



Methylene Chloride

Workplace Chemical Protection Program



Revision Log

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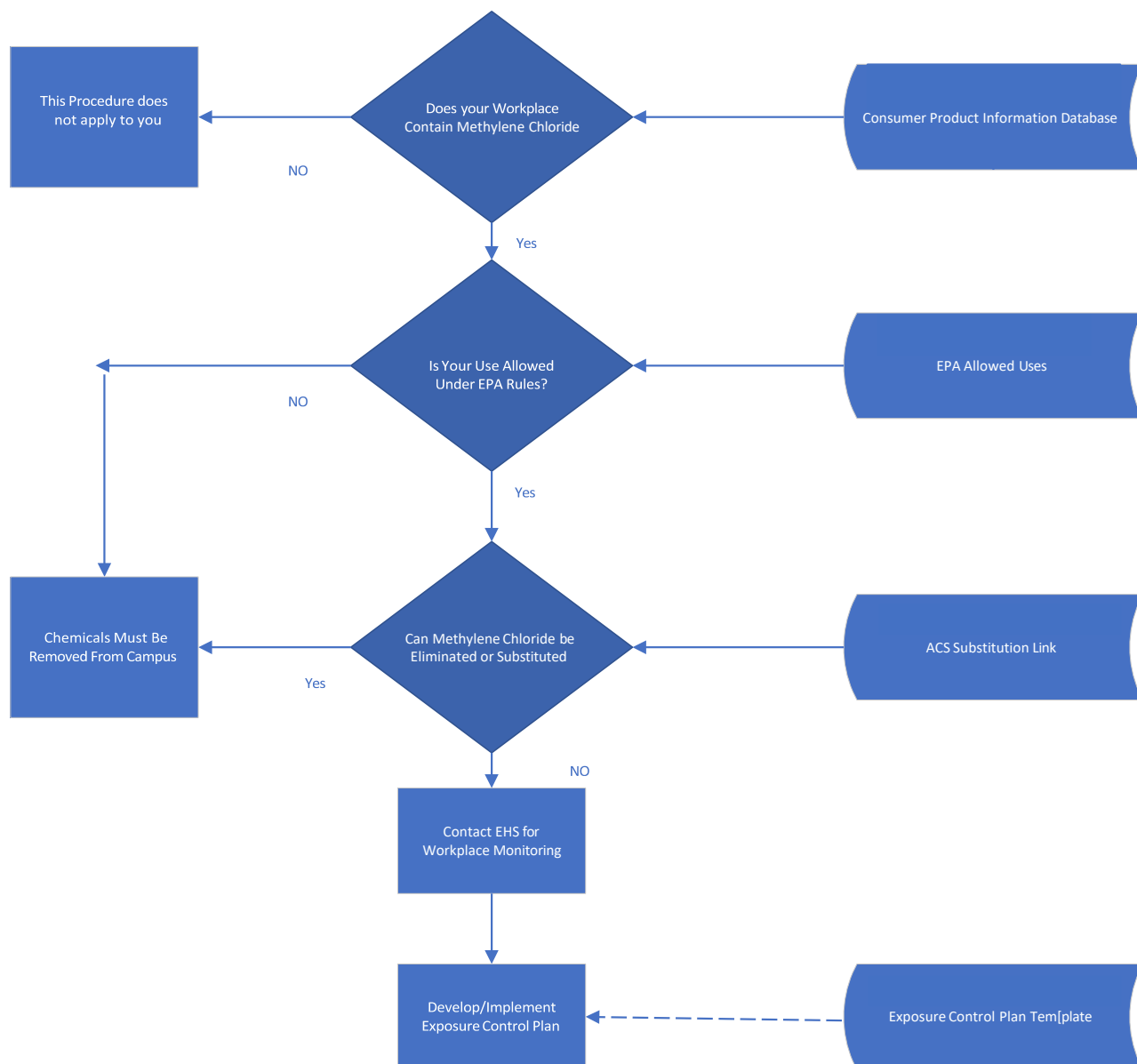


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Procedural Flow Diagram





Purpose

Michigan Technological University (Michigan Tech) is committed to the health and safety of the entire campus community. This program is intended to protect employees, students and visitors from potential health hazards associated with **Methylene Chloride**, and to ensure materials containing **Methylene Chloride** will be handled in compliance with all applicable federal, state and local regulations.

This program is intended to summarize Michigan Technological University's **Methylene Chloride Workplace Chemical Protection Program (WCPP)** for the administration, faculty, staff, students, visitors, and external contractors that work or live on campus and satellite properties with the potential to be exposed to **Methylene Chloride**.

This plan includes, but is not limited to, the identification, elimination, and substitution of materials containing 0.1% or greater **Methylene Chloride**, development of exposure control plans, emergency protocols, medical and environmental surveillance guidelines, hazard communication requirements, training, and the disposal of **Methylene Chloride** containing waste products on university-owned properties.

Scope

This program applies to all laboratories, shops, studios, and work areas where **Methylene Chloride** or mixtures containing 0.1% or greater **Methylene Chloride** concentration are used, handled, or stored.

Adherence to this program satisfies the **Workplace Chemical Protection Program (WCPP)** and **Exposure Control Plan** requirements of [40 CFR Part 751, Methylene Chloride; Regulation Under the Toxic Substances Control Act](#) and Michigan Occupational Safety and Health Administration (MIOSHA) [Part 313, Methylene Chloride General Industry Standard](#).

