Stanford | Environmental Health & Safety

Stanford University Environmental Health & Safety

Dichloromethane Workplace Chemical Protection Program (WCPP)

October 2025

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Note: The dichloromethane rule bans most uses of dichloromethane. However, one of the narrow, permitted uses is "*use as a laboratory chemical*." All other commercial and industrial uses, such as use as a solvent or paint remover in other university applications (e.g., facilities management use, as a product in the arts, *etc.*.) is prohibited.

Purpose

The U.S. 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 can cause central nervous system harm, including unconsciousness and death through respiratory paralysis.

The EPA has identified a limited number of applications that may continue. A Workplace Chemical Protection Program (WCPP) is required for those entities that will continue using DCM under these allowable uses. Stanford University has implemented the following requirements to satisfy this obligation.

Definitions, Roles, and Responsibilities

As needed monitoring: Exposure measurements taken when there is a change of use.

De minimis: The threshold concentration for which the regulatory restrictions are not required. For DCM, this concentration is 0.01% by weight.

Exposure Control Plan (ECP): This documents 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 Stanford University and each Principal Investigator (PI), instructor, or supervisor who oversees a location where DCM is used or a person who uses DCM. Stanford University Environmental Health & Safety (EH&S) is responsible for writing and updating this program. PIs, instructors, and supervisors are responsible for implementing this program and for approving and enforcing any ECPs applicable to their work area.

Periodic monitoring: Dependent upon the results of the initial and/or repeat monitoring. The frequency for gathering new monitoring data ranges from 3 months to 5 years.

Potentially exposed person: Any person who may be exposed to a chemical or mixture in a workplace as a result of a condition of use of that chemical substance or mixture. This applies

regardless of whether a person is a user of the chemical or an employee. Potentially exposed persons are responsible for complying with the provisions of this program.

Prohibited uses: The EPA has established exposure limits for 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 full list of prohibited uses in its Guide to Complying with the 2024 Methylene Chloride Regulation.

Regulated area: An area demarcated where airborne concentrations exceed, or there is a reasonable possibility they may exceed, the Existing Chemical Exposure Limit (ECEL)/Time-weighted average (TWA) of 2 parts-per million (ppm) or EPA Short Term Exposure Limit (STEL) of 16 ppm.

Retailer: An entity that distributes or makes available products to consumers.

Short Term Exposure Limit (**STEL):** any 15-minute reference period covering a specific task where airborne concentrations may instantaneously exceed the full-shift exposure limit (15-minute TWA).

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). There is also, **Action limit (AL)** to consider which is half of TWA value. This limit is set to trigger proactive measures like exposure monitoring to protect worker health.

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 inhalation exposures to DCM will be kept below 2 ppm (8-hour TWA) and short-term exposures will be kept below 16 ppm (15-minute TWA). Additional monitoring will be implemented whenever long-term inhalation exposures exceed the action limit of 1 ppm. Any deviation from these limits must be approved by EH&S and will be documented in a written ECP. This documentation will include a respiratory protection program to be implemented in work areas receiving a variance.

Exposure Monitoring

Monitoring Requirements

Initial monitoring for DCM is required to establish a baseline for DCM users and to inform the development of the ECP. Initial monitoring results will be used to determine the frequency of compliance activities such as periodic monitoring. Monitoring must be taken when and where operating conditions are best representative of each potentially exposed person's highest likely full shift and 15-minute exposures occur.

Exemptions to Initial Monitoring

Two conditions can exempt a lab from conducting initial monitoring for DCM:

1. If objective data generated during the last five (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 five (5) years of that data.
2. If exposure to DCM is less than 30 days per year with two (2) 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.

Initial and Periodic Monitoring

The results of initial monitoring will determine how frequently periodic monitoring must occur. Periodic monitoring can range from every three (3) months, every six (6) months or every five (5) years depending on the following conditions:

DCM Concentration (exposure monitoring results)			**Periodic monitoring requirement frequency** *(Determine monitoring frequency based on initial monitoring results)*
8-hr TWA (ECEL)		**15-min TWA (STEL)**	
< 1 ppm	and	≤ 16 ppm	ECEL and EPA STEL periodic monitoring at least once every five (5) years.
< 1 ppm	or	> 16 ppm	ECEL monitoring at least once every five (5) years AND EPA STEL periodic monitoring required every three (3) months.
≥ 1 ppm & ≤ 2 ppm	or	≤ 16 ppm	ECEL monitoring every six (6) months.
≥ 1 ppm & ≤ 2 ppm	or	> 16 ppm	ECEL periodic monitoring every six (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.

Please note initial ECEL and EPA STEL monitoring must be repeated at least every five (5) years to reestablish current exposure conditions and a new baseline to determine monitoring frequency.

