

CHEMICAL HYGIENE PLAN

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1.0 CHEMICAL HYGIENE OVERVIEW

1.1 Scope

This plan applies to activities associated with the William & Mary campus that involve the handling, storage, or other manipulation of hazardous chemicals. The Chemical Hygiene Plan (CHP) must be followed by all faculty, staff, and students. Settings in which this plan applies include but are not limited to:

- 1.1.1 Laboratory-type operations in which chemicals are manipulated or otherwise experimented with. This includes teaching and research laboratories.
- 1.1.2 Anywhere multiple chemicals are combined.
- 1.1.3 Facilities where hazardous materials are stored.
- 1.1.4 Anywhere engineering controls exist to protect personnel from hazardous chemical exposure.

1.2 Purpose

The purpose of the Chemical Hygiene Plan is to protect employees from health hazards associated with hazardous chemicals used in the workplace by maintaining exposures below permissible limits. This Plan complies with OSHA's laboratory standard, 29 CFR 1910.1450, and should be used in conjunction with the university's [Hazard Communication Program](#). In the Commonwealth of Virginia, the Virginia Occupational Safety and Health (VOSH) Program is responsible for enforcing OSHA laws and regulations.

1.3 Responsibilities

- 1.3.1 President, Provost, Vice Provost and Deans: Provide continuing support for institutional chemical hygiene and promote the importance of safety. The Vice Provost and deans have ultimate responsibility for chemical hygiene at the university and must, with other administrators, uphold and enforce this plan.
- 1.3.2 Next Level Supervisors: Support the institutional chemical hygiene within their respective organizations. This includes associate/assistant directors, department heads, and other supervisors. These positions are responsible for setting the example and demonstrating continuous support to effectively implement this plan.
- 1.3.3 Environmental Health & Safety (EH&S) Office: Develop, coordinate, implement, maintain and monitor the university's Chemical Hygiene Plan. Aid the Chemical Hygiene Officer as required under this Plan. Partner with supervisors and principal investigators to

ensure and monitor the plans' effectiveness. Provide technical guidance.

- 1.3.4 Chemical Hygiene Officer (CHO): Provide technical guidance in the development and implementation of this plan. The CHO is qualified by training and/or experience to have the knowledge and competence to use the appropriate equipment and testing procedures to identify and evaluate various situations and to suggest abatement procedures for health and safety hazards.

The CHO works with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices. The CHO is aware of current legal requirements concerning regulated substances, ensures that appropriate audits are maintained, helps principal investigators develop necessary precautions and adequate laboratory facilities, and suggests ways to improve the chemical hygiene program.

- 1.3.5 Principal Investigators, Project Supervisors, and Laboratory Supervisors:

- a) Enforce requirements and processes identified in the chemical hygiene plan within their laboratory or their respective area.
- b) Ensure that laboratory workers, including students, know and follow the chemical hygiene rules outlined in this plan, use personal protective equipment, and ensure safety items are available and in working order and good condition.
- c) Identify and provide appropriate training.
- d) Provide regular, formal chemical hygiene and housekeeping inspections including routine inspections of safety and emergency equipment.
- e) Know and comply with the current legal requirements for regulated substances used in his/her laboratory or area.
- f) Ensure the Safety Data Sheets (SDS) for materials used in the lab are available to laboratory workers and students.
- g) Determine the required levels of personal protective equipment (PPE) and ensure its use.
- h) Establish lab-specific standard operating procedures that include activities performed, associated hazards, and controls established to prevent injury/incidents.
- i) Ensure that facilities and training for the proper use of hazardous materials ordered/used in the laboratory are adequate.
- j) Prepare, maintain, and update as needed an inventory of chemicals/materials for each lab.
- k) Ensure that their SDSs are available via the SDS online database and communicate changes to EH&S. The university's electronic SDS Library is available at:

<https://www.wm.edu/offices/ehs/hazard/>

1.3.6 Laboratory Workers (faculty, staff, and students):

- a) Plan and conduct all operations in accordance with institutional chemical hygiene procedures to include those published in this plan.
- b) Receive and complete training required to work in the assigned laboratory or laboratories, including all training prescribed by EH&S and training from the PI on lab-specific SOPs and procedures.
- c) Develop and follow good personal chemical hygiene habits.
- d) Use prescribed engineering controls and personal protective equipment (PPE).
- e) Share/report safety concerns, including near-misses, to their supervisor.

1.4 Training

Training must be provided to ensure employees understand workplace hazards, required safety procedures, and necessary PPE to minimize exposure and environmental contamination. Training is required upon initial assignment to areas with hazardous chemicals and before new exposure situations are introduced.

1.4.1 Training requirements under the Laboratory Standard, 29 CFR 1910.1450:

- a) The contents of the 29 CFR 1910.1450 and its appendices;
- b) The location and availability of the W&M Chemical Hygiene Plan;
- c) The Permissible Exposure Limits (PELs) and Threshold Limit Values (TLVs) for OSHA-regulated substances and recommended exposure limits for other hazardous chemicals where there are no applicable OSHA standards;
- d) Signs and symptoms associated with exposures to hazardous chemicals used in the lab;
- e) The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory, including, but not limited to, safety data sheets (SDSs);
- f) Appropriate PPE and the proper wear, use, maintenance, and limitations of;
- g) Standard Operating Procedures developed for particularly hazardous substances

1.4.2 Training Availability

- a) PI's are responsible for ensuring faculty, staff, and students in their lab have the appropriate hazard-specific training applicable to the processes in use, and chemicals present.

- b) W&M EH&S provides web-based training for a variety of topics, for example general laboratory safety, personal protective equipment, hazard communication, and hazardous waste management.
- c) University and student employees have access to web-based training via the university's learning management system in Workday. University employees must complete these trainings in Workday for recordkeeping.
- d) PI's are responsible for ensuring that students that work in their laboratory have received the appropriate web-based & in-person training. This training is also available in a Box folder and can be administered and recorded based on the preferences of the PI/supervisor.
- e) Laboratory SOPs must be reviewed and signed by each laboratory worker that will perform the procedure.
- f) PI's are responsible for keeping training records for laboratory workers and students under their purview. EH&S will review these records during annual laboratory inspections and they must be available upon request.

2.0 CHEMICAL/PHYSICAL HAZARDS & CONTROLS

2.1. Procurement, Labeling, Distribution, and Storage










2.1.1 Procurement

- a) Obtain chemicals and other laboratory materials from vendors that comply with EPA and DOT regulations.
- b) Order the smallest quantity necessary for the work being performed in the laboratory. Avoid storage of excess quantities of chemicals.
- c) Confirm the laboratory representative designated to receive chemicals has been trained in handling the specific hazards of the item being received and can locate the appropriate SDS.
- d) Never accept a container that has visible signs of deterioration or damage.

2.1.2 Labeling

- a) Original containers must retain the manufacturer's original label. Labels on all chemical containers may not be removed or defaced until the container is empty.
- b) Secondary containers (containers other than the original container) must bear the full chemical name and any applicable hazard warnings / pictograms. OSHA pictograms are found within 29 CFR 1910.1200 Hazard Communication Standard and are shown below:

HCS Pictograms and Hazards

<p>Health Hazard</p>  <ul style="list-style-type: none"> • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity 	<p>Flame</p>  <ul style="list-style-type: none"> • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides 	<p>Exclamation Mark</p>  <ul style="list-style-type: none"> • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non-Mandatory)
<p>Gas Cylinder</p>  <ul style="list-style-type: none"> • Gases Under Pressure 	<p>Corrosion</p>  <ul style="list-style-type: none"> • Skin Corrosion/ Burns • Eye Damage • Corrosive to Metals 	<p>Exploding Bomb</p>  <ul style="list-style-type: none"> • Explosives • Self-Reactives • Organic Peroxides
<p>Flame Over Circle</p>  <ul style="list-style-type: none"> • Oxidizers 	<p>Environment (Non-Mandatory)</p>  <ul style="list-style-type: none"> • Aquatic Toxicity 	<p>Skull and Crossbones</p>  <ul style="list-style-type: none"> • Acute Toxicity (fatal or toxic)

- c) Hazardous waste labeling guidelines are found in the university's Hazardous Waste Program.
- d) Once empty, containers must be rinsed and the labels marked out and the container marked as empty.

2.1.3 Distribution & Transportation

- a) When transferring chemicals from the original container to secondary containers, label the containers with the information described in the above "Labeling" section if the contents are not immediately used by the same individual who performed the transfer.
- b) When performing transfers of hazardous chemicals, use secondary containment measures and any applicable equipment to prevent spills.
- c) Laboratory personnel may transport chemicals within the same building, from room to room. During transportation, chemicals must be kept in a secondary container and on a cart with applicable spill cleanup measures available. If moving chemicals

between floors, use an elevator.

- d) Hazardous waste must not be transported at any time by individuals outside of the EH&S Office. For a hazardous waste pickup, reference <https://www.wm.edu/offices/ehs/waste-recycling/hazardwaste/>.
- e) If there is a need to move chemicals between buildings, EH&S will perform the transfer. Email safety@wm.edu to request a relocation of chemicals.
- f) William & Mary employees shall contact the EH&S Office prior to transferring hazardous materials off campus. Outline the reason for transport, the destination, and the verification that there is coordination with a safety representative or appropriate personnel at the new location has taken place.

2.1.4 Storage

- a) Chemicals shall be stored according to the hazard classes listed below:
 - i. Explosives
 - ii. Gases
 - iii. Flammable and combustible liquid
 - iv. Flammable solid, spontaneously combustible, and dangerous when wet.
 - v. Oxidizer and organic peroxide
 - vi. Poison (toxic)
 - vii. Radioactive
 - viii. Corrosive
 - ix. Miscellaneous
- b) Precautions must be taken when storing certain hazard classes of chemicals
 - i. Acids: Store large bottles on low shelves or in acid cabinets. Segregate oxidizing acids (ie nitric acid) from organic acids, flammable and combustible materials. Segregate acids from bases and active metals such as sodium, potassium, magnesium.
 - ii. Bases: Segregate bases from acids.
 - iii. Flammables: Store only in approved safety cans or cabinets. Segregate from oxidizing acids and oxidizers. Keep away from any source of ignition (flames, localized heat, or sparks). Store highly volatile flammable liquids in properly ventilated, cool storage areas.
 - iv. Oxidizers: Store in a cool, dry place. Keep away from flammable and combustible materials such as paper and wood. Keep away from reducing

agents such as zinc, alkaline metals, and formic acid.

