Reed College Workplace Chemical Protection Program for Methylene Chloride

August 2025

Table of Contents

1.0 Purpose and Scope

The Workplace Chemical Protection Program (WCPP) provides a standard to protect employees, students, and all community members from health and safety hazards associated with Methylene Chloride (CAS# 75-09-2) while working at Reed College.

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 has 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. A WCPP is required for those entities that will continue using DCM under these allowable uses. This document, in conjunction with the Reed College Chemical Hygiene Plan (CHP), standard operating procedures (SOPs), and department specific safety manuals aims to address chemical exposure in the workplace and satisfy the conditions required for allowable use of DCM and DCM-containing products (de minimus threshold of 0.1% DCM).

Occupational exposure limits, chemical exposure monitoring, regulated area identification and demarcation, exposure control plans, dermal and respiratory protections, and training requirements are to be in congruence with the EPA Toxic Substance Control Act requirements. The limits, standards, and procedures outlined in this document are applicable to all activities at Reed College involving DCM.

2.0 Responsibilities of Positions

2.1 Environmental Health and Safety Department (EHS)

EHS Staff are Chemical Hygiene Officers for the College and have the following responsibilities:

- Work with the users of DCM, administrators, and other community members to provide adequate facilities and to develop and implement appropriate policies and practices.
- Monitor procurement, use, and disposal of DCM in laboratories.
- Maintain appropriate audits of laboratories, stockrooms, and storage spaces.
- Provide technical assistance for complying with the WCPP and answer chemical safety questions for employees, students, and visitors.
- Know the current legal requirements concerning regulated substances.
- Seek ways to improve DCM handling procedures and reduce exposure.
- Review and update the WCPP annually and as needed with departmental members.
- Conduct exposure monitoring as needed.

- Provide initial training to PIs, instructors, and/or laboratory supervisors and support in disseminating training to all affected laboratory personnel.

2.2 Reed College Administration

The President and other Officers of Reed College have ultimate responsibility for chemical hygiene and provide continuing support for institutional chemical hygiene. This includes support for the WCPP.

2.3 Department Chairs

Department chairs are responsible for reviewing, evaluating, and distributing the WCPP to other departmental employees annually and as needed.

2.4 Laboratory Supervisors

Laboratory supervisors carry the overall responsibility for chemical hygiene within the laboratory. Laboratory supervisors include principal investigators (PIs) in academic labs, researchers in charge of research labs, laboratory instructors for laboratory-based classes, and stockroom managers supplying dichloromathane and DCM-containing products to their departments.

For the program to be effective, these individuals will expand the plan to cover the hazards associated with DCM and safe work practices unique to each lab. These modifications must be in writing and maintained with the laboratory copy of this manual. A template to develop a laboratory-specific exposure control plan is given in Appendix 3.

Other responsibilities of laboratory supervisors include:

- Acquiring the necessary information to recognize and control chemical hazards in the laboratory.
- Knowing the signs and symptoms of overexposure, as well as the physical and sensory characteristics (odor, appearance) of DCM.
- Using appropriate laboratory practices and controls, such as properly functioning engineering controls and personal protective equipment (PPE), to reduce the potential for exposure.
- Supervising the performance of staff and all other persons in the lab so that everyone understands and follows safe laboratory practices and procedures.
- Providing and documenting training for employees, students, and any potentially exposed individuals to recognize and control hazards related to DCM and follow standard procedures for dealing with accidents involving the chemical.
- Understanding the current legal requirements regulating DCM used in the laboratory.
- Consulting with the Chemical Hygiene Officers (EHS) before purchasing, utilizing, or producing any DCM.

2.5 Laboratory Workers

Laboratory workers include staff, research assistants, student researchers, and laboratory students who enter spaces where DCM or DCM-containing products are used. Responsibilities for laboratory workers include:

- Planning and conducting each operation according to chemical hygiene procedures. This requires working knowledge of this written WCPP, exposure control plans, and the Chemical Hygiene Plan.
- Developing appropriate personal chemical hygiene habits.
- Using the PPE provided, keeping it in working order, and informing supervisors when new equipment is required.
- Reporting accidents/incidents to supervisors as soon as possible.
- Participating in training on recognizing and controlling hazards.

