



Buy Clean Manual Interactive CD-ROM



EPP: What Is it?

Environmentally Preferable Purchasing (EPP) is the practice of purchasing products that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose.

EPP: What Is it?

EPP products can include:

- Recycled content products
- Less toxic products
- Water conserving products
- Energy conserving products
- More durable products
- Biodegradable products
- Products with less packaging

History of EPP

- 1993 – President Clinton signed Executive Order 12873
- 1998 Executive Order 13101
 - ⇒ Required EPA to develop guidance for environmentally preferable purchasing.
- EPA's EPP Website
 - ⇒ <http://www.epa.gov/oppt/epp/> *(will open in default web browser)*

Benefits of EPP Program

- Recycled aluminum cans require 95% less energy to manufacture.
- Using 1 ton of recycled paper saves 20 trees and 7,000 gallons of water.
- 100 Energy Star computers and monitors can save \$10,000 in energy costs over 5 years.
- Correlation between improved health and working environment when using certain EP products.

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Implementing a School EPP Program

- Identify key team players:
 - ⇒ Superintendent
 - ⇒ Director of Facilities
 - ⇒ Purchasing Personnel
 - ⇒ Principal
 - ⇒ Custodial Staff
- Forge partnership between Facilities Director & Purchasing Department
- Develop an EPP Policy Statement

Implementing a School EPP Program

- Inventory current cleaning products
 - ⇒ Product Inventory Sheet
- Identify cleaning product ingredients & safety concerns
 - ⇒ Use Material Safety Data Sheets (MSDS)
- Develop and list desired product attributes
 - ⇒ EPP Selection Criteria Checklist

Implementing a School EPP Program

- Develop a purchasing policy and EPP bid specifications
- Identify alternative cleaners
- Make the switch!
 - ⇒ Establish target date and inform all involved parties
 - ⇒ Arrange training for custodial staff
 - ⇒ Change out cleaning products

Implementing a School EPP Program

- Understanding basics of implementing an EPP program
 - ⇒ Brief “walk-through” of the process
 - ⇒ Recognize general tools necessary to implement a program at your school.
 - ⇒ You won’t be an expert!!

EPP Product Inventory

- **Step One - Product Inventory**

- ⇒ Make a comprehensive list of the types and quantities of cleaners used
- ⇒ Establishes a baseline
 - ✓ Superscore – floor stripper
 - ✓ H₂Orange₂ Concentrate 117 – all purpose cleaner
 - ✓ Simple Green – Cleaner/degreaser

EPP Product Inventory Sheet

EPP Product Ingredients and Safety Concerns

- **Step Two – Identify Ingredients and Safety Concerns**
 - ⇒ Use your material safety data sheets (MSDS) that are provided with your cleaning products
 - ✓ Recipe of ingredients and their hazards
 - ⇒ Also review labels on products for additional information

EPP Product Ingredients and Safety Concerns

- **Step Two - Label Information**

- ⇒ *Keep away from heat and flame*
- ⇒ *Do not use while smoking*
- ⇒ *WARNING! Causes irritation*
Vapors harmful

Attributes

- **Step Three - Use MSDS to Identify Attributes**

- ⇒ What Are Attributes?

- ✓ Product characteristics that impact human health & the environment

- ⇒ Examples

- ✓ Carcinogens – does it contain carcinogens?
 - ✓ Flammability – is it highly flammable?
 - ✓ Biodegradability – is the product biodegradable?

Purchase Policy/Bid Specifications

- **Step Four – Develop a purchase policy and bid specifications**
 - ⇒ Purchase policy allows all personnel to understand the school's purchasing goals
 - ⇒ Bid specifications are necessary for your vendors so they know what kind of products you want
 - ⇒ Keep them as simple as possible
 - ⇒ Require training (if necessary) for custodial staff

Alternative Cleaners

- **Step Five - Identify Alternative Cleaners**
 - ⇒ Start with current vendor
 - ⇒ Request MSDS's, samples, and if possible, product demonstrations
 - ⇒ Much information available through the internet
 - ⇒ Green Seal—non-profit group that identifies and promotes products that have reduced impact to the environment

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Make the Switch

● Step Six – Make the Switch

- ⇒ Establish beginning and ending target dates to complete the change
- ⇒ Plan on training for your custodial staff – don't forget to see if your vendor can provide this!
- ⇒ Have a plan to dispose of your old cleaning products
 - ✓ Donate to organizations that can use them
 - ✓ Will your vendor take them for you?
 - ✓ No other option – contact your state environmental regulatory agency for proper disposal


Glossary of Environmentally Preferable Purchasing Terms


Acids  - Solutions with a pH range between 0 to 6.9. They are corrosive between pH 0 and 2.0 and produce severe burns on contact. See also pH.

Uses: Many cleaning products (e.g., delimers, bathroom cleaners, bowl cleaners) are acidic.

Acute health effects - Effects which occur rapidly as a result of short-term (usually less than 24 hours) exposures. Acute effects are usually of short duration, but long-term effects can occur after one exposure. Examples include irritation, corrosivity, chemically induced unconsciousness (narcosis), or death.


Acute toxicity - The potential of a chemical substance to cause adverse health effects from short-term exposure.

Aerosol propellants - Gases used to pressurize spray products. **Chlorofluorocarbons** , which deplete the ozone layer, may be found in old cleaning products. Today other chemicals, such as isobutene, a petroleum product may be used. Hydrocarbon propellants like isobutene contribute to smog problems because of their contribution to tropospheric (ground level) ozone formation.

Alkalies  (bases) - Solutions with a pH range between 7.1 to 14.0. An alkali is corrosive when pH is higher than 11.5. See also pH.

Uses: Many cleaning products (e.g., bleach, detergents, dishwashing soaps, drain openers and oven cleaners) are alkalies.

Ambient air pollutants - Pollutants for which ambient air quality standards have been developed. These pollutants include nitrogen oxides, sulfur dioxide, ozone precursors, particulate matter, carbon monoxide, and lead.

Bioaccumulate  - The process where chemicals are collected and stored in plant and animal tissue. Some products may contain ingredients that will be taken up by smaller aquatic plants and animals and increase in concentration through the food chain as these plants and animals are consumed by larger animals.

Biobased product - Commercial or industrial products (other than food or feed) that utilize biological products or renewable, domestic, agricultural (plant, animal and marine),

or forestry materials.

Biodegradable - The ability of a substance, material or product ingredient to readily decompose under natural conditions by the action of microbes.

Biological oxygen demand (BOD) - Refers to increase use of oxygen by microorganisms in surface water when they metabolize organic chemicals. The total BOD load in an aquatic ecosystem is an important water quality parameter because this increased use of oxygen reduces amounts available to aquatic organisms like fish. At the same time, it is important to note that the availability of carbon sources (essentially what BOD measures) is often not the primary limiting factor in the growth of microorganisms in an aquatic ecosystem. In many aquatic ecosystems, other nutrients grow and it is the additional loading of these nutrients, rather than carbon, that is the primary factor in excessive microbial growth and oxygen depletion.

Carcinogen - Chemical capable of causing cancer.

Cardiac sensitizer - Chemical which, upon repeated exposure, can in some persons cause the heart to become sensitive to the stimulant properties of epinephrine (which is produced by the body's adrenal glands). Subsequent exposure to the sensitizer may cause fatal cardiac arrhythmias. Some chlorinated solvents are sensitizers.

CAS number - Chemical Abstract System number. A unique number used to identify each chemical.

Central nervous system depressant - Chemical toxic to neurons in the brain. With increasing acute exposure, CNS depressants cause headache, dizziness, confusion euphoria, drowsiness, loss of consciousness and death through inhibition of breathing. Chronic exposure may cause tremors, personality changes, visual impairment, and loss of hearing, memory, or intellectual capacity. Many organic solvents are CNS depressants.

Chronic health effects - Effects which generally occur as a result of long-term exposure, and are long duration. Examples include cancer, liver damage and chronic bronchitis.

Chronic toxicity - A chemical that is toxic over continual/repeated exposure.

Combustible - A substance having a flash point at or above 100° Fahrenheit up to and including 150° Fahrenheit, according to the Consumer Product Safety Commission. The Occupational Safety and Health Administration defines a combustible liquid as having a

flashpoint at or above 100° Fahrenheit but below 200° Fahrenheit.

Corrosive - Chemical which, upon contact can cause deep tissue damage, such as burns to eyes or skin.

Dyes - (Includes azo, basic disperse, fiber-reactive, vat dyes and fluorescent agents) May cause allergic reactions.


Uses: As colorants or whitening agents in many products, including all-purpose cleaners, disinfectants, fabric softeners.


Flammable - A substance having a flashpoint above 20° and below 100° Fahrenheit, according to the Consumer Product Safety Commission. An extremely flammable substance has a flashpoint at or below 20° Fahrenheit.

Flashpoint  - Lowest temperature for sufficient vapor to form in the presence of oxygen to permit ignition.

Fragrances - Any of 4,000 chemicals. May cause skin irritation, discoloration, rashes or allergic reactions. May be irritating to the eyes and respiratory tract.

Uses: Many cleaning products, either to simulate the smell of "fresh air", flowers, etc., or to mask odors of other chemicals in the product.

Hazardous ingredient - Toxic, corrosive, ignitable, or **reactive ingredient** .

Incompatible  - Chemicals which are incompatible react violently or produce toxic byproducts.

Irritation - Redness, swelling or tissue damage caused by chemicals. The degree of irritation is dependent on dose. Chemical irritation may result in mild skin itching, or fatal damage to the lungs.

LC50/Lethal concentration - A measure of acute toxicity. The lethal concentration that if inhaled will kill half of a group of organisms in an experiment in a given time. In EPA's Toxic Substances Control Act program, a chronic LC50 or Ec50 <0.1 mg/L is highly toxic; and a chronic LC50 or EC50 > 10 mg/L is a low toxicity.


LD50/Lethal dose - A measure of acute toxicity. The lethal dose that will kill 50% of lab


animals exposed to it orally or through the skin. The lower the LD50, the more toxic the compound.

Mutagen - A chemical that can alter genetic material in humans.

Organic chemical - A chemical which contains carbon. Chemicals which do not contain carbon are termed "inorganic".

Oxidizer (oxidizing agent) - A chemical capable of reacting with other chemicals in an "oxidation" reaction. Chemical reactions involving strong oxidizers may release heat or be explosive.

Ozone depletion  - Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbons or halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.

pH  - A measure of the acidity or alkalinity of a solution. A pH of 7 is considered neutral. A pH greater than 7 indicates alkalinity. A pH less than 7 indicates acidity. In the absence of specific test data on irritation, pH provides some insight into whether a product will be corrosive or cause irritation. Products with very high or very low pH (11.5 or 2) should be assumed to be corrosive. High or low pH values (e.g., between 9 and 11, or between 4 and 2) indicate the product would be more irritating than neutral pH products where the pH is closer to 7.

Sensitizer - A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction after repeated exposure to the chemical.

Solvent - Liquid used to dissolve other substances. Aqueous solvents consist primarily of water, while organic solvents can include a variety of organic chemicals such as acetone, benzene, toluene, ethyl acetate, xylene and turpentine. Most organic solvents are **Volatile Organic Compounds (VOCs)** that contribute to smog problems because of their contribution to tropospheric (ground level) ozone formation.

Teratogen - A chemical that causes malformation in the fetus and/or birth defects in humans.

Volatile Organic Compounds (VOCs)



- In this context, VOC means any organic compound (carbon containing) which has a vapor pressure of greater than 0.1 mm Hg or, if the vapor pressure is unknown, has 12 or fewer carbon atoms. VOCs in cleaning products are of potential concern because of indoor air exposures to office workers and others. They are also of concern because they contribute to the formation of smog in outdoor air. Some chemicals considered VOCs include acetone, benzene, perchloroethylene, among many others.

Glossary of Common Cleaning Chemicals

Acetone [CAS No. 67-64-1] - Flammable volatile liquid with distinctive odor. Reacts explosively with hydrogen peroxide. Irritating to eyes, respiratory tract and skin. May be absorbed by inhalation. Can cause changes in liver's ability to metabolize inhalation. Can cause damage, dizziness, sedation and coma.

Uses: Spot and graffiti remover, solvent.

Ammonia compounds - (Includes ammonium chloride [CAS No. 12125-02-9], ammonium hydroxide [CAS No. 1336-21-6], benzalkonium chloride [CAS No. 8001-54-5]) - Usually liquids with a pungent odor. Corrosive in concentrations found in commercial products (over 10%). Forms irritating chloramine gas when combined with chlorine-containing products. Fumes can cause irritation of the eyes, respiratory tract. Liquid can cause skin burns. Toxic to fish, and reduces oxygen in surface water.

Uses: In many cleaning products, depending on concentration, as antiseptic, bactericide, fungicide, sanitizer, deodorant. Used in detergents as a surfactant. Also found in floor polish, glass window cleaners, household hard surface cleaners, rug and upholstery cleaners.

Ammonium chloride [CAS No. 12125-02-9] - Colorless crystals which are soluble in water and ammonia. Dust is mildly irritating to eyes, nose and throat. See also Ammonia compounds, Quaternary ammonium chloride. Ammonium chloride is harmful to aquatic life in very low concentrations.

2-Butoxy ethanol [CAS No. 111-76-2] (Also known as Ethylene glycol monobutyl ether; Monobutyl ethylene glycol) - Incompatible with bleach. May damage eyes and respiratory tract. Absorbed defects in lab animals. With chronic exposure, causes central nervous system toxicity, testicular atrophy.

Uses: In many cleaning products, including glass, window and all-purpose cleaners.

Benzene [CAS No. 71-43-2] - Flammable liquid with a sweet odor. Toxic to bone marrow,

and cause of leukemia in humans. In 1978, the Consumer Product Safety Commission outlawed its use in many cleaning products, although it may still be found in old stocks. Degrades slowly. See BOD discussion.

Uses: Spot remover, carpet spotter, laundry starch preparations.

Carbolic Acid - See Phenol

Caustic soda - See Lye.

Chlorine [CAS No. 7782-56-5] (including sodium hypochlorite, Clorox) - Strong oxidizer. Produces toxic chloramines gas when mixed with ammoniated cleaning products. Corrosive to eyes and skin. Fumes are irritating or corrosive to the respiratory tract. Can kill microscopic life in waterways, septic tanks and sewage treatment plants. Toxic to aquatic life.

Uses: Bleach, disinfectants, all-purpose cleaners, mildew remover, bathroom cleaners, spot removers, or in scouring powders.

Chlorine dioxide [CAS No. 10049-04-4] (chlorine oxide) - Strong oxidizing gas which can be dissolved in cold water. It may react with hot water or steam to produce toxic and corrosive fumes of hydrochloric acid. Severe respiratory and eye irritant.

Uses: Bactericide & antiseptic.

Dichloromethane - See Methylene chloride.

Dimethylbenzene - See Xylene.

Ethanol (alcohol) [CAS No. 64-17-5] - Clear liquid which can be absorbed by inhalation and across skin. Central nervous system depressant. Vapors can produce some eye and upper respiratory tract irritation.

Uses: Detergents, disinfectants, carpet cleaners, tub and tile cleaners, air fresheners.

Ethylene glycol monobutyl ether - See 2 - Butoxy ethanol.

Limonene (d-Limonene, 4-isopropenyl-1-methylcyclohexene [CAS No. 5989-27-5]) - A flammable, colorless liquid in some plants. Skin irritant, sensitizer. If ingested in sufficient quantity, may be toxic to kidneys. When heated to decomposition, emits acrid smoke, fumes.

Uses: Aerosol, non-aerosol deodorants/air fresheners, bathroom tub and tile cleaners, hard surface cleaners, liquid laundry detergents, dry cleaning pre-spotter, polishing

preparations, mechanics soap, oven cleaners, rug/upholstery cleaners, other specialty cleaning and sanitation products.

Lye (caustic soda, sodium hydroxide [CAS No. 1310-73-2], potassium hydroxide [CAS No. 1310-58-3]) - Corrosive white crystals or colorless liquid. Liquid may cause severe eye burns or blindness, or skin burns with subsequent tissue scarring.

Vapors are irritating to the eyes and respiratory tract. Aerosol formulations present an inhalation hazard.

Uses: Drain opener, oven cleaner, detergents.

Methylbenzene - See Toluene.

Methylene Chloride (methylene dichloride; dichloromethane) [CAS No. 75-09-2] - Colorless liquid. Incompatible with strong oxidizers and caustics. Central nervous system depressant. Probable human carcinogen.

Uses: Disinfectant, all-purpose cleaner, degreaser, septic tank cleaner, laundry starch preparations, rug and upholstery cleaners.

Monobutyl ethylene glycol - See 2-Butoxy ethanol.

Naphthalene [CAS No. 91-20-3] - White crystalline solid with the odor of mothballs. Skin exposure may cause severe dermatitis. Irritating to eyes and respiratory tract.

Inhalation may cause headache, nausea, confusion, damage to red blood cells. Possible human carcinogen.

Uses: Detergents, air fresheners, spotters.

Nitrobenzene [CAS No. 98-95-3] - A yellow oily liquid with an odor like shoe polish. May be absorbed via inhalation and through the skin. Chronic inhalation may cause liver damage. May bind with blood to reduce oxygen availability. Central nervous system depressant.

Uses: Furniture polish, floor polish.

Perchloroethylene (tetrachlorethylene; ethylene tetrachloride; PERC) [CAS No. 127-18-4] - Colorless volatile liquid about $1\frac{1}{2}$ times heavier than water. Central nervous system depressant, liver and kidney toxicant. Inhalation may cause respiratory tract irritation or cardiac arrhythmias. Irritating to the skin and eyes on direct contact. When released in water, can smother small aquatic life. Can be toxic to sewage treatment bacteria.

Uses: Graffiti remover, carpet spotter, metal cleaner, degreaser, dry cleaning solvent, furniture polish, household hard surface cleaners, laundry starch preparations, oven

cleaner.

Petroleum distillates - The lighter liquid hydrocarbons refined from crude oil by distillation, including petroleum ether, naphtha, mineral oil, mineral spirits, Stoddard solvent and kerosene. (Heavier distillates include propane and butane). Liquid petroleum distillates contain varying, but usually small amount of aromatic hydrocarbons (benzene, toluene, xylene, cycloparaffins, naphthenes). Liquid petroleum distillates are flammable. They are skin, eye and respiratory tract irritants. See also volatile organic compounds.

Uses: Found in many janitorial cleaning products.

Phenol (carbolic acid) [CAS No. 108-95-2] - Colorless crystals, which can be dissolved in water or some organic solvents. Liquids have sweetish, sickening odor and can burn skin and eyes. In aqueous solution, phenol is not highly volatile, but it is readily absorbed through the skin. Abnormal pigmentation commonly occurs following dermal contact with phenol compounds. Vapors are strongly irritating to eyes, nose and throat. Exposure by inhalation to a low concentration of phenol six times for five minutes produced increased sensitivity to light.

Uses: In detergents, disinfectants, deodorants, furniture polish, air fresheners, mold and mildew removers.

Phosphates - Phosphate-containing compounds increase biological oxygen demand in surface water.

Uses: In detergents, bathroom cleaners, floor strippers.

Phosphoric acid [CAS No. 7664-38-2] - Colorless, odorless liquid. Corrosive to ferrous metals and alloys. Should not be mixed with bleach or ammonia. Phosphorus-containing compounds increase biological oxygen demand in surface water. When used as an agent for metal cleaning, phosphoric acid may react with impurities in the metal and release phosphine gas.

Uses: Metal brightness, cleaners, detergents, sanitizers.

Pine oil [CAS No. 8002-09-3] - Flammable liquid. An irritant to the eyes, upper respiratory tract and skin. May cause mild respiratory and central nervous system depression, and kidney toxicity.

Uses: In floor polish, glass window cleaners, hard surface cleaners, liquid detergents, toilet bowl cleaners, disinfectants.

Potassium metabisulfite [CAS No. 16731-55-8] - Colorless crystals which are soluble in water and ammonia. Dust is mildly irritating to eyes, nose and throat. See also Sulfur

compounds.

Uses: Washing powders.

Quaternary ammonium chloride (dodecyl dimethyl ammonium chloride) [CAS No. 7135-51-5] - A flammable liquid. Corrosive. An irritant to the eyes, skin, upper respiratory tract. May cause central nervous system depression. Ingestion may cause pain, swelling, breathing difficulty, convulsions. Ammonium chloride is harmful to aquatic life in very low concentrations.

Uses: Disinfectant, sanitizer.

Sodium bisulfite - See Sulfur compounds.

Sodium dodecyl benzene sulfonate [CAS No. 25155-30-0] - Environmental hazard.

Increases biological oxygen demand in surface water. See also Biological oxygen demand.

Uses: As a wetting agent (surfactant) in heavy duty laundry products; metal cleaners, specialty cleaners and sanitation products.

Sodium hydroxide - See Chlorine.

Sulfur compounds (Including potassium metabisulfite [CAS No. 16731-55-8] and sodium bisulfate [CAS No. 7631-90-5]) - Corrosive irritant to skin, eyes, and mucous membranes; sulfur-containing compounds may be allergenic and may produce skin rashes or difficulty breathing in persons with asthma. When used in rust removers, may produce fumes of sulfur dioxide, a respiratory irritant.

Uses: Antioxidant and preservative in a variety of cleaning products.

Tetrachloroethylene - See Perchloroethylene.

Toluene (methylbenzene) [CAS No. 108-88-3] - Volatile, flammable liquid with strong chemical odor. Eye, skin and respiratory irritant. Central nervous system depressant. Cardiac sensitizer. Prolonged or repeated exposure may cause liver, kidney damage or anemia. Exposure during pregnancy may result in birth defects.

Uses: Solvent in a variety of products such as graffiti remover, floor polish, furniture polish, laundry starch preparations, household hard surface cleaners.

Trichloroethane (1,1,1-trichloroethane [CAS No. 71-55-6]; 1,1,2-trichloroethane [CAS No. 79-00-5]) - Colorless liquid with mild chloroform-like odor. Because it is four times heavier than air, vapors tend to collect in low spaces. Corrosive to aluminum. Repeated dermal exposure may result in skin irritation. Central nervous system depressant. Cardiac sensitizer. The 1,1,1-isomer is also a Class 1 ozone depleter (like CFCs) being phased out

under the Clean Air Act.

Uses: Solvent, degreaser, spotting fluid, drain cleaner; formerly used as an aerosol propellant.

Trichloroethylene [CAS No. 79-01-6] - Colorless liquid with mild chloroform-like odor. Because it is four times heavier than air, vapors tend to collect in low spaces. Suspected human carcinogen. Central nervous system depressant. Cardiac sensitizer. Associated with birth defects of the heart, and in animals, decreased fetal weight and abnormal sperm.

Uses: Degreaser, solvents, graffiti remover.

Xylene (dimethylbenzene) [CAS No. 1330-20-7] - Colorless, flammable liquid with a sweet odor. May attack some forms of plastic and rubber. Incompatible with strong oxidizers. Vapor may cause irritation of the eyes, nose and throat. Central nervous system depressant. Chronic exposure to xylene may cause dry irritated skin, reversible eye damage, anemia and toxicity to white and red blood cells.

Uses: Solvent, air fresheners, stainless steel cleaner, floor polish.



U.S. EPA Region 4

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Table of Contents

Chapter 1	History of Environmentally Preferable Purchasing (EPP)	1
1.1	What is Environmentally Preferable Purchasing?	1
1.2	Does Our School Have to Use EPP?	2
1.3	Who are KPPC and SAR?	2
Chapter 2	Why Implement an EPP Program?	4
Chapter 3	Your EPP Team: Who & Why	7
3.1	Key Team Players	7
3.2	Forge Partnership Between Facilities Director and Purchasing Department	8
3.3	Custodial Staff Input	8
Chapter 4	How to Implement an EPP Program	9
4.1	Step One – Inventory Current Cleaning Products	9
4.2	Step Two – Identify the Cleaning Product Ingredients	9
4.3	Step Three – Listing Product Attributes	13
4.4	Step Four – Developing a Purchasing Policy/Bid Specifications	15
4.5	Step Five – Identifying Alternative Cleaners	15
4.6	Step Six – Make the Switch!	16
Chapter 5	Evaluate Your EPP Program Success	18
Chapter 6	EPP Case Studies	20
6.1	City of Santa Monica	20
6.2	Yellowstone and Grand Teton National Parks	20
6.3	GSA and EPA Cleaning Products Pilot Project	21
Chapter 7	EPP Resources	22
7.1	EPP Online Resources	22
7.2	EPP Documents	25
Chapter 8	Glossary	27
8.1	Glossary of Environmentally Preferable Purchasing Terms	27
8.2	Glossary of Common Cleaning Chemicals	31

Appendices

Appendix A – Product Inventory List

Appendix B – Explanation of Material Safety Data Sheets

Appendix C – Sample Material Safety Data Sheets

Appendix D – Explanation of National Fire Protection Safety Diamond/Hazardous
Materials Identification System

Appendix E – EPP Selection Criteria Checklist

Appendix F – Sample Bid Specifications

Chapter 1

1.0 History of Environmentally Preferable Purchasing (EPP)

Environmentally Preferable Purchasing (EPP) was first introduced in 1993 when President Clinton signed Executive Order (EO) 12873, *Federal Acquisition, Recycling, and Waste Prevention*. In 1998, President Clinton signed EO 13101, *Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition*, which superceded the previous EO. However, it did retain similar requirements for the U.S. Environmental Protection Agency (EPA) to develop guidance to address environmentally preferable purchasing. EPA subsequently developed a *Final Guidance on Environmentally Preferable Purchasing* (www.epa.gov/opptintr/epp/finalguidancetoc.htm). EPA's final guidance document was designed to help federal agencies comply with President Clinton's EO 13101.

1.1 What is Environmentally Preferable Purchasing?

The federal government defines environmentally preferable purchasing, or EPP as it is more commonly known, as "...products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose. This comparison may consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, or disposal of the product or service."

What this really means is the goal of an EPP program is to get purchasers to select products that have a reduced effect on human health and the environment, when compared to other competitive products. Purchasers should consider the *life cycle* of the product. A product's life cycle considers all aspects of the product such as purchasing of raw material, manufacturing, packaging and distribution, use, and finally, disposal.

Environmentally preferable products can include items such as:

- Recycled content products
- Less toxic products
- Products with less packaging
- Water conserving products
- Biodegradable products

1.2 Does Our School Have to Use EPP?

Although Kentucky does require that schools implement recycling, as long as it is economically feasible, there are no state requirements or federal requirements for schools to implement the EPP program.

The goal of this training manual and the accompanying training is to help schools develop their own EPP Program. Although EPP can and does focus on many types of different products, the goal of this training focuses on identifying EPP products with respect to janitorial cleaning supplies. After this training is completed, it will be up to the individual schools to decide if they want to implement EPP.

1.3 Who are KPPC and SAR?

The Kentucky Pollution Prevention Center (KPPC) was established in 1994 through a Kentucky legislative mandate. KPPC serves as the state's resource for pollution prevention (P2) technical assistance to Kentucky industries, businesses, schools, and many other organizations. KPPC is located within the Speed Scientific School at the University of Louisville, but is responsible for working with organizations throughout the Commonwealth. Many of KPPC's services are free, non-regulatory, and confidential.

SAR is a non-profit organization that was established in 1997. SAR focuses on promoting environmental awareness and recycling among schools located in eastern Kentucky. Initially, SAR worked with just a few schools in only a few counties, however their region eventually grew to over 205 schools representing nearly 21 counties.

KPPC and SAR understand the importance of environmental stewardship among our communities. The EPP program is an important step towards a safer and cleaner environment. It is our goal that this training manual will provide the foundation necessary for your school to implement a successful EPP program.

Chapter 2

2.0 Why Implement an EPP Program?

Implementing an environmentally friendly purchasing program for janitorial cleaning products is much more than simply "doing the right thing for the environment." Schools today face many difficult and challenging issues, not the least of which is trying to ensure that students learn in a clean and healthy environment. Children can spend up to eight hours a day in the school building; thus a healthy indoor environment is crucial. Just as important however, is that faculty and staff also work in a healthy, clean environment.

Allergic reactions to "sick" indoor environments keep 10,000 American children out of school each day. *The Janitorial Products Pollution Prevention Project* (www.westp2net.org/Janitorial/jp4.htm), which was conducted in the San Francisco Bay area, found that six percent of the cleaning products that were analyzed were "so dangerous, that they should not be used" and an "additional 35 percent were dangerous, but can be used successfully with extreme care." The project identified some of the most dangerous products as acid toilet bowl cleaners; floor finish strippers; heavy-duty, high strength degreasers; sewer drain openers, and oven cleaners.¹

As part of this same study, an 18-month evaluation of janitors in Santa Clara County was undertaken and found that the 27,000 janitors working in the county sustained approximately 1,200 injuries annually, 20 percent of which were mostly chemical burns to the eyes or skin. A further review of just 25 percent of the county's janitors found that








¹ www.westp2net.org/Janitorial/jp4.htm

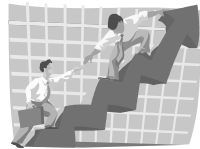
they used 400,000 pounds of hazardous materials annually in cleaning, or approximately 60 pounds a year per janitor.²

Based upon the statistics presented above, it is obvious that schools do face difficult challenges in maintaining healthy buildings to all involved individuals - teachers, staff, and students. However, if adopting an EPP program for janitorial products is beneficial to schools, then why are more schools not taking advantage of this program? A summary provided below helps identify advantages and disadvantages to such a program, and may help your school overcome these obstacles in the future.





EPP Program for Janitorial Cleaning Products

Advantages

-  Creates a safer environment for students, faculty and staff;
-  May reduce the potential for concerns about chemical compatibility;
-  Disposal of environmentally friendly products will be easier;
-  Potentially fewer cleaning products;
-  Potential to streamline purchasing with fewer products;
-  Reduce the chance for exposure to dangerous chemicals; and
-  Environmental stewardship - "Lead the Charge".



Disadvantages

-  It is new - people may not want to cooperate;
-  It is different - people are unsure of different ideas;
-  Change is often challenging and can be time consuming; and
-  Training will likely be necessary.

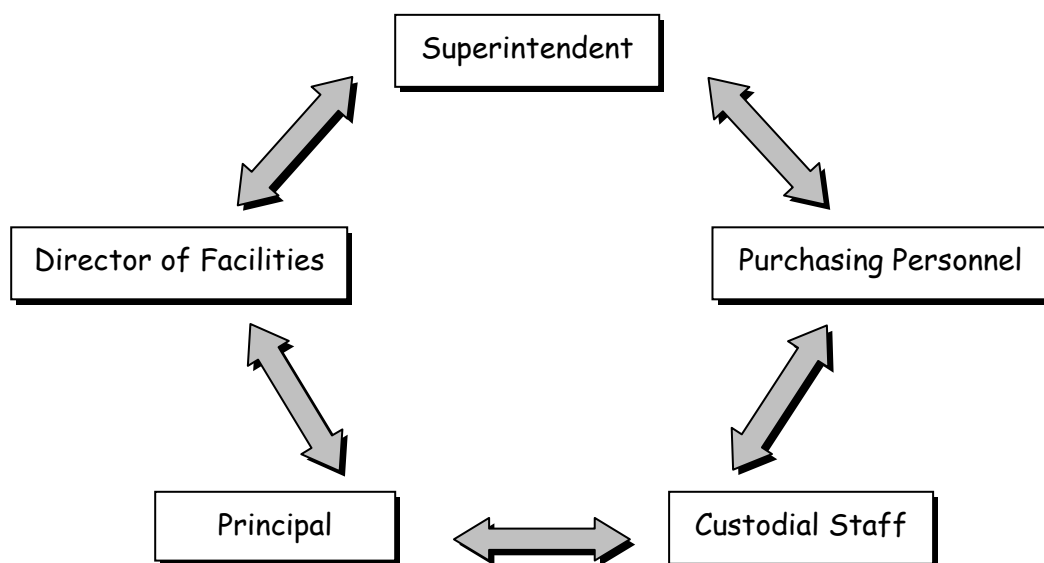
² www.cleaningpro.com

Remember, change is always difficult. But, it is important to stress to those directly involved (janitorial cleaning staff, purchasing department, etc.) the benefits that these individuals can enjoy. As with anything, making sure that people from all departments within the school are involved is extremely important to the success of your program.