Non-Michigan Tech employees, specifically visiting faculty, research personnel, contractors, students, and other non-employee persons working in areas with the potential to be exposed to **Methylene Chloride**, are included in this plan in relation to Michigan Tech's expectations of **Methylene Chloride containing materials** handling on campus and other MTU-owned/leased properties.

All contracted employees are ultimately responsible for following their respective companies' protocols for handling **Methylene Chloride** materials, including personal exposure monitoring, applicable training, and appropriate personal protective equipment. Contractors/contracting firms must be compliant with all applicable local, state, and federal regulations in addition to any obligations identified in their Michigan Tech contracts.

Michigan Tech is not responsible for developing and maintaining **Methylene Chloride**



Workplace Chemical Protection Programs in collaborative institutions or corporate laboratories or spaces, but is responsible for the safety of our employees utilizing the spaces.

Definitions

CNS: Central Nervous System (CNS) refers to the complex network of nerves and tissues that control and coordinate all bodily functions.

DHHS: The Department of Health and Human Services (DHHS) works with state and local governments funding research programs and providing public health services, food and drug safety programs, health insurance programs, and many other public services.

ECP: Exposure Control Plans (ECP) outline procedures and practices to protect workers from exposure to bloodborne pathogens and other hazardous substances in the workplace, ensuring a safer environment.

EPA: The Environmental Protection Agency (EPA) is an agency of the United States government tasked with environmental protection matters.

Isotopologues - Chemicals that differ from its parent chemical in that at least one atom has a different number of neutrons.

MIOSHA: The Michigan Occupational Safety and Health Administration (MIOSHA) is part of the Michigan Department of Licensing and Regulatory Affairs and is responsible for the health and safety of Michigan's workforce.

OEL: Occupational Exposure Limits (OEL), are regulatory values indicating safe levels of exposure to chemical substances in the workplace air, primarily intended to prevent workers from inhaling harmful chemicals.

TSCA: The Toxic Substances Control Act (TSCA) is a law that gives the Environmental Protection Agency (EPA) the power to regulate chemicals in the United States.

TWA: Time-weighted average (TWA) is a method of calculating a worker's daily exposure to hazardous substances such as dust, fumes, chemicals, gases, or vapors. It is averaged to an 8-hour workday or 40-hour work week, along with the average levels of exposure to the hazardous substance and the time spent exposed to them.

WCPP: The Workplace Chemical Protection Program (WCPP) is a program outlined in EPA's Toxic Substances Control Act (TSCA) section 6 to protect potentially exposed persons in the workplace from unreasonable risk due to exposure to a TSCA regulated chemical substance.



Background

Methylene Chloride (CAS # 75-09-2) is a colorless liquid with a chloroform-like odor that is used in a variety of laboratory and commercial applications. Synonyms include: Dichloromethane; DCM; MeCl & MeCl₂; Methane dichloride; Methylene bichloride; Methylene dichloride. This program applies to all **Isotopologues** of **Methylene Chloride**, including its deuterated form (CAS # 1665-00-5).

Methylene Chloride is volatile, producing potentially toxic concentrations at room temperature. It is slightly soluble in water and miscible with most organic solvents.

In April 2024, the **EPA** finalized prohibitions and workplace protections under the [Toxic Substances Control Act \(TSCA\)](#) for **Methylene Chloride**. This new regulation includes a phase out of its use in consumer and commercial products, and outlines strict regulation of its use in very limited, approved situations.

Although thirteen (13) uses for **Methylene Chloride** are not subject to complete prohibition under the **EPA** rule, **Michigan Tech's WCPP Program** only pertains to the following two (2) conditions of use (if you believe your use falls under the other 11 exempted uses contact EHS for additional guidance):

1. Laboratory Chemical Use: refers to the industrial, research, or commercial use of **Methylene Chloride** in a laboratory process or in specialized laboratory equipment for instrument calibration/maintenance chemical analysis, chemical synthesis, extracting and purifying other chemicals, dissolving other substances, executing research, development, test and evaluation methods, and similar activities, such as use as a solvent, reagent, analytical standard, or other experimental use.

2. Bonding Agent/Solvent Welding Use: refers to the industrial, research, or commercial use of **Methylene Chloride** or a **Methylene Chloride Solvent Blend** to chemically bond polymer substrates including, but not limited to, acrylic or polycarbonate, creating a seamless, airtight, and waterproof joint.

For these conditions of use, the **EPA** requires employers to develop and institute a **Workplace Chemical Protection Plan (WCPP)**.

ALL other uses of Methylene Chloride are prohibited on the Michigan Tech Campus and satellite properties.



Routes of Exposure

1. Inhalation

Inhalation is the most important route of exposure and **Methylene Chloride** vapor is absorbed readily from the lungs. **Odor is not an adequate warning property for Methylene Chloride**, the odor threshold is 250 ppm, which is 10 times higher than the OSHA PEL (25 ppm). Olfactory fatigue may also occur at high concentrations. **Methylene Chloride** is heavier than air and may cause asphyxiation in enclosed, poorly ventilated, or low-lying areas.

2. Skin/Eye Contact

Exposure to high levels of **Methylene Chloride** vapor can cause skin and eye irritation. Prolonged dermal contact with liquid **Methylene Chloride** may produce chemical burns. **Methylene Chloride** is absorbed slowly through intact skin but probably not in quantities that cause acute systemic toxicity.

