SITE-SPECIFIC HEALTH AND SAFETY PLAN

4825 West Lawrence Avenue
Chicago, Illinois

Phase II Environmental Site Assessment:
Soil, Soil Gas, and Groundwater Sampling

Prepared By:
Weaver Consultants Group North Central, LLC

Dated:
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1.0 INTRODUCTION

This Site-Specific Health and Safety Plan (Plan) describes the general procedures, applicability and responsibilities that are to be implemented to protect Weaver Consultants Group North Central, LLC (WCG) and its employees involved in the Phase II Environmental Site Assessment (ESA) activities, including soil and groundwater sampling, at the property located 4825 West Lawrence Avenue in Chicago, Illinois (the Site). This Plan and associated site health and safety procedures are intended to satisfy the requirements of 29 CFR 120, Hazardous Operations and Emergency Response, and applicable subparts of 29 CFR 1926 and 1910.

1.1 Scope and Applicability of Plan

The purpose of this Plan is to define the requirements and designate protocols to be followed at the Site during monitoring well installation and soil, soil gas, and groundwater sampling activities. Applicability extends to on-Site WCG employees.

WCG personnel on-Site shall be informed of the site emergency response procedures and potential fire, explosion, health, or safety hazards of the operation. In addition, this information will be presented to WCG subcontractors to be used for general informational purposes only. Emergency services and authorized personnel are listed below in **Table 1** and the route to the nearest hospital is included as **Appendix A**. This Plan summarizes potential hazards in **Table 2** and defines protective measures planned for the Site. This Plan must be reviewed and an agreement to comply with the requirements must be signed by WCG employees prior to initiation of work at the Site (see **Appendix B** for Agreement Sign-In Sheet).

During development of this Plan, consideration was given to current safety standards as defined by EPA/OSHA/NIOSH, health effects and standards for known contaminants, and procedures designed to account for the potential of exposure to unknown substances. Specifically, the following reference sources have been consulted:

- OSHA 29 CFR 1910.120 and EPA 40 CFR 311;
- OSHA 29 CFR 1910.1200 Hazard Communication;
- OSHA 29 CFR 1926;
- U.S. EPA, OERR ERT Standard Operating Safety Guides;
- NIOSH/OSHA/USCG/EPA Occupational Health and Safety Guidelines;
- EPA Standard Operating Safety Guide, Office of Emergency and Remedial Response;

- ACGIH Threshold Limit Values;
- Keller's Official OSHA Construction Safety Handbook;
- 2001 Manual on Uniform Traffic Control Devices;
- NIOSH Pocket Guide to Chemical Hazards 1997; and
- 2000 North American Emergency Response Guidebook.

1.2 Visitors

All visitors entering the work areas at the Site will be required to read and verify compliance with the provisions of the Plan. In addition, visitors will be expected to comply with relevant OSHA requirements, such as PPE requirements (**Section 4.0**) and training (**Section 9.0**). In addition, visitors will also be expected to provide their own personal protective equipment.
In the event that a visitor does not adhere to the provisions of the Plan, he/she will be escorted from the Site. All non-conformance incidents will be recorded in the daily logs and reported to the Project Manager and other applicable authorities.

1.3 Subcontractors

WCG's subcontractors shall be expected to execute their specific job duties in a safe manner, and to provide sufficient resources, personnel, and equipment to meet this expectation. To facilitate this work effort, a copy of the Plan will be provided to each subcontractor to be used for general informational purposes only. Each subcontractor is responsible for preparing and implementing their own Health and Safety Plan.

1.4 Site Background Information

The Site is located at 4825 West Lawrence Avenue in Chicago, Illinois. The Site is comprised of described as four parcels in Chicago, Cook County, Illinois. The subject property is occupied by the Chicago Department of Water Management (CDWM) and Streets and City of Chicago Sanitation Department. The City of Chicago has occupied the subject property for approximately five to ten (10) years for use as a meeting spot for Streets and Sanitation employees and for their personnel vehicle storage, as well as vehicle and equipment storage relating to the CDWM Department. Equipment and material storage included portable water tanks, dump trucks, snowplow trucks, a large salt pile (approximately 30 feet tall, 200 feet long,

and 80 feet wide) for snow removal, asphalt grindings, sand, stone, backhoes, dozers, and skid steers.

WCG prepared a Phase I Environmental Site Assessment (ESA) dated April 8, 2025 for the Public Building Commission of Chicago. The Phase I ESA identified the following four recognized environmental condition (REC) with respect to the Site:

- The likely presence of impacts associated with the current use of the subject property for vehicle storage and upkeep, and apparent associated staining.
- The known presence of impacts identified during the 2019 Phase II Subsurface Investigation.
- The likely presence of impacts associated with the historical presence of four registered USTs with two associated closed LUST incidents.
- The likely presence of impacts associated with historical industrial use of the subject property including the use, storage, and alleged dumping of hazardous materials and a potential existing gasoline tank.

2.0 COMPREHENSIVE HASP RESPONSIBILITIES

2.1 Project Manager

The Project Manager (PM) is responsible for the following with respect to WCG employees on-Site:

- Making certain that personnel under their direction and oversight receive and are aware of the provisions of this Plan, are instructed in the work practices necessary to ensure safety, and are familiar with planned procedures for dealing with emergencies;
- Approving changes to the Plan;
- Making certain field personnel are in compliance with the hazardous waste worker health and safety training requirements of 29 CFR 1910.120; and
- Correcting work practices or conditions that may result in injury or exposure to hazardous substances.

2.2 Site Health and Safety Officer (HSO)

The Site Health and Safety Officer (HSO) is responsible for the following with respect to WCG employees on-Site:

- Developing or reviewing and approving action-specific plans that may become necessary based on unforeseen field conditions for use by WCG personnel;
- Implementing the action-specific plans and reporting to the PM if there are deviations from the anticipated conditions described in the Plan;
- Assuring the implementation of the Plan by WCG personnel, as necessary;
- Updating and modifying the Plan as site or environmental conditions change, in consultation with the PM;
- Conducting periodic self-inspections to determine if the Plan is being followed;
- Stopping work at any time, if warranted, due to unsafe conditions, and notifying the PM of any Stop Work Orders issued;
- Monitoring on-Site hazards and conditions;
- Maintaining proper health and safety documentation on Site;
- Making certain that monitoring equipment is operating correctly and is maintained according to manufacturer's instructions;

- Calibrating monitoring equipment as needed and recording results on appropriate forms;
- Conducting safety briefings and site-specific training (as needed) for WCG personnel;
- Selecting protective clothing and equipment in consultation with the PM;
- Periodically inspecting protective clothing and equipment;
- Ensuring that protective clothing and equipment are properly stored and maintained; and
- Monitoring on-Site WCG personnel for signs of stress, such as cold exposure, heat stress, and fatigue as warranted.

2.3 Emergency Services and Authorized Personnel

TABLE 1

Organization/Personnel	Name	Telephone
Emergency Medical Facility	Endeavor Health Swedish Hospital Emergency Department	(773) 878-8200
Ambulance Service	Chicago Fire Station 108, Ambulance 47	Emergency 911
Fire Department	Chicago Fire Station 108, Ambulance 47	Emergency 911 Non-Emergency (312) 744-3951
Police Department	Chicago Police Department, 16th District	Emergency 911 Non-Emergency (312) 742-4480
Poison Control Center	Illinois Poison Control Center	(800) 222-1222
On-Site HSO	Ben Levy	(847) 922-4423
Project Manager	Allison Fournier	(773) 756-8203

2.4 Driving Directions to the Endeavor Health Swedish Hospital Emergency Department

Driving directions can be found in **Appendix A.**

3.0 SITE HAZARD EVALUATION

3.1 Summary of Site Hazards

Activities to be completed at the Site include the advancement of up to ten (10) soil probes, two soil-gas probes and the installation of up to three one-inch temporary monitoring wells, and associated soil and groundwater sampling activities. Potential hazards may be present in the subsurface soils, soil vapor, and groundwater if they are impacted with metals, petroleum products, volatile organic compounds, or semi-volatile organic compounds. See **Appendix D** for Standard Safety Procedures for Drilling.

TABLE 2
Summary of Site Hazards

Field Activities	Potential Hazards
Mobilization/Work in Vicinity of Active Heavy Machinery	Trips, slips and falls, heavy machinery (Geoprobe drill rig).
Soil, Soil Gas, and Groundwater Sampling	Direct contact with contaminants in soil; heavy machinery; noise; trips, slips and falls; inhalation or ignition of escaping vapors or gases, presence of USTs.

3.2 Potential Contaminants

The following table, **Table 3**, lists the potential contaminants, OSHA permissible exposure limits (PELs) and short-term exposure limits (STEL), upper and lower explosive limits, and the physical properties and routes of exposure for the potential contaminants when available. The risk of exposure via inhalation and dermal contact is likely greater than ingestion or absorption.

TABLE 3
Potential Contaminants/Physical Properties

Contaminant	PEL/STEL	IDLH	LEL/UEL	Flashpoint	Routes of Exposure
Benzene[1]	PEL - 1 ppm STEL - 5 ppm	500 ppm	1.2%/7.8%	12°F	Ingestion, inhalation, absorption, skin and/or eye contact
Ethylbenzene	100 ppm	800 ppm	0.8%/6.7%	55°F	Ingestion, inhalation, skin and/or eye contact

Contaminant	PEL/STEL	IDLH	LEL/UEL	Flashpoint	Routes of Exposure
Toluene [2]	PEL - 200 ppm STEL - 500 ppm	500 ppm	1.1%/7.1%	40°F	Ingestion, inhalation, absorption, skin and/or eye contact
Xylenes [3]	100 ppm	900 ppm	0.9%/6.7%	90°F	Ingestion, inhalation, absorption, skin and/or eye contact
PNAs [4]	0.2 mg/m^3	80 mg/m^3	N/A	N/A	Inhalation, ingestion, skin and/or eye contact
Arsenic	0.010 mg/m3	5 mg/m3	N/A	N/A	Inhalation, skin absorption, skin and/or eye contact, ingestion
Cadmium	0.005 mg/m^3	9 mg/m^3	N/A	N/A	Inhalation, ingestion
Copper	1 mg/m^3	100 mg/m^3	N/A	N/A	Inhalation, ingestion, skin and/or eye contact
Chromium	1 mg/m^3	5 mg/m^3	N/A	N/A	Ingestion, inhalation, direct contact
Lead	0.05 mg/m^3	100 mg/m^3	N/A	N/A	Inhalation, ingestion, skin and/or eye contact
Nickel	1 mg/m^3	10 mg/m^3	N/A	N/A	Inhalation, ingestion, skin and/or eye contact

Notes: -Information obtained from NIOSH Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, January 2003.

-Material Safety Data Sheets attached for substances identified above (see **Appendix C**).

-PEL values based on an 8-hour work day, 40-hour work week time weighted average (TWA) unless otherwise noted.

[1] – STEL of 5 ppm consists of a 10-minute maximum peak.

[2] – STEL of 500 ppm consists of a 10-minute maximum peak.

[3]– o-Xylene (ortho-Xylene) values used for xylene information as it represents the most stringent data.

[4]Benzo(a)pyrene values used as PNA containing most stringent data.

3.4 Indicator Compounds

Indicator compounds are used to determine levels of protection to address chemical hazards at the Site. The indicator compound is the contaminant of concern (COC) at the Site with the lowest PEL or STEL. As the Site holds the potential to expose workers to the COCs identified above, benzene will be used as the indicator COC due to its low PEL and explosive limits. The table below, **Table 4**, describes the actions to be taken based on readings taken from the breathing zone using a direct reading instrument, such as a PID.

TABLE 4

PID Action Levels

PID Reading (ppm)	Action	Protection Level
Less than 1	Monitor worker breathing zones every 30 minutes	Level D
$\geq$ 1 and < 5	Continuous Monitoring	Level D – After 15 minutes of exposure, must evacuate area
≥ 5	Cease Operations for 15-Minutes and then Monitor	Level D - Evacuate Area

These action levels apply to all fieldwork covered under the scope of work for this Plan.

3.3 Air Monitoring

Potential releases of dust, odors, and other airborne contaminants will be controlled through a series of preventive measures, monitoring, and response actions. Air monitoring will be conducted using a PID to monitor for organic vapors within the breathing zone during monitoring well installation activities and soil and groundwater sampling. Prior to conducting air monitoring activities during installation and sampling activities each day, an ambient value will be established by monitoring the background atmosphere free of any potential contaminants. The WCG employee will use this ambient reading as a baseline value to assist in assessing the action levels outlined above in **Section 3.4**.

The following general procedures will be followed while using air monitoring equipment:

- Every morning, calibrate PID with isobutylene gas according to manufacturer specifications;
- Monitor worker breathing zones with PID during monitoring well installation activities and soil and groundwater sampling activities every 30 minutes; and
- Monitor retrieved soil samples using PID.

4.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

4.1 Minimum Levels

The minimum level of protection for Site personnel performing monitoring well installation activities and soil, groundwater, and soil-gas sampling activities will be Level D. During installation and sampling activities, Modified Level D Protection will be required for the sampler. The following levels of personal protection are anticipated to be applicable to this Site as no supplied air or self-contained breathing apparatus (SCBA) systems should be necessary.

4.2 Level D Protection

- Work uniform, long pants only, long sleeves allowed as weather dictates;
- Steel-toed boots;
- Hi-visibility reflective vest;
- Safety glasses; and
- Hard hats.

4.3 Modified Level D Protection

- Work uniform, long pants only, short sleeves allowed as weather dictates;
- Steel-toed boots;
- Hi-visibility reflective vest;
- Safety glasses;
- Hard hats;
- Durable and disposable chemical resistant gloves (nitrile / neoprene); and
- Earplugs (as required).

5.0 SAFE WORK PRACTICES

5.1 Site Control Measures

The following section defines procedures and measures for maintaining Site control. Site control is an essential component in the implementation of the Site health and safety program. To control access to the Site, minimize worker exposure, and to reduce the spread of potentially hazardous materials by workers, good hygiene practices should be employed by all personnel. The following sections describe general work practices to aid in reducing the spread of potentially hazardous materials and minimize worker exposure.

5.2 Standard Operating Procedures

5.2.1 Personal Precautions

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated to be contaminated;
- Hands and face must be thoroughly washed upon leaving the work area;
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles and discolored surfaces, kneel on ground, lean, sit, or place equipment on the ground in the potentially contaminated areas;
- Medicine and alcohol can potentially increase the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel at potentially hazardous waste operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless specifical1y approved by a qualified physician;
- WCG personnel must be familiar with standard operating safety procedures and any additional instructions and information contained in the Plan;
- WCG personnel must adhere to the information contained in the Plan; and
- WCG Personnel will be aware of symptoms of exposure to toxic chemicals on Site (refer to **Appendix C** for MSDS) and for heat or cold stress.

5.2.2 Operations

- WCG personnel going on-Site must be adequately trained and thoroughly briefed on anticipated hazards, equipment to be worn, and safety practices to be followed, emergency procedures, and communications. WCG personnel must read the Plan and sign the proper documentation prior to the initiation of the project work outlined within this Plan;
- Site health and safety briefings (tail gate briefings) will be conducted on a daily basis or as necessary, as changes in Site conditions occur.
- The Plan will be amended as Site conditions change;
- WCG personnel and equipment in known contaminated areas should be minimized, consistent with effective Site operations;
- Access controls including warning signs and barriers or cones will be utilized at excavations left open overnight, control zones and areas known to have elevated contamination levels; and
- WCG personnel will refrain from entry into test pit excavations. If WCG personnel entry is required into an excavation greater than 4 feet deep, all applicable OSHA requirements must be met and this Plan will require modification prior to entry.

5.3 General Occupational Hazards

General hazards encountered during the on-Site work may include the following:

- Back strain from hand digging, lifting, etc.;
- Irritation from dust generated during asphalt/concrete destruction and/or excavating;
- Driving vehicles and placing trailers on uneven surfaces creates a possibility of the vehicle rolling, getting stuck in mud or ditches, or of an accident due to flat tires or striking obstacles;
- Crushing or pinching hazard due to trailer placement or equipment movement; and
- Working around heavy equipment can be dangerous because of the size and power of the equipment, the limited operatory field of vision, and the noise levels that can be produced by the equipment.