Chapter 3

3.0 Your EPP Team: Who & Why

An environmental purchasing effort requires the involvement of a number of key players. Facilitating communication and partnerships between these individuals and departments will be key to the success of your school's effort.



3.1 Key Team Players

The *Superintendent* encourages widespread participation in the program by issuing a policy statement or directive communicating the school district's commitment to EPP (some sample policy statements are provided at the end of this chapter). Faculty and staff will follow the lead once the climate of acceptance has been conveyed from the highest school authority.

The *Director of Facilities* provides technical expertise to identify environmental and health risks and helps to develop criteria and specifications for selecting safer products that also meet performance standards. This position is ultimately responsible for final product approval.

Purchasing Personnel develop product bid specifications, maintain a listing of acceptable product alternatives and costs, and process orders.

The *Principal* allows and encourages participation at the individual school, therefore, setting the climate of acceptance for faculty and staff at a more direct level.

Custodial Staff identify product performance needs and use products. Custodial staff input and participation is essential for success of the program.

3.2 Forge Partnership Between Facilities Director and Purchasing Department

An effective partnership between the facilities director and the purchasing department is key. The two entities must work together to design the bid specifications to meet the goal of the project while ensuring product performance. Purchasing personnel will rely on the facilities director for technical input in the bid specifications.

3.3 Custodial Staff Input

As the ultimate end-user of the products, custodial staff involvement in the decision-making process is critical to the success of the program. It is important to recognize and utilize the expertise of the staff as the products are evaluated. Additionally, it will increase the morale of custodians who recognize the school's concern for their health and working conditions and who appreciate the opportunity to participate in making decisions about their work.

Example EPP Policy Statements

1. *The Douglass County School District is committed to providing a safe and healthy environment for its faculty and students. To help achieve this, schools are encouraged to implement an environmentally preferable purchasing (EPP) program for janitorial cleaning products. Purchasing environmentally friendly cleaning products demonstrates our goal to live and work in a cleaner environment.*
2. *The Douglass County School District is committed to minimizing the adverse environmental impacts of its purchases through environmentally preferable purchasing (EPP) for janitorial cleaning products. EPP not only protects the environment; but also protects human health, thus ultimately improving the overall quality of the District's school purchases by placing an increased value on the well being of its faculty, staff and students.*
3. *The purchase and use of products and services can have a profound impact on the environment. The Douglass County School District recognizes the positive impact that it can make on the environment through the purchasing decisions that its employees make. It is the intent of the District to integrate environmentally preferable purchasing (EPP) considerations into purchases of janitorial cleaning products. Although the environment may not be the core of our professional mission, the integration of these factors will result in economic, health and environmental gains that will further our goals while providing a safe and clean environment for our faculty, staff and students.*

Chapter 4

4.0 How to Implement an EPP Program

Implementing an EPP program will require time and effort from a variety of individuals. Though it may seem like a huge task, large state governments like the State of Massachusetts have developed their own successful EPP program. The implementation process has been separated into a series of steps that will hopefully allow things to move more smoothly.

4.1 Step One – Inventory Current Cleaning Products

A Product Inventory Sheet is included in **Appendix A**. This is used to identify the types and quantities of products that your custodial staff is currently using. This basically includes toilet bowl cleaners, floor cleaners, glass cleaners, etc. Remember, this program only focuses on custodial cleaning products and does not look at other products outside of this specific area.

In order to collect accurate product inventory information, you will want to interview your purchasing personnel, custodial staff, and others that may have knowledge of your cleaning products. It is important to talk to all groups; you may be temporarily out of stock of a particular product and not know it unless you talk to all parties. Make sure you have developed a complete list of all the cleaning products used.

4.2 Step Two – Identify Cleaning Product Ingredients & Safety Concerns

After you have fully inventoried your custodial cleaning products, you will then need to identify the health and safety of each product. Remember, the purpose of implementing

this EPP program is to find substitute cleaning products that have reduced effects on the health of your people, and on the environment where they work.

There are two primary ways to evaluate the health and safety of your cleaning products; use the material safety data sheet (MSDS) that should accompany each cleaning product you use, or read the labels on each cleaning product. The MSDS provides more detailed information and will be briefly discussed in this section, but a more thorough discussion of an MSDS is presented in **Appendix B**.

An MSDS provides information about a particular product and hazards that may be associated with that product. The federal Occupational Safety and Health Administration (OSHA) mandate MSDS's. OSHA requires every company that manufactures or distributes hazardous chemicals in the United States to prepare an MSDS. An MSDS must provide a variety of fundamental information related to the chemical that will allow the user to recognize and prepare for potential hazards associated with the chemical and prepare for and react to emergency situations. **It is required by law that employers provide copies of MSDS's to employees that use those specific products.**

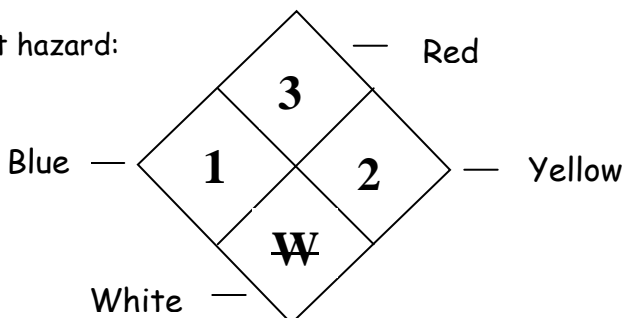
OSHA requires specific elements that must be contained within all MSDS's. However, it does not mandate the format this information is presented. Therefore, you will receive MSDS's from different companies that will not look alike. Examples of several different types of MSDS's are provided in **Appendix C**.

At a minimum, OSHA requires that every MSDS contain the following information:

- ☞ Chemical identity - The identity of the substance as it appears on the label.
- ☞ Manufacturers name and contact information - Manufacturer's name, address, telephone number and emergency telephone number. The date the MSDS was prepared and an optional signature of the preparer.
- ☞ Hazardous ingredients/identity information - Lists the hazardous components by chemical identity and other common names. Includes OSHA Permissible Exposure Limit (PEL), ACGIH Threshold Level Value (TLV) and other recommended exposure limits. Percentage listing of the hazardous components is optional.
- ☞ Physical/chemical characteristics - Boiling point, vapor pressure, vapor density, specific gravity, melting point, evaporation rate, solubility in water, physical appearance and odor.
- ☞ Fire and explosion hazard data - Flash point (and method used to determine it), flammability limits, extinguishing media, special firefighting procedures, unusual fire and explosion hazards.
- ☞ Reactivity data - Stability, conditions to avoid, incompatibility (materials to avoid), hazardous decomposition or byproducts, hazardous polymerization (and conditions to avoid).
- ☞ Health hazard data - Routes of entry (inhalation, skin, ingestion), health hazards (acute = immediate and chronic = build up over time), carcinogenicity, signs and symptoms of exposure, medical conditions generally aggravated by exposure, emergency and first aid procedures.
- ☞ Precautions for safe handling and use - Steps to be taken in case material is released or spilled, waste disposal method, precautions to be taken in handling or storage, other precautions.
- ☞ Control measures - Respiratory protection, ventilation (local, mechanical exhaust, special or other), protective gloves, eye protection, other protective clothing or equipment, work/hygienic practices.

Some MSDS's will have the National Fire Protection Association (NFPA) safety diamond. The diamond is divided into four sections, each designated with a different color that contains a number between 0 and 4; the lower the number, the less the hazard. Each section and color represents a different hazard:

- Red - Flammability;
- Blue - Health Hazard;
- Yellow - Reactivity; and
- White - Special Hazards.



Additional information on the NFPA safety diamond is provided in **Appendix D**. The Hazardous Materials Identification System (HMIS) can also be used to help identify hazardous materials. The HMIS uses horizontal bars rather than a diamond and focuses on worker exposure versus fire hazards. The numbers for both models represent the same level of hazard. Additional information on the HMIS is also provided in **Appendix D**.




Health	2	Blue
Flammability	1	Red
Reactivity	0	Yellow
Personal Protection	B	White

Although MSDS's provide much good information, they can have errors, the data can be incomplete, etc. - in short, they may not tell the whole story. That is why it is equally important to look at the cleaning product labels, in addition to the accompanying MSDS's. Look for warnings on the labels such as CORROSIVE, CAUTION, WARNING, DANGER,

POISON, FLAMMABLE, COMBUSTIBLE, etc. If, after reviewing the MSDS and the product label you are still unable to make a decision as to the safety of the product, contact the product manufacturer, vendor, distributor, etc. and request additional information.

4.3 Step Three - Listing Product Attributes

Identifying health and safety impacts of your cleaning products is not enough. You will need to take the information that you learned (via the MSDS's, product labels, etc.) and develop standards that you can compare your products against. Unfortunately, there are no universal standards that have been established to determine if certain cleaning products are environmentally preferable. However, some organizations have identified "attributes" they consider when purchasing environmentally friendly cleaning products. Several EPP projects have been implemented that focused on janitorial cleaning products. These include a joint study conducted by the Government Services Administration (GSA) and the EPA in 1993, and a second program implemented in the City of Santa Monica. Both studies (among others) are included in **Chapter 6 - EPP Case Studies** and have identified key environmental attributes that were considered when purchasing environmentally friendly cleaning products. These attributes are presented below.

-  Skin/Eye Irritation - the potential for adverse reactions from skin/eye exposure to the product.
-  Chronic health risks - the likely chronic health risks from skin and inhalation exposure to the product.
-  Biodegradability - toxic chemicals usually degrade to less toxic forms. The faster a chemical degrades, the lower the exposure potential. As a rule of thumb, for an "environmentally-preferable" product, more than half should biodegrade within 28 days. The balance of the product should biodegrade within a few months after its application.

- 📖 Carcinogens - products that contain known or suspected carcinogens (cancer causing) should not be used.
- 📖 Percentage of volatile organic compounds (VOCs) - VOCs are known to contribute to smog formation and create health risks. Products that do not contain VOCs in concentrations that exceed 10% of the weight of the product are preferred.
- 📖 Amount of product packaging - products with reduced packaging decrease the volume of waste that must be disposed.
- 📖 Presence of ozone depleters - ozone-depleting compounds should be minimized. Click on this link, <http://www.epa.gov/ozone/ods.html> to view a list of ozone-depleting substances provided by the U.S. EPA.
- 📖 Potential exposure to the concentrated cleaning solution - the product dispensing method should include safety precaution designs to minimize exposure to the concentrated solution.
- 📖 Flammability - non-flammable products are preferable.
- 📖 Presence of fragrances and dyes - cosmetic additives can be considered unnecessary additives that increase overall life-cycle impacts and that could increase health and safety and ecological concerns.
- 📖 Energy needs - products that work effectively in cold water reduce energy consumption.
- 📖 Presence of petroleum or hydrocarbons - petroleum or hydrocarbon chemicals should be minimized whenever possible.
- 📖 Corrosiveness - does the product have an unusually low or high pH? Water has a pH of 7.0.

These attributes are not meant to be inclusive of all attributes that other organizations have identified. However, they provide an excellent framework from which your school can develop an environmentally friendly procurement program for janitorial cleaning

products. **Appendix E** contains a blank EPP *Selection Criteria Checklist* with a list of attributes that your school may want to use. For simplicity, the checklist does not include all attributes listed in this chapter. Also included in **Appendix E** is a sample *Selection Criteria Checklist* for a glass cleaner.

4.4 Step Four - Developing a Purchasing Policy/Bid Specifications

You must develop bid specifications for your potential vendors. This will take some time, but the effort is well worth it. Develop the bid specifications so that they are clear and easy to understand. It will require much less of your time in the long run if the specifications are easy to read and very succinct. Your bid specifications will include the same attributes you selected from the previous section.

To help you develop your own bid specifications, an example is included in **Appendix F**. Although this may be more detailed than what you initially need, it should give you a good start. It is probably a good idea to require product samples as part of your bid specifications so you can test them at your school.

4.5 Step Five - Identifying Alternative Cleaners

Finding a list of vendors, let alone a list of alternative cleaners can be a time-consuming project. It is best to start with your current vendor to see if they carry the products that you are seeking. The next step is to search other vendors and find out the types of products they may carry.

Your current vendor, along with others you may contact may not readily have the information necessary to make your decisions. But, you are in the driver's seat, if they want your business, they will do what is necessary. It will likely take time and patience.

They are probably not accustomed to their customers asking for the kind of information you need. Ask for MSDS's for the products you want. If these are not readily available, request that they get this information from the manufacturers directly. They may not want to go to this trouble. You can either try to find another vendor, or ask who the manufacturer is and make a request for the MSDS's directly. Always ask for samples of the products that you are interested in. Many vendors will want to visit your school to demonstrate their product. Take them up on this. This will give you an opportunity to meet them directly and determine if they are someone that you want to do business with. Be sure to arrange their visit with your custodial staff. They will want to be there for the product testing.

4.6 Step Six - Make the Switch!

You have come this far, now it is time to finish the job. You will want to establish a target date when you would like to have your EPP program in place. Without a target date, it is easy to get sidetracked, and before you know it, too much time has elapsed along with any enthusiasm your school may have had. It is important to establish a realistic target date; too short and you are sure to miss it, too long and folks may lose interest. There is no rule of thumb here. You will have the best idea as to how long it will take your school to implement the program.

Training will be absolutely necessary. Your new products may require a completely different approach; therefore it will be necessary to arrange training for your custodial staff. Ask the vendor that you have selected to provide training to use their product. If they want your business, they will be happy to provide this training. Remember, this is something new, so don't be alarmed if your staff is less than enthusiastic. It is important to explain why you are changing the program, and stress the health benefits they can

expect. Change for no reason will be met with frustration, lack of cooperation, and ultimately may result in your program failing.

Don't forget that as you phase the program in, you will need to dispose of your old cleaning products. There are several options you have available:

- Donate them to other organizations that can use them;
- See if your vendor will take them (not very likely, but it won't hurt to ask); and
- Proper disposal - make sure you know the proper disposal method for all of your old products! Contact the Kentucky Division of Waste Management at 502-564-6716 with disposal questions.

Remember, you may have limited storage for your cleaning products, so it is best to try and dispose of as many of your old cleaning products as possible, before your new, environmentally friendly products arrive!







Chapter 5

5.0 Evaluate Your EPP Program's Success

In Spring 2002, KPPC will mail a follow-up survey to all schools associated with this grant. The scope of the survey will address whether or not the schools implemented or attempted to implement an EPP program based upon information received through the Buy Clean training program conducted in October 2001. The survey will attempt to quantify any changes the schools experienced based upon implementation.

Information obtained through the survey is crucial, as it will provide an idea of whether or not this program is feasible to implement within the existing school structure. It will also indicate whether the information provided in the training manual was sufficient to allow schools to implement the program without additional technical oversight. Input from the survey will be used in developing any future revisions to the manual.

Topics to be addressed in the survey include:

-  A copy of the initial *Product Inventory Sheet* and *EPP Selection Criteria Checklist* filled out by the school at the beginning of the process.
-  A list of alternative products selected to be used and what original products each replaced along with an updated *EPP Selection Criteria Checklist*.
-  Any cost factors associated with the change addressing whether new products selected are more expensive or less expensive than existing products.
-  Staff acceptance and involvement in the project.
-  Overall school climate on implementing the program.
-  Any physical or environmental changes experienced since implementation.

- ✎ Reasons for not participating for any schools who did not attempt to implement the EPP program.
- ✎ Reasons for failing to implement the program for those who attempted but did not follow-through.

Chapter 6

6.0 EPP Case Studies

Three different EPP Case Studies focusing on janitorial cleaning products are covered in this chapter. These include:

- [City of Santa Monica](#);
- [Yellowstone and Grand Teton National Parks](#); and
- [Joint Government Services Administration and EPA Project](#).

A brief discussion of each project is provided below:

6.1 City of Santa Monica

The City of Santa Monica, California has a population of 90,000 and generates more than \$520 million per year on tourism. In 1998, the city decided to replace their janitorial cleaning products with more environmentally friendly substitutes. Through this project, they were able to eliminate 3,200 pounds annually of hazardous materials by replacing 15 of 17 cleaning products with less toxic or nontoxic alternatives. In addition, they were able to reduce their spending by five percent on custodial products.

6.2 Yellowstone and Grand Teton National Parks

Yellowstone and Grand Teton National Parks significantly reduced the toxicity of their janitorial cleaning products. During the product inventory, 130 different cleaning products were identified in use at Yellowstone; another 30 were found on shelves but were not being used. Many of the products contained chemicals known to have significant health impacts to workers. The parks chose to use the bid specifications that were first developed by the City of Santa Monica. Important lessons learned during this project included:

- Early coordination with warehouse manager and purchasing departments;
- Identifying someone that will serve as the "champion" to push the project along; and
- Obtaining top management support that is regularly communicated.

6.3 GSA and EPA Cleaning Products Pilot Project

A cooperative effort between the U.S. General Services Administration (GSA) and the U.S. Environmental Protection Agency (EPA) was initiated to facilitate the purchase of environmental preferable cleaning products. The joint GSA/EPA project team developed a matrix that can be used to identify and compare commercial cleaning products with reduced impacts to human health and the environment.

Chapter 7

7.0 EPP Resources

There are many different resources available for environmentally preferable purchasing. Many of the sites listed on the following pages will include additional links to still other sites with even more information.

7.1 EPP Online Resources

EPA's Environmentally Preferable Purchasing Program Web Site

www.epa.gov/oppt/epp

Includes EPA's guidance on EPP, descriptions of federal pilot projects, and tools and resources - including the EPP database, collections of case studies, and electronic copies of the EPP Update.

EPP Update

www.epa.gov/opptintr/epp/docupdates.htm

EPA's semi-annual newsletter on EPP program activities. Issues of this publication are available online.

EPP Database

<http://notes.erg.com>

Contains information on more than 600 products and services. It provides links to contract language and specifications created and used by federal and state governments and others to buy environmentally preferable products and services.

EPPNET

www.nerc.org/eppnet.html

The Northeast Recycling Council (NERC) established the EPPNET list server to link federal, state, local, and private procurement and environmental officials. Potential participants must first register for approval.

Hospitals for a Healthy Environment (H2E) Environmentally Preferable Purchasing Guide

www.geocities.com/EPP_how_to_guide

While aimed at hospitals, the principles and steps in this EPP guide are applicable to any type organization. This Web site is a cooperative project of the U.S. EPA and the American Hospital Association.

National Pollution Prevention Roundtable (NPPR) EPP Discussion Group

www.p2.org/workgroup/epp

The EPP Discussion Group was formed in 1999 to promote networking and communication among people practicing EPP and people interested in learning about EPP; minimize duplication of effort on EPP issues through increased communication; and serve as a resource to NPPR members interested in EPP.

The Environmentally Preferable Purchasing Guide

www.swmcb.org/EPPG/1_1.htm

Published by the Solid Waste Management Coordinating Board, a group consisting of six metropolitan counties in Minnesota, this online EPP guide is aimed at government and school purchasers. The guide reviews more than 30 product areas, providing information on cost, performance, specifications, and availability.

King County, Washington Environmental Purchasing Program

www.metrokc.gov/procure/green

King County's Web site provides a history of the county's EPP policies, descriptions of its experience with various environmentally preferable products, bid and contract specifications, and local vendor information.

Massachusetts Environmentally Preferable Products Procurement

www.state.ma.us/osd/enviro/enviro.htm

The Commonwealth of Massachusetts is one of the first states in the country to initiate an EPP program. Its Web site includes state EPP policies and regulations, bid and contract specifications, and product information and experience.

Minnesota Materials Management Division Environmentally Responsible Purchasing

www.mmd.admin.state.mn.us/envir.htm

Provides new updates on various products available to state agencies, lists environmentally responsible products and services available, highlights state legislative and executive order requirements, and includes an electronic version of the state's biennial report on EPP.

City of Santa Monica's Purchasing Policy

www.ci.santa-monica.ca.us/environment/policy/purchasing

Provides criteria for procuring products and services, negotiating contracts and bid specifications, and complying with city ordinances through environmental preferable purchasing.

Office of the Federal Environmental Executive

www.ofee.gov

The Office of the Federal Environmental Executive serves to implement E. O. 13101, which is designed to further expand and strengthen the federal government's commitment to recycling and buying recycled-content and environmentally preferable products. The Web site contains various reports and resources.

U.S. Department of Energy's Federal Energy Management Program (FEMP)

www.eere.energy.gov/femp

FEMP seeks to help government agencies reduce energy and water use, manage utility costs, and promote renewable energy. The Web site provides information about the program's mission, technical assistance resources, and documents highlighting program success stories.

Medical Academic and Scientific Community Organization, Inc. (MASCO)

<http://www1.netcasters.com/mercury/>

MASCO has developed a mercury database for 1,147 different compounds. Users can select one of the compounds listed from the database and then calculate the quantity of mercury in the compound based upon the total amount used.

Cleaner Technologies Substitute Assessment (CTSA)

<http://www.epa.gov/opptintr/dfe/tools/ctsa.htm>

CTSA is a methodology for evaluating the comparative risk, performance, cost, and resource conservation of alternatives to chemicals currently used by specific industry sectors. It was developed by the EPA Design for the Environment (DfE) Program, the

University of Tennessee Center for Clean Products and Clean Technologies, and other partners in voluntary, cooperative, industry-specific pilot projects.

7.2 EPP Documents

To order hard copies of these publications (except WasteWise Updates), contact the Pollution Prevention Information Clearinghouse at 202-260-1023 or by e-mail: ppic@epa.gov. The following documents are also available online at www.epa.gov/opptintr/epp/documents/doccase.htm

Federal Pioneers: Environmentally Preferable Purchasing Stories from the Federal Government

EPA 742-F-00-008. September 2000.

Includes case studies on 27 successful applications of EPP in the federal government. The examples include everything from photocopiers to custodial services. They are from a diverse group of agencies - from the Department of Interior to the Navy - demonstrating the different ways EPP can be applied and providing models for other federal purchasers.

Private Sector Pioneers Report

EPA742-R-99/001. June 1999.

Highlights the EPP efforts of 18 private companies. Besides expanding the market of green products, many of the companies in the report are preventing pollution and saving millions of dollars through EPP.

State and Local Government Pioneers: How State and Local Governments Are Implementing Environmentally Preferable Purchasing Practices

EPA742-R-00/004. November 2000.

Illustrates how more than 40 state and local governments are implementing EPP. The study shows that green purchasing is expanding beyond recycled content products to include many other environmental attributes, such as chlorine-free, reduced volatile organic compounds content, use of alternative fuels, and reduced product packaging.

Green Spending: A Case Study of Massachusetts' Environmental Purchasing Program.

EPA742-R-98/002. August 1998.

Highlights the unique approach taken by the Commonwealth of Massachusetts in its environmental purchasing program. The commonwealth's proactive decisions regarding environmental purchasing have made the state a leader among state governments in EPP.

Leading by Example: How EPA Incorporated Environmental Features into New Buildings.

EPA742-R-98/001. January 1998.

Provides two case studies to demonstrate how large building projects can cost-effectively incorporate environmental features, while also addressing the concerns unique to each site. The case studies describe how EPA balanced function, cost, and environmental impact while designing and constructing two new EPA facilities.

Defending the Environment at the Department of Defense.

EPA742-R-99/002. July 1999.

Documents how the U.S. Department of Defense (DOD) introduced EPP into routine renovations of the Pentagon and several other DOD facilities.

Chapter 8

8.1 Glossary of Environmentally Preferable Purchasing Terms

Acids - Solutions with a pH range between 0 to 6.9. They are corrosive between pH 0 and 2.0 and produce severe burns on contact. See also pH.

Uses: Many cleaning products (e.g., delimers, bathroom cleaners, bowl cleaners) are acidic.

Acute health effects - Effects which occur rapidly as a result of short-term (usually less than 24 hours) exposures. Acute effects are usually of short duration, but long-term effects can occur after one exposure. Examples include irritation, corrosivity, chemically induced unconsciousness (narcosis), or death.

Acute toxicity: The potential of a chemical substance to cause adverse health effects from short-term exposure.

Aerosol propellants - Gases used to pressurize spray products. Chlorofluorocarbons, which deplete the ozone layer, may be found in old cleaning products. Today other chemicals, such as isobutene, a petroleum product may be used. Hydrocarbon propellants like isobutene contribute to smog problems because of their contribution to tropospheric (ground level) ozone formation.

Alkalies (bases) - Solutions with a pH range between 7.1 to 14.0. An alkali is corrosive when pH is higher than 11.5. See also pH.

Uses: Many cleaning products (e.g., bleach, detergents, dishwashing soaps, drain openers and oven cleaners) are alkalies.

Ambient air pollutants: Pollutants for which ambient air quality standards have been developed. These pollutants include nitrogen dioxide, sulfur dioxide, ozone precursors, particulate matter, carbon monoxide, and lead.

Bioaccumulate: The process where chemicals are collected and stored in plant and animal tissue. Some products may contain ingredients that will be taken up by smaller aquatic plants and animals and increase in concentration through the food chain as these plants and animals are consumed by larger animals.

Biobased product: Commercial or industrial products (other than food or feed) that utilize biological products or renewable, domestic, agricultural (plant, animal and marine), or forestry materials.

Biodegradable: The ability of a substance, material or product ingredient to readily decompose under natural conditions by the action of microbes.

Biological oxygen demand (BOD) - Refers to increase use of oxygen by microorganisms in surface water when they metabolize organic chemicals. The total BOD load in an aquatic ecosystem is an important water quality parameter because this increased use of oxygen reduces amounts available to aquatic organisms like fish. At the same time, it is important to note that the availability of carbon sources (essentially what BOD measures) is often not the primary limiting factor in the growth of microorganisms in an aquatic ecosystem. In many aquatic ecosystems, other nutrients grow and it is the additional loading of these nutrients, rather than carbon, that is the primary factor in excessive microbial growth and oxygen depletion.

Carcinogen - Chemical capable of causing cancer.

Cardiac sensitizer - Chemical which, upon repeated exposure, can in some persons cause the heart to become sensitive to the stimulant properties of epinephrine (which is produced by the body's adrenal glands). Subsequent exposure to the sensitizer may cause fatal cardiac arrhythmias. Some chlorinated solvents are sensitizers.

CAS number - Chemical Abstract System number. A unique number used to identify each chemical.

Central nervous system depressant - Chemical toxic to neurons in the brain. With increasing acute exposure, CNS depressants cause headache, dizziness, confusion euphoria, drowsiness, loss of consciousness and death through inhibition of breathing. Chronic exposure may cause tremors, personality changes, visual impairment, and loss of hearing, memory, or intellectual capacity. Many organic solvents are CNS depressants.

Chronic health effects - Effects which generally occur as a result of long-term exposure, and are long duration. Examples include cancer, liver damage and chronic bronchitis.

Chronic toxicity: A chemical that is toxic over continual/repeated exposure.

Combustible - A substance having a flash point at or above 100° Fahrenheit up to and including 150° Fahrenheit, according to the Consumer Product Safety Commission. The Occupational Safety and Health Administration defines a combustible liquid as having a flashpoint at or above 100° Fahrenheit but below 200° Fahrenheit.

Corrosive - Chemical which, upon contact can cause deep tissue damage, such as burns to eyes or skin.

Dyes - (Includes azo, basic disperse, fiber-reactive, vat dyes and fluorescent agents) May cause allergic reactions.

Uses: As colorants or whitening agents in many products, including all-purpose cleaners, disinfectants, fabric softeners.

Flammable - A substance having a flashpoint above 20° and below 100° Fahrenheit, according to the Consumer Product Safety Commission. An extremely flammable substance has a flashpoint at or below 20° Fahrenheit.

Flashpoint - Lowest temperature for sufficient vapor to form in the presence of oxygen to permit ignition.

Fragrances - Any of 4,000 chemicals. May cause skin irritation, discoloration, rashes or allergic reactions. May be irritating to the eyes and respiratory tract.

Uses: Many cleaning products, either to simulate the smell of "fresh air", flowers, etc., or to mask odors of other chemicals in the product.

Hazardous ingredient - Toxic, corrosive, ignitable, or reactive ingredient.

Incompatible - Chemicals which are incompatible react violently or produce toxic byproducts.

Irritation - Redness, swelling or tissue damage caused by chemicals. The degree of irritation is dependent on dose. Chemical irritation may result in mild skin itching, or fatal damage to the lungs.

LC50/Lethal concentration - A measure of acute toxicity. The lethal concentration that if inhaled will kill half of a group of organisms in an experiment in a given time. In EPA's Toxic Substances Control Act program, a chronic LC50 or EC50 <0.1 mg/L is highly toxic; and a chronic LC50 or EC50 > 10 mg/L is a low toxicity.

LD50/Lethal dose - A measure of acute toxicity. The lethal dose that will kill 50% of lab animals exposed to it orally or through the skin. The lower the LD50, the more toxic the compound.

Mutagen - A chemical that can alter genetic material in humans.

Organic chemical - A chemical which contains carbon. Chemicals which do not contain carbon are termed "inorganic".

Oxidizer (oxidizing agent) - A chemical capable of reacting with other chemicals in an "oxidation" reaction. Chemical reactions involving strong oxidizers may release heat or be explosive.

Ozone depletion - Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbons or halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.

pH - A measure of the acidity or alkalinity of a solution. A pH of 7 is considered neutral. A pH greater than 7 indicates alkalinity. A pH less than 7 indicates acidity. In the absence of specific test data on irritation, pH provides some insight into whether a product will be corrosive or cause irritation. Products with very high or very low pH (11.5 or 2) should be assumed to be corrosive. High or low pH values (e.g., between 9 and 11, or between 4 and 2) indicate the product would be more irritating than neutral pH products where the pH is closer to 7.

Sensitizer - A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction after repeated exposure to the chemical.

Solvent - Liquid used to dissolve other substances. Aqueous solvents consist primarily of water, while organic solvents can include a variety of organic chemicals such as acetone, benzene, toluene, ethyl acetate, xylene and turpentine. Most organic solvents are Volatile Organic Compounds (VOCs) that contribute to smog problems because of their contribution to tropospheric (ground level) ozone formation.

Teratogen - A chemical that causes malformation in the fetus and/or birth defects in humans.

Volatile Organic Compounds (VOCs) - In this context, VOC means any organic compound (carbon containing) which has a vapor pressure of greater than 0.1 mm Hg or, if the vapor pressure is unknown, has 12 or fewer carbon atoms. VOCs in cleaning products are of potential concern because of indoor air exposures to office workers and others. They are also of concern because they contribute to the formation of smog in outdoor air. Some

chemicals considered VOCs include acetone, benzene, perchloroethylene, among many others.

8.2 Glossary of Common Cleaning Chemicals

Acetone [CAS No. 67-64-1] - Flammable volatile liquid with distinctive odor. Reacts explosively with hydrogen peroxide. Irritating to eyes, respiratory tract and skin. May be absorbed by inhalation. Can cause changes in liver's ability to metabolize inhalation. Can cause damage, dizziness, sedation and coma.

Uses: Spot and graffiti remover, solvent.

Ammonia compounds - (Includes ammonium chloride [CAS No. 12125-02-9], ammonium hydroxide [CAS No. 1336-21-6], benzalkonium chloride [CAS No. 8001-54-5]) - Usually liquids with a pungent odor. Corrosive in concentrations found in commercial products (over 10%). Forms irritating chloramine gas when combined with chlorine-containing products. Fumes can cause irritation of the eyes, respiratory tract. Liquid can cause skin burns. Toxic to fish, and reduces oxygen in surface water.

Uses: In many cleaning products, depending on concentration, as antiseptic, bactericide, fungicide, sanitizer, deodorant. Used in detergents as a surfactant. Also found in floor polish, glass window cleaners, household hard surface cleaners, rug and upholstery cleaners.

Ammonium chloride [CAS No. 12125-02-9] Colorless crystals which are soluble in water and ammonia. Dust is mildly irritating to eyes, nose and throat. See also Ammonia compounds, Quaternary ammonium chloride. Ammonium chloride is harmful to aquatic life in very low concentrations.

