Workplace Chemical Protection Program (WCPP): Dichloromethane

Contents

Purpose 2
Definitions, Roles, and Responsibilities 2
Exposure Limits 3
Exposure Monitoring 3
Regulated Areas 6
Exposure Control Plan 7
Centralized ECP for Research Laboratories and Academic Support Shop-Use 7
Hierarchy of Controls to minimize exposure 7
Elimination 7
Substitution 7
Engineering Controls 8
Administrative Controls 8
Personal Protective Equipment (PPE) 8
ECP Registration for Approved Spaces and Use-types 9
Training and Information 10
Centralized Dichloromethane Training 10
Lab/Shop-Specific Dichloromethane Training 10
Recordkeeping 10
References 12

Purpose

The Environmental Protection Agency (EPA), under the Toxic Substances Control Act (TSCA), has determined that methylene chloride, also known as dichloromethane (DCM), poses an unreasonable risk of injury to health because cumulative exposures to DCM can cause cancer and damage to the liver and kidneys. Acute exposures to high concentrations of DCM vapor in poorly ventilated spaces have caused central nervous system harm, up to and including unconsciousness and death through respiratory paralysis.

The EPA has identified a limited number of applications that may continue. Entities that will continue using DCM under these allowable uses must have a workplace chemical protection program. The University of Delaware 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 regulatory restrictions are not required. For DCM, this concentration is 0.01% by weight.
- **Exposure Control Plan (ECP)** - The documented actions taken to mitigate occupational exposures and comply with the WCPP at the lab, department, or institute level.
- **Owners/operators** - Anyone who owns, leases, operates, controls, or supervises a workplace. This includes the University of Delaware and each principal investigator (PI), instructor, or supervisor who oversees a location where DCM is used, as well as individuals who use DCM. The University of Delaware is responsible for writing and updating this Program. PIs, instructors, and supervisors are responsible for implementing this Program and for approving and enforcing any applicable Exposure Control Plans for their work areas.
- **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 DCM 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 complete 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 the EPA Short-Term Exposure Limit (STEL) of 16 ppm.
- **Retailer** - An entity that distributes or makes available products to consumers.

- **Time-Weighted Average (TWA)** - The potentially exposed person's average airborne exposure in any 8-hour work shift of a 40-hour work week (8-hour TWA), or in any 15-minute reference period covering a specific task where airborne concentrations may instantaneously exceed the full-shift exposure limit (15-minute TWA).
- **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 exposure to DCM will be kept below 2 ppm (8-hour TWA), and short-term exposure will be kept below 16 ppm (15-minute TWA) wherever possible. Additional monitoring will be implemented whenever long-term exposures exceed 1 ppm. Regulated Areas will be established for any work areas where long-term exposures may exceed 2 ppm (8-hour TWA) or where tasks are performed that may result in short-term exposures exceeding 16 ppm (15-minute TWA).

Exposure Monitoring

Monitoring Requirements
Initial monitoring for DCM is required to establish a baseline for DCM users and to inform of the development of the Exposure Control Plan (ECP). All initial monitoring shall be conducted by November 9, 2026, or within 30 days of introducing DCM in the workplace. Initial monitoring results will be used to determine the frequency of compliance activities, such as periodic monitoring. Monitoring must occur under conditions that best represent each potentially exposed person's highest-likely full-shift exposure, as well as during any tasks that could result in 15-minute peak exposures.

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:
    a. Direct reading measurements must be taken in the environment to ensure levels are below the ECEL action level and the EPA STEL.
    b. Appropriate controls must be implemented to ensure that levels are below ECEL and EPA STEL.

Initial and Periodic Monitoring
The results of the initial monitoring will determine the frequency of subsequent periodic tracking. Periodic monitoring can range from every 3 months, every 6 months, or every 5 years, depending on the following conditions:

Determine monitoring frequency based on initial monitoring results.