5.4 Hazard Prevention

Prevention of the general hazards encountered during on-Site work may include the following:

- Back strain can be prevented by frequent breaks in routine. Use slow, even movements and proper lifting techniques (i.e., with the legs). Work gloves will reduce the incidence of hand injury and blisters associated with hand tools;
- Dust suppression techniques, such as wetting the soil with water, will reduce dust exposure;
- Seatbelts should be worn within moving vehicles at all times;
- Personnel should never approach a piece of heavy equipment without the operators' acknowledgment and stoppage of work or yielding to the employee;
- Never walk under the load of a bucket or stand beside an opening truck bed;
- Maintain visual contact with the operator when in close proximity to the heavy equipment;
- Wear hearing protection while on or around heavy equipment, when normal conversation cannot be heard above work operations; and
- Steel-toed shoes, safety glasses, Hi-visibility reflective vest, and a hard hat shall be worn for all work conducted near heavy equipment.

6.0 DECONTAMINATION PROCEDURES

6.1 Introduction

During Site subsurface activities, various equipment and/or materials will require decontamination. This section discusses personnel and equipment decontamination procedures. Decontamination practices are established to prevent harmful materials from being transferred into clean areas or from exposing unprotected workers. All equipment exiting an area of potential contamination will undergo decontamination.

6.2 Decontamination Procedures

As minimal amount of contact with contaminated materials is anticipated, a mix of water and alconox/liquinox should be used to wash any hand sampling tools as needed. A tray utilizing the same mixture should be used as a boot wash, if deemed necessary. Plastic bags should be on hand to walk on and to use for disposal of any sampling equipment (bailers, gloves, etc.). Dispose of any materials collected in plastic bags in this instance in the proper disposal receptacle.

7.0 EMERGENCY EQUIPMENT AND FIRST AID

7.1 Rules

In general accordance with requirements listed within 40 CFR 311 (Worker Protection) and the OSHA requirements listed within 40 CFR 1910.157 (Portable Fire Extinguishers) and 40 CFR 1910.151 (Medical Services and First Aid), the Site will be equipped with the following safety equipment to comply with 40 CFR 1910.120(j)(1)(xii):

- Fire Extinguishers (ABC);
- First Aid Kits; and
- Other emergency equipment deemed necessary by the Plan.

7.2 Fire Extinguishers

Fire suppression equipment (ABC Extinguishers) have been placed in WCG's vehicles. Fire extinguishers will be placed according to manufacturer's specifications, and within easy access to the operators. WCG' fire extinguishers present on-Site will be clearly marked, accessible, and operable at all times. Furthermore, subcontractor trailers and equipment will possess adequate fire suppression equipment.

7.3 First Aid Equipment

Small mobile first aid kits for cuts, minor burns, abrasions, etc. should be placed in the HSO's vehicle. All first aid kits will be clearly marked and accessible. In addition, WCG personnel will be informed as to their location, and if or when any of the units are moved. Furthermore, subcontractor trailers and equipment will possess small mobile first aid kits.

8.0 EMPLOYEE TRAINING REQUIREMENTS

8.1 Training

WCG personnel must have received 40 hours of initial training in hazardous waste operations to participate in the fieldwork (40 CFR 1910.120(e)). Field personnel must also be current in their annual refresher (8-hour) training. Subcontractors will provide documentation of initial (40-hour) and refresher (8-hour) training when requested by the HSO or OSHA representative.
Visitors will not be allowed within the work area unless they are 40-hour OSHA trained and possess the applicable Level D PPE. Also, visitors without an escort will not be allowed within 25 feet of any operating equipment when working in Level D.

9.0 HEAT AND COLD STRESS

9.1 Thermal Stresses

Prolonged exposure to excessive heat and cold is a known danger to outside workers. Employees need to be aware of conditions and how long they should be under physically stressful situations without taking a rest. The following sections describe cold and heat working conditions and gives work/rest schedules.

9.2 Heat Stress Reduction – Work Practice Controls

- Develop and adhere to work/rest schedule (**Table 5**);
- Take breaks in cool areas;
- Encourage hourly intake of fluids;
- Schedule work for coolest part of the day (early morning, early evening);
- Allow and encourage workers to pace themselves and take extra breaks when needed;
- Allow new workers time to adjust before working full time: 20% Day 1 with a 20% increase on each successive day; and
- Avoid overtime.

TABLE 5
Hot Weather Work/Break Schedule [1]

Adjusted Temperature [2]	Normal Work Ensemble [3]	Impermeable Ensemble
≥ 90°F (32.2°C)	After each 45 minutes of work	After each 15 minutes
87.5° - 90°F (30.80° - 32.2°C)	After each 60 minutes of work	After each 30 minutes
82.5° - 87.5°F (28.1 °- 30.8°C)	After each 90 minutes of work	After each 60 minutes
77.5° - 825°F (25.3° - 28.1 °C)	After each 120 minutes of work	After each 90 minutes

Source: NIOSH/OSHA/USCG/EPA, 1985.
Notes:
1. For work levels of 250 kilocalories/hour.
2. Calculate the adjusted air temperature by using this equation:

Adjusted air temperature (°F) = Air temperature (in °F) + (13 × (% sunshine/100))

Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to

produce a shadow. (100 % sunshine = no cloud cover and a sharp, distinct shadow; 0% sunshine = no shadows.)

3. A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants. As described in **Section 5.1**, a short sleeve shirt may be worn if weather conditions allow.

9.3 Heat Stress - Signs and Symptoms

Send worker to air conditioned area or within the shade immediately if any of the following symptoms are noted:

- Heat rash;
- Heat cramps (e.g. muscle spasms; pain in hands, feet or abdomen);
- Heat exhaustion (pale cool moist skin; heavy sweating; dizziness; nausea; fainting); and
- Heat stroke (red, hot, usually dry skin; lack of or reduced perspiration; nausea; dizziness, confusion; strong, rapid pulse).

9.4 Cold Stress Reduction – Engineering Controls

- Use general or spot heating to increase temperature at work site if this does not create a hazardous situation;
- Shield work area from wind if possible;
- Cover metal handles of tools and equipment with thermal insulating materials;
- Do not sit on unprotected metal chair seats;
- Heated rest areas are to be available if work is to be performed in an equivalent wind chill temperature of 20°F or below; and
- Encourage workers to use heated rest areas regularly.

9.5 Cold Stress Reduction – Work Practice Controls

- Develop and adhere to work/rest schedule;
- Encourage frequent intake of warm, caffeine-free, sweet, non-alcoholic drinks or soup;
- Schedule work for warmest part of the day;
- Allow and encourage workers to pace themselves and take extra breaks when needed;
- Allow new workers time to adjust before working full time;
- Arrange work to minimize standing or sitting still for long periods of time;

- Reorganize work procedures so as much of a job as possible can be done in a warm environment;
- Avoid overtime;
- Remove outer layer of clothing after entering a warm shelter; and
- If clothes are wet, change to dry work clothes before returning to work in cold. If not possible, loosen clothes to facilitate evaporation.

The table below, **Table 6**, details the recommended cold stress work/warm-up schedule for activities performed in cold weather.

TABLE 6
Recommended Cold Weather Work/Break Schedule (in minutes)

Temperature (°F)	Wind Speed (mph)				
	0	**5**	**10**	**15**	**20**
-15 to -19	110/10	110/10	75/10	55/10	40/10
-20 to -24	110/10	75/10	55/10	40/10	30/10
-25 to -29	75/10	55/10	40/10	30/10	Cease work
-30 to -34	55/10	40/10	30/10	Cease work	Cease work
-35 to -39	40/10	30/10	Cease work	Cease work	Cease work
-40 to -44	30/10	Cease work	Cease work	Cease work	Cease work
≥ -45	Cease work	Cease work	Cease work	Cease work	Cease work

Note: Cold stress schedule applies to moderate/ heavy work activities. For light to moderate work activities apply work/ break schedule one step lower.

Wind Speeds:

5 MPH :Light flag moves;

10 MPH: Light flag fully extended;

15 MPH: Raises newspaper sheet; and

20 MPH: Blowing and drifting snow.

9.6 Cold Stress – Signs and Symptoms

Send worker to warm shelter immediately if any of the following symptoms are noted:

- Onset of heavy shivering;
- Frostnip (skin turning white);
- Feeling of excessive fatigue;
- Drowsiness; and
- Euphoria.

APPENDIX A

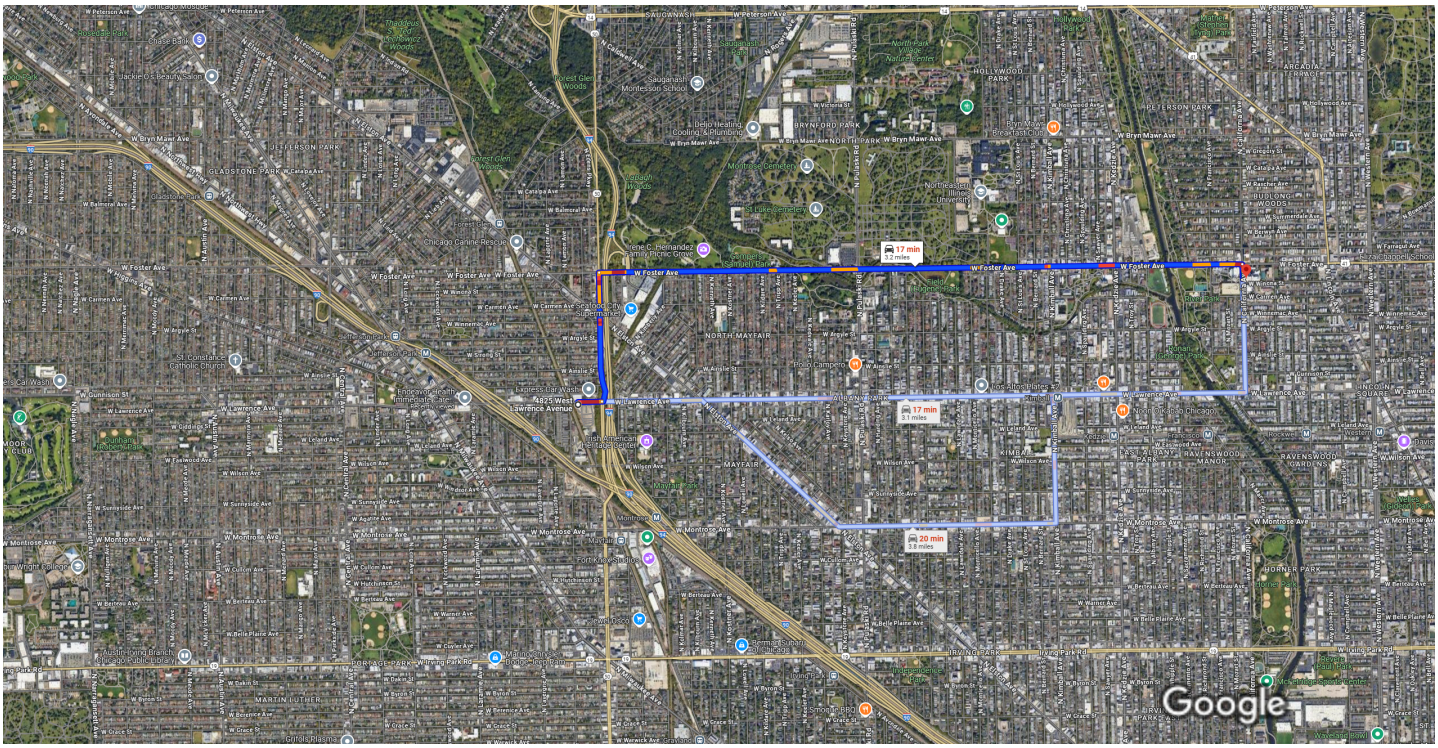
Route to Nearest

Hospital

Google Maps

4825 W Lawrence Ave, Chicago, IL 60630 to Endeavor Health Swedish Hospital Emergency Department, 5145 N California Ave, Chicago, IL 60625

Drive 3.2 miles, 17 min



Imagery ©2025 Airbus, Maxar Technologies, Map data ©2025 Google 1000 ft

via W Foster Ave — 17 min
Fastest route, despite the usual traffic — 3.2 miles

via W Lawrence Ave — 17 min
Heavy traffic, as usual — 3.1 miles

via W Montrose Ave and W Lawrence Ave — 20 min
Heavy traffic, as usual — 3.8 miles

Explore nearby Endeavor Health Swedish Hospital Emergency Department

Restaurants | Hotels | Gas stations | Parking Lots | More

APPENDIX B

Agreement Sign-In

Sheet

HEALTH & SAFETY PLAN ACKNOWLEDGMENT FORM

4825 W Lawrence Avenue, Chicago, IL

Each employee conducting field work shall sign this form after the pre-entry health and safety plan briefing is completed and prior to commencing work on site. This form shall be kept at the site during the work effort. At the conclusion of the project, the form shall be sent to the EM for inclusion into the project file.

Site Personnel Sign-off

By affixing your signature to the space below, you acknowledge that you have been briefed on the work effort at this site, and the potential safety and health hazards to be encountered, methods to prevent exposure to these health and safety hazards.

I understand this briefing and will comply with the safety requirements for this project.

Signature / Date

_____	Date: _____
_____	Date: _____
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Weaver Consultants Group

******Retain this form in the project files*****

APPENDIX C

Material Safety

Data Sheets

Methyl chloroform

Synonyms & Trade Names Chlorothene; 1,1,1-Trichloroethane; 1,1,1-Trichloroethane (stabilized)

CAS No. 71-55-6	**RTECS No.** KJ2975000 (/niosh-rtecs/KJ2D6518.html)	**DOT ID & Guide** 2831 160 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=160) (http://www.cdc.gov/Other/disclaimer.html)
Formula CH_3CCl_3	**Conversion** 1 ppm = 5.46 mg/m³	**IDLH** 700 ppm See: 71556 (/niosh/idlh/71556.html)

Exp

NIOSH REL : C 350 ppm (1900 n [15-minute] See Appendix C (nengapdxc.html) (Chloroethanes)
OSHA PEL † (nengapdxg.html): TWA 350 ppm (1900 mg/m³)

NIOSH 1003 (/niosh/docs/2003-154/pdfs/1003.pdf)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a mild, chloroform-like odor.

MW:	BP:	FRZ:	Sol:	VP:	IP:
133.4	165°F	-23°F	0.4%	100 mmHg	11.00 eV
Sp.Gr: 1.34	**Fl.P:** ?	**UEL:** 12.5%	**LEL:** 7.5%		

Combustible Liquid, but burns with difficulty.

Incompatibilities & Reactivities Strong caustics; strong oxidizers; chemically-active metals such as zinc, aluminum, magnesium powders, sodium & potassium; water [Note: Reacts slowly with water to form hydrochloric acid.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage

Target Organs Eyes, skin, central nervous system, cardiovascular system, liver

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 700 ppm:
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0079 (/niosh/ipcsneng/neng0079.html) See MEDICAL TESTS: 0141 (/niosh/docs/2005-110/nmed0141.html)

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1,1,2,2-Tetrachloroethane

Synonyms & Trade Names Acetylene tetrachloride, Symmetrical tetrachloroethane

CAS No. 79-34-5	**RTECS No.** KI8575000 (/niosh-rtecs/KI82D818.html)	**DOT ID & Guide** 1702 151 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=151) (http://www.cdc.gov/Other/disclaimer.html)
Formula $CHCl_2CHCl_2$	**Conversion** 1 ppm = 6.87 mg/m3	**IDLH** Ca [100 ppm] See: 79345 (/niosh/idlh/79345.html)

Exposure Limits

NIOSH REL : Ca TWA 1 ppm (7 mg/m3) [skin] See Appendix A (nengapdxa.html) See Appendix C (nengapdxc.html) (Chloroethanes)

OSHA
(35

Measurement Methods

NIOSH 1019 (/niosh/docs/2003-154/pdfs/1019.pdf), 2562 (/niosh/docs/2003-154/pdfs/2562.pdf);
OSHA 7 (http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html)
Other/disclaimer.html)
cs/2003-154/) or OSHA Methods
s/sltc/methods/index.html)
(http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to pale-yellow liquid with a pungent, chloroform-like odor.

MW: 167.9	**BP:** 296°F	**FRZ:** -33°F	**Sol:** 0.3%	**VP:** 5 mmHg	**IP:** 11.10 eV
Sp.Gr(77°F): 1.59	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Noncombustible Liquid

Incompatibilities & Reactivities Chemically-active metals, strong caustics, fuming sulfuric acid [Note: Degrades slowly when exposed to air.]