2-Butoxy ethanol [CAS No. 111-76-2] (Also known as Ethylene glycol monobutyl ether; Monobutyl ethylene glycol) - Incompatible with bleach. May damage eyes and respiratory tract. Absorbed defects in lab animals. With chronic exposure, causes central nervous system toxicity, testicular atrophy.

Uses: In many cleaning products, including glass, window and all-purpose cleaners.

Benzene [CAS No. 71-43-2] - Flammable liquid with a sweet odor. Toxic to bone marrow, and cause of leukemia in humans. In 1978, the Consumer Product Safety Commission outlawed its use in many cleaning products, although it may still be found in old stocks. Degrades slowly. See BOD discussion.

Uses: Spot remover, carpet spotter, laundry starch preparations.

Carbolic Acid - See Phenol

Caustic soda - See Lye.

Chlorine [CAS No. 7782-56-5] (including sodium hypochlorite, Clorox) - Strong oxidizer. Produces toxic chloramines gas when mixed with ammoniated cleaning products. Corrosive to eyes and skin. Fumes are irritating or corrosive to the respiratory tract. Can kill microscopic life in waterways, septic tanks and sewage treatment plants. Toxic to aquatic life.

Uses: Bleach, disinfectants, all-purpose cleaners, mildew remover, bathroom cleaners, spot removers, or in scouring powders.

Chlorine dioxide [CAS No. 10049-04-4] (chlorine oxide) - Strong oxidizing gas which can be dissolved in cold water. It may react with hot water or steam to produce toxic and corrosive fumes of hydrochloric acid. Severe respiratory and eye irritant.

Uses: Bactericide & antiseptic.

Dichloromethane - See Methylene chloride.

Dimethylbenzene - See Xylene.

Ethanol (alcohol) [CAS No. 64-17-5] - Clear liquid which can be absorbed by inhalation and across skin. Central nervous system depressant. Vapors can produce some eye and upper respiratory tract irritation.

Uses: Detergents, disinfectants, carpet cleaners, tub and tile cleaners, air fresheners.

Ethylene glycol monobutyl ether - See 2 - Butoxy ethanol.

Limonene (d-Limonene, 4-isopropenyl-1-methylcyclohexene [CAS No. 5989-27-5]) - A flammable, colorless liquid in some plants. Skin irritant, sensitizer. If ingested in sufficient quantity, may be toxic to kidneys. When heated to decomposition, emits acrid smoke, fumes.

Uses: Aerosol, non-aerosol deodorants/air fresheners, bathroom tub and tile cleaners, hard surface cleaners, liquid laundry detergents, dry cleaning pre-spotter, polishing preparations, mechanics soap, oven cleaners, rug/upholstery cleaners, other specialty cleaning and sanitation products.

Lye (caustic soda, sodium hydroxide [CAS No. 1310-73-2], potassium hydroxide [CAS No. 1310-58-3]) Corrosive white crystals or colorless liquid. Liquid may cause severe eye burns or blindness, or skin burns with subsequent tissue scarring.

Vapors are irritating to the eyes and respiratory tract. Aerosol formulations present an inhalation hazard.

Uses: Drain opener, oven cleaner, detergents.

Methylbenzene - See Toluene.

Methylene Chloride (methylene dichloride; dichloromethane) [CAS No. 75-09-2].

Colorless liquid. Incompatible with strong oxidizers and caustics. Central nervous system depressant. Probable human carcinogen.

Uses: Disinfectant, all-purpose cleaner, degreaser, septic tank cleaner, laundry starch preparations, rug and upholstery cleaners.

Monobutyl ethylene glycol - See 2-Butoxy ethanol.

Naphthalene [CAS No. 91-20-3] White crystalline solid with the odor of mothballs. Skin exposure may cause severe dermatitis. Irritating to eyes and respiratory tract.

Inhalation may cause headache, nausea, confusion, damage to red blood cells. Possible human carcinogen.

Uses: Detergents, air fresheners, spotters.

Nitrobenzene [CAS No. 98-95-3] - A yellow oily liquid with an odor like shoe polish. May be absorbed via inhalation and through the skin. Chronic inhalation may cause liver damage. May bind with blood to reduce oxygen availability. Central nervous system depressant.

Uses: Furniture polish, floor polish.

Perchloroethylene (tetrachlorethylene; ethylene tetrachloride; PERC) [CAS No. 127-18-4]

- Colorless volatile liquid about $1 \frac{1}{2}$ times heavier than water. Central nervous system depressant, liver and kidney toxicant. Inhalation may cause respiratory tract irritation or cardiac arrhythmias. Irritating to the skin and eyes on direct contact. When released in water, can smother small aquatic life. Can be toxic to sewage treatment bacteria.

Uses: Graffiti remover, carpet spotter, metal cleaner, degreaser, dry cleaning solvent, furniture polish, household hard surface cleaners, laundry starch preparations, oven cleaner.

Petroleum distillates - The lighter liquid hydrocarbons refined from crude oil by distillation, including petroleum ether, naphtha, mineral oil, mineral spirits, Stoddard solvent and kerosene. (Heavier distillates include propane and butane). Liquid petroleum distillates contain varying, but usually small amount of aromatic hydrocarbons (benzene, toluene, xylene, cycloparaffins, naphthenes). Liquid petroleum distillates are flammable. They are skin, eye and respiratory tract irritants. See also volatile organic compounds.
Uses: Found in many janitorial cleaning products.

Phenol (carbolic acid) [CAS No. 108-95-2] - Colorless crystals, which can be dissolved in water or some organic solvents. Liquids have sweetish, sickening odor and can burn skin and eyes. In aqueous solution, phenol is not highly volatile, but it is readily absorbed through the skin. Abnormal pigmentation commonly occurs following dermal contact with phenol compounds. Vapors are strongly irritating to eyes, nose and throat. Exposure by inhalation to a low concentration of phenol six times for five minutes produced increased sensitivity to light.

Uses: In detergents, disinfectants, deodorants, furniture polish, air fresheners, mold and mildew removers.

Phosphates - Phosphate-containing compounds increase biological oxygen demand in surface water.

Uses: In detergents, bathroom cleaners, floor strippers.

Phosphoric acid [CAS No. 7664-38-2] - Colorless, odorless liquid. Corrosive to ferrous metals and alloys. Should not be mixed with bleach or ammonia. Phosphorus-containing compounds increase biological oxygen demand in surface water. When used as an agent for metal cleaning, phosphoric acid may react with impurities in the metal and release phosphine gas.

Uses: Metal brightness, cleaners, detergents, sanitizers.

Pine oil [CAS No. 8002-09-3] - Flammable liquid. An irritant to the eyes, upper respiratory tract and skin. May cause mild respiratory and central nervous system depression, and kidney toxicity.

Uses: In floor polish, glass window cleaners, hard surface cleaners, liquid detergents, toilet bowl cleaners, disinfectants.

Potassium metabisulfite [CAS No. 16731-55-8] - Colorless crystals which are soluble in water and ammonia. Dust is mildly irritating to eyes, nose and throat. See also Sulfur compounds.

Uses: Washing powders.

Quaternary ammonium chloride (dodecyl dimethyl ammonium chloride) [CAS No. 7135-51-5] A flammable liquid. Corrosive. An irritant to the eyes, skin, upper respiratory tract. May cause central nervous system depression. Ingestion may cause pain, swelling, breathing difficulty, convulsions. Ammonium chloride is harmful to aquatic life in very low concentrations.

Uses: Disinfectant, sanitizer.

Sodium bisulfite - See Sulfur compounds.

Sodium dodecyl benzene sulfonate [CAS No. 25155-30-0] - Environmental hazard. Increases biological oxygen demand in surface water. See also Biological oxygen demand.

Uses: As a wetting agent (surfactant) in heavy duty laundry products; metal cleaners, specialty cleaners and sanitation products.

Sodium hydroxide - See Chlorine.

Sulfur compounds (Including potassium metabisulfite [CAS No. 16731-55-8] and sodium bisulfate [CAS No. 7631-90-5]) - Corrosive irritant to skin, eyes, and mucous membranes; sulfur-containing compounds may be allergenic and may produce skin rashes or difficulty breathing in persons with asthma. When used in rust removers, may produce fumes of sulfur dioxide, a respiratory irritant.

Uses: Antioxidant and preservative in a variety of cleaning products.

Tetrachloroethylene - See Perchloroethylene.

Toluene (methylbenzene) [CAS No. 108-88-3] - Volatile, flammable liquid with strong chemical odor. Eye, skin and respiratory irritant. Central nervous system depressant. Cardiac sensitizer. Prolonged or repeated exposure may cause liver, kidney damage or anemia. Exposure during pregnancy may result in birth defects.

Uses: Solvent in a variety of products such as graffiti remover, floor polish, furniture polish, laundry starch preparations, household hard surface cleaners.

Trichloroethane (1,1,1-trichloroethane [CAS No. 71-55-6]; 1,1,2-trichloroethane [CAS No. 79-00-5]) - Colorless liquid with mild chloroform-like odor. Because it is four times heavier than air, vapors tend to collect in low spaces. Corrosive to aluminum. Repeated dermal exposure may result in skin irritation. Central nervous system depressant. Cardiac sensitizer. The 1,1,1-isomer is also a Class 1 ozone depleter (like CFCs) being phased out under the Clean Air Act.

Uses: Solvent, degreaser, spotting fluid, drain cleaner; formerly used as an aerosol propellant.

Trichloroethylene [CAS No. 79-01-6] - Colorless liquid with mild chloroform-like odor. Because it is four times heavier than air, vapors tend to collect in low spaces. Suspected human carcinogen. Central nervous system depressant. Cardiac sensitizer. Associated with birth defects of the heart, and in animals, decreased fetal weight and abnormal sperm.

Uses: Degreaser, solvents, graffiti remover.

Xylene (dimethylbenzene) [CAS No. 1330-20-7] - Colorless, flammable liquid with a sweet odor. May attack some forms of plastic and rubber. Incompatible with strong oxidizers. Vapor may cause irritation of the eyes, nose and throat. Central nervous system depressant. Chronic exposure to xylene may cause dry irritated skin, reversible eye damage, anemia and toxicity to white and red blood cells.

Uses: Solvent, air fresheners, stainless steel cleaner, floor polish.

Appendix A
Product Inventory Sheet

Product Inventory Sheet

School: _____

Date: _____

Product Name	Use	Quantity Used (per month)		Quantity In Stock	
		Lbs.	Gals.	Lbs.	Gals.
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					

Appendix B
Explanation of Sample Material Safety Data Sheets

INTRODUCTION TO MATERIAL SAFETY DATA SHEETS (MSDS)

An understanding on how to interpret an MSDS is your best defense against accidents and injury. On the following pages are descriptions of the sections contained in an MSDS, and short notes that will help you find and interpret the information the Occupational Safety and Health Administration (OSHA) requires on a typical good-quality sheet.

There is no single mandatory format for the MSDS. Therefore each MSDS may look a little different, but all will provide, at a minimum, the required information as mandated by OSHA's Hazard Communication Standard. Variety will occur in the section titles, and contents of sections. Some manufacturers may be more explicit with their information than others.

I. CHEMICAL IDENTIFICATION

This section, (also denoted as Product Information, or Material Identification) identifies the chemical or trade name product on the label, and its supplier. The manufacturers name, address, telephone number, and emergency telephone number will be located here. This section may also contain descriptive terms to further help identify the material, such as chemical family, molecular weight, and chemical formula. The material identity, including its chemical, common names and synonyms will be found in this section. For example, brand name or trade name: Clorox; chemical name: sodium hypochlorite; common name: bleach.

II. COMPONENTS OR INGREDIENTS

Chemical names and percentages of the chemicals that comprise the product will be identified in this section. Some manufacturers may only list those components that present a physical or health hazard and are present at or above 1% in the mixture. If a component is identified as a carcinogen by the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), or by OSHA, it will generally be noted here, or footnoted in this section, when present at or above 0.1% in the product. **Some manufacturers use a separate section for noting carcinogenicity, or may include this status in the "Health Hazard" section.**

The only time you won't find the identity of a chemical component listed here is when the company has claimed it as a trade secret. The MSDS will still describe hazards and safety precautions of the trade secret chemicals.

III. PHYSICAL AND CHEMICAL DATA

This section describes the product appearance, odor, and other physical and chemical characteristics. Some of the following items may be applicable to the material:

Boiling Point (BP):

The boiling point is the temperature at which a liquid turns into a vapor. Flammable materials with low BPs generally present fire hazards. In the case of a chemical mixture, the manufacturer may either list the BP value as a range of temperatures or that of the component with the lowest value.

Melting Point:

The melting point is the temperature at which a solid changes to a liquid.

Boiling Point and Melting Points are helpful in preventing dangerous changes in state, such as from a liquid to a breathable gas.

Vapor Pressure:

Vapor pressures are useful in learning how quickly a material becomes airborne within the workplace and thus how quickly a worker is exposed to it. Vapor pressures reported on MSDS are in millimeters of mercury (mm Hg) at 68° F (20° C), unless otherwise stated. In the case of a chemical mixture, the manufacturer may list the value as a range or that of the component with the highest value.

For example; values less than 1.0 mm Hg at 20°C would be considered "non-volatile" and above 100 would be considered "highly volatile."

Vapor Density:

The vapor density is compared to air which equals 1. Materials lighter than air have vapor densities less than one. Materials heavier than air have vapor densities greater than one. All vapors and gases mix with air, but the lighter materials tend to rise and dissipate (unless confined). Heavier vapors and gases are likely to concentrate in low or enclosed places, and may create toxic, fire or explosion hazards.

Evaporation Rate:

The evaporation rate is the rate at which a material vaporizes from the liquid or solid state when compared to a known material's vaporization rate. This rate is useful in evaluating a material's health and fire hazards.

Specific Gravity:

The specific gravity is an expression of the density (or heaviness) of a material as compared to water = 1. Insoluble materials with specific gravity of greater than one will sink in water. Insoluble materials with a specific gravity less than one will float on water, which is an important consideration for fire suppression and spill cleanup.

Water Solubility:

Water solubility expresses the percentage of a material that will dissolve in water. Water solubility is useful in determining cleanup methods for spills and fire-extinguishing methods for a material.

pH:

The pH value represents a scale from 0-14 that describes the acidity or alkalinity of a material. Water has a pH of 7. pH is an important consideration when determining corrosive properties. Materials on the low end of the scale will be more acidic, materials on the high end of the scale will be more alkaline or caustic.

- pH 1-5 - strongly acidic (For comparison Coke & Pepsi have a pH of around 3.4)
- pH 5-7 - weakly acidic
- pH 7-9 - weakly basic/caustic
- pH 9-14 - strongly basic /caustic

Appearance and Odor:

Appearance and odor refer to the general characteristics of the material, e.g. powder, colorless liquid, aromatic odor. The visual appearance of a product is also useful as an aid in verifying the product and that it is correctly labeled.

IV. PHYSICAL HAZARDS

This section gives potential flammability and explosion hazards, recommended procedures in handling these hazards, and storage considerations. This section also contains reactivity data. Many manufacturers divide the physical hazards category into two sections, the "Fire and Explosion Data" and "Reactivity Data."

A. FIRE AND EXPLOSION DATA**Flash Point:**

The flash point is defined by the National Fire Protection Association (NFPA) as the lowest temperature at which a flammable liquid gives off sufficient vapor to form an ignitable mixture with air near its surface or within a vessel. Special precautions should be taken when the product has a low flash point. Materials

having a low flash point are a greater fire hazard than materials having a high flash point.

Flammable Limits (Explosive Limits):

Flammable limits refer to the range of flammable gas or vapor concentrations between which ignition will occur if an ignition source is present. LFL (or LEL) is the lower flammable limit. UFL (or UEL) is to the upper flammable limit. All concentrations between LFL and UFL are in the flammable range, and special precautions are needed to prevent ignition or explosion.

Ignition Temperature:

The ignition temperature is the lowest temperature at which a combustible material ignites in air and continues to burn independently of the source of heat.

Autoignition Temperature:

Autoignition temperature describes the minimum temperature to which a substance must be heated, without the application of a flame or spark, which will cause that substance to ignite.

Hazardous Decomposition Products:

This area will describe the known or expected hazardous products resulting from heating, burning, or other reactions.

Extinguishing Media:

Extinguishing media specifies the firefighting agents that should be used to extinguish fires. Some chemicals react violently in the presence of water, so other methods, such as the use of foam or CO₂ (carbon dioxide) should be followed.

Firefighting Equipment:

This will describe equipment used to protect firefighters from toxic products of vaporization, combustion, or decomposition in fire situations.

Firefighting Methods:

If unusual fire hazards are involved or special firefighting procedures mandated, this will be specified here.

NFPA Codes:

Fire Diamond - National Fire Protection Association -NFPA Hazard Rating.
Per "NFPA 704" publication. A visual system, as illustrated on the following pages, that provides a general idea of the inherent hazards, and their severity, of materials relating to fire prevention, exposure, and control. The NFPA fire diamond is read in the preferred order; (A) Health, (B) Flammability, (C) Reactivity, (D) Special.

***Position A - Health Hazard
(Blue).***

DEGREE OF HAZARD; LEVEL OF SHORT-
TERM PROTECTION

**0 = Ordinary Combustible Hazards
in a Fire**

Exposure to materials under fire
conditions will offer no hazard
beyond that of ordinary combustible
material.

1 = Slightly Hazardous

Exposure to material will cause
irritation but only minor residual
injury even if no treatment is given.

2 = Hazardous

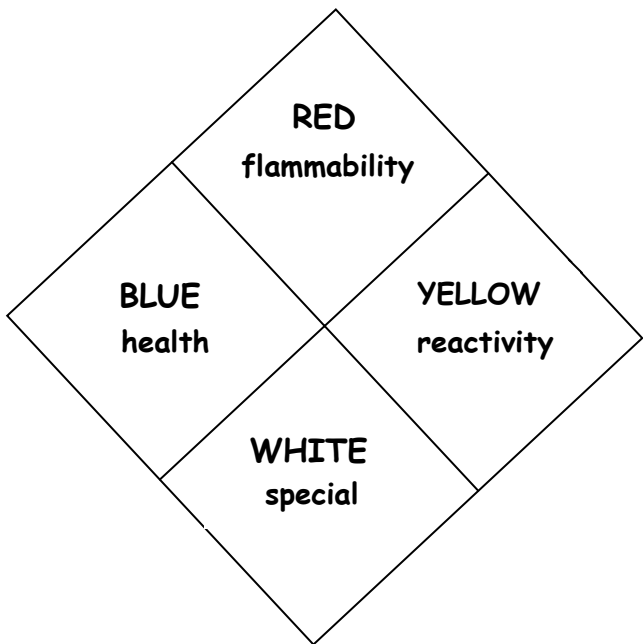
Intense or continued exposure to material can cause temporary incapacitation or
possible residual injury unless prompt medical treatment is given.

3 = Extreme Danger

Short exposure to material can cause serious temporary or residual injury even if
prompt medical treatment is given.

4 = Deadly

Very short exposure to material can cause death or major residual injury even if
prompt medical treatment is given.



Position B - Flammability (Red).

SUSCEPTIBILITY TO BURNING

0 = Will Not Burn

Material that will not burn.

1 = Will Ignite if Preheated

Flash point above 200°F. Material that must be preheated before ignition can occur.

2 = Will Ignite if Moderately Heated

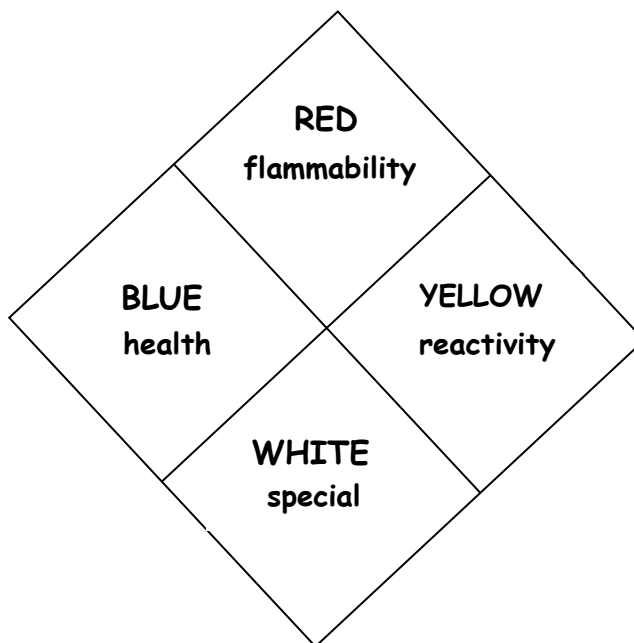
Flash point below 200°F. Material that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.

3 = Will Ignite at Most Ambient Conditions

Flash point below 100°F. A liquid or solid that can be ignited under almost all ambient temperature conditions.

4 = Burns Readily at Ambient Conditions

Flash point below 73°F. Material will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or will burn readily when dispersed in air.



Position C - Reactivity, Instability (Yellow).

ENERGY RELEASED IF BURNED, DECOMPOSED,
OR MIXED

0 = Stable and Not Reactive with Water

Material is normally stable, even under fire exposure conditions, and is not reactive with water.

1 = Unstable if Heated

Material is normally stable, but can become unstable at elevated temperatures and pressures or may react with water with some release of energy, but not violently.

2 = Violent Chemical Change

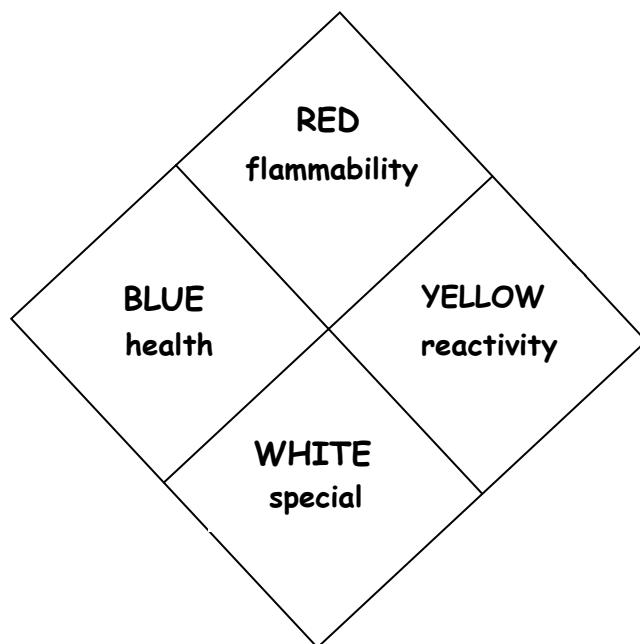
Material is normally unstable and readily undergoes violent chemical change but does not detonate. Also may react violently with water or may form potentially explosive mixtures with water.

3 = Shock and Heat May Detonate

Material is capable of detonation or explosive reaction but requires a strong initiating source; or which must be heated under confinement before initiation; or may react explosively with water.

4 = May Detonate

Material is readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.



Position D - Special Hazard (White).

OXY = Oxidizer

ACID = Acid

ALKALI = Alkali

COR = Corrosive

-W- = Use No Water, reacts!

B. REACTIVITY DATA:

This area will describe chemical incompatibilities, and whether or not the substance is stable. This section is important in determining which situations and substances to keep the product away from to avoid unfavorable conditions.

Chemical Incompatibilities:

This section will list the chemicals that might cause the product to burn, explode, release dangerous byproducts or otherwise "react" unfavorably, when they come in contact with the product.

Chemical Instabilities:

This section will describe environmental conditions to avoid, such as heat or direct sunlight, to prevent hazardous reactions.

Hazardous Polymerization:

This area will tell you if the material will polymerize, or react with itself. Hazardous polymerization is a reaction which takes place at a rate which produces rapid build-up of large amounts of energy (heat and pressure) that can lead to explosion. This section indicates whether hazardous polymerization may or may not occur, and under what storage conditions.

V. HEALTH HAZARDS

Manufacturers provide data on health hazards under a variety of section titles, including health effects, and first aid procedures. At a minimum this information should contain information regarding signs and symptoms of overexposure, primary routes of entry, first aid and emergency procedures, as well as medical conditions aggravated by overexposure.

Exposure Recommendations:

Exposure recommendations may be listed here or under the "Components or Ingredients" section. These recommendations are descriptors establishing the concentration of the chemical to which you can be safely exposed. They are often listed as permissible exposure limit (PEL) or threshold limit value (TLV).

PEL:

Permissible exposure limit is a term established by OSHA that may be expressed as a Time Weighted Average (TWA) or as a ceiling exposure limit. The PEL indicates the permissible concentration of air contaminants to which nearly all

workers may be repeatedly exposed eight hours a day, forty hours a week, over a working lifetime (30 years) without adverse health effects.

TLV:

Threshold Limit Value is a term used by ACGIH to express airborne concentration of a material to which almost all workers can be exposed without adverse effects. ACGIH expressed TLVs in three ways:

TLV-TWA: The allowable Time-weighted Average concentration for a normal 8-hour workday or 40-hour work week.

TLV-STEL: The Short-Term Exposure Limit, or maximum concentration for a continuous 15-minute exposure period (maximum of four such periods per day, with at least 60 minutes between exposure periods, and provided the daily TLV-TWA is not exceeded).

TLV-C: The ceiling exposure limit-the concentration that should not be exceeded even instantaneously.

Emergency and First Aid Procedures:

This section will describe how to administer first aid and emergency procedures in case of eye and skin contact, ingestion, and inhalation.

Primary Routes of Entry:

The MSDS will explain the most likely route of exposure and entry into your body based on properties and expected usages of the chemical or trade name product.

This may include, inhaling, swallowing, or absorption through your skin.

Acute and chronic health effects:

These sections will explain what signs and symptoms to watch out for, e.g. headache, dizziness, nausea, or rashes.

Acute health effects or acute exposure is an adverse effect due to a single or short term overexposure, with symptoms developing rapidly. It refers to the most common effects that would be expected to occur from direct contact (eye, skin, inhalation, or ingestion) of the product.

OSHA's definition of highly toxic and toxic are included on the following page:

A **highly toxic** substance is one having:

1. An oral LD₅₀ of 50 mg/kg or less.
2. A dermal LD₅₀ of 200 mg/kg or less.
3. An inhalation LC₅₀ of 200 ppm or less of gas or vapor; or 2 mg/l or less of mist, fume or dust.

A **toxic substance** is one having:

1. An oral LD₅₀ between 50 and 500 mg/kg.
2. A dermal LD₅₀ between 200 and 1000 mg/kg.
3. An inhalation LC₅₀ between 200 ppm, 2000 ppm of gas or vapors, or between 2 and 20 mg/l of mist fume or dust.

Chronic health effects or chronic exposure refer to the adverse effects that are most likely to occur from repeated, prolonged or long term exposure. It describes symptoms that develop over a long period of time, or that recur frequently.

LC₅₀ Lethal Concentration 50, or median lethal concentration:

The concentration of a material in air that on the basis of laboratory tests (respiratory route) is expected to kill 50% of a group of test animals when administered as a single exposure in a specific time period, usually one hour. The LC₅₀ is expressed as parts of material per million parts of air, by volume (ppm) for gases and vapors, as micrograms of material per liter of air (ug/l), or milligrams of material per cubic meter of air (mg/m³) for dusts and mists, as well as for gases and vapors.

LC_{Lo} Lethal Concentration Low:

The lowest concentration of a substance in air reported to have caused death in humans or animals. The reported concentrations may be entered for periods of exposure that are less than 24 hours (acute) or greater than 24 hours (subacute and chronic).

LD₅₀ Lethal Dose 50:

The single dose of a substance that causes the death of 50% of an animal population from exposure to the substance by any route other than inhalation. Other lethal-dose percentages, such as LD₁, LD₁₀, LD₃₀, and LD₉₉ may be in the scientific literature. LD₅₀ is usually expressed as milligrams or grams of material per kilogram of animal weight (mg/kg or g/kg).

LD_{Lo} Lethal Dose Low:

The lowest dose of a substance introduced by any route, other than inhalation, reported to have caused death in humans or animals.

HMIS Codes:

The Hazardous Materials Identification System, **HMIS**, was developed by the National Paint & Coatings Association (NPCA) to help employers comply with OSHA's Hazard Communication (HCS), 29 CFR 1910.1200

The system utilizes colored bars, numbers and symbols to convey the hazards of chemicals used in the workplace.

Do not confuse HMIS® labels (colored bars) with NFPA labels (colored diamonds). The two systems are similar but **not** identical.

Health (BLUE)

The Health section conveys the health hazards of the material. In the latest version of HMIS®, the blue Health bar has two spaces, one for an asterisk and one for a numeric hazard rating.

If present, the asterisk signifies a chronic health hazard, meaning that long-term exposure to the material could cause a health problem such as emphysema or kidney damage. NFPA lacks this important information because the NFPA system is meant only for emergency or acute (short-term) exposures.

According to NPCA, the numeric hazard assessment procedure is **different** than that used by NFPA. However, there was no publicly available information explaining the differences. On a qualitative level, the numbering systems are more or less identical, with a 0 to 4 scale where 0 indicates minimal hazard and 4 indicates an extreme hazard.

Flammability (RED)
According to the NPCA, the criteria used to assign numeric values (0=low hazard to 4=high hazard) are identical to those used by NFPA. In other words, in this category, the systems are identical.
Reactivity (YELLOW)
According to the NPCA, the criteria used to assign numeric values (0=low hazard to 4=high hazard) are identical to those used by NFPA. In other words, in this category, the systems are identical.
Personal Protection (WHITE)
This is by far the largest area of difference between the NFPA and HMIS® systems. In the NFPA system, the white area is used to convey special hazards whereas HMIS® uses the white section to indicate what personal protective equipment (PPE) should be used when working with the material.

VI. SPILL OR LEAK PROCEDURES

This section will describe precautions and actions to be taken in the event of a spill or leak and methods of clean-up and disposal.

VII. PROCEDURES AND PRECAUTIONS FOR SAFE HANDLING, STORAGE AND USE:

This section may alternatively be titled Special Protection, Personal Protective Equipment, or Safe Handling and Storage Requirements. This area of the MSDS contains control measures such as personal protective equipment recommendations, engineering controls and work practices that are necessary for the safe handling and use of the product. If protective equipment is needed, this section will list the specific types that are recommended, such as respirators, gloves, and goggles. Specific steps and precautions to take to safeguard your health, such as proper ventilation requirements, also are described here. Ventilation is described using two terms; local or general. Local ventilation refers an exhaust duct system with a hood or enclosure. General ventilation refers to a dilution fan in the wall or ceiling. Storage and handling requirements addressed in this section may

include such things as grounding containers during a transfer of flammables to prevent static electricity as an ignition source.

VIII. SPECIAL PRECAUTIONS OR OTHER COMMENTS:

The manufacturer may describe special precautions if there is something other than standard information the user should be aware of. Regulatory compliance issues such as Department of Transportation (DOT) policies for handling and transportation, or Resource Conservation and Recovery Act (RCRA) classification for proper disposal may also be addressed here.

Appendix C
Sample Material Safety Data Sheets

PRO-LINK Liquid Enzymes

Glass Cleaner

Powerful window cleaner... light duty all purpose cleaner. Easily removes smears, smudges, fingerprints, oils, grease, and soils. Exclusive B-52 Anti-Static Agent helps repel dust particles.

DIRECTIONS

Glass & Most Surfaces

Spray a light mist over the entire surface. Spread once and polish dry. **HELPFUL HINT:** For best results, use two cloths or paper towels — wipe off with the first and polish with the second.

Acrylic (Thermoplastic) Surfaces

PRO-LINK Glass Cleaner is excellent for acrylic surfaces. Remove loose dirt particles by rinsing surface with water. Spray a light mist over the entire surface. Use two very soft cloths or paper towels — wipe off with the first and polish with the second.

Computer & Office Machines

Always spray PRO-LINK Glass Cleaner on paper



Glass Cleaner

Glass & Acrylic Formula

- FAST WIPE-OUT
- ANTI-STATIC
- NON-FOGGING
- FILM FREE
- B-52 POLISHING AGENT

towels and then wipe the area to be cleaner. Never spray directly onto any working part.

