a chemical or physical hazard through the use or substitution of engineered machinery or equipment. Engineering controls include process change, substitution, isolation, ventilation, and source modification. See Section 6.0 for additional information about engineering controls.

Room Design – When designing a room when chemicals are going to be used, the following factors should be considered:

- Relationship between the room and office spaces
- Whether or not the laboratory warrants an open or closed design
- Equivalent linear feet of workspace (bench and equipment)
- Laboratory layout and furnishing
  - Adaptability
  - Casework, furnishings, and fixtures
  - Shared spaces
  - Flooring
  - Doors, windows, and walls
- Noise and Vibration
- Safety Equipment
- Utilities
- Americans with Disabilities Act

Design and Ventilation – These are effective methods to help prevent exposure to airborne substances by controlling release into the work environment through proper design and the use of hoods and other ventilation systems. The three goals of design and ventilation in a laboratory are:

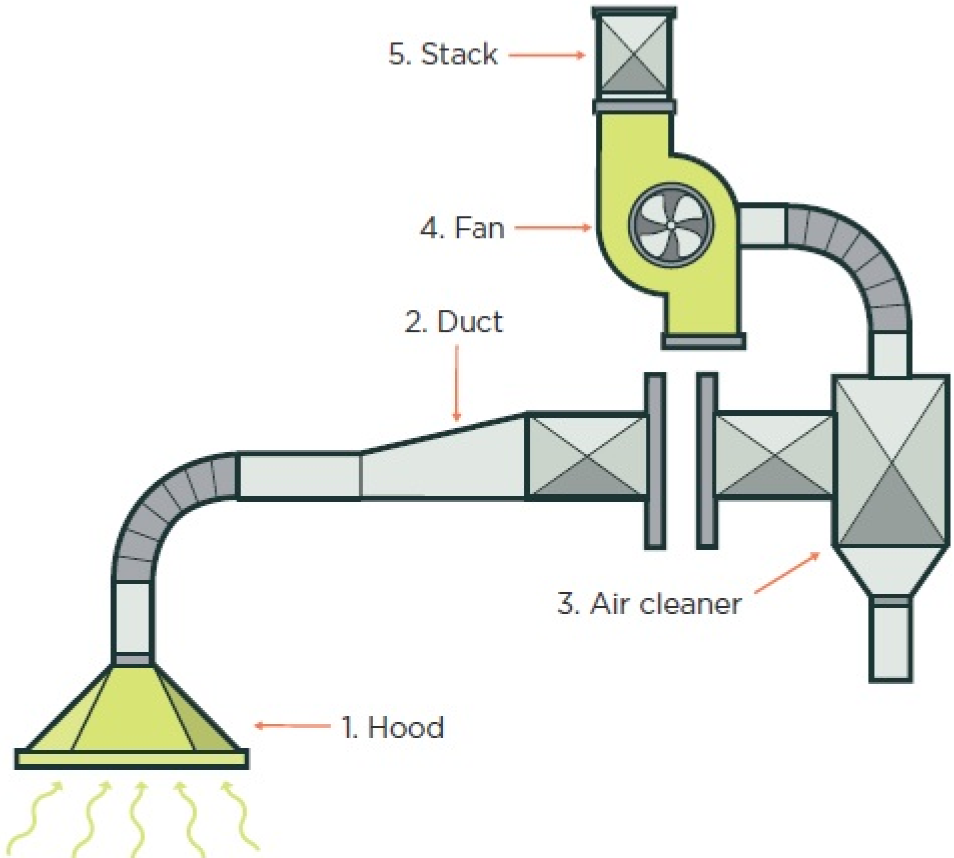
- Safety
- Comfort
- Energy Efficiency

Chemical Fume Hoods (CFHs) – CFHs are a type of ventilation system with the primary function of exhausting chemical fumes, vapors, gasses, dust, mist, and aerosol. CFHs also serve as physical barriers between reactions and the laboratory, offering a measure of protection against inhalation exposure, chemical spills, run-away reactions, and fires. CFHs reduce potential exposure hazards to personnel, including contaminant concentrations near the edge of the sash. These engineering controls offer no protection to the product or environment. Any toxic or volatile (tendency of chemical to vaporize) chemical must be used inside of a CFH to lower the chances of inhalation exposure.

Paint Spray Booths – They are controlled environments for paint application, designed to contain hazardous vapors and provide a safer, healthier environment for painters. Paint spray booths must be designed to:

- **Filter contaminants**: Remove flammable and toxic materials from the air
- **Move air currents**: Direct air flow toward an exhaust system
- **Confine vapors and residue**: Limit the escape of spray, vapor, and residue
- **Protect workers**: Reduce the risk of exposure to toxic materials, flammable mists, and particulates
- **Reduce fire and explosion hazards**: Contain and direct vapors and residue to an exhaust system

Localized Exhaust Ventilation (LEV) - The purpose of LEV is to capture and remove airborne contaminants at their source before they can spread throughout a workplace. This helps to protect workers from harmful exposure to dusts, fumes, vapors, mists, and gases. Most LEV systems will have the following components (see Figure 5.2).



[11]

Figure 5.2 Local Exhaust Ventilation Components

5.3 ADMINISTRATIVE CONTROLS

Administrative controls are changes in work procedures such as written safety guidelines, rules, supervision, schedules, signs, labels, SDSs, and training to reduce personnel exposure to hazardous chemicals.

5.3.1 Exposure Monitoring

OSHA 1910.1450(d) employers to monitor employee exposure to hazardous chemicals if there is reason to believe PELs may be exceeded. Initial monitoring must be conducted in such cases, and periodic monitoring is required if exposure levels are found above the PEL. Monitoring can cease once results consistently show exposure below the PEL. Employees must be notified of monitoring results in writing within 15 working days. While students are not covered by OSHA under this statute, ClarkU will include students in the exposure determination.

---

[11] https://www.worksafe.govt.nz/topic-and-industry/fumes/local-exhaust-ventilation-quick-guide/

In addition, EPA’s Methylene Chloride Standard requires exposure monitoring for methylene chloride when warranted. Refer to Section 4.13 for details.