3. Ingestion

Acute toxic effects, including death, can result from ingestion.

Occupational Exposure Limits (OELs)

Occupational Exposure Limits enacted by the EPA's revised TSCA regulation are more restrictive than MIOSHA OELs and as a federally approved standard, supersede state guidelines.

- EPA TSCA Chemical Exposure Limit (ECEL): 2 ppm as an 8-hour Time Weighted Average (TWA)
- EPA TSCA Action Level: 1 ppm as an 8-hour TWA
- EPA Short-Term Exposure Limit (STEL): 16 ppm as a 15-minute TWA

Old exposure limits:

- MIOSHA Action Level: 12.5 ppm as an 8-hour TWA
- MIOSHA 8-hour Permissible Exposure Limit (PEL): 25 ppm as an 8-hour TWA
- MIOSHA 15-minute STEL: 125 ppm as a 15-minute TWA



Potential Health Effects

Methylene Chloride poses both non-cancer and cancer health risks from acute and chronic inhalation and dermal exposures.

- **Methylene Chloride** is irritating to the skin, eyes, and respiratory tract. These effects can result from inhalation or dermal exposure to **Methylene Chloride**. Prolonged skin contact may cause chemical burns.
- Exposure by any route can cause Central Nervous System (CNS) depression. Ingestion of **Methylene Chloride** can cause severe gastrointestinal irritation.
- Carbon monoxide, a metabolite of **Methylene Chloride**, may contribute to delayed toxic effects. The fetus and neonates are particularly vulnerable to poisoning with carbon monoxide.

Acute Exposure

Adverse health effects of **Methylene Chloride** are due both to the parent compound and carbon monoxide which is a metabolite of **Methylene Chloride**. Carbon monoxide induces the formation of carboxyhemoglobin, thus depriving the brain from normal oxygen delivery and utilization. Signs and symptoms of exposure to very high levels (>750 ppm) of **Methylene Chloride** may be evident within minutes of exposure onset. Less pronounced exposures may induce adverse signs and symptoms within hours.

CNS

Methylene Chloride exposure causes dose-related CNS depression. Typical acute symptoms (within minutes to hours) include headache, drowsiness, lightheadedness, slurred speech, decreased alertness, slowed reaction times, irritability, impaired gait, and stupor. Rapid loss of consciousness, coma, seizures, and death have been reported.

Metabolic

Methylene Chloride is metabolized in the liver, in part to carbon monoxide, which will produce elevated carboxyhemoglobin levels and decrease the oxygen-carrying capacity of the blood. Carboxyhemoglobin levels may continue to rise for several hours after exposure has ceased. The fetus is particularly vulnerable to poisoning with carbon monoxide.

Cardiovascular

Methylene Chloride may cause electrocardiographic changes resembling those of carbon monoxide poisoning. Elevated carboxyhemoglobin and carboxymyoglobin levels may cause insufficient oxygen supply to the heart in persons who have preexisting coronary disease.



Respiratory

Victims of acute, high-level inhalation exposures may suffer airway irritation, inflammation of the lungs, and accumulation of fluid in the lungs.

Gastrointestinal

Nausea, vomiting, gastrointestinal ulceration and bleeding have been reported after ingestion.

Hepatic

Liver dysfunction may result from acute, high-level exposure to **Methylene Chloride**.

Dermal

Methylene Chloride causes skin irritation and blistering. Prolonged dermal contact may result in second- and third-degree chemical burns.

Ocular

High concentrations of **Methylene Chloride** vapor may cause eye irritation and tearing. When splashed in the eye, **Methylene Chloride** can cause burning pain, inflammation of the eye surface, and inflammation of the iris.

Potential Sequelae

Survivors of severe, acute exposure (e.g., cases of coma, seizures, or respiratory arrest) may suffer brain or heart damage from lack of oxygen to these organs. Exposure to high levels of **Methylene Chloride**, which may lead to the formation of high amounts of the metabolite carbon monoxide, may lead to permanent sequelae, including mental deterioration, urinary and fecal incontinence, and gait disturbance.

Chronic Exposure

Irritant contact dermatitis manifested by inflammation and hives has been noted in workers who have chronic skin exposure.

Carcinogenicity

The DHHS has determined that **Methylene Chloride** may be reasonably anticipated to be a human carcinogen based on adequate evidence in experimental animals.

Reproductive and Developmental Effects

Methylene Chloride has been shown to cross the placenta in animals and has been found in human breast milk. The fetus and neonates are more susceptible to carbon monoxide, a **Methylene Chloride** metabolite, poisoning. Acute, nonlethal maternal intoxication with carbon monoxide may result in fetal death or permanent neurologic sequelae.



Consult the Safety Data Sheet for **Methylene Chloride**, [SDSONLINE](#) database maintained by Michigan Tech, as well as the references section for more information.

WCPP Compliance Path

Departments that use or possess **Methylene Chloride** are required to do the following:

1. **Check your workspace for Methylene Chloride**
 - ensure all items are inventoried in [SDS ONLINE](#).
 - If your inventory contains **Methylene Chloride** or **Methylene Chloride**-containing solutions ($\geq 0.1\%$ by weight), continue to **Step #2**.
2. **Review the EPA's Fact Sheet** to determine if your use of **Methylene Chloride** is allowed or prohibited under the new rules.
3. **Eliminate Methylene Chloride or substitute it** for a less hazardous chemical where possible.
 - Elimination or substitution is **required for prohibited uses** and strongly recommended for allowed uses.
 - **Find a replacement** for prohibited uses by **November 1, 2026**.
4. Promptly **remove chemicals that are no longer in use**.
 - Label Containers as hazardous waste.
 - [Request hazardous waste collection](#).