Changes in Conditions

Change in condition	Change in periodic monitoring requirement
If two (2) consecutive monitoring events have taken place at least seven (7) days apart that indicate that potential exposure has decreased from above the ECEL (> 2 ppm) to at or below the ECEL (≤ 2 ppm), but at or above the ECEL action level (≥ 1 ppm).	Transition from ECEL periodic monitoring frequency from every three (3) months to every six (6) months
If two (2) consecutive monitoring events have taken place at least seven (7) days apart that indicate that potential exposure has decreased to below the ECEL action level (<1 ppm) and at or below the EPA STEL (≤ 16 ppm)	Transition from ECEL periodic monitoring frequency every six (6) months to once every five (5) years. The second consecutive monitoring event will delineate the new date from which the next five (5)-year periodic exposure monitoring must occur.

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 PI, instructor, or supervisor who oversees the location where DCM is used is responsible for notifying EH&S in advance and may not proceed with use of DCM until monitoring has been scheduled.

Sampling Requirements

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

1. Sampling must be conducted for inhalation hazard.
2. Samples must be taken for every potentially exposed person or a representative sample for all potentially exposed persons.
3. Sampling must be taken when and where the operating conditions are representative of full shift exposures.

4. All potentially exposed persons must be given the opportunity to observe exposure monitoring.
5. Samples must be taken at the personal breathing zone (PBZ). Note that there is a specific exception that allows PBZ samples taken in one shift to apply to other work shifts, provided that the owner or operator can document the tasks and conditions are similar across shifts in the facility sampled. Sampling must measure workplace air concentrations for methylene chloride (referred to in the rule as ambient air), without taking respiratory protections into account.
6. Notification of monitoring results to the monitored person within 15 working days after receipt of results.

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.

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.

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:

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

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.

Respiratory Protection

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

Centralized Exposure Control Plan (ECP) for Laboratory Use

This ECP covers safety practices to be followed for use of DCM as a laboratory chemical at Stanford University. Any deviation from this plan requires approval in writing from Stanford University EH&S.

Elimination

Use of DCM is allowed under this program as a laboratory chemical and in waste operations to dispose of materials generated through other approved uses. These uses cannot be eliminated because of 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.

Substitution

The labs at Stanford University have considered and assessed alternative chemicals for DCM.

The following substitutes have been considered for DCM:

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

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

Engineering/Ventilation Controls

Use a properly functioning and certified chemical fume hood or glove boxes when handling DCM.

Administrative Controls

All use of DCM must stop if any malfunction of the local exhaust ventilation device (i.e., chemical fume hood and glove box) is suspected. Any PPE suspected of coming in contact with DCM must be changed immediately. DCM must be stored appropriately in labs.

Personal Protective Equipment

In addition to proper street clothing (long pants or equivalent that covers legs and ankles, and close-toed non-perforated shoes that completely cover the feet), wear a lab coat, safety glasses or splash goggles, and either polyvinyl alcohol (PVA) gloves or double nitrile gloves. Linear Low-Density Polyethylene (LLDPE) laminate gloves 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. PIs, instructors, and supervisors are responsible for final glove selection. Reference can be made to the glove selection guide.

Training

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 is provided from a centralized, institutional level to the PIs, instructors, supervisors, and researchers who work with DCM in their labs.

Centralized Dichloromethane Training

The institutional training program for DCM at Stanford University is developed. Access the EHS-4130: Working with Dichloromethane training on STARS. It covers the hazards of DCM use, regulatory requirements. hierarchy of controls, exposure control plan, and ends with a short quiz.

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 Stanford University and by individual research groups associated with overlapping programs such as medical surveillance, training, and chemical hygiene program elements:

Exposure Control Records: These records will be maintained by the labs. They can save these documents on BioRAFT under the documents tabs or have a dedicated lab folder saved on google drive or G Drive.

Exposure Monitoring Records: Monitoring records will be maintained by EH&S using Smartsheet and Google Docs.

References

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

Preliminary Information on Manufacturing, Processing, Distribution, Use, and Disposal: Methylene Chloride

Risk Evaluation for Methylene Chloride - See Appendix

Appendix

DCM Exposure Control Plan Template

This template can be used by any lab who plans to use DCM or who would like to have a template for a DCM ECP.