5.3.2 Safety Data Sheets (SDS)

SDSs are documents created by the chemical manufacturer that describe the substance. Some information found on an SDS includes chemical and physical characteristics, handling requirements, storage and disposal information, and signs and symptoms of exposure. SDSs are required for all chemicals at ClarkU and must remain on file for 30 years after employment. OSHA requires up-to-date SDSs that are readily available for each chemical. The Chemical Hygiene Officer is responsible for obtaining SDSs for chemicals used and stored at ClarkU. SDSs shall be maintained in binders in the areas/rooms where the chemicals are being stored and used by laboratorians or are available via the chemical manufacturer’s webpage. SDSs are accessible to all personnel and regulatory inspectors as needed. Personnel have a right to access any or all SDSs. If an SDS is not included in the shipment, ClarkU shall contact the chemical manufacturer in order to obtain the SDS.

5.3.3 Signs and Labels

5.3.3.1 Labels

All containers of chemicals, hazardous chemicals, and hazardous waste (e.g., chemical container), and chemical storage areas shall be appropriately labeled indicating the hazards present and any other relevant regulatory requirements. All chemical containers at ClarkU must be labeled regardless of size and whether or not they are hazardous. Refer to the ClarkU HAZCOM for details about the labeling requirements for chemical containers. Labeling of all chemical containers assists emergency personnel and others in identifying what is and what is not hazardous should a spill occur or other emergency situation arise. Original labels on chemical containers must not be removed or defaced.

5.3.3.2 National Fire Protection Association 704 Signage

In order to communicate the hazards associated with a laboratory, ClarkU uses the NFPA 704 system diamond for chemical containers. See Appendix F for details regarding this system. All door(s)/partition(s) leading into the laboratory shall be posted with a NFPA 704 diamond signage addressing the hazards of the materials contained in the lab, requirements for personal protective equipment, any special hazards located in the lab, and emergency contact information.

5.3.4 Inspections

The CHO with or without laboratorians and select LSC members will periodically conduct laboratory inspections. Inspections will include a walkthrough of the selected areas and will cover lab safety, PPE, waste management, and related topics. Results of the inspections will be brought to lab supervisors and will be used as a guide to identify and correct similar and/or other environmental, health and safety issues in their areas(s). Refer to the ClarkU Inspection Protocol for additional information about the inspection process. Laboratories, which are identified as a "High Hazard" laboratory, will be inspected on an annual basis. The LSC will determine whether the inspections are announced or unannounced inspections.

5.4 PERSONAL PROTECTIVE EQUIPMENT

ClarkU is required to determine if PPE should be used to protect their laboratory personnel. This is conducted via a PPE Assessment Form. PPE should be used in conjunction with guards, engineering controls, and administrative controls. PPE may be required to reduce personnel exposure to hazards when engineering and administrative controls are not feasible or effective in reducing these exposures to acceptable levels. PPE should always be worn if there is a possibility that personal clothing, skin, or any part of the head could become contaminated with hazardous chemicals. Examples include laboratory coats, aprons, jumpsuits, boots, shoe covers, and gloves. Review SDSs to determine the necessary PPE to limit exposure. The appropriate type of PPE depends on how the chemical enters the body, referred to as the route of exposure, which is specified in the SDS. The four major routes of exposures are skin absorption, inhalation, ingestions, and injection.

Laboratorians who face possible injury or potential chemical exposure of any kind that cannot be eliminated through engineering, work practice or administrative controls must wear appropriate the appropriate PPE. The following sections explain the different types of PPE, which may be warranted in a laboratory setting.

5.4.1 Eye and Face Protection

Safety glasses with side shields that conform to previous (previously purchased eye and face protection) and current versions of American National Standards Institute (ANSI) Standard Z87.1 are required for work with hazardous chemicals. Ordinary prescription glasses with hardened lenses do not serve as safety glasses.

Although safety glasses can provide protection from injury from flying particles, they offer little protection against chemical splashes. Splash goggles should be worn if there is a splash hazard in any operation involving hazardous chemicals. Full face shields are worn in conjunction with either safety glasses or splash goggles. When there is a possibility of liquid splashes, both a face shield and splash goggles should be worn; this is especially important for work with highly corrosive liquids. Full-face shields with throat protection and safety glasses with side shields should be used when handling highly hazardous chemicals. If work in the laboratory could involve exposure to lasers, ultraviolet light, infrared light, or intense visible light, specialized eye protection should be worn. Safety glasses should be provided for visitors in the laboratory.

5.4.2 Hand Protection

Laboratory personnel must select and wear the appropriate gloves when handling hazardous chemicals. No single glove can provide universal protection for all situations, so it is essential to assess the hazards of each task and select gloves accordingly. Refer to Appendix G and the glove manufacturer for an example of a glove compatibility chart. The following general guidelines should be followed for glove selection and use:

- Similar gloves supplied by different manufacturers may not offer the same level of protection; therefore, the manufacturer's glove selection chart should be reviewed.
- Select gloves which are resistant to the chemicals you may be exposed to. Consult the relevant SDS which may recommend a particular glove material.
- Select gloves of the correct size and fitting; gloves that are too small are uncomfortable and may tear whereas larger gloves may interfere with dexterity.
- Before use, check gloves (even new ones) for physical damage such as tears and pin holes.
- When removing gloves, do so in a way that avoids the contaminated exterior contacting the skin.
- Wash hands with soap and water after removing gloves.

Many factors affect the breakthrough times of gloves including thickness of glove material, chemical concentration, amount of chemical that comes into contact with the glove, length of time the glove is exposed to the chemical, temperature at which the work is done, and possibility of abrasion or puncture. Glove selection guides are available from most manufacturers.

If chemicals do penetrate the glove material, they could be held in prolonged contact with the hand and cause more serious damage than in the absence of a proper glove. Gloves should be replaced immediately if they are contaminated or torn. The use of double gloves may be appropriate in situations involving chemicals of high or multiple hazards. Leather gloves are appropriate for handling broken glassware and inserting tubing into stoppers, where protection from chemicals is not needed. Gloves should be decontaminated or washed appropriately before they are taken off and should be left in the laboratory and not be allowed to touch any uncontaminated objects in the laboratory or any other area. Gloves should be replaced periodically, depending on the frequency of use.

5.4.3 Laboratory Coats, Protective Suits and Aprons

Laboratorians are required to wear laboratory coats when there is a potential chemicals to:

- Provide protection of skin and personal clothing from incidental contact and small splashes.
- Prevent the spread of contamination outside the lab (provided they are not worn outside the lab).
- Provide a removable barrier in the event of an incident involving a spill or splash of hazardous substances.