Eliminating or Replacing Methylene Chloride

Laboratories

Laboratories can use the following resources to find replacements for products containing **Methylene Chloride**.

1. The American Chemical Society (ACS) Green Chemistry Institute has developed a [Solvent Tool](#).



2. The Organic Photonics & Electronics Group at Umeå University has similarly developed a [Green Solvent Selection Tool](#), which can be used to help select solvents based on a variety of physical and chemical properties.
3. The [Green Chemistry Teaching and Learning Community](#) has published a resource library page with a variety of other tools for elimination/substitution.

Non-Laboratory Locations, Facilities, and Shops

Facilities and shops can use the following resources to find replacements for products containing **Methylene Chloride**.

1. The EPA has evaluated a [list of alternative products](#) (Appendix A and B), which can be used to help find replacement products based on condition of use.

After October 28, 2027: All industrial or commercial use of **Methylene Chloride**, including any **Methylene Chloride**-containing products (except for [allowed uses](#)) will be prohibited from use on Michigan Tech Campus and satellite properties.

Continued Use Requirements

If **Methylene Chloride** elimination or substitution is **NOT** possible **AND** the use is allowed under the new EPA TSCA rules, then the following usage requirements will apply:

1. EHS is responsible for workplace exposure monitoring, where required, to determine site specific **Methylene Chloride** levels.
2. Laboratories will be required to implement a written **Methylene Chloride Operation Specific Exposure Control Plan** to meet the [EPA's exposure control plan requirement](#).

EHS has created a Methylene Chloride Exposure Control Plan Template (Appendix A) that meets the critical components of the EPA's exposure control plan.



Exposure Monitoring

Exposure monitoring is required by all laboratories continuing to use **Methylene Chloride**. The surveillance will ensure potential exposures do not exceed the EPA exposure limits and to ensure regulatory compliance for all persons exposed above the EPA action level.

Exposure monitoring shall be conducted for all potentially exposed persons or for an individual or group of individuals determined to be representative of the exposure group. EHS will determine when representative samples are appropriate.

Potentially exposed persons will be notified of monitoring results within 15 business days after receipt of the monitoring results.

EHS shall maintain recordkeeping of all exposure monitoring events for a period of at least 5 years from the monitoring event.

Operations Requiring Exposure Monitoring

1. Existing operations involving **Methylene Chloride** at or above 0.1% concentration.
2. New operations involving **Methylene Chloride** at or above 0.1% concentration.
3. The alteration of an existing operation involving **Methylene Chloride** in any manner that may present increased exposure potential.

Laboratory Management (Principal Investigator, Lab Manager, Departmental Chair, or Departmental Professional Staff) are responsible for notifying EHS of an exposure assessment requirement.

Periodic Monitoring based on the initial monitoring results, will be conducted in accordance with [40 CFR 751.109\(d\)\(3\) Workplace Chemical Protection Program](#).

TABLE 1 TO PARAGRAPH (d)(3)—PERIODIC MONITORING REQUIREMENTS BASED ON INITIAL EXPOSURE MONITORING RESULTS

Air concentration condition observed during initial exposure monitoring	Periodic monitoring requirement
If the initial exposure monitoring concentration is below the ECEL action level and at or below the EPA STEL	ECEL and EPA STEL periodic monitoring at least once in every 5 years.



**TABLE 1 TO PARAGRAPH (d)(3)—PERIODIC MONITORING REQUIREMENTS BASED
ON INITIAL EXPOSURE MONITORING RESULTS**

Air concentration condition observed during initial exposure monitoring	Periodic monitoring requirement
If the initial exposure monitoring concentration is below the ECEL action level and above the EPA STEL	ECEL periodic required at least once every 5 years, and EPA STEL periodic monitoring required every 3 months.
If the initial exposure monitoring concentration is at or above the ECEL action level and at or below the ECEL; and at or below the EPA STEL	ECEL periodic monitoring every 6 months.
If the initial exposure monitoring concentration is at or above the ECEL action level and at or below the ECEL; and above the EPA STEL	ECEL periodic monitoring every 6 months and EPA STEL periodic monitoring every 3 months.
If the initial exposure monitoring concentration is above the ECEL and below, at, or above the EPA STEL	ECEL periodic monitoring every 3 months and EPA STEL periodic monitoring every 3 months.
If 2 consecutive monitoring events have taken place 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.
If 2 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.



**TABLE 1 TO PARAGRAPH (d)(3)—PERIODIC MONITORING REQUIREMENTS BASED
ON INITIAL EXPOSURE MONITORING RESULTS**

Air concentration condition observed during initial exposure monitoring	Periodic monitoring requirement
If the owner or operator engages in any conditions of use described in paragraph (a) of this section and is required to monitor either the ECEL or EPA STEL in a 3-month interval, but does not engage in any of those uses for the entirety of the 3-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 described in paragraph (a) of this section.
Owner or operator engages in any conditions of use described in paragraph (a) of this section and is required to monitor the ECEL in a 6-month interval, but does not engage in any of those uses for the entirety of the 6-month interval	The owner or operator may forgo the upcoming periodic monitoring event. However, documentation of cessation of the condition(s) of use must be maintained until periodic monitoring resumes, and initial monitoring is required when the owner or operator resumes or starts any of the conditions of use described in paragraph (a) of this section.