Type of work in your lab that involves DCM use *(Select all that apply):*

- ☐ Chemical Synthesis and Reactions
- ☐ Chromatography
- ☐ Extraction and Purification
- ☐ Dispensing and Transferring
- ☐ Rotary Evaporation System
- ☐ Chemical Analysis and Sample Preparation
- ☐ Calibration and Standards
- ☐ Instrument Maintenance
- ☐ Cleaning, Degreasing, or Dissolving
- ☐ Others: *(Write in)*

Please add a brief description of the above mentioned work involving DCM *(Note: Please reference any lab material (i.e., SOP, procedure document) for this task involving DCM.)*

Hierarchy of controls

Labs are highly encouraged to consider DCM elimination and/or substitution for the task mentioned. A few examples for substitutes have been considered for dichloromethane:

- ☐ 2-Methyltetrahydrofuran
- ☐ Cyclopentylmethyl ether
- ☐ Ethanol

- ☐ Ethyl acetate
- ☐ Isopropanol
- ☐ Methanol
- ☐ Methyl isobutyl ketone
- ☐ Methyl tert-butyl ether
- ☐ Toluene
- ☐ Other: *(Write in)*

If any of the above have been deemed inadequate for substitution, list the reasons. Here are few potential reason(s) that may apply:

- ☐ Undesirable cross-reactivity
- ☐ Poor match for polarity
- ☐ Poor match for density
- ☐ Boiling point too high
- ☐ Need to maintain reproducibility of established procedure
- ☐ Other: *(Write in)*

*If DCM **elimination/substitution** was implemented and the lab no longer uses DCM then there is no requirement to fill out the remainder of the template.*

List the frequency, quantity, and duration of DCM use:
Frequency: ☐ One time ☐ Daily ☐ Weekly ☐ Monthly ☐ Other *(Write In)*

Quantity: ☐ <10 ml ☐ 100 ml-500 ml ☐ >1L ☐ 1L-4L ☐ >4L ☐ Other *(Write In)*

Duration per experiment: ☐ Minutes_____ ☐ Hours _____

Engineering Controls

(Note: reference can be made to the Stanford EH&S risk assessment tool)

- ☐ Certified chemical fume hood
- ☐ Glove box
- ☐ Snorkel (Note: Snorkel is not an appropriate engineering control for DCM use)
- ☐ Others: *(Write in)*

DCM should only be used with appropriate engineering controls in place. Stop the use of DCM if the engineering control is malfunctioning.

Administrative Controls

Training

- ☐ EHS- 4130: Working with Dichloromethane
- ☐ EHS-1900: Chemical Safety for Laboratories

Personal protective equipment (PPE)

- ☐ Appropriate street clothing (long pants, full sleeves, closed-toed shoes)

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

PPE used when handling DCM:

- ☐ Eye protection
- ☐ Safety glasses
- ☐ Goggles
- ☐ Others: *(Write in)*

Skin Protection:

- ☐ Flame resistant lab coat
- ☐ Chemical resistant apron
- ☐ Others: *(Write in)*

Hand protection:

- ☐ Nitrile gloves (double gloves)
- ☐ Polyvinyl alcohol (PVA) gloves (*Note: PVA gloves are not suitable when working with aqueous solutions as PVA is water soluble)*
- ☐ Linear Low-Density Polyethylene (LLDPE) laminate gloves
- ☐ Dupont Viton gloves
- ☐ Silvershield gloves

Refer to the chemical glove resistance guide from Ansell for information on glove selection

Storage of DCM

Where is DCM stored in your lab?

- ☐ Inside certified chemical fume hood
- ☐ Flammable cabinet
- ☐ Others: *(Write in)*

Check and write in the location/accessibility/certification of the safety equipment that serves your lab:

- ☐ Emergency eyewash and safety shower location:

  Ensure that it is accessible, not blocked. Check tag that it has been tested within the last month.

- ☐ First Aid Kit location:
- ☐ Chemical Spill Kit location:
- ☐ Fire Extinguisher location:

Emergency response

In the event that DCM is spilled outside of fume hood, it is expected that airborne concentrations will exceed the regulatory limits*.

Notify others in the area of the spill. Evacuate the location where the spill occurred. Report the spill to your Supervisor and to the EH&S.

Regulatory limits: The California Division of Occupational Safety and Health (Cal/OSHA) **Permissible Exposure Limit (PEL) for DCM is **25 parts per million** (ppm) as an 8-hour TWA and **Action Level (AL)** of **12.5 ppm**. In addition, Cal/OSHA has established Short-Term Exposure Limits (STELs), which are 15-minute TWA exposures not to be exceeded at any time during a workday even if the 8-hour TWA is below the PEL. The Cal/OSHA **STEL** for DCM is **125 ppm**.*

*Additionally, the Environmental Protection Agency (EPA) has established an Existing Chemical Exposure Limit (ECEL), which is a maximum average airborne concentration of the chemical that someone can be exposed to without experiencing unreasonable risk from inhalation exposure to the chemical. The **EPA ECEL for DCM is 2 ppm** as an 8-hour TWA, the **EPA AL is 1 ppm** as an 8-hour TWA, and the **EPA STEL is 16 ppm**.*

General Use SOP: Dichloromethane (DCM)

Methylene chloride or dichloromethane (DCM) is a halogenated compound commonly used as a reaction solvent, tissue clearing, and paint stripping applications.