Appropriate laboratory coats should be worn, buttoned, with the sleeves rolled down. Laboratory coats should be fire-resistant and fully covering. Laboratory coats or laboratory aprons made of special materials are available for high-risk activities. Laboratory coats that have been used in the laboratory should be left there to minimize the possibility of spreading chemicals to eating and office areas, and they should be cleaned regularly. Rings, bracelets, watches, or other jewelry that could trap chemicals close to the skin, come in contact with electrical sources, or get caught in machinery should not be worn. Leather clothing or accessories should not be worn in situations where chemicals could be absorbed in the leather and held close to the skin.

5.4.4 Laboratory Attire

When performing work with hazardous chemicals, laboratory personnel should wear proper laboratory attire, which includes:

- Clothing that covers:
  - Both legs entirely (no holes or rips, no shorts, no dresses/skirts [if required by your religion, then ensure the length is long enough to cover both legs]),
  - Body torso from under chin to pants/skirt/dress (no tanks/Camis/crop tops),
  - Ankles (no exposed skin),
  - Heel (no clogs), and
  - Feet (no open-toed shoes/Crocs)
- Non-slip and impervious shoes (no high heels)

Hair tied back in a ponytail or bun to prevent contact with hazardous spaces

5.4.5 Foot Protection

Closed-toed shoes should be worn in areas where hazardous chemicals are in use or mechanical work is being done. Clogs, perforated shoes, bare feet, sandals, and cloth shoes do not provide protection against chemicals. Shoe covers may be required for work with especially hazardous chemicals.

6.0 ENGINEERING CONTROLS

Engineering controls minimize exposure to hazardous substances in laboratories. These controls are designed to prevent or reduce the release of harmful substances into the work environment, ensuring worker safety by addressing hazards at their source. Effective engineering controls include proper room design, ventilation systems, and specialized equipment such as CFH. The goals of engineering controls in laboratory environments are to enhance safety, ensure comfort, and improve energy efficiency.

6.1 CHEMICAL FUME HOODS

Laboratory fume hoods are a type of ventilation system with the primary function of exhausting chemical fumes, vapors, gasses, dust, mist, and aerosol. Fume hoods also serve as physical barriers between reactions and the laboratory, offering a measure of protection against inhalation exposure, chemical spills, run-away reactions, and fires.

A typical CFH has a box-like structure with a moveable sash window. Experimental procedures are performed within the hood, which is consistently and safely ventilated, usually by means of an extract blower and ductwork. Chemical fumes that are exhausted and diluted many times over in the atmosphere have negligible effects on human health.

When environmental concerns are of importance, an extract treatment system, often referred to as a scrubber, is installed to remove most of the vapors from the exhaust air stream.
CFHs reduce potential exposure hazards to personnel, including contaminant concentrations near the edge of the sash. These engineering controls offer no protection to the product or environment. Any toxic or volatile (tendency of chemical to vaporize) chemical must be used inside of a CFH to lower the chances of inhalation exposure.

Except when adjustments to the apparatus are being made, the hood should be kept closed, with vertical sashes down and horizontal sashes closed, to help prevent the spread of a fire, spill, or other hazards into the laboratory. Basic guidelines for operating a fume hood include the following:

- Confirm that the fume hood has been certified within the last year (label with date).
- Confirm that the chemical can be used in the fume hood.
- Never put your head inside a fume hood to check an experiment.
- Do not clutter the fume hood with bottles, chemicals, or equipment as it restricts airflow (e.g., do not block baffles) and workspace.
- Immediately report any suspected fume hood malfunctions to the CHO.
- Limit foot traffic behind while performing operations in the hood.

- Equipment and chemicals should be placed at least 6 inches from the front of the working surface to prevent emissions from escaping. It is recommended that this be marked with tape as a visual reminder
- Check to ensure the hood is functioning properly prior to use by taping a Kimwipe to the bottom edge of the sash where you will be standing. If the Kimwipe is pulled into the hood and there is a current certification, then you are permitted to use the CFH
- Work should be performed with the hood sash in the lowest practical position. The sash should be placed below shoulder level to ensure face protection
- As a rule of thumb, use a hood when working with a substance with an occupational exposure limit (OEL) or permissible exposure limits (PEL) of less than 50 ppm
- Never store chemicals or other items unless authorized to do so by the CHO (e.g., SAA) in a fume hood NOTE: The CFH must be tested and certified with the storage in it to ensure that it is functioning properly with the storage in it.
- Do not alter any fume hood ventilation system
- DO NOT use PERCHLORIC ACID in ANY FUME HOOD unless it is a designated "perchloric acid use" hood
- Keep all laboratory doors closed. This will minimize crosscurrents, enhance hood performance, and keep odors from spreading throughout the building

6.2 LOCALIZED EXHAUST VENTILATION

To capture contaminants effectively, the material must be closer than approximately one-half the diameter of the exhaust arm from the end of the hose. Unless the intake for the exhaust arm is placed very close to the point source, it will not provide the appropriate capture. The face velocity of an exhaust arm is based on the requirements for the operation. The velocity and the capture efficiency drop sharply with distance from the intake. Generally, a safe distance is between 2 inches and 6 inches away. In cases where there is a question about efficacy of capture, perform a smoke test to determine if the flow is adequate.

6.3 SPRAY PAINT BOOTHS

To properly use a spray booth, ensure it is well-ventilated with a directed airflow towards the exhaust, maintain clean filters regularly, spray in a controlled manner to avoid overspray, clean your spray gun thoroughly after each use, and always follow safety protocols regarding flammable materials and proper storage of paint and coatings within the designated area; never introduce open flames or spark-producing equipment near the booth.

6.4 SAFETY SHOWERS AND EYEWASH STATIONS

In case of an exposure to hazardous substances, a reliable, clean source of water must be available to rinse contaminants from the body. Eyewash stations and safety showers are located in ClarkU laboratories. Laboratory Supervisors must ensure that safety showers and eyewash stations are free from obstruction. Laboratory supervisors are responsible for ensuring that their personnel are aware of the nearest safety shower and eyewash station location and how to use the device. ClarkU is responsible for conducting periodic inspections of the safety showers and eyewash stations to ensure they are working properly.

7.0 INFORMATION AND TRAINING

7.1 INFORMATION

ClarkU will provide the following information and/or where to find this information to laboratory personnel prior to working with any chemical and via email request to the CHO:

- The contents of 29 CFR 1910.1450 and its appendices
- The EPA Methylene Chloride Standard
- The availability and location of this CHP.
- SDSs.
- SOPs for specific topics (See Section 3.0 for details)
- PELs for OSHA-regulated substances or recommended exposure limits for other hazardous chemicals (OELs) where there is no applicable OSHA standard; and the ECEL and ESTEL for methylene chloride
- Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory.