3.0 Hazards of Dichloromethane

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 has caused central nervous system harm, up to and including unconsciousness and death through respiratory paralysis. Direct exposure to skin and eyes can cause irritation.

4.0 Exposure Monitoring

4.1 Initial Monitoring

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 (existing chemical exposure limit, ECEL) and 15-minute (short-term exposure limit, STEL) exposure.

4.1.1 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 EPA STEL.

b. Appropriate controls must be put in place to ensure levels are below the ECEL and EPA STEL.

4.2 Monitoring Frequency

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:

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 required every 3 months
> 1 ppm & ≤ 2 ppm	or	< 16 ppm	ECEL monitoring every 6 months
> 1 ppm & ≤ 2 ppm	or	> 16 ppm	ECEL periodic monitoring every 6 months AND immediate suspension of tasks causing the 15-min TWA to exceed 16 ppm in the monitored lab
> 2 ppm	or	> or ≤ 16 ppm	Immediate suspension of use of DCM in the monitored lab

4.2.1 Changes in Conditions

The frequency of periodic monitoring may be reduced if **two consecutive samples** taken at least **7 days apart** show the 8-hour TWA exposure has decreased from between 1 and 2 ppm to below 1 ppm.

Lifting of a suspension of DCM use similarly requires that **two consecutive samples** taken at least **7 days apart** show the 8-hour TWA exposure has decreased to below 2 ppm AND that the 15-minute TWA exposure has decreased to below 16 ppm.

4.2.2 Suspension of Periodic Monitoring

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 Supervisor who oversees the location where DCM is used is responsible for notifying EHS in advance, and may not proceed with use of DCM until monitoring has been scheduled.

4.3 Sampling Requirements

The following sampling guidelines must be followed for every potentially exposed person.

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

5.0 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 STEL of 16 ppm based on monitoring. Regulated areas are only allowed by variance under this Program, with additional required controls as outlined below.

5.1 Establishing Regulated Areas

Regulated areas must be established and clearly demarcated by signage indicating use of DCM in the area. 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.

Dichloromethane (Methylene Chloride) Warning

- 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

5.2 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 PPE prior to entering the regulated area.

5.3 Respiratory Protection

A NIOSH Approved Supplied-Air Respirator (SAR) or Self-Contained Breathing Apparatus (SCBA) is required to enter a regulated area. EHS assesses each use case and determines the appropriate respiratory protection based on the EPA rule as part of Reed College's Respiratory Protection Program.

6.0 Exposure Control Plan

Exposure Control Plans (ECPs) are created to reduce DCM use as feasible and establish safe handling practices for potentially exposed individuals. All individuals who may be exposed to DCM must be provided with the ECP and adhere to the requirements therein.

A general ECP has been established for all activities involving DCM at Reed College. Laboratories, machine shops, or other approved locations should develop lab/shop specific ECPs that meet the minimum requirements outlined in the general ECP.

6.1 General Exposure Control Plan

This Exposure Control Plan (ECP) covers safety practices to be followed for use of DCM as a laboratory chemical, as a bonding agent in solvent welding and in waste operations to dispose of materials generated through approved uses at Reed College. Any deviation from this Plan requires approval in writing from EHS. The use of DCM 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 DCM UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.

6.1.1 Elimination

Use of DCM is allowed under this Program as a laboratory chemical, as a bonding agent in solvent welding and in waste operations to dispose of materials generated through approved uses. These uses cannot be eliminated because of DCM'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.

6.1.2 Substitution

Substitutes should be considered for DCM whenever possible. The following list of chemicals is provided as potential substitutes:

- 2-Methyltetrahydrofuran
- Cyclopentylmethyl ether
- Ethanol
- Ethyl acetate
- Isopropanol
- Methanol
- Methyl isobutyl ketone
- Methyl tert-butyl ether
- Toluene

6.1.3 Engineering Controls

Local exhaust ventilation must be used for all processes employing DCM. Acceptable controls include fume hoods, glove boxes, exhausted enclosures, and snorkel exhaust systems.