Hazards of DCM

Acute exposure: Direct exposure to skin and eyes can cause irritation.

Chronic exposure: 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.

Control of Hazards

General

- Minimize the potential for splash, splatter, or other likely scenarios for accidental contact with DCM.
- Ensure that no decanting or pouring of DCM is done outside of a certified chemical fume hood or glove box.
- Be diligent about lab hygiene: avoid touching your face or items that you will handle with ungloved hands (e.g., a smartphone), change gloves regularly and thoroughly, and wash your hands immediately after completing work with DCM.

Engineering/Ventilation Controls

Use a properly functioning and certified chemical fume hood or glove boxes when handling DCM.

Personal Protective Equipment

In addition to proper street clothing (long pants or equivalent that covers legs and ankles, and close-toed non-perforated shoes that completely cover the feet), wear a lab coat, safety glasses or splash goggles, and either polyvinyl alcohol (PVA) gloves or double nitrile gloves. Linear Low-Density Polyethylene (LLDPE) laminate gloves 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. PIs, instructors, and supervisors are responsible for final glove selection. Reference can be made to the glove selection guide.

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

Special Handling Procedures and Storage Requirements

- Avoid contact with skin and eyes, and do not inhale.
- Containers should be closed when not in use.
- Segregate incompatible chemicals and use secondary containment.
- Do not store in aluminum containers. DCM reacts with aluminum and its alloys.
- Keep containers tightly closed. Store in a cool, dry, and well-ventilated area.
- Keep away from incompatible substances such as oxidizing agents, acids, and amines.
- Use in the smallest practical quantities for the experiment being performed.
- Work must be conducted in a properly functioning chemical fume hood.
- Containers should be labeled appropriately. The label should indicate the name of the chemical(s) in the container.
- Containers should be in good condition and compatible with the material.

DCM Emergency Response Procedures

Dichloromethane (DCM) is a heavy and volatile compound. Due to its volatile nature, it will evaporate very quickly, but if ventilation is not sufficient it will tend to gather in low-lying areas. In the event that DCM is spilled outside of fume hood, it is expected that airborne concentrations will exceed the regulatory limits*. Notify others in the area of the spill. Evacuate the location where the spill occurred. Report the spill to your supervisor and EH&S.

Please note that all research labs at Stanford University at minimum have six room air exchanges per hour (ACH), which should allow researchers to evacuate and for DCM to evaporate.

Contacts

Please notify your PI and relevant staff in your lab if you were exposed to DCM or spilled DCM.

EH&S Hotline (24/7 service): (650) 725-9999

Emergency Department (ED) (24/7 service): 911

Stanford University Occupational Health Center (SUOHC) 8am - 4pm, Monday - Friday: (650) 725-5308

Spills

- Less than 30 ml
    - Cover spill if possible, using a spill kit.
    - Evacuate the area and wait 30-45 minutes to allow room ventilation to eliminate DCM.
    - Report on the spill to EH&S Incident Hotline: **(650) 725-9999**
- Greater than 30 ml
    - Evacuate the area and call the EH&S Incident Hotline. **(650) 725-9999**
    - Post signage on entrances to warn others not to enter
    - Alert nearby researchers about the spill

Dermal Exposure

Eye Exposure

- Alert someone in the lab and go to the nearest eyewash station.
- Use the eyewash station for at least 15 minutes.
- If wearing contact lenses, remove and flush eyes for at least 15 minutes.
- Go to SUOHC or ED depending on degree of exposure.
    - Blurriness or blindness? Go to ED

Skin Exposure

Hands & arms:

- If a small amount has splashed onto your gloves, immediately replace the gloves.
- If a large amount has spilled onto your gloves, immediately remove the gloves, go to the nearest sink, and wash your hands for at least 15 minutes.
- Burning sensation or tingling sensation on your hands or arms?
    - Go to the SUOHC or ED.

Head, chest, back, legs, feet:

- Alert someone in the lab and go to the nearest emergency safety shower.
- Remove all contaminated clothing.
- Use the safety shower for at least 15 minutes.
- Go to the SUOHC or ED depending on degree of exposure
    - Symptoms: redness, dry skin, burning sensation, tingling sensation

Inhalation Exposure

- Evacuate the area and go to an area with fresh air.
- Go to the SUOHC or ED depending on degree of exposure.
    - Symptoms: dizziness, headache, nausea, weakness, unconsciousness

Ingestion Exposure

- Evacuate the area and go to an area with fresh air.
- Do not induce vomiting!
- Go to the ED depending on the amount of chemical ingested.