7.2 TRAINING

All personnel working in a laboratory shall be trained on the contents of this CHP and all applicable procedures that are pertinent to a procedure, experiment, or task. Training shall include but is not limited to:

- Provisions of this CHP.
- Methods and observations that may be used to detect the presence or release of a hazardous chemical (Section 5.3.1 for information exposure monitoring.).
- The physical and health hazards of chemicals in the laboratory.
- Measures personnel can take to protect themselves from these hazards (Refer to Sections 5.0 and 6.0)
- OSHA regulated substances
- PELs and OELs
- ECEL and ESTEL for methylene chloride
- Signs and symptoms associated with exposures to hazardous chemicals
- Safe handling, storage, and disposal of hazardous chemicals
- How to read an SDS
- The selection, use, cleaning, and disposal of PPE.

7.3 FREQUENCY OF TRAINING

Training shall be provided for laboratory personnel prior to starting work in the laboratory; before each new possible hazard exposure; before using new or altered equipment; and whenever there are changes to procedures or this CHP. Refresher training is required annually. Additional training may be assigned as part of an incident investigation, based on the results of an inspection, or as requested by the LSC, CHO, or another member of the ClarkU community.

7.4 RECORD KEEPING

The CHO is responsible for establishing and maintaining records for personnel training, personnel environmental monitoring, any medical consultations and examinations, including tests or written opinions, and compliance records.

8.0 MEDICAL CONSULTATIONS AND EXAMINATIONS

ClarkU shall provide their personnel who work with hazardous chemicals the opportunity for medical attention and follow-up by a competent physician if they show signs and symptoms of exposure.

8.1 MEDICAL SURVEILLANCE

ClarkU shall provide personnel with the opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances. All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician at a reasonable time and free of cost under the following circumstances.

- Whenever personnel develop signs or symptoms associated with a hazardous chemical to which they may have been exposed in the laboratory
- Where exposure monitoring reveals an exposure level routinely above the:
  - OSHA action level (see Appendix B for definition of action level) (or in the absence of an action level, the PEL for an OSHA-regulated substance with exposure monitoring and medical surveillance requirements.
  - OSHA PEL
  - NIOSH or ACGIH OEL
  - ECEL
  - ESTEL
- 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.

8.2 INFORMATION PROVIDED TO THE PHYSICIAN

ClarkU shall provide the following information to the physician:

- The identity of the hazardous chemical(s) to which the personnel may have been exposed and the SDS.
- A description of the conditions under which the exposure occurred including quantitative exposure data, if available.
- A description of the signs and symptoms of exposure personnel are experiencing, if any.

8.3 PHYSICIANS WRITTEN OPINION

ClarkU shall obtain a written opinion from the examining physician, which shall include the following:

- Recommendation for further medical follow-up.
- The results of the medical examination and any associated tests.
- Any medical condition that may be revealed in the course of the examination that may place personnel at increased risk as a result of exposure to a hazardous workplace.
- A statement that personnel have been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.
- The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

APPENDIX A

CHEMICAL HYGIENE REVIEW AND REVISION LOG

CHEMICAL HYGIENE REVIEW AND REVISION LOG

Clark University (ClarkU) Laboratory Safety Committee and Chemical Hygiene Officer on an annual basis or whenever necessary to reflect new or modified tasks, procedures, and standards of care associated with this program. Others within the ClarkU community may also participate in this review process. The purpose of this log is to document this review and changes to this document.

Date	Version	Brief Description of the Review
10/2012	Version 1.0	New document
05/2025	Version 2.0	Update to reflect current regulations, standards of care, and best management practices

APPENDIX B

DEFINITIONS

DEFINITIONS

Accident–an incident that does result in actual harm, injury, damage, or loss.

Acid–a compound that undergoes dissociation in water with the formation of hydrogen ions. Acids have pH values below 7 and will neutralize bases or alkaline media. Acids will react with bases to form salts. Acids have a sour taste and with a pH in the 0 to 2 range cause severe skin and eye burns.

Action level–a concentration designated in 29 CFR part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

Administrative controls–interventions that change the way work is completed or provide workers more information by giving them relevant procedures training or warnings. Administrative controls are often used together with higher-level controls. [1]

Aerosol–a material which is dispensed from its container as a mist, spray, or foam by a propellant under pressure [2]

Aerosol can–a non-refillable receptacle containing a gas compressed, liquefied, or dissolved under pressure, the sole purpose of which is to expel a liquid, paste, or powder and fitted with a self-closing release device allowing the contents to be ejected by the gas.[3]

Base (alkali)–a compound that has the ability to neutralize an acid and form a salt. Alkali also forms a soluble soap with a fatty acid. Alkalis have pH values above 7 to 14. They are bitter in a water solution. Alkalis with pH values between 12 to14 are considered to be corrosive and will cause severe damage to the skin, eyes and mucous membranes. Common strong alkalis are sodium and potassium hydroxide.

Batteries–devices consisting of one or more electrically connected electrochemical cells which is designed to receive, store, and deliver electric energy. An electrochemical cell is a system consisting of an anode, cathode, and an electrolyte, plus such connections (electrical and mechanical) as may be needed to allow the cell to deliver or receive electrical energy. The term battery also includes an intact unbroken battery from which the electrolyte has been removed.[4]

---

[1] https://www.osha.gov/sites/default/files/Hierarchy_of_Controls_02.01.23_form_508_2.pdf
[2] https://www.osha.gov/sites/default/files/training-library_TrngandMatlsLib_FlammableLiquids.pdf
[3] https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-260/subpart-B/section-260.105
[4] 310 CMR 30.1000, https://www.mass.gov/doc/310-cmr-30000-hazardous-waste-regulations/download

Blood/hematopoietic toxin–agents which act on the blood or hematopoietic system: decrease hemoglobin function; deprive the body tissues of oxygen.

Boiling Point–the temperature at which a liquid changes to a vapor state, at a given pressure; usually expressed in degrees of Fahrenheit or Centigrade at sea level pressure (760 mm Hg or one atmosphere). Flammable materials with low boiling points generally present special fire hazards.[5]

Carcinogen(see select carcinogen)

Chemical Hygiene Officer–an employee appointed by the employer, qualified through training or experience, to offer technical expertise in the creation and execution of the Chemical Hygiene Plan. This definition does not restrict the individual's job title or position within the employer's organizational hierarchy.