Recommended for Use on acrylic (thermoplastic) surfaces. Excellent because it is ammonia free. Also use on any surface not harmed by water. — stainless steel, chrome, mirrors, TV screens, plastic, tile, counters, tabletops, vinyl upholstery, baked enamel surfaces, etc.

Precautionary Statements:

CAUTION:

KEEP OUT OF REACH OF CHILDREN.

Statement of Practical Treatment:

Contains Isopropanol.

Use in a well ventilated area. In case of accident, wash with soap and water. Call physician.

CONTAINS: Water [7732-18-5], Isopropanol [67-63-0]

See MSDS For Complete Safety Information.

FOR INDUSTRIAL AND INSTITUTIONAL USE ONLY

KEEP FROM FREEZING

Reorder No.

Net Contents: 32 Fl. Oz. (1 U.S. Qt.) 946 ml

Reorder No.

Marketed by/Distribuidor por:

PRO-LINK
1-800-74-LINKS

San Antonio, TX 78209 USA • London, Ontario N6H 5E1 Canada

EMERGENCY MEDICAL TELEPHONE
NUMBER 1-800-228-5635

MATERIAL SAFETY DATA SHEET



SECTION I - IDENTITY AND MANUFACTURER'S INFORMATION

PRO-LINK
8301 Broadway #301
San Antonio, Texas 78209 USA
Phone: 210-930-1191 Fax: 210-930-1712
Product Name: PRO-LINK Glass Cleaner
Date Prepared: 1-1-96
Prepared by Regulatory Affairs Department

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous components	CAS#s	OSHA PEL	ACGIH TLV	Other Limits	% (Optional)
2 Propanol	67-63-0		400 ppm		5-7

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point... 212°F
Vapor Pressure (mm Hg.)... N/E
Vapor Density (AIR=1)... N/E
Solubility in Water... Complete
Appearance and Odor... Lt. blue/Alcohol odor
Specific Gravity (H₂O=1)... 0.985
Percent Volatile By Volume (%)... 100%
Evaporation Rate
H₂O=1 Other=1 N/E

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): 123°F TCC Flammable Limits: N/A LEL: Not Det.
UEL: Not Det. Extinguishing Media: CO₂; Water Foam Special Fire Fighting Procedures: Keep away from heat, spark, or flames. Do not enter fire area without proper equipment, including self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: Treat as combustible liquid.

SECTION V - PHYSICAL HAZARDS

Stability ☐ Unstable ☒ Stable Conditions to Avoid: Elevated temperature, ignition sources.

Incompatibility: Do not mix with other chemicals.

(Materials to Avoid)

Hazardous Decomposition: Carbon Dioxide, Carbon Monoxide.

Products or By-products

Hazardous ☐ May Occur Conditions to Avoid: N/A

Polymerization ☒ Will Not Occur

SECTION VI - HEALTH HAZARDS

Route(s) of Entry: Inhalation? ☒ Skin? ☒ Ingestion? ☒
Health Hazards (1, Acute and 2, Chronic) Acute - Irritation of skin or eyes.

Chronic - Chronic data is not presently available.

Chemical Listed as Carcinogen or Potential Carcinogen:

National Toxicology Program: ☐ Yes ☒ No

I.A.R.C. Monographs: ☐ Yes ☒ No

OSHA: ☐ Yes ☒ No

Signs and Symptoms of Exposure: Irritation or burning sensation.

Medical Conditions Generally Aggravated by Exposure: Skin conditions and respiratory ailments.

Emergency and First Aid Procedures: Eyes — Flush eye immediately with plenty of water. Get medical attention. Skin — Wash off with soap and water. Inhalation — Move to fresh air. Keep at rest. Get prompt medical attention. Ingestion — Do not induce vomiting. Keep at rest. Get medical attention.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Steps To Be Taken In Case Material Is Released Or Spilled: Eliminate all sources of ignition immediately. Contain spill and ventilate area to remove fumes. Collect in an approved container with sand or absorbent clay.

Waste Disposal Method: If this material becomes a waste material, refer to latest EPA or state regulations regarding proper disposal.

Precautions To Be Taken In Handling And Storing: Keep liquid and vapors away from heat, sparks, and flame. Keep container tightly closed when not in use. Store at ambient temperatures. Use with adequate ventilation.

Other Precautions: Keep out of reach of children. Wash with soap and water after use.

SECTION VIII - CONTROL MEASURES

Respiratory Protection (Specify Type): Not required.

Ventilation: Yes Local Exhaust: Not required.

Mechanical (Gen.): As required Special: Not required Other: Not required

Protective Gloves: Rubber Eye Protection: Goggles

Other Protective Clothing Or Equipment: Not required

Work/Hygiene Practices: Good housekeeping practices apply. Wash thoroughly after handling.

NOTICE: NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OR MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OF ANY OTHER NATURE, ARE MADE WITH RESPECT TO INFORMATION CONCERNING THE PRODUCT REFERRED TO IN THIS MATERIAL SAFETY DATA SHEET. The goal of defining precisely, in measurable terms, every possible health effect that may occur in the workplace as a result of chemical exposures cannot realistically be accomplished. The information and recommendations contained in this Material Safety Data Sheet are supplied pursuant to 29 C.F.R. 1910.1200 of the Occupational Safety and Health Standards Hazard Communication Rule. The information and recommendations set forth herein are presented in good faith and believed to be correct as of the date hereof. PRO-LINK, however, makes no representations as to the completeness or accuracy thereof, and information is supplied upon the express condition that the persons receiving the same will be required to make their own determination as to its suitability for their purposes prior to use. In no event will PRO-LINK be responsible for any damages of any nature whatsoever resulting from the use of, reliance upon, or the misuse of this information. The information as supplied herein is simply to be informative and intended solely to alert the user of the substance which is the subject matter of this Material Safety Data Sheet. The ultimate compliance with federal, state or local regulations concerning the use or disposal of this compound, or compliance with respect to product's liability, rests solely upon the purchaser thereof.

EnvirOx LLC

MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT INFORMATION

PRODUCT NAME: **H₂Orange₂ Concentrate 117**

PRODUCT CLASSIFICATION: Water Soluble Cleaner

MANUFACTURER: EnvirOx LLC

P.O. Box 140, Georgetown, IL 61846

TELEPHONE: 217-662-2130

EMERGENCY TELEPHONE: 217-431-5154

SECTION II - INGREDIENTS

HAZARDOUS INGREDIENTS:

Hydrogen Peroxide < 4%

SECTION III - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: N/A

FLAMMABLE EXPLOSIVE LIMITS % BY VOLUME:

Lower: N/A
Upper: N/A

FIRE EXTINGUISHING MEDIA: CO₂ or Dry Chemical

SPECIAL FIRE-FIGHTING PROCEDURES: None known

UNUSUAL FIRE AND EXPLOSION HAZARD: None known

SECTION IV - PHYSICAL DATA

BOILING POINT:

112 Degrees F.

SPECIFIC GRAVITY (Water=1):

1.02

SOLUBILITY IN WATER:

Complete

MELTING POINT:

Unknown

PH:

3.6

APPEARANCE:

Clear

ODOR:

Citrus

SECTION V - PRODUCT HEALTH HAZARD DATA

PRINCIPAL ROUTES OF ABSORPTION:

Inhalation - N/A

Ingestion - May cause stomach upset

Skin - May cause skin irritation if left on for long periods of time.

Eye - May cause eye irritation

POSSIBLE SYMPTOMS OF OVEREXPOSURE: Dry skin or stinging sensation

EMERGENCY AND FIRST AID PROCEDURES:

Inhalation - N/A

Ingestion - Drink several glasses of water and consult physician.

Skin - If irritation occurs, rinse thoroughly with water for at least 5 minutes. Apply moisturizing cream. If irritation persists, consult physician.

SECTION V - PRODUCT HEALTH HAZARD DATA (continued)

Eye - Flush eyes with water for at least 15 minutes holding lids apart to ensure complete irrigation. If irritation persists, consult physician.

SECTION VI - REACTIVITY DATA

STABLE: Yes

STABILITY CONDITIONS TO AVOID: None known

INCOMPATIBILITY (Materials to Avoid: Strong Reducing Agents

HAZARDOUS DECOMPOSITION PRODUCTS: None known

HAZARDOUS POLYMERIZATION: Will not occur

SECTION VII - SPILL, LEAK OR DISPOSAL PROCEDURES

WASTE DISPOSAL METHOD: Biodegradable Product. Dispose of container according to state, federal and local laws.

PRECAUTIONS IN HANDLING AND STORING: Store indoors. Store away from strong reducing agents.

OTHER PRECAUTIONS TO BE TAKEN: None known

SECTION VIII - SPECIAL PROTECTION INFORMATION

VENTILATION REQUIREMENTS: Local Exhaust OK

PROTECTIVE EQUIPMENT:

Eye - Safety Glasses recommended when handling concentrate.
Skin - Rubber Gloves recommended if skin is sensitive.

OTHER PROTECTIVE PRECAUTION: None

HMIS Codes:

Health: 0
Flammability: 0
Reactivity: 0

The exact composition of this material is a trade secret.

The information contained herein is correct to the best of our knowledge. The recommendations or suggestions contained in this Data Sheet are made without guarantee or representation as to results. We suggest that you evaluate these recommendations and suggestions in your own laboratory prior to use. Our responsibility for claims arising from breach of warranty, negligence, or otherwise is limited to the purchase price of the material. Freedom to use any patent owned by anyone is not to be inferred from any statement contained herein. WITH REGARD TO THE MATERIAL, SELLER MAKES NO WARRANTY OF ANY KIND WHATEVER, EXPRESS OR IMPLIED, AND ALL WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED BY SELLER.

DATE: 01/99

By Denise Vollmer

MATERIAL SAFETY DATA SHEET: SIMPLE GREEN®

I. PRODUCT & COMPANY INFORMATION

PRODUCT NAME: SIMPLE GREEN® CLEANER / DEGREASER

Page 1 of 4

COMPANY NAME: SUNSHINE MAKERS, INC.

15922 Pacific Coast Highway
Huntington Harbour, CA 92649 USA
Telephone: 800-228-0709 • 562-795-6000
Fax: 562-592-3034
Website: www.simplegreen.com

Version No. 1006
Issue Date: March, 1999

For 24-hour emergency, call Chem-Tel, Inc.: 800-255-3924

USE OF PRODUCT: An all purpose cleaner and degreaser used undiluted or diluted in water for direct, spray, and dip tank procedures.

II. INGREDIENT INFORMATION

The only ingredient of Simple Green® with established exposure limits is undiluted 2-butoxyethanol (<6%) (Butyl Cellosolve; CAS No. 111-76-2); the OSHA PEL and ACGIH TLV is 25 ppm (skin). Note, however, that Butyl Cellosolve is only one of the raw material ingredients that undergo processing and dilution during the manufacture of Simple Green®. Upon completion of the manufacturing process, Simple Green® does not possess the occupational health risks associated with exposure to undiluted Butyl Cellosolve. Verification of this is contained in the independent test results detailed under "Toxicological Information" on Page 3 of this MSDS.

The Butyl Cellosolve in Simple Green® is part of a chemical category (glycol ethers) regulated by the Emergency Planning and Community Right-to-Know Act (SARA, Title III, section 313); therefore, a reporting requirement exists. Based upon chemical analysis, Simple Green® contains no known EPA priority pollutants, heavy metals, or chemicals listed under RCRA, CERCLA, or CWA. Analysis by TCLP (Toxicity Characteristic Leaching Procedure) according to RCRA revealed no toxic organic or inorganic constituents.

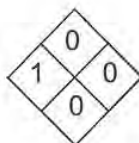
All components of Simple Green® are listed on the TSCA Chemical Substance Inventory.

III. HAZARDS IDENTIFICATION

UN Number: Not required
Dangerous Goods Class: Nonhazardous

Hazard Rating (NFPA/HMIS)

Health = 1* Reactivity = 0
Fire = 0 Special = 0



Rating Scale

0 = minimal 1 = slight
2 = moderate 3 = serious
4 = severe

*Mild eye irritant, non-mutagenic and non-carcinogenic. **None of the ingredients in Simple Green® are regulated or listed as potential cancer agents by Federal OSHA, NTP, or IARC.**

IV. FIRST AID MEASURES

SYMPTOMS OF OVEREXPOSURE AND FIRST AID TREATMENT

- Eye contact: Reddening may develop. Immediately rinse the eye with large quantities of cool water; continue 10-15 minutes or until the material has been removed; be sure to remove contact lenses, if present, and to lift upper and lower lids during rinsing. Get medical attention if irritation persists.
- Skin contact: Minimal effects, if any; rinse skin with water, rinse shoes and launder clothing before reuse. Reversible reddening may occur in some dermal-sensitive users; thoroughly rinse area and get medical attention if reaction persists.
- Swallowing: Essentially non-toxic. Give several glasses of water to dilute; do not induce vomiting. If stomach upset occurs, consult physician.
- Inhalation: Non-toxic. Exposures to concentrate-mist may cause mild irritation of nasal passages or throat; remove to fresh air. Get medical attention if irritation persists.
-

V. FIRE FIGHTING MEASURES

Simple Green® is stable, not flammable, and will not burn.

- | | |
|-----------------------------------|---|
| Flash Point/Auto-Ignition: | Not flammable. |
| Flammability Limits: | Not flammable. |
| Extinguishing Media: | Not flammable/nonexplosive. No special procedures required. |
| Special Fire Fighting Procedures: | None required. |
-

VI. ACCIDENTAL RELEASE MEASURES

Recover usable material by convenient method; residual may be removed by wipe or wet mop. If necessary, unrecoverable material may be washed to drain with large quantities of water.

VII. HANDLING, STORAGE & TRANSPORT INFORMATION

No special precautions are required. **This product is non-hazardous for storage and transport according to the U.S. Department of Transportation Regulations.** Simple Green® requires no special labeling or placarding to meet U.S. Department of Transportation requirements.

- | | |
|------------------------|--------------|
| UN Number: | Not required |
| Dangerous Goods Class: | Nonhazardous |
-

VIII. EXPOSURE CONTROLS

Exposure Limits: The Simple Green® formulation presents no health hazards to the user when used according to label directions for its intended purposes. Mild skin and eye irritation is possible (please see Eye contact and Skin contact in Section IV.).

Ventilation: No special ventilation is required during use.

Human Health Effects or Risks from Exposure: Adverse effects on human health are not expected from Simple Green®, based upon twenty years of use without reported adverse health incidence in diverse population groups, including extensive use by inmates of U.S. Federal prisons in cleaning operations.

Simple Green® is a mild eye irritant; mucous membranes may become irritated by concentrate-mist.

Simple Green® is not likely to irritate the skin in the majority of users. Repeated daily application to the skin without rinsing, or continuous contact of Simple Green® on the skin may lead to temporary, but reversible, irritation.

Medical Conditions Aggravated by Exposure: No aggravation of existing medical conditions is expected; dermal-sensitive users may react to dermal contact by Simple Green®.

IX. PERSONAL PROTECTION

Precautionary Measures:	No special requirements under normal use conditions.
Eye Protection:	Caution, including reasonable eye protection, should always be used to avoid eye contact where splashing may occur.
Skin Protection:	No special precautions required; rinse completely from skin after contact.
Respiratory Protection:	No special precautions required.
Work and Hygienic Practices:	No special requirements. Wash or rinse hands before touching eyes or contact lenses.

X. PHYSICAL AND CHEMICAL PROPERTIES

Appearance/odor:	Translucent green liquid with characteristic sassafras odor.		
Specific Gravity:	1.0257	Vapor Pressure:	17 mm Hg @ 20 °C; 22 mm Hg @ 25 °C
pH of concentrate:	9.5	Vapor Density:	1.3 (air = 1)
Evaporation:	>1 (butyl acetate = 1)	Density:	8.5 lbs./gallon
Boiling Point:	110 °C (231 °F)		
Freezing Point:	-9 °C (16 °F) If product freezes, it will reconstitute without loss of efficacy when brought back to room temperature and agitated.		

VOC Composite Partial Pressure: 0.006 mm Hg @ 20 °C

Volatile Organic Compounds (VOCs): 7.96 g/L per ASTM Method 3960-90. Per California AQMD's VOC test method, product must be diluted at least 2 parts of water to 1 part Simple Green® in order to meet SCAQMD Rule 1171 & Rule 1122 and BAAQMD Regulation 8-16 VOC requirements for solvent cleaning operations.

Water Solubility: Completely soluble in water. The higher salt concentrations in marine ecosystems will lead to complexes with Simple Green® that may become visible at ratios above one part Simple Green® to 99 parts seawater.

Ash Content: At 600 °F: 1.86% by weight.

Nutrient Content: Nitrogen: <1.0% by weight (fusion and qualitative test for ammonia).
Phosphorus: 0.3% by formula.
Sulfur: 0.6% by weight (barium chloride precipitation method).

Detection: Simple Green® has a characteristic sassafras odor that is not indicative of any hazardous situation.

XI. STABILITY AND REACTIVITY INFORMATION

Nonreactive. Simple Green® is stable, even under fire conditions, and will not react with water or oxidizers. Hazardous polymerization will not occur.

XII. TOXICOLOGICAL INFORMATION

Nonhuman Toxicity**Acute Mortality Studies:**

Oral LD ₅₀ (rat):	>5.0 g/kg body weight
Dermal LD ₅₀ (rabbit):	>2.0 g/kg body weight

Dermal Irritation: Only mild, but reversible, irritation was found in a standard 72-hr test on rabbits. A value of 0.2 (non-irritating) was found on a scale of 8.

Eye Irritation: With or without rinsing with water, the irritation scores in rabbits at 24 hours did not exceed 15 (mild irritant) on a scale of 110.

Subchronic dermal effects: No adverse effects, except reversible dermal irritation, were found in rabbits exposed to Simple Green® (up to 2.0 g/kg/day for 13 weeks) applied to the skin of 25 males and 25 females. Only female body weight gain was affected. Detailed microscopic examination of all major tissues showed no adverse changes.

Fertility Assessment by Continuous Breeding: The Simple Green® formulation had no adverse effect on fertility and reproduction in CD-1 mice with continuous administration for 18 weeks, and had no adverse effect on the reproductive performance of their offspring.

XIII. BIODEGRADABILITY AND ENVIRONMENTAL TOXICITY INFORMATION

Biodegradability:

Simple Green® is readily decomposed by naturally occurring microorganisms. The biological oxygen demand (BOD), as a percentage of the chemical oxygen demand (COD), after 4, 7, and 11 days was 56%, 60%, and 70%, respectively. Per OECD Closed Bottle Test, Simple Green® meets OECD and EPA recommendations for ready biodegradability.

In a standard biodegradation test with soils from three different countries, Butyl Cellosolve reached 50% degradation in 6 to 23 days, depending upon soil type, and exceeded the rate of degradation for glucose which was used as a control for comparison.

Environmental Toxicity Information:

Simple Green® is considered practically non-toxic per EPA's aquatic toxicity scale. Simple Green® is non-lethal to any of the marine and estuarine test animals listed in the following table at concentrations below 200 mg/L (0.02%). This table shows the Simple Green® concentrations that are likely to be lethal to 50% of the exposed organisms.

	LC ₅₀ in mg/L (ppm)	
	48-hour	96-hour
<u>Marine Fish:</u>		
Mud minnow (<i>Fundulus heteroclitus</i>)	1690	1574
Whitebait (<i>Galaxias maculatus</i>)	210	210
<u>Marine/Estuarine Invertebrates:</u>		
Brine Shrimp (<i>Artemia salina</i>)	610	399
Grass Shrimp (<i>Palaemonetes pugio</i>)	270	220
Green-lipped Mussel (<i>Perna canaliculus</i>)	220	220
Mud Snail (<i>Potamopyrgus estuarinus</i>)	410	350

XIV. DISPOSAL CONSIDERATIONS

Simple Green® is fully water soluble and biodegradable and will not harm sewage-treatment microorganisms if disposal by sewer or drain is necessary. Dispose of in accordance with all applicable local, state, and federal laws.

XV. OTHER INFORMATION

Containers:	Simple Green® residues can be completely removed by rinsing with water; the container may be recycled or applied to other uses.
Electrical Wiring Compatibility:	Polyimide insulated wiring is not affected by exposure to Simple Green®. After immersion in Simple Green® for 14 days at 74°F, the 61 cm piece of polyimide insulated wire passed a one minute dielectric proof test at 2500 volts (ASTM D-149).
Contact Point:	Sunshine Makers, Inc., Research and Development Division: 562-795-6000.

*** NOTICE ***

All information appearing herein is based upon data obtained by the manufacturer and recognized technical sources. Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of this information, Sunshine Makers, Inc. or its distributors extends no warranties, makes no representations and assumes no responsibility as to the suitability of such information for application to purchaser's intended purposes or for consequences of its use.

Appendix D
Explanation of the National Fire Protection Association Safety Diamond and
the National Paint & Coatings Association
Hazardous Materials Identification System

Material below reproduced courtesy of the University of Kentucky Environmental Health and Safety Department.

This section has been extracted from an extended description that can be found at: <http://ehs.uky.edu/classes/hazcomm/hazcomtrain.html>



Here's an example of an alternative labeling system designed by the National Fire Protection Association (NFPA) that uses color, numbers and other information to convey the hazards of the chemical.

The NFPA system uses a diamond-shaped diagram of symbols and numbers to indicate the degree of hazard associated with a particular chemical or material. These diamond shaped symbols are placed on containers of chemicals or materials to identify the degree of hazard associated with the chemical or material. The diagram identifies four color-coded categories of hazard for each material. Each category is divided in levels of hazard potential with increasing numbers indicating increasing hazards. The exception is the white section that provides Special Hazards information. The abbreviated degrees of hazard in each of these categories are given as follows:

Health

The degree of health hazard of a chemical or material is based on the form or condition of the material, as well as its inherent properties. The degree of health hazard of a material should indicate the degree of personal protective equipment required for working safety with the material.

- 1 is for slightly hazardous (toxic) material which requires only minimal protection (for example, safety glasses and gloves) in addition to normal work clothing to work with safely.
- 2 is for moderately toxic or a hazardous or moderately toxic material which requires additional PPE or equipment (e.g. chemical goggles, lab/work smock, local ventilation) in addition to that required for less toxic material. Consult the MSDS for specific health hazard and proper PPE to use with this material.
- 3 or 4 is for highly to extremely toxic (deadly) materials (and any carcinogen, mutagen, or teratogen). These materials will require specialized equipment (e.g. respirator or exhaust hood, full face shield, rubber apron, specialized glove, handling tongs, etc) beyond that required for moderately toxic material. You must consult the MSDS and/or other safety information to determine the hazard (acute or chronic) and the proper PPE and engineering controls to safely use this material.

Flammability or Fire Hazard

The flammability or fire hazards deal with the degree of susceptibility of the material to ignite and burn. The form or condition of the materials, as well as their properties, affects the extent of the hazard. Many hazardous materials such as acetone and gasoline, have a flash point (ignition temperature) far below freezing and will readily ignite with a spark if the vapor concentration is sufficient.

- 1 is for materials with a flash point above 200°F.
- 2 is for materials with a flash point below 200°F but above 100°F.
- 3 is for materials with a flash point below 100°F but above 73°F.
- 4 is for materials with a flash point below 73°F.

Reactivity

The reactivity hazards deal with the potential of a material or chemical to release energy. Some materials are capable of rapid energy release without any catalyst, while others can undergo violent eruptive or explosive reactions if they come in contact with water or other materials. Generally this rating is used to indicate the potential to react if the material is heated, jarred, or shocked.

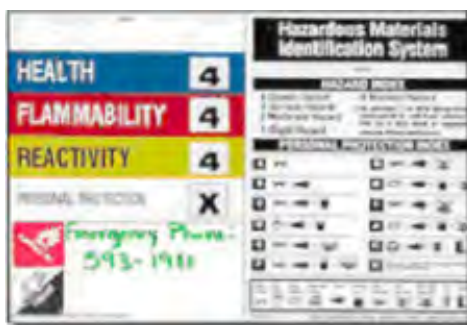
- 1 indicates a material that may be reactive if heated and one that reacts with water.
- 2 indicates a material that may react violently without detonation.
- 3 indicates a material that may detonate or explode if subjected to a strong initiating force or heating under confinement.
- 4 indicates a material that readily detonates or explodes.

Special Hazard

An open space at the bottom of the NFPA diagram can be used to indicate additional information about the chemical or material. This information may include the chemical or material's radioactivity, proper fire extinguishing agent, skin hazard, its use in pressurized containers, protective equipment required, or unusual reactivity with water.

- OX or OXY indicates a material that is an oxidizer.
- W indicates a material that is water reactive.
- ALK indicates a material that is alkali.
- COR indicates a material that is corrosive.
- RAD indicates a material that is radioactive.

Below are two other examples of an alternative labeling system designed by the National Paint & Coatings Association (NPCA). The labeling scheme is called the Hazardous Material Identification System (HMIS). It uses a similar system to convey the hazards of the chemical.



HMIS I & II



HMIS III

HMIS® labels can appear in a variety of formats. Some will include additional spaces to list target organ effects, a labeling requirement under the HCS, and other information, but the four colored areas shown here will always be present.

The new HMIS III label provides employees the tools to understand and handle chemicals exhibiting a variety of physical hazards with a far greater degree of precision. Although "Reactivity" has provided useful information for physical hazards, HMIS® III now provides more information about a chemical's physical hazard(s). The new HMIS III not only specifically incorporates each hazard, with specific criteria to evaluate the degree of hazard, but permits employers to identify the hazard present with an icon or symbol. Under the new HMIS® III, a worker can know immediately, for example, that a material he is handling is rated as an explosive, and that it is rated as a "3" giving him or her much more precise and useful information about the safe handling of that material.

Specific sections of an HMIS® label include the following:

Health

- The Health section conveys the health hazards of the material. In the latest version of HMIS®, the blue Health bar has two spaces, one for an asterisk and one for a numeric hazard rating.

If present, the asterisk (*) signifies a chronic health hazard, meaning that long-term exposure to the material could cause a health problem such as emphysema or kidney damage. NFPA lacks this important information because the NFPA system is meant only for emergency or acute (short-term) exposures.

The numbering systems are more or less identical to NFPA, with a 0 to 4 scale where 0 indicates minimal hazard and 4 indicates an extreme hazard.

Flammability

- For HMIS I and II, the criteria used to assign numeric values (0 = low hazard to 4 = high hazard) are identical to those used by NFPA. In other words, in **this** category, the systems are identical.
- For HMIS III, the flammability criteria are defined according to OSHA standards. A 0 to 4 scale is still used.





































Reactivity

- The criteria used to assign numeric values (0 = low hazard to 4 = high hazard) were identical to those used by NFPA. In other words, in this category, the systems are identical.

Personal Protection

- HMIS® uses the white section to indicate what PPE should be used when working with the material.

HMIS® uses a letter coding system or variant for this section. Below is the lettering scheme along with a series of graphics meant to reinforce the meaning of each letter:

HMIS ®	Required Equipment				
A	 Safety Glasses				
B	 Safety Glasses	 Gloves			
C	 Safety Glasses	 Gloves	 Protective Apron		
D	 Face Shield	 Gloves	 Protective Apron		
E	 Safety Glasses	 Gloves	 Dust Respirator		
F	 Safety Glasses	 Gloves	 Protective Apron	 Dust Respirator	
G	 Safety Glasses	 Gloves	 Vapor Respirator		
H	 Splash Goggles	 Gloves	 Protective Apron	 Vapor Respirator	
I	 Safety Glasses	 Gloves	 Vapor Respirator	 Dust Respirator	
J	 Splash Goggles	 Gloves	 Protective Apron	 Vapor Respirator	 Dust Respirator
K	 Air Line Mask or Hood	 Gloves	 Full Suit	 Boots	
L through Z	Site-specific label. Ask your supervisor or safety specialist for handling instructions				

The main thing to remember is, the higher the rating number, the more hazardous the chemical.

Appendix E
EPP Selection Criteria Checklist

EPP Selection Criteria Checklist

School: _____

School Contact: _____

City: _____ State: _____

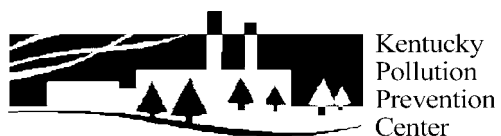
Phone: _____ Fax: _____

Product Name: _____

Use: _____

List of Chemicals

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____
- g. _____



Kentucky
Pollution
Prevention
Center



Janitorial Cleaning Products



*Attributes	Ranking				Comments
	low risk			high risk	
Carcinogens	1	2	3	4	
Flammability	1	2	3	4	
Corrosiveness (pH)	1	2	3	4	
Chronic Health Risks	1	2	3	4	
Skin/Eye Irritant	1	2	3	4	
Percentage VOCs	1	2	3	4	
Biodegradability	1	2	3	4	
Product Packaging	1	2	3	4	
Energy Needs	1	2	3	4	

Total Score

***These are just a few of the different attributes that schools may want to consider**

EPP Selection Criteria Checklist

School: General High School

School Contact: John Doe

City: Louisville **State:** KY

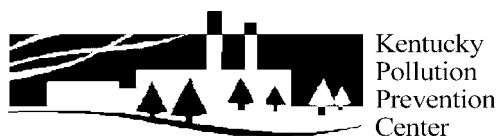
Phone: 555-5555 **Fax:** 555-5555

Product Name: Generic Glass Cleaner - SAMPLE

Use: Clean Glass

List of Chemicals

- a. Sodium Xylene Sulphonate
- b. Sodium Lauryl Sulfate
- c. 2-Butoxyethanol
- d. _____
- e. _____
- f. _____
- g. _____



Kentucky
Pollution
Prevention
Center



Janitorial Cleaning Products



*Attributes	Ranking				Comments
	low risk			high risk	
Carcinogens	<u>1</u>	2	3	4	
Flammability	<u>1</u>	2	3	4	
Corrosiveness (pH)	1	2	3	<u>4</u>	
Chronic Health Risks	1	2	<u>3</u>	4	
Skin/Eye Irritant	1	2	3	<u>4</u>	
Percentage VOCs	1	2	<u>3</u>	4	
Biodegradability	1	2	3	<u>4</u>	
Product Packaging	<u>1</u>	2	3	4	
Energy Needs	<u>1</u>	2	3	4	
Total Score				22	

***These are just a few of the different attributes that schools may want to consider**

Appendix F
Sample Bid Specifications

Example Bid Specification Language for Environmentally Preferable Janitorial Cleaning Products

I. Environmentally Preferable Janitorial Cleaning Products Categories

The Douglass County School District has established desirable attributes for the evaluation of five (5) representative categories of janitorial cleaning products as listed below. Offerors may propose more than one product within a product category (example only – brand “X” and brand “Y” for all-purpose cleaner) and/or propose a single product that addresses more than one product category or cleaning task (example only – brand “X” as all-purpose cleaner and general disinfectant).

Janitorial Cleaning Product Categories

- (1) All-Purpose Cleaner
- (2) General Degreaser
- (3) General Disinfectant
- (4) Floor Stripper
- (5) Bathroom Cleaner

II. Desirable Attributes for Janitorial Cleaning Products

The following ten (10) attributes should be present in some verifiable or demonstrable degree in an offered product. It is required that offerors shall provide a Material Safety Data Sheet (MSDS), equivalent information, and/or any additional information specifically requested for each product offered in the product categories specified in Section I to enable the District to evaluate the desirable characteristics with respect to that product.

Failure of a product to meet any of the criteria listed below, or failure to submit acceptable verification that a product meets these criteria, may lead to the automatic rejection of the bid.

- (1) Carcinogen: The District wishes entirely to eliminate the use of products containing known and probable carcinogens. Accordingly, no chemical cleaning product shall contain constituent compounds that are classified as known or probable carcinogens by any of the following organizations:
 - American Conference of Governmental Industrial Hygienists (ACGIH);
 - International Agency for Research on Cancer (IARC);
 - National Institute of Occupational Health and Safety (NIOSH);
 - National Toxicology Program (NTP); and,
 - Occupational Health and Safety Organization (OSHA).