DCM Concentration (exposure monitoring results)			Re--monitoring frequency
8-hr TWA (ECEL)		**15-min TWA (STEL)**	
< 1 ppm	and	≤ 16 ppm	ECEL and EPA STEL periodic monitoring at least once every 5 years
< 1 ppm	or	> 16 ppm	ECEL monitoring at least once every 5 years, AND EPA STEL periodic monitoring is required every 3 months
> 1 ppm & ≤ 2 ppm	or	< 16 ppm	ECEL is monitored every 6 months
> 1 ppm & ≤ 2 ppm	or	> 16 ppm	ECEL periodic monitoring every 6 months AND EPA STEL periodic monitoring every 3 months
> 2 ppm	or	> or ≤ 16 ppm	ECEL periodic monitoring every 3 months AND EPA STEL periodic monitoring every 3 months

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

Criteria	Action
Exposure reduced to at or below ECEL (but Above Action Level). ● Two consecutive samples taken at least 7 days apart show that an 8-hour TWA exposure to DCM has decreased from above the ECEL to between 1 ppm and 2 ppm.	Adjust periodic monitoring frequency from every 3 months to every 6 months.
Exposure reduced to below the ECEL Action Level. Two consecutive samples, taken at least 7 days apart, show that DCM exposure has decreased. ● 8-hour TWA: Below 1 ppm (Action Level). ● 15-minute exposure: At or below 16 ppm (EPA STEL).	Adjust periodic monitoring frequency from every 6 months to every 5 years.

Suspension of Periodic Monitoring

a. For non-regulated areas: Monitoring may be suspended if work with DCM will not occur during the timeframe where monitoring would be required under this plan. In this case, the next use of DCM must be monitored. **The PI, instructor, or lab supervisor who oversees the location where DCM is used is responsible for notifying EHS in advance and may not proceed with DCM use until monitoring has been scheduled.**

b. For regulated areas requiring SCBAs: Monitoring may be suspended if work with DCM is suspended based on the criteria below.

Criteria	Action
Conditions Requiring 3-Month Interval Monitoring Not Performed: Processes or tasks included in the finalized Workplace Chemical Protection Program (WCPP) that require 3-month interval monitoring do not occur during the period necessary.	Periodic monitoring may be suspended. Maintain documentation confirming that the processes or tasks were not performed. Resume monitoring when the conditions of DCM use specified in the WCPP are restarted.
Conditions Requiring 6-Month Interval Monitoring Not Performed: Processes or tasks specified in the finalized WCPP that necessitate 6-month interval monitoring do not occur during the required period.	Periodic monitoring may be suspended. Maintain documentation confirming that the processes or tasks were not performed. Resume monitoring when the conditions of DCM use specified in the WCPP are restarted.

Sampling Requirements
Every potentially exposed person must follow the following sampling guidelines.

1. Sampling Requirements:
    a. Sampling must be conducted for every potentially exposed person or a representative sample representing all exposed people.
    b. Sampling must be taken when and where the operating conditions are representative of full shift exposures.
    c. All potentially exposed people must be allowed to observe exposure monitoring.
    d. Samples must be taken at the personal breathing zone.
    e. Notification of monitoring results to the monitored person and potentially exposed persons (e.g., similar exposure group) within 15 working days after receipt of results.
2. Sampling Report (Appendix A):
    a. Provide the ECEL, action level, EPA STEL, and significance of each.
    b. Provide the quantity, location, and manner of DCM use at the time of monitoring.
    c. Provide monitoring results.
    d. Indicate whether the concentration exceeds the ECEL, action level, and EPA STEL.
    e. Describe actions taken to reduce exposure below the exposure limits.
    f. Describe the respiratory protection measures if needed.
    g. List any identified releases of DCM during monitoring.

Regulated Areas

A regulated area must be established wherever airborne concentrations of DCM exceed, or could reasonably be expected to exceed, the ECEL of 2 ppm or the STEL of 16 ppm based on monitoring. The **University Chemical Hygiene Committee** or the **University Chemical Hygiene Officer** must approve the boundaries of each regulated area established under this Program.