6.1.4 Administrative Controls

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

Storage of DCM must be compliant with requirements for Particularly Hazardous Substances. More information covering these requirements can be found in the Reed College Chemical Hygiene Plan.

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

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

6.1.5 Personal Protective Equipment (PPE)

DCM may only be handled while wearing a lab coat, safety glasses or splash goggles, and either polyvinyl alcohol (PVA) gloves or double (2 individual per hand) nitrile gloves. Linear Low-Density Polyethylene (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. Supervisors are responsible for final glove selection.

6.2 Laboratory Specific Exposure Control Plan

Laboratories should develop their own ECP specific to their procedures and practices which require DCM use. These laboratory specific ECPs should satisfy the requirements of the general ECP listed above. A template for laboratory specific ECPs can be found in Appendix 3.

7.0 Training and Information

The EPA rule includes requirements for training and references the OSHA Methylene Chloride Standard training requirements. Both EPA and OSHA reference general training requirements (e.g., nature of training required, frequency, *etc*.) as well as task-specific training. As such, training may be provided from a centralized, institutional level and/or at the lab-specific level by PIs, instructors, and supervisors who oversee the assignment of tasks in the lab.

7.1 Training Requirements

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. Must be done in a comprehensive manner that is understandable to potentially exposed persons.
3. Shall cover hazards associated with DCM as required by the OSHA Hazard Communication Standard 1910.1200(b)(3)(iii) or site Chemical Hygiene Plan (some might use a lab manual instead).
    a. Dermal protection must cover glove selection (type and material), use, expected duration of glove effectiveness, actions to take when glove integrity is compromised, storage, procedure for glove removal, disposal, and chemical hazards.
    b. Inhalation protection training must occur annually if respiratory protection is required. It must cover medical requirements, fit testing procedures, hazards, use of respirator, donning/doffing of respirator, limitations, maintenance, and storage.
    c. Personal Protective Equipment training should cover selection, use, inspections, and replacement schedules.
4. Training is required to be repeated as necessary to maintain requisite knowledge of safe use and handling.
5. Individuals for whom exposure monitoring results exceed the EPA action level or EPA STEL shall be re-trained as necessary to ensure that each employee maintains the requisite understanding of the principles of safe use and handling of DCM.
6. When there are workplace changes, such as modifications of tasks or procedures or new procedures, which can reasonably be expected to increase the exposure level, the laboratory supervisor shall update the training as necessary to ensure that each affected employee has the requisite proficiency.

7.2 Training Dissemination

7.2.1 Training for PIs, Instructors, and Supervisors

Individuals responsible for laboratory spaces and the activities therein, such as PIs, laboratory course instructors, and laboratory supervisors, must receive training covering the WCPP. EHS representatives will meet with these individuals when notified of desired DCM use and will provide training to them. EHS will maintain records of these training.

7.2.2 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).

Additionally, the PI, instructor, and/or supervisor will provide all personnel with additional required training and access to the WCPP. EHS will provide guidance and technical support in

creating training materials congruent with the requirements listed above. The PI, instructor, and/or supervisor will maintain records of these trainings.
The PI, instructor, or supervisor shall ensure that only individuals trained on DCM safety are allowed to perform DCM tasks. Training materials are found in Appendix 4.

7.3 Change in Procedure

If tasks are modified or new tasks are initiated, the PI, instructor, or supervisor shall notify EHS as additional DCM monitoring and new hands-on training may be required.

8.0 Recordkeeping

Compliance records must be retained for a period of 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 generation and maintenance of these records, as they are crucial in proving adherence to the restrictions set forth by the EPA. It is acknowledged that many of these records and documentation are already maintained by Reed College and by individual research groups associated with overlapping programs such as Medical Surveillance, Training and Chemical Hygiene program elements.

8.1 Exposure Control Records:

These records will be maintained by their generator as specified below.