Fires

- Decomposes on heating or burning
- Toxic vapors can evolve
    - Hydrogen chloride
    - Phosgene

- Do not attempt to extinguish a fire involving DCM. Immediately evacuate the area and pull the fire alarm, then call 911.

Waste Disposal

Dispose of DCM as hazardous waste. All hazardous waste containers should have a waste tag attached before any waste is added. Before combining materials in waste containers, review the Safety Data Sheets and EH&S's Incompatibility Guide.

Minimum Training Requirements

- General Safety & Emergency Preparedness (EHS-4200)
- Chemical Safety for Laboratories (EHS-1900)
- Working with Dichloromethane (EHS-4130)
- Any additional laboratory-specific training (tier III) that the Principal Investigator sees fit

Regulatory limits: The California Division of Occupational Safety and Health (Cal/OSHA)* ***Permissible Exposure Limit (PEL)* *for DCM is* ***25 parts per million*** *(ppm) as an 8-hour TWA and* ***Action Level (AL)*** *of* ***12.5 ppm****. In addition, Cal/OSHA has established Short-Term Exposure Limits (STELs), which are 15-minute TWA exposures not to be exceeded at any time during a workday even if the 8-hour TWA is below the PEL. The Cal/OSHA* ***STEL*** *for DCM is* ***125 ppm****.*

Additionally, the Environmental Protection Agency (EPA) has established an Existing Chemical Exposure Limit (ECEL), which is a maximum average airborne concentration of the chemical that someone can be exposed to without experiencing unreasonable risk from inhalation exposure to the chemical. The ***EPA ECEL for DCM is 2 ppm*** *as an 8-hour TWA, the* ***EPA AL is 1 ppm*** *as an 8-hour TWA, and the* ***EPA STEL is 16 ppm****.*

SAFETY DATA SHEET

Version 6.24
Revision Date 06/24/2025
Print Date 06/25/2025

SECTION 1. IDENTIFICATION

1.1 Product identifiers

Product name : Dichloromethane

Product Number : 270997
Brand : Sigma-Aldrich
Index-No. : 602-004-00-3
CAS-No. : 75-09-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : After February 3, 2025, this chemical substance (as defined in TSCA section 3(2))/product cannot be distributed in commerce to retailers. After January 28, 2026, this chemical substance (as defined in TSCA section 3(2))/product is and can only be distributed in commerce or processed with a concentration of methylene chloride equal to or greater than 0.1% by weight for the following purposes: (1) Processing as a reactant; (2) Processing for incorporation into a formulation, mixture, or reaction product; (3) Processing for repackaging; (4) Processing for recycling; (5) Industrial or commercial use as a laboratory chemical; (6) Industrial or commercial use as a bonding agent for solvent welding; (7) Industrial and commercial use as a paint and coating remover from safety critical, corrosion-sensitive components of aircraft and spacecraft; (8) Industrial and commercial use as a processing aid; (9) Industrial and commercial use for plastic and rubber products manufacturing; (10) Industrial and commercial use as a solvent that becomes part of a formulation or mixture, where that formulation or mixture will be used inside a manufacturing process, and the solvent (methylene chloride) will be reclaimed; (11) Industrial and commercial use in the refinishing for wooden furniture, decorative pieces, and architectural fixtures of artistic, cultural or historic value until May 8, 2029; (12) Industrial and commercial use in adhesives and sealants in aircraft, space vehicle, and turbine applications for structural and safety critical non-structural applications until May 8, 2029; (13) Disposal; and (14) Export.
The product is being supplied under the TSCA R&D Exemption

(40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich Inc. 3050 SPRUCE ST ST. LOUIS MO 63103 UNITED STATES
Telephone	:	+1 314 771-5765
Fax	:	+1 800 325-5052

1.4 Emergency telephone number

Emergency Phone #	:	800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin irritation	:	Category 2
Eye irritation	:	Category 2A
Carcinogenicity	:	Category 2
Specific target organ toxicity - single exposure	:	Category 3 (Central nervous system)

Other hazards

None known.

GHS label elements

Hazard pictograms :

Signal Word	:	Warning
Hazard Statements	:	H315 Causes skin irritation. H319 Causes serious eye irritation. H336 May cause drowsiness or dizziness. H351 Suspected of causing cancer.
Precautionary statements	:	**Prevention:** P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.
P261 Avoid breathing mist or vapours.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves, protective clothing, eye protection and face protection.

Response:

P302 + P352 IF ON SKIN: Wash with plenty of water.
P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P332 + P313 If skin irritation occurs: Get medical advice/ attention.
P337 + P313 If eye irritation persists: Get medical advice/ attention.

Storage:

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

Components

Chemical name	CAS No./Unique ID	Concentration (% w/w)	Trade secret
Dichloromethane	75-09-2*	>= 80 - <= 100	TSC

* Indicates that the identifier is a CAS No.
TSC- the actual concentration or concentration range is withheld as a trade secret

SECTION 4. FIRST AID MEASURES

General advice : Show this safety data sheet to the doctor in attendance.