- v. Water reactive chemicals: Store in a cool, dry place. Post appropriate warning signs not to fight fire with water.
 - vi. Pyrophorics (ignite spontaneously when exposed to air): Store in a cool, dry place in airtight containers.
 - vii. Peroxides formers: Store in airtight containers with receiving, opening and future disposal dates.
 - viii. Carcinogens and teratogens: Store according to the hazard category of the chemical and ensure that all containers are labeled as such.
 - ix. Select Agents: Store in locked cabinets.
 - x. DEA-regulated materials: Store in locked cabinets and per DEA regulations.
- c) In addition to storing chemicals according to their hazard class, adhere to the following general storage practices:
- i. Amounts of solvents and chemicals stored in the laboratory working areas should be as small as possible.
 - ii. Hazardous chemicals should be segregated into well-identified areas with proper ventilation.
 - iii. Chemicals not requiring specific cabinet storage shall be stored in another closed cabinet or on shelves and protected from the chance of falling or breakage.
 - iv. Store chemicals in secondary containers, when possible, to prevent spills.
 - v. Store heavy containers on lower shelves.
 - vi. Avoid storing liquids in glass containers higher than eye-level.
 - vii. Never store chemicals on the floor.
 - viii. Avoid exposure to direct sunlight and heat.
 - ix. If cold storage is required, the refrigeration unit must not be used for any other purpose and have a sign reading "NO FOOD - LAB CHEMICAL STORAGE ONLY".
 - x. If a chemical is flammable or combustible and cold storage is required, it must be stored in an approved refrigerator or freezer designed for flammable chemical storage.
 - xi. Stored chemicals should be examined several times per year for deterioration, container integrity, and possible replacement.

- xii. Any chemicals in damaged containers must be transferred to undamaged secondary containers.
- xiii. Unused, expired, or unneeded chemicals should be discarded as hazardous waste or repurposed for use in another lab. Contact EH&S at safety@wm.edu for guidance on chemical cleanouts.
- xiv. Only substances used for household cleaning purposes (Windex, household multi-purpose cleaners) may be stored under sinks.

2.2 Safety Data Sheets & Chemical Inventory

2.2.1 Safety Data Sheets (SDS)

- a) Manufacturers are required to prepare and provide safety data sheets (SDSs) for chemicals with hazardous properties. SDSs for hazardous chemicals used in a work area must be readily available to employees.
- b) William & Mary utilizes an online SDS database through VelocityEHS. The link to W&M's database can be found here: <https://www.wm.edu/offices/ehs/hazard/> and on the front and back of laboratory door signage via a QR code.
- c) When a new chemical is added to a space, the owner of the space must contact EH&S to ensure the SDS is added to the database.
- d) Reading and utilizing the information in a safety data sheet is covered under the Hazard Communication Program and this is communicated via web-based Hazard Communication training.
- e) Safety data sheets are an important source of information relating to the chemical and physical hazards of the chemical, PPE requirements, first aid response, and handling & storage, among others.

2.2.2 Chemical Inventory

- a) All areas storing hazardous chemicals must have an inventory of all chemicals (including gas cylinders) on site. This inventory must be updated routinely to effectively demonstrate a current list of hazardous chemicals available.
- b) A chemical inventory must include the following information about each chemical:
 - i. Full name on SDS
 - ii. CAS Number
 - iii. Building
 - iv. Room
 - v. Additional location details (ie cabinet C, cold storage refrigerator, etc)

- vi. Principal investigator email address
 - vii. Principal Investigator's name
 - viii. Manufacturer
 - ix. Number of containers
 - x. Amount in container (for 32 oz, this would be "32")
 - xi. Unit (unit of measure such as oz, g, L)
 - xii. Phase (solid, liquid, gas)
 - xiii. Type of container (plastic, glass, metal)
- c) A chemical inventory is required to be submitted to the EH&S Office at least annually. Contact EH&S when removing or adding new chemicals to ensure the SDS Online database stays current.

2.3 Laboratory Design & Signage

2.3.1 General Design

- a) Each laboratory should have a general ventilation system appropriate for its hazards, with air intake and exhaust positioned to prevent contaminated air exceeding PEL or TLV limits from entering the laboratory.
- b) Each laboratory also must provide adequate, well-ventilated storage areas, laboratory hoods, and sinks.
- c) Where required, other safety equipment including eyewash stations, drench hoses, and showers, must be provided and conspicuously labeled.
- d) Appropriate arrangements for waste storage and disposal must exist, to include secondary containment. Reference <https://www.wm.edu/offices/ehs/waste-recycling/hazardwaste/> for more information.
- e) All building utility/mechanical systems, including electrical, water supply, sanitary plumbing, vacuum, compressed air etc., must be adequate and appropriate for equipment, processes, and activities in the laboratory.
- f) Chemical hygiene related equipment (hoods, refrigerators, etc.) should undergo continuing inspection (at least annually) and be modified, improved, replaced or repaired by qualified personnel as needed.
- g) The work performed and its scale must be appropriate for the laboratory's size, type, and ventilation capabilities.

2.3.2 Ventilation

- a) The general ventilation system should supply breathing air and support local

ventilation devices, continuously replace laboratory air, maintain airflow from non-laboratory areas to the exterior, and not be relied upon to protect against toxic substances released in the laboratory.

- b) Provide at least 2.5 linear feet of fume hood space per two workers regularly handling hazardous chemicals. Hoods should have monitoring devices to verify adequate performance before use. If the hood is alarming or not working properly, do not use and enter a work order to address the issue.
- c) Local exhaust ventilation, canopy hoods, snorkels, etc., should be provided as needed. Each system should have a separate exhaust duct.
- d) Exhaust air from glove boxes and isolation rooms should be passed through scrubbers or another treatment facility before release into the regular exhaust system.
- e) Cold/warm rooms should have provisions for rapid escape in case of power failure.
- f) Modifications to ventilation systems should be made only if testing shows that these modifications will ensure that worker protection from airborne toxic substances will continue to be adequate. Modifications shall be made only by a qualified/authorized technician. Changes must be reviewed with EH&S prior to contracting or starting work.
- g) Request for modification shall be submitted to Facilities Operations for review and then approved by the university's building code official, if needed, before proceeding with modifications. The system shall be re-certified after maintenance or modifications.
- h) In reference to performance, six to twelve room air changes/hour is normally adequate general ventilation if local exhaust systems such as hoods are used as the primary method of control. General air flow should not be turbulent and should be relatively uniform throughout the area, with no high velocity or static areas. Airflow into and within the hood should not be excessively turbulent. Hood face velocity should be adequate.
- i) Typically, the face velocity would be 80 – 100 feet per minute (FPM). Ventilation systems shall be evaluated upon installation, tested annually, and whenever changes are made.

2.3.3 Maintenance

- a) Safety equipment such as eye wash fountains, safety showers, and other protective equipment shall be inspected monthly by the PI or his/her designated alternate.
- b) Annual building safety equipment testing shall be performed and/or coordinated by Facilities Operations.

- c) All maintenance and repair needs should be requested through the Facilities Operations work request system.

2.3.4 Signage

- a) Location signs for safety showers, eyewash stations, other safety equipment, exits, and storage areas should be posted. EH&S can assist in determining the proper type and placement of signs.
- b) Warning signs, denoting restricted areas or hazardous equipment are required.
- c) Door signage facing common areas must be restricted to safety and formal research protocol – related information. There shall be no additional signage or items posted that could distract from safety- related signage. This stipulation is for doors only.
- d) Front door safety signage is posted by the EH&S Office with input from the Principal Investigator, who is responsible for ensuring its accuracy. No additional items or signage may be posted on laboratory doors that could distract from safety signage
- e) Back door Hazard Communication and emergency contact signage is posted by the EH&S Office. No additional items or signage may be posted on laboratory doors that could distract from safety signage.

2.4 General Guidelines for Working with Chemicals

This section details standard practices to follow when working with chemicals. Particularly hazardous substances should be reviewed with EH&S and the Principal Investigator so that appropriate additional safety precautions may be taken.

2.4.1 General Laboratory Rules

- a) Wear long pants or a long skirt that reaches your ankles to fully cover your legs.
- b) Wear close-toed shoes at all times in the laboratory. Open-toed shoes, sandals, crocs or flip flops are not to be worn in the laboratory areas.
- c) Select a shirt or lab coat that covers your arms and upper torso (no crop tops or sleeveless shirts unless covered by a lab coat).
- d) Confine long hair, loose clothing, and dangling jewelry.
- e) Do not bring any drinks or food inside of a laboratory.
- f) Do not eat, drink, smoke, chew gum, or apply cosmetics or lip balm in areas where laboratory chemicals are present. Wash hands before and after conducting these activities.
- g) Avoid working alone.

- h) Know the location of the spill kit, eyewashes, emergency shower, fire extinguisher(s) and nearest exit path(s).
- i) A PI must always be available for each laboratory. If the PI is unable to come to work or is out of town for personal or campus business, an alternative PI must be clearly designated on the laboratory door, and lab members (including students) must have the ability to contact this person.
- j) Perform only authorized experiments. Researchers who are responsible for their own experimental programs should inform others working in the area of chemicals being used and their potential hazards.