Chemical Hygiene Plan–a written plan established and enforced by the employer that outlines procedures, equipment, personal protective equipment, and work practices designed to:

(i) hazards presented by hazardous chemicals used in that particular workplace and
(ii) meets the requirements of 29 CFR 1910.1450(e)

Chemical-specific SOP–a standard operating procedure that must be followed relevant to health and safety considerations when laboratory work involves the use of specific hazardous chemicals

Compressed gas–(i) a gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70ºF (21.1ºC), or (ii) a gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130ºF (54.4ºC) regardless of the pressure at 70ºF (21.1ºC); or (iii) a liquid having a vapor pressure exceeding 40 psi at 100ºF (37.8ºC) as determined by ASTM D-323-72.[6]

Corrosive–A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact.[1]

Decontamination–the process of removing or neutralizing contaminants that have accumulated on personnel and equipment [7]

---

[5] Hazard Communication - Guidance For Hazard Determination | OSHA.gov | Occupational Safety and Health Administration

[6] https://www.osha.gov/hazcom/ghd053107

[7] https://www.osha.gov/hazardous-waste/decontamination#:~:text=Decontamination%20%2D%20the%20process%20of%20removing,of%20contaminants%20from%20the%20site

Designated area–a specific location designated for handling "select carcinogens," reproductive toxins, or substances with high acute toxicity. This area can be an entire laboratory, a section within a laboratory, or a specific device such as a laboratory hood.

Elimination–ensuring a hazard no longer exists. Examples of elimination include ending the use of a hazardous chemical, doing work at ground level rather than at heights, or stopping the use of noisy processes. [8]

Emergency–any incident such as, but not limited to, equipment malfunction, container rupture, or control equipment failure that leads to the unintended release of a hazardous chemical into the workplace.

Employee–individual working in a laboratory setting who may encounter hazardous chemicals during the performance of their duties.

Engineering controls–controls that reduce exposure by preventing hazards from coming into contact with workers while still allowing workers to complete their job. Examples of engineering controls include chemical fume hoods, machine guards, interlocks, etc.[9]

Explosive–a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.[10]

Flammable gas–a gas that, at ambient temperatures and pressures, forms a flammable mixture with air at a concentration of less than thirteen (13) percent by volume; or forms a range of flammable mixtures with air wider than twelve (12) percent by volume.

Flash Point–the minimum temperature of a liquid at which sufficient vapor is given off to form an ignitable mixture with the air, near the surface of the liquid or within the vessel used.[11]

Hazard–the inherent capacity of a substance to cause an adverse effect.

Hazard class–a way of grouping materials or substances based on their potential to cause harm, either to humans, the environment, or property, and is used for transportation and storage regulations.

---

[8] https://www.osha.gov/sites/default/files/Hierarchy_of_Controls_02.01.23_form_508_2.pdf
[9] https://www.osha.gov/sites/default/files/Hierarchy_of_Controls_02.01.23_form_508_2.pdf
[10] https://www.osha.gov/hazcom/ghd053107
[11] https://www.nfpa.org/news-blogs-and-articles/blogs/2024/04/17/what-is-an-ignitable-liquid-and-how-is-it-classified

Hazardous chemical–any chemical identified as a health hazard or simple asphyxiant under the criteria of the Hazard Communication Standard (§1910.1200).

Hazardous waste–is any solid, liquid, sludge, or containerized gas that is discarded, has served its intended use, or is manufacturing by-product, and exhibits any of the following characteristics identified: Flammable, Corrosive, Reactive, Toxic.

Health hazard–a chemical identified as presenting any of the following hazardous effects: acute toxicity (via any exposure route), skin corrosion or irritation, serious eye damage or irritation, respiratory or skin sensitization, germ cell mutagenicity, carcinogenicity, reproductive toxicity, specific target organ toxicity (single or repeated exposure), or aspiration hazard. The criteria for classifying a chemical as a health hazard are specified in Appendix A of the Hazard Communication Standard (§1910.1200) and § 1910.1200(c) (definition of "simple asphyxiant").

Hepatotoxin–a chemical which can produce liver damage.

Highly hazardous chemicals–substances that possess toxic, reactive, flammable, or explosive properties and have the potential to cause a catastrophic event when handled improperly. These chemicals are regulated under the Process Safety Management Standard (§ 1910.119), which includes a list of specific highly hazardous chemicals with threshold quantities and covers those chemicals that may present a significant risk to workers due to their inherent properties or large-scale use. Examples include chemicals with acute toxicity, high flammability, or explosive reactivity, such as chlorine, ammonia, hydrogen sulfide, and flammable gases or liquids.

Ignitable–a solid, liquid or compressed gas which is capable of being set afire.[12]

Incident–any unexpected event that has the potential to cause harm, injury, or damage, but may not necessarily result in it.

Incompatible chemicals–chemicals, that when stored together, could create a hazardous reaction such as the production of toxic gas, accelerated corrosion, or an exothermic reaction (a chemical reaction that releases heat), which could result in an explosion or fire.[13]

Irritant–a chemical which is not corrosive but causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. [14]

---

[12] https://www.osha.gov/hazcom/ghd053107#a

[13] Incompatible Chemicals Storage: A Sanitary Survey Quick Reference Guide for Determining How to Properly Store Chemicals at a Water Treatment Plant

[14] https://www.osha.gov/hazcom/ghd053107

Just-in-Time–a system in which materials or components are delivered immediately before they are required in order to minimize inventory.

Laboratory–facility where hazardous chemicals are used in a laboratory setting, typically involving small quantities handled on a non-production basis.

Laboratory scale–work involving substances where the containers used for reactions, transfers, and handling are small enough to be easily and safely managed by a single person. "Laboratory scale" does not apply to workplaces engaged in the production of commercial quantities of materials.

Laboratory-type hood–a laboratory device enclosed on five sides, with a movable or fixed partial sash on the remaining side, designed and maintained to draw air from the laboratory and minimize the release of air contaminants. It allows chemical handling within the enclosure while limiting employee exposure to hands and arms only. Walk-in hoods with adjustable sashes meet this definition, provided the sashes are properly adjusted to maintain airflow and effective exhaust of contaminants, and employees do not enter the enclosure during the release of airborne hazardous chemicals.