If inhaled : After inhalation: fresh air. Call in physician.

In case of skin contact	:	In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.
In case of eye contact	:	After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.
If swallowed	:	After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.
Most important symptoms and effects, both acute and delayed	:	The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11
Protection of first-aiders	:	For personal protection see section 8.
Notes to physician	:	No data available

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Water Foam Carbon dioxide (CO2) Dry powder
Unsuitable extinguishing media	:	For this substance/mixture no limitations of extinguishing agents are given.
Specific hazards during fire fighting	:	Combustible. Development of hazardous combustion gases or vapours possible in the event of fire.
Hazardous combustion products	:	Carbon oxides Hydrogen chloride gas
Specific extinguishing methods	:	No data available
Further information	:	Suppress (knock down) gases/vapours/mists with a water spray jet.

Prevent fire extinguishing water from contaminating surface water or the ground water system.

Special protective equipment for fire-fighters	:	Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Advice for non-emergency personnel: Do not breathe vapours, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert. Advice for emergency responders: For personal protection see section 8.
Environmental precautions	:	Do not let product enter drains.
Methods and materials for containment and cleaning up	:	Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

SECTION 7. HANDLING AND STORAGE

For precautions see section 2.2.

Advice on safe handling	:	Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.
Further information on storage conditions	:	Tightly closed. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorised persons.
Storage class	:	6.1C, Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects
Recommended storage temperature	:	Recommended storage temperature see product label.
Further information on	:	Heat sensitive.

storage stability Handle and store under inert gas.

Packaging material : Suitable material: Sure-Seal Bottles

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Dichloromethane	75-09-2	TWA	50 ppm	ACGIH
		PEL	25 ppm	OSHA CARC
		STEL	125 ppm	OSHA CARC
		ECEL-TWA	2 ppm	TSCA ECEL
		EPA STEL	16 ppm 57 mg/m3	TSCA ECEL

Biological occupational exposure limits

Components	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
Dichloromethane	75-09-2	Dichloromethane	Urine	End of shift (As soon as possible after exposure ceases)	0.3 mg/l	ACGIH BEI

Engineering measures : No data available

Personal protective equipment

Respiratory protection : required when vapours/aerosols are generated.

Recommended Filter type: : Filter AX (EN 371)

The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

Hand protection

Material	:	Viton®
Break through time	:	120 min
Glove thickness	:	0.7 mm
Protective index	:	Splash contact
Manufacturer	:	Vitoject® (KCL 890 / Aldrich Z677698, Size M)
Remarks	:	This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Eye protection	:	Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses
Skin and body protection	:	protective clothing
Hygiene measures	:	Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Color	:	colourless
Odor	:	ether-like
Odor Threshold	:	250 ppm
pH	:	No data available
Melting point/ range	:	-143 °F / -97 °C
Boiling point/boiling range	:	103.6 - 104 °F / 39.8 - 40 °C
Flash point	:	does not flash
Evaporation rate	:	0.71

Burning rate	:	No data available
Self-ignition	:	1121 °F / 605 °C 1,013 hPa Method: DIN 51794
Upper explosion limit / Upper flammability limit	:	Upper explosion limit 22 %(V)
Lower explosion limit / Lower flammability limit	:	Lower explosion limit 13 %(V)
Vapor pressure	:	584 hPa (77 °F / 25 °C)
Relative vapour density	:	2.93
Relative density	:	No data available
Density	:	1.325 g/mL (77 °F / 25 °C)
Solubility(ies)		
Water solubility	:	13.2 g/l (77 °F / 25 °C) pH: 7
Partition coefficient: n-octanol/water	:	log Pow: 1.25 (68 °F / 20 °C) pH: 7 Method: (experimental) Bioaccumulation is not expected.
Autoignition temperature	:	1033.0 °F / 556.1 °C
Decomposition temperature	:	No data available
Viscosity		
Viscosity, dynamic	:	0.42 mPa.s (77 °F / 25 °C)
Viscosity, kinematic	:	No data available
Flow time	:	No data available
Explosive properties	:	Not classified as explosive.
Oxidizing properties	:	none
Refractive index	:	1.42 (68 °F / 20 °C) 589.3 nm
Molecular weight	:	84.93 g/mol
Particle characteristics		
Particle size	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No data available
Chemical stability	:	Sensitivity to light The product is chemically stable under standard ambient conditions (room temperature) .
Contains the following stabiliser(s):	:	2-methyl-2-butene (>0.005 - <0.015 %)
Possibility of hazardous reactions	:	Risk of explosion with: Alkali metals nitrogen oxides nitrogen dioxide Potassium sodium azide perchloric acid Nitric acid aluminium chloride Amines Oxygen (as liquefied gas) powdered aluminium sodium aromatic hydrocarbons with powdered aluminium Exothermic reaction with: Alkaline earth metals Powdered metals amides alcoholates nonmetallic oxides potassium tert-butanolate sodium amide Lithium
Conditions to avoid	:	no information available
Incompatible materials	:	No data available
Hazardous decomposition products	:	In the event of fire: see section 5