Operation Specific Exposure Control Plan

For Michigan Tech Research Laboratories opting to continue **Methylene Chloride** use, **Appendix A: Operation Specific Exposure Control Plan (ECP)** template can be utilized to satisfy the requirements of the TSCA regulations.

The **Principal Investigator (PI)** or designated **Lab Supervisor** is ultimately responsible for the development, implementation, compliance, and maintenance of the **ECP** within their lab areas.

The **ECP** will include the following:

1. Selection of specific laboratory exposure control measures (**Hierarchy of Controls**), including:
 - a. How the controls are implemented.
 - b. Why alternative controls were not selected.



2. The **ECP** shall document why the substitution or elimination of **Methylene Chloride** was not feasible.
3. The **ECP** will include procedures for all of the following:
 - a. Response plans for reasonably expected changes that may introduce additional sources of exposure.
 - b. Response plans for reasonably expected changes that may result in increased laboratory exposure.
 - c. Procedures for implementing corrective actions to mitigate exposure to **Methylene Chloride** in the laboratory.
 - d. Required training, method of training delivery, and recertification of training intervals.
4. Documented periodic reviews, on an annual basis or if triggered by a laboratory equipment change, procedural change, or suspected exposure incident, are the responsibility of the **Principal Investigator (PI), Lab Supervisor, or Departmental Lab Manager**.

The reviews will include:

 - a. The effectiveness of the exposure controls.
 - b. Identify any necessary updates to the exposure controls.
 - c. Confirm that all persons are properly implementing the exposure controls.
 - d. Confirm that training is adequate for the specific laboratory environment.

Hierarchy of Controls

A [Hierarchy of Controls](#) provides a means of determining ways to implement control measures (from most effective to least effective) that protect persons from injuries, illnesses, and fatalities.

As identified in the graphic **Figure 1.0 Hierarchy of Controls**, the primary exposure control methods are hazard elimination or substitution by a less hazardous process or toxic substance. Laboratories should systematically implement exposure controls in the following order of effectiveness:

1. **Elimination**
2. **Substitution**

3. Engineering Controls
4. Administrative Controls
5. Personal Protective Equipment (PPE)

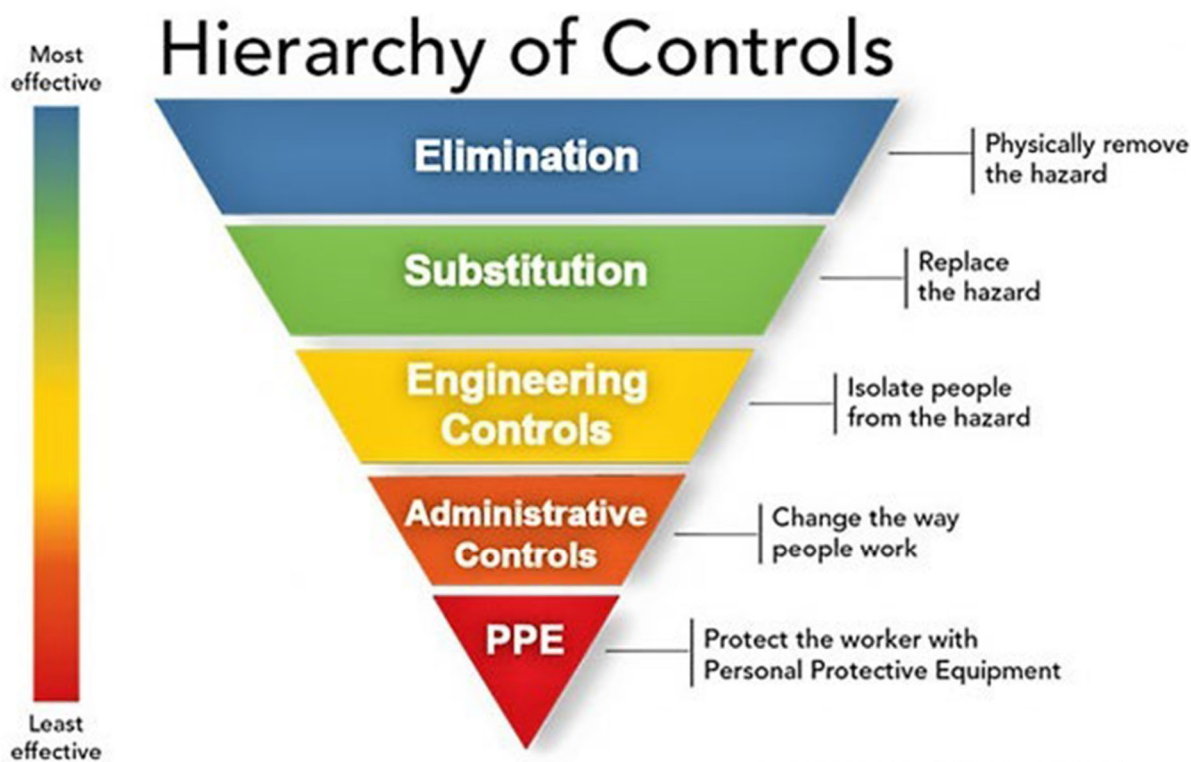


Image by: NIOSH 2021

Figure 1.0 Hierarchy of Controls

In some cases, a combination of controls may be necessary (e.g., ventilated containment hoods and PPE when working with **Methylene Chloride**).