Establishing Regulated Areas
Regulated areas must be established and clearly demarcated by signage indicating the use of DCM in the area. Signage alerts potentially exposed individuals to the area's boundaries and minimizes the number of people exposed.

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

Methylene Chloride - DANGER
Authorized Personnel Only
Airborne Concentrations may exceed:
ECEL: 2 ppm
STEL: 16 ppm

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

Access Control
Only authorized personnel may enter a regulated area. These personnel must receive DCM-specific training, including hazard communication, safe handling practices, emergency procedures, and proper use of dermal PPE and respiratory protection prior to entering the regulated area.

Respiratory Protection
A NIOSH-approved supplied-air Respirator (SAR) or Self-Contained Breathing Apparatus (SCBA) is required to enter a regulated area. Additional details regarding medical evaluation, fit testing, and training are included in the **University of Delaware**'s Respiratory Protection Program.

Exposure Control Plan

Centralized ECP for Research Laboratories and Academic Support Shop-Use

This Exposure Control Plan (ECP) outlines the safety practices to be followed when using DCM as a laboratory chemical or as a bonding agent in research and teaching facilities at the University of Delaware. Any deviation from this Plan requires approval in writing from the University Chemical Hygiene Committee. The use of DCM is subject to pre-approval by the Principal Investigator (PI) and/or Supervisor responsible for the laboratory or shop in which it will be used. All laboratories and shops with approved use types will be provided with an ECP registration form to be renewed no later than 5 years from the last evaluation date or 30 days from the introduction of a new use type.

DO NOT USE DCM UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL

Hierarchy of Controls to minimize exposure

Elimination

Use of DCM is allowed under this Program as a laboratory chemical, as a bonding agent for solvent welding, and in waste operations for the disposal of materials generated through other approved uses. These uses cannot be eliminated due to DCM's unique chemical properties and the necessity to ensure that 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.

Substitution

Substitution of alternative solvents for DCM has been evaluated and determined to be impractical. Common reasons include undesirable reactivity, physical property limitations, and safety concerns. For example, alcohols, methyl isobutyl ketone, and ethyl acetate cannot replace DCM as a reaction solvent due to reactivity issues; ethers are unsuitable for column chromatography because of their high boiling points and risk of peroxide formation; and toluene cannot substitute for DCM in processes requiring a polar solvent. Additionally, methods replicating previous work may continue to use DCM to maintain reproducibility and comparability of results. Other factors may also prevent substitution depending on the specific application. *See page 12 for resources on identifying potential substitutions.*

Engineering Controls

Local exhaust ventilation must be employed for all operations involving DCM. Acceptable engineering controls include fume hoods, glove boxes, exhausted enclosures, and snorkels. Containers of DCM must always remain sealed; bottles shall be capped immediately after use, and squeeze bottles shall not be stored on benchtops. Solvent and waste flasks connected to analytical equipment must be properly closed to prevent vapor release. All work with DCM shall cease immediately if any malfunction of the designated local exhaust ventilation system is suspected.

Administrative Controls

Use of DCM under this Program requires strict adherence to exposure reduction measures. Work practices shall be optimized to minimize the duration, frequency, and intensity of tasks involving DCM. Administrative controls, including comprehensive training, scheduled breaks, and restricted access to designated high-risk areas, must be implemented. Before entering any laboratory where DCM is present, all personnel must review the Safety Data Sheet (SDS), Workplace Chemical Protection Program (WCPP), and Exposure Control Plan (ECP). Acknowledgment of receiving this information and agreement to comply with all training requirements are mandatory.

Personal Protective Equipment (PPE)

DCM may only be handled while wearing a lab coat, safety glasses or splash goggles, and appropriate gloves, depending on use case/ exposure risk.

DCM rapidly penetrates ordinary gloves; the recommended best practice is the ***Gold Standard*: *wear a thin, specialized Silver Shield (LLDPE laminate) glove underneath a nitrile glove.*** The outer nitrile layer protects the chemical barrier from tears and must be replaced immediately if a splash occurs.