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - 2,500 mg/kg
(Calculation method)
LD50 Oral - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 401)
LC50 Inhalation - Mouse - 4 h - 86 mg/l - vapour

Remarks: (ECHA)
Symptoms: Possible damages:, mucosal irritations
Acute toxicity estimate Dermal - 2,500 mg/kg
(Calculation method)
LD50 Dermal - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)

Skin corrosion/irritation
Skin - Rabbit
Result: Irritations - 4 h
(OECD Test Guideline 404)
Remarks: Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation
Remarks: (ECHA)
Remarks: Risk of corneal clouding.

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: negative
(OECD Test Guideline 429)

Germ cell mutagenicity
Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: positive
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: positive

Test Type: In vivo micronucleus test
Species: Mouse
Cell type: Bone marrow
Application Route: Gavage
Method: OECD Test Guideline 474
Result: negative

Carcinogenicity
Suspected of causing cancer.

IARC: 2A - Group 2A: Probably carcinogenic to humans (Dichloromethane)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Dichloromethane)

OSHA: OSHA specifically regulated carcinogen (Dichloromethane)

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
Inhalation - May cause drowsiness or dizziness. - Central nervous system

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 104 Weeks - No observed adverse effect level - 6 mg/kg

Repeated dose toxicity - Rat - male and female - Inhalation - 104 Weeks

RTECS: PA8050000
Dizziness, Nausea, Vomiting, narcosis, Cough, irritant effects, Unconsciousness, Shortness of breath, respiratory paralysis, somnolence, depressed respiration, CNS disorders, inebriation
Risk of corneal clouding.
The following applies to aliphatic halogenated hydrocarbons in general: systemic effect: narcosis, cardiovascular disorders. Toxic effect on liver, kidneys.
Dichloromethane is metabolized in the body producing carbon monoxide which increases and sustains carboxyhemoglobin levels in the blood, reducing the oxygen-carrying capacity of the blood.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Systemic effects:

After absorption of large quantities:

CNS disorders
Drowsiness
Dizziness
drop in blood pressure
Cardiac irregularities
depressed respiration
inebriation
Unconsciousness
narcosis

Swallowing may result in damage to the following:

Liver
Kidney

The following applies to aliphatic halogenated hydrocarbons in general: systemic effect: narcosis, cardiovascular disorders. Toxic effect on liver, kidneys.

Other dangerous properties can not be excluded.

This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

Dichloromethane:

Toxicity to fish	:	LC50 (Pimephales promelas (fathead minnow)): 193.00 mg/l End point: mortality Exposure time: 96 h Test Type: flow-through test Analytical monitoring: yes Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	:	LC50 (Daphnia magna (Water flea)): 27 mg/l End point: mortality Exposure time: 48 h Test Type: static test Method: US-EPA
Toxicity to fish (Chronic toxicity)	:	LC50 (Pimephales promelas (fathead minnow)): 471 mg/l End point: mortality Exposure time: 8 d Test Type: flow-through test Analytical monitoring: yes Remarks: (ECHA)
Toxicity to microorganisms	:	EC50 (activated sludge): 2,590 mg/l Exposure time: 40 min Test Type: static test Analytical monitoring: yes Method: OECD Test Guideline 209

Persistence and degradability

Components:

Dichloromethane:

Biodegradability	:	aerobic Inoculum: activated sludge, non-adapted Concentration: 5 mg/l Result: Readily biodegradable. Biodegradation: 68 % Exposure time: 28 d Method: OECD Test Guideline 301D GLP: yes

Bioaccumulative potential

Components:

Dichloromethane:

Bioaccumulation	:	Species: Cyprinus carpio (Carp) Bioconcentration factor (BCF): 2 - 5.4 Exposure time: 6 Weeks Concentration: 250 µg/l Method: OECD Test Guideline 305 GLP: yes Species: Cyprinus carpio (Carp) Bioconcentration factor (BCF): 6 - 40 Exposure time: 6 Weeks Concentration: 25 µg/l Method: OECD Test Guideline 305 GLP: yes
Partition coefficient: n-octanol/water	:	log Pow: 1.25 (68 °F / 20 °C) pH: 7 Method: (experimental) Remarks: Bioaccumulation is not expected.