Laboratory use of hazardous chemicals–the handling or use of hazardous chemicals where all of the following conditions are satisfied:

- (i) The chemical manipulations are performed on a laboratory scale
- (ii) Multiple chemical procedures or chemicals are involved;
- (iii) The procedures are not part of a production process and do not mimic production operations; and
- (iv) Appropriate protective laboratory practices and equipment are available and routinely used to reduce the risk of employee exposure to hazardous chemicals

Major chemical spill–An uncontrolled release or spill of a hazardous substance (solid, liquid, or gas) that presents an immediate danger to personnel or the environment, requiring specialized assistance for cleanup and response.

Medical consultation–a consultation between an employee and a licensed physician to assess whether any medical examinations or procedures are necessary following a potential significant exposure to a hazardous chemical.

Mercury-containing devices–any electrical product or component (excluding batteries, lamps and thermostats) which contains elemental mercury that is necessary for its operation and is housed within an outer metal, glass, or plastic casing. Mercury-containing devices include, but are not limited to, thermocouples, thermometers, manometers, barometers, sphygmomanometers, electrical switches, and relays, as well as certain gas flow regulators and water meters.

Mercury-containing lamps–any bulb or tube portion of an electric lighting device specifically designed to produce radiant energy including, but not limited to, incandescent, fluorescent, high intensity discharge, and neon lamps in which mercury is purposefully introduced by the manufacturer for the operation of the lamp.

Minor chemical spill–a spill that can be safely cleaned up by trained personnel using readily available materials and does not pose a significant risk of fire, explosion, or chemical exposure.

National Fire Protection Association (NFPA) flammable and combustible liquids–Flammable liquids that are ignitable and classified as Class I liquids, which includes those with a flash point below 100 °F. Class I is subdivided into Class IA (flash point below 73°F and boiling point below 100°F), Class IB (flash point below 73 °F and boiling point at or above 100°F), and Class IC (flash point at or above 73°F, but below 100°F). NFPA defined combustible liquids as those that are ignitable and classified as Class II (flash point at or above 100°F but below 140°F), Class IIIA (flash point at or above 140°F but below 200°F) and Class IIIB flash at or above 200°F). [15]

Near Miss–an incident where a potential hazard or dangerous situation arises and does not lead to any harm or damage due to timely intervention or other factors.

Nephrotoxic–a chemical which produces kidney damage**.**

Neurotoxin–a chemical which produces its primary toxic effect on the nervous system.

Occupational Safety and Health Administration (OSHA) flammable and combustible liquids–Any liquid having a flashpoint at or below 199.4 °F (93 °C). Flammable liquids are divided into four categories as follows:

- Category 1 shall include liquids having flashpoints below 73.4 °F (23 °C) and having a boiling point at or below 95 °F (35 °C).
- Category 2 shall include liquids having flashpoints below 73.4 °F (23 °C) and having a boiling point above 95 °F (35 °C).
- Category 3 shall include liquids having flashpoints at or above 73.4 °F (23 °C) and at or below 140 °F (60 °C). When a Category 3 liquid with a flashpoint at or above 100 °F (37.8 °C) is heated for use to within 30 °F (16.7 °C) of its flashpoint, it shall be handled in

[15] https://www.nfpa.org/news-blogs-and-articles/blogs/2024/04/17/what-is-an-ignitable-liquid-and-how-is-it-classified

accordance with the requirements for a Category 3 liquid with a flashpoint below 100 °F (37.8 °C).

- Category 4 shall include liquids having flashpoints above 140 °F (60 °C) and at or below 199.4 °F (93 °C). When a Category 4 flammable liquid is heated for use to within 30 °F (16.7 °C) of its flashpoint, it shall be handled in accordance with the requirements for a Category 3 liquid with a flashpoint at or above 100 °F (37.8 °C).
- When liquid with a flashpoint greater than 199.4 °F (93 °C) is heated for use to within 30 °F (16.7 °C) of its flashpoint, it shall be handled in accordance with the requirements for a Category 4 flammable liquid.[16]

Oxidizer–a chemical other than a blasting agent or explosive that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.[17]

Particularly-hazardous substance– a select carcinogen, reproductive toxin, and/or a substance that has a high degree of acute toxicity.[18]

Personal protective equipment (PPE) – equipment, clothing, and devices given to workers to protect them from hazards. [19]

Pesticides – a substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, and any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant; provided that the term "Pesticide" shall not include any article that is a "new animal drug" within the meaning of § 201(w) of the Federal Food, Drug and Cosmetic Act, or that has been determined by the Secretary of the United States Department of Health, Education and Welfare not to be a new animal drug by a regulation establishing conditions of use for the article, or that is an animal feed within the meaning of § 201(x) of the Federal Food, Drug and Cosmetic Act.

Physical hazard–a chemical identified as presenting one or more of the following hazardous effects: explosive; flammable (gas, aerosol, liquid, or solid); oxidizer (liquid, solid, or gas); self-reactive; pyrophoric (gas, liquid, or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; emits flammable gas upon contact with water; or combustible dust. The criteria for classifying a chemical as a physical hazard are outlined in Appendix B of the Hazard Communication Standard (§1910.1200) and § 1910.1200(c) (definitions of "combustible dust" and "pyrophoric gas").

[16] https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.106
[17] https://www.osha.gov/hazcom/ghd053107
[18] Particularly Hazardous Substances – Environment, Health & Safety – UW–Madison
[19] https://www.osha.gov/sites/default/files/Hierarchy_of_Controls_02.01.23_form_508_2.pdf5

Protective laboratory practices and equipment–laboratory procedures, practices, and equipment accepted by laboratory health and safety experts as effective or demonstrated by the employer to effectively reduce the risk of employee exposure to hazardous chemicals.

Pyrophoric chemical–a chemical that will ignite spontaneously in air at a temperature of 130º F (54.4ºC) or below.

Reactive–can cause damage to the human body by the release of gases that will burn, explode, or produce high pressure that can inflict injury to a person nearby[20]

Reproductive toxins–chemicals that negatively impact reproductive capabilities, including effects on sexual function, fertility in adult males and females, and the development of offspring. Chemicals classified as reproductive toxins under the Hazard Communication Standard (§ 1910.1200) are considered reproductive toxins for the purposes of this CHP.

Risk–the probability that an adverse effect will occur.

Select carcinogen–any substance which meets one of the following criteria:

(i) regulated by OSHA as a carcinogen

(ii) listed under the category "known to be carcinogens", in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or

(iii) listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

a. inhalation exposure of 6-7 hours per day, 5 days per week, for a substantial portion of a lifetime at doses below 10 mg/m^3
b. after repeated dermal (skin) application at doses below 300 mg/kg of body weight per week; or
c. following oral dosages of less than 50 mg/kg of body weight per day.