1. Lab-specific Exposure Control Plans will be maintained by the PI, instructor, and/or laboratory supervisor.
2. 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 EHS .
3. Documentation of personal protective equipment being used as part of the program will be maintained by EHS .
4. Training records for the PI, instructor, and/or supervisor will be maintained by EHS
5. Lab-specific training records will be maintained by the PI, instructor, and/or laboratory supervisor responsible.
6. Maintenance, shutdown or malfunction documentation for facility exposure controls that cause air concentrations to exceed the ECEL or STEL will be maintained by EHS. Each PI, instructor, or supervisor who oversees a location where DCM is used or a person who uses DCM is responsible for notifying Facilities Services and EHS immediately when such events are suspected to have occurred.

8.2 Exposure Monitoring Records

Monitoring records will be maintained by EHS for employees that may be potentially exposed including:

1. All measurements made to determine conditions affecting monitoring results, including copies of the notifications to the potentially exposed persons.
2. The identities of all potentially exposed persons whose exposure was not measured and whose exposure is intended to be represented by the monitoring. Note, all potentially exposed persons whose exposures were not measured and whose exposure is intended to be represented by monitoring are listed within training rosters and maintained by lab supervisors
3. Description of analytical methods.
4. Information on air monitoring equipment, including calibration dates, limits of detection and malfunctions.
5. 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.

8.3 Records Related to Any Eligible Exemptions

Records of any eligible exemptions will be maintained by EHS.

Appendix 1: Approved Dichloromethane Uses

Building	Room/Room Type (PI/Supervisor)	Activity	Requirements
Chemistry	Approved Wet Laboratories (310 - Bowring lab; 409 - Campillo-Alvarado lab; 418 - O'Brien lab)	Solvent in synthesis or other reactions	-Open bottles in fume hood, glove box, or under ventilation only. -Containers must be closed when transporting outside ventilation device. -Doubled nitrile, PVA, or other suitable gloves are required when manipulating DCM or risk of splash or droplets.
Physics	Machine Shop (Jay Ewing)	Solvent plastic welding	-Use only in fume hood, glove box, or under ventilation. -Containers must be closed when transporting outside of ventilation device. -Doubled nitrile, PVA, or other suitable gloves are required when manipulating DCM or risk of splash or droplets.

Appendix 2: Monitoring Results

Initial monitoring for DCM is required to establish a baseline for DCM users and to inform the development of the Exposure Control Plan (ECP). Monitoring must be taken when and where operating conditions are best representative of each potentially exposed person's highest likely full shift (existing chemical exposure limit, ECEL) and 15-minute exposures (short-term exposure limit, STEL) occur.

Date	Department/Activity	Exposure Limit Type (ECEL/STEL)	Result (ppm)	Required Action
11/6/2024	Chemistry - Laboratory Synthesis; monitored individual identified as having greatest potential exposure	ECEL - 8 hour -TWA	0.04 (7-hour test, 8 hour-TWA of 0.046),	None. Below ECEL Action Level. Conditions suitable for continued DCM use
1/22/2025	Chemistry - Moving bottle from chemical fume hood to Rotovap; monitored individual identified as having greatest potential exposure	STEL - 15 min	Less than 1.3 minimum level of quantification. (25 min test, worst case 15-min STEL of 0.78)	None. Below STEL Action Level. Conditions suitable for continued DCM use
1/22/2025	Physics - Solvent plastic welding within chemical fume hood	STEL - 15 min	Less than 1.3 minimum level of quantification. (25 min test, worst case 15-min STEL of 0.78)	None. Below STEL Action Level. Conditions suitable for continued DCM use

Definitions

ECEL - Existing Chemical Exposure Limit, an 8-hour Time Weighted Average (TWA) expressing the expected exposure of DCM a worker would receive during a typical work day. Results equal to or exceeding 2ppm are unacceptable and warrant immediate suspension of DCM use.

ECEL Action Level - Results equal or exceeding 1ppm require increased monitoring frequency and possible suspension of DCM use.

STEL- Short Term Exposure Limit, a 15-minute exposure meant to represent the greatest possible exposure during a working period. Results equal to or exceeding 16ppm are unacceptable and warrant immediate suspension of DCM use.