Mobility in soil

No data available

Other adverse effects

Product:

Ozone-Depletion Potential	:	Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances Remarks: This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

Components:

Dichloromethane:

Results of PBT and vPvB assessment	:	Substance is not persistent, bioaccumulative, and toxic (PBT). Substance is not very persistent and very bioaccumulative (vPvB).
	:	Substance does not meet the criteria for PBT or vPvB according to Regulation (EC) No 1907/2006, Annex XIII.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No.	:	UN 1593
Proper shipping name	:	Dichloromethane
Class	:	6.1
Packing group	:	III
Labels	:	Division 6.1 - Toxic substances
Packing instruction (cargo aircraft)	:	663
Packing instruction (passenger aircraft)	:	655

IMDG-Code

UN number	:	UN 1593
Proper shipping name	:	DICHLOROMETHANE
Class	:	6.1
Packing group	:	III
Labels	:	6.1
EmS Code	:	F-A, S-A
Marine pollutant	:	no

Transport in bulk according to IMO instruments

Not applicable for product as supplied.

National Regulations

49 CFR Road

UN/ID/NA number	:	UN 1593
Proper shipping name	:	Dichloromethane
Class	:	6.1
Packing group	:	III
Labels	:	Division 6.1 - Toxic substances
ERG Code	:	160
Marine pollutant	:	no
Poison Inhalation Hazard	:	No

Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

SECTION 15. REGULATORY INFORMATION

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Dichloromethane	75-09-2	1000	1000

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : Acute Health Hazard
Chronic Health Hazard

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

Dichloromethane	75-09-2	>= 90 - <= 100 %

Clean Air Act

This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
The following chemical(s) are listed as HAP under the U.S. Clean Air Act, Section 112 (40 CFR 61):

Dichloromethane	75-09-2	>= 90 - <= 100 %

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).
The following chemical(s) are listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489):

Dichloromethane	75-09-2	>= 90 - <= 100 %

Clean Water Act

This product does not contain any Hazardous Substances listed under the U.S. CleanWater Act, Section 311, Table 116.4A.
This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.
This product contains the following toxic pollutants listed under the U.S. Clean Water Act Section 307

Dichloromethane	75-09-2	>= 90 - <= 100 %

This product contains the following priority pollutants related to the U.S. Clean Water Act:

Dichloromethane	75-09-2	>= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

Dichloromethane	75-09-2

Pennsylvania Right To Know

Dichloromethane	75-09-2

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Dichloromethane	75-09-2

Washington Chemicals of High Concern

Dichloromethane	75-09-2

California Prop. 65

WARNING: This product can expose you to chemicals including Dichloromethane, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

The components of this product are reported in the following inventories:

TSCA : All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

After February 3, 2025, this chemical substance (as defined in TSCA section 3(2))/product cannot be distributed in commerce to retailers. After January 28, 2026, this chemical substance (as defined in TSCA section 3(2))/product is and can only be distributed in commerce or processed with a concentration of methylene chloride equal to or greater than 0.1% by weight for the following purposes: (1) Processing as a reactant; (2) Processing for incorporation into a formulation, mixture, or reaction product; (3) Processing for repackaging; (4) Processing for recycling; (5) Industrial or commercial use as a laboratory chemical; (6) Industrial or commercial use as a bonding agent for solvent welding; (7) Industrial and commercial use as a paint and coating remover from safety critical, corrosion-sensitive components of aircraft and spacecraft; (8) Industrial and commercial use as a processing aid; (9) Industrial and commercial use for plastic and rubber products manufacturing; (10) Industrial and commercial use as a solvent that becomes part of a formulation or mixture, where that formulation or mixture will be used inside a manufacturing process, and the solvent (methylene chloride) will be reclaimed; (11)

Industrial and commercial use in the refinishing for wooden furniture, decorative pieces, and architectural fixtures of artistic, cultural or historic value until May 8, 2029; (12) Industrial and commercial use in adhesives and sealants in aircraft, space vehicle, and turbine applications for structural and safety critical non-structural applications until May 8, 2029; (13) Disposal; and (14) Export.

The following substance(s) is/are subject to TSCA 12(b) export notification requirements:
Dichloromethane 75-09-2

SECTION 16. OTHER INFORMATION

Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
ACGIH BEI	:	ACGIH - Biological Exposure Indices (BEI)
OSHA CARC	:	OSHA Specifically Regulated Chemicals/Carcinogens
TSCA ECEL	:	TSCA Existing Chemical Exposure Limit
ACGIH / TWA	:	8-hour, time-weighted average
OSHA CARC / PEL	:	Permissible exposure limit (PEL)
OSHA CARC / STEL	:	Excursion limit
TSCA ECEL / ECEL-TWA	:	Existing Chemical Exposure List (TWA)
TSCA ECEL / EPA STEL	:	EPA STEL

AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation,

Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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