- (2) Flammability/Flash Point: Products that do not ignite easily are favored.
- (3) Corrosiveness (pH): Products that have a pH closer to neutral are favored.
- (4) Chronic Health Risks: Products that pose no potential for chronic health risks are favored.
- (5) Skin/Eye Irritant: Products that are less irritating to the skin and eyes are favored.
- (6) Volatile Organic Compound (VOC) Content: Products with the lowest VOC levels possible are favored. Most desirable are products that do not contain VOC's in concentrations that exceed 10% of the weight of the product.
- (7) Ozone-Depleting Compounds: Products that do not contain ozone-depleting compounds are favored.
- (8) Biodegradability: Products that are partially or completely biodegradable are favored.
- (9) Product Packaging: Products that are packaged in recyclable or reusable containers (such as use of refillable product distribution devices and/or concentrates) and containers which are made with a percentage of post-consumer recycled materials are favored. Additionally, products that use no, or only a minimal amount of, polypropylene and/or polystyrene ("Styrofoam") packaging are favored.
- (10) Energy Needs: Products that work effectively in cold water, which decreases the amount of energy consumption necessary, are favored.

Some wording for potential additional attributes depending on District priorities:

- (A) No Sealed Aerosol Spray Cans: *All chemical cleaning products must be available in either a liquid form or manual pump action sprays and/or concentrates that can be dispensed into pump bottles for use.*
- (B) Dyes and Fragrances: *Products that do not contain dyes or fragrances are favored.*

III. Product Efficacy Testing

In addition to being evaluated for environmental preferability, offered products will be evaluated for their efficacy. That is, a chemical cleaning or recycled content product that meets the desirable attributes still may be deemed ineffective for its intended purpose(s) after testing by the evaluators. Such products will be rejected.

IV. Training Program

The District believes that an effective training program is central to the success of using environmentally preferable products. Vendors who can supply a quality on-site training program and be accessible to trouble-shoot problem applications are favored.

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

INDEX of Chemical Abstract Numbers (CAS NO.)

GUIDE	CAS NO
0023	
0024	
0039	
0055	
0114	
0139	
0140	
0144	
0149	
0152	
0207	
0288	
0294	
0305	
0323	
0346	
0384	
0432	
0434	
0480	
0520	
0545	
0547	
0558	
0608	
0614	
0646	
0651	
0666	
0667	
0293	50-00-0
0174	50-29-3
0010	50-78-2
0007	53-96-3
0446	54-11-5
0285	55-38-9
0456	55-63-0
0107	56-23-5
0479	56-38-2
0302	56-81-5
0227	57-14-7
0570	57-24-9
0574	57-50-1
0528	57-57-8
0112	57-74-9
0370	58-89-9
0220	60-11-7
0277	60-29-7
0419	60-34-4
0206	60-57-1
0027	61-82-5
0033	62-53-3
0202	62-73-7
0564	62-74-8
0461	62-75-9
0100	63-25-2
0262	64-17-5

0296	64-18-6
0002	64-19-7
0397	67-56-1
0359	67-63-0
0004	67-64-1
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0226	68-12-2
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0388	72-43-5
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0368	7439-92-1
0379	7439-96-5
0383	7439-97-6
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0519	7440-06-4
0544	7440-16-6
0554	7440-21-3
0557	7440-22-4
0585	7440-25-7
0613	7440-31-5
0645	7440-33-7
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0038	7440-38-2
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0566	7681-57-4
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0606	7722-88-5
0507	7723-14-0
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0550	7782-49-2
0115	7782-50-5
0300	7782-65-2
0337	7783-06-4
0336	7783-07-5
0475	7783-41-7
0455	7783-54-2
0580	7783-60-0
0551	7783-79-1
0588	7783-80-4
0040	7784-42-1
0503	7786-34-7
0065	7789-30-2
0117	7790-91-2
0505	7803-51-2
0568	7803-52-3
0556	7803-62-5
0113	8001-35-2
0492	8002-05-9
0477	8002-74-2
0540	8003-34-7
0497	8004-13-5
0299	8006-61-9
0648	8006-64-2
0366	8008-20-6
0472	8012-95-1
0410	8022-00-2
0438	8030-30-6
0664	8032-32-4
0569	8052-41-3
0042	8052-42-4
0177	8065-48-3
0110	9004-34-6
0567	9005-25-8
0046	10022-31-8
0465	10024-97-2
0578	10025-67-9
0508	10025-87-3
0509	10026-13-8
0476	10028-15-6
0331	10035-10-6
0116	10049-04-4
0448	10102-43-9
0454	10102-44-0
0147	10210-68-1

<u>0061</u>	<u>10294-33-4</u>
<u>0045</u>	<u>10361-37-2</u>
<u>0126</u>	<u>11097-69-1</u>
<u>0647</u>	<u>11107-01-0</u>
<u>0431</u>	<u>12001-26-2</u>
<u>0380</u>	<u>12079-65-1</u>
<u>0409</u>	<u>12108-13-3</u>
<u>0029</u>	<u>12125-02-9</u>
<u>0059</u>	<u>12179-04-3</u>
<u>0287</u>	<u>12604-58-9</u>
<u>0172</u>	<u>13121-70-5</u>
<u>0308</u>	<u>13397-24-5</u>
<u>0444</u>	<u>13463-39-3</u>
<u>0345</u>	<u>13463-40-6</u>
<u>0617</u>	<u>13463-67-7</u>
<u>0587</u>	<u>13494-80-9</u>
<u>0253</u>	<u>13838-16-9</u>
<u>0286</u>	<u>14484-64-1</u>
<u>0584</u>	<u>14807-96-6</u>
<u>0553</u>	<u>14808-60-7</u>
<u>0142</u>	<u>14977-61-8</u>
<u>0559</u>	<u>15096-52-3</u>
<u>0279</u>	<u>16219-75-3</u>
<u>0387</u>	<u>16752-77-5</u>
<u>0148</u>	<u>16842-03-8</u>
<u>0175</u>	<u>17702-41-9</u>
<u>0048</u>	<u>17804-35-2</u>
<u>0616</u>	<u>18282-10-5</u>
<u>0183</u>	<u>19287-45-7</u>
<u>0481</u>	<u>19624-22-7</u>
<u>0473</u>	<u>20816-12-0</u>
<u>0430</u>	<u>21087-64-9</u>
<u>0111</u>	<u>21351-79-1</u>
<u>0615</u>	<u>21651-19-4</u>
<u>0283</u>	<u>22224-92-6</u>
<u>0663</u>	<u>25013-15-4</u>
<u>0235</u>	<u>25321-14-6</u>
<u>0620</u>	<u>25376-45-8</u>
<u>0407</u>	<u>25639-42-3</u>
<u>0518</u>	<u>26499-65-0</u>
<u>0560</u>	<u>26628-22-8</u>
<u>0354</u>	<u>26952-21-6</u>
<u>0241</u>	<u>34590-94-8</u>
<u>0582</u>	<u>35400-43-2</u>
<u>0125</u>	<u>53469-21-9</u>
<u>0393</u>	<u>59355-75-8</u>
<u>0330</u>	<u>61788-32-7</u>
<u>0443</u>	<u>62765-93-9</u>
<u>0145</u>	<u>65996-93-2</u>
<u>0521</u>	<u>65997-15-1</u>
<u>0372</u>	<u>68476-85-7</u>
<u>0655</u>	<u>68956-68-3</u>
<u>0491</u>	<u>93763-70-3</u>

[INTRODUCTION](#)[INDEX with CHEMICAL NAMES and SYNONYMS](#)[INDEX with CHEMICAL NAMES](#)[INDEX with CAS NUMBERS](#)[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

INDEX of Chemical Names

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
0001	Acetaldehyde	75-07-0	AB1925000
0002	Acetic acid	64-19-7	AF1225000
0003	Acetic anhydride	108-24-7	AK1925000
0004	Acetone	67-64-1	AL3150000
0005	Acetone cyanohydrin	75-86-5	OD9275000
0006	Acetonitrile	75-05-8	AL7700000
0007	2-Acetylaminofluorene	53-96-3	AB9450000
0008	Acetylene	74-86-2	AO9600000
0009	Acetylene tetrabromide	79-27-6	KI8225000
0010	Acetylsalicyclic acid	50-78-2	VO0700000
0011	Acrolein	107-02-8	AS1050000
0012	Acrylamide	79-06-1	AS3325000
0013	Acrylic acid	79-10-7	AS4375000
0014	Acrylonitrile	107-13-1	AT5250000
0015	Adiponitrile	111-69-3	AV2625000
0016	Aldrin	309-00-2	IO2100000
0017	Allyl alcohol	107-18-6	BA5075000
0018	Allyl chloride	107-05-1	UC7350000
0019	Allyl glycidyl ether	106-92-3	RR0875000
0020	Allyl propyl disulfide	2179-59-1	JO0350000
0021	alpha-Alumina	1344-28-1	BD1200000
0022	Aluminum	7429-90-5	BD0330000
0023	Aluminum (pyro powders and welding fumes		
0024	Aluminum (soluble salts and alkyls, as A		
0025	4-Aminodiphenyl	92-67-1	DU8925000
0026	2-Aminopyridine	504-29-0	US1575000
0027	Amitrole	61-82-5	XZ3850000
0028	Ammonia	7664-41-7	BO0875000
0029	Ammonium chloride fume	12125-02-9	BP4550000
0030	Ammonium sulfamate	7773-06-0	WO6125000
0031	n-Amyl acetate	628-63-7	AJ1925000
0032	sec-Amyl acetate	626-38-0	AJ2100000
0033	Aniline (and homologs)	62-53-3	BW6650000
0034	o-Anisidine	90-04-0	BZ5410000
0035	p-Anisidine	104-94-9	BZ5450000
0036	Antimony	7440-36-0	CC4025000
0037	ANTU	86-88-4	YT9275000
0038	Arsenic (inorganic compounds, as As)	7440-38-2	CG0525000
0039	Arsenic, organic compounds (as As)		
0040	Arsine	7784-42-1	CG6475000
0041	Asbestos	1332-21-4	CI6475000
0042	Asphalt fumes	8052-42-4	CI9900000
0043	Atrazine	1912-24-9	XY5600000
0044	Azinphos-methyl	86-50-0	TE1925000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
0045	Barium chloride (as Ba)	10361-37-2	CO8750000
0046	Barium nitrate (as Ba)	10022-31-8	CO9625000
0047	Barium sulfate	7727-43-7	CR0600000
0048	Benomyl	17804-35-2	DD6475000

0049	Benzene	71-43-2	CY1400000
0050	Benzenethiol	108-98-5	DC0525000
0051	Benzidine	92-87-5	DC9625000
0052	Benzoyl peroxide	94-36-0	DM8575000
0053	Benzyl chloride	100-44-7	XS8925000
0054	Beryllium & beryllium compounds (as Be)	7440-41-7	DS1750000
0055	Bismuth telluride, doped with Selenium s		
0056	Bismuth telluride, undoped	1304-82-1	FB3110000
0057	Borates, tetra, sodium salts (Anhydrous)	1330-43-4	ED4588000
0058	Borates, tetra, sodium salts (Decahydrat	1303-96-4	VZ2275000
0059	Borates, tetra, sodium salts (Pentahydra	12179-04-3	
0060	Boron oxide	1303-86-2	ED7900000
0061	Boron tribromide	10294-33-4	ED7400000
0062	Boron trifluoride	7637-07-2	ED2275000
0063	Bromacil	314-40-9	YO9100000
0064	Bromine	7726-95-6	EF9100000
0065	Bromine pentafluoride	7789-30-2	EF9350000
0066	Bromoform	75-25-2	PB5600000
0067	1,3-Butadiene	106-99-0	EI9275000
0068	n-Butane	106-97-8	EJ4200000
0069	2-Butanone	78-93-3	EL6475000
0070	2-Butoxyethanol	111-76-2	KJ8575000
0071	2-Butoxyethanol acetate	112-07-2	KJ8925000
0072	n-Butyl acetate	123-86-4	AF7350000
0073	sec-Butyl acetate	105-46-4	AF7380000
0074	tert-Butyl acetate	540-88-5	AF7400000
0075	Butyl acrylate	141-32-2	UD3150000
0076	n-Butyl alcohol	71-36-3	EO1400000
0077	sec-Butyl alcohol	78-92-2	EO1750000
0078	tert-Butyl alcohol	75-65-0	EO1925000
0079	n-Butylamine	109-73-9	EO2975000
0080	tert-Butyl chromate	1189-85-1	GB2900000
0081	n-Butyl glycidyl ether	2426-08-6	TX4200000
0082	n-Butyl lactate	138-22-7	OD4025000
0083	n-Butyl mercaptan	109-79-5	EK6300000
0084	o-sec-Butylphenol	89-72-5	SJ8920000
0085	p-tert-Butyltoluene	98-51-1	XS8400000
0086	n-Butyronitrile	109-74-0	ET8750000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0087	Cadmium dust (as Cd)	7440-43-9	EU9800000
0088	Cadmium fume (as Cd)	1306-19-0	EV1930000
0089	Calcium arsenate (as As)	7778-44-1	CG0830000
0090	Calcium carbonate	1317-65-3	EV9580000
0091	Calcium cyanamide	156-62-7	GS6000000
0092	Calcium hydroxide	1305-62-0	EW2800000
0093	Calcium oxide	1305-78-8	EW3100000
0094	Calcium silicate	1344-95-2	VV9150000
0095	Calcium sulfate	7778-18-9	WS6920000
0096	Camphor (synthetic)	76-22-2	EX1225000
0097	Caprolactam	105-60-2	CM3675000
0098	Captafol	2425-06-1	GS4900000
0099	Captan	133-06-2	GW5075000
0100	Carbaryl	63-25-2	FC5950000
0101	Carbofuran	1563-66-2	FB9450000
0102	Carbon black	1333-86-4	FF5800000
0103	Carbon dioxide	124-38-9	FF6400000
0104	Carbon disulfide	75-15-0	FF6650000
0105	Carbon monoxide	630-08-0	FG3500000
0106	Carbon tetrabromide	558-13-4	FG4725000
0107	Carbon tetrachloride	56-23-5	FG4900000
0108	Carbonyl fluoride	353-50-4	FG6125000
0109	Catechol	120-80-9	UX1050000
0110	Cellulose	9004-34-6	FJ5691460
0111	Cesium hydroxide	21351-79-1	FK9800000
0112	Chlordane	57-74-9	PB9800000
0113	Chlorinated camphene	8001-35-2	XW5250000
0114	Chlorinated diphenyl oxide		
0115	Chlorine	7782-50-5	FO2100000
0116	Chlorine dioxide	10049-04-4	FO3000000
0117	Chlorine trifluoride	7790-91-2	FO2800000
0118	Chloroacetaldehyde	107-20-0	AB2450000
0119	alpha-Chloroacetophenone	532-27-4	AM6300000
0120	Chloroacetyl chloride	79-04-9	AO6475000
0121	Chlorobenzene	108-90-7	CZ0175000
0122	o-Chlorobenzylidene malononitrile	2698-41-1	OO3675000
0123	Chlorobromomethane	74-97-5	PA5250000
0124	Chlorodifluoromethane	75-45-6	PA6390000

0125	Chlorodiphenyl (42% chlorine)	53469-21-9	TO1356000
0126	Chlorodiphenyl (54% chlorine)	11097-69-1	TO1360000
0127	Chloroform	67-66-3	FS9100000
0128	bis-Chloromethyl ether	542-88-1	KN1575000
0129	Chloromethyl methyl ether	107-30-2	KN6650000
0130	1-Chloro-1-nitropropane	600-25-9	TX5075000
0131	Chloropentafluoroethane	76-15-3	KH7877500
0132	Chloropicrin	76-06-2	PB6300000
0133	beta-Chloroprene	126-99-8	EI9625000
0134	o-Chlorostyrene	2039-87-4	WL4160000
0135	o-Chlorotoluene	95-49-8	XS9000000
0136	2-Chloro-6-trichloromethyl pyridine	1929-82-4	US7525000
0137	Chlorpyrifos	2921-88-2	TF6300000
0138	Chromic acid and chromates	1333-82-0	GB6650000
0139	Chromium(II) compounds (as Cr)		
0140	Chromium(III) compounds (as Cr)		
0141	Chromium metal	7440-47-3	GB4200000
0142	Chromyl chloride	14977-61-8	GB5775000
0143	Clopidol	2971-90-6	UU7711500
0144	Coal dust		GF8281000
0145	Coal tar pitch volatiles	65996-93-2	GF8655000
0146	Cobalt metal dust and fume (as Co)	7440-48-4	GF8750000
0147	Cobalt carbonyl (as Co)	10210-68-1	GG0300000
0148	Cobalt hydrocarbonyl (as Co)	16842-03-8	GG0900000
0149	Coke oven emissions		GH0346000
0150	Copper (dusts and mists, as Cu)	7440-50-8	GL5325000
0151	Copper fume (as Cu)	1317-38-0	GL7900000
0152	Cotton dust (raw)		GN2275000
0153	Crag® herbicide	136-78-7	KK4900000
0154	o-Cresol	95-48-7	GO6300000
0155	m-Cresol	108-39-4	GO6125000
0156	p-Cresol	106-44-5	GO6475000
0157	Crotonaldehyde	4170-30-3	GP9499000
0158	Cruformate	299-86-5	TB3850000
0159	Cumene	98-82-8	GR8575000
0160	Cyanamide	420-04-2	GS5950000
0161	Cyanogen	460-19-5	GT1925000
0162	Cyanogen chloride	506-77-4	GT2275000
0163	Cyclohexane	110-82-7	GU6300000
0164	Cyclohexanethiol	1569-69-3	GV7525000
0165	Cyclohexanol	108-93-0	GV7875000
0166	Cyclohexanone	108-94-1	GW1050000
0167	Cyclohexene	110-83-8	GW2500000
0168	Cyclohexylamine	108-91-8	GX0700000
0169	Cyclonite	121-82-4	XY9450000
0170	Cyclopentadiene	542-92-7	GY1000000
0171	Cyclopentane	287-92-3	GY2390000
0172	Cyhexatin	13121-70-5	WH8750000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0173	2,4-D	94-75-7	AG6825000
0174	DDT	50-29-3	KJ3325000
0175	Decaborane	17702-41-9	HD1400000
0176	1-Decanethiol	143-10-2	
0177	Demeton	8065-48-3	TF3150000
0178	Diacetone alcohol	123-42-2	SA9100000
0179	2,4-Diaminoanisole (and its salts)	615-05-4	BZ8580500
0180	o-Dianisidine	119-90-4	DD0875000
0181	Diazinon®	333-41-5	TF3325000
0182	Diazomethane	334-88-3	PA7000000
0183	Diborane	19287-45-7	HO9275000
0184	1,2-Dibromo-3-chloropropane	96-12-8	TX8750000
0185	2-N-Dibutylaminoethanol	102-81-8	KK3850000
0186	Dibutyl phosphate	107-66-4	TB9605000
0187	Dibutyl phthalate	84-74-2	TI0875000
0188	Dichloroacetylene	7572-29-4	AP1080000
0189	o-Dichlorobenzene	95-50-1	CZ4500000
0190	p-Dichlorobenzene	106-46-7	CZ4550000
0191	3,3'-Dichlorobenzidine (and its salts)	91-94-1	DD0525000
0192	Dichlorodifluoromethane	75-71-8	PA8200000
0193	1,3-Dichloro-5,5-dimethylhydantoin	118-52-5	MU0700000
0194	1,1-Dichloroethane	75-34-3	KI0175000
0195	1,2-Dichloroethylene	540-59-0	KV9360000
0196	Dichloroethyl ether	111-44-4	KN0875000
0197	Dichloromono-fluoromethane	75-43-4	PA8400000
0198	1,1-Dichloro-1-nitroethane	594-72-9	KI1050000
0199	1,3-Dichloropropene	542-75-6	UC8310000
0200	2,2-Dichloropropionic acid	75-99-0	UF0690000

0201	Dichlorotetrafluoroethane	76-14-2	KI1101000
0202	Dichlorvos	62-73-7	TC0350000
0203	Dicrotophos	141-66-2	TC3850000
0204	Dicyclopentadiene	77-73-6	PC1050000
0205	Dicyclopentadienyl iron	102-54-5	LK0700000
0206	Dieldrin	60-57-1	IO1750000
0207	Diesel exhaust		
0208	Diethanolamine	111-42-2	KL2975000
0209	Diethylamine	109-89-7	HZ8750000
0210	2-Diethylaminoethanol	100-37-8	KK5075000
0211	Diethylenetriamine	111-40-0	IE1225000
0212	Diethyl ketone	96-22-0	SA8050000
0213	Diethyl phthalate	84-66-2	TI1050000
0214	Difluorodibromomethane	75-61-6	PA7525000
0215	Diglycidyl ether	2238-07-5	KN2350000
0216	Diisobutyl ketone	108-83-8	MJ5775000
0217	Diisopropylamine	108-18-9	IM4025000
0218	Dimethyl acetamide	127-19-5	AB7700000
0219	Dimethylamine	124-40-3	IP8750000
0220	4-Dimethylaminoazobenzene	60-11-7	BX7350000
0221	bis(2-(Dimethylamino)ethyl)ether	3033-62-3	KR9460000
0222	Dimethylaminopropionitrile	1738-25-6	UG1575000
0223	N,N-Dimethylaniline	121-69-7	BX4725000
0224	Dimethyl carbamoyl chloride	79-44-7	FD4200000
0225	Dimethyl-1,2-dibromo-2,2-dichlorethyl ph	300-76-5	TB9450000
0226	Dimethylformamide	68-12-2	LO2100000
0227	1,1-Dimethylhydrazine	57-14-7	MV2450000
0228	Dimethylphthalate	131-11-3	TI1575000
0229	Dimethyl sulfate	77-78-1	WS8225000
0230	Dinitolmide	148-01-6	XS4200000
0231	o-Dinitrobenzene	528-29-0	CZ7450000
0232	m-Dinitrobenzene	99-65-0	CZ7350000
0233	p-Dinitrobenzene	100-25-4	CZ7525000
0234	Dinitro-o-cresol	534-52-1	GO9625000
0235	Dinitrotoluene	25321-14-6	XT1300000
0236	Di-sec octyl phthalate	117-81-7	TI0350000
0237	Dioxane	123-91-1	JG8225000
0238	Dioxathion	78-34-2	TE3350000
0239	Diphenyl	92-52-4	DU8050000
0240	Diphenylamine	122-39-4	JJ7800000
0241	Dipropylene glycol methyl ether	34590-94-8	JM1575000
0242	Dipropyl ketone	123-19-3	MJ5600000
0243	Diquat (Diquat dibromide)	85-00-7	JM5690000
0244	Disulfiram	97-77-8	JO1225000
0245	Disulfoton	298-04-4	TD9275000
0246	2,6-Di-tert-butyl-p-cresol	128-37-0	GO7875000
0247	Diuron	330-54-1	YS8925000
0248	Divinyl benzene	1321-74-0	CZ9370000
0249	1-Dodecanethiol	112-55-0	JR3155000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0250	Emery	1302-74-5	GN0231000
0251	Endosulfan	115-29-7	RB9275000
0252	Endrin	72-20-8	IO1575000
0253	Enflurane	13838-16-9	KN6800000
0254	Epichlorohydrin	106-89-8	TX4900000
0255	EPN	2104-64-5	TB1925000
0256	Ethanolamine	141-43-5	KJ5775000
0257	Ethion	563-12-2	TE4550000
0258	2-Ethoxyethanol	110-80-5	KK8050000
0259	2-Ethoxyethyl acetate	111-15-9	KK8225000
0260	Ethyl acetate	141-78-6	AH5425000
0261	Ethyl acrylate	140-88-5	AT0700000
0262	Ethyl alcohol	64-17-5	KO6300000
0263	Ethylamine	75-04-7	KH2100000
0264	Ethyl benzene	100-41-4	DA0700000
0265	Ethyl bromide	74-96-4	KH6475000
0266	Ethyl butyl ketone	106-35-4	MJ5250000
0267	Ethyl chloride	75-00-3	KH7525000
0268	Ethylene chlorohydrin	107-07-3	KK0875000
0269	Ethylenediamine	107-15-3	KH8575000
0270	Ethylene dibromide	106-93-4	KH9275000
0271	Ethylene dichloride	107-06-2	KI0525000
0272	Ethylene glycol	107-21-1	KW2975000
0273	Ethylene glycol dinitrate	628-96-6	KW5600000
0274	Ethyleneimine	151-56-4	KX5075000
0275	Ethylene oxide	75-21-8	KX2450000
0276	Ethylene thiourea	96-45-7	NI9625000

0277	Ethyl ether	60-29-7	KI5775000
0278	Ethyl formate	109-94-4	LO8400000
0279	Ethylidene norbornene	16219-75-3	RB9450000
0280	Ethyl mercaptan	75-08-1	K19625000
0281	N-Ethylmorpholine	100-74-3	OE4025000
0282	Ethyl silicate	78-10-4	VV9450000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0283	Fenamiphos	22224-92-6	TB3675000
0284	Fensulfothion	115-90-2	TF3850000
0285	Fenthion	55-38-9	TF9625000
0286	Ferbam	14484-64-1	NO8750000
0287	Ferrovandium dust	12604-58-9	LK2900000
0288	Fibrous glass dust		LK3651000
0289	Fluorine	7782-41-4	LM6475000
0290	Fluorotrichloromethane	75-69-4	PB6125000
0291	Fluoroxene	406-90-6	KO4250000
0292	Fonofos	944-22-9	TA5950000
0293	Formaldehyde	50-00-0	LP8925000
0294	Formalin (as formaldehyde)		
0295	Formamide	75-12-7	LO0525000
0296	Formic acid	64-18-6	LO4900000
0297	Furfural	98-01-1	LT7000000
0298	Furfuryl alcohol	98-00-0	LU9100000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0299	Gasoline	8006-61-9	LX3300000
0300	Germanium tetrahydride	7782-65-2	LY4900000
0301	Glutaraldehyde	111-30-8	MA2450000
0302	Glycerin (mist)	56-81-5	MA8050000
0303	Glycidol	556-52-5	UB4375000
0304	Glycolonitrile	107-16-4	AM0350000
0305	Grain dust (oat, wheat, barley)		MD7900000
0306	Graphite (natural)	7782-42-5	MD9659600
0307	Graphite (synthetic)	7440-44-0	FF5250100
0308	Gypsum	13397-24-5	MG2360000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0309	Hafnium	7440-58-6	MG4600000
0310	Halothane	151-67-7	KH6550000
0311	Heptachlor	76-44-8	PC0700000
0312	n-Heptane	142-82-5	MI7700000
0313	1-Heptanethiol	1639-09-4	MJ1400000
0314	Hexachlorobutadiene	87-68-3	EJ0700000
0315	Hexachlorocyclopentadiene	77-47-4	GY1225000
0316	Hexachloroethane	67-72-1	KI4025000
0317	Hexachloronaphthalene	1335-87-1	QJ7350000
0318	1-Hexadecanethiol	2917-26-2	
0319	Hexafluoroacetone	684-16-2	UC2450000
0320	Hexamethylene diisocyanate	822-06-0	MO1740000
0321	Hexamethyl phosphoramidate	680-31-9	TD0875000
0322	n-Hexane	110-54-3	MN9275000
0323	Hexane isomers (excluding n-Hexane)		
0324	n-Hexanethiol	111-31-9	MO4550000
0325	2-Hexanone	591-78-6	MP1400000
0326	Hexone	108-10-1	SA9275000
0327	sec-Hexyl acetate	108-84-9	SA7525000
0328	Hexylene glycol	107-41-5	SA0810000
0329	Hydrazine	302-01-2	MU7175000
0330	Hydrogenated terphenyls	61788-32-7	WZ6535000
0331	Hydrogen bromide	10035-10-6	MW3850000
0332	Hydrogen chloride	7647-01-0	MW4025000
0333	Hydrogen cyanide	74-90-8	MW6825000
0334	Hydrogen fluoride	7664-39-3	MW7875000
0335	Hydrogen peroxide	7722-84-1	MX0900000
0336	Hydrogen selenide	7783-07-5	MX1050000
0337	Hydrogen sulfide	7783-06-4	MX1225000
0338	Hydroquinone	123-31-9	MX3500000
0339	2-Hydroxypropyl acrylate	999-61-1	AT1925000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0340	Indene	95-13-6	NK8225000
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0341	Indium	7440-74-6	NL1050000
0342	Iodine	7553-56-2	NN1575000
0343	Iodoform	75-47-8	PB7000000
0344	Iron oxide dust and fume (as Fe)	1309-37-1	NO7400000
0345	Iron pentacarbonyl (as Fe)	13463-40-6	NO4900000
0346	Iron salts (soluble, as Fe)		
0347	Isoamyl acetate	123-92-2	NS9800000
0348	Isoamyl alcohol (primary)	123-51-3	EL5425000
0349	Isoamyl alcohol (secondary)	6032-29-7	
0350	Isobutane	75-28-5	TZ4300000
0351	Isobutyl acetate	110-19-0	AI4025000
0352	Isobutyl alcohol	78-83-1	NP9625000
0353	Isobutyronitrile	78-82-0	TZ4900000
0354	Isooctyl alcohol	26952-21-6	NS7700000
0355	Isophorone	78-59-1	GW7700000
0356	Isophorone diisocyanate	4098-71-9	NO9370000
0357	2-Isopropoxyethanol	109-59-1	KL5075000
0358	Isopropyl acetate	108-21-4	AI4930000
0359	Isopropyl alcohol	67-63-0	NT8050000
0360	Isopropylamine	75-31-0	NT8400000
0361	N-Isopropylaniline	768-52-5	BY4190000
0362	Isopropyl ether	108-20-3	TZ5425000
0363	Isopropyl glycidyl ether	4016-14-2	TZ3500000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0364	Kaolin	1332-58-7	GF1670500
0365	Kepone	143-50-0	PC8575000
0366	Kerosene	8008-20-6	OA5500000
0367	Ketene	463-51-4	OA7700000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0368	Lead	7439-92-1	OF7525000
0369	Limestone	1317-65-3	EV9580000
0370	Lindane	58-89-9	GV4900000
0371	Lithium hydride	7580-67-8	OJ6300000
0372	L.P.G.	68476-85-7	SE7545000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0373	Magnesite	546-93-0	OM2470000
0374	Magnesium oxide fume	1309-48-4	OM3850000
0375	Malathion	121-75-5	WM8400000
0376	Maleic anhydride	108-31-6	ON3675000
0377	Malonaldehyde	542-78-9	TX6475000
0378	Malononitrile	109-77-3	OO3150000
0379	Manganese compounds and fume (as Mn)	7439-96-5	OO9275000
0380	Manganese cyclopentadienyl tricarbonyl	12079-65-1	OO9720000
0381	Manganese tetroxide (as Mn)	1317-35-7	OP0895000
0382	Marble	1317-65-3	EV9580000
0383	Mercury compounds [except (organo) alkyl]	7439-97-6	OV4550000
0384	Mercury (organo) alkyl compounds (as Hg)		
0385	Mesityl oxide	141-79-7	SB4200000
0386	Methacrylic acid	79-41-4	OZ2975000
0387	Methomyl	16752-77-5	AK2975000
0388	Methoxychlor	72-43-5	KJ3675000
0389	Methoxyflurane	76-38-0	KN7820000
0390	4-Methoxyphenol	150-76-5	SL7700000
0391	Methyl acetate	79-20-9	AI9100000
0392	Methyl acetylene	74-99-7	UK4250000
0393	Methyl acetylene-propadiene mixture	59355-75-8	UK4920000
0394	Methyl acrylate	96-33-3	AT2800000
0395	Methylacrylonitrile	126-98-7	UD1400000
0396	Methylal	109-87-5	PA8750000
0397	Methyl alcohol	67-56-1	PC1400000
0398	Methylamine	74-89-5	PF6300000
0399	Methyl (n-amyl) ketone	110-43-0	MJ5075000
0400	Methyl bromide	74-83-9	PA4900000
0401	Methyl Cellosolve®	109-86-4	KL5775000
0402	Methyl Cellosolve® acetate	110-49-6	KL5950000
0403	Methyl chloride	74-87-3	PA6300000
0404	Methyl chloroform	71-55-6	KJ2975000
0405	Methyl-2-cyanoacrylate	137-05-3	AS7000000
0406	Methylcyclohexane	108-87-2	GV6125000
0407	Methylcyclohexanol	25639-42-3	GW0175000
0408	o-Methylcyclohexanone	583-60-8	GW1750000