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms nausea, vomiting, abdominal pain; tremor fingers; jaundice, hepatitis, liver tenderness; dermatitis; leukocytosis (increased blood leukocytes); kidney damage; [potential occupational carcinogen]

Target Organs Skin, liver, kidneys, central nervous system, gastrointestinal tract

Cancer Site [in animals: liver tumors]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support

Wash skin: When contaminated **Remove:** When wet or contaminated **Change:** No recommendation **Provide:** Eyewash, Quick drench	**Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0332 (/niosh/ipcsneng/neng0332.html) See MEDICAL TESTS: 0222 (/niosh/docs/2005-110/nmed0222.html)

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1,1-Dichloroethane

Synonyms & Trade Names Asymmetrical dichloroethane; Ethylidene chloride; 1,1-Ethylidene dichloride

CAS No. 75-34-3	**RTECS No.** KI0175000 (/niosh-rtecs/KI2AB98.html)	**DOT ID & Guide** 2362 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula $CHCl_2CH_3$	**Conversion** 1 ppm = 4.05 mg/m³	**IDLH** 3000 ppm See: 75343 (/niosh/idlh/75343.html)
Exposure Limits **NIOSH REL** : TWA 100 ppm (400 mg/m³) See Appendix C (nengapdxc.html) (Chloroethanes) **OSHA PEL** : TWA 100 ppm (400 mg/m³)		**Measurement Methods** **NIOSH** 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) ; **OSHA** 7 (http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Phys

MW:	BP:	FRZ:	Sol:	VP:	IP:
99.0	135°F	-143°F	0.6%	182 mmHg	11.06 eV
Sp.Gr:	**Fl.P:**	**UEL:**	**LEL:**		
1.18	2°F	11.4%	5.4%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers, strong caustics

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation skin; central nervous system depression; liver, kidney, lung damage

Target Organs Skin, liver, kidneys, lungs, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap flush promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 1000 ppm:
(APF = 10) Any supplied-air respirator

Up to 2500 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

Up to 3000 ppm:
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0249 (/niosh/ipcsneng/neng0249.html)

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Ethylene dichloride

Synonyms & Trade Names 1,2-Dichloroethane; Ethylene chloride; Glycol dichloride

CAS No. 107-06-2	**RTECS No.** KI0525000 (/niosh-rtecs/KI802C8.html)	**DOT ID & Guide** 1184 131 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=131) (http://www.cdc.gov/Other/disclaimer.html)
Formula $ClCH_2CH_2Cl$	**Conversion** 1 ppm = 4.05 mg/m3	**IDLH** Ca [50 ppm] See: 107062 (/niosh/idlh/107062.html)

Exposure Limits

NIOSH REL : Ca TWA 1 ppm (4 mg/m3) ST 2 ppm (8 mg/m3) See Appendix A (nengapdxa.html) See Appendix C (nengapdxc.html) (Chloroethanes)

OSHA PEL † (nengapdxg.html) : TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]

Measurement Methods

NIOSH 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) ; **OSHA** 3 (http://www.osha.gov/dts/sltc/methods/organic/org003/org003.html) (http://www.cdc.gov/Other/disclaimer.html)

See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Phys
beco ɔdor. [Note: Decomposes slowly,

MW:	BP:	FRZ:	Sol:	VP:	IP:
99.0	182°F	-32°F	0.9%	64 mmHg	11.05 eV
Sp.Gr:	**Fl.P:**	**UEL:**	**LEL:**		
1.24	56°F	16%	6.2%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers & caustics; chemically-active metals such as magnesium or aluminum powder, sodium & potassium; liquid ammonia [Note: Decomposes to vinyl chloride & HCl above 1112°F.]

Exposure Routes inhalation, ingestion, skin absorption, skin and/or eye contact

Symptoms irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]

Target Organs Eyes, skin, kidneys, liver, central nervous system, cardiovascular system

Cancer Site [in animals: forestomach, mammary gland & circulatory sys cancer]

Personal Protection/Sanitation (See protection codes (protect.html))	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately

Skin: Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet (flammable) **Change:** No recommendation **Provide:** Eyewash, Quick drench	**Skin:** Soap wash promptly **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0250 (/niosh/ipcsneng/neng0250.html) See MEDICAL TESTS: 0104 (/niosh/docs/2005-110/nmed0104.html)

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1,2-Dichloroethylene

Synonyms & Trade Names Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene

CAS No. 540-59-0	**RTECS No.** KV9360000 (/niosh-rtecs/KV8ED280.html)	**DOT ID & Guide** 1150 130P (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130&poly=1) (http://www.cdc.gov/Other/disclaimer.html)
Formula ClCH=CHCl	**Conversion** 1 ppm = 3.97 mg/m³	**IDLH** 1000 ppm See: 540590 (/niosh/idlh/540590.html)
Exposure Limits **NIOSH REL** : TWA 200 ppm (790 mg/m³) **OSHA PEL** : TWA 200 ppm (790 mg/m³)		**Measurement Methods** **NIOSH** 1003 (/niosh/docs/2003-154/pdfs/1003.pdf); **OSHA** 7 (http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Phys ans isomers) with a slightly acrid, chloroform-like odor.

MW: 97.0	**BP:** 118-140°F	**FRZ:** -57 to -115°F	**Sol:** 0.4%	**VP:** 180-265 mmHg	**IP:** 9.65 eV
Sp.Gr(77°F): 1.27	**Fl.P:** 36-39°F	**UEL:** 12.8%	**LEL:** 5.6%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers, strong alkalis, potassium hydroxide, copper [Note: Usually contains inhibitors to prevent polymerization.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, respiratory system; central nervous system depression

Target Organs Eyes, respiratory system, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Soap wash promptly **Breathing:** Respiratory support

Wash skin: When contaminated **Remove:** When wet (flammable) **Change:** No recommendation	**Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 1000 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode£
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)£
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0436 (/niosh/ipcsneng/neng0436.html)

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Propylene dichloride

Synonyms & Trade Names Dichloro-1,2-propane; 1,2-Dichloropropane

CAS No. 78-87-5	**RTECS No.** TX9625000 (/niosh-rtecs/TX92DDA8.html)	**DOT ID & Guide** 1279 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula $CH_3CHClCH_2Cl$	**Conversion** 1 ppm = 4.62 mg/m3	**IDLH** Ca [400 ppm] See: 78875 (/niosh/idlh/78875.html)

Exposure Limits

NIOSH REL : Ca See Appendix A (nengapdxa.html)
OSHA PEL † (nengapdxg.html) : TWA 75 ppm (350 mg/

Measurement Methods
NIOSH 1013 (/niosh/docs/2003-154/pdfs/1013.pdf) ;
OSHA 7
v/dts/sltc/methods/organic/org001/org001.html)
.gov/Other/disclaimer.html)
h/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a chloroform-like odor. [pesticide]

MW: 113.0	**BP:** 206°F	**FRZ:** -149°F	**Sol:** 0.3%	**VP:** 40 mmHg	**IP:** 10.87 eV
Sp.Gr: 1.16	**Fl.P:** 60°F	**UEL:** 14.5%	**LEL:** 3.4%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers, strong acids, active metals

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, respiratory system; drowsiness, dizziness; liver, kidney damage; in animals: central nervous system depression; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, liver, kidneys, central nervous system

Cancer Site [in animals: liver & mammary gland tumors]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0441 (/niosh/ipcsneng/neng0441.html)

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1,3-Dichloropropene

Synonyms & Trade Names 3-Chloroallyl chloride; DCP; 1,3-Dichloro-1-propene; 1,3-Dichloropropylene; Telone®

CAS No. 542-75-6	**RTECS No.** UC8310000 (/niosh-rtecs/UC7ECCF0.html)	**DOT ID & Guide** 2047 129 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage aspx?guide=129) /Other/disclaimer.html)

Formula $ClHC{=}CHCH_2Cl$	**Conv** ...ml = 4.54 mg/m³
IDLH Ca [N.D.] See: IDLH INDEX (/niosh/idlh/intridl4.html)	

Exposure Limits

NIOSH REL : Ca TWA 1 ppm (5 mg/m3) [skin]
See Appendix A (nengapdxa.html)
OSHA PEL † (nengapdxg.html): none

Measurement Methods
None available
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to straw-colored liquid with a sharp, sweet, irritating, chloroform-like odor. [insecticide] [Note: Exists as mixture of cis- & trans-isomers.]

MW:	BP:	FRZ:	Sol:	VP:	IP:
111.0	226°F	-119°F	0.2%	28 mmHg	?
Sp.Gr:	**Fl.P:**	**UEL:**	**LEL:**		
1.21	77°F	14.5%	5.3%		

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

Incompatibilities & Reactivities Aluminum, magnesium, halogens, oxidizers [Note: Epichlorohydrin may be added as a stabilizer.]

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, respiratory system; eye, skin burns; lacrimation (discharge of tears); headache, dizziness; in animals; liver, kidney damage; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys

Cancer Site [in animals: cancer of the bladder, liver, lung & forestomach]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap flush immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0995 (/niosh/ipcsneng/neng0995.html)

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2-Butanone

Synonyms & Trade Names Ethyl methyl ketone, MEK, Methyl acetone, Methyl ethyl ketone

CAS No. 78-93-3	**RTECS No.** EL6475000 (/niosh-rtecs/EL62CCF8.html)	**DOT ID & Guide** 1193 127 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=127) (http://www.cdc.gov/Other/disclaimer.html)
Formula $CH_3COCH_2CH_3$	**Conversion** 1 ppm = 2.95 mg/m³	**IDLH** 3000 ppm See: 78933 (/niosh/idlh/78933.html)

Exposure Limits

NIOSH REL : TWA 200 ppm (590 mg/m³) ST 300 ppm (885 mg/m³)

OSHA PEL † (nengapdxg.html): TWA 200 ppm (590 mg/m³)

Measurement Methods

NIOSH 2500 (/niosh/docs/2003-154/pdfs/2500.pdf), 2555 (/niosh/docs/2003-154/pdfs/2555.pdf), 3800 (/niosh/docs/2003-154/pdfs/3800.pdf);

OSHA 16 (http://www.osha.gov/dts/sltc/methods/organic/org016/org016.html) (http://www.cdc.gov/Other/disclaimer.html), 84 (http://www.osha.gov/dts/sltc/methods/organic/org084/org084.html) (http://www.cdc.gov/Other/disclaimer.html), 1004 w.osha.gov/dts/sltc/methods/mdt/mdt1004/1004.html) w.cdc.gov/Other/disclaimer.html) M (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor.

MW: 72.1	**BP:** 175°F	**FRZ:** -123°F	**Sol:** 28%	**VP:** 78 mmHg	**IP:** 9.54 eV
Sp.Gr: 0.81	**Fl.P:** 16°F	UEL(200°F): 11.4%	LEL(200°F): 1.4%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers, amines, ammonia, inorganic acids, caustics, isocyanates, pyridines

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation
Provide: Eyewash

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Water wash immediately
Breathing: Fresh air
Swallow: Medical attention immediately

Respirator Recommendations
NIOSH/OSHA

Up to 3000 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode£
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)£
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0179 (/niosh/ipcsneng/neng0179.html) See MEDICAL TESTS: 0133 (/niosh/docs/2005-110/nmed0133.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

2-Hexanone

Synonyms & Trade Names Butyl methyl ketone, MBK, Methyl butyl ketone, Methyl n-butyl ketone

CAS No. 591-78-6	**RTECS No.** MP1400000 (/niosh-rtecs/MP155CCo.html)	**DOT ID & Guide**
Formula $CH_3CO[CH_2]_3CH_3$	**Conversion** 1 ppm = 4.10 mg/m3	**IDLH** 1600 ppm See: 591786 (/niosh/idlh/591786.html)

Exposure Limits
NIOSH REL : TWA 1 ppm (4 mg/m3)
OSHA PEL † (nengapdxg.html): TWA 100 ppm (410 mg/m3)

Measurement Methods
NIOSH 1300 (/niosh/docs/2003-154/pdfs/1300.pdf), 2555 (/niosh/docs/2003-154/pdfs/2555.pdf);
OSHA PV2031 (http://www.osha.gov/dts/sltc/methods/partial/pv2031/2031.html) (http://www.cdc.gov/Other/disclaimer.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with an acetone-like odor.

MW: 100.2	**BP:** 262°F	**FRZ:**	**Sol:** 2%	**VP:** 11 mmHg	**IP:** 9.34 eV
Sp.Gr					

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

Incompatibilities & Reactivities Strong oxidizers

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, nose; peripheral neuropathy: lassitude (weakness, exhaustion), paresthesia; dermatitis; headache, drowsiness

Target Organs Eyes, skin, respiratory system, central nervous system, peripheral nervous system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

Up to 10 ppm:
(APF = 10) Any supplied-air respirator

Up to 25 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

Up to 50 ppm:
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 1600 ppm:
(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0489 (/niosh/ipcsneng/neng0489.html) See MEDICAL TESTS: 0132 (/niosh/docs/2005-110/nmed0132.html)

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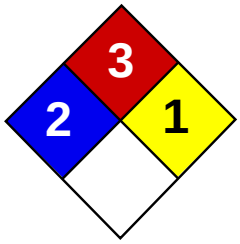

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Methyl isobutyl ketone MSDS

Section 1: Chemical Product and Company Identification

Product Name: Methyl isobutyl ketone

Catalog Codes: SLM3412

CAS#: 108-10-1

RTECS: SA9275000

TSCA: TSCA 8(b) inventory: Methyl isobutyl ketone

CI#: Not available.

Synonym: 4-Methyl-2-pentanone

Chemical Formula: C6H12O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Methyl isobutyl ketone	108-10-1	100

Toxicological Data on Ingredients: Methyl isobutyl ketone: ORAL (LD50): Acute: 1600 mg/kg [Guinea pig]. 2671 mg/kg [Mouse]. 2080 mg/kg [Rat]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit]. VAPOR (LC50): Acute: 8000 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (irritant, permeator). Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 460°C (860°F)

Flash Points: CLOSED CUP: 14°C (57.2°F). OPEN CUP: 23°C (73.4°F).

Flammable Limits: LOWER: 1.4% UPPER: 7.5%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 50 STEL: 75 CEIL: 125 (ppm) from ACGIH (TLV) [1995] TWA: 205 STEL: 300 CEIL: 510 (mg/m3) from ACGIH [1995] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 100.16 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 115.9°C (240.6°F)

Melting Point: -84°C (-119.2°F)

Critical Temperature: Not available.

Specific Gravity: 0.802 (Water = 1)

Vapor Pressure: 15.7 mm of Hg (@ 20°C)

Vapor Density: 3.45 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.1 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Partially soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Not available.

Special Remarks on Reactivity: Forms explosive peroxides on prolonged storage.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 1600 mg/kg [Guinea pig]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 8000 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion, of inhalation. Hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Methyl isobutyl ketone : UN1245 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Methyl isobutyl ketone Massachusetts RTK: Methyl isobutyl ketone TSCA 8(b) inventory: Methyl isobutyl ketone SARA 313 toxic chemical notification and release reporting: Methyl isobutyl ketone CERCLA: Hazardous substances.: Methyl isobutyl ketone

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

DSCL (EEC):
R11- Highly flammable. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:40 PM

Last Updated: 05/21/2013 12:00 PM

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ACENAPHTHENE

ICSC: 1674

1,2-Dihydroacenaphthylene 1,8-Ethylenenaphthalene $C_{12}H_{10}$ Molecular mass: 154.2 ICSC # 1674		CAS # 83-32-9 RTECS # AB1000000 UN # 3077 October 12, 2006 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray. Dry powder. Foam. Carbon dioxide.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE	See NOTES.	PREVENT DISPERSION OF DUST!	
•**INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
•**SKIN**		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•**EYES**		Safety goggles	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: P2 filter respirator for harmful particles. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants . Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	UN Hazard Class: 9 UN Packing Group: III Signal: Warning Enviro Very toxic to aquatic life with long lasting effects
ICSC: 1674	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

ACENAPHTHENE

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** WHITE TO BEIGE CRYSTALS **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** On combustion, forms toxic gases including carbon monoxide. Reacts with strong oxidants . **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion. **INHALATION RISK:** A harmful concentration of airborne particles can be reached quickly when dispersed . **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** See Notes.
PHYSICAL PROPERTIES	Boiling point: 279°C Melting point: 95°C Density: 1.2 g/cm^3 Solubility in water, g/100 ml at 25°C: 0.0004	Vapour pressure, Pa at 25°C: 0.3 Relative vapour density (air = 1): 5.3 Flash point: 135°C o.c. Auto-ignition temperature: >450 °C Octanol/water partition coefficient as log Pow: 3.9 - 4.5
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised that this substance does not enter the environment. 	