2.4.2. Fume Hood Management & Use

- a) Fume hoods and other associated protective equipment should be always maintained in operating conditions.
- b) Monitoring of performance and any scheduled preventative maintenance must be done in accordance with the manufacturer's recommendations, at a minimum annually.
- c) Materials stored in the hood should be kept to a minimum and should not block vents or air flow. Too much equipment and the presence of bulky objects in the hood are common causes of poor performance (air turbulence and dead spots). To minimize air turbulence and dead air, raise necessary bulky objects off the work surface.
- d) A fume hood shall not be used for chemical storage, unless storage is its sole function. When used for storage, the fume hood shall remain ON at all times and the sash shall be maintained in a CLOSED position.
- e) Place work well inside the hood, at least 6 inches from the sash. The forward six inches are most subject to drafts and turbulence. Pour and transfer materials as far back as feasible.
- f) Do not place your head inside a fume hood.
- g) Maintain the hood sash at the smallest open area. Use the sash as a protective shield.
 - i. For horizontal hood sashes, keep the sash as low as feasible when working in the hood. Never raise the hood above 18" as the ventilation will be negatively impacted.
 - ii. For sashes with a combination vertical / horizontal sash, use the vertical panes for moving things in and out of the hood, and use the horizontal sash when working in the hood. It is also possible to use the middle panes as a shield while working with only your arms in the hood. Never use the hood

without the glass sash in front of your face as a shield.

- h) Keep the hood clean. Clean up spills immediately to avoid buildup of contaminants in the hood.

2.4.3. Housekeeping

- a) Each person is responsible for keeping his/her work area neat and orderly.
- b) All persons using community areas such as hoods, ovens, and balances share responsibility for keeping those areas clean.
- c) Floors, counter tops, and high touch areas should be cleaned regularly.
- d) Laboratory benches, aisles, and hallways should not be used as storage areas. They should be cleared immediately after completion of each experiment.
- e) Compressed gas cylinders and dewars must be stored in designated areas only.
- f) Access to exits, emergency equipment (fire extinguishers, safety showers, eyewashes, etc) and electrical panels shall never be blocked.
- g) Laboratory apparatus shall be assembled in a stable, orderly fashion.
- h) Clean up all small spills (less than one liter) and leaks immediately. Neutralize acid or base spills using spill kit materials or sodium carbonate for acids, or boric acid for bases. Clean solvent spills with activated carbon solvent cleaner or spill pads. All spills, regardless of size, must be reported to the EH&S Office to ensure proper cleanup and disposal.

2.4.4. Personal Protective Equipment (PPE)

Any personal protective equipment (PPE) required, such as specialized clothing, gloves, respirators, or goggles, will be provided at no cost to the employee.

- a) General Guidelines
 - i. PPE will be compatible with the hazardous chemical being handled.
 - ii. The SDS provides pertinent information on the type of PPE to be used.
 - iii. Actual selection may vary depending on availability of other equipment such as fume hoods, ventilation systems, etc.
 - iv. Assistance in selecting and in training the individual on the use and care of the PPE can be provided by the EH&S Office upon request.
 - v. Necessary funds for these materials and any other safety related items, should be included in the contract or grant budgets and the normal operating budgets of the research or service departments.
- b) Respirators

- i. Where the use of respirators is necessary to maintain exposure below the PEL, they shall be provided at no cost to the employee and selected based on the specific hazardous chemicals being used.
 - ii. All respirator use must be reviewed and approved by EH&S. This includes N95s.
 - iii. Procedures for selection of the proper respirator and subsequent qualitative/quantitative fit testing are provided in the university's [Respiratory Protection Program](#).
 - iv. Prescribed and voluntary use of respiratory protection (including N95s) must be reviewed and documented by the EH&S office prior to use.
 - v. Student (non-employee) and visitor (non-contractor) participation in respirator use will be limited to voluntary use of disposable filtering facepiece respirator (N95 mask), unless other use is approved in writing by EH&S.
- c) Eye Protection

Eye protection for laboratory workers is of such importance that all persons working directly with hazardous chemicals in the laboratory must have eye protection of some type.

- i. This may include safety glasses, safety goggles, face shields, exhaust hoods, protective shatterproof shields or a combination thereof.
- ii. Safety glasses must be worn whenever there is a risk of eye injury from flying particles, chemical splashes, or potentially injurious light radiation.
- iii. Safety glasses must fit securely and offer side protection. Normal prescription eyewear is not sufficient.
- iv. OTG (Over-the-glasses) safety glasses are worn over prescription glasses.
- v. If the task involves high splash risks, fine dust, or hazardous vapors, choose safety goggles or OTG goggles instead of safety glasses.
- vi. Safety glasses or goggles must be worn under face shields or when using a hood sash or shatterproof shield.
- vii. The only exceptions to wearing eye protection are as follows:
 - Persons working at their desks in lab areas or adjacent to lab benches need not wear eye protection.
 - In offices removed from likely contact with laboratory materials.
 - Specialized laboratories as approved by EH&S.

d) Gloves

Skin contact is a potential exposure route to hazardous materials and can cause dermatitis, burns, or absorption of toxic or carcinogenic chemicals.

- i. Proper protective gloves need to be worn when working with toxic or corrosive materials or with materials of unknown toxicity.
- ii. No one glove is suitable for handling all chemicals. Additionally, gloves designed to protect against chemical hazards generally are not good choice for protection against physical hazards such as very hot or very cold materials.
- iii. Chemical protective gloves should be selected on the basis of the material being handled and their suitability for the particular laboratory operation.
- iv. Glove manufacturers provide a matrix for the suitability of glove materials which must be reviewed prior to choosing the glove for the task.
- v. Latex gloves are not recommended for use due to the risk of sensitization from repeat usage. This can cause users to develop a latex sensitivity or allergy.

2.5 Chemical Classifications

Chemicals are categorized based on their characteristics and hazards.

2.5.1 Allergens, Reproductive Toxins, and Embryotoxins

Allergens can cause sensitization of the skin and lungs after prolonged or repeated exposure. Embryotoxins are reproductive toxins that affect a growing fetus. Reproductive toxins affect both men and women and can cause sterility in men and affect both the eggs and developing fetus in women.

- a) When working with allergens such as diazomethane, isocyanate, and dichromates, wear suitable gloves to prevent hand contact. Prolonged or repeated exposure to these chemicals can lead to sensitization of the skin and lungs.
- b) When working with embryotoxins such as organomercurials, lead compounds, and formamide, women of childbearing potential should take special care to avoid exposure, particularly during the first trimester of pregnancy. Pregnant women or those planning pregnancy should consult their PI/supervisor and EH&S before working with reproductive toxins. These substances must be handled in a hood with appropriate protective equipment, including gloves
- c) Store these materials, properly labeled, in adequately ventilated areas in unbreakable secondary containers whenever possible.
- d) Notify the Principal Investigator / lab supervisor and EH&S of all incidents of exposure or spills.

2.5.2 Moderate Chronic or High Acute Toxicity Chemicals

- a) Examples of these chemicals are hydrofluoric acid, hydrogen cyanide, and diisopropyl fluorophosphate.
- b) Use and store these chemicals only in areas of restricted access that are posted with special warning signs. These areas should include a hood with an average face velocity of at least 80 linear feet per minute (LFM) or other containment device when procedures may result in the generation of aerosols or vapors containing the chemical.
- c) Always avoid skin contact by using gloves and long sleeves. Check the chemical compatibility charts and safety data sheets to be sure that gloves used are appropriate for the chemical used. Wash hands and arms immediately after use.
- d) Ensure that at least 2 people are present if the material in use is highly toxic or of unknown toxicity.
- e) Be prepared for an accident or spill. Store breakable containers of this substance in chemical-resistant trays. Cover work and storage surfaces, if possible, with removable, absorbent, plastic-backed paper. Know where spill kits are located.
- f) Methylene chloride (dichloromethane) is a highly volatile and chronically toxic solvent. The Methylene Chloride Workplace Chemical Protection Program (Appendix E) details procedures/guidelines to protect the health and safety of all persons in the university community who may be occupationally exposed to methylene chloride. Methylene chloride shall not be used without an approved exposure control plan, and exposure monitoring.

2.5.3 High Chronic Toxic Chemicals

- a) Examples of these chemicals are dimethyl mercury, nickel carbonyl, benzo-a-pyrene, N-nitrosodiethylamine, and any other human carcinogen or substance with high carcinogenic potency in animals.
- b) Conduct all work and transfers involving these substances in a controlled area, such as a restricted-access hood, glove box, or designated lab space where personnel are aware of the hazards and required precautions. Prepare a written use and disposal plan and obtain approval from the laboratory supervisor and principal investigator.
- c) Decontaminate vacuum pumps, glassware, and other equipment in the hood before removing them from the controlled area. Decontaminate the area before resuming normal work and remove protective equipment and thoroughly wash exposed skin before leaving.
- d) If toxicologically significant amounts of these substances are used regularly (three or more times per week), consult a university-approved occupational medical provider regarding medical surveillance. Copies of the physician's recommendations should

be provided to the EH&S Office and the employee's supervisor. The department will cover all medical surveillance and evaluation costs.

- e) Adequate records should be kept by the Principal Investigator of the amounts stored and used, dates of use, and names of users.
- f) The controlled area should be conspicuously marked with warning signs and restricted access signs and all containers should be appropriately labeled. Contact EH&S for assistance in developing proper signs.
- g) These chemicals should be stored only in a ventilated, limited access area in appropriately labeled, unbreakable, chemically-resistant secondary containers.

2.5.4 Carcinogens

Carcinogens are chemical or physical agents that cause cancer. Generally, they are chronically toxic, meaning that they cause damage after repeated or extended exposure and their effects may have no immediate harmful effects.

- a) Many substances are known carcinogens, and additional carcinogens continue to be identified. Non-carcinogenic substitutes should be used whenever possible; otherwise, precautions must be taken to prevent inhalation, ingestion, or skin contact exposures
- b) Chemical carcinogens have been defined in two classes. The experimental animal carcinogens which present a minimum hazard, and the suspected and known human carcinogens which present a high degree of hazard.
- c) The only carcinogens specifically regulated are listed in 29 CFR part 1910, Subpart Z. This standard contains exposure limits and requirements for specific toxic and hazardous substances in the workplace.
- d) These standards are not replaced by the Occupational Exposure to Hazardous Chemicals in Laboratories Standard, 29 CFR 1910.1450.
- e) Users of these materials must comply with all applicable substance-specific standards when exposures exceed OSHA permissible exposure limits or action levels. Copies of these standards are available from the EH&S Office, and OSHA-regulated carcinogens are listed on the OSHA website: [Carcinogens - Standards | Occupational Safety and Health Administration \(osha.gov\)](https://www.osha-slc.gov/standards/carcinogens)
- f) In addition to all general safety rules cited above, when working with carcinogens, the following procedures should also be employed:
 - i. Prepare a written plan for use and disposal of these materials and obtain the approval of the laboratory supervisor and principal investigator. Forward a copy of the approved plan to EH&S.
 - ii. Consult the safety data sheets and complete a protocol outline (Appendix A)

and submit to EH&S for review. A copy of this document should be filed with the principal investigator and lab supervisor as well.