Elimination or Substitution Controls

Utilizing **Elimination** or **Substitution Control** strategies for **Methylene Chloride** is the most effective process to lower the exposure potential resulting in laboratory illnesses or injuries.

The Controls for Elimination and Substitution are covered in previous sections of this document.



Engineering Controls

Engineering Controls are designed to control the hazard at the source before it comes in contact with the worker through isolation or enclosure of the process.

Examples of **Methylene Chloride Engineering Controls** include:

1. Working with open containers of **Methylene Chloride** should be conducted only in a fume hood, glovebox, or other vapor containment device.
 - a. Note that when selecting a containment device, that **Methylene Chloride** is heavier than air.
 - b. The use of snorkels, downdraft tables, and other devices that do not totally enclose the procedure fall under number 2 below.
2. Procedures that involve the handling of **Methylene Chloride** outside of a fume hood or glove box must be vetted via exposure monitoring to ensure they do not exceed exposure limits.
3. Emergency eyewash and shower facilities must be available within the laboratory for immediate flushing of eyes or skin in the event of personal exposure.

Administrative Controls

Administrative controls are changes in work procedures to reduce the duration, frequency, and severity of exposure to hazardous chemicals or situations. Administrative controls include **Work Practice Controls** and **Regulated Areas** which are intended to reduce the likelihood of exposure by changing the way a task is performed.

Examples of **Methylene Chloride** administrative controls include:

- The OSHA publication, "[*Training Requirements in OSHA Standards*](#)" p.103 covers the requirements for [Training on job-related hazards](#) associated with **Methylene Chloride** during initial assignment, for any new or updated procedure, and whenever a new process or piece of equipment is introduced to the laboratory.
- Provide for medical surveillance, fit testing, equipment, appropriate selection and availability of PPE
- Train and educate about proper use and disposal of PPE and proper PPE maintenance, surface disinfection, and cleaning practices.
- Adjust work schedules to avoid fatigue and burnout.



- Display warning signs for potential hazards
(example: **Figure 2.0 Signage Example for Methylene Chloride**)
- Develop laboratory specific written health and safety policy and procedure manuals available and accessible, 24 hours a day/7 days per week and ensure they are annually reviewed and updated. Guidelines can be found in the following reference: ○ [Toxic and Hazardous Substances](#) (for laboratories)
- Provide an up to date inventory of hazardous chemicals, Safety Data Sheets (SDS), and secondary labels accessible 24/7, as outlined in the following reference:
 - [Hazard Communication Standard](#)

Work Practice Controls for Methylene Chloride

- **Requirement:** Designate a **Regulated Area** for working with **Methylene Chloride**, and label it appropriately.
- Keep containers closed as much as possible.
- Handle open containers, including the collection of **Methylene Chloride** waste, only in a chemical fume hood, glove box or other containment device.
- Use in the smallest practical quantities for the experiment being performed.
- Once work with **Methylene Chloride** is complete, wipe down the work area with soap and water solution.
- Keep away from ignition sources. Incompatible with strong oxidizers and metals.
- Ensure the proper spill kits are present..
- Purchase only enough material needed to complete an experiment.
- If gloves become contaminated with **Methylene Chloride**, remove gloves immediately and wash hands with soap and water for 15 minutes. Check hands for any signs of contamination.
- Launder lab coats on a periodic basis.
- Do not eat, drink, or smoke in areas where **Methylene Chloride** or other chemicals are used.



Regulated Areas

- A regulated area distinguishes places where airborne concentrations of **Methylene Chloride** exceed, or there is a reasonable possibility they may exceed, the applicable ECEL or the EPA STEL.
- Regulated areas must be established within 3 months following receipt of monitoring data that indicates the EPA ECEL or STEL is exceeded.
- A regulated area must be visibly marked from the rest of the workplace in a manner that adequately establishes and alerts potentially exposed persons to the boundaries of the area and minimizes the number of authorized persons exposed to **Methylene Chloride** within the regulated area.
- Demarcation of the regulated area will be accomplished by the following:
 - a. Posting of signage that reads "*Danger: Regulated Area. Methylene Chloride, authorized personnel only. Respiratory protection and protective clothing required*".



Figure 2.0 Signage Example for Methylene Chloride

- b. Barriers, caution tape, or any other highly visible indicator that would effectively indicate the boundaries of the area may be used, in addition to the required signage.



- Access to the regulated area is restricted to authorized individuals who have received appropriate training and personal protective equipment.
- Respiratory protection is required by all individuals who enter the regulated area while operations involving **Methylene Chloride** are being conducted. Respiratory protection shall be issued and used in compliance with the following section (**Personal Protective Equipment**).

Personal Protective Equipment

Personal Protective Equipment (PPE) is the last line of defense and least effective method of control against the hazards of **Methylene Chloride**.

PPE does **NOT** take the place of engineering or administrative controls. Effective use of **PPE** relies on the user and is only used until better controls can be identified and implemented in the review process of the **Operation Specific Exposure Control Plan**.

Skin and Eye Protective Equipment

- **Methylene Chloride** readily penetrates through standard nitrile, natural rubber, and polyvinyl chloride laboratory gloves.
- Wear two pairs of gloves when using **Methylene Chloride**. Disposable gloves provide minimum protection for general laboratory use and should be changed frequently or whenever contamination is suspected.
- The inner glove should be made of a laminate of polyethylene (PE)/ethylene vinyl alcohol (EVOH) or a laminate of Viton®/Butyl rubber, a laminate of polyethylene vinyl alcohol/ethylene vinyl alcohol (PVA/EVA), Polyvinyl Alcohol (PVA), or other laminate materials that are resistant to **Methylene Chloride** to prevent penetration through to skin.