NOTES

Acenaphthene occurs as a pure substance and also as a component of polyaromatic hydrocarbon (PAH) mixtures. Human population studies have associated PAH's exposure with cancer and cardiovascular diseases. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

Transport Emergency Card: TEC (R)-90GM7-III

ADDITIONAL INFORMATION

ICSC: 1674	**ACENAPHTHENE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

Page last reviewed: July 22, 2015

Page last updated: July 1, 2014

Content source: National Institute for Occupational Safety and Health (http://www.cdc.gov/NIOSH/)

ACENAPHTHENE

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TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray. Dry powder. Foam. Carbon dioxide.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE	See NOTES.	PREVENT DISPERSION OF DUST!	
•**INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
•**SKIN**		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•**EYES**		Safety goggles	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: P2 filter respirator for harmful particles. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants . Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	UN Hazard Class: 9 UN Packing Group: III Signal: Warning Enviro Very toxic to aquatic life with long lasting effects
ICSC: 1674	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

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PHYSICAL PROPERTIES	Boiling point: 279°C Melting point: 95°C Density: 1.2 g/cm^3 Solubility in water, g/100 ml at 25°C: 0.0004	Vapour pressure, Pa at 25°C: 0.3 Relative vapour density (air = 1): 5.3 Flash point: 135°C o.c. Auto-ignition temperature: >450 °C Octanol/water partition coefficient as log Pow: 3.9 - 4.5
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised that this substance does not enter the environment. 	

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ICSC: 1674	**ACENAPHTHENE**

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Content source: National Institute for Occupational Safety and Health (http://www.cdc.gov/NIOSH/)

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

Acetone

Synonyms & Trade Names Dimethyl ketone, Ketone propane, 2-Propanone

CAS No. 67-64-1	**RTECS No.** AL3150000 (/niosh-rtecs/AL3010B0.html)	**DOT ID & Guide** 1090 127 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=127) (http://www.cdc.gov/Other/disclaimer.html)
Formula $(CH_3)_2CO$	**Conversion** 1 ppm = 2.38 mg/m³	**IDLH** 2500 ppm [10%LEL] See: 67641 (/niosh/idlh/67641.html)
Exposure Limits **NIOSH REL** : TWA 250 ppm (590 mg/m³) **OSHA PEL** † (nengapdxg.html) : TWA 1000 ppm (2400 mg/m³)		**Measurement Methods** **NIOSH** 1300 (/niosh/docs/2003-154/pdfs/1300.pdf), 2555 (/niosh/docs/2003-154/pdfs/2555.pdf), 3800 (/niosh/docs/2003-154/pdfs/3800.pdf); **OSHA** 69 (http://www.osha.gov/dts/sltc/methods/organic/org069/org069.html) ther/disclaimer.html) /2003-154/) or OSHA Methods sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a fragrant, mint-like odor.

MW: 58.1	**BP:** 133°F	**FRZ:** -140°F	**Sol:** Miscible	**VP:** 180 mmHg	**IP:** 9.69 eV
Sp.Gr: 0.79	**Fl.P:** 0°F	**UEL:** 12.8%	**LEL:** 2.5%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Oxidizers, acids

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet (flammable) **Change:** No recommendation	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Soap wash immediately **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Change: No recommendation

Respirator Recommendations

NIOSH

Up to 2500 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0087 (/niosh/ipcsneng/neng0087.html) See MEDICAL TESTS: 0002 (/niosh/docs/2005-110/nmed0002.html)

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Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

ANTHRACENE

ICSC: 0825

Anthracin Paranaphthalene $C_{14}H_{10}$ / $(C_6H_4CH)_2$ Molecular mass: 178.2 ICSC # 0825	CAS # 120-12-7 RTECS # CA9350000 March 24, 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT DISPERSION OF DUST!	
•**INHALATION**	Cough. Sore throat.	Ventilation (not if powder), local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•**SKIN**	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•**EYES**	Redness. Pain.	Safety spectacles, face shield, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	Abdominal pain.	Do not eat, drink, or smoke during work.	Rinse mouth. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING

Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place Do NOT let this chemical enter the environment. (Extra personal protection: P2 filter respirator for harmful particles).	Separated from strong oxidants. Well closed.	
ICSC: 0825	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

ANTHRACENE

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** WHITE CRYSTALS OR FLAKES. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** The substance decomposes on heating, under influence of strong oxidants producing acrid, toxic fume , causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance slightly irritates the skin and the respiratory tract. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis under the influence of UV light.
PHYSICAL PROPERTIES	Boiling point: 342°C Melting point: 218°C Density: 1.25-1.28 g/cm^3 Solubility in water, g/100 ml at 20 °C: 0.00013 Vapour pressure, Pa at 25°C: 0.08	Relative vapour density (air = 1): 6.15 Flash point: 121°C Auto-ignition temperature: 538°C Explosive limits, vol% in air: 0.6-? Octanol/water partition coefficient as log Pow: 4.5 (calculated)

ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. 

NOTES

Green oil, Tetra-olive N2G are trade names.

NFPA Code: H0; F1; R;

ADDITIONAL INFORMATION

ICSC: 0825 **ANTHRACENE**

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Page last reviewed: July 22, 2015

Page last updated: July 1, 2014

Content source: National Institute for Occupational Safety and Health (http://www.cdc.gov/NIOSH/)

Arsenic (inorganic compounds, as As)

Synonyms & Trade Names Arsenic metal: Arsenia
Other synonyms vary depending upon the specific As compound. [Note: OSHA considers "Inorganic Arsenic" to mean copper acetoarsenite and all inorganic compounds containing arsenic except ARSINE.]

CAS No. 7440-38-2 (metal)	**RTECS No.** CG0525000 (metal) (/niosh-rtecs/CG802C8.html)	**DOT ID & Guide** 1558 152 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=152) (http://www.cdc.gov/Other/disclaimer.html) (metal) 1562 152 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=152) (http://www.cdc.gov/Other/disclaimer.html) (dust)
Formula As (metal)	**Conversion**	**IDLH** Ca [5 mg/m³ (as As)] See: 7440382 (/niosh/idlh/7440382.html)
Exposure Limits **NIOSH REL** : Ca C 0.002 mg/m³ [15-minute] See Appendix A (nengapdxa.html) **OSHA PEL** : [1910.1018] TWA 0.010 mg/m³		**Measurement Methods** **NIOSH** 7300 (/niosh/docs/2003-154/pdfs/7300.pdf), 7301 (/niosh/docs/2003-154/pdfs/7301.pdf), 7303 (/niosh/docs/2003-154/pdfs/7303.pdf), 7900 (/niosh/docs/2003-154/pdfs/7900.pdf), 9102 (/niosh/docs/2003-154/pdfs/9102.pdf); ;/sltc/methods/inorganic/id105/id105.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Metal: Silver-gray or tin-white, brittle, odorless solid.

MW: 74.9	**BP:** Sublimes	MLT: 1135°F (Sublimes)	**Sol:** Insoluble	**VP:** 0 mmHg (approx)	**IP:** NA
Sp.Gr: 5.73 (metal)	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of dust when exposed to flame.

Incompatibilities & Reactivities Strong oxidizers, bromine azide [Note: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.]

arsenic to form the highly toxic gas arsine.]

Exposure Routes inhalation, skin absorption, skin and/or eye contact, ingestion

Symptoms Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]

Target Organs Liver, kidneys, skin, lungs, lymphatic system

Cancer Site [lung & lymphatic cancer]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated/Daily
Remove: When wet or contaminated
Change: Daily
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
(See Appendix E) (nengapdxe.html)

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0013 (/niosh/ipcsneng/neng0013.html) See MEDICAL TESTS: 0017 (/niosh/docs/2005-110/nmed0017.html)

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Barium chloride (as Ba)

Synonyms & Trade Names Barium dichloride

CAS No. 10361-37-2	**RTECS No.** CQ8750000 (/niosh-rtecs/CQ8583B0.html)	**DOT ID & Guide** 1564 154 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=154) (http://www.cdc.gov/Other/disclaimer.html) (barium compound, n.o.s.)
Formula $BaCl_2$	**Conversion**	**IDLH** 50 mg/m³ (as Ba) See: IDLH INDEX (/idlh/intridl4.html)
Exposure Limits **NIOSH REL** *: TWA 0.5 mg/m³ [*Note: The REL also applies to other soluble barium compounds (as Ba) except Barium sulfate.] **OSHA PEL** *: TWA 0.5 mg/m³ [*Note: The PEL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]		**Measurement Methods** **NIOSH** 7056 (/niosh/docs/2003-154/pdfs/7056.pdf), 7303 (/niosh/docs/2003-154/pdfs/7303.pdf); **OSHA** ID121 (http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description White, odorless solid.

MW:	BP:	MLT:	Sol:	VP:	IP:
208.2	2840°F	1765°F	38%	Low	?

Sp.Gr:	Fl.P:	UEL:	LEL:
3.86	NA	NA	NA

Noncombustible Solid

Incompatibilities & Reactivities Acids, oxidizers

Expo

Symptoms irritation eyes, skin, [illegible] iratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia

Target Organs Eyes, skin, respiratory system, heart, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Water flush immediately **Breathing:** Respiratory support

Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily

Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 5 mg/m3:
(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 10) Any supplied-air respirator

Up to 12.5 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

Up to 25 mg/m3:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 50 mg/m3:
(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0614 (/niosh/ipcsneng/neng0614.html)

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BENZ(a)ANTHRACENE

ICSC: 0385

1,2-Benzoanthracene Benzo(a)anthracene 2,3-Benzphenanthrene Naphthanthracene $C_{18}H_{12}$ Molecular mass: 228.3 ICSC # 0385	CAS # 56-55-3 RTECS # CV9275000 EC # 601-033-00-9 October 23, 1995 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.		Water spray, powder. In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles , face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: complete protective clothing including self-contained breathing apparatus.	Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61
ICSC: 0385	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

BENZ(a)ANTHRACENE

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLOURLESS TO YELLOW - BROWN FLUORESCENT FLAKES OR POWDER. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** **OCCUPATIONAL EXPOSURE LIMITS:** TLV: A2 (suspected human carcinogen); (ACGIH 2004). MAK: Carcinogen category: 2 (as pyrolysis product of organic materials) (DFG 2005).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is probably carcinogenic to humans.
PHYSICAL PROPERTIES	Sublimation point: 435°C Melting point: 162°C Relative density (water = 1): 1.274 Solubility in water: none	Vapour pressure, Pa at 20°C: 292 Octanol/water partition coefficient as log Pow: 5.61
ENVIRONMENTAL DATA	Bioaccumulation of this chemical may occur in seafood.	

NOTES

This substance is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. Tetraphene is a common name. Card has been partly updated in October 2005 and August 2006: see sections Occupational Exposure Limits, EU classification.

ADDITIONAL INFORMATION

ICSC: 0385 **BENZ(a)ANTHRACENE**

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Benzene

Synonyms & Trade Names Benzol, Phenyl hydride

CAS No. 71-43-2	RTECS No. CY1400000 (/niosh-rtecs/CY155CCo.html)	DOT ID & Guide 1114 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula C_6H_6	Conversion 1 ppm = 3.19 mg/m³	IDLH Ca [500 ppm] See: 71432 (/niosh/idlh/71432.html)

Exposure Limits

NIOSH REL : Ca TWA 0.1 ppm ST 1 ppm See Appendix A (nengapdxa.html)
OSHA PEL : [1910.1028] TWA 1 ppm ST 5 ppm See Appendix F (nengapdxf.html)

Measurement Methods

NIOSH 1500 (/niosh/docs/2003-154/pdfs/1500.pdf), 1501 (/niosh/docs/2003-154/pdfs/1501.pdf), 3700 (/niosh/docs/2003-154/pdfs/3700.pdf), 3800 (/niosh/docs/2003-154/pdfs/3800.pdf);
OSHA 12 (http://www.osha.gov/dts/sltc/methods/organic/org012/org012.html) (http://www.cdc.gov/Other/disclaimer.html), 1005 methods/validated/1005/1005.html) disclaimer.html)
e: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to light-yellow liquid with an aromatic odor. [Note: A solid below 42°F.]

MW: 78.1	BP: 176°F	FRZ: 42°F	Sol: 0.07%	VP: 75 mmHg	IP: 9.24 eV
Sp.Gr: 0.88	Fl.P: 12°F	UEL: 7.8%	LEL: 1.2%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers, many fluorides & perchlorates, nitric acid

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, blood, central nervous system, bone marrow

Cancer Site [leukemia]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
(See Appendix E) (nengapdxe.html)

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0015 (/niosh/ipcsneng/neng0015.html) See MEDICAL TESTS: 0022 (/niosh/docs/2005-110/nmed0022.html)

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BENZO(k)FLUORANTHENE

ICSC: 0721

Dibenzo(b,jk)fluorene 8,9-Benzofluoranthene 11,12-Benzofluoranthene $C_{20}H_{12}$ Molecular mass: 252.3 ICSC # 0721	CAS # 207-08-9 RTECS # DF6350000 EC # 601-036-00-5 March 25, 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING

Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61
ICSC: 0721	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

BENZO(k)FLUORANTHENE

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK: Carcinogen category: 2; (DFG 2004).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 480°C Melting point: 217°C Solubility in water: none	Octanol/water partition coefficient as log Pow: 6.84
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in crustacea and in fish.	

NOTES

Benzo(k)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing benzo(k)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Card has been partly updated in October 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

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Content source: National Institute for Occupational Safety and Health (http://www.cdc.gov/NIOSH/)

BENZO(ghi)PERYLENE

ICSC: 0739

1,12-Benzoperylene 1,12-Benzperylene $C_{22}H_{12}$ Molecular mass: 276.3 ICSC # 0739	CAS # 191-24-2 RTECS # DI6200500 October 18, 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions.	NO open flames.	In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING

Sweep spilled substance into covered containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Well closed.	
ICSC: 0739	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

BENZO(ghi)PERYLENE

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** PALE YELLOW-GREEN CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: 550°C Melting point: 278°C Density: 1.3 g/cm^3	Solubility in water: none Octanol/water partition coefficient as log Pow: 6.58
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air and water.	

NOTES

Benzo(ghi)perylene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco. Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

Page last reviewed: July 22, 2015

Page last updated: July 1, 2014

Content source: National Institute for Occupational Safety and Health (http://www.cdc.gov/NIOSH/)

BENZO(k)FLUORANTHENE

ICSC: 0721

Dibenzo(b,jk)fluorene 8,9-Benzofluoranthene 11,12-Benzofluoranthene $C_{20}H_{12}$ Molecular mass: 252.3 ICSC # 0721	CAS # 207-08-9 RTECS # DF6350000 EC # 601-036-00-5 March 25, 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING

Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61
ICSC: 0721	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

BENZO(k)FLUORANTHENE

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK: Carcinogen category: 2; (DFG 2004).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 480°C Melting point: 217°C Solubility in water: none	Octanol/water partition coefficient as log Pow: 6.84
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in crustacea and in fish.	

NOTES

Benzo(k)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing benzo(k)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Card has been partly updated in October 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

Page last reviewed: July 22, 2015

Page last updated: July 1, 2014

Content source: National Institute for Occupational Safety and Health (http://www.cdc.gov/NIOSH/)

Bromoform

Synonyms & Trade Names Methyl tribromide, Tribromomethane

CAS No. 75-25-2	**RTECS No.** PB5600000 (/niosh-rtecs/PB557300.html)	**DOT ID & Guide** 2515 159 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=159) (http://www.cdc.gov/Other/disclaimer.html)
Formula $CHBr_3$	**Conversion** 1 ppm = 10.34 mg/m³	**IDLH** 850 ppm See: 75252 (/niosh/idlh/75252.html)
Exposure Limits **NIOSH REL** : TWA 0.5 ppm (5 mg/m³) [skin] **OSHA PEL** : TWA 0.5 ppm (5 mg/m³) [skin]		**Measurement Methods** **NIOSH** 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) ; **OSHA** 7 (http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to yellow liquid with a chloroform-like odor. [Note: A solid below 47°F.]