STEL Action Level - Results equal or greater than 8ppm require increased monitoring frequency and possible suspension of DCM use.

Appendix 3: 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 DCM. Each Principal Investigator (PI) and/or Supervisor is responsible for developing, reviewing, and approving ECPs for all procedures that use DCM 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.

This Exposure Control Plan covers safety practices to be followed for use of dichloromethane as INSERT PROCEDURE NAME in INSERT Building and Room Number. The use of dichloromethane is subject to pre-approval by the Principal Investigator (PI) and/or Supervisor. DO NOT USE DICHLOROMETHANE UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.

Substitution

The following substitutes have been considered for dichloromethane:

- ☐ 2-Methyltetrahydrofuran
- ☐ Cyclopentylmethyl ether
- ☐ Ethanol
- ☐ Ethyl acetate
- ☐ Isopropanol
- ☐ Methanol
- ☐ Methyl isobutyl ketone
- ☐ Methyl tert-butyl ether
- ☐ Toluene
- ☐ Other _____

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

Dichloromethane 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 **INSERT Building and Room Number** 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.

Dichloromethane is approved for use in **INSERT Building and Room Number** in Insert Specific Location (e.g., benchtop, fume hood).
Dichloromethane is approved for storage in **INSERT Building and Room Number** in Insert Specific Location (e.g., cabinet).

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

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

Personal Protective Equipment (PPE)

Dichloromethane may only be handled while wearing the following PPE:

Eye Protection
☐ Safely glasses
☐ Goggles
☐ Face shield
☐ Other _____
Skin Protection
☐ Lab coat
☐ Apron
☐ Other _____
Hand Protection
☐ Nitrile gloves (Double gloved)
☐ Polyvinyl alcohol gloves
☐ LLDPE gloves
☐ Viton gloves
☐ Silvershield gloves

Lab-Specific ECP: Bowring Lab

This Exposure Control Plan covers safety practices to be followed for use of dichloromethane as a **crystallization solvent** in **Chemistry 310**. The use of dichloromethane is subject to pre-approval by the Principal Investigator (PI) and/or Supervisor. **DO NOT USE DICHLOROMETHANE UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.**

Substitution

The following substitutes have been considered for dichloromethane:

- ☒ 2-Methyltetrahydrofuran
- ☒ Cyclopentylmethyl ether
- ☒ Ethanol
- ☒ Ethyl acetate
- ☒ Isopropanol
- ☒ Methanol
- ☒ Methyl isobutyl ketone
- ☒ Methyl tert-butyl ether
- ☒ Toluene
- ☒ Other _1,2-dichlorobenzene; 1,2-difluorobenzene; acetonitrile_____

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 Working with small quantities that can be controlled with engineering controls

Engineering Controls

Dichloromethane 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 **Chemistry 310** 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.

Dichloromethane is approved for use in **Chemistry 310** within the **fume hoods or glove box**. Dichloromethane is approved for storage in **Chemistry 310** in the **gloveboxes, refrigerators, and chemical storage cabinets**.

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

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

Personal Protective Equipment (PPE)

Dichloromethane may only be handled while wearing the following PPE:

Eye Protection
- ☒ Safely glasses
- ☐ Goggles
- ☐ Face shield
- ☐ Other _____

Skin Protection
- ☒ Lab coat
- ☐ Apron
- ☐ Other _____

Hand Protection
- ☒ Nitrile gloves (Double gloved)
- ☐ Polyvinyl alcohol gloves
- ☐ LLDPE gloves
- ☐ Viton gloves
- ☐ Silvershield gloves
- ☒ Butyl gloves (glovebox)

Lab-Specific ECP: Campillo-Alvarado Lab

This Exposure Control Plan covers safety practices to be followed for use of dichloromethane as a **crystallization solvent** in **Chemistry 409**. The use of dichloromethane is subject to pre-approval by the Principal Investigator (PI) and/or Supervisor. **DO NOT USE DICHLOROMETHANE UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.**

Substitution

The following substitutes have been considered for dichloromethane:

- ☐ 2-Methyltetrahydrofuran
- ☐ Cyclopentylmethyl ether
- ☒ Ethanol
- ☒ Ethyl acetate
- ☒ Isopropanol
- ☒ Methanol
- ☐ Methyl isobutyl ketone
- ☐ Methyl tert-butyl ether
- ☒ Toluene
- ☒ Other _benzene, chloroform, tetrahydrofuran_____

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 sometimes it is required to get the specific solid form (process requirement)

Engineering Controls

Dichloromethane 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 **Chemistry 409** 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.