- For **low-risk, incidental contact** tasks, double nitrile gloves (8 mil/ 0.2 mm or greater) are acceptable. However, because DCM can permeate even thick nitrile gloves (15 mil) in just 1 to 5 minutes, you must stop and immediately change the contaminated glove.
- **For tasks with a higher risk of splash or extended dermal exposure,** use a more chemical-resistant glove (e.g., LLDPE laminate/ Silver Shield, Viton Butyl, or PVA — suitable for organic solvents but less effective in aqueous conditions because PVA is water-soluble).

Principal Investigators, instructors, and supervisors are responsible for final glove selection. Other glove types may be acceptable; always review the manufacturer's chemical compatibility data prior to use. See references 6-9 for additional information on glove selection.

Any PPE that may have been exposed to DCM must be replaced immediately.

Summary of Exposure Controls

To minimize the risk of DCM exposure, all unauthorized uses must be eliminated, substitutions considered where feasible, approved engineering controls employed, administrative and training requirements enforced, storage conducted in compliance with hazardous substance regulations, use suspended during ventilation failure, and appropriate PPE worn at all times.

Description of Approved Activities and Spaces

EHS has reviewed, assessed, and approved the following use cases for DCM as a laboratory chemical for industrial and commercial purposes (including academic laboratories), both inside and outside of ventilated enclosures: solvent use; extraction and purification of chemicals; dissolution of substances; synthesis reagent; chemical analysis; chromatography effluent; rotary evaporation; analytical standards; polymerization; plastics fusion/welding; and use as a solvent or reagent for mass spectrometry.

Lab spaces with approved DCM use for specific use types have been reviewed and authorized by EHS in the following buildings: 15 Innovation Way, AP Biopharmaceutical Innovation Center, Brown Lab, Cannon Marine Studies Lab, Colburn Lab, Drake Hall, Colburn Lab, DuPont Hall, Harker Interdisciplinary Science & Engineering, Lammot Du Pont Lab, Sharp Laboratory, and Spencer Lab.

Before using DCM, please verify that your specific use case and lab space have been approved by EHS using the link below. If the use of DCM is approved in your space, the individual must complete appropriate training and review the laboratory-specific ECP/ SOP for DCM. If approval has not yet been granted, the individual must contact EHS for further guidance. DCM may not be used for any purpose until formal approval is obtained.

DCM Exposure Protection Plan Summary of Approved Spaces

If tasks are modified, new tasks are initiated, or any changes are made to working conditions, the PI, instructor, or supervisor shall notify EHS/ University Chemical Hygiene Officer, as additional DCM monitoring may be required.

ECP Registration for Approved Spaces and Use-types

Before beginning any work with dichloromethane (DCM), you must complete this survey and contact EHS to review your intended use, location, and control measures. If you need assistance or have any questions about the process, please reach out to us.

Survey Link: **https://forms.gle/MxCN9hooYEVNuhFL7**

Training and Information

Centralized Dichloromethane Training

The EPA rule mandates training and incorporates requirements from OSHA's Methylene Chloride Standard. Both agencies specify general training elements—such as content, frequency, and delivery—as well as task-specific instruction. Training may be communicated at the institutional level or tailored to individual labs by principal investigators, instructors, and supervisors. At the University of Delaware, Environmental Health & Safety (EHS) develops and maintains the institutional DCM training program, which is accessible through Scishield. Completion of this training is mandatory for all individuals who work with DCM.

The program shall cover these requirements:

1. Training shall be consistent with OSHA's Methylene Chloride Standard 1910.1052(l)(1) through (6), including completing training prior to initial job assignment.
2. Shall cover hazards associated with DCM as required by the OSHA Hazard Communication Standard 1910.1200(b)(3)(iii) and the Chemical Hygiene Plan.
3. Must be done in a comprehensive manner that is understandable to potentially exposed people.