MW: 252.8	**BP:** 301°F	**FRZ:** 47°F	**Sol:** 0.1%	**VP:** 5 mmHg	**IP:** 10.48 eV
Sp.Gr 2.89					

Noncombustible Liquid

Incompatibilities & Reactivities Lithium, sodium, potassium, calcium, aluminum, zinc, magnesium, strong caustics, acetone [Note: Gradually decomposes, acquiring yellow color; air & light accelerate decomposition.]

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, respiratory system; central nervous system depression; liver, kidney damage

Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Soap wash promptly **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Wash skin: When contaminated **Remove:** When wet or contaminated **Change:** No recommendation	**Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 12.5 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode£
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)£

Up to 25 ppm:
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s)£
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 850 ppm:
(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0108 (/niosh/ipcsneng/neng0108.html)

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Methyl bromide

Synonyms & Trade Names Bromomethane, Monobromomethane

CAS No. 74-83-9	**RTECS No.** PA4900000 (/niosh-rtecs/PA4AC4A0.html)	**DOT ID & Guide** 1062 123 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=123) (http://www.cdc.gov/Other/disclaimer.html)
Formula CH_3Br	**Conversion** 1 ppm = 3.89 mg/m3	**IDLH** Ca [250 ppm] See: 74839 (/niosh/idlh/74839.html)
Exposure Limits **NIOSH REL** : Ca See Appendix A (nengapdxa.html) **OSHA PEL** † (nengapdxg.html): C 20 ppm (80 mg/m3) [skin]		**Measurement Methods** **NIOSH** 2520 (/niosh/docs/2003-154/pdfs/2520.pdf) ; **OSHA** PV2040 (http://www.osha.gov/dts/sltc/methods/partial/pv2040/2040.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless gas with a chloroform-like odor at high concentrations. [Note: A liquid below 38°F. Shipped as a liquefied compressed gas.]

MW:	BP:	FRZ:	Sol:	VP:	IP:
95.0	38°F	-137°F	2%	1.9 atm	10.54 eV

Sp.Gr:	Fl.P:	UEL:	LEL:	RGasD:	
1.73 (Liquid at 32°F)	NA (Gas)	16.0%	10%	3.36	

Flammable Gas, but only in presence of a high energy ignition source.

Incompatibilities & Reactivities Aluminum, magnesium, strong oxidizers [Note: Attacks aluminum to form aluminum trimethyl, which is SPONTANEOUSLY flammable.]

Exposure Routes inhalation, skin absorption (liquid), skin and/or eye contact (liquid)

Symptoms irritation eyes, skin, respiratory system; muscle weak, incoordination, visual disturbance, dizziness; nausea, vomiting, headache; malaise (vague feeling of discomfort); hand tremor; convulsions; dyspnea (breathing difficulty); skin vesiculation; liquid: frostbite; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, central nervous system

Target Organs Eyes, skin, respiratory system, central nervous system

Cancer Site [in animals: lung, kidney & forestomach tumors]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)
Wash skin: When contaminated (liquid)
Remove: When wet (flammable)
Change: No recommendation
Provide: Quick drench (liquid)

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately (liquid)
Skin: Water flush immediately (liquid)
Breathing: Respiratory support

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0109 (/niosh/ipcsneng/neng0109.html) See MEDICAL TESTS: 0138 (/niosh/docs/2005-110/nmed0138.html)

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Cadmium dust (as Cd)

Synonyms & Trade Names Cadmium metal: Cadmium
Other synonyms vary depending upon the specific cadmium compound.

CAS No. 7440-43-9 (metal)	**RTECS No.** EU9800000 (metal) (/niosh-rtecs/EU958940.html)	**DOT ID & Guide** 2570 154 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=154) (http://www.cdc.gov/Other/disclaimer.html) (cadmium compound)
Formula Cd (metal)	**Conversion**	**IDLH** Ca [9 mg/m³ (as Cd)] See: 7440439 (/niosh/idlh/7440439.html)

Exposure Limits

NIOSH REL *: Ca See Appendix A (nengapdxa.html) [*Note: The REL applies to all Cadmium compounds (as Cd).]

OSHA PEL *: [1910.1027] TWA 0.005 mg/

Cadı

Measurement Methods

NIOSH 7048 (/niosh/docs/2003-154/pdfs/7048.pdf), 7300 (/niosh/docs/2003-154/pdfs/7300.pdf), 7301 (/niosh/docs/2003-154/pdfs/7301.pdf), 7303 (/niosh/docs/2003-154/pdfs/7303.pdf), 9102 (/niosh/docs/2003-154/pdfs/9102.pdf)
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tc/methods/inorganic/id121/id121.html) (http://www.cdc.gov/Other/disclaimer.html), ID125G (http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html) (http://www.cdc.gov/Other/disclaimer.html), ID189 (http://www.osha.gov/dts/sltc/methods/inorganic/id189/id189.html) (http://www.cdc.gov/Other/disclaimer.html), ID206 (http://www.osha.gov/dts/sltc/methods/inorganic/id206/id206.html) (http://www.cdc.gov/Other/disclaimer.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Metal: Silver-white, blue-tinged lustrous, odorless solid.

MW:	BP:	MLT:	Sol:	VP:	IP:
112.4	1409°F	610°F	Insoluble	0 mmHg (approx)	NA

Sp.Gr:	Fl.P:	UEL:	LEL:
8.65 (metal)	NA	NA	NA

Metal: Noncombustible Solid in bulk form, but will burn in powder form.

Incompatibilities & Reactivities Strong oxidizers; elemental sulfur, selenium & tellurium

Exposure Routes inhalation, ingestion

Symptoms pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]

Target Organs respiratory system, kidneys, prostate, blood

Cancer Site [prostatic & lung cancer]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: No recommendation
Eyes: No recommendation
Wash skin: Daily
Remove: No recommendation
Change: Daily

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
(See Appendix E) (nengapdxe.html)

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0020 (/niosh/ipcsneng/neng0020.html) See MEDICAL TESTS: 0035 (/niosh/docs/2005-110/nmed0035.html)

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Carbon disulfide

Synonyms & Trade Names Carbon bisulfide

CAS No. 75-15-0	**RTECS No.** FF6650000 (/niosh-rtecs/FF657890.html)	**DOT ID & Guide** 1131 131 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=131) (http://www.cdc.gov/Other/disclaimer.html)
Formula CS_2	**Conversion** 1 ppm = 3.11 mg/m3	**IDLH** 500 ppm See: 75150 (/niosh/idlh/75150.html)
Exposure Limits **NIOSH REL** : TWA 1 ppm (3 mg/m3) ST 10 ppm (30 mg/m3) [skin] **OSHA PEL** † (nengapdxg.html): TWA 20 ppm C 30 ppm 100 ppm (30-minute maximum peak)		**Measurement Methods** **NIOSH** 1600 (/niosh/docs/2003-154/pdfs/1600.pdf) , 3800 (/niosh/docs/2003-154/pdfs/3800.pdf) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to faint-yellow liquid with a sweet ether-like odor. [Note: Reagent grades are foul smelling.]

MW:	BP:	FRZ:	Sol:	VP:	IP:
76.1	116°F	-169°F	0.3%	297 mmHg	10.08 eV
Sp.Gr:	**Fl.P:**	**UEL:**	**LEL:**		
1.26	-22°F	50.0%	1.3%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers; chemically-active metals such as sodium, potassium & zinc; azides; rust; halogens; amines [Note: Vapors may be ignited by contact with ordi

Exposure Routes inhalation, skin , ingestion, skin and/or eye contact

Symptoms dizziness, headache, poor sleep, lassitude (weakness, exhaustion), anxiety, anorexia, weight loss; psychosis; polyneuropathy; Parkinson-like syndrome; ocular changes; coronary heart disease; gastritis; kidney, liver injury; eye, skin burns; dermatitis; reproductive effects

Target Organs central nervous system, peripheral nervous system, cardiovascular system, eyes,

kidneys, liver, skin, reproductive system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

Up to 10 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)
(APF = 10) Any supplied-air respirator

Up to 25 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)

Up to 50 ppm:
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s)
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 500 ppm:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0022 (/niosh/ipcsneng/neng0022.html) See MEDICAL TESTS: 0039 (/niosh/docs/2005-110/nmed0039.html)

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Carbon tetrachloride

Synonyms & Trade Names Carbon chloride, Carbon tet, Freon® 10, Halon® 104, Tetrachloromethane

CAS No. 56-23-5	**RTECS No.** FG4900000 (/niosh-rtecs/FG4AC4A0.html)	**DOT ID & Guide** 1846 151 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=151) (http://www.cdc.gov/Other/disclaimer.html)
Formula CCl_4	**Conversion** 1 ppm = 6.29 mg/m³	**IDLH** Ca [200 ppm] See: 56235 (/niosh/idlh/56235.html)

Exposure Limits

NIOSH REL : Ca ST 2 ppm (12.6 mg/m³) [60-minute] See Appendix A (nengapdxa.html)

OSHA PEL † (nengapdxg.html): TWA 10 ppm C 25 ppm 200 ppm (5-minute max

Measurement Methods

NIOSH 1003 (/niosh/docs/2003-154/pdfs/1003.pdf); **OSHA** 7 (http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html) (http://www.cdc.gov/Other/disclaimer.html)

See: NMAM (/niosh/docs/2003-154/) or OSHA Methods /methods/index.html) sclaimer.html)

Physical Description Colorless li characteristic ether-like odor.

MW: 153.8	**BP:** 170°F	**FRZ:** -9°F	**Sol:** 0.05%	**VP:** 91 mmHg	**IP:** 11.47 eV
Sp.Gr: 1.59	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Noncombustible Liquid

Incompatibilities & Reactivities Chemically-active metals such as sodium, potassium & magnesium; fluorine; aluminum [Note: Forms highly toxic phosgene gas when exposed to flames or welding arcs.]

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen]

Target Organs central nervous system, eyes, lungs, liver, kidneys, skin

Cancer Site [in animals: liver cancer]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0024 (/niosh/ipcsneng/neng0024.html) See MEDICAL TESTS: 0041 (/niosh/docs/2005-110/nmed0041.html)

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Chlorobenzene

Synonyms & Trade Names Benzene chloride, Chlorobenzol, MCB, Monochlorobenzene, Phenyl chloride

CAS No. 108-90-7	**RTECS No.** CZ0175000 (/niosh-rtecs/CZ2AB98.html)	**DOT ID & Guide** 1134 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula C_6H_5Cl	**Conversion** 1 ppm = 4.61 mg/m3	**IDLH** 1000 ppm See: 108907 (/niosh/idlh/108907.html)
Exposure Limits **NIOSH REL** : See Appendix D (nengapdxd.html) **OSHA PEL** : TWA 75 ppm (350 mg/m3)		**Measurement Methods** **NIOSH** 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) ; **OSHA** 7 (http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) claimer.html)

Physical Description Colorless li[illegible] aromatic-like odor.

MW:	BP:	FRZ:	Sol:	VP:	IP:
112.6	270°F	-50°F	0.05%	9 mmHg	9.07 eV
Sp.Gr:	**Fl.P:**	**UEL:**	**LEL:**		
1.11	82°F	9.6%	1.3%		

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

Incompatibilities & Reactivities Strong oxidizers

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose; drowsiness, incoordination; central nervous system depression; in animals: liver, lung, kidney injury

Target Organs Eyes, skin, respiratory system, central nervous system, liver

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet (flammable)	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Soap wash promptly **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Remove: When wet (flammable)
Change: No recommendation

Respirator Recommendations
OSHA

Up to 1000 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode£
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)£
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0642 (/niosh/ipcsneng/neng0642.html) See MEDICAL TESTS: 0253 (/niosh/docs/2005-110/nmed0253.html)

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Ethyl chloride

Synonyms & Trade Names Chloroethane, Hydrochloric ether, Monochloroethane, Muriatic ether

CAS No. 75-00-3	**RTECS No.** KH7525000 (/niosh-rtecs/KH72D288.html)	**DOT ID & Guide** 1037 115 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=115) (http://www.cdc.gov/Other/disclaimer.html)
Formula CH_3CH_2Cl	**Conversion** 1 ppm = 2.64 mg/m3	**IDLH** 3800 ppm [10%LEL] See: 75003 (/niosh/idlh/75003.html)

Exposure Limits

NIOSH REL : Handle with caution in the workplace. See Appendix C (nengapdxc.html) (Chloroethanes)

OSHA PEL : TWA 1000 ppm (2600 mg/m3)

Measurement Methods

NIOSH 2519 (/niosh/docs/2003-154/pdfs/2519.pdf)

See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Phys Ship[illegible]ent, ether-like odor. [Note:

MW: 64.5	**BP:** 54°F	**FRZ:** -218°F	**Sol:** 0.6%	**VP:** 1000 mmHg	**IP:** 10.97 eV
Sp.Gr: 0.92 (Liquid at 32°F)	**Fl.P:** NA (Gas) -58°F (Liquid)	**UEL:** 15.4%	**LEL:** 3.8%	**RGasD:** 2.23	

Flammable Gas

Incompatibilities & Reactivities Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium; oxidizers; water or steam [Note: Reacts with water to form hydrochloric acid.]

Exposure Routes inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact

Symptoms incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest;

liver, kidney damage

Target Organs Liver, kidneys, respiratory system, cardiovascular system, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)
Wash skin: No recommendation
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately (liquid)
Skin: Water flush promptly (liquid)
Breathing: Respiratory support
Swallow: Medical attention immediately (liquid)

Respirator Recommendations
OSHA

Up to 3800 ppm:
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0132 (/niosh/ipcsneng/neng0132.html)

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Chloroform

Synonyms & Trade Names Methane trichloride, Trichloromethane

CAS No. 67-66-3	**RTECS No.** FS9100000 (/niosh-rtecs/FS8ADAE0.html)	**DOT ID & Guide** 1888 151 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=151) (http://www.cdc.gov/Other/disclaimer.html)
Formula $CHCl_3$	**Conversion** 1 ppm = 4.88 mg/m3	**IDLH** Ca [500 ppm] See: 67663 (/niosh/idlh/67663.html)
Exposure Limits **NIOSH REL** : Ca ST 2 ppm (9.78 mg/m3) [60-minute] See Appendix A (nengapdxa.html) **OSHA PEL** † (nengapdxg.html) : C 50 ppm (240 mg/m3)		**Measurement Methods** **NIOSH** 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Phys

MW: 119.4	**BP:** 143°F	**FRZ:** -82°F	Sol(0.5%	**P:** 160 mmHg	**IP:** 11.42 eV
Sp.Gr: 1.48	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Noncombustible Liquid

Incompatibilities & Reactivities Strong caustics; chemically-active metals such as aluminum or magnesium powder, sodium & potassium; strong oxidizers [Note: When heated to decomposition, forms phosgene gas.]

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]

Target Organs Liver, kidneys, heart, eyes, skin, central nervous system

Cancer Site [in animals: liver & kidney cancer]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0027 (/niosh/ipcsneng/neng0027.html) See MEDICAL TESTS: 0047 (/niosh/docs/2005-110/nmed0047.html)

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Methyl chloride

Synonyms & Trade Names Chloromethane, Monochloromethane

CAS No. 74-87-3	**RTECS No.** PA6300000 (/niosh-rtecs/PA602160.html)	**DOT ID & Guide** 1063 115 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=115) (http://www.cdc.gov/Other/disclaimer.html)
Formula CH_3Cl	**Conversion** 1 ppm = 2.07 mg/m3	**IDLH** Ca [2000 ppm] See: 74873 (/niosh/idlh/74873.html)

Exposure Limits

NIOSH REL : Ca See Appendix A (nengapdxa.html)

OSHA PEL † (nengapdxg.html): TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3 hours)

Measurement Methods

NIOSH 1001 (/niosh/docs/2003-154/pdfs/1001.pdf)

See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) /disclaimer.html)

Phys t noticeable at dangerous concentrations. [Note: Shipped ed compressed gas.]

MW: 50.5	**BP:** -12°F	**FRZ:** -144°F	**Sol:** 0.5%	**VP:** 5.0 atm	**IP:** 11.28 eV
	Fl.P: NA (Gas)	**UEL:** 17.4%	**LEL:** 8.1%	**RGasD:** 1.78	

Flammable Gas

Incompatibilities & Reactivities Chemically-active metals such as potassium, powdered aluminum, zinc & magnesium; water [Note: Reacts with water (hydrolyzes) to form hydrochloric acid.]