Caution

Because **Methylene Chloride** can readily penetrate nitrile and neoprene, wearing just an outer glove of this material will not protect your skin from **Methylene Chloride** exposure.

- Based on work activities, outer gloves made of nitrile or neoprene are also recommended to prevent cuts, tears, punctures, or rips to the inner **Methylene Chloride**-resistant gloves.
- Do not wear contact lenses while working with **Methylene Chloride**.



- Splash goggles should be worn when a splash hazard exists; safety glasses with side shields (both that meet the requirements of ANSI/ISEA Z87.1) are required at a minimum.
- A fully buttoned laboratory coat must be worn when working with **Methylene Chloride**.
- A chemically resistant apron should be used if transferring or using large quantities of **Methylene Chloride** in open containers.

Respiratory Protection

- Respiratory protection is to be used only when **ALL** other control measures are exhausted. When **elimination, substitution, engineering, and administrative controls** cannot reliably reduce exposures below the EPA OELs, **Respiratory Protection is Mandatory**.
- If respiratory protection is required, supplied-air respirators must be used. Cartridge based air purifying respirators are **NOT** permitted. Respirator selection criteria shall comply with [40 CFR 751.109\(f\)\(2\)](#).
- All users of respiratory protection must be enrolled in the Michigan Tech [Respiratory Protection Program](#). Users will receive training on the use, maintenance, and care of the prescribed respirator. Users will also be required to obtain medical clearance for respirator use, and be fit tested by EHS personnel.

Please contact EHS-support@mtu.edu for assistance in enrolling in the MTU Respiratory Protection Program.

All users of respiratory protection must comply fully with the **MTU Respiratory Protection Program**.

Compliance failures will result in laboratory use privilege revocation until compliance is achieved.

Transportation and Storage

Prior to working with **Methylene Chloride**, employees must be trained in the proper handling, storage, and transportation of the chemical.

- Keep **Methylene Chloride** containers tightly closed and sealed until ready for use.
- Transport **Methylene Chloride** in secondary containment, preferably a polyethylene or other non-reactive acid/solvent bottle carrier.



- Store **Methylene Chloride** containers in a cool, well-ventilated area.
- Store in secondary containment away from moisture, strong oxidizers, strong caustics, plastics, rubber, nitric acid, water + heat, and chemically active metals, such as aluminum and magnesium powder, sodium, potassium, and lithium.
- Do not store on the floor.
- Avoid ignition sources.

Medical Surveillance

In the event that exposure has occurred:

- Medical surveillance will be available for employees who may be exposed above the EPA action level on 30 or more days per year or above the EPA ECEL or EPA STEL on 10 or more days per year.
- Medical Recommendations must account for the potential of **Methylene Chloride** exposure to contribute to or aggravate the employee's existing cardiac, hepatic, neurological (including stroke), or skin disease.
- When a physician recommends a medical accommodation or removal due to the employee's exposure to **Methylene Chloride**, the Michigan Tech Equal Opportunity Compliance and Title IX team will assist in the case as needed.

Spill Response and Personal Exposure Guidelines

In case of personal exposure, remove the affected person from the exposure immediately. Flush the affected area for at least 15 minutes with an emergency eyewash or shower, as appropriate. **Call 9-1-1 immediately to seek medical attention.**

Spills For spills that occur inside of a fume hood (< 100 milliliters)

- If the lab group has received proper training and a proper spill kit is available, the spill may be cleaned up by the lab group. **o Contain and collect the spilled material with absorbents. o Package for hazardous waste disposal.**
o Use care to avoid personal exposure via inhalation or skin contact.
- If the lab group has not received proper training and a spill kit is not available, please contact EHS at (906) 487-2118 (during business hours) or Public Safety (906) 487- 2216 (after hours).



For spills that occur outside of a fume hood or are greater than 100ml inside the hood.

- Evacuate the lab, and call Public Safety (906) 487- 2216.
- Stay close by to answer questions when emergency response personnel arrive.
- Restriction laboratory access to authorized emergency response personnel until cleared by EHS.
- Any volume of Methylene Chloride released outside of direct containment will result in overexposure to personnel not equipped with respiratory protection. Full PPE must be worn during any large volume clean-up procedures.

First Aid

For eyes

- Irrigate the eyes for 15 minutes, holding eyelids apart.
- Call 9-1-1 immediately to seek medical assistance. Keep track of the length of time eyes are being irrigated and inform responding medical personnel.

For skin

- For full body exposure, remove contaminated clothing and irrigate with the emergency shower for 15 minutes.
- If exposed hands and/or arms are contaminated, rinse the area with soap and water for 15 minutes.
- Call 9-1-1 immediately to seek medical assistance.

For inhalation

- Remove to fresh air.
- Call 9-1-1 immediately to seek medical assistance.



Fire:

- Evacuate the lab, pull the nearest fire alarm pull station and evacuate to a safe area. Call 9-1-1 immediately. Follow the laboratory fire safety evacuation plan.

All [work-related injuries, property damage, or near misses](#) must be reported within 24 hours to EHS by the Principal Investigator or lab manager.