Lab/Shop-Specific Dichloromethane Training

Each PI, instructor, and/or supervisor who oversees the assignment of tasks requiring the use of DCM in the lab shall implement and document hands-on training for lab personnel, covering:

1. Task or activity-specific PPE required and location of PPE.
2. Exposure controls required during tasks with DCM, and training on how to use those controls (e.g., appropriate fume hood sash level).
3. The PI, instructor, or supervisor shall ensure that only individuals trained in DCM safety are allowed to perform DCM tasks.

If tasks are modified or new tasks are initiated, the PI, instructor, or supervisor shall notify the University Chemical Hygiene Officer, as additional DCM monitoring may be required.

Recordkeeping

Compliance records must be retained for five years. Owners and operators, including each PI, instructor, or supervisor who oversees a location where DCM is used, or a person who uses DCM, are required to participate in the generation and maintenance of these records, as they are crucial for proving compliance with the EPA's restrictions. It is acknowledged that many of these records and documentation are already maintained by the University of Delaware and by

individual research groups associated with overlapping programs such as Medical Surveillance, Training, and Chemical Hygiene program elements:

1. **Exposure Control Records:** These records will be maintained by the generator as specified below.
    a. Lab-specific Exposure Control Plan registrations will be maintained by the Principal Investigator or Supervisor with assistance from EHS.
    b. Implementation records, including inspections, evaluations, and exposure control updates, as well as confirmation that affected persons are properly implementing exposure controls, will be maintained by the Principal Investigator or Supervisor with assistance from EHS.
    c. Documentation of Personal protective equipment being used as part of the program will be maintained by the Principal Investigator or Supervisor with assistance from EHS.
    d. Training records for centralized DCM training will be maintained by the EHS department.
    e. Lab-specific training records will be maintained by the Principal Investigator or Supervisor.
    f. Maintenance, shutdown, or malfunction documentation for facility exposure controls that cause air concentrations to exceed the ECEL or STEL will be maintained by Facilities and Environmental Health and Safety (EHS). Each PI, instructor, or supervisor who oversees a location where DCM is used or a person who uses DCM is responsible for notifying EHS immediately when such events are suspected to have occurred.
2. **Exposure Monitoring Records:** Monitoring records will be maintained by EHS for employees who 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 people whose exposure was not measured and whose exposure is intended to be represented by 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:** Will be maintained by EHS with assistance from the Principal Investigator or Supervisor.

Timeline for Compliance

The EPA has extended the compliance deadline for laboratories using DCM to support sustained adherence to the requirements outlined in the May 2024 final rule

- By November 9, 2026, complete initial monitoring:
- Within 14 days of monitoring, notify monitored people and similar exposure groups of the results.
- By February 8, 2027, establish regulated areas and ensure compliance with the Existing Chemical Exposure Limit.
- By May 10, 2027, write and implement the Exposure Control Plan(s).

References

1. A Guide to Complying with the 2024 Methylene Chloride Regulation
2. EPA Fact Sheet: Methylene Chloride or Dichloromethane
3. FACT SHEET: 2024 Final Risk Management Rule for Methylene Chloride under TSCA
4. Methylene Chloride Hazards for Bathtub Refinishers
5. Preliminary Information on Manufacturing, Processing, Distribution, Use, and Disposal: Methylene Chloride
6. Risk Evaluation for Methylene Chloride - See Appendix F for details on glove materials
7. Ansell Chemical Glove Resistance Guide
8. MAPA Professional Chemical Resistance Guide
9. ChemRest – Search and filter by glove material to view resistance times

Reference Material for substitution options

- The Lab Safety Institute Use This Not That: Safer Substitutions for Methylene Chloride (Free Webinar)
- American Chemical Society: DCM Alternatives & Resources
- Sanofi's Solvent Selection Guide: A Step Toward More Sustainable Processes
- A convenient guide to help select replacement solvents for dichloromethane in chromatography
- Chlorinated solvents: their advantages, disadvantages, and alternatives in organic and medicinal chemistry.
- Greener solvent alternatives
  EPA: An Alternatives Assessment for Use of Methylene Chloride