Exposure Routes inhalation, skin and/or eye contact (liquid)

Symptoms dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects; [potential occupational carcinogen]

Target Organs central nervous system, liver, kidneys, reproductive system

Cancer Site [in animals: lung, kidney & forestomach tumors]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Frostbite
Eyes: Frostbite
Wash skin: No recommendation
Remove: When wet (flammable)
Change: No recommendation
Provide: Frostbite wash

First Aid (See procedures (firstaid.html))
Eye: Frostbite
Skin: Frostbite
Breathing: Respiratory support

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0419 (/niosh/ipcsneng/neng0419.html) See MEDICAL TESTS: 0140 (/niosh/docs/2005-110/nmed0140.html)

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Chromium metal

Synonyms & Trade Names Chrome, Chromium

CAS No. 7440-47-3	**RTECS No.** GB4200000 (/niosh-rtecs/GB401640.html)	**DOT ID & Guide**
Formula Cr	**Conversion**	**IDLH** 250 mg/m3 (as Cr) See: 7440473 (/niosh/idlh/7440473.html)

Exposure Limits

NIOSH REL : TWA 0.5 mg/m3 See Appendix C (nengapdxc.html)
OSHA PEL *: TWA 1 mg/m3 See Appendix C (nengapdxc.html) [*Note: The PEL also applies to insoluble chromium salts.]

Measurement Methods

NIOSH 7024 (/niosh/docs/2003-154/pdfs/7024.pdf), 7300 (/niosh/docs/2003-154/pdfs/7300.pdf), 7301 (/niosh/docs/2003-154/pdfs/7301.pdf), 7303 (/niosh/docs/2003-154/pdfs/7303.pdf), 9102 (/niosh/docs/2003-154/pdfs/9102.pdf) ;
OSHA ID121 (http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html) (http://www.cdc.gov/Other/disclaimer.html), ID125G (http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html) (http://www.cdc.gov/Other/disclaimer.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Blue-white to steel-gray, lustrous, brittle, hard, odorless solid.

MW: 52.0	**BP:** 4788°F	MLT: 3452°F	**Sol:** Insoluble	**VP:** 0 mmHg (approx)	**IP:** NA
Sp.Gr: 7.14	**Fl.P:**	UEL: NA	LEL: NA		

Non[illegible]idly if heated in a flame.

Incompatibilities & Reactivities Strong oxidizers (such as hydrogen peroxide), alkalis

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; lung fibrosis (histologic)

Target Organs Eyes, skin, respiratory system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: No recommendation
Eyes: No recommendation
Wash skin: No recommendation
Remove: No recommendation
Change: No recommendation

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

Up to 2.5 mg/m3:
(APF = 5) Any quarter-mask respirator.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.*

Up to 5 mg/m3:
(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.*
(APF = 10) Any supplied-air respirator*

Up to 12.5 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode*
(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.*

Up to 25 mg/m3:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter*
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 250 mg/m3:
(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0029 (/niosh/ipcsneng/neng0029.html)

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Coal tar pitch volatiles

Synonyms & Trade Names

Acridine, Anthracene, Benzo(a)pyrene, Chrysene, Coal tar, Phenanthrene, pyrene [Note: NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products.]

CAS No.

65996-93-2

RTECS No.

GF8655000

DOT ID & Guide

2713 153(acridine)

Formula

Conversion

IDLH

Ca [80 mg/m^3]
See: 65996932

Exposure Limits

NIOSH REL

Ca TWA 0.1 mg/m^3 (cyclohexane-extractable fraction) See Appendix A (nengapdxa.html) See Appendix C (nengapdxc.html)

OSHA PEL

TWA 0.2 mg/m^3 (benzene-soluble fraction) [1910.1002] See Appendix C (nengapdxc.html)

Measurement Methods

OSHA 58
See: NMAM or OSHA Methods

Physical Description

Black or dark-brown amorphous residue.

Molecular Weight

Properties vary depending upon the specific compound.

Cumene

Synonyms & Trade Names Cumol, Isopropyl benzene, 2-Phenyl propane

CAS No. 98-82-8	**RTECS No.** GR8575000 (/niosh-rtecs/GR82D818.html)	**DOT ID & Guide** 1918 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula $C_6H_5CH(CH_3)_2$	**Conversion** 1 ppm = 4.92 mg/m3	**IDLH** 900 ppm [10%LEL] See: 98828 (/niosh/idlh/98828.html)
Exposure Limits **NIOSH REL** : TWA 50 ppm (245 mg/m3) [skin] **OSHA PEL** : TWA 50 ppm (245 mg/m3) [skin]		**Measurement Methods** **NIOSH** 1501 (/niosh/docs/2003-154/pdfs/1501.pdf) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a sharp, penetrating, aromatic odor.

MW: 120.2	**BP:** 306°F	**FRZ:** -141°F	**Sol:** Insoluble	**VP:** 8 mmHg	**IP:** 8.75 eV
Sp.Gr: 0.86	**Fl.P:** 96°F	**UEL:** 6.5%	**LEL:** 0.9%		

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

Incompatibilities & Reactivities Oxidizers, nitric acid, sulfur acid [Note: Forms cumene hydroperoxide upon long exposure to air.]

Expo ...e contact

Symptoms irritation eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma

Target Organs Eyes, skin, respiratory system, central nervous system

Personal Protection/Sanitation (See protection	**First Aid** (See procedures (firstaid.html))

codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

Eye: Irrigate immediately
Skin: Water flush promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 500 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 10) Any supplied-air respirator*

Up to 900 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode*
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0170 (/niosh/ipcsneng/neng0170.html) See MEDICAL TESTS: 0060 (/niosh/docs/2005-110/nmed0060.html)

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DIBENZO(a,h)ANTHRACENE

ICSC: 0431

1,25,6-Dibenzanthracene $C_{22}H_{14}$ Molecular mass: 278.4 ICSC # 0431	CAS # 53-70-3 RTECS # HN2625000 EC # 601-041-00-2 October 23, 1995 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN	Redness. Swelling. Itching.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: P3 filter respirator for toxic particles.	Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

ICSC: 0431

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

DIBENZO(a,h)ANTHRACENE

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS CRYSTALLINE POWDER.

PHYSICAL DANGERS:

CHEMICAL DANGERS:

OCCUPATIONAL EXPOSURE LIMITS:
TLV not established.

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance may have effects on the skin , resulting in photosensitization. This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES	Boiling point: 524°C Melting point: 267°C Relative density (water = 1): 1.28	Solubility in water: none Octanol/water partition coefficient as log Pow: 6.5
ENVIRONMENTAL DATA	Bioaccumulation of this chemical may occur in seafood. 	

NOTES

This is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. DBA is a commonly used name. This substance is one of many polycyclic aromatic hydrocarbons (PAH). Card has been partly updated in October 2005. See section EU classification.

ADDITIONAL INFORMATION

ICSC: 0431 **DIBENZO(a,h)ANTHRACENE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

Page last reviewed: July 22, 2015

Page last updated: July 1, 2014

Content source: National Institute for Occupational Safety and Health (http://www.cdc.gov/NIOSH/)

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Revision Date 10-Feb-2015 **Revision Number** 1

1. Identification

Product Name **Chlorodibromomethane**

Cat No. : **AC195540000; AC195540100**

Synonyms CDBM; Dibromochloromethane

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Entity / Business Name
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 4
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Warning

Hazard Statements
Harmful if swallowed
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Wear protective gloves/protective clothing/eye protection/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Storage
Store in a well-ventilated place. Keep container tightly closed
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
Chlorodibromomethane	124-48-1	> 98

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Obtain medical attention.

Inhalation Remove from exposure, lie down. Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Obtain medical attention.

Ingestion Call a physician immediately. Clean mouth with water.

Most important symptoms/effects No information available.
Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray. Carbon dioxide (CO_2). Dry chemical. chemical foam.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Hydrogen chloride gas Carbon monoxide (CO) Carbon dioxide (CO_2) Hydrogen halides Bromine
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions See Section 12 for additional ecological information.

Methods for Containment and Clean Up Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Do not flush into surface water or sanitary sewer system.

7. Handling and storage

Handling Avoid contact with skin and eyes. Do not breathe dust. Do not breathe vapors or spray mist. Use only in area provided with appropriate exhaust ventilation.

Storage Keep in a dry place. Keep container tightly closed. Keep refrigerated.

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Yellow-orange
Odor	sweet
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-22 °C / -7.6 °F
Boiling Point/Range	115 - 120 °C / 239 - 248 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	7.2
Relative Density	2.451
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C H Br2 Cl
Molecular Weight	208.28

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Strong oxidizing agents, Strong acids, Strong bases, Strong reducing agents, Metals

Hazardous Decomposition Products Hydrogen chloride gas, Carbon monoxide (CO), Carbon dioxide (CO_2), Hydrogen halides, Bromine

Hazardous Polymerization No information available.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information No acute toxicity information is available for this product

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Chlorodibromomethane	370 mg/kg (Rat)	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Chlorodibromomethane	124-48-1	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Substances which cause concern for man owing to possible mutagenic effects but for which the available information is not adequate for making a satisfactory assessment

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available
Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity
Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Do not empty into drains.

Persistence and Degradability No information available
Bioaccumulation/ Accumulation No information available.

Mobility .

Component	log Pow
Chlorodibromomethane	2.09

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT
UN-No UN2810
Hazard Class 6.1
Packing Group III

TDG
UN-No UN2810
Hazard Class 6.1
Packing Group III

IATA Not regulated

IMDG/IMO Not regulated

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Chlorodibromomethane	X	-	X	204-704-0	-		-	-	-	-	-

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313 Not applicable

SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Chlorodibromomethane	-	-	X	X

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Chlorodibromomethane	100 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Chlorodibromomethane	X	X	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): N

DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class D1B Toxic materials
D2B Toxic materials

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 10-Feb-2015
Print Date 10-Feb-2015
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

Ethyl benzene

Synonyms & Trade Names Ethylbenzol, Phenylethane

CAS No. 100-41-4	**RTECS No.** DA0700000 (/niosh-rtecs/DAAAE60.html)	**DOT ID & Guide** 1175 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula $CH_3CH_2C_6H_5$	**Conversion** 1 ppm = 4.34 mg/m³	**IDLH** 800 ppm [10%LEL] See: 100414 (/niosh/idlh/100414.html)

Exposure Limits

NIOSH REL : TWA 100 ppm (435 mg/m³) ST 125 ppm (545 mg/m³)

OSHA PEL † (nengapdxg.html) : TWA 100 ppm (435 mg/m³)

Measurement Methods

NIOSH 1501 (/niosh/docs/2003-154/pdfs/1501.pdf) ;
OSHA 7 (http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html) (http://www.cdc.gov/Other/disclaimer.html) , 1002 (dts/sltc/methods/mdt/mdt1002/1002.html) (ther/disclaimer.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with an aromatic odor.

MW:	BP:	FRZ:	Sol:	VP:	IP:
106.2	277°F	-139°F	0.01%	7 mmHg	8.76 eV

Sp.Gr:	Fl.P:	UEL:	LEL:
0.87	55°F	6.7%	0.8%

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma

Target Organs Eyes, skin, respiratory system, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Water flush promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 800 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0268 (/niosh/ipcsneng/neng0268.html) See MEDICAL TESTS: 0098 (/niosh/docs/2005-110/nmed0098.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

INDENO(1,2,3-cd)PYRENE

ICSC: 0730

o-Phenylenepyrene 2,3-Phenylenepyrene $C_{22}H_{12}$ Molecular mass: 276.3 ICSC # 0730	CAS # 193-39-5 RTECS # NK9300000 March 25, 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•**INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
•**SKIN**		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•**EYES**		Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING

Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	
ICSC: 0730	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

INDENO(1,2,3-cd)PYRENE

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK: Carcinogen category: 2; (DFG 2004).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 536°C Melting point: 164°C Solubility in water: none	Octanol/water partition coefficient as log Pow: 6.58
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in fish.	

NOTES

Indeno(1,2,3-cd)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing Indeno(1,2,3-c,d)pyrene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Card has been partly updated in October 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

Page last reviewed: July 22, 2015

Page last updated: July 1, 2014

Content source: National Institute for Occupational Safety and Health (http://www.cdc.gov/NIOSH/)

Lead

Synonyms & Trade Names Lead metal, Plumbum

CAS No.	RTECS No.	DOT ID & Guide
7439-92-1	OF7525000 (/niosh-rtecs/OF72D288.html)	

Formula	Conversion	IDLH
Pb		100 mg/m3 (as Pb) See: 7439921 (/niosh/idlh/7439921.html)

Exposure Limits

NIOSH REL *: TWA (8-hour) 0.050 mg/m3 See Appendix C (nengapdxc.html) [*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]

OSHA PEL *: [1910.1025] TWA 0.050 mg/m3 See Appendix C (nengapdxc.html) [*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]

Measurement Methods

NIOSH 7082 (/niosh/docs/2003-154/pdfs/7082.pdf), 7105 (/niosh/docs/2003-154/pdfs/7105.pdf), 7300 (/niosh/docs/2003-154/pdfs/7300.pdf), 7301 (/niosh/docs/2003-154/pdfs/7301.pdf), 7303 (/niosh/docs/2003-154/pdfs/7303.pdf), 7700 (/niosh/docs/2003-154/pdfs/7700.pdf), 7701 (/niosh/docs/2003-154/pdfs/7701.pdf), 7702 (/niosh/docs/2003-154/pdfs/7702.pdf), 9100 (/niosh/docs/2003-154/pdfs/9100.pdf), 9102 (/niosh/docs/2003-154/pdfs/9102.pdf), 9105 (/niosh/docs/2003-154/pdfs/9105.pdf);
OSHA ID121 (http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html) (http://www.cdc.gov/Other/disclaimer.html), ID125G (http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html) (http://www.cdc.gov/Other/disclaimer.html), ID206 (http://www.osha.gov/dts/sltc/methods/inorganic/id206/id206.html) (http://www.cdc.gov/Other/disclaimer.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description A heavy, ductile, soft, gray solid.

MW:	BP:	MLT:	Sol:	VP:	IP:
207.2	3164°F	621°F	Insoluble	0 mmHg (approx)	NA

Sp.Gr:	Fl.P:	UEL:	LEL:
11.3			NA

Nonc[illegible]

Incompatibilities & Reactivities Strong oxidizers, hydrogen peroxide, acids

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension

Target Organs Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: When wet or contaminated
Change: Daily

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap flush promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
(See Appendix E) (nengapdxe.html)
NIOSH/OSHA

Up to 0.5 mg/m3:
(APF = 10) Any air-purifying respirator with an N100, R100, or P100 filter (including N100, R100, and P100 filtering facepieces) except quarter-mask respirators.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 10) Any supplied-air respirator

Up to 1.25 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

Up to 2.5 mg/m3:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 50 mg/m3:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Up to 100 mg/m3:
(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0052 (/niosh/ipcsneng/neng0052.html) See MEDICAL TESTS: 0127 (/niosh/docs/2005-110/nmed0127.html)

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Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Mercury compounds [except (organo) alkyls] (as Hg)

Synonyms & Trade Names Mercury metal: Colloidal mercury, Metallic mercury, Quicksilver
Synonyms of "other" Hg compounds vary depending upon the specific compound.

CAS No. 7439-97-6 (metal)	**RTECS No.** OV4550000 (metal) (/niosh-rtecs/OV456D70.html)	**DOT ID & Guide** 2809 172 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=172) (http://www.cdc.gov/Other/disclaimer.html) (metal)
Formula Hg (metal)	**Conversion**	**IDLH** 10 mg/m3 (as Hg) See: 7439976 (/niosh/idlh/7439976.html)
Exposure Limits **NIOSH REL** : Hg Vapor: TWA 0.05 mg/m3 [skin] Other: C 0.1 mg/m3 [skin] **OSHA PEL** † (nengapdxg.html) : TWA 0.1 mg/m3		**Measurement Methods** **NIOSH** 6009 (/niosh/docs/2003-154/pdfs/6009.pdf) ; **OSHA** ID140 (http://www.osha.gov/dts/sltc/methods/inorganic/id140/id140.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.]

MW:	BP:	FRZ:	Sol:	VP:	IP:
200.6	674°F	-38°F	Insoluble	0.0012 mmHg	?