0409	Methyl cyclopentadienyl manganese tricarbonyl	12108-13-3	OP1450000
0410	Methyl demeton	8022-00-2	TG1760000
0411	4,4'-Methylenebis(2-chloroaniline)	101-14-4	CY1050000
0412	Methylene bis(4-cyclohexylisocyanate)	5124-30-1	NO9250000
0413	Methylene bisphenyl isocyanate	101-68-8	NO9350000
0414	Methylene chloride	75-09-2	PA8050000
0415	4,4'-Methylenedianiline	101-77-9	BY5425000
0416	Methyl ethyl ketone peroxide	1338-23-4	EL9450000
0417	Methyl formate	107-31-3	LO8925000
0418	5-Methyl-3-heptanone	541-85-5	MJ7350000
0419	Methyl hydrazine	60-34-4	MV5600000
0420	Methyl iodide	74-88-4	PA9450000
0421	Methyl isoamyl ketone	110-12-3	MP3850000
0422	Methyl isobutyl carbinol	108-11-2	SA7350000
0423	Methyl isocyanate	624-83-9	NO9450000
0424	Methyl isopropyl ketone	563-80-4	EL9100000
0425	Methyl mercaptan	74-93-1	PB4375000
0426	Methyl methacrylate	80-62-6	OZ5075000
0427	Methyl parathion	298-00-0	TG0175000
0428	Methyl silicate	681-84-5	VV9800000
0429	alpha-Methyl styrene	98-83-9	WL5075300
0430	Metribuzin	21087-64-9	XZ2990000
0431	Mica (containing less than 1% quartz)	12001-26-2	VV8760000
0432	Mineral wool fiber		PY8070000
0433	Molybdenum	7439-98-7	QA4680000
0434	Molybdenum (soluble compounds, as Mo)		
0435	Monocrotophos	6923-22-4	TC4375000
0436	Monomethyl aniline	100-61-8	BY4550000
0437	Morpholine	110-91-8	OD6475000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0438	Naphtha (coal tar)	8030-30-6	DE3030000
0439	Naphthalene	91-20-3	OJ0525000
0440	Naphthalene diisocyanate	3173-72-6	NO9600000
0441	alpha-Naphthylamine	134-32-7	OM1400000
0442	beta-Naphthylamine	91-59-8	OM2100000
0443	Niax® Catalyst ESN	62765-93-9	OR3900000
0444	Nickel carbonyl	13463-39-3	OR6300000
0445	Nickel metal and other compounds (as Ni)	7440-02-0	OR5950000
0446	Nicotine	54-11-5	OS5250000
0447	Nitric acid	7697-37-2	OU5775000
0448	Nitric oxide	10102-43-9	OX0525000
0449	p-Nitroaniline	100-01-6	BY7000000
0450	Nitrobenzene	98-95-3	DA6475000
0451	4-Nitrobiphenyl	92-93-3	DV5600000
0452	p-Nitrochlorobenzene	100-00-5	CZ1050000
0453	Nitroethane	79-24-3	K15600000
0454	Nitrogen dioxide	10102-44-0	OW9800000
0455	Nitrogen trifluoride	7783-54-2	OX1925000
0456	Nitroglycerine	55-63-0	OX2100000
0457	Nitromethane	75-52-5	PA9800000
0458	2-Nitronaphthalene	581-89-5	OJ9760000
0459	1-Nitropropane	108-03-2	TZ5075000
0460	2-Nitropropane	79-46-9	TZ5250000
0461	N-Nitrosodimethylamine	62-75-9	IQ0525000
0462	o-Nitrotoluene	88-72-2	XT3150000
0463	m-Nitrotoluene	99-08-1	XT2975000
0464	p-Nitrotoluene	99-99-0	XT3325000
0465	Nitrous oxide	10024-97-2	OX1350000
0466	Nonane	111-84-2	RA6115000
0467	1-Nonanethiol	1455-21-6	

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0468	Octachloronaphthalene	2234-13-1	OK0250000
0469	1-Octadecanethiol	2885-00-9	
0470	Octane	111-65-9	RG8400000
0471	1-Octanethiol	111-88-6	
0472	Oil mist (mineral)	8012-95-1	PY8030000
0473	Osmium tetroxide	20816-12-0	RN1140000
0474	Oxalic acid	144-62-7	RO2450000
0475	Oxygen difluoride	7783-41-7	RS2100000
0476	Ozone	10028-15-6	RS8225000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0477	Paraffin wax fume	8002-74-2	RV0350000
0478	Paraquat (Paraquat dichloride)	1910-42-5	DW2275000
0479	Parathion	56-38-2	TF4550000
0480	Particulates not otherwise regulated		
0481	Pentaborane	19624-22-7	RY8925000
0482	Pentachloroethane	76-01-7	KI6300000
0483	Pentachloronaphthalene	1321-64-8	OK0300000
0484	Pentachlorophenol	87-86-5	SM6300000
0485	Pentaerythritol	115-77-5	RZ2490000
0486	n-Pentane	109-66-0	RZ9450000
0487	1-Pentanethiol	110-66-7	SA3150000
0488	2-Pentanone	107-87-9	SA7875000
0489	Perchloromethyl mercaptan	594-42-3	PB0370000
0490	Perchloryl fluoride	7616-94-6	SD1925000
0491	Perlite	93763-70-3	SO5254000
0492	Petroleum distillates (naphtha)	8002-05-9	SE7449000
0493	Phenol	108-95-2	SJ3325000
0494	Phenothiazine	92-84-2	SN5075000
0495	p-Phenylene diamine	106-50-3	SS8050000
0496	Phenyl ether (vapor)	101-84-8	KN8970000
0497	Phenyl ether-biphenyl mixture (vapor)	8004-13-5	DV1500000
0498	Phenyl glycidyl ether	122-60-1	TZ3675000
0499	Phenylhydrazine	100-63-0	MW8925000
0500	N-Phenyl-beta-naphthylamine	135-88-6	OM4550000
0501	Phenylphosphine	638-21-1	SZ2100000
0502	Phorate	298-02-2	TD9450000
0503	Phosdrin	7786-34-7	GO5250000
0504	Phosgene	75-44-5	SY5600000
0505	Phosphine	7803-51-2	SY7525000
0506	Phosphoric acid	7664-38-2	TB6300000
0507	Phosphorus (yellow)	7723-14-0	TH3500000
0508	Phosphorus oxychloride	10025-87-3	TH4897000
0509	Phosphorus pentachloride	10026-13-8	TB6125000
0510	Phosphorus pentasulfide	1314-80-3	TH4375000
0511	Phosphorus trichloride	7719-12-2	TH3675000
0512	Phthalic anhydride	85-44-9	TI3150000
0513	m-Phthalodinitrile	626-17-5	CZ1900000
0514	Picloram	1918-02-1	TJ7525000
0515	Picric acid	88-89-1	TJ7875000
0516	Pindone	83-26-1	NK6300000
0517	Piperazine dihydrochloride	142-64-3	TL4025000
0518	Plaster of Paris	26499-65-0	TP0700000
0519	Platinum	7440-06-4	TP2160000
0520	Platinum (soluble salts, as Pt)		
0521	Portland cement	65997-15-1	VV8770000
0522	Potassium cyanide (as CN)	151-50-8	TS8750000
0523	Potassium hydroxide	1310-58-3	TT2100000
0524	Propane	74-98-6	TX2275000
0525	Propane sultone	1120-71-4	RP5425000
0526	1-Propanethiol	107-03-9	TZ7300000
0527	Propargyl alcohol	107-19-7	UK5075000
0528	beta-Propiolactone	57-57-8	RO7350000
0529	Propionic acid	79-09-4	UE5950000
0530	Propionitrile	107-12-0	UF9625000
0531	Propoxur	114-26-1	FC3150000
0532	n-Propyl acetate	109-60-4	AJ3675000
0533	n-Propyl alcohol	71-23-8	UH8225000
0534	Propylene dichloride	78-87-5	TX9625000
0535	Propylene glycol dinitrate	6423-43-4	TY6300000
0536	Propylene glycol monomethyl ether	107-98-2	UB7700000
0537	Propylene imine	75-55-8	CM8050000
0538	Propylene oxide	75-56-9	TZ2975000
0539	n-Propyl nitrate	627-13-4	UK0350000
0540	Pyrethrum	8003-34-7	UR4200000
0541	Pyridine	110-86-1	UR8400000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0542	Quinone	106-51-4	DK2625000
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GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0543	Resorcinol	108-46-3	VG9625000
0544	Rhodium (metal fume and insoluble compou	7440-16-6	VI9069000
0545	Rhodium (soluble compounds, as Rh)		
0546	Ronnel	299-84-3	TG0525000
0547	Rosin core solder, pyrolysis products		
0548	Rotenone	83-79-4	DJ2800000

0549	Rouge	1309-37-1	NO7400000
GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
0550	Selenium	7782-49-2	VS7700000
0551	Selenium hexafluoride	7783-79-1	VS9450000
0552	Silica, amorphous	7631-86-9	VV7310000
0553	Silica, crystalline (as respirable dust)	14808-60-7	VV7330000
0554	Silicon	7440-21-3	VW0400000
0555	Silicon carbide	409-21-2	VW0450000
0556	Silicon tetrahydride	7803-62-5	VV1400000
0557	Silver (metal dust and soluble compounds)	7440-22-4	VW3500000
0558	Soapstone (containing less than 1% quartz)		VV8780000
0559	Sodium aluminum fluoride (as F)	15096-52-3	WA9625000
0560	Sodium azide	26628-22-8	VY8050000
0561	Sodium bisulfite	7631-90-5	VZ2000000
0562	Sodium cyanide (as CN)	143-33-9	VZ7530000
0563	Sodium fluoride (as F)	7681-49-4	WB0350000
0564	Sodium fluoroacetate	62-74-8	AH9100000
0565	Sodium hydroxide	1310-73-2	WB4900000
0566	Sodium metabisulfite	7681-57-4	UX8225000
0567	Starch	9005-25-8	GM5090000
0568	Stibine	7803-52-3	WJ0700000
0569	Stoddard solvent	8052-41-3	WJ8925000
0570	Strychnine	57-24-9	WL2275000
0571	Styrene	100-42-5	WL3675000
0572	Subtilisins	1395-21-7	CO9450000
0573	Succinonitrile	110-61-2	WN3850000
0574	Sucrose	57-50-1	WN6500000
0575	Sulfur dioxide	7446-09-5	WS4550000
0576	Sulfur hexafluoride	2551-62-4	WS4900000
0577	Sulfuric acid	7664-93-9	WS5600000
0578	Sulfur monochloride	10025-67-9	WS4300000
0579	Sulfur pentafluoride	5714-22-7	WS4480000
0580	Sulfur tetrafluoride	7783-60-0	WT4800000
0581	Sulfuryl fluoride	2699-79-8	WT5075000
0582	Sulprofos	35400-43-2	TE4165000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
0583	2,4,5-T	93-76-5	AJ8400000
0584	Talc (containing no asbestos and less than 1% asbestos)	14807-96-6	WW2710000
0585	Tantalum (metal and oxide dust, as Ta)	7440-25-7	WW5505000
0586	TEDP	3689-24-5	XN4375000
0587	Tellurium	13494-80-9	WY2625000
0588	Tellurium hexafluoride	7783-80-4	WY2800000
0589	Temephos	3383-96-8	TF6890000
0590	TEPP	107-49-3	UX6825000
0591	o-Terphenyl	84-15-1	WZ6472000
0592	m-Terphenyl	92-06-8	WZ6470000
0593	p-Terphenyl	92-94-4	WZ6475000
0594	2,3,7,8-Tetrachloro-dibenzo-p-dioxin	1746-01-6	HP3500000
0595	1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	KI1425000
0596	1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	KI1420000
0597	1,1,1,2-Tetrachloroethane	630-20-6	KI8450000
0598	1,1,2,2-Tetrachloroethane	79-34-5	KI8575000
0599	Tetrachloroethylene	127-18-4	KX3850000
0600	Tetrachloronaphthalene	1335-88-2	OK3700000
0601	Tetraethyl lead (as Pb)	78-00-2	TP4550000
0602	Tetrahydrofuran	109-99-9	LU5950000
0603	Tetramethyl lead (as Pb)	75-74-1	TP4725000
0604	Tetramethyl succinonitrile	3333-52-6	WN4025000
0605	Tetranitromethane	509-14-8	PB4025000
0606	Tetrasodium pyrophosphate	7722-88-5	UX7350000
0607	Tetryl	479-45-8	BY6300000
0608	Thallium (soluble compounds, as Tl)		
0609	4,4'-Thiobis(6-tert-butyl-m-cresol)	96-69-5	GP3150000
0610	Thioglycolic acid	68-11-1	AI5950000
0611	Thionyl chloride	7719-09-7	XM5150000
0612	Thiram	137-26-8	JO1400000
0613	Tin	7440-31-5	XP7320000
0614	Tin (organic compounds, as Sn)		
0615	Tin(II) oxide (as Sn)	21651-19-4	
0616	Tin(IV) oxide (as Sn)	18282-10-5	XO4000000
0617	Titanium dioxide	13463-67-7	XR2275000
0618	o-Tolidine	119-93-7	DD1225000
0619	Toluene	108-88-3	XS5250000
0620	Toluenediamine	25376-45-8	XS9445000

0621	Toluene-2,4-diisocyanate	584-84-9	CZ6300000
0622	o-Toluidine	95-53-4	XU2975000
0623	m-Toluidine	108-44-1	XU2800000
0624	p-Toluidine	106-49-0	XU3150000
0625	Tributyl phosphate	126-73-8	TC7700000
0626	Trichloroacetic acid	76-03-9	AJ7875000
0627	1,2,4-Trichlorobenzene	120-82-1	DC2100000
0628	1,1,2-Trichloroethane	79-00-5	KJ3150000
0629	Trichloroethylene	79-01-6	KX4550000
0630	Trichloronaphthalene	1321-65-9	OK4025000
0631	1,2,3-Trichloropropane	96-18-4	TZ9275000
0632	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	KJ4000000
0633	Triethylamine	121-44-8	YEO175000
0634	Trifluorobromomethane	75-63-8	PA5425000
0635	Trimellitic anhydride	552-30-7	DC2050000
0636	Trimethylamine	75-50-3	PA0350000
0637	1,2,3-Trimethylbenzene	526-73-8	DC330000
0638	1,2,4-Trimethylbenzene	95-63-6	DC3325000
0639	1,3,5-Trimethylbenzene	108-67-8	OX6825000
0640	Trimethyl phosphate	121-45-9	TH1400000
0641	2,4,6-Trinitrotoluene	118-96-7	XU0175000
0642	Triorthocresyl phosphate	78-30-8	TD0350000
0643	Triphenylamine	603-34-9	YK2680000
0644	Triphenyl phosphate	115-86-6	TC8400000
0645	Tungsten	7440-33-7	YO7175000
0646	Tungsten (soluble compounds, as W)		
0647	Tungsten carbide (cemented)	11107-01-0	YO7350000
0648	Turpentine	8006-64-2	YO8400000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0649	1-Undecanethiol	5332-52-5	
0650	Uranium (insoluble compounds, as U)	7440-61-1	YR3490000
0651	Uranium (soluble compounds, as U)		

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0652	n-Valeraldehyde	110-62-3	YV3600000
0653	Vanadium dust	1314-62-1	YW2450000
0654	Vanadium fume	1314-62-1	YW2460000
0655	Vegetable oil mist	68956-68-3	YX1850000
0656	Vinyl acetate	108-05-4	AK0875000
0657	Vinyl bromide	593-60-2	KU8400000
0658	Vinyl chloride	75-01-4	KU9625000
0659	Vinyl cyclohexene dioxide	106-87-6	RN8640000
0660	Vinyl fluoride	75-02-5	YZ7351000
0661	Vinylidene chloride	75-35-4	KV9275000
0662	Vinylidene fluoride	75-38-7	KW0560000
0663	Vinyl toluene	25013-15-4	WL5075000
0664	VM & P Naphtha	8032-32-4	OI6180000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0665	Warfarin	81-81-2	GN4550000
0666	Welding fumes		ZC2550000
0667	Wood dust		ZC9850000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0668	o-Xylene	95-47-6	ZE2450000
0669	m-Xylene	108-38-3	ZE2275000
0670	p-Xylene	106-42-3	ZE2625000
0671	m-Xylene-alpha, alpha'-diamine	1477-55-0	PF8970000
0672	Xylidine	1300-73-8	ZE8575000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0673	Yttrium	7440-65-5	ZG2980000
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GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0674	Zinc chloride fume	7646-85-7	ZH1400000
0675	Zinc oxide	1314-13-2	ZH4810000

0676	Zinc stearate	557-05-1	ZH5200000
0677	Zirconium compounds (as Zr)	7440-67-7	ZH7070000

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#) **Note: Large File**

[INDEX with CHEMICAL NAMES](#) **Note: Medium File**

[INDEX with CAS NUMBERS](#) **Note: Small File**

[APPENDICES](#)

The Pocket Guide includes the following:

- **Chemical Names, synonyms, trade names, conversion factors, CAS, RTECS, and DOT Numbers**
- **NIOSH Recommended Expoure Limits (NIOSH RELs)**
- **Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs)**
- **NIOSH Immediate Dangerous to Life and Health values (NIOSH IDLHs)**
- **A physical description of the agent with chemical and physical properties**
- **Measurement methods**
- **Personal Protection and Sanitation Recommendations**
- **Respirator Recommendations**
- **Information on Health Hazards including route, symptoms, first aid and target organ information.**

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

INTRODUCTION

The *NIOSH Pocket Guide to Chemical Hazards* is intended as a source of general industrial hygiene information for workers, employers, and occupational health professionals. The *Pocket Guide* presents key information and data in abbreviated tabular form for 677 chemicals or substance groupings (e.g., manganese compounds, tellurium compounds, inorganic tin compounds, etc.) that are found in the work environment. The industrial hygiene information found in the *Pocket Guide* should help users recognize and control occupational chemical hazards. The chemicals or substances contained in this revision include all substances for which the National Institute for Occupational Safety and Health (NIOSH) has recommended exposure limits (RELs) and those with permissible exposure limits (PELs) as found in the Occupational Safety and Health Administration (OSHA) General Industry Air Contaminants Standard (29 CFR 1910.1000).

Background

In 1974, NIOSH (which is responsible for recommending health and safety standards) joined OSHA (whose jurisdictions include promulgation and enforcement activities) in developing a series of occupational health standards for substances with existing PELs. This joint effort was labeled the Standards Completion Program and involved the cooperative efforts of several contractors and personnel from various divisions within NIOSH and OSHA. The Standards Completion Program developed 380 substance-specific draft standards with supporting documentation that contained technical information and recommendations needed for the promulgation of new occupational health regulations. The *Pocket Guide* was developed to make the technical information in those draft standards more conveniently available to workers, employers, and occupational health professionals. The *Pocket Guide* is updated periodically to reflect new data regarding the toxicity of various substances and any changes in exposure standards or recommendations.

Data Collection and Application

The data were collected from a variety of sources, including NIOSH policy documents such as criteria documents and Current Intelligence Bulletins (CIBs), and recognized references in the fields of industrial hygiene, occupational medicine, toxicology, and analytical chemistry.

NIOSH RECOMMENDATIONS

Acting under the authority of the Occupational Safety and Health Act of 1970 (29 USC Chapter 15) and the Federal Mine Safety and Health Act of 1977 (30 USC Chapter 22), NIOSH develops and periodically revises recommended exposure limits (RELs) for hazardous substances or conditions in the workplace. NIOSH also recommends appropriate preventive measures to reduce or eliminate the adverse health and safety effects of these hazards. To formulate these recommendations, NIOSH evaluates all known and available medical, biological, engineering, chemical, trade, and other information relevant to the hazard. These recommendations are then published and transmitted to OSHA and the Mine Safety and Health Administration (MSHA) for use in promulgating legal standards.

NIOSH recommendations are published in a variety of documents. Criteria documents recommend workplace exposure

limits and appropriate preventive measures to reduce or eliminate adverse health effects and accidental injuries.

Current Intelligence Bulletins (CIBs) are issued to disseminate new scientific information about occupational hazards. A CIB may draw attention to a formerly unrecognized hazard, report new data on a known hazard, or present information on hazard control.

Alerts, Special Hazard Reviews, Occupational Hazard Assessments, and Technical Guidelines support and complement the other standards development activities of the Institute. Their purpose is to assess the safety and health problems associated with a given agent or hazard (e.g., the potential for injury or for carcinogenic, mutagenic, or teratogenic effects) and to recommend appropriate control and surveillance methods. Although these documents are not intended to supplant the more comprehensive criteria documents, they are prepared to assist OSHA and MSHA in the formulation of regulations.

In addition to these publications, NIOSH periodically presents testimony before various Congressional committees and at OSHA and MSHA rulemaking hearings.

A complete list of occupational safety and health issues for which NIOSH has formal policies (e.g., recommendations for occupational exposure to chemical and physical hazards, engineering controls, work practices, safety considerations, etc.) can be found in *NIOSH Recommendations for Occupational Safety and Health: Compendium of Policy Documents and Statements* [DHHS (NIOSH) Publication No. 92-100].

HOW TO USE THIS POCKET GUIDE

The Pocket Guide has been designed to provide chemical-specific data to supplement general industrial hygiene knowledge. To maximize the amount of data provided in this limited space, abbreviations and codes have been used extensively. These abbreviations and codes, which have been designed to permit rapid comprehension by the regular user, are discussed for each column in the following subsections.

Chemical Name and Structure/Formula, CAS and RTECS Numbers, and DOT ID and Guide Numbers

Chemical Name and Structure/Formula - The chemical name found in the OSHA General Industry Air Contaminants Standard (29 CFR 1910.1000) is listed first. The chemical formula is also provided under the chemical name.

CAS and RTECS Numbers - The Chemical Abstracts Service (CAS) number, in the format xxx-xx-x, is unique for each chemical and allows efficient searching on computerized data bases. The *NIOSH Registry of Toxic Effects of Chemical Substances* (RTECS) number, in the format ABxxxxxxx, may be useful for obtaining additional toxicologic information on a specific substance.

DOT ID and GUIDE Number - The U.S. Department of Transportation (DOT) identification number and the corresponding guide number. Their format is xxxx xxx. The Identification number (xxxx) indicates that the chemical is regulated by DOT. The Guide number (xxx) refers to actions to be taken to stabilize an emergency situation; this information can be found in the *2000 Emergency Response Guidebook* (Office of Hazardous Materials Training and Initiatives [DHM-50], Research and Special Programs Administration, U.S. Department of Transportation, Washington, D.C. 20590-0001; for sale by the U.S. Government Printing Office, Superintendent of Documents, Mail Stop: SSOP, Washington, D.C. 20402-9328). A page index for all DOT ID numbers listed is included at the back of the *Pocket Guide* to help the user locate a specific substance; please note however, that many DOT numbers are NOT unique for specific substances.

Synonyms, Trade Names, and Conversion Factors

Common synonyms and trade names are listed alphabetically for each chemical. Factors for the conversion of ppm

(parts of vapor or gas per million parts of contaminated air by volume) to mg/m³ (milligrams of vapor or gas per cubic meter of contaminated air) at 25 °C and 1 atmosphere are listed for chemicals with exposure limits expressed in ppm.

Exposure Limits

The NIOSH recommended exposure limits (RELs) are listed first in this column. Unless noted otherwise, RELs are time-weighted average (TWA) concentrations for up to a 10-hour workday during a 40-hour workweek. A short-term exposure limit (STEL) is designated by "ST" preceding the value; unless noted otherwise, the STEL is a 15-minute TWA exposure that should not be exceeded at any time during a workday. A ceiling REL is designated by "C" preceding the value; unless noted otherwise, the ceiling value should not be exceeded at any time. Any substance that NIOSH considers to be a potential occupational carcinogen is designated by the notation "Ca" see ([Appendix A](#), which contains a brief discussion of potential occupational carcinogens).

The OSHA permissible exposure limits (PELs), as found in Tables Z-1, Z-2, and Z-3 of the OSHA General Industry Air Contaminants Standard (29 CFR 1910.1000), that were effective on July 1, 1993* and which are currently enforced by OSHA are listed next. [*Note: In July 1992, the 11th Circuit Court of Appeals in its decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992) vacated more protective PELs set by OSHA in 1989 for 212 substances, moving them back to PELs established in 1971. The appeals court also vacated new PELs for 164 substances that were not previously regulated. The substances for which OSHA PELs were vacated on June 30, 1993 are indicated by the symbol "†" following OSHA PEL in this column. A number of RELs are based on NIOSH concurrence with the data presented and the airborne exposure limits proposed in this rulemaking.] Unless noted otherwise, PELs are TWA concentrations that must not be exceeded during any 8-hour workshift of a 40-hour workweek. A STEL is designated by "ST" preceding the value and is measured over a 15-minute period unless noted otherwise. OSHA ceiling concentrations (designated by "C" preceding the value) must not be exceeded during any part of the workday; if instantaneous monitoring is not feasible, the ceiling must be assessed as a 15-minute TWA exposure. In addition, there are a number of substances from Table Z-2 (e.g., beryllium, ethylene dibromide, etc.) that have PEL ceiling values that must not be exceeded except for specified excursions. For example, a "5-minute maximum peak in any 2 hours" means that a 5-minute exposure above the ceiling value, but never above the maximum peak, is allowed in any 2 hours during an 8-hour workday. [Appendix B](#) contains a brief discussion of substances regulated as carcinogens by OSHA.

Concentrations are given in ppm, mg/m³, mppcf (millions of particles per cubic foot of air as determined from counting an impinger sample), or fibers/cm³ (fibers per cubic centimeter). The "[skin]" designation indicates the potential for dermal absorption; skin exposure should be prevented as necessary through the use of good work practices and gloves, coveralls, goggles, and other appropriate equipment. The "(total)" designation indicates that the REL or PEL listed is for "total particulate" versus the "(resp)" designation which refers to the "respirable fraction" of the airborne particulate. [Appendix C](#) contains more detailed discussions of the specific exposure limits for certain low-molecular-weight aldehydes, asbestos, various dyes (benzidine-, o-tolidine-, and o-dianisidine-based), carbon black, the various chromium compounds (chromic acid and chromates, chromium(II) and chromium(III) compounds, and chromium metal), coal tar pitch volatiles, coke oven emissions, cotton dust, lead, NIAX Catalyst ESN, trichloroethylene, and tungsten carbide (cemented). [Appendix D](#) contains a brief discussion of substances included in the *Pocket Guide* with no established RELs at this time and [Appendix F](#) contains miscellaneous notes regarding the OSHA PELs. [Appendix G](#) lists the OSHA PELs that were vacated on June 30, 1993.]

IDLH

For the June 1994 Edition of the *Pocket Guide*, immediately dangerous to life or health concentrations (IDLHs) were reviewed and, in many cases, were revised and made more protective. As a consequence of the IDLH changes, many of the respirator recommendations for these substances were also revised. The criteria utilized to determine the adequacy of existing IDLH values were a combination of those used during the Standards Completion Program and a newer methodology developed by NIOSH. These "interim" criteria form a tiered approach with acute human toxicity data being used preferentially, followed next by acute animal inhalation toxicity data, and then finally by acute animal oral toxicity data to determine an updated IDLH value. When relevant acute toxicity data were insufficient or

unavailable, the use of chronic toxicity data or an analogy to a chemically similar substance was considered. The criteria and information sources for both the original and revised IDLH values are given in *Documentation for Immediately Dangerous to Life and Health Concentrations (IDLHs)* (NTIS Publication No. PB-94-195047). NIOSH is currently assessing the various uses of IDLHs and whether the original criteria used to derive the IDLH values are valid or if other information or criteria should be utilized. Based on this assessment, NIOSH will develop a new strategy for revising the IDLH values currently listed, as well as for developing new IDLH values for the more than 300 substances listed in the *Pocket Guide* without IDLHs.

The definition of IDLH that was derived during the Standards Completion Program was based on the Mine Safety and Health Administration (MSHA) definition stipulated in 30 CFR 11.3(t). The purpose for establishing an IDLH value in the Standards Completion Program was to ensure that a worker could escape without injury or irreversible health effects from an IDLH exposure in the event of the failure of respiratory protection equipment. The IDLH was considered a maximum concentration above which only a highly reliable breathing apparatus providing maximum worker protection was permitted. In determining IDLH values, the ability of a worker to escape without loss of life or irreversible health effects was considered along with severe eye or respiratory irritation and other deleterious effects (e.g., disorientation or incoordination) that could prevent escape. As a safety margin, the Standards Completion Program IDLH values were based on the effects that might occur as a consequence of a 30-minute exposure. However, the 30-minute period was NOT meant to imply that workers should stay in the work environment any longer than necessary, in fact, EVERY EFFORT SHOULD BE MADE TO EXIT IMMEDIATELY!

The current NIOSH definition for an IDLH exposure condition, as stipulated in the *NIOSH Respirator Decision Logic* (DHHS [NIOSH] Publication No. 87-108, NTIS Publication No. PB-91-151183), is a condition "that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment." The purpose of establishing an IDLH exposure concentration is to "ensure that the worker can escape from a given contaminated environment in the event of failure of the respiratory protection equipment." The *NIOSH Respirator Decision Logic* uses these IDLH values as one of several respirator selection criteria. Under the *NIOSH Respirator Decision Logic*, the most protective respirators (e.g., a self-contained breathing apparatus equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode) would be selected for firefighting, exposure to carcinogens, entry into oxygen-deficient atmospheres, in emergency situations, during entry into an atmosphere that contains a substance at a concentration greater than 2,000 times the NIOSH REL or OSHA PEL, and for entry into IDLH atmospheres.

IDLH values are listed for over 380 substances. The notation "Ca" appears in this column for all substances that NIOSH considers to be potential occupational carcinogens. However, IDLH values that were originally determined in the Standards Completion Program or were recently revised are shown in brackets following the "Ca" designations. "10%LEL" indicates that the IDLH was based on 10% of the lower explosive limit for safety considerations even though the relevant toxicological data indicated that irreversible health effects or impairment of escape existed only at higher concentrations. "N.D." indicates that an IDLH has not as yet been determined.

Physical Description

This entry provides a brief description of the appearance and odor of each substance. Notations are made as to whether a substance can be shipped as a liquefied compressed gas or whether it has major use as a pesticide.

Chemical and Physical Properties

The following abbreviations are used for the chemical and physical properties given for each substance. "NA" indicates that a property is not applicable, and a question mark (?) indicates that it is unknown.

- MW Molecular weight
- BP Boiling point at 1 atmosphere, °F
- Sol Solubility in water at 68 °F (unless a different temperature is noted), % by weight (i.e., g/100 ml)
- Fl.P Flash point (i.e., the temperature at which the liquid phase gives off enough vapor to flash when exposed to

	an external ignition source), closed cup (unless annotated "(oc)" for open cup), °F
IP	Ionization potential, eV (electron volts) [Ionization potentials are given as a guideline for the selection of photoionization detector lamps used in some direct-reading instruments.]
VP	Vapor pressure at 68 °F (unless a different temperature is noted), mm Hg; "approx" indicates approximately
MLT	Melting point for solids, °F
FRZ	Freezing point for liquids and gases, °F
UEL	Upper explosive (flammable) limit in air, % by volume (at room temperature unless otherwise noted)
LEL	Lower explosive (flammable) limit in air, % by volume (at room temperature unless otherwise noted)
MEC	Minimum explosive concentration, g/m ³ (when available)
Sp.Gr	Specific gravity at 68 °F (unless a different temperature is noted) referenced to water at 39.2 °F (4 °C)
RGasD	Relative density of gases referenced to air = 1 (indicates how many times a gas is heavier than air at the same temperature)

When possible, the flammability/combustibility of a substance was determined and listed after the specific gravity. The following OSHA criteria (29 CFR 1910.106) were used to classify flammable or combustible liquids:

Class IA flammable liquid	Fl.P. below 73 °F and BP below 100 °F.
Class IB flammable liquid	Fl.P. below 73 °F and BP at or above 100 °F.
Class IC flammable liquid	Fl.P. at or above 73 °F and below 100 °F.
Class II combustible liquid	Fl.P. at or above 100 °F and below 140 °F.
Class IIIA combustible liquid	Fl.P. at or above 140 °F and below 200 °F.
Class IIIB combustible liquid	Fl.P. at or above 200 °F.