- iii. Conduct all transfers and work with these materials in a “controlled area.” A “controlled area” is defined as a restricted access hood, glove box, or portion of a lab, designated for use of carcinogens, for which all people with access are aware of the substances being used and necessary precautions.
- iv. The controlled area must be marked with signage that states: “Caution, Cancer Suspect Agent.”
- v. Entrances into areas where known carcinogens are used in appreciable quantities shall be posted: “Cancer-Suspect Agent, Authorized Personnel Only.”
- vi. These chemicals should be stored only in a ventilated, limited access area in appropriately labeled, unbreakable, chemically resistant secondary containers.
- vii. Adequate records should be kept of the amounts sorted and used, dates of use, and names of users.

2.5.5 Flammable Materials

A flammable material is defined by its flash point, or the minimum temperature at which a liquid gives off vapor in sufficient concentration to form an ignitable mixture within the air near the surface of the liquid. Chemicals with a flash point below 100°F (93.3°C) are defined as flammable. Materials with a flash point above this temperature are considered combustible.

- a) When handling flammables, know the location and proper use of fire extinguishers and other pertinent safety equipment in your area.
- b) Never heat flammable liquids with an open flame, hot plate, or uninsulated resistance heaters. Use a heating mantle, steam bath, or hot water bath instead. Electrically driven stirrers should be explosion proof.
- c) Handle solvents in exhaust hoods or a well-ventilated area.
- d) Keep solvents to a minimum in the lab.
- e) Since static electricity can start flammable solvent fires, electrically ground containers when transferring from one container to another if hot or a potential for sparking exists.
 - i. Metal drums in common areas are grounded.
- f) Formaldehyde is a colorless, flammable, strong-smelling chemical widely used in laboratories on campus. The Formaldehyde Program (Appendix C) details procedures/guidelines to protect the health and safety of all persons in the university community who may be occupationally exposed to formaldehyde gas, its solutions, and/or materials that release formaldehyde.

2.5.6 Reactives

Reactive chemicals have the ability to react when exposed to other chemicals or certain physical conditions. When they react spontaneously, they may generate large quantities of heat, light, gases, or toxic chemicals. These include explosives, acid-sensitive oxidizers and reducers, water sensitive materials, and pyrophoric materials (react when exposed to air).

- a) Hazards are specific to each chemical and the SDS must be thoroughly reviewed. It is important to understand the possible dangers before use.
- b) Keep the amount used in the laboratory to a minimum.
- c) Use a hood sash, a safety shield, or a face shield along with safety glasses or goggles.
- d) Segregate chemicals that are capable of explosive reactions with each other and take greater precautions as the quantities of such chemicals increase.

2.5.7 Corrosives

Corrosives are defined by OSHA as “a chemical that causes visible destruction of, or irreversible alterations in living tissue by chemical action at the site of contact.” These materials can destroy both living tissue and other materials they come in contact with. These include bases, oxidizers, and acids.

- a) Understand possible dangers before using by consulting both the SDS and the label.
- b) Store in proper containers that are compatible with the contents, and free of any damage that could cause the material to leak out of the container.
- c) Inspect containers regularly for damage and see that lids fit properly.
- d) Follow all rules pertaining to good housekeeping, labeling, handling, and disposal. Avoid spillage. If a spill occurs, neutralizing agents are available in any spill kit.
- e) Use appropriate protective equipment.
- f) Keep sealed when not in use.

2.5.8 Compressed Gases

Compressed gases are defined by OSHA to be a gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70°F. Hazards associated with compressed gases include oxygen displacement, fires, explosions, and toxic gas exposures as well as physical hazards associated with high pressure systems.

- a) Always store gas cylinders in an upright position.
- b) In certain temporary or transient situations, or where upright storage is impractical, cylinders may be stored horizontally if they are secured to prevent rolling. Be alert to extra hazards such as dropping cylinders while moving them from vertical to horizontal.

- c) Do not store compressed gases near heat sources or in unventilated areas such as storage trailers and closets, or anywhere the temperature exceeds 125°F (252°C).
- d) Store combustible or flammable gases at least 20 ft. (6 m) from oxygen cylinders and other oxidizing chemicals and cylinders or separate them by a fire-rated partition.
- e) Store bulk quantities of gases outside buildings, and well away from building ventilation intakes. Request guidance from EH&S on maximum quantities of compressed gases allowed in your work area.
- f) Never store a flammable gas container in an unventilated cabinet. Flammable liquid storage cabinets are not intended for the storage of small cylinders of compressed or liquefied gases.
- g) Always keep the cap on the cylinder during transport and when not in use with a regulator attached.
- h) Except when used in specially designed equipment, all cylinders must be stored upright and secured to prevent tipping. When storing cylinders of different sizes together, ensure all are properly secured. Lecture bottles may be stored horizontally.
- i) Use hand trucks whenever moving gas containers. The containers must be upright and secured by chains or straps and the protective caps must be in place. Hand trucks must only be used when transporting and never for storage or use.
- j) Label all storage areas for compressed gases as to contents and identify empty and full cylinder storage racks with signs. Individual cylinders or tanks must be labeled as to contents and important precautions.
 - i. Cylinder storage areas should be well drained to prevent bottom corrosion.
 - ii. Gas cylinders will cause bone-crushing foot injuries if dropped.
 - iii. Always use a reducing valve or a pre-set pressure controller.
 - iv. Do not lubricate, modify, or tamper with a cylinder valve.

2.5.9 Select Agents

Select agents are biological agents and toxins that have been determined to pose a severe threat to public health and safety. Specifically regulated pathogens and toxins are defined in Title 42, CFR, Part 73. Under Federal Regulations, certain classes of activity require formal review before they may be undertaken by employees or students of the university.

- a) Faculty members who have select agents or toxins, or those who plan to purchase them in the coming term, are to notify EH&S **immediately**, with information on type, quantity, storage location and safety precautions against theft, diversion, and misuse.
- b) Empty select agent containers, including shipping containers, should be deactivated

using a 1:10 bleach solution. Containers should be marked “Deactivated” prior to turning them in for disposal.

2.5.10 Peroxide-Forming Chemicals (PFCs)

Some common organic chemicals can react with air to form unstable and dangerous peroxide compounds. Peroxides are a class of chemical compounds with unusual stability issues and are one of the most hazardous classes of chemicals routinely handled in the laboratory.

- a) Faculty members who have peroxide-forming chemicals should affix a label to the container indicating the date received, date opened and name of owner.
- b) Typically, PFCs are stored in tightly closed containers. Vent caps may be appropriate if pressure venting is required. See manufacturer recommendations.
- c) Prior to using, PFCs should be evaluated for peroxide content.
 - i. Users should verify that the container shows no visible discoloration, liquid stratification or crystallization around the cap or in the solution.
 - ii. Users should test liquids for peroxide content using either EM Quant peroxide test strips or Quantofix peroxide test strips. Assessing peroxide levels is identified on the test strips bottle.

3.0 LABORATORY EXPERIMENTS & EQUIPMENT PROCEDURES

3.1 Hierarchy of Controls

The hierarchy of controls identifies the preferred order of action to best control hazardous workplace exposures. This is to be used when identifying hazards that are present in a laboratory process.

3.1.1 Elimination: This removes the hazard at the source and is the preferred method of hazard control. This could change the work process to stop using a toxic chemical, heavy object, or sharp tool.

3.1.2 Substitution: Using a safer alternative to the source of the hazard. When considering a substitute, compare the potential new risks of using the substitute to the original risks.

3.1.3 Engineering Controls: These reduce or prevent hazards from coming into contact with workers. The most effective engineering controls:

- a) Are a part of the original equipment design
- b) Remove or block the hazard at the source before it comes into contact with the worker
- c) Prevent users from modifying or interfering with the control
- d) Need minimal user action for the controls to work

- e) Operate correctly without interfering with the work process or making the work process more difficult.

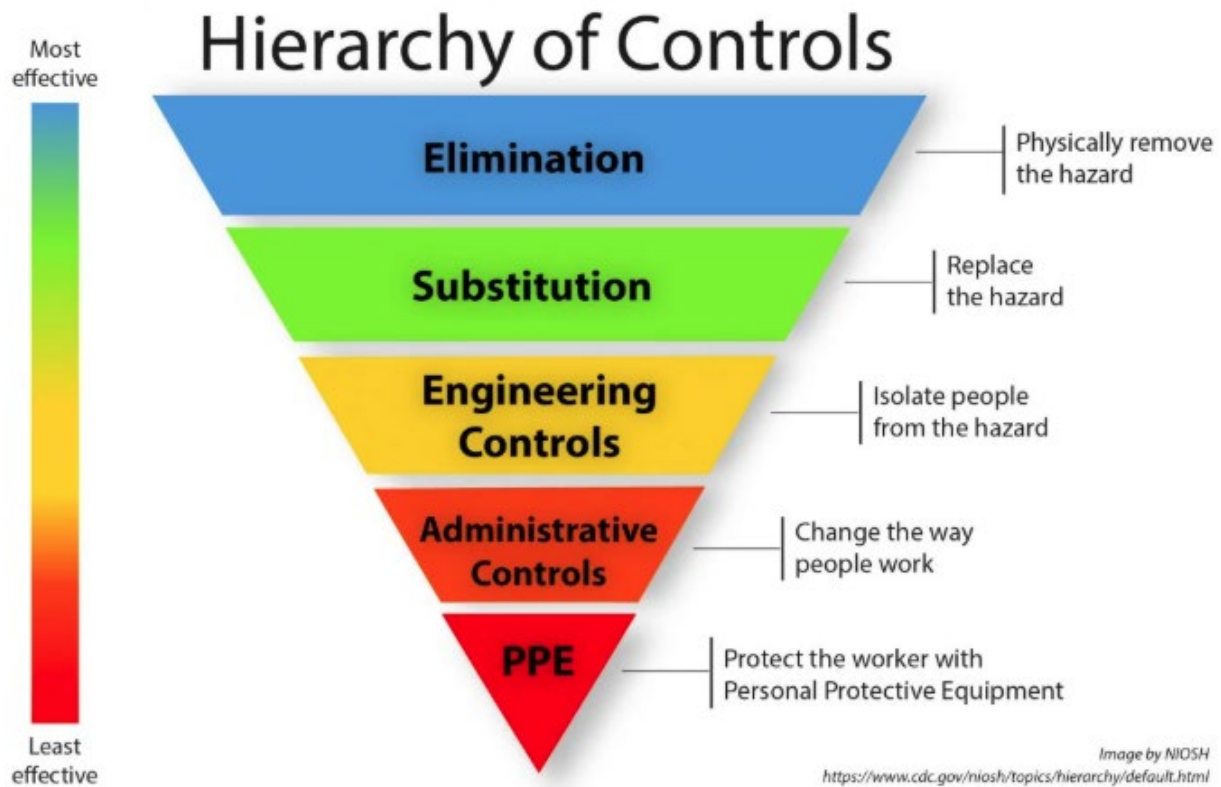
3.1.4 Administrative Controls

These establish work practices that reduce the duration, frequency, or intensity of exposure to hazards. This may include:

- a) Work process training
- b) Job rotation
- c) Ensuring adequate rest breaks
- d) Limiting access to hazardous areas or machinery
- e) Adjusting the speed of the process

3.1.5 Personal Protective Equipment (PPE)

This is equipment worn to minimize exposure to hazards. Examples include gloves, safety glasses, hearing protection, and hard hats. PPE should not be relied upon when other effective control options (above) are available. Personal protective equipment types and selection are covered in section 2.4.4.



3.2 Laboratory Experiments

3.2.1 Planning Experiments

- a) Principal investigators must develop SOPs for work involving hazardous chemicals or processes using the Appendix B template. At a minimum, SOPs must include:
 - i. A description of the process or task and the desired outcome.
 - ii. Roles & responsibilities for overall content, administration, maintenance, and training.
 - iii. Training required.
 - iv. A hazard analysis that both identifies the hazards and describes how they are mitigated.
 - v. Supplies and equipment required.
 - vi. Personal Protective Equipment required
 - vii. Description of how to perform the experiment or operation.
 - viii. Emergency response procedures if hazards are not properly mitigated.
 - ix. Decontamination procedures if using select agents or high acute toxic chemicals.
 - x. References used to create and supplement the SOP.
- b) List all possible reactions, including side reactions, before starting experiments. When working with select carcinogens, reproductive toxins, and chemicals with high acute toxicity, the protocol outline for the use of particularly hazardous substances (Appendix B) should be utilized.
- c) Think through all reactants, intermediates, and products in terms of flammability, toxicity, and reactivity hazards.
- d) Follow recognized safety procedures concerning protective equipment, housekeeping and handling.
- e) In an unknown reaction, always start with small quantities of material and carefully observe reaction characteristics such as temperature, color, viscosity, and physical state.
- f) Obtain safety data on reactants and products from chemical reference books, laboratory analysis, or SDS.
- g) If possible, determine from thermodynamic and kinetic considerations the total quantity and rate of evolution of heat and gases to be released during the reaction.
- h) Provide adequate cooling, ventilation, pressure relief, and gas purging.

- i) Isolate the reaction vessel, if possible and make frequent inspections of equipment during the reaction.

3.2.2 Required Prior Approvals

Prior approval from the laboratory supervisor is required for any work outside normal laboratory operations. This approval process should be documented.

- a) Employees must obtain prior authorization from their supervisor to proceed with, or resume a task when:
 - i. New procedures involving hazardous chemicals must be reviewed before starting and as needed during the project.
 - ii. There is reason to suspect a failure of any of the equipment used in the process, especially controls such as fume hoods.
 - iii. Members of the staff have become ill, suspect exposure, smell chemicals, or otherwise suspect a failure of any controls.
 - iv. Any activity with foreseeable chemical hazards, including off-hours work, lone occupancy, or unattended operations
- b) Each supervisor/PI must establish the minimum number of qualified persons that must be present or sufficiently available for an activity involving hazardous materials. Post appropriate hazard warning signs and contact information outside of an area or room where an unattended process involving hazardous chemicals is in progress. Such unattended processes should follow an approved written procedure.

3.2.3 Standard Operating Procedures

Standard Operating Procedures are required for all tasks related to laboratory experiments. SOPs document how work is performed and identify the health and safety considerations necessary to reduce risk when working with hazardous chemicals or hazardous operations.

- a) SOPs are required for work involving hazardous chemicals and should also be developed for equipment or operations that pose physical hazards. Examples include, but are not limited to:
 - i. Work with particularly hazardous chemicals (e.g., hydrofluoric acid, pyrophorics)
 - ii. Laser operations
 - iii. Use of cryogenic liquids and fill procedures
 - iv. Compressed gas cylinder handling and regulator changes
 - v. High-voltage or high-energy equipment
- b) The EH&S Office provides guidance and assistance with SOP development but does

not generate SOPs on behalf of laboratories. SOPs must reflect the specific materials, equipment, and practices used by each research group.

4.0 LABORATORY INSPECTIONS & ISSUE RESOLUTION

4.1 Types of Inspections

4.1.1 Annual Laboratory Inspections

- a) All laboratories on campus that contain hazardous materials are typically inspected on an annual basis. Shops that contain hazardous materials such as makerspaces and areas within Facilities Operations are managed through the shop inspection program.
- b) If a PI would like to accompany EH&S on the inspection, they must contact safety@wm.edu by the first of the month when their inspection is due.
- c) Issues that are found are recorded in CampusOptics and assigned to the appropriate responsible party.

4.1.2 Unannounced Laboratory Inspections

All laboratories on campus are subject to inspection at any time. Approximately 10% of all laboratories on campus will be subject to an unannounced inspection each year. Reports and issues will be sent to the Principal Investigator and issues will be addressed and escalated in the same manner as annual inspection issues.

4.2 Issue Resolution

If a safety issue is identified in a laboratory outside of a formalized inspection, an issue can be assigned to the Principal Investigator or other responsible individual to address the safety issue.

4.2.1 CampusOptics

CampusOptics is a cloud-based system utilized by EH&S to track inspections and issues related to inspections. Each Principal Investigator or laboratory supervisor is responsible for receiving and completing issues within the CampusOptics system at wm.campusoptics.com.

4.2.2 Timeline of Resolution

- a) Items that are medium or low risk are given a due date of 30 days.
- b) High risk items are addressed in a timelier manner depending on the severity.
- c) Issues not addressed by their due date are reported to the responsible party with the chair of the department in copy. Thirty days are given to address these.
- d) If issues are not addressed or in the process of being addressed by the due date

determined in the first notice, a second notice will be sent to the responsible party with the chair of the department and dean in copy.

- e) Recurring issues and lack of attention to issues reported can be further escalated to the Vice Provost for Research and Provost on a case-by-case basis.

5.0 EMERGENCY PREPAREDNESS & RESPONSE

5.1 Employee Exposure Determination and Reduction Actions

5.1.1 Procedures

- a) Initial exposure monitoring is required only when a substance is regulated by a standard requiring monitoring and there is reason to believe exposures may routinely exceed the action level, TLV, or PEL.
- b) If monitoring is initiated, it will be performed in accordance with the relevant standard.
- c) Laboratory workers will be informed of the results of any monitoring within 15 days after receipt of the data. Notification will be made in writing, either to the individual (s) concerned, or by posting results in an appropriate location that is accessible to the laboratory workers.

5.1.2 Exposure Reduction Actions

- a) As stated in earlier sections of this Plan, hoods, proper ventilation, equipment including clothing, personal hygiene, safety shields, glove boxes, and prudent work practices are all measures that can be taken to reduce probability of laboratory worker exposure.
- b) EH&S will make periodic checks of laboratory facilities, in particular the high-risk areas, to ensure that these actions are being implemented. It is recommended that the laboratory supervisor accompany EH&S whenever possible.

5.2 Medical Program

5.2.1 General

All employees working with hazardous chemicals will be provided an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following conditions:

- a) Whenever the employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
- b) When exposure monitoring reveals an exposure level routinely above the action level (or PEL) for a VOSH regulated substance for which there are exposure monitoring and medical surveillance requirements.

- c) 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.
- d) Medical exams and consultations must be conducted by or under the supervision of a licensed physician and provided at no cost to the employee, without loss of pay, and at a reasonable time and place.

5.2.2 Emergency Medical Assistance.

The Williamsburg Fire Department provides EMS. Call 911 from a campus or cell phone, state the emergency and location, and report any chemical contamination immediately to dispatch and responders upon arrival.

5.2.3 Medical Information.

Whenever an employee is referred to a physician under this Chemical Hygiene Plan, the physician should be provided with the following information:

- c) The identity of the hazardous chemicals (s) to which the employee may have been exposed, including, if possible, a copy of the SDS. A description of the conditions under which the exposure occurred including quantitative exposure data, if available.
- d) A description of the signs and symptoms of exposure that the employee is experiencing, if any.

5.2.4 Physician's Written Opinion.

The written evaluation from the examining physician shall include:

- a) Any recommendation for further medical follow-up.
- b) The results of the medical examination and any associated tests.
- c) Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace.
- d) A statement that the employee has 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.
- e) This written opinion shall not reveal any specific findings of diagnoses not related to the occupational exposure.

5.3 **Record Keeping**

Accurate records shall be maintained by the EH&S Office of any measurements taken to monitor employee exposures and medical consultation/examinations including tests or written opinions required by this Plan. Information copies will be provided upon request to the Workers' Compensation Program representative.

APPENDIX A**Glossary of Terms**

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

Allergen: Substance causing altered body reactivity to a toxic substance in response to a first exposure.

Chemical Hygiene Officer: An employee designated by the employer, qualified by training or experience to provide technical guidance in the development and implementation of the Chemical Hygiene Plan.

Chronic: Long term degenerative effect of a hazardous substance marked by frequent reoccurrence over a long period of time.