Sp.Gr:	Fl.P:	UEL:	LEL:
13.6 (metal)	NA	NA	NA

Metal: Noncombustible Liquid

Incompatibilities & Reactivities Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis;

tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria

Target Organs Eyes, skin, respiratory system, central nervous system, kidneys

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: No recommendation
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

Mercury vapor:

NIOSH

Up to 0.5 mg/m3:
(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern†
(APF = 10) Any supplied-air respirator

Up to 1.25 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)

Up to 2.5 mg/m3:
(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mou ern†
(APl ece and is operated in a continuous-flow
(APF = 50) Any powered, air-p spirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern(canister)
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m3:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
Any appropriate escape-type, self-contained breathing apparatus

Other mercury compounds: NIOSH/OSHA

Up to 1 mg/m3:
(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern†

(APF = 10) Any supplied-air respirator

Up to 2.5 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)

Up to 5 mg/m3:
(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode
(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern(canister)
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m3:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0056 (/niosh/ipcsneng/neng0056.html) See MEDICAL TESTS: 0136 (/niosh/docs/2005-110/nmed0136.html)

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Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Methylene chloride

Synonyms & Trade Names Dichloromethane, Methylene dichloride

CAS No. 75-09-2	**RTECS No.** PA8050000 (/niosh-rtecs/PA7AD550.html)	**DOT ID & Guide** 1593 160 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=160) (http://www.cdc.gov/Other/disclaimer.html)
Formula CH_2Cl_2	**Conversion** 1 ppm = 3.47 mg/m3	**IDLH** Ca [2300 ppm] See: 75092 (/niosh/idlh/75092.html)
Exposure Limits **NIOSH REL** : Ca See Appendix A (nengapdxa.html) **OSHA PEL** : [1910.1052] TWA 25 ppm ST 1[illegible]		**Measurement Methods** **NIOSH** 1005 (/niosh/docs/2003-154/pdfs/1005.pdf), 3800 (/niosh/docs/2003-154/pdfs/3800.pdf); **OSHA** 59 (http://www.osha.gov/dts/sltc/methods/organic/org059/org059.html) r/disclaimer.html), 80 c/methods/organic/org080/org080.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a chloroform-like odor. [Note: A gas above 104°F.]

MW:	BP:	FRZ:	Sol:	VP:	IP:
84.9	104°F	-139°F	2%	350 mmHg	11.32 eV

Sp.Gr:	Fl.P:	UEL:	LEL:
1.33	?	23%	13%

Combustible Liquid

Incompatibilities & Reactivities Strong oxidizers; caustics; chemically-active metals such as aluminum, magnesium powders, potassium & sodium; concentrated nitric acid

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]

Target Organs Eyes, skin, cardiovascular system, central nervous system

Cancer Site [in animals: lung, liver, salivary & mammary gland tumors]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
(See Appendix E) (nengapdxe.html)

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0058 (/niosh/ipcsneng/neng0058.html) See MEDICAL TESTS: 0148 (/niosh/docs/2005-110/nmed0148.html)

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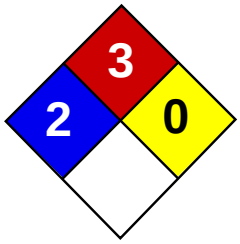

Material Safety Data Sheet
Methyl tert-butyl ether MSDS

Section 1: Chemical Product and Company Identification

Product Name: Methyl tert-butyl ether

Catalog Codes: SLM2152

CAS#: 1634-04-4

RTECS: KN5250000

TSCA: TSCA 8(b) inventory: Methyl tert-butyl ether

CI#: Not available.

Synonym:

Chemical Name: Methyl tert-Butyl Ether

Chemical Formula: C5-H12-O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Methyl {tert-}butyl ether	1634-04-4	100

Toxicological Data on Ingredients: Methyl tert-butyl ether: ORAL (LD50): Acute: 4000 mg/kg [Rat]. 5960 mg/kg [Mouse]. VAPOR (LC50): Acute: 23576 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Extremely hazardous in case of eye contact (irritant), of ingestion. Very hazardous in case of skin contact (irritant), of inhalation. Hazardous in case of skin contact (permeator). Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Extremely hazardous in case of eye contact (irritant), of ingestion. Very hazardous in case of skin contact (irritant), of inhalation. Hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 224°C (435.2°F)

Flash Points: CLOSED CUP: -28°C (-18.4°F).

Flammable Limits: LOWER: 2.5% UPPER: 15.1%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Characteristic. (Strong.)

Taste: Not available.

Molecular Weight: 88.15 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 55.2°C (131.4°F)

Melting Point: -109°C (-164.2°F)

Critical Temperature: Not available.

Specific Gravity: 0.7405 (Water = 1)

Vapor Pressure: 245 mm of Hg (@ 20°C)

Vapor Density: 3.1 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:

Soluble in methanol, diethyl ether. Partially soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 4000 mg/kg [Rat]. Acute toxicity of the vapor (LC50): 23576 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:
Extremely hazardous in case of ingestion. Very hazardous in case of skin contact (irritant), of inhalation. Hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Methyl tert-butyl ether : UN2398 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Methyl tert-butyl ether Massachusetts RTK: Methyl tert-butyl ether TSCA 8(b) inventory: Methyl tert-butyl ether SARA 313 toxic chemical notification and release reporting: Methyl tert-butyl ether CERCLA: Hazardous substances.: Methyl tert-butyl ether

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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m-Xylene

Synonyms & Trade Names 1,3-Dimethylbenzene; meta-Xylene; m-Xylol

CAS No. 108-38-3	**RTECS No.** ZE2275000 (/niosh-rtecs/ZE22B6B8.html)	**DOT ID & Guide** 1307 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula $C_6H_4(CH_3)_2$	**Conversion** 1 ppm = 4.34 mg/m³	**IDLH** 900 ppm See: 95476 (/niosh/idlh/95476.html)

Exposure Limits
NIOSH REL : TWA 100 ppm (435 mg/m³) ST 150 ppm (655 mg/m³)
OSHA PEL † (nengapdxg.html) : TWA 100 ppm (435 mg/m³)

Measurement Methods
NIOSH 1501 (/niosh/docs/2003-154/pdfs/1501.pdf), 3800 (/niosh/docs/2003-154/pdfs/3800.pdf); **OSHA** 1002 (http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html) (http://www.cdc.gov/Other/disclaimer.html)
...cs/2003-154/) or OSHA Methods ...s/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with an aromatic odor.

MW:	BP:	FRZ:	Sol:	VP:	IP:
106.2	282°F	-54°F	Slight	9 mmHg	8.56 eV
Sp.Gr:	**Fl.P:**	**UEL:**	**LEL:**		
0.86	82°F	7.0%	1.1%		

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

Incompatibilities & Reactivities Strong oxidizers, strong acids

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Change: No recommendation

Respirator Recommendations

NIOSH/OSHA

Up to 900 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0085 (/niosh/ipcsneng/neng0085.html)

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Naphthalene

Synonyms & Trade Names Naphthalin, Tar camphor, White tar

CAS No. 91-20-3	**RTECS No.** QJ0525000 (/niosh-rtecs/QJ802C8.html)	**DOT ID & Guide** 1334 133 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=133) (http://www.cdc.gov/Other/disclaimer.html) (crude or refined) 2304 133 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=133) (http://www.cdc.gov/Other/disclaimer.html) (molten)
Formula $C_{10}H_8$	**Conversion** 1 ppm = 5.24 mg/m³	**IDLH** 250 ppm See: 91203 (/niosh/idlh/91203.html)
Exposure Limits **NIOSH REL** : TWA 10 ppm (50 mg/m³) ST 15 ppm (75 mg/m³) **OSHA PEL** † (nengapdxg.html) : TWA 10 ppm (50 mg/m³)		**Measurement Methods** **NIOSH** 1501 (/niosh/docs/2003-154/pdfs/1501.pdf) ; **OSHA** 35 (http://www.osha.gov/dts/sltc/methods/organic/org035/org035.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to brown solid with an odor of mothballs. [Note: Shipped as a molten solid.]

MW:	BP:	MLT:	Sol:	VP:	IP:
128.2	424°F	176°F	0.003%	0.08 mmHg	8.12 eV
Sp.Gr: 1.15					

Combustible Solid, but will take t to ignite.

Incompatibilities & Reactivities Strong oxidizers, chromic anhydride

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage

Target Organs Eyes, skin, blood, liver, kidneys, central nervous system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Molten flush immediately/solid-liquid soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 100 ppm:
(APF = 10) Any air-purifying half-mask respirator with organic vapor cartridge(s) in combination with an N95, R95, or P95 filter. The following filters may also be used: N99, R99, P99, N100, R100, P100.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.*
(APF = 10) Any supplied-air respirator*

Up to 250 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode*
(APF = 50) Any air-purifying full-facepiece respirator equipped with organic vapor cartridge(s) in combination with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 25) Any powered, air-purifying respirator with an organic vapor cartridge in combination with a high-efficiency particulate filter.*
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0667 (/niosh/ipcsneng/neng0667.html) See MEDICAL TESTS: 0152 (/niosh/docs/2005-110/nmed0152.html)

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Nickel metal and other compounds (as Ni)

Synonyms & Trade Names **Nickel metal:** Elemental nickel, Nickel catalyst
Synonyms of other nickel compounds vary depending upon the specific compound.

CAS No. 7440-02-0 (Metal)	RTECS No. QR5950000 (Metal) (/niosh-rtecs/QR5ACA30.html)	DOT ID & Guide
Formula Ni (Metal)	Conversion	IDLH Ca [10 mg/m³ (as Ni)] See: 7440020 (/niosh/idlh/7440020.html)

Exposure Limits

NIOSH REL *: Ca TWA 0.015 mg/m³ See Appendix A (nengapdxa.html) [*Note: The REL does not apply to Nickel carbonyl.]

OSHA PEL *† (nengapdxg.html): TWA 1 mg/m3 [*Note: The PEL does not apply to N

Measurement Methods

NIOSH 7300 (/niosh/docs/2003-154/pdfs/7300.pdf), 7301 (/niosh/docs/2003-154/pdfs/7301.pdf), 7303 (/niosh/docs/2003-154/pdfs/7303.pdf), 9102 (/niosh/docs/2003-154/pdfs/9102.pdf) ;

OSHA ID121 ltc/methods/inorganic/id121/id121.html) er/disclaimer.html), ID125G (http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html) (http://www.cdc.gov/Other/disclaimer.html)

See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Metal: Lustrous, silvery, odorless solid.

MW: 58.7	BP: 5139°F	MLT: 2831°F	Sol: Insoluble	VP: 0 mmHg (approx)	IP: NA
Sp.Gr: 8.90 (Metal)	Fl.P: NA	UEL: NA	LEL: NA		

Metal: Combustible Solid; nickel sponge catalyst may ignite SPONTANEOUSLY in air.

Incompatibilities & Reactivities Strong acids, sulfur, selenium, wood & other combustibles, nickel nitrate

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]

Target Organs Nasal cavities, lungs, skin

Cancer Site [lung and nasal cancer]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: No recommendation
Wash skin: When contaminated/Daily
Remove: When wet or contaminated
Change: Daily

First Aid (See procedures (firstaid.html))

Skin: Water flush immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0062 (/niosh/ipcsneng/neng0062.html) See MEDICAL TESTS: 0156 (/niosh/docs/2005-110/nmed0156.html)

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o-Xylene

Synonyms & Trade Names 1,2-Dimethylbenzene; ortho-Xylene; o-Xylol

CAS No. 95-47-6	**RTECS No.** ZE2450000 (/niosh-rtecs/ZE256250.html)	**DOT ID & Guide** 1307 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula $C_6H_4(CH_3)_2$	**Conversion** 1 ppm = 4.34 mg/m³	**IDLH** 900 ppm See: 95476 (/niosh/idlh/95476.html)

Exposure Limits

NIOSH REL : TWA 100 ppm (435 mg/m³) ST 150 ppm (655 mg/m³)

OSHA PEL † (nengapdxg.html) : TWA 100 ppm (435 mg/m³)

Measurement Methods

NIOSH 1501 (/niosh/docs/2003-154/pdfs/1501.pdf), 3800 (/niosh/docs/2003-154/pdfs/3800.pdf); **OSHA** 1002 (http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html)

(http://www.cdc.gov/Other/disclaimer.html)

cs/2003-154/) or OSHA Methods s/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with an aromatic odor.

MW:	BP:	FRZ:	Sol:	VP:	IP:
106.2	292°F	-13°F	0.02%	7 mmHg	8.56 eV
Sp.Gr:	**Fl.P:**	**UEL:**	**LEL:**		
0.88	90°F	6.7%	0.9%		

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

Incompatibilities & Reactivities Strong oxidizers, strong acids

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Remove: When wet (flammable)
Change: No recommendation

Respirator Recommendations

NIOSH/OSHA

Up to 900 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0084 (/niosh/ipcsneng/neng0084.html)

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p-Xylene

Synonyms & Trade Names 1,4-Dimethylbenzene; para-Xylene; p-Xylol

CAS No. 106-42-3	**RTECS No.** ZE2625000 (/niosh-rtecs/ZE280DE8.html)	**DOT ID & Guide** 1307 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula $C_6H_4(CH_3)_2$	**Conversion** 1 ppm = 4.41 mg/m³	**IDLH** 900 ppm See: 95476 (/niosh/idlh/95476.html)

Exposure Limits

NIOSH REL : TWA 100 ppm (435 mg/m³) ST 150 ppm (655 mg/m³)

OSHA PEL † (nengapdxg.html) : TWA 100 ppm (435 mg/m³)

Measurement Methods

NIOSH 1501 (/niosh/docs/2003-154/pdfs/1501.pdf), 3800 (/niosh/docs/2003-154/pdfs/3800.pdf); **OSHA** 1002 (http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html) (http://www.cdc.gov/Other/disclaimer.html)

ocs/2003-154/) or OSHA Methods ts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with an aromatic odor. [Note: A solid below 56°F.]

MW:	BP:	FRZ:	Sol:	VP:	IP:
106.2	281°F	56°F	0.02%	9 mmHg	8.44 eV

Sp.Gr:	Fl.P:	UEL:	LEL:		
0.86	81°F	7.0%	1.1%		

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

Incompatibilities & Reactivities Strong oxidizers, strong acids

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis

Target Organs Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Change: No recommendation

Respirator Recommendations

NIOSH/OSHA

Up to 900 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0086 (/niosh/ipcsneng/neng0086.html)

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Selenium

Synonyms & Trade Names Elemental selenium, Selenium alloy

CAS No.	RTECS No.	DOT ID & Guide
7782-49-2	VS7700000 (/niosh-rtecs/VS757E20.html)	2658 152 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=152) (http://www.cdc.gov/Other/disclaimer.html) (powder)

Formula	Conversion	IDLH
Se		1 mg/m³ (as Se) See: 7782492 (/niosh/idlh/7782492.html)

Exposure Limits

NIOSH REL *: TWA 0.2 mg/m³ [*Note: The REL also applies to other selenium compounds (as Se) except Selenium hexafluoride.]

OSHA PEL *: TWA 0.2 mg/m³ [*Note: The PEL also applies to other selenium compounds (as Se) except Selenium hexafluoride.]

Measurement Methods

NIOSH 7300 (/niosh/docs/2003-154/pdfs/7300.pdf), 7301 (/niosh/docs/2003-154/pdfs/7301.pdf), 7303 (/niosh/docs/2003-154/pdfs/7303.pdf), 9102 (/niosh/docs/2003-154/pdfs/9102.pdf), S190 (II-7);
OSHA ID121 (http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html) (http://www.cdc.gov/Other/disclaimer.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Amorphous or crystalline, red to gray solid. [Note: Occurs as an impurity in most sulfide ores.]

MW:	BP:	MLT:	Sol:	VP:	IP:
79.0	1265°F	392°F	Insoluble	0 mmHg (approx)	NA

Sp.Gr
4.28

Combustible Solid

Incompatibilities & Reactivities Acids, strong oxidizers, chromium trioxide, potassium bromate, cadmium

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage

Target Organs Eyes, skin, respiratory system, liver, kidneys, blood, spleen

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: No recommendation
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation
Provide: Quick drench

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 1 mg/m3:
(APF = 5) Any quarter-mask respirator.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.*
(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.*
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.*
(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.*
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0072 (/niosh/ipcsneng/neng0072.html)

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Silver (metal dust and soluble compounds, as Ag)

Synonyms & Trade Names **Silver metal:** Argentum
Synonyms of soluble silver compounds such as Silver nitrate ($AgNO_3$) vary depending upon the specific compound.