Sensitizer–a chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure.[21]

Substitution–changing out a material or process to reduce a hazard. Examples include switching to a less hazardous chemical or switching to a process that uses less force, speed, temperature, or electrical current.[22]

Toxic chemical–a chemical falling within any of the following categories:

[20] https://www.osha.gov/hazcom/ghd053107
[21] https://www.osha.gov/hazcom/ghd053107
[22] https://www.osha.gov/sites/default/files/Hierarchy_of_Controls_02.01.23_form_508_2.pdf,

(i) A chemical that has a median lethal dose (LD_{50}) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

(ii) A chemical that has a median lethal dose (LD_{50}) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.[23]

(iii) A chemical that has a median lethal concentration (LC_{50}) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each

Unstable reactive chemical–a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature. [24]

Volatility–the tendency or ability or a liquid or solid material to form a gaseous form at ordinary temperatures. Liquids such as alcohol and gasoline, because of their tendency to evaporate rapidly, are called volatile liquids.[25]

Water-reactive chemical–a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.[26]

---

[23] https://www.osha.gov/hazcom/ghd053107

[24] https://www.osha.gov/hazcom/ghd053107

[25] Hazard Communication - Guidance For Hazard Determination | OSHA.gov | Occupational Safety and Health Administration

[26] https://www.osha.gov/hazcom/ghd053107

APPENDIX C

CONTACTS AND USEFUL WEBSITES

CONTACTS AND USEFUL WEBSITES

Contacts	
Name	Phone / Email
Jennifer Bosselman, MS, CCHO, Chemical Hygiene Officer, Environmental Health & Engineering, Inc. (Environmental Health and Safety [EHS] Contractor)	617-593-0291 Cell
Jennifer Hanselman, Associate Provost and Dean of Research	508-793-7779 Office
Triumvirate Environmental (Waste and Hazardous Materials Emergency Response Contractor)	800-966-9282 (24-hour)
University Police	508-793-7575
ClarkU EHS Website	https://www.clarku.edu/offices/ehs/

Websites	
Topic	Website
American Chemical Society	www.acs.org
American Conference of Governmental Industrial Hygienists	https://www.acgih.org/
Environmental Protection Agency	www.epa.gov
Massachusetts Department of Environmental Protection	https://www.mass.gov/orgs/massachusetts-department-of-environmental-protection
National Institute for Occupational Safety and Health	https://www.cdc.gov/niosh/index.html
National Fire Protection Association	https://www.nfpa.org
Occupational Safety and Health Administration	www.osha.gov
Pubchem	https://pubchem.ncbi.nlm.nih.gov/

APPENDIX D

CLARKU ACCIDENT REPORT

Clark University Accident Report

Injured party____________________ Date of birth__________ Social Security # ____/____/____

Address____

Street City State Zip

Job title________________________ Department________________________

Telephone #____________________ Date of injury______________ Time of injury__________

Date reported____________ Was injured employee engaged in usual job activities? ☐ Yes ☐ No

Where did the injury/accident occur? ____

Describe *how* the injury/accident occurred____________________________________

____

____

Nature of the injury (cut, burn, sprain, etc.)__________________________________

Injured body part(s)____

Did the injury/accident involve exposure to bloodborne pathogens (bodily fluids)? ☐ Yes ☐ No

Type of injury (check all that apply):

- ☐ No treatment required
- ☐ On-campus first aid only
- ☐ Off-campus physician/hospital
  (please indicate name of medical provider):________________________________
- ☐ No lost time
- ☐ Lost time (number of days _____)

Was the injury/accident witnessed? ☐ Yes ☐ No

If yes, name(s) of witnesses: ____

____

____________________________________ ______________________________

Name of person completing this form (please print) Signature

Release of Information

I hereby authorize Clark University (or any of its insurance representatives), to be furnished any information regarding this injury, including reports and records, results of diagnosis, treatment, prognosis, and recommendations for further treatment. This information is to be used for the purpose of evaluating and handling my claim for injury as a result of an incident occurring on or about the above noted date of injury/accident and for no other purpose, now or in the future.

____________________________________ ____________________

Signature of injured party Date

Please return this completed form to the Office of Human Resources.

APPENDIX E

CHEMICAL SPILL KIT CONTENTS

1. Absorbents
   - Universal Spill Absorbent: universal spill pillow or absorbent pads in commercial spill kits. Alternatively, a 1:1:1 mixture of Flor-Dri (or unscented kitty litter), sodium bicarbonate, and sand. This all-purpose absorbent is good for most chemical spills including solvents, acids (NOT for hydrofluoric acid), and bases.
   - Hydrofluoric Acid (HF): HF compatible spill pillow or liquid “HF acid eater”
   - Solvents/Organic Liquid Absorbent: Inert absorbents such as vermiculite, clay, sand, FlorDri, and Oil-Dri.

2. Neutralizers
   - Acid Spill Neutralizer: sodium bicarbonate, sodium carbonate, or calcium carbonate.
   - Alkali (Base) Neutralizer: sodium bisulfate.
   - Bromine Neutralizer: 5% solution of sodium thiosulfate and inert absorbent.

3. Personal Protective Equipment (PPE)
   - Safety Goggles and Face Shield
   - Heavy Neoprene Gloves
   - Disposable Lab Coat and Corrosive Apron
   - Plastic Vinyl Booties

4. Tools for clean-up
   - Plastic Dustpan and Scoop
   - Plastic Bags (30 Gallon, 3 mm thickness) for contaminated PPE and other solid spill response debris
   - One Plastic Bucket (5 gallon polyethylene) with lid for spill and absorbent residues

5. Others
   - For HF: calcium gluconate gel (always check expiration date)
   - For mercury: aspirator bulb and mercury decontaminating powder
   - For alkali metals: dry sand or a class “D” fire extinguisher
   - For acid chlorides: Oil Dri, Zorb-All or dry sand 6. Spill clean-up procedure

APPENDIX F

NATIONAL FIRE PROTECTION ASSOCIATION SIGNAGE NFPA 704

NATIONAL FIRE PROTECTION ASSOCIATION SIGNAGE NFPA 704

Signage based on the NFPA 704 labeling system, *Standard System for Identification of the Hazards of Materials for Emergency Response,* are posted at the entrances to all laboratories. This is confirmed during the inspection process. Also, many chemical manufacturers include the NFPA rating system in the labeling of chemical containers. The following is an example of the NFPA labeling system.