Designated Area: An area which may be used for work with select carcinogens, reproductive toxins or highly acute toxic substances. A designated area may be the entire laboratory or a device as a fume hood.

Embryotoxin: A harmful agent that retards the growth, or adversely affects the development of an unborn child.

Glove Box: A sealed, protectively lined compartment, having ports to which are attached gloves for use in handling materials inside the compartment.

Hazardous Chemical: Any chemical for which there is statistically significant evidence that acute or chronic health effects may occur in exposed employees. This includes select carcinogens, reproductive toxins, irritants, corrosives, sensitizers, and other substances which may damage lungs, skin, eyes, or mucous membranes.

Hazardous Material: any substance or material that could adversely affect the safety of the public, handlers or carriers during transportation. This includes laboratory chemicals, radioactive materials, compressed gases, biological agents, refrigerants, and instruments that contain hazardous materials.

Highly Acutely Toxic: Any hazardous chemical with a short-term health effect which could be fatal or cause damage to target organs as a result of a single exposure or several exposures of short duration.

Laboratory Facility: Any facility/room/location/area where hazardous chemicals are used. It is a workplace where relatively small amounts are used on a non-production basis.

Laboratory Worker: An employee or assigned worker who may be exposed to hazardous chemicals in a laboratory, including maintenance and custodial staff. OSHA excludes occasional visitors (e.g., guests or salespeople). Students are only considered employees if paid; otherwise, they must still receive the same training and protections as employees..

Materials of Trade: a hazardous material, other than a hazardous waste, that is carried on a motor vehicle 1) for the purpose of protecting the health and safety of the motor vehicle operator or passengers 2) for the purpose of supporting the operation or maintenance of a motor vehicle or 3) by a private motor carrier in direct support of a principal business that is other than transportation by motor vehicle.

Other Regulated Material for Domestic Transport (ORM-D): a marking for mail or shipping in the United States that identifies other regulated materials for domestic transport only. Packages bearing this mark contain hazardous material in a limited quantity that presents a limited hazard during transportation, due to its form, quantity and packaging.

Oxidizer: A chemical that ignites or promotes combustion in other materials, thereby causing fire either to itself or through the release of oxygen or other gases.

Oxidizing Agent: Oxygen-containing material which can decompose, generating oxygen.

Particularly Hazardous Substance: chemicals with special acute or chronic toxicity. These chemicals are defined as being a select carcinogen, reproductive toxin, or have a high degree of acute toxicity.

Permissible Exposure Limit (PEL): the maximum amount or concentration of a chemical that a worker may be exposed to on a measurement of an 8-hour time weighted average, established by OSHA.

Peroxide-forming Chemicals: a class of compounds that can form and accumulate peroxide crystals under normal conditions, which may detonate under heat or mechanical shock. Many common organic solvents can form explosive peroxides, with formation accelerated by air, light, heat, moisture, or metal contamination. Peroxides may even form in unopened containers exposed to air during packaging.

Physical Hazards: a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric,

unstable (reactive) or water reactive.

Reactivity: The proclivity of a compound to chemically react with other substances or itself, resulting in the liberation of energy. Can cause the formation of toxic or corrosive materials, pressure build up, and temperature fluctuations.

Reproductive Toxin: Any chemical which affects the reproductive capabilities including chromosomal damage (mutagens), lethal effects on the fertilized egg, developing embryo, or fetus (embryotoxin) and malformation of the fetus (teratogens).

Teratogen: An agent or factor that causes malformation of an embryo.

Threshold Limit Value (TLV): A time weighted average air concentration based on an 8-hour day, established by the American Conference of Governmental Industrial Hygienists (ACGIH)

Transportation: The act or process of moving or shipping goods or things from one place to another. Common forms of transportation include planes, trains, automobiles and other two-wheel devices such as bikes or motorcycles.

Water Reactive: A chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

APPENDIX B- Standard Operating Procedure Template

Subject:		Publish Date:	
Written By:		Revision Date:	
Department:	[Department(s) this applies to, or "Campus" if it applies to all areas on campus that perform this task.]		

Standard Operating Procedure Title: [Clearly identifies the activity/task.]

Purpose: [What process or task will this cover and what is the desired outcome? This should be no longer than 1-2 sentences.]

Scope: [Which departments, roles, or functions will this affect?]

Roles and Responsibilities: [Define roles responsible for executing activities within the procedure. In most laboratory-specific SOPs, the PI is responsible for the SOP's overall content, administration, and maintenance, as well as training on the SOP. Departmental SOPs must define who is responsible for these tasks. Who is responsible for following the instructions outlined?]

Training: [What training is required to perform this procedure? Are there other SOPs someone would need to be trained on? For example, procuring liquid nitrogen or moving a gas cylinder.]

Hazard Analysis

- A. Hazard Identification** [Identify the hazards the procedure presents. What physical or chemical hazards? Biological hazards? Ask yourself, "What if...?"]
- B. Hazard Mitigation** [Explain the precautions and specify PPE that is used to minimize each hazard you identify.]

Supplies & Equipment: [Supplies required to perform the task & equipment used in the procedure. This may point to another SOP for reference, such as gas chromatograph, rotovap, etc]

Personal Protective Equipment: [specify the exact type of PPE, for instance 4 mil nitrile gloves, or silver shield gloves, etc]

Procedures: [The core steps necessary for accomplishing the purpose of the procedure, along with individual action steps within each core step. Include clarifying information and possible warnings.]

Emergency Response: [What steps do you take in the event one of your "What if" hazards actually happens?]

References: [List any references that you are using to formulate this process – i.e. peer review journal article, other SOPs, government-issued documents, etc.]

APPENDIX C**Protocol Outline for the Use of
Particularly Hazardous Substances (PHS)****DATE:****1. Project director or Principal Investigator's name:****2. Experience.** Summary of prior training and experience:**3. Personnel** conducting the work and their prior training and experience:**4. Identification of particularly hazardous substance. (Attach SDS):**

Full chemical name CAS #

5. Health hazard data:

OSHA (PEL):

ACGIH (TLV-TWA):

OSHA (STEL):

NIOSH (REL):

5.1 Routes of exposure:

5.2 Effects of overexposure (chronic and acute)

6. Standard operating procedures

6.1 Maximum quantity to be purchased or stored:

6.2 Designated area where material will be stored and handled:

6.3 Ventilation provisions:

6.4 Special weighing areas to be used:

6.5 Weighing techniques that will be used:

6.6 Experimental procedures:

6.7 Amounts expected to be used per month or week:

6.8 Solvents to be used:

6.9 Where the experiment is to be conducted (e.g. hood, glove box):

6.10 All designated areas. Where each part of the procedure will be conducted:

6.11 A summary of the rationale for using this hazardous substance:

7. Safety precautions that will be taken.

7.1 Include personal protective equipment, ventilation requirements, and any analytical methods available for monitoring possible exposure levels:

7.2 Emergency procedures including first aid procedure for eye or skin contact, inhalation, and ingestion:

7.3 Spill and leak cleanup requirements should be outlined with an emphasis on personal protective equipment required for cleanup of each of the possible physical states of the materials (liquid or solid).

8. Waste management and deactivation/disposal procedures:

APPENDIX D

Formaldehyde Program

I. INTRODUCTION

A. Purpose

The formaldehyde program establishes procedures to protect university personnel from occupational exposure to formaldehyde gas, solutions, and releasing materials. OSHA sets an 8-hour TWA limit of 0.75 ppm and a 15-minute STEL of 2 ppm.

The Formaldehyde Program consists of methods to be used to minimize possible workplace exposures to formaldehyde and to monitor the exposures and procedures and actions to be followed should exposures exceed specific levels or should there be a spill.

B. SCOPE AND APPLICATION

This program applies to all individuals (faculty, staff, students, & visitors) in university-managed areas who may be exposed to formaldehyde. Work areas are periodically monitored per specific requirements to assess exposure levels. The university ensures formaldehyde is handled safely and in compliance with applicable standards and regulations.

C. DEFINITIONS

Formaldehyde: The chemical formaldehyde (HCHO) has an irritating pungent odor and is classified as an upper respiratory irritant because of its high solubility in water. Formaldehyde is used in a variety of operations but tissue preservation is the primary source of exposure within the university community. See the Safety Data Sheet (SDS) for additional information.

PEL (Permissible Exposure Limit): The maximum permissible airborne concentration of formaldehyde to which any employee may be exposed. The PEL is established by OSHA as a legal standard. The PEL for formaldehyde is 0.75 ppm.

Action-Level: The exposure level below which respiratory protection and many other requirements of the Formaldehyde Standard need not be implemented. The current action level for formaldehyde is 0.5 ppm calculated as a TWO concentration.

STEL (Short-Term Exposure Limit): The maximum concentration of formaldehyde to which workers can be exposed continuously over a period of 15 minutes. The STEL for formaldehyde currently is 2.0 ppm.

TLV/TWA (Threshold Limit Value/Time Weighted Average): The time weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which it is believed nearly all workers may be repeatedly exposed, day after day, without adverse effect. These values are published yearly by the American Conference of Governmental Industrial Hygienists (ACGIH).

Time Weighted Average (TWA): The actual measured exposure level averaged over an 8-hour time period.

II. EXPOSURE MONITORING

Employees potentially exposed to formaldehyde are periodically monitored for short- and full-shift levels using representative sampling and passive dosimeters. If exposures exceed 0.5 ppm, the supervisor is notified, exposure reduction steps are recommended, and a written control plan is required. Exposures must be reduced below 0.5 ppm. Short-term high exposures are also monitored using 15-minute samples to ensure STEL compliance..

Monitoring will be conducted by the EH&S Office in such manner as to be representative of the 8-hour TWA of each employee. Representative 8-hour TWA employee exposures shall be determined on the basis of one or more samples representing full-shift exposure for each shift for each job classification in each work area. The frequency of such monitoring is required as follows:

- Initially, wherever there may be exposure by employees above the PEL to establish a baseline exposure level.
- Whenever there is a change in processes, equipment, personnel or control measures which may result in new or additional exposure to formaldehyde.
- If a report is received of signs or symptoms of a respiratory irritation or dermal conditions associated with formaldehyde exposure.
- Semiannually, whenever the most recent monitoring result reveals a TWA exposure above the 0.5 ppm action level.
- Annually, whenever the most recent monitoring result reveals employee exposure at or above the STEL.