Dichloromethane is approved for use in **Chemistry 409** within the **fume hoods**.
Dichloromethane is approved for storage in **Chemistry 409** in the **chemical storage cabinets**.

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

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

Personal Protective Equipment (PPE)

Dichloromethane may only be handled while wearing the following PPE:

Eye Protection
- ☒ Safely glasses
- ☐ Goggles
- ☐ Face shield
- ☐ Other _____

Skin Protection
- ☒ Lab coat
- ☐ Apron
- ☐ Other _____

Hand Protection
- ☒ Nitrile gloves (Double gloved)
- ☐ Polyvinyl alcohol gloves
- ☐ LLDPE gloves
- ☐ Viton gloves
- ☐ Silvershield gloves

Lab-Specific ECP: O'Brien Lab

This Exposure Control Plan covers safety practices to be followed for use of dichloromethane as a **solvent** in **Chemistry 418**. The use of dichloromethane is subject to pre-approval by the Principal Investigator (PI) and/or Supervisor. **DO NOT USE DICHLOROMETHANE UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.**

Substitution

The following substitutes have been considered for dichloromethane:

- ☐ 2-Methyltetrahydrofuran
- ☐ Cyclopentylmethyl ether
- ☐ Ethanol
- ☒ Ethyl acetate
- ☐ Isopropanol
- ☐ Methanol
- ☐ Methyl isobutyl ketone
- ☒ Methyl tert-butyl ether
- ☐ Toluene
- ☒ Other _dichloroethane, chloroform_____

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 Worse health hazards for alternative halogenated solvents

Engineering Controls

Dichloromethane 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 **Chemistry 418** 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.

Dichloromethane is approved for use in **Chemistry 418** within the **fume hoods and glove boxes**.
Dichloromethane is approved for storage in **Chemistry 409** in the **flammable cabinets**.

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

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

Personal Protective Equipment (PPE)

Dichloromethane may only be handled while wearing the following PPE:

Eye Protection
- ☒ Safely glasses
- ☐ Goggles
- ☐ Face shield
- ☐ Other _____

Skin Protection
- ☒ Lab coat
- ☐ Apron
- ☐ Other _____

Hand Protection
- ☒ Nitrile gloves (Double gloved)
- ☐ Polyvinyl alcohol gloves
- ☐ LLDPE gloves
- ☐ Viton gloves
- ☐ Silvershield gloves

Appendix 4: Training for DCM Users

Training can be accomplished by reviewing our training slides found at https://www.reed.edu/ehs/safety-information-and-programs/ under “Methylene Chloride Safety Training” or the material below. Certification of training be completed by filling out the Reed College Methylene Chloride Training Completing Form, or by signing the attestation at the end of this appendix and providing a copy to EHS at ehs@reed.edu.

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. The EPA has identified a limited number of applications that may continue, including use as a laboratory chemical and in solvent plastic welding applications. A Workplace Chemical Protection Plan (WCPP) is required for continued use, which includes monitoring and training.

Hazards of Dichloromethane

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 has caused central nervous system harm, up to and including unconsciousness and death through respiratory paralysis. Direct exposure to skin and eyes can cause irritation.

How to Protect Yourself

Elimination/Substitution: The best way to protect yourself from DCM exposure is to simply eliminate its use. There are several alternatives that may be suitable substitutes depending on their applications. Potential substitutes include:

- ☐ 2-Methyltetrahydrofuran
- ☐ Cyclopentylmethyl ether
- ☐ Ethanol
- ☐ Ethyl acetate
- ☐ Isopropanol
- ☐ Methanol
- ☐ Methyl isobutyl ketone
- ☐ Methyl tert-butyl ether
- ☐ Toluene

Engineering Controls: If DCM must be used, ventilation systems need to be utilized to reduce the risk of inhalation. Work should be performed in a chemical fume hood, glove box, or with a snorkel funnel to contain vapors.