Incompatibilities and Reactivities

This entry lists important hazardous incompatibilities or reactivities of each substance.

Measurement Methods

This entry provides a source (NIOSH or OSHA) and the method number for which a measurement method can be used to determine the exposure. Unless otherwise noted, the NIOSH methods are from the 4th edition of the *NIOSH Manual of Analytical Methods* (DHHS [NIOSH] Publication No. 94-113). If a different edition of the *NIOSH Manual of Analytical Methods* is cited, the appropriate edition and, where applicable, the volume number would be noted [e.g., II-4 (2nd edition, volume 4)]. The OSHA methods are from the OSHA web site, <http://www.osha-slc.gov/dts/sltc/methods/>. "None available" means that no method is available from the NIOSH or OSHA source.

Personal Protection and Sanitation

This column presents a summary of recommended practices for each toxic substance. These recommendations supplement general work practices (e.g., no eating, drinking, or smoking where chemicals are used). Table 3 explains the codes used. Each category is described as follows:

SKIN:	Recommends the need for personal protective clothing.
EYES:	Recommends the need for eye protection.
WASH SKIN:	Recommends when workers should wash the spilled chemical from the body in addition to normal washing (e.g., before eating).
REMOVE:	Advises workers when to remove clothing that has accidentally become wet or significantly contaminated.

CHANGE: Recommends whether the routine changing of clothing is needed.

PROVIDE: Recommends the need for eyewash fountains and/or quick drench facilities.

First Aid

This entry lists [emergency procedures](#) for eye and skin contact, inhalation, and ingestion of the toxic substance.

Respirator Recommendations

This entry provides a condensed table of allowable respirator use for those substances for which IDLH values have been determined. NIOSH is currently reevaluating the IDLH values, and as new or revised IDLH values are developed, respirator selection recommendations will be incorporated into subsequent editions of the *Pocket Guide*. In the interim no respirator recommendations will be made for substances without IDLH values (these will be noted by "To be added later").

NIOSH has developed a new set of regulations in 42 CFR 84 (also referred to as "Part 84") for testing and certifying nonpowered, air-purifying, particulate-filter respirators. The new Part 84 respirators have passed a more demanding certification test than the old respirators (e.g.; dust; dust and mist; dust, mist, and fume; spray paint; pesticide; etc.) certified under 30 CFR 11 (also referred to as "Part 11"). Under Part 84, NIOSH is allowing manufacturers to continue selling and shipping Part 11 particulate filters as NIOSH-certified until July 10, 1998. It is important to see the *NIOSH Guide to the Selection and Use of Particulate Respirators* (DHHS [NIOSH] Publication No. 96-101) for substitution of Part 84 respirators for Part 11 respirators.

The first line in the entry indicates whether the "NIOSH" or the "OSHA" exposure limit is used on which to base the respirator recommendations. The more protective limit between the NIOSH REL or the OSHA PEL is always used. "NIOSH/OSHA" indicates that the limits are equivalent.

Each subsequent line lists a maximum use concentration (MUC) followed by the classes of respirators, with their assigned protection factors (APFs), that are acceptable for use up to the MUC. Individual respirator classes are separated by diagonal lines (/). More protective respirators may be worn. Emergency or planned entry into unknown concentrations or entry into IDLH conditions are followed by the classes of respirators acceptable for these conditions. "Escape" indicates that the respirators are to be used only for escape purposes. For each MUC or condition this entry lists only those respirators with the required APF and other use restrictions based on the *NIOSH Respirator Decision Logic*.

In certain cases, the recommended respirators are annotated with the following symbols as additional information:

* Substance reported to cause eye irritation or damage; may require eye protection

£ Substance causes eye irritation or damage; eye protection needed

^ If not present as a fume

ı Only nonoxidizable sorbents allowed (not charcoal)

† End of service life indicator (ESLI) required

All respirators selected must be approved by NIOSH and MSHA under the provisions of 30 CFR 11 or by NIOSH under 42 CFR 84. The current listing of NIOSH/MSHA certified respirators can be found in the *NIOSH Certified Equipment List* (DHHS [NIOSH] Publication No. 2001-139). A list of Part 84 respirators can be found on the NIOSH Home Page (<http://www.cdc.gov/niosh/>) or obtained by calling 1-800-35-NIOSH.

A complete respiratory protection program must be implemented and must fulfill all requirements of 29 CFR 1910.134. A respiratory protection program must include a written standard operating procedure covering regular training, fit-testing, fit-checking, periodic environmental monitoring, maintenance, medical monitoring, inspection, cleaning, storage and periodic program evaluation. Selection of a specific respirator within a given class of

recommended respirators depends on the particular situation; this choice should be made only by a knowledgeable person. *REMEMBER:* Air-purifying respirators will not protect users against oxygen-deficient atmospheres, and they are not to be used in IDLH conditions. The only respirators recommended for fire fighting are self-contained breathing apparatuses that have full facepieces and are operated in a pressure-demand or other positive-pressure modes. Additional information on the selection and use of respirators can be found in the *NIOSH Respirator Decision Logic* and the *NIOSH Guide to Industrial Respiratory Protection* (DHHS [NIOSH] Publication No. 87-116).

Route of Health Hazard

This entry lists the toxicologically important routes of entry for each substance and whether contact with the skin or eyes is potentially hazardous.

Symptoms

This entry lists the potential symptoms of exposure.

Target Organs

This entry lists the organs that are affected by exposure to each substance.

EPA's Environmentally Preferable Purchasing Program Web Site

<http://www.epa.gov/oppt/epp>

Includes EPA's guidance on EPP, descriptions of federal pilot projects, and tools and resources – including the EPP database, collections of case studies, and electronic copies of the EPP Update.

EPP Update

<http://www.epa.gov/oppt/epp/documents/docupdates.htm>

EPA's semi-annual newsletter on EPP program activities. Issues of this publication are available online.

EPP Database

<http://yosemite1.epa.gov/oppt/eppstand2.nsf>

Contains information on more than 600 products and services. It provides links to contract language and specifications created and used by federal and state governments and others to buy environmentally preferable products and services.

EPPNET

<http://www.nerc.org/eppnet.html>

The Northeast Recycling Council (NERC) established the EPPNET list server to link federal, state, local, and private procurement and environmental officials. Potential participants must first register for approval.

Hospitals for a Healthy Environment (H2E) Environmentally Preferable Purchasing Guide

http://www.geocities.com/EPP_how_to_guide

While aimed at hospitals, the principles and steps in this EPP guide are applicable to any type organization. This Web site is a cooperative project of the U.S. EPA and the American Hospital Association.

National Pollution Prevention Roundtable (NPPR) EPP Discussion Group

<http://www.p2.org/workgroup/epp>

The EPP Discussion Group was formed in 1999 to promote networking and communication among people practicing EPP and people interested in learning about EPP; minimize duplication of effort on EPP issues through increased communication; and serve as a resource to NPPR members interested in EPP.

The Environmentally Preferable Purchasing Guide

http://www.swmcb.org/EPPG/1_1.htm

Published by the Solid Waste Management Coordinating Board, a group consisting of six metropolitan counties in Minnesota, this online EPP guide is aimed at government and school purchasers. The guide reviews more than 30 product areas, providing information on cost, performance, specifications, and availability.

King County, Washington Environmental Purchasing Program

<http://www.metrokc.gov/procure/green>

King County's Web site provides a history of the county's EPP policies, descriptions of its experience with various environmentally preferable products, bid and contract specifications, and local vendor information.

Massachusetts Environmentally Preferable Products Procurement

<http://www.state.ma.us/osd/enviro/enviro.htm>

The Commonwealth of Massachusetts is one of the first states in the country to initiate an EPP program. Its Web site includes state EPP policies and regulations, bid and contract specifications, and product information and experience.

Minnesota Materials Management Division Environmentally Responsible Purchasing

<http://www.mmd.admin.state.mn.us/envir.htm>

Provides new updates on various products available to state agencies, lists environmentally responsible

products and services available, highlights state legislative and executive order requirements, and includes an electronic version of the state's biennial report on EPP.

City of Santa Monica's Purchasing Policy

<http://www.ci.santa-monica.ca.us/environment/policy/purchasing>

Provides criteria for procuring products and services, negotiating contracts and bid specifications, and complying with city ordinances through environmental preferable purchasing.

Office of the Federal Environmental Executive

<http://www.ofee.gov>

The Office of the Federal Environmental Executive serves to implement E. O. 13101, which is designed to further expand and strengthen the federal government's commitment to recycling and buying recycled-content and environmentally preferable products. The Web site contains various reports and resources.

U.S. Department of Energy's Federal Energy Management Program (FEMP)

<http://www.eere.energy.gov/femp>

FEMP seeks to help government agencies reduce energy and water use, manage utility costs, and promote renewable energy. The Web site provides information about the program's mission, technical assistance resources, and documents highlighting program success stories.

Medical Academic and Scientific Community Organization, Inc. (MASCO)

<http://www1.netcasters.com/mercury/>

MASCO has developed a mercury database for 1,147 different compounds. Users can select one of the compounds listed from the database and then calculate the quantity of mercury in the compound based upon the total amount used.

Cleaner Technologies Substitute Assessment (CTSA)

<http://www.epa.gov/opptintr/dfe/tools/ctsa.htm>

CTSA is a methodology for evaluating the comparative risk, performance, cost, and resource conservation of alternatives to chemicals currently used by specific industry sectors. It was developed by the EPA Design for the Environment (DfE) Program, the University of Tennessee Center for Clean Products and Clean Technologies, and other partners in voluntary, cooperative, industry-specific pilot projects.

[INTRODUCTION](#)[INDEX with CHEMICAL NAMES and SYNONYMS](#)[INDEX with CHEMICAL NAMES](#)[INDEX with CAS NUMBERS](#)[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

INDEX of Chemical Names and Synonyms

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
0017	AA	107-18-6	BA5075000
0007	AAF	53-96-3	AB9450000
0007	2-AAF	53-96-3	AB9450000
0019	AGE	106-92-3	RR0875000
0030	AMS	7773-06-0	WO6125000
0429	AMS	98-83-9	WL5075300
0014	AN	107-13-1	AT5250000
0037*	ANTU	86-88-4	YT9275000
0514	ATCP	1918-02-1	TJ7525000
0589	Abate®	3383-96-8	TF6890000
0010	Acetal	50-78-2	VO0700000
0001*	Acetaldehyde	75-07-0	AB1925000
0007	2-Acetaminofluorene	53-96-3	AB9450000
0002*	Acetic acid	64-19-7	AF1225000
0002	Acetic acid (aqueous)	64-19-7	AF1225000
0003	Acetic acid anhydride	108-24-7	AK1925000
0001	Acetic aldehyde	75-07-0	AB1925000
0003*	Acetic anhydride	108-24-7	AK1925000
0260	Acetic ester	141-78-6	AH5425000
0260	Acetic ether	141-78-6	AH5425000
0003	Acetic oxide	108-24-7	AK1925000
0004*	Acetone	67-64-1	AL3150000
0005*	Acetone cyanohydrin	75-86-5	OD9275000
0006*	Acetonitrile	75-05-8	AL7700000
0665	3-(alpha-Acetonyl)-benzyl-4-hydroxycouma	81-81-2	GN4550000
0010	2-Acetoxybenzoic acid	50-78-2	VO0700000
0010	o-Acetoxybenzoic acid	50-78-2	VO0700000
0656	1-Acetoxyethylene	108-05-4	AK0875000
0610	Acetyl mercaptan	68-11-1	AI5950000
0003	Acetyl oxide	108-24-7	AK1925000
0424	2-Acetyl propane	563-80-4	EL9100000
0007*	2-Acetylaminofluorene	53-96-3	AB9450000
0008*	Acetylene	74-86-2	AO9600000
0102	Acetylene black	1333-86-4	FF5800000
0195	Acetylene dichloride	540-59-0	KV9360000
0195	cis-Acetylene dichloride	540-59-0	KV9360000
0195	trans-Acetylene dichloride	540-59-0	KV9360000
0009*	Acetylene tetrabromide	79-27-6	KI8225000
0598	Acetylene tetrachloride	79-34-5	KI8575000
0010*	Acetylsalicyclic acid	50-78-2	VO0700000
0011	Acraldehyde	107-02-8	AS1050000
0013	Acroleic acid	79-10-7	AS4375000
0011*	Acrolein	107-02-8	AS1050000
0011	Acrylaldehyde	107-02-8	AS1050000
0012*	Acrylamide	79-06-1	AS3325000
0012	Acrylamide monomer	79-06-1	AS3325000
0013*	Acrylic acid	79-10-7	AS4375000
0011	Acrylic aldehyde	107-02-8	AS1050000
0012	Acrylic amide	79-06-1	AS3325000
0014*	Acrylonitrile	107-13-1	AT5250000
0014	Acrylonitrile monomer	107-13-1	AT5250000
0041	Actinolite	1332-21-4	CI6475000

0041	Actinolite asbestos	1332-21-4	CI6475000
0307	Activated carbon	7440-44-0	FF5250100
0015*	Adiponitrile	111-69-3	AV2625000
0262	Alcohol	64-17-5	KO6300000
0016*	Aldrin	309-00-2	IO2100000
0492	Aliphatic petroleum naphtha	8002-05-9	SE7449000
0017*	Allyl alcohol	107-18-6	BA5075000
0011	Allyl aldehyde	107-02-8	AS1050000
0018*	Allyl chloride	107-05-1	UC7350000
0019*	Allyl glycidyl ether	106-92-3	RR0875000
0020*	Allyl propyl disulfide	2179-59-1	JO0350000
0631	Allyl trichloride	96-18-4	TZ9275000
0392	Allylene	74-99-7	UK4250000
0017	Allylic alcohol	107-18-6	BA5075000
0019	1-Allyloxy-2,3-epoxypropane	106-92-3	RR0875000
0021	Alumina	1344-28-1	BD1200000
0021*	alpha-Alumina	1344-28-1	BD1200000
0022	Aluminium	7429-90-5	BD0330000
0022*	Aluminum	7429-90-5	BD0330000
0023*	Aluminum (pyro powders and welding fumes		
0024*	Aluminum (soluble salts and alkyls, as A		
0022	Aluminum metal	7429-90-5	BD0330000
0250	Aluminum oxide	1302-74-5	GN0231000
0021	Aluminum oxide	1344-28-1	BD1200000
0022	Aluminum powder	7429-90-5	BD0330000
0250	Aluminum trioxide	1302-74-5	GN0231000
0021	Aluminum trioxide	1344-28-1	BD1200000
0160	Amidocyanogen	420-04-2	GS5950000
0027	3-Amino-1,2,4-triazole	61-82-5	XZ3850000
0027	2-Amino-1,3,4-triazole	61-82-5	XZ3850000
0623	3-Amino-1-methylbenzene	108-44-1	XU2800000
0514	4-Amino-3,5,6-trichloro-2-picolinic acid	1918-02-1	TJ7525000
0514	4-Amino-3,5,6-trichloropicolinic acid	1918-02-1	TJ7525000
0430	4-Amino-6-(1,1-dimethylethyl)-3-(methylt	21087-64-9	XZ2990000
0495	4-Aminoaniline	106-50-3	SS8050000
0035	para-Aminoanisole	104-94-9	BZ5450000
0034	ortho-Aminoanisole	90-04-0	BZ5410000
0033	Aminobenzene	62-53-3	BW6650000
0025	p-Aminobiphenyl	92-67-1	DU8925000
0025	4-Aminobiphenyl	92-67-1	DU8925000
0079	1-Aminobutane	109-73-9	EO2975000
0097	Aminocaproic lactam	105-60-2	CM3675000
0168	Aminocyclohexane	108-91-8	GX0700000
0672	Aminodimethylbenzene	1300-73-8	ZE8575000
0025	p-Aminodiphenyl	92-67-1	DU8925000
0025*	4-Aminodiphenyl	92-67-1	DU8925000
0263	Aminoethane	75-04-7	KH2100000
0256	2-Aminoethanol	141-43-5	KJ5775000
0256	beta-Aminoethyl alcohol	141-43-5	KJ5775000
0211	bis(2-Aminoethyl)amine	111-40-0	IE1225000
0274	Aminoethylene	151-56-4	KX5075000
0168	Aminohexahydrobenzene	108-91-8	GX0700000
0398	Aminomethane	74-89-5	PF6300000
0671	1,3-bis(Aminomethyl)benzene	1477-55-0	PF8970000
0441	1-Aminonaphthalene	134-32-7	OM1400000
0442	2-Aminonaphthalene	91-59-8	OM2100000
0449	para-Aminonitrobenzene	100-01-6	BY7000000
0623	1-Aminophenylmethane	108-44-1	XU2800000
0360	2-Aminopropane	75-31-0	NT8400000
0026*	2-Aminopyridine	504-29-0	US1575000
0026	alpha-Aminopyridine	504-29-0	US1575000
0624	4-Aminotoluene	106-49-0	XU3150000
0623	m-Aminotoluene	108-44-1	XU2800000
0622	o-Aminotoluene	95-53-4	XU2975000
0622	2-Aminotoluene	95-53-4	XU2975000
0027	Aminotriazole	61-82-5	XZ3850000
0027	3-Aminotriazole	61-82-5	XZ3850000
0672	Aminoxylenes	1300-73-8	ZE8575000
0027*	Amitrole	61-82-5	XZ3850000
0030	Ammate herbicide	7773-06-0	WO6125000
0028*	Ammonia	7664-41-7	BO0875000
0030	Ammonium amidosulfonate	7773-06-0	WO6125000
0029	Ammonium chloride	12125-02-9	BP4550000
0029*	Ammonium chloride fume	12125-02-9	BP4550000
0029	Ammonium muriate fume	12125-02-9	BP4550000
0030*	Ammonium sulfate	7773-06-0	WO6125000
0041	Amosite (cunningtonite-grunerite)	1332-21-4	CI6475000
0031*	n-Amyl acetate	628-63-7	AJ1925000
0032*	sec-Amyl acetate	626-38-0	AJ2100000
0031	Amyl acetic ester	628-63-7	AJ1925000
0031	Amyl acetic ether	628-63-7	AJ1925000

0652	Amyl aldehyde	110-62-3	YV3600000
0418	Amyl ethyl ketone	541-85-5	MJ7350000
0487	Amyl hydrosulfide	110-66-7	SA3150000
0487	Amyl mercaptan	110-66-7	SA3150000
0399	Amyl methyl ketone	110-43-0	MJ5075000
0399	n-Amyl methyl ketone	110-43-0	MJ5075000
0487	Amyl sulfhydrate	110-66-7	SA3150000
0028	Anhydrous ammonia	7664-41-7	BO0875000
0057	Anhydrous borax	1330-43-4	ED4588000
0095	Anhydrous calcium sulfate	7778-18-9	WS6920000
0095	Anhydrous gypsum	7778-18-9	WS6920000
0331	Anhydrous hydrogen bromide	10035-10-6	MW3850000
0332	Anhydrous hydrogen chloride	7647-01-0	MW4025000
0334	Anhydrous hydrogen fluoride	7664-39-3	MW7875000
0095	Anhydrous sulfate of lime	7778-18-9	WS6920000
0033*	Aniline (and homologs)	62-53-3	BW6650000
0033	Aniline oil	62-53-3	BW6650000
0240	Anilinobenzene	122-39-4	JJ7800000
0500	2-Anilinonaphthalene	135-88-6	OM4550000
0035	4-Anisidine	104-94-9	BZ5450000
0035*	p-Anisidine	104-94-9	BZ5450000
0034*	o-Anisidine	90-04-0	BZ5410000
0034	2-Anisidine	90-04-0	BZ5410000
0165	Anol	108-93-0	GV7875000
0166	Anone	108-94-1	GW1050000
0244	Antabuse®	97-77-8	JO1225000
0041	Anthophyllite	1332-21-4	CI6475000
0041	Anthophyllite asbestos	1332-21-4	CI6475000
0144	Anthracite coal dust		GF8281000
0036*	Antimony	7440-36-0	CC4025000
0568	Antimony hydride	7803-52-3	WJ0700000
0036	Antimony metal	7440-36-0	CC4025000
0036	Antimony powder	7440-36-0	CC4025000
0568	Antimony trihydride	7803-52-3	WJ0700000
0531	Aprocarb®	114-26-1	FC3150000
0028	Aqua ammonia	7664-41-7	BO0875000
0447	Aqua fortis	7697-37-2	OU5775000
0013	Aqueous acrylic acid (technical grade is	79-10-7	AS4375000
0028	Aqueous ammonia	7664-41-7	BO0875000
0331	Aqueous hydrogen bromide (i.e.	10035-10-6	MW3850000
0332	Aqueous hydrogen chloride (i.e.	7647-01-0	MW4025000
0334	Aqueous hydrogen fluoride (i.e.	7664-39-3	MW7875000
0557	Argentum	7440-22-4	VW3500000
0125	Aroclor® 1242	53469-21-9	TO1356000
0126	Aroclor® 1254	11097-69-1	TO1360000
0038*	Arsenic (inorganic compounds, as As)	7440-38-2	CG0525000
0040	Arsenic hydride	7784-42-1	CG6475000
0040	Arsenic trihydride	7784-42-1	CG6475000
0039*	Arsenic, organic compounds (as As)		
0040	Arseniuretted hydrogen	7784-42-1	CG6475000
0040	Arsenous hydride	7784-42-1	CG6475000
0040*	Arsine	7784-42-1	CG6475000
0047	Artificial barite	7727-43-7	CR0600000
0041*	Asbestos	1332-21-4	CI6475000
0042*	Asphalt fumes	8052-42-4	CI9900000
0042	Asphalt: Asphaltum	8052-42-4	CI9900000
0010	Aspirin	50-78-2	VO0700000
0638	Assymetrical trimethylbenzene	95-63-6	DC3325000
0194	Asymmetrical dichloroethane	75-34-3	KI0175000
0043*	Atrazine	1912-24-9	XY5600000
0587	Aurum paradoxum	13494-80-9	WY2625000
0541	Azabenzene	110-86-1	UR8400000
0560	Azide	26628-22-8	VY8050000
0182	Azimuthylene	334-88-3	PA7000000
0541	Azine	110-86-1	UR8400000
0044*	Azinphos-methyl	86-50-0	TE1925000
0274	Azirane	151-56-4	KX5075000
0274	Aziridine	151-56-4	KX5075000
0560	Azium	26628-22-8	VY8050000
0182	Azomethylene	334-88-3	PA7000000
0427	Azophos®	298-00-0	TG0175000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
0128	BCME	542-88-1	KN1575000
0081	BGE	2426-08-6	TX4200000
0370	BHC	58-89-9	GV4900000
0246	BHT	128-37-0	GO7875000
0528	BPL	57-57-8	RO7350000

0415	para	101-77-9	BY5425000
0572	Bacillus subtilis	1395-21-7	CO9450000
0572	Bacillus subtilis BPN	1395-21-7	CO9450000
0572	Bacillus subtilis Carlsburg	1395-21-7	CO9450000
0347	Banana oil	123-92-2	NS9800000
0047	Barite	7727-43-7	CR0600000
0045*	Barium chloride (as Ba)	10361-37-2	CO8750000
0045	Barium dichloride	10361-37-2	CO8750000
0046	Barium dinitrate	10022-31-8	CO9625000
0046*	Barium nitrate (as Ba)	10022-31-8	CO9625000
0046	Barium salt of nitric acid	10022-31-8	CO9625000
0047	Barium salt of sulfuric acid	7727-43-7	CR0600000
0047*	Barium sulfate	7727-43-7	CR0600000
0046	Barium(II) nitrate (1:2)	10022-31-8	CO9625000
0047	Barytes (natural)	7727-43-7	CR0600000
0181	Basudin®	333-41-5	TF3325000
0577	Battery acid	7664-93-9	WS5600000
0285	Baytex	55-38-9	TF9625000
0574	Beet sugar	57-50-1	WN6500000
0048*	Benomyl	17804-35-2	DD6475000
0033	Benzenamine	62-53-3	BW6650000
0049*	Benzene	71-43-2	CY1400000
0121	Benzene chloride	108-90-7	CZ0175000
0163	Benzene hexahydride	110-82-7	GU6300000
0167	Benzene tetrahydride	110-83-8	GW2500000
0495	1,4-Benzenediamine	106-50-3	SS8050000
0513	1,3-Benzenedicarbonitrile	626-17-5	CZ1900000
0512	1,2-Benzenedicarboxylic anhydride	85-44-9	TI3150000
0671	1,3-Benzenedimethanamine	1477-55-0	PF8970000
0543	m-Benzenediol	108-46-3	VG9625000
0109	o-Benzenediol	120-80-9	UX1050000
0338	p-Benzenediol	123-31-9	MX3500000
0543	1,3-Benzenediol	108-46-3	VG9625000
0109	1,2-Benzenediol	120-80-9	UX1050000
0338	1,4-Benzenediol	123-31-9	MX3500000
0050*	Benzenethiol	108-98-5	DC0525000
0635	1,2,4-Benzenetricarboxylic anhydride	552-30-7	DC2050000
0051*	Benzidine	92-87-5	DC9625000
0051	Benzidine-based dyes	92-87-5	DC9625000
0251	Benzoepin	115-29-7	RB9275000
0049	Benzol	71-43-2	CY1400000
0052	Benzoperoxide	94-36-0	DM8575000
0542	p-Benzoquinone	106-51-4	DK2625000
0542	1,4-Benzoquinone	106-51-4	DK2625000
0052*	Benzoyl peroxide	94-36-0	DM8575000
0053*	Benzyl chloride	100-44-7	XS8925000
0054*	Beryllium & beryllium compounds (as Be)	7440-41-7	DS1750000
0051	4,4'-Bianiline	92-87-5	DC9625000
0204	Bicyclopentadiene	77-73-6	PC1050000
0203	Bidrin®	141-66-2	TC3850000
0067	Biethylene	106-99-0	EI9275000
0431	Biotite	12001-26-2	VV8760000
0239	Biphenyl	92-52-4	DU8050000
0051	1,1'-Biphenyl-4,4'-diamine	92-87-5	DC9625000
0051	4,4'-Biphenyldiamine	92-87-5	DC9625000
0056	Bismuth sesquitelluride	1304-82-1	EB3110000
0056	Bismuth telluride	1304-82-1	EB3110000
0055*	Bismuth telluride, doped with Selenium s		
0056*	Bismuth telluride, undoped	1304-82-1	EB3110000
0056	Bismuth tritelluride	1304-82-1	EB3110000
0042	Bitumen (European term)	8052-42-4	CI9900000
0144	Bituminous coal dust		GF8281000
0067	Bivinyll	106-99-0	EI9275000
0151	Black copper oxide fume	1317-38-0	GL7900000
0306	Black lead	7782-42-5	MD9659600
0586	Bladafum®	3689-24-5	XN4375000
0582	Bolstar®	35400-43-2	TE4165000
0057*	Borates, tetra, sodium salts (Anhydrous)	1330-43-4	ED4588000
0058*	Borates, tetra, sodium salts (Decahydrat	1303-96-4	VZ2275000
0059*	Borates, tetra, sodium salts (Pentahydra	12179-04-3	
0058	Borax	1303-96-4	VZ2275000
0058	Borax decahydrate	1303-96-4	VZ2275000
0057	Borax dehydrated	1330-43-4	ED4588000
0059	Borax pentahydrate	12179-04-3	
0060	Boric anhydride	1303-86-2	ED7900000
0060	Boric oxide	1303-86-2	ED7900000
0183	Boroethane	19287-45-7	HO9275000
0061	Boron bromide	10294-33-4	ED7400000
0062	Boron fluoride	7637-07-2	ED2275000
0183	Boron hydride	19287-45-7	HO9275000
0060*	Boron oxide	1303-86-2	ED7900000

0061*	Boron tribromide	10294-33-4	ED7400000
0062*	Boron trifluoride	7637-07-2	ED2275000
0060	Boron trioxide	1303-86-2	ED7900000
0372	Bottled gas	68476-85-7	SE7545000
0524	Bottled gas	74-98-6	TX2275000
0063*	Bromacil	314-40-9	YO9100000
0064*	Bromine	7726-95-6	EF9100000
0065	Bromine fluoride	7789-30-2	EF9350000
0065*	Bromine pentafluoride	7789-30-2	EF9350000
0310	1-Bromo-1-chloro-2,2,2-trifluoroethane	151-67-7	KH6550000
0310	2-Bromo-2-chloro-1,1,1-trifluoroethane	151-67-7	KH6550000
0063	5-Bromo-3-sec-butyl-6-methyluracil	314-40-9	YO9100000
0063	5-Bromo-6-methyl-3-(1-methylpropyl)uraci	314-40-9	YO9100000
0123	Bromochloromethane	74-97-5	PA5250000
0265	Bromoethane	74-96-4	KH6475000
0657	Bromoethene	593-60-2	KU8400000
0657	Bromoethylene	593-60-2	KU8400000
0066*	Bromoform	75-25-2	PB5600000
0400	Bromomethane	74-83-9	PA4900000
0634	Bromotrifluoromethane	75-63-8	PA5425000
0093	Burned lime	1305-78-8	EW3100000
0093	Burnt lime	1305-78-8	EW3100000
0067	Butadiene	106-99-0	EI9275000
0067*	1,3-Butadiene	106-99-0	EI9275000
0068*	n-Butane	106-97-8	EJ4200000
0068	normal-Butane	106-97-8	EJ4200000
0573	Butanedinitrile	110-61-2	WN3850000
0086	Butanenitrile	109-74-0	ET8750000
0083	Butanethiol	109-79-5	EK6300000
0083	1-Butanethiol	109-79-5	EK6300000
0083	n-Butanethiol	109-79-5	EK6300000
0076	1-Butanol	71-36-3	EO1400000
0076	n-Butanol	71-36-3	EO1400000
0077	2-Butanol	78-92-2	EO1750000
0069*	2-Butanone	78-93-3	EL6475000
0416	2-Butanone peroxide	1338-23-4	EL9450000
0157	2-Butenal	4170-30-3	GP9499000
0376	cis-Butenedioic anhydride	108-31-6	ON3675000
0070*	2-Butoxyethanol	111-76-2	KJ8575000
0071*	2-Butoxyethanol acetate	112-07-2	KJ8925000
0071	2-Butoxyethyl acetate	112-07-2	KJ8925000
0220	Butter yellow	60-11-7	BX7350000
0075	Butyl 2-propenoate	141-32-2	UD3150000
0070	Butyl Cellosolve®	111-76-2	KJ8575000
0071	Butyl Cellosolve® acetate	112-07-2	KJ8925000
0072	Butyl acetate	123-86-4	AF7350000
0072*	n-Butyl acetate	123-86-4	AF7350000
0073*	sec-Butyl acetate	105-46-4	AF7380000
0074*	tert-Butyl acetate	540-88-5	AF7400000
0075*	Butyl acrylate	141-32-2	UD3150000
0075	n-Butyl acrylate	141-32-2	UD3150000
0076	Butyl alcohol	71-36-3	EO1400000
0076*	n-Butyl alcohol	71-36-3	EO1400000
0077*	sec-Butyl alcohol	78-92-2	EO1750000
0078*	tert-Butyl alcohol	75-65-0	EO1925000
0080*	tert-Butyl chromate	1189-85-1	GB2900000
0082	Butyl ester of 2-hydroxypropanoic acid	138-22-7	OD4025000
0072	n-Butyl ester of acetic acid	123-86-4	AF7350000
0073	sec-Butyl ester of acetic acid	105-46-4	AF7380000
0074	tert-Butyl ester of acetic acid	540-88-5	AF7400000
0075	Butyl ester of acrylic acid	141-32-2	UD3150000
0080	di-tert-Butyl ester of chromic acid	1189-85-1	GB2900000
0082	Butyl ester of lactic acid	138-22-7	OD4025000
0072	Butyl ethanoate	123-86-4	AF7350000
0266	Butyl ethyl ketone	106-35-4	MJ5250000
0081*	n-Butyl glycidyl ether	2426-08-6	TX4200000
0071	Butyl glycol acetate	112-07-2	KJ8925000
0068	Butyl hydride	106-97-8	EJ4200000
0082	Butyl lactate	138-22-7	OD4025000
0082*	n-Butyl lactate	138-22-7	OD4025000
0083*	n-Butyl mercaptan	109-79-5	EK6300000
0325	Butyl methyl ketone	591-78-6	MP1400000
0070	Butyl oxitol	111-76-2	KJ8575000
0625	Butyl phosphate	126-73-8	TC7700000
0516	tert-Butyl valone	83-26-1	NK6300000
0158	4-t-Butyl-2-chlorophenylmethyl methylpho	299-86-5	TB3850000
0079	Butylamine	109-73-9	EO2975000
0079*	n-Butylamine	109-73-9	EO2975000
0246	Butylated hydroxytoluene	128-37-0	GO7875000
0077	Butylene hydrate	78-92-2	EO1750000
0084*	o-sec-Butylphenol	89-72-5	SJ8920000