Semiannual and annual monitoring, as specified above, are not required when two consecutive formaldehyde monitoring sessions which have been executed at least 7 calendar days apart and both indicate TWA and/or STEL exposures below 0.5 ppm and/or 2.0 ppm, respectively.

TWA levels measured to be in excess of 0.5 ppm are considered to remain above this level until 2 consecutive monitoring periods performed at least 7 calendar days apart confirm that the exposure concentration has dropped to below 0.5 ppm.

III. REPORTING MONITORING RESULTS

The area supervisor, with EH&S, must notify affected employees of formaldehyde monitoring results in writing within 15 days of receipt, either individually or by posting for at least three days. If the PEL is exceeded, employees must also be informed in writing of corrective actions.

TWA monitoring may be conducted at the discretion of the supervisor or EH&S. If PEL or STEL limits are exceeded, required PPE, including respirators, must be used immediately; additional protective gear may be needed at lower levels. OSHA specifies full-face respirators with formaldehyde-approved cartridges. EH&S will assist in selecting PPE, which is provided at no cost and must be worn. Employee rotation to reduce exposure is prohibited.

IV. MEDICAL REMOVAL

If an employee reports significant eye, respiratory, or skin irritation or sensitization from formaldehyde, they must be evaluated by a physician. If work-related exposure is confirmed and restrictions are recommended, the employer must promptly remove or reassign the employee to lower or no exposure work. Medical evaluation must be provided at no cost and without loss of pay.

V. INFORMATION AND TRAINING

All employees exposed to formaldehyde concentrations of 0.1 ppm or greater must receive training annually. The training program shall be conducted in a manner in which the employee is able to understand and shall include the following information:

1. The requirements of the OSHA regulations concerning formaldehyde (29 CFR 1910.1048) and a discussion of the safety data sheet.
2. A description of the operations in the work area where formaldehyde is present and an explanation of the safe work practices appropriate for limiting the exposure to formaldehyde.
3. A description of the potential health hazards associated with an exposure to formaldehyde and a description of the signs and symptoms of an exposure to formaldehyde. As a minimum, specific health hazards include: cancer, irritation and sensitization of the skin and respiratory system, eye and throat irritation, and acute toxicity.
4. A discussion of monitoring and other methods used to detect the presence of formaldehyde in the work area.
5. The measures employees must take to protect themselves from hazards associated with formaldehyde exposure. The purpose for, proper use of, and limitations of the required personal protective clothing and equipment.

6. The medical surveillance program applies to employees exposed to formaldehyde at or above the action level or STEL. It is also required in the following situations:

- If an employee develops signs and symptoms of an overexposure to formaldehyde.
- If an employee is exposed to formaldehyde during an emergency.
If requested by an employee's examining physician.

7. A review of emergency procedures for the handling of spills, emergencies, and clean-up.

8. An explanation of the importance of engineering and work practice controls for employee protection and any necessary instruction in the use of these controls.

VI. ENGINEERING CONTROLS

The Hierarchy of Controls reduces risk from least to most effective: PPE, administrative controls, engineering controls, substitution, and elimination. Ventilation (local or general) is the primary engineering control for reducing airborne exposure. Safe work practices and administrative procedures are also essential and must be followed to limit formaldehyde exposure.

If it is determined that there are areas where the concentration of airborne formaldehyde exceeds either the TWA or the STEL, the university will regulate those areas and post and maintain legible signs bearing the following information at all entrances or access ways:



FORMALDEHYDE

MAY CAUSE CANCER

**CAUSES SKIN, EYE AND
RESPIRATORY IRRITATION**

AUTHORIZED PERSONNEL ONLY

VII. LEAK, SPILL, AND EMERGENCY PROCEDURES

Small spills should be absorbed, collected in labeled containers, and reported to EH&S. For areas with potential large formaldehyde releases, supervisors must develop an emergency plan assigning roles and response procedures.

In a large spill or leak, evacuate the area immediately except for designated emergency personnel. Shut off ignition sources if safe to do so. Do not attempt cleanup without proper training and PPE.

Trained personnel should isolate the area and restrict access. Contact EH&S immediately at 757-221-1643.

Individuals with potential excessive formaldehyde exposure should receive prompt medical evaluation. Symptoms include eye and skin irritation and respiratory distress. If severity is uncertain, call the rescue squad for transport to an emergency facility.

APPENDIX E**Methylene Chloride Workplace Chemical Protection Program (WCPP)****Purpose**

The Environmental Protection Agency (EPA), under the Toxic Substances Control Act (TSCA), has ruled that methylene chloride (also called dichloromethane, DCM) poses an unreasonable risk of injury to health or the environment. Most uses are banned; however, there are 13 allowed uses of methylene chloride.

A Workplace Chemical Protection Program is required for those entities that will continue using methylene chloride under these allowable uses. William & Mary has implemented the following requirements to satisfy this obligation.

Definitions, Roles and Responsibilities

- **As needed monitoring** - Exposure measurements taken when there is a change of use.
- **De minimis** - The threshold concentration for which the regulatory restrictions are not required. For methylene chloride this concentration is 0.01% by weight.
- **Exposure Control Plan (ECP)** - This documents actions taken to mitigate occupational exposures and comply with the WCPP.
- **Owners / operators** - Anyone who owns, leases, operates, controls, or supervises a workplace. This includes William & Mary and each PI, instructor, or supervisor who oversees a location where methylene chloride is used or a person who uses methylene chloride. William & Mary EHS is responsible for writing and updating this Program. PIs, instructors, and supervisors are responsible for implementing this program and for approving and enforcing any Exposure Control Plans applicable to their work area.
- **Periodic monitoring** - Dependent upon the results of the initial and/or repeat monitoring; the frequency for gathering new monitoring data ranges from 3 months to 5 years.
- **Potentially exposed person** - Any person who may be exposed to a chemical or mixture in a workplace as a result of a condition of use of that chemical substance or mixture. This applies regardless of whether a person is a user of the chemical or an employee. Potentially exposed persons are responsible for complying with the provisions of this Program.
- **Prohibited Uses** - the EPA has established exposure limits for methylene chloride for **some** conditions of use, including “use as a laboratory chemical.” Nearly all other commercial and industrial uses, such as use as a solvent or paint remover, are prohibited. EPA has a full list of prohibited uses in its [Guide to Complying with the 2024 Methylene Chloride Regulation](#).

- **Regulated area** - An area demarcated where airborne concentrations exceed, or there is a reasonable possibility they may exceed, the Existing Chemical Exposure Limit (ECEL) of 2 ppm or EPA Short Term Exposure Limit (STEL) of 16 ppm.
- **Retailer** - An entity that distributes or makes available products to consumers.
- **Workplace Chemical Protection Program (WCPP)** - A written program to protect potentially exposed persons in the workplace who are engaged in conditions of use that are not prohibited.

Exposure Limits

Under this program, long-term exposures to methylene chloride will be kept below 2 ppm (8-hour TWA) and short-term exposures will be kept below 16 ppm (15-minute TWA). Additional monitoring will be implemented whenever long-term exposures exceed 1 ppm. Any deviation from these limits must be approved by William & Mary's EH&S Office and will be documented in a written Exposure Control Plan. This documentation will include a respiratory protection program to be implemented in excepted work areas.

Exposure Monitoring

1. Monitoring requirements

Initial monitoring for DCM is required to establish a baseline for DCM users and to inform the development of the Exposure Control Plan (ECP). All initial monitoring shall be conducted by May 5, 2025, or within 30 days after the introduction of DCM in the workplace. Initial monitoring results will be used to determine the frequency of compliance activities such as periodic monitoring. Monitoring must be taken when and where operating conditions are best representative of each potentially exposed person's highest likely full shift and 15-minute exposures occur.

2. Exemptions to Initial Monitoring

Two conditions can exempt an employer from conducting initial monitoring for DCM.

1. If objective data generated during the last 5 years demonstrates DCM is not released in the workplace environment at or above the ECEL action level and EPA STEL and with initial monitoring conducted within 5 years of that data.
2. If exposure to DCM is less than 30 days per year with two conditions: 1) Direct reading measurements must be taken in the environment to ensure levels are below the ECEL action level and EPA STEL and 2) Appropriate controls must be put in place to ensure levels are below the ECEL and EPA STEL.

3. Initial and Periodic Monitoring

The results of initial monitoring will determine how frequently periodic monitoring must

occur. Periodic monitoring can range from every 3 months, every 6 months or every 5 years depending on the following conditions:

1. Every 5 years, if initial monitoring shows levels below the ECEL action level (1ppm) and at or below the EPA STEL (16ppm).
2. If initial monitoring shows levels below the ECEL action level but above the EPA STEL. In that case, periodic monitoring must be done every 5 years but STEL monitoring must be done every 3 months.
3. If initial monitoring results are at or above the ECEL action level but at or below the ECEL (2ppm) and at or below the EPA STEL. In that case, periodic monitoring must occur every 6 months.
4. If initial monitoring results are above the ECEL action level, at or below the ECEL, and above the EPA STEL. In that case, periodic monitoring must be done every 6 months for the ECEL and every 3 months for the EPA STEL.
5. If initial monitoring results are above the ECEL and below, at, or above the EPA STEL, periodic monitoring for both the ECEL and EPA STEL must be conducted every 3 months.

4. Changes in Conditions

The frequency of periodic monitoring will change depending on whether exposure conditions have changed.

1. If two consecutive monitoring events have occurred at least 7 days apart that indicate that potential exposure has decreased from above the ECEL to at or below the ECEL, but at or above the ECEL action level, transition from ECEL periodic monitoring frequency from every 3 months to every 6 months.
2. If two consecutive monitoring events have taken place at least 7 days apart that indicate that potential exposure has decreased to below the ECEL action level and at or below the EPA STEL, transition from ECEL periodic monitoring frequency from every 6 months to once every 5 years. The second consecutive monitoring event will delineate the new date from which the next 5-year periodic exposure monitoring must occur.
3. If the owner or operator engages in any conditions of use described in this plan, and is required to monitor either the ECEL or EPA STEL in a 3 or 6-month interval, but does not engage in any of those uses for the entirety of the 3 or 6-month interval, the owner or operator may forgo the upcoming periodic monitoring event. However, documentation of cessation of use of methylene chloride must be maintained, and initial monitoring is required when the owner or operator resumes or starts any of the conditions of use as described in this plan.