Administrative Controls: All occupants of laboratories that use DCM need to review the WCPP and Exposure Control Plan (ECP) and receive training about hazards and control measures (i.e. this document). You must agree to follow the rules outlined here and sign that you will do so.

DCM should be stored in a compatible bottle, labeled according to GHS standards, and placed in secondary containment. Additionally, it should be stored away from incompatible chemicals below eye level.

If any ventilation devices malfunction, all work with DCM within that device should be stopped. Do not restart any DCM work in the hood/glove box/snorkel until it has been repaired and is functioning properly.

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

Personal Protective Equipment (PPE): The last line of defense against DCM exposure is PPE. You should wear the standard PPE required for work with hazardous chemicals (lab coat, full leg coverings, closed-toe shoes, and safety glasses) as well as additional hand protection in the form either: 1) Doubled (two per hand) nitrile gloves; 2) Polyvinyl alcohol (PVA) gloves; or 3) LLDPE laminate or butyl viton gloves if using strong oxidizing acids.

Any PPE suspected of coming in contact with DCM must be changed immediately. This means changing gloves frequently during DCM manipulations. Your instructor should demonstrate how to safely remove gloves to avoid contact with contamination.

Respiratory protection is required if working in an environment suspected of exceeding exposure limits. Further training for respiratory protection is facilitated through our Respiratory Protection Program. If there is a reason to suspect DCM in an area exceeds the exposure limit, stop all work immediately, notify your supervisor and EHS, and leave the space until further investigation can take place.

Exposure Limits and Action Levels: Exposure limits and action level thresholds have been designated by the EPA. Monitoring has been conducted to ensure that approved work activities do not exceed the exposure limits or action thresholds. New procedures or activities may require initial monitoring to determine exposure levels, please notify your supervisor and EHS if you wish to start a new procedure and do not start until it has been approved by both groups.

ECEL - Existing Chemical Exposure Limit, an 8-hour Time Weighted Average (TWA) expressing the expected exposure of DCM a worker would receive during a typical work day. Results equal to or exceeding 2ppm are unacceptable and warrant immediate suspension of DCM use.

ECEL Action Level - Results equal or exceeding 1ppm require increased monitoring frequency and possible suspension of DCM use.

STEL- Short Term Exposure Limit, a 15-minute exposure meant to represent the greatest possible exposure during a working period. Results equal to or exceeding 16ppm are unacceptable and warrant immediate suspension of DCM use.

STEL Action Level - Results equal or greater than 8ppm require increased monitoring frequency and possible suspension of DCM use.

Lab/Shop Specific Exposure Control Plans: Your lab supervisor will provide you with specific instructions for the procedures involving DCM and additional exposure controls for your workplace. You should abide by these protocols as well as the general exposure control listed above.

Rights and Stop Work Authorization

If you feel unsafe in your workplace or are unsure of exposure control measures you may stop work at any time. Please notify your supervisor and/or EHS of your concerns and do not resume work until you are confident that you can work safely.

Name:

_____

Signature:

_____

Date:

_____

Laboratory Supervisor/PI:

_____

Appendix 5: Resources

- Ansell Chemical Glove Resistance Guide
- A Guide to Complying with the 2024 Methylene Chloride Regulation
- EPA Fact Sheet: Methylene Chloride or Dichloromethane
- FACT SHEET: 2024 Final Risk Management Rule for Methylene Chloride under TSCA
- Methylene Chloride Hazards for Bathtub Refinishers
- OSHA 1910.1052 Methylene Chloride Standard
- Preliminary Information on Manufacturing, Processing, Distribution, Use, and Disposal: Methylene Chloride
- Reed College Chemical Hygiene Plan
- Risk Evaluation for Methylene Chloride - See Appendix F for details on glove materials