FIRE HAZARD (RED)

0—will not burn
1—will ignite if preheated
2—will ignite if moderately heated
3—will ignite at most ambient conditions
4—burns readily at ambient conditions

HEALTH HAZARD (BLUE)

0—no more than ordinary combustibles in a fire
1—slightly hazardous
2—hazardous
3—extreme danger
4—deadly

REACTIVITY (YELLOW)

0—stable and not reactive with water
1—unstable if heated
2—violent chemical change
3—shock and heat may detonate
4—may detonate

SPECIFIC HAZARD

OX—oxidizer
~~W~~ —use no water
SA—simple asphyxiant gases

APPENDIX G

GLOVE COMPATIBILITY CHART

GLOVE COMPATIBILITY CHART

The following table is excerpted from U.S. Occupational Safety and Health Administration *Personal Protective Equipment* (OSHA 3151-02R 2023).[1]

The rating abbreviations are as follows: VG—Very Good; G—Good; F—Fair; P—Poor (not recommended). Chemicals marked with an asterisk (*) are for Limited Service.

Chemical Resistance Selection Chart for Protective Gloves[1]				
Chemical	**Neoprene**	**Natural Latex or Rubber**	**Butyl**	**Nitrile Latex**
*Acetaldehyde	VG	G	VG	G
Acetic acid	VG	VG	VG	VG
*Acetone	G	VG	VG	P
Ammonium hydroxide	VG	VG	VG	VG
*Amyl acetate	F	P	F	P
Aniline	G	F	F	P
*Benzaldehyde	F	F	G	G
*Benzene	F	F	F	P
Butyl acetate	G	F	F	P
Butyl alcohol	VG	VG	VG	VG
Carbon disulfide	F	F	F	F
*Carbon tetrachloride	F	P	P	G
Castor oil	F	P	F	VG
*Chlorobenzene	F	P	F	P
*Chloroform	G	P	P	P
Chloronaphthalene	F	P	F	F
Chromic Acid (50%)	F	P	F	F
Citric acid (10%)	VG	VG	VG	VG
Cyclohexanol	G	F	G	VG
*Dibutyl phthalate	G	P	G	G
Diesel fuel	G	P	P	VG
Diisobutyl ketone	P	F	G	P
Dimethylformamide	F	F	G	G
Dioctyl phthalate	G	P	F	VG
Dioxane	VG	G	G	G
Epoxy resins, dry	VG	VG	VG	VG
*Ethyl acetate	G	F	G	F
Ethyl alcohol	VG	VG	VG	VG
Ethyl ether	VG	G	VG	G
*Ethylene dichloride	F	P	F	P
Ethylene glycol	VG	VG	VG	VG
Formaldehyde	VG	VG	VG	VG
Formic acid	VG	VG	VG	VG
Freon 11	G	P	F	G
Freon 12	G	P	F	G
Freon 21	G	P	F	G
Freon 22	G	P	F	G

[1] https://safety.fsu.edu/safety_manual/OSHA%20Glove%20Selection%20Chart.pdf

Chemical Resistance Selection Chart for Protective Gloves[1] (continued)				
Chemical	Neoprene	Natural Latex or Rubber	Butyl	Nitrile Latex
*Furfural	G	G	G	G
Gasoline, leaded	G	P	F	VG
Gasoline, unleaded	G	P	F	VG
Glycerine	VG	VG	VG	VG
Hexane	F	P	P	G
Hydrochloric acid	VG	G	G	G
Hydrofluoric acid (48%)	VG	G	G	G
Hydrogen peroxide (30%)	G	G	G	G
Hydroquinone	G	G	G	F
Isooctane	F	P	P	VG
Isopropyl alcohol	VG	VG	VG	VG
Kerosene	VG	F	F	VG
Ketones	G	VG	VG	P
Lacquer thinners	G	F	F	P
Lactic acid (85%)	VG	VG	VG	VG
Lauric acid (36%)	VG	F	VG	VG
Lineoleic acid	VG	P	F	G
Linseed oil	VG	P	F	VG
Maleic acid	VG	VG	VG	VG
Methyl alcohol	VG	VG	VG	VG
Methylamine	F	F	G	G
Methyl bromide	G	F	G	F
*Methyl chloride	P	P	P	P
*Methyl ethyl ketone	G	G	VG	P
*Methyl isobutyl ketone	F	F	VG	P
Methyl methacrylate	G	G	VG	F
Monoethanolamine	VG	G	VG	VG
Morpholine	VG	VG	VG	G
Naphthalene	G	F	F	G
Naphthas, aliphatic	VG	F	F	VG
Naphthas, aromatic	G	P	P	G
*Nitric acid	G	F	F	F
Nitromethane (95.5%)	F	P	F	F
Nitropropane (95.5%)	F	P	F	F
Octyl alcohol	VG	VG	VG	VG
Oleic acid	VG	F	G	VG
Oxalic acid	VG	VG	VG	VG
Palmitic acid	VG	VG	VG	VG
Perchloric acid (60%)	VG	F	G	G
Perchloroethylene	F	P	P	G
Petroleum distillates (naphtha)	G	P	P	VG
Phenol	VG	F	G	F
Phosphoric acid	VG	G	VG	VG
Potassium hydroxide	VG	VG	VG	VG
Propyl acetate	G	F	G	F
Propyl alcohol	VG	VG	VG	VG
Propyl alcohol (iso)	VG	VG	VG	VG
Sodium hydroxide	VG	VG	VG	VG
Styrene	P	P	P	F
Stryene (100%)	P	P	P	F

Chemical Resistance Selection Chart for Protective Gloves[1] (continued)				
Chemical	Neoprene	Natural Latex or Rubber	Butyl	Nitrile Latex
Sulfuric acid	G	G	G	G
Tannic acid (65%)	VG	VG	VG	VG
Tetrahydrofuran	P	F	F	F
*Toluene	F	P	P	F
(continued)Toluene diisocyanate	F	G	G	F
*Trichloroethylene	F	F	P	G
Triethanolamine	VG	G	G	VG
Tung oil	VG	P	F	VG
Turpentine	G	F	F	VG
*Xylene	P	P	P	F

* Limited Service
VG Very Good
G Good
F Fair
P Poor (not recommended)

1 https://www.osha.gov/sites/default/files/publications/osha3151.pdf