5. Sampling Requirements

1. Sampling requirements

- Must use personal breathing zone sampling
- May use similar exposure groups provided the person monitored is the most exposed person
- All members of the similar exposure group must have an opportunity to observe the monitoring
- Notification of monitoring results to monitored person and potentially exposed persons (e.g., similar exposure group)
 - Within 15 working days after receipt of results
 - Shared individually or publicly in writing
 - May need to be provided in multiple languages

Regulated Areas

A regulated area must be established wherever airborne concentrations of methylene chloride exceed, or could reasonably be expected to exceed, the ECEL of 2 ppm or STEL of 16 ppm based on monitoring.

In lab settings, a combination of engineering and administrative controls generally keeps exposure levels below these limits. Some activities, such as hazardous waste bulking or using methylene chloride outside of a fume hood, may exceed these limits. In cases where exposure limits may be exceeded, a number of additional controls are required as outlined below.

Establishing Regulated Areas

Regulated areas must be established and clearly demarcated by signage indicating use of methylene chloride in the area within three months of receiving initial monitoring data. Signage serves to alert potentially exposed persons of the boundaries of the area and minimizes the number of exposed persons.

The exact wording will be tailored for each area and may be in multiple languages as needed. An example of wording is the following.

Methylene Chloride Warning

- Authorized Personnel Only
- Airborne Concentrations may exceed:
 - o ECEL: 2 ppm
 - o STEL: 16 ppm

Avoid Exposure

- Follow Safety Protocols
- Respiratory Protection Required When Methylene Chloride is in Use

Access Control

Restrict access to authorized personnel only. These personnel must receive methylene chloride-specific training, including hazard communication, safe handling practices, emergency procedures, and proper use of PPE.

Respiratory Protection

Respiratory protection is required for activities where the exposure limits may be exceeded based on monitoring results. Either a NIOSH Approved Supplied-Air Respirator (SAR) or Self-Contained Breathing Apparatus (SCBA) are the only respirators approved for use by the EPA. Currently, the William & Mary respiratory protection program does not have the capability to support Supplied-Air respirators. Therefore, engineering controls must be in place.

Exposure Control Plan

Common Language

Elimination

Use of methylene chloride is allowed under this Program as a laboratory chemical and in waste operations to dispose of materials generated through other approved uses. These uses cannot be eliminated because of methylene chloride's unique chemical properties and in order to ensure results from ongoing experiments can be compared with previously-obtained experimental results. In accordance with EPA regulation, all uses not explicitly permitted under this Program shall be eliminated.

Centralized ECP for Laboratory Use

This Exposure Control Plan covers safety practices to be followed for use of methylene chloride as a laboratory chemical at William & Mary. Any deviation from this Plan requires approval in writing from the W&M EH&S Office. The use of methylene chloride is subject to pre-approval by the Principal Investigator (PI) and/or Supervisor responsible for the laboratory in which it will be used. **DO NOT USE METHYLENE CHLORIDE UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.**

Substitution

The following substitutes have been considered for methylene chloride:

- 2-methyltetrahydrofuran
- cyclopentylmethyl ether

- methyl tert-butyl ether
- methyl isobutyl ketone
- toluene
- ethyl acetate
- methanol
- ethanol
- isopropanol

Alcohols, methyl isobutyl ketone, and ethyl acetate cannot be substituted for methylene chloride as a reaction solvent due to undesirable reactivity. Ethers cannot be substituted for methylene chloride in column chromatography due to their high boiling points and the risk of peroxide formation. Toluene cannot be substituted for methylene chloride in processes that require a polar solvent. Finally, any process that replicates previous work may continue to use methylene chloride in order to maintain reproducibility and comparability of previous results.

Engineering Controls

Local exhaust ventilation must be used for all processes employing methylene chloride. Acceptable controls typically include fume hoods, glove boxes, exhausted enclosures, and snorkels. Any change in control requires

Administrative Controls

All occupants of laboratories that use methylene chloride shall review this WCPP and ECP prior to entry, and sign that they have received the information they contain and agree to abide by the training provided to them.

Storage of methylene chloride must be compliant with requirements for Particularly Hazardous Substances.

Stop all use of methylene chloride if any malfunction of the local exhaust ventilation device indicated above is suspected.

Any PPE suspected of coming in contact with methylene chloride must be changed immediately.

Personal Protective Equipment (PPE)

Methylene chloride may only be handled while wearing a lab coat, safety glasses or splash goggles, and either polyvinyl alcohol gloves or double nitrile gloves. LLDPE laminate or butyl viton gloves may be used for procedures involving strong oxidizing acids. Polyvinyl alcohol or LLDPE laminate gloves may be used for procedures involving significant risk of fire.

Lab/Shop-Specific ECPs

The template on the following two pages may be used to complete an Exposure Control Plan (ECP) for specific uses of methylene chloride. Each Principal Investigator (PI) and/or Supervisor is responsible for developing, reviewing, and approving ECPs for all procedures that use methylene chloride in locations they are responsible for. One ECP may cover more than one procedure so long as all control measures are consistent across all covered procedures.

Lab-Specific Exposure Control Plan Format

This Exposure Control Plan covers safety practices to be followed for use of methylene chloride as [INSERT PROCEDURE NAME] in [INSERT LOCATION]. The use of methylene chloride is subject to pre-approval by the Principal Investigator (PI) and/or Supervisor. DO NOT USE METHYLENE CHLORIDE UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.

Substitution

The following substitutes have been considered for methylene chloride:

- 2-methyltetrahydrofuran
- cyclopentylmethyl ether
- methyl tert-butyl ether
- methyl isobutyl ketone
- toluene
- ethyl acetate
- methanol
- ethanol
- isopropanol

They have been deemed inadequate for the following reason(s):

- Undesirable cross-reactivity
- Poor match for polarity
- Poor match for density
- Boiling point too high
- Need to maintain reproducibility of established procedure
- Other _____

Engineering Controls

Methylene chloride will be used with the following engineering controls in place:

- Local Exhaust Ventilation (select one):
 - Fume Hood
 - Glove box
 - Exhausted enclosure
 - Snorkel
 - Splash shield
 - Other: _____

Administrative Controls

All occupants of INSERTLOCATION shall review this WCPP and ECP prior to entry and sign that they have received the information they contain and agree to abide by the training provided to them.

Methylene chloride is approved for use in [INSERT LOCATION] in _____.

Methylene chloride is approved for storage in [INSERT LOCATION] in _____.

Stop all use of methylene chloride if any malfunction of the local exhaust ventilation device indicated above is suspected and contact EHS.

Any PPE suspected of coming in contact with methylene chloride must be changed immediately.

Personal Protective Equipment (PPE)

Methylene chloride may only be handled while wearing the following PPE:

Eye Protection:

- Safety glasses
- Goggles
- Face shield (either safety glasses or goggles must be checked as well if using a face shield)
- Other: _____

Skin Protection:

- Lab Coat
- Apron
- Other: _____

Hand Protection:

- Nitrile gloves (double-gloved)
- Polyvinyl alcohol gloves
- LDPE gloves
- Viton gloves
- Silvershield gloves

Training and Information

Training **prior to initial job assignment**

- a. Training consistent with OSHA's Methylene Chloride Standard 1910.1052(l)(1) through (6)
 - i. Must cover glove selection, use, and disposal if dermal exposure is expected to occur
 - ii. Must cover respirators consistent with OSHA's Respiratory Protection Standard 1910.134(k) if respiratory protection is required

Recordkeeping

Compliance records must be retained for five years, including shipping, purchasing, and use documentation for methylene chloride. Exposure monitoring and control records must also be maintained in a form accessible to users and inspectors.

Owners and operators, including each PI, instructor, or supervisor who oversees a location where methylene chloride is used or a person who uses methylene chloride, are required to participate in generation and maintenance of these records, as they are crucial in proving adherence to the restrictions set forth by the EPA.

EH&S must retain records for a minimum of 5 years. It is acknowledged that many of these program elements may already have records and documentation associated with overlapping programs such as Medical Surveillance, Training and Chemical Hygiene program elements. It is beholden to the campus program manager that those records be retained and meet the minimum requirements for this rule for the following information:

1. Exposure Control Records: This includes the Exposure Control Plan, which must be made available to employees for inspection.
 - a. Implementation records, including inspections, evaluations and exposure control updates, as well as confirmation that affected persons are properly implementing exposure controls.
 - b. Documentation of Personal protective equipment and respiratory protection being used as part of the program, including any fit testing records.
 - c. Training records
 - d. Maintenance, shutdown or malfunction documentation for facility exposure controls that cause air concentrations to be above the ECEL or STEL, including duration, corrective actions and measurements.
2. Exposure Monitoring Records: Monitoring records for employees that may be potentially exposed including:
 - a. All measurements made to determine conditions affecting monitoring results, including copies of the notifications to the potentially exposed persons
 - b. The identities of all potentially exposed persons whose exposure was not measured and whose exposure is intended to be represented by the monitoring
 - c. Description of analytical methods
 - d. Information on air monitoring equipment, including calibration dates, limits of detection and malfunctions
 - e. Objective data being used to forgo initial exposure monitoring including: the use being evaluated, the source of the data, the measurement methods and results, and any other relevant information.
3. Records related to any eligible exemptions

References

- [EPA Fact Sheet: Methylene Chloride or Methylene chloride](#)
- [A Guide to Complying with the 2024 Methylene Chloride Regulation](#)
- [FACT SHEET: 2024 Final Risk Management Rule for Methylene Chloride under TSCA](#)
- [Methylene Chloride Hazards for Bathtub Refinishers](#)
- [Risk Evaluation for Methylene Chloride](#) - See Appendix F for details on glove materials
- [Ansell Chemical Glove Resistance Guide](#)
- [Preliminary Information on Manufacturing, Processing, Distribution, Use, and Disposal: Methylene Chloride](#)