If the injury results in a death, hospitalization, amputation, or loss of an eye, EHS must be notified immediately for state and federal purposes.

Hazardous Waste Disposal

Spent, unused, and expired **Methylene Chloride** is considered hazardous waste and must be properly disposed of in accordance with state and federal regulations.

Please refer to the [Michigan Tech Hazardous Waste Collection and Disposal Procedures](#) for waste containers, labels, manifests, waste collection, and any questions regarding proper **Methylene Chloride** waste disposal.

Empty containers that once contained **Methylene Chloride** must be disposed of as hazardous waste. Please properly label the empty container with a hazardous waste label.

PLEASE NOTE

Gloves that are not contaminated with methylene chloride may be disposed of in the trash.

Gloves, KimWipes, and other solid waste contaminated with Methylene Chloride must be disposed of as hazardous waste.



Training Requirements

Required **Methylene Chloride** training is the responsibility of the PI or lab manager for all potentially exposed persons before performing any task involving a potential exposure to **Methylene Chloride**.

At a minimum, the **Methylene Chloride Training** must include:

- Available access and training for this document: **Methylene Chloride Workplace Chemical Protection Program**.
- Available access and training for the **Operation Specific Exposure Control Plan(s)** and acknowledgment of ECP by the trainee.
- Requirements and accessibility of the **MIOSHA Methylene Chloride Standard** and the **EPA TSCA Final Rule on Methylene Chloride**.
- Hazards communication including chemical labeling, global harmonization system, and safety data sheets.
- Methods and observations to detect the presence of **Methylene Chloride**.

- Knowledge of symptoms for both acute and chronic exposures.
- Laboratory Operations where **Methylene Chloride** may be present.
- Measures individuals must take to protect themselves from hazards associated with exposure to **Methylene Chloride**.
 - This includes:
 - The proper use of engineering controls.
 - When to use PPE
 - Proper donning, doffing, adjustment, and wearing of PPE
 - PPE limitations
 - Proper care maintenance, useful life, and disposal of PPE



References and Additional Resources

Regulatory references and additional reading

- [USEPA-Risk Management for Methylene Chloride](#)
- [MIOSHA Part3131-MethyleneChloride](#)
- [USOSHA-Substance Safety Data Sheet and Technical Guidelines for Methylene Chloride](#)
- [ASTDR-ToxFAQsfor Methylene Chloride](#)
- [NIOSH Pocket Guide to Chemical Hazards- Methylene Chloride](#)
- [CDC: Contact Lens Use in a Chemical Environment](#)

Alternative Chemical Selection

- [Sigma-Aldrich Greener Solvent Alternatives](#)
- [A Convenient Guide to Help Select Replacement Solvents for Dichloromethane in Chromatography](#)
- [ACS Tools for Innovation in Chemistry: Solvent Selection Tool](#)



APPENDIX A:

Methylene Chloride Exposure Control Plan Template



Appendix A

Methylene Chloride Exposure Control Plan

In compliance with the Michigan Tech's Methylene Chloride Workplace Chemical Protection Program (WCPP), all laboratories conducting operations involving methylene chloride, or any mixture containing methylene chloride at or above 0.1% concentration, must complete an Operation Specific **Methylene Chloride Exposure Control Plan**.

Laboratory Management must complete each section of this form to detail specific efforts to comply with the requirements defined in the WCPP. Send the completed form to EHS (ehs-support@mtu.edu) and maintain a copy for your records.

Revision Date:

Lab Manager/PI Name:

Department, Institute, or Research Facility:

Location:

Building:

Room number(s):

Specify specific location within room (hood, bench, workspace, etc.):

Volume of Methylene Chloride solutions used in this operation:

Concentration:



Provide a detailed description of operation.

Explain why elimination or substitution of methylene chloride from this operation is not feasible, not effective, or otherwise not implemented:



Describe engineering controls implemented to reduce exposures.

Engineering controls protect workers by removing hazardous conditions or by placing a barrier between the worker and the hazard. Engineering controls may include ventilation devices (fume hoods, local exhaust ventilation), containment devices (glove boxes), and vapor control devices (cold trap):

Describe administrative or work practice controls implemented to reduce exposures.

This may include standard operating procedure training, posting of signage, how demarcation boundaries are marked, or limiting access to areas with potential methylene chloride exposure.



Describe personal protective equipment required for this operation.

Describe additional safety training required:



List the Regulated Areas in the laboratory and methods of demarcation.

A Regulated Area is any area where airborne concentrations exceed, or there is a reasonable potential to exceed, the exposure limits.



Plan Review and Updates

Laboratory Management: Annual Review and updates to the exposure control plan are mandatory to ensure effectiveness of the exposure controls, identify necessary exposure controls updates, and confirm that all persons are properly trained and implementing the exposure controls.

Updates should reflect any significant changes to compliance with the exposure control requirements. Any change that may reasonably introduce additional sources or increased exposure of **Methylene Chloride** must be documented.

Upon instituting any changes to this form, the revised copy must be submitted to EHS (EHS-support@mtu.edu).

Reviewer	Date of Review	Summary of Revisions



All laboratory personnel, including laboratory management, must complete the Certification.

I have read, received training, and understand the above **Methylene Chloride** Exposure Control Plan.

I have received and completed all of the training required by this plan.

I have received prior approval from my Lab Management to perform this procedure. I agree to contact my Supervisor if I plan to modify this procedure.

Methylene Chloride WCPP