CAS No. 7440-22-4 (metal)	**RTECS No.** VW3500000 (metal) (/niosh-rtecs/VW3567E0.html)	**DOT ID & Guide**
Formula Ag (metal)	**Conversion**	**IDLH** 10 mg/m3 (as Ag) See: 7440224 (/niosh/idlh/7440224.html)
Exposure Limits **NIOSH REL** : TWA 0.01 mg/m3 **OSHA PEL** : TWA 0.01 mg/m3		**Measurement Methods** **NIOSH** 7300 (/niosh/docs/2003-154/pdfs/7300.pdf), 7301 (/niosh/docs/2003-154/pdfs/7301.pdf), 9102 (/niosh/docs/2003-154/pdfs/9102.pdf); **OSHA** ID121 (http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Metal: White, lustrous solid.

MW: 107.					**IP:** NA
Sp.Gr: 10.49 (metal)	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		

Metal: Noncombustible Solid, but flammable in form of dust or powder.

Incompatibilities & Reactivities Acetylene, ammonia, hydrogen peroxide, bromoazide, chlorine trifluoride, ethyleneimine, oxalic acid, tartaric acid

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance

Target Organs Nasal septum, skin, eyes

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated ($AgNO_3$)
Change: Daily
Provide: Eyewash

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Water flush
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
NIOSH/OSHA

Up to 0.25 mg/m3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode£
(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.£

Up to 0.5 mg/m3:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m3:
(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.
Click here (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0810 (/niosh/ipcsneng/neng0810.html) See MEDICAL TESTS: 0208 (/niosh/docs/2005-110/nmed0208.html)

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Styrene

Synonyms & Trade Names Ethenyl benzene, Phenylethylene, Styrene monomer, Styrol, Vinyl benzene

CAS No. 100-42-5	**RTECS No.** WL3675000 (/niosh-rtecs/WL381378.html)	**DOT ID & Guide** 2055 128P (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=128&poly=1) (http://www.cdc.gov/Other/disclaimer.html) (inhibited)
Formula $C_6H_5CH=CH_2$	**Conversion** 1 ppm = 4.26 mg/m³	**IDLH** 700 ppm See: 100425 (/niosh/idlh/100425.html)

Exposure Limits

NIOSH REL : TWA 50 ppm (215 mg/m³) ST 100 ppm (425 mg/m³)
OSHA PEL † (nengapdxg.html): TWA 100 ppm C 200 ppm 600 ppm (5-minute maximum peak in any 3 hours)

Measurement Methods
NIOSH 1501 (/niosh/docs/2003-154/pdfs/1501.pdf), 3800 (/niosh/docs/2003-154/pdfs/3800.pdf);
OSHA 9 (http://www.osha.gov/dts/sltc/methods/organic/org009/org009.html) (http://www.cdc.gov/Other/disclaimer.html), 89 (http://www.osha.gov/dts/sltc/methods/organic/org089/org089.html) (http://www.cdc.gov/Other/disclaimer.html)
See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless to yellow, oily liquid with a sweet, floral odor.

MW:	BP:	FRZ:	Sol:	VP:	IP:
104.2	293°F	-23°F	0.03%	5 mmHg	8.40 eV

Sp.Gr
0.91

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

Incompatibilities & Reactivities Oxidizers, catalysts for vinyl polymers, peroxides, strong acids, aluminum chloride [Note: May polymerize if contaminated or subjected to heat. Usually contains an inhibitor such as tert-butylcatechol.]

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects

Target Organs Eyes, skin, respiratory system, central nervous system, liver, reproductive system

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Water flush

Eyes: Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet (flammable) **Change:** No recommendation	**Breathing:** Respiratory support **Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH

Up to 500 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 10) Any supplied-air respirator*

Up to 700 ppm:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode*
(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0073 (/niosh/ipcsneng/neng0073.html)
See MEDICAL TESTS: 0214 (/niosh/docs/2005-110/nmed0214.html)

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Toluene

Synonyms & Trade Names Methyl benzene, Methyl benzol, Phenyl methane, Toluol

CAS No. 108-88-3	**RTECS No.** XS5250000 (/niosh-rtecs/XS501BDo.html)	**DOT ID & Guide** 1294 130 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130) (http://www.cdc.gov/Other/disclaimer.html)
Formula $C_6H_5CH_3$	**Conversion** 1 ppm = 3.77 mg/m3	**IDLH** 500 ppm See: 108883 (/niosh/idlh/108883.html)

Exposure Limits

NIOSH REL : TWA 100 ppm (375 mg/m3) ST 150 ppm (560 mg/m3)

OSHA PEL † (nengapdxg.html) : TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)

Measurement Methods

NIOSH 1500 (/niosh/docs/2003-154/pdfs/1500.pdf), 1501 (/niosh/docs/2003-154/pdfs/1501.pdf), 3800 (/niosh/docs/2003-154/pdfs/3800.pdf), 4000 (/niosh/docs/2003-154/pdfs/4000.pdf);

OSHA 111 (http://www.osha.gov/dts/sltc/methods/organic/org111/org111.html) (http://www.cdc.gov/Other/disclaimer.html)

See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (sltc/methods/index.html) /disclaimer.html)

Physical Description Colorless liquid with a sweet, pungent, benzene-like odor.

MW: 92.1	**BP:** 232°F	**FRZ:** -139°F	Sol(74°F): 0.07%	**VP:** 21 mmHg	**IP:** 8.82 eV
Sp.Gr: 0.87	**Fl.P:** 40°F	**UEL:** 7.1%	**LEL:** 1.1%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities Strong oxidizers

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage

Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Soap wash promptly

Eyes: Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet (flammable) **Change:** No recommendation	**Breathing:** Respiratory support **Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH

Up to 500 ppm:
(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)*
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0078 (/niosh/ipcsneng/neng0078.html) See MEDICAL TESTS: 0232 (/niosh/docs/2005-110/nmed0232.html)

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Vinyl chloride

Synonyms & Trade Names Chloroethene, Chloroethylene, Ethylene monochloride, Monochloroethene, Monochloroethylene, VC, Vinyl chloride monomer (VCM)

CAS No. 75-01-4	**RTECS No.** KU9625000 (/niosh-rtecs/KU92DDA8.html)	**DOT ID & Guide** 1086 116P (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=116&poly=1) (http://www.cdc.gov/Other/disclaimer.html) (inhibited)
Formula CH_2=CHCl	**Conversion** 1 ppm = 2.56 mg/m3	**IDLH** Ca [N.D.] See: IDLH INDEX (/niosh/idlh/intridl4.html)
Exposure Limits **NIOSH REL** : Ca See Appendix A (nengapdxa.html) **OSHA PEL** : [1910.1017] TWA 1 ppm C 5 ppm [15-minute]		**Measurement Methods** **NIOSH** 1007 (/niosh/docs/2003-154/pdfs/1007.pdf) ; **OSHA** 4 (http://www.osha.gov/dts/sltc/methods/organic/org004/org004.html) (http://www.cdc.gov/Other/disclaimer.html) , 75 (http://www.osha.gov/dts/sltc/methods/organic/org075/org075.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless g (below 7°F) with a pleasant odor at high concentrations. [Note: Shipped as a liquefied compressed gas.]

MW: 62.5	**BP:** 7°F	**FRZ:** -256°F	Sol(77°F): 0.1%	**VP:** 3.3 atm	**IP:** 9.99 eV
	Fl.P: NA (Gas)	**UEL:** 33.0%	**LEL:** 3.6%	**RGasD:** 2.21	

Flammable Gas

Incompatibilities & Reactivities Copper, oxidizers, aluminum, peroxides, iron, steel [Note: Polymerizes in air, sunlight, or heat unless stabilized by inhibitors such as phenol. Attacks iron & steel in presence of moisture.]

Exposure Routes inhalation, skin and/or eye contact (liquid)

Symptoms lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]

Target Organs Liver, central nervous system, blood, respiratory system, lymphatic system

Cancer Site [liver cancer]

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Frostbite
Eyes: Frostbite
Wash skin: No recommendation
Remove: When wet (flammable)
Change: No recommendation
Provide: Frostbite wash

First Aid (See procedures (firstaid.html))
Eye: Frostbite
Skin: Frostbite
Breathing: Respiratory support

Respirator Recommendations
(See Appendix E) (nengapdxe.html)

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0082 (/niosh/ipcsneng/neng0082.html)
See MEDICAL TESTS: 0241 (/niosh/docs/2005-110/nmed0241.html)

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APPENDIX D

Standard Safety

Procedures for Drilling

SECTION 31 DRILL RIG SAFETY POLICY

31.1 Purpose and Scope

The purpose of this policy is to provide an overview of working safely around drilling operations with truck-mounted and other powered drill rigs. The policy addresses the off-road movement of drill rigs, overhead and buried utilities, use of augers, rotary and core drilling, and other drilling operations and activities.

31.2 Key Terms

Combustible Gas Indicator (CGI): A gas leak detector and confined space monitor.

Lower Explosive Limit (LEL): Lowest concentration (by percentage) of a gas or vapor in air that is capable of producing a flash or fire in presence of an ignition source (arc, flame, heat, etc.).

31.3 Applicability

Drill rig safety and maintenance is the responsibility of the drill rig operator. For drill rigs operated by contractors, the primary responsibility for safety is with the contractor. Company employees are responsible for their own safety including recognizing and avoiding drill rig hazards. Company employees that observe a drill rig condition believed to be unsafe will advise the drill rig operator of the unsafe condition.

31.4 Safety Guidelines

31.4.1 General Guidelines and Knowledge

Company technicians, geologists, engineers, or other field staff assigned to observe drilling operations or collect soil samples should observe the following guidelines:

- Employees will not assist the drillers with the drilling equipment or supplies and will not at any time operate the drill rig controls.
- Employees working near the drill rigs must always remain AWARE of hazards.
- Employees will avoid any moving parts or equipment.
- Personnel must stay clear of drill rig and trailer during loading and unloading.
- Avoid climbing onto any part of the drill rig as it will create a fall hazard. Loose -fitting clothing or other items that may be caught in the moving equipment is prohibited.
- Safe access onto and off the drill rig is required. Jumping off or climbing up areas not designed for access is prohibited.

- Blind spots of the equipment will be identified and discussed with the crew. Crew members must stay clear of any blind spots when equipment is in motion or operation.
- Require a meeting at project start-up regarding the drill rig operator responsibility for rig safety and any site and equipment specific safety requirements.
- Set up any sample tables and general work areas for the field staff to the side of the drill rig (preferably a minimum of 33 feet (10 meters away)) and not directly behind the rig.
- Unloading or loading of the drill rig must be done in a safe area. Roadway signage and barricades must be used as appropriate if loading is done in or near an active roadway.

31.4.2 Movement of Drill Rigs – Drill Rig Operator Responsibility

Before moving a rig, the operator must do the following:

- To the extent practical, walk the planned route of travel and inspect it for overhead utility lines, depressions, gullies, ruts, and other obstacles.
- Lower the mast (or tower or derrick) of the rig.
- Check the brakes of the truck/carrier, especially if the terrain along the route of travel is rough or sloped.
- Discharge all passengers before moving on rough or steep terrain.
- Engage the front axle (on 4x4, 6x6, etc. vehicles) before traversing rough or steep terrain.
- Driving drill rigs along the sides of hills or embankments should be avoided; however, if side-hill travel becomes necessary, the operator must conservatively evaluate the ability of the rig to remain upright while on the hill or embankment. The possibility must be considered that the presence of drilling tools on the rig may reduce the ability of the rig to remain upright (raises the center of mass of the rig).
- Logs, ditches, road curbs, and other long and horizontal obstacles should be normally approached and driven over squarely, not at an angle.
- When close lateral or overhead clearance is encountered, the driver of the rig should be guided by another person on the ground.
- Loads on the drill rig and truck must be properly stored while the vehicles are moving.
- After the drill rig has been positioned to begin drilling, the brakes and/or locks must be set before drilling begins. If the rig is positioned on a steep grade and leveling off the ground is impossible or impractical, the wheels of the transport vehicle should be blocked or other means of preventing the rig from moving or toppling over.

31.4.3 Buried and Overhead Utilities - Drill Rig Operator Responsibility

- The location of overhead and buried utility lines must be determined before drilling begins by contacting the local one-call system at least two full working days before the work.
- When overhead power lines are close by, the drill rig mast should not be raised unless the distance between the rig and the nearest power line is at least 20 feet (7 meters) or other distance as required by local ordinances, whichever is greater. The drill rig operator should walk completely around the rig to make sure that proper distance exists.
- When the drill rig is positioned near an overhead line, the rig operator should be aware that hoist lines and power lines can be moved towards each other by wind. When necessary and approved by the Project Manager, the utility and/or power lines may be shielded, shut down, or moved by the appropriate personnel.

31.4.4 Clearing the Work Area - Drill Rig Operator Responsibility

- Before a drill rig is positioned to drill, the area on which the rig is to be positioned should be cleared of removable obstacles and be leveled when sloped, if possible. The cleared/leveled area should be large enough to accommodate the rig and supplies.

31.4.5 Safe Use of Augers - Drill Rig Operator Responsibility

- Never place hands or fingers under the bottom of an auger flight or drill rods when hoisting the augers or rods over the top of another auger or rod in the ground or other hard surfaces, such as the drill rig platform.
- Never allow feet to get under the auger or drill rod while they are being hoisted.
- When the drill is rotating, stay clear of the drill string and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.
- Move auger cuttings away from the auger with a long-handled shovel or spade; never use hands or feet when the auger is moving.
- Never clean an auger attached to the drill rig unless the transmission is in neutral or the engine is off, and the auger has stopped rotating.
- Do not wear loose clothing or jewelry while working near the drill rig. Long hair must be pulled back to avoid entanglement with moving parts.
- Hearing protection is recommended when working near an operating drill rig.

31.4.6 Safe Use of Hand Tools

Regulations regarding hand tools should be observed in addition to the guidelines provided below:

- Each tool should be used only to perform tasks for which it was originally designed.
- Damaged tools should be repaired before use or discarded.
- Safety goggles or glasses should be worn when using a hammer or chisel. Nearby co-workers and by-standers should be required to wear safety goggles or glasses or keep a safe distance.
- Tools should be kept cleaned and stored in an orderly manner when not in use.

31.4.7 Safe Use of Wire Line Hoists, Wire Rope, and Hoisting Hardware

- Inspect slings, ropes, and related equipment before each use. Any damage such as fraying, bird caging or other visible damage will require that the equipment not be used until repaired or replaced.
- Never touch a cable while it is moving.

31.4.8 Traffic Safety

- Drilling in streets, parking lots or other areas of vehicular traffic requires a definition of the work zones with cones, warning tape, etc. and compliance with local Police requirements.

31.4.9 Fire Safety

- Fire extinguishers (type ABC) will be kept on or near drill rigs for fighting small fires.
- If methane or other flammable gases or vapors are suspected in the area, a **combustible gas indicator (CGI)** will be used to monitor the air near the borehole with all work to stop at 20 percent of the **Lower Explosive Limit (LEL).**
- Work will stop during lightning storms.

31.4.10 Protective Equipment

- Company employees will follow the Company PPE policy (Section 12: Company Personal Protective Equipment (PPE) Policy) for protective equipment when working near drill rigs. This includes a hard hat, hearing and eye protection, policy-compliant work boots, and high visibility clothing. The drill operator and crew will also wear hard hats, hearing and eye protection, high-visibility clothing and protective toe boots if subcontracted by the Company. Client safety requirements beyond the Company policy will also be followed.

31.5 Gas Well Drill Rig Hole Safety – Drill Rig Operator Responsibility

- Before drilling begins, an iron fence will be put in front and the sides of the Kelley bar and bucket to ensure that there will be no personnel intrusions near the borehole.

- After the hole is drilled an iron grate is carefully set over the open hole by the machine. The iron grate will remain in place over the hole until well completion activities at the borehole are completed. The iron grate must support a minimum of a 300-pound person and any other weight from bentonite and or equipment that is placed on the grate.
- Until the grate is over the hole, under no circumstances will any personnel move beyond the fence that is put in place, unless personnel are wearing an approved safety harness securely connected to an approved anchor point.