0084	2-sec-Butylphenol	89-72-5	SJ8920000
0085	4-tert-Butyltoluene	98-51-1	XS8400000
0085*	p-tert-Butyltoluene	98-51-1	XS8400000
0242	Butyrone	123-19-3	MJ5600000
0086	Butyronitrile	109-74-0	ET8750000
0086*	n-Butyronitrile	109-74-0	ET8750000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0123	CB	74-97-5	PA5250000
0123	CBM	74-97-5	PA5250000
0632	CFC-113	76-13-1	KJ4000000
0409	CI-2	12108-13-3	OP1450000
0128	bis-CME	542-88-1	KN1575000
0129	CMME	107-30-2	KN6650000
0122	CS	2698-41-1	OQ3675000
0087*	Cadmium dust (as Cd)	7440-43-9	EU9800000
0088*	Cadmium fume (as Cd)	1306-19-0	EV1930000
0088	Cadmium monoxide	1306-19-0	EV1930000
0089*	Calcium arsenate (as As)	7778-44-1	CG0830000
0091	Calcium carbimide	156-62-7	GS6000000
0090*	Calcium carbonate	1317-65-3	EV9580000
0369	Calcium carbonate	1317-65-3	EV9580000
0382	Calcium carbonate	1317-65-3	EV9580000
0091*	Calcium cyanamide	156-62-7	GS6000000
0092	Calcium hydrate	1305-62-0	EW2800000
0094	Calcium hydrosilicate	1344-95-2	VV9150000
0092*	Calcium hydroxide	1305-62-0	EW2800000
0094	Calcium metasilicate	1344-95-2	VV9150000
0094	Calcium monosilicate	1344-95-2	VV9150000
0093*	Calcium oxide	1305-78-8	EW3100000
0089	Calcium salt (2:3) of arsenic acid	7778-44-1	CG0830000
0090	Calcium salt of carbonic acid	1317-65-3	EV9580000
0094	Calcium salt of silicic acid	1344-95-2	VV9150000
0095	Calcium salt of sulfuric acid	7778-18-9	WS6920000
0094*	Calcium silicate	1344-95-2	VV9150000
0095*	Calcium sulfate	7778-18-9	WS6920000
0518	Calcium sulfate hemihydrate	26499-65-0	TP0700000
0308	Calcium(II) sulfate dihydrate	13397-24-5	MG2360000
0096	2-Camphonone	76-22-2	EX1225000
0096*	Camphor (synthetic)	76-22-2	EX1225000
0574	Cane sugar	57-50-1	WN6500000
0097*	Caprolactam	105-60-2	CM3675000
0097	epsilon-Caprolactam	105-60-2	CM3675000
0098*	Captafol	2425-06-1	GS4900000
0099*	Captan	133-06-2	GW5075000
0099	Captane	133-06-2	GW5075000
0098	Captofol	2425-06-1	GS4900000
0295	Carbamaldehyde	75-12-7	LO0525000
0100*	Carbaryl	63-25-2	FC5950000
0203	Carbicron®	141-66-2	TC3850000
0160	Carbimide	420-04-2	GS5950000
0397	Carbinol	67-56-1	PC1400000
0160	Carbodiimide	420-04-2	GS5950000
0101*	Carbofuran	1563-66-2	FB9450000
0493	Carbolic acid	108-95-2	SJ3325000
0367	Carbomethene	463-51-4	OA7700000
0503	2-Carbomethoxy-1-methylvinyl dimethyl ph	7786-34-7	GO5250000
0104	Carbon bisulfide	75-15-0	FF6650000
0102*	Carbon black	1333-86-4	FF5800000
0106	Carbon bromide	558-13-4	FG4725000
0107	Carbon chloride	56-23-5	FG4900000
0108	Carbon difluoride oxide	353-50-4	FG6125000
0103*	Carbon dioxide	124-38-9	FF6400000
0104*	Carbon disulfide	75-15-0	FF6650000
0108	Carbon fluoride oxide	353-50-4	FG6125000
0316	Carbon hexachloride	67-72-1	KI4025000
0105*	Carbon monoxide	630-08-0	FG3500000
0161	Carbon nitride	460-19-5	GT1925000
0105	Carbon oxide	630-08-0	FG3500000
0504	Carbon oxychloride	75-44-5	SY5600000
0108	Carbon oxyfluoride	353-50-4	FG6125000
0555	Carbon silicide	409-21-2	VW0450000
0107	Carbon tet	56-23-5	FG4900000
0106*	Carbon tetrabromide	558-13-4	FG4725000
0107*	Carbon tetrachloride	56-23-5	FG4900000
0373	Carbonate magnesium	546-93-0	OM2470000
0103	Carbonic acid gas	124-38-9	FF6400000
0504	Carbonyl chloride	75-44-5	SY5600000

0504	Carbonyl dichloride	75-44-5	SY5600000
0108	Carbonyl difluoride	353-50-4	FG6125000
0108*	Carbonyl fluoride	353-50-4	FG6125000
0147	di-mu-Carbonylhexacarbonyldicobalt	10210-68-1	GG0300000
0555	Carborundum®	409-21-2	VW0450000
0529	Carboxyethane	79-09-4	UE5950000
0635	4-Carboxyphthalic anhydride	552-30-7	DC2050000
0109*	Catechol	120-80-9	UX1050000
0092	Caustic lime	1305-62-0	EW2800000
0523	Caustic potash	1310-58-3	TT2100000
0565	Caustic soda	1310-73-2	WB4900000
0258	Cellosolve®	110-80-5	KK8050000
0259	Cellosolve® acetate	111-15-9	KK8225000
0110*	Cellulose	9004-34-6	FJ5691460
0309	Celtium	7440-58-6	MG4600000
0521	Cement	65997-15-1	VV8770000
0647	Cemented WC	11107-01-0	Y07350000
0647	Cemented tungsten carbide	11107-01-0	Y07350000
0111	Cesium hydrate	21351-79-1	FK9800000
0111*	Cesium hydroxide	21351-79-1	FK9800000
0111	Cesium hydroxide dimer	21351-79-1	FK9800000
0318	Cetyl mercaptan	2917-26-2	
0102	Channel black	1333-86-4	FF5800000
0364	China clay	1332-58-7	GF1670500
0162	Chlorcyan	506-77-4	GT2275000
0112	Chlordan	57-74-9	PB9800000
0112*	Chlordane	57-74-9	PB9800000
0112	Chlordano	57-74-9	PB9800000
0365	Chlordecone	143-50-0	PC8575000
0113*	Chlorinated camphene	8001-35-2	XW5250000
0114*	Chlorinated diphenyl oxide		
0115*	Chlorine	7782-50-5	FO2100000
0162	Chlorine cyanide	506-77-4	GT2275000
0116*	Chlorine dioxide	10049-04-4	FO3000000
0117	Chlorine fluoride	7790-91-2	FO2800000
0490	Chlorine fluoro oxide	7616-94-6	SD1925000
0116	Chlorine oxide	10049-04-4	FO3000000
0490	Chlorine oxyfluoride	7616-94-6	SD1925000
0116	Chlorine peroxide	10049-04-4	FO3000000
0117*	Chlorine trifluoride	7790-91-2	FO2800000
0253	2-Chloro-1,1,2-trifluoroethyl difluorome	13838-16-9	KN6800000
0133	2-Chloro-1,3-butadiene	126-99-8	EI9625000
0253	2-Chloro-1-(difluoromethoxy)-1,1,2-trifl	13838-16-9	KN6800000
0135	2-Chloro-1-methylbenzene	95-49-8	XS9000000
0130*	1-Chloro-1-nitropropane	600-25-9	TX5075000
0184	1-Chloro-2,3-dibromopropane	96-12-8	TX8750000
0254	1-Chloro-2,3-epoxypropane	106-89-8	TX4900000
0134	1-Chloro-2-ethenylbenzene	2039-87-4	WL4160000
0135	1-Chloro-2-methylbenzene	95-49-8	XS9000000
0018	1-Chloro-2-propene	107-05-1	UC7350000
0043	2-Chloro-4-ethylamino-6-isopropylamino-s	1912-24-9	XY5600000
0452	1-Chloro-4-nitrobenzene	100-00-5	CZ1050000
0136	2-Chloro-6-(trichloro-methyl)pyridine	1929-82-4	US7525000
0136*	2-Chloro-6-trichloromethyl pyridine	1929-82-4	US7525000
0043	6-Chloro-N-ethyl-N'-(1-methylethyl)-1,3	1912-24-9	XY5600000
0118*	Chloroacetaldehyde	107-20-0	AB2450000
0118	2-Chloroacetaldehyde	107-20-0	AB2450000
0118	Chloroacetaldehyde (40% aqueous solution	107-20-0	AB2450000
0120	Chloroacetic acid chloride	79-04-9	AO6475000
0120	Chloroacetic chloride	79-04-9	AO6475000
0119	2-Chloroacetophenone	532-27-4	AM6300000
0119*	alpha-Chloroacetophenone	532-27-4	AM6300000
0120*	Chloroacetyl chloride	79-04-9	AO6475000
0199	3-Chloroallyl chloride	542-75-6	UC8310000
0122	2-Chlorobenzalmalonitrile	2698-41-1	OO3675000
0121*	Chlorobenzene	108-90-7	CZ0175000
0121	Chlorobenzol	108-90-7	CZ0175000
0122*	o-Chlorobenzylidene malononitrile	2698-41-1	OO3675000
0123*	Chlorobromomethane	74-97-5	PA5250000
0133	Chlorobutadiene	126-99-8	EI9625000
0113	Chlorocamphene	8001-35-2	XW5250000
0142	Chlorochromic anhydride	14977-61-8	GB5775000
0162	Chlorocyanide	506-77-4	GT2275000
0162	Chlorocyanogen	506-77-4	GT2275000
0124*	Chlorodifluoromethane	75-45-6	PA6390000
0129	Chlorodimethyl ether	107-30-2	KN6650000
0125*	Chlorodiphenyl (42% chlorine)	53469-21-9	TO1356000
0126*	Chlorodiphenyl (54% chlorine)	11097-69-1	TO1360000
0118	2-Chloroethanal	107-20-0	AB2450000
0267	Chloroethane	75-00-3	KH7525000
0268	2-Chloroethanol	107-07-3	KK0875000

0658	Chloroethene	75-01-4	KU9625000
0268	2-Chloroethyl alcohol	107-07-3	KK0875000
0196	bis(2-Chloroethyl)ether	111-44-4	KN0875000
0658	Chloroethylene	75-01-4	KU9625000
0632	Chlorofluorocarbon-113	76-13-1	KJ4000000
0127*	Chloroform	67-66-3	FS9100000
0224	Chloroformic acid dimethylamide	79-44-7	FD4200000
0504	Chloroformyl chloride	75-44-5	SY5600000
0403	Chloromethane	74-87-3	PA6300000
0129	Chloromethoxymethane	107-30-2	KN6650000
0128	Chloromethyl ether	542-88-1	KN1575000
0128*	bis-Chloromethyl ether	542-88-1	KN1575000
0129*	Chloromethyl methyl ether	107-30-2	KN6650000
0119	Chloromethyl phenyl ketone	532-27-4	AM6300000
0053	Chloromethylbenzene	100-44-7	XS8925000
0452	4-Chloronitrobenzene	100-00-5	CZ1050000
0452	p-Chloronitrobenzene	100-00-5	CZ1050000
0131*	Chloropentafluoroethane	76-15-3	KH7877500
0132*	Chloropicrin	76-06-2	PB6300000
0133	Chloroprene	126-99-8	EI9625000
0133*	beta-Chloroprene	126-99-8	EI9625000
0018	3-Chloropropene	107-05-1	UC7350000
0018	3-Chloropropylene	107-05-1	UC7350000
0254	2-Chloropropylene oxide	106-89-8	TX4900000
0254	gamma-Chloropropylene oxide	106-89-8	TX4900000
0134*	o-Chlorostyrene	2039-87-4	WL4160000
0134	2-Chlorostyrene	2039-87-4	WL4160000
0134	ortho-Chlorostyrene	2039-87-4	WL4160000
0404	Chlorothene	71-55-6	KJ2975000
0135*	o-Chlorotoluene	95-49-8	XS9000000
0135	2-Chlorotoluene	95-49-8	XS9000000
0053	alpha-Chlorotoluene	100-44-7	XS8925000
0117	Chlorotrifluoride	7790-91-2	FO2800000
0137*	Chlorpyrifos	2921-88-2	TF6300000
0137	Chlorpyrifos-ethyl	2921-88-2	TF6300000
0141	Chrome	7440-47-3	GB4200000
0138	Chromic acid (CrO3): Chromic anhydride	1333-82-0	GB6650000
0138*	Chromic acid and chromates	1333-82-0	GB6650000
0138	Chromic oxide	1333-82-0	GB6650000
0142	Chromic oxychloride	14977-61-8	GB5775000
0141	Chromium	7440-47-3	GB4200000
0142	Chromium chloride oxide	14977-61-8	GB5775000
0142	Chromium dichloride dioxide	14977-61-8	GB5775000
0142	Chromium dioxide dichloride	14977-61-8	GB5775000
0142	Chromium dioxychloride	14977-61-8	GB5775000
0141*	Chromium metal	7440-47-3	GB4200000
0142	Chromium oxychloride	14977-61-8	GB5775000
0139*	Chromium(II) compounds (as Cr)		
0140*	Chromium(III) compounds (as Cr)		
0138	Chromium(VI) oxide (1:3)	1333-82-0	GB6650000
0142*	Chromyl chloride	14977-61-8	GB5775000
0041	Chrysotile	1332-21-4	CI6475000
0540	Cinerin I or II	8003-34-7	UR4200000
0364	Clay	1332-58-7	GF1670500
0143*	Clopidol	2971-90-6	UU7711500
0144*	Coal dust		GF8281000
0145*	Coal tar pitch volatiles	65996-93-2	GF8655000
0147*	Cobalt carbonyl (as Co)	10210-68-1	GG0300000
0148*	Cobalt hydrocarbonyl (as Co)	16842-03-8	GG0900000
0146	Cobalt metal dust	7440-48-4	GF8750000
0146*	Cobalt metal dust and fume (as Co)	7440-48-4	GF8750000
0146	Cobalt metal fume	7440-48-4	GF8750000
0147	Cobalt octacarbonyl	10210-68-1	GG0300000
0147	Cobalt tetracarbonyl dimer	10210-68-1	GG0300000
0149*	Coke oven emissions		GH0346000
0262	Cologne spirit	64-17-5	KO6300000
0397	Columbian spirits	67-56-1	PC1400000
0409	Combustion Improver-2	12108-13-3	OP1450000
0372	Compressed petroleum gas	68476-85-7	SE7545000
0574	Confectioner's sugar	57-50-1	WN6500000
0150*	Copper (dusts and mists, as Cu)	7440-50-8	GL5325000
0151*	Copper fume (as Cu)	1317-38-0	GL7900000
0150	Copper metal dusts	7440-50-8	GL5325000
0150	Copper metal fumes	7440-50-8	GL5325000
0151	Copper monoxide fume	1317-38-0	GL7900000
0151	Copper(II) oxide fume	1317-38-0	GL7900000
0567	Corn starch	9005-25-8	GM5090000
0250	Corundum	1302-74-5	GN0231000
0152*	Cotton dust (raw)		GN2275000
0143	Coyden®	2971-90-6	UU7711500
0153*	Crag® herbicide	136-78-7	KK4900000

0153	Crag@ herbicide No. 1	136-78-7	KK4900000
0156*	p-Cresol	106-44-5	GO6475000
0156	4-Cresol	106-44-5	GO6475000
0155	3-Cresol	108-39-4	GO6125000
0155*	m-Cresol	108-39-4	GO6125000
0154	2-Cresol	95-48-7	GO6300000
0154*	o-Cresol	95-48-7	GO6300000
0156	para-Cresol	106-44-5	GO6475000
0155	meta-Cresol	108-39-4	GO6125000
0154	ortho-Cresol	95-48-7	GO6300000
0156	p-Cresylic acid	106-44-5	GO6475000
0155	m-Cresylic acid	108-39-4	GO6125000
0154	o-Cresylic acid	95-48-7	GO6300000
0553	Cristobalite	14808-60-7	VV7330000
0041	Crocidolite (Riebeckite)	1332-21-4	CI6475000
0157*	Crotonaldehyde	4170-30-3	GP9499000
0438	Crude solvent coal tar naphtha	8030-30-6	DE3030000
0158*	Cruformate	299-86-5	TB3850000
0559	Cryocide	15096-52-3	WA9625000
0559	Cryodust	15096-52-3	WA9625000
0559	Cryolite	15096-52-3	WA9625000
0089	Cucumber dust	7778-44-1	CG0830000
0159*	Cumene	98-82-8	GR8575000
0638	psi-Cumene	95-63-6	DC3325000
0159	Cumol	98-82-8	GR8575000
0091	Cyanamide	156-62-7	GS6000000
0160*	Cyanamide	420-04-2	GS5950000
0395	2-Cyano-1-propene	126-98-7	UD1400000
0005	2-Cyano-2-propanol	75-86-5	OD9275000
0378	Cyanoacetonitrile	109-77-3	OO3150000
0530	Cyanoethane	107-12-0	UF9625000
0014	Cyanoethylene	107-13-1	AT5250000
0161*	Cyanogen	460-19-5	GT1925000
0162*	Cyanogen chloride	506-77-4	GT2275000
0160	Cyanogen nitride	420-04-2	GS5950000
0005	Cyanohydrin-2-propanone	75-86-5	OD9275000
0006	Cyanomethane	75-05-8	AL7700000
0304	Cyanomethanol	107-16-4	AM0350000
0086	1-Cyanopropane	109-74-0	ET8750000
0395	2-Cyanopropene-1	126-98-7	UD1400000
0542	1,4-Cyclohexadiene dioxide	106-51-4	DK2625000
0163*	Cyclohexane	110-82-7	GU6300000
0164*	Cyclohexanethiol	1569-69-3	GV7525000
0165*	Cyclohexanol	108-93-0	GV7875000
0166*	Cyclohexanone	108-94-1	GW1050000
0167*	Cyclohexene	110-83-8	GW2500000
0165	Cyclohexyl alcohol	108-93-0	GV7875000
0166	Cyclohexyl ketone	108-94-1	GW1050000
0168*	Cyclohexylamine	108-91-8	GX0700000
0164	Cyclohexylmercaptan	1569-69-3	GV7525000
0406	Cyclohexylmethane	108-87-2	GV6125000
0164	Cyclohexylthiol	1569-69-3	GV7525000
0169*	Cyclonite	121-82-4	XY9450000
0170*	Cyclopentadiene	542-92-7	GY1000000
0170	1,3-Cyclopentadiene	542-92-7	GY1000000
0380	Cyclopentadienyl tricarbonyl manganese	12079-65-1	OO9720000
0205	bis(Cyclopentadienyl)iron	102-54-5	LK0700000
0380	Cyclopentadienylmanganese tricarbonyl	12079-65-1	OO9720000
0171*	Cyclopentane	287-92-3	GY2390000
0169	Cyclotrimethylenetrinitramine	121-82-4	XY9450000
0172*	Cyhexatin	13121-70-5	WH8750000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0173*	2,4-D	94-75-7	AG6825000
0220	DAB	60-11-7	BX7350000
0411	DACPM	101-14-4	CY1050000
0184	DBCP	96-12-8	TX8750000
0187	DBP	84-74-2	TI0875000
0188	DCA	7572-29-4	AP1080000
0190	p-DCB	106-46-7	CZ4550000
0189	o-DCB	95-50-1	CZ4500000
0661	1,1-DCE	75-35-4	KV9275000
0199	DCP	542-75-6	UC8310000
0204	DCPD	77-73-6	PC1050000
0193	DDH	118-52-5	MU0700000
0174*	DDT	50-29-3	KJ3325000
0174	p,p'-DDT	50-29-3	KJ3325000
0202	DDVP	62-73-7	TC0350000

0208	DEA	111-42-2	KL2975000
0236	DEHP	117-81-7	TI0350000
0212	DEK	96-22-0	SA8050000
0213	DEP	84-66-2	TI1050000
0211	DETA	111-40-0	IE1225000
0215	DGE	2238-07-5	KN2350000
0216	DIBK	108-83-8	MJ5775000
0217	DIPA	108-18-9	IM4025000
0218	DMAC	127-19-5	AB7700000
0224	DMCC	79-44-7	FD4200000
0412	DMDI	5124-30-1	NO9250000
0388	DMDT	72-43-5	KJ3675000
0226	DMF	68-12-2	LO2100000
0227	DMH	57-14-7	MV2450000
0461	DMNA	62-75-9	IO0525000
0228	DMP	131-11-3	TI1575000
0234	DNC	534-52-1	GO9625000
0234	DNOC	534-52-1	GO9625000
0235	DNT	25321-14-6	XT1300000
0236	DOP	117-81-7	TI0350000
0240	DPA	122-39-4	JJ7800000
0242	DPK	123-19-3	MJ5600000
0248	DVB	1321-74-0	CZ9370000
0193	Dactin	118-52-5	MU0700000
0200	Dalapon	75-99-0	UF0690000
0284	Dasanit®	115-90-2	TF3850000
0175*	Decaborane	17702-41-9	HD1400000
0175	Decaboron tetradecahydride	17702-41-9	HD1400000
0365	Decachlorooctahydro-1,3,4-metheno-2H-cyc	143-50-0	PC8575000
0365	Decachlorooctahydro-kepone-2-one	143-50-0	PC8575000
0365	Decachlorotetrahydro-4,7-methanoindeneon	143-50-0	PC8575000
0176*	1-Decanethiol	143-10-2	
0176	Decylmercaptan	143-10-2	
0176	n-Decylmercaptan	143-10-2	
0238	Delnav®	78-34-2	TE3335000
0177*	Demeton	8065-48-3	TF3150000
0410	Demeton methyl	8022-00-2	TG1760000
0215	Di(2,3-epoxypropyl) ether	2238-07-5	KN2350000
0236	Di(2-ethylhexyl)phthalate	117-81-7	TI0350000
0208	Di(2-hydroxyethyl)amine	111-42-2	KL2975000
0185	2-Di-N-butylaminoethanol	102-81-8	KK3850000
0185	2-Di-N-butylaminoethyl alcohol	102-81-8	KK3850000
0245	Di-Syston®	298-04-4	TD9275000
0186	Di-n-butyl hydrogen phosphate	107-66-4	TB9605000
0187	Di-n-butyl phthalate	84-74-2	TI0875000
0236*	Di-sec octyl phthalate	117-81-7	TI0350000
0246*	2,6-Di-tert-butyl-p-cresol	128-37-0	GO7875000
0178	Diacetone	123-42-2	SA9100000
0178*	Diacetone alcohol	123-42-2	SA9100000
0215	Diallyl ether dioxide	2238-07-5	KN2350000
0329	Diamine	302-01-2	MU7175000
0191	4,4'-Diamino-3,3'-dichlorobiphenyl	91-94-1	DD0525000
0618	4,4'-Diamino-3,3'-dimethylbiphenyl	119-93-7	DD1225000
0179	1,3-Diamino-4-methoxybenzene	615-05-4	BZ8580500
0179*	2,4-Diaminoanisole (and its salts)	615-05-4	BZ8580500
0495	p-Diaminobenzene	106-50-3	SS8050000
0495	1,4-Diaminobenzene	106-50-3	SS8050000
0051	4,4'-Diaminobiphenyl	92-87-5	DC9625000
0211	2,2'-Diaminodiethylamine	111-40-0	IE1225000
0051	p-Diaminodiphenyl	92-87-5	DC9625000
0415	para'-Diaminodiphenyl-methane	101-77-9	BY5425000
0415	4,4'-Diaminodiphenylmethane	101-77-9	BY5425000
0618	Diaminoditolyl	119-93-7	DD1225000
0269	1,2-Diaminoethane	107-15-3	KH8575000
0620	Diaminotoluene	25376-45-8<	XS9445000
0415	Dianilinomethane	101-77-9	BY5425000
0180	Dianisidine	119-90-4	DD0875000
0180*	o-Dianisidine	119-90-4	DD0875000
0180	3,3'-Dianisidine	119-90-4	DD0875000
0552	Diatomaceous earth	7631-86-9	VV7310000
0552	Diatomaceous silica	7631-86-9	VV7310000
0552	Diatomite	7631-86-9	VV7310000
0181	Diazide®	333-41-5	TF3325000
0181*	Diazinon®	333-41-5	TF3325000
0182	Diazirine	334-88-3	PA7000000
0182*	Diazomethane	334-88-3	PA7000000
0676	Dibasic zinc stearate	557-05-1	ZH5200000
0494	Dibenzothiazine	92-84-2	SN5075000
0052	Dibenzoyl peroxide	94-36-0	DM8575000
0183*	Diborane	19287-45-7	HO9275000
0183	Diboron hexahydride	19287-45-7	HO9275000

0225	1,2-Dibromo-2,2-dichloroethyl dimethyl p	300-76-5	TB9450000
0184*	1,2-Dibromo-3-chloropropane	96-12-8	TX8750000
0184	Dibromochloropropane	96-12-8	TX8750000
0214	Dibromodifluoromethane	75-61-6	PA7525000
0270	1,2-Dibromoethane	106-93-4	KH9275000
0225	Dibrom®	300-76-5	TB9450000
0187	Dibutyl 1,2-benzene-dicarboxylate	84-74-2	TI0875000
0186	Dibutyl acid o-phosphate	107-66-4	TB9605000
0186*	Dibutyl phosphate	107-66-4	TB9605000
0186	Dibutyl phosphoric acid	107-66-4	TB9605000
0187*	Dibutyl phthalate	84-74-2	TI0875000
0185	Dibutylaminoethanol	102-81-8	KK3850000
0185	2-Dibutylaminoethanol	102-81-8	KK3850000
0246	Dibutylated hydroxytoluene	128-37-0	GO7875000
0389	2,2-Dichloro-1,1-difluoro-1-methoxyethan	76-38-0	KN7820000
0389	2,2-Dichloro-1,1-difluoroethyl methyl et	76-38-0	KN7820000
0534	Dichloro-1,2-propane	78-87-5	TX9625000
0198*	1,1-Dichloro-1-nitroethane	594-72-9	KI1050000
0199	1,3-Dichloro-1-propene	542-75-6	UC8310000
0143	3,5-Dichloro-2,6-dimethyl-4-pyridinol	2971-90-6	UU7711500
0191	3,3'-Dichloro-4,4'-biphenyldiamine	91-94-1	DD0525000
0191	3,3'-Dichloro-4,4'-diaminobiphenyl	91-94-1	DD0525000
0411	3,3'-Dichloro-4,4'-diaminodiphenylmethan	101-14-4	CY1050000
0193*	1,3-Dichloro-5,5-dimethylhydantoin	118-52-5	MU0700000
0188*	Dichloroacetylene	7572-29-4	AP1080000
0190*	p-Dichlorobenzene	106-46-7	CZ4550000
0189*	o-Dichlorobenzene	95-50-1	CZ4500000
0190	1,4-Dichlorobenzene	106-46-7	CZ4550000
0189	1,2-Dichlorobenzene	95-50-1	CZ4500000
0190	para-Dichlorobenzene	106-46-7	CZ4550000
0189	ortho-Dichlorobenzene	95-50-1	CZ4500000
0191	o,o'-Dichlorobenzidine	91-94-1	DD0525000
0191*	3,3'-Dichlorobenzidine (and its salts)	91-94-1	DD0525000
0191	Dichlorobenzidine base	91-94-1	DD0525000
0189	o-Dichlorobenzol	95-50-1	CZ4500000
0191	3,3'-Dichlorobiphenyl-4,4'-diamine	91-94-1	DD0525000
0190	Dichlorocide	106-46-7	CZ4550000
0196	2,2'-Dichlorodiethyl ether	111-44-4	KN0875000
0192*	Dichlorodifluoromethane	75-71-8	PA8200000
0128	Dichlorodimethyl ether	542-88-1	KN1575000
0142	Dichlorodioxochromium	14977-61-8	GB5775000
0174	Dichlorodiphenyltrichloroethane	50-29-3	KJ3325000
0271	1,2-Dichloroethane	107-06-2	KI0525000
0194*	1,1-Dichloroethane	75-34-3	KI0175000
0661	1,1-Dichloroethene	75-35-4	KV9275000
0196*	Dichloroethyl ether	111-44-4	KN0875000
0196	2,2'-Dichloroethyl ether	111-44-4	KN0875000
0195*	1,2-Dichloroethylene	540-59-0	KV9360000
0195	sym-Dichloroethylene	540-59-0	KV9360000
0661	1,1-Dichloroethylene	75-35-4	KV9275000
0188	Dichloroethyne	7572-29-4	AP1080000
0197	Dichlorofluoromethane	75-43-4	PA8400000
0414	Dichloromethane	75-09-2	PA8050000
0128	Dichloromethyl ether	542-88-1	KN1575000
0197*	Dichloromonofluoromethane	75-43-4	PA8400000
0198	Dichloronitroethane	594-72-9	KI1050000
0153	2-(2,4-Dichlorophenoxy)ethyl sodium sulf	136-78-7	KK4900000
0173	Dichlorophenoxyacetic acid	94-75-7	AG6825000
0173	2,4-Dichlorophenoxyacetic acid	94-75-7	AG6825000
0247	3-(3,4-Dichlorophenyl)-1,1-dimethylurea	330-54-1	YS8925000
0534	1,2-Dichloropropane	78-87-5	TX9625000
0200	2,2-Dichloropropanoic acid	75-99-0	UF0690000
0199*	1,3-Dichloropropene	542-75-6	UC8310000
0200*	2,2-Dichloropropionic acid	75-99-0	UF0690000
0200	alpha, alpha-Dichloropropionic acid	75-99-0	UF0690000
0199	1,3-Dichloropropylene	542-75-6	UC8310000
0201*	Dichlorotetrafluoroethane	76-14-2	KI1101000
0201	1,2-Dichlorotetrafluoroethane	76-14-2	KI1101000
0202	2,2-Dichlorovinyl dimethyl phosphate	62-73-7	TC0350000
0202*	Dichlorvos	62-73-7	TC0350000
0147	Dicobalt Octacarbonyl	10210-68-1	GG0300000
0147	Dicobalt carbonyl	10210-68-1	GG0300000
0203*	Dicrotophos	141-66-2	TC3850000
0161	Dicyan	460-19-5	GT1925000
0513	m-Dicyanobenzene	626-17-5	CZ1900000
0513	1,3-Dicyanobenzene	626-17-5	CZ1900000
0015	1,4-Dicyanobutane	111-69-3	AV2625000
0573	1,2-Dicyanoethane	110-61-2	WN3850000
0161	Dicyanogen	460-19-5	GT1925000
0378	Dicyanomethane	109-77-3	OQ3150000
0412	Dicyclohexylmethane 4,4'-diisocyanate	5124-30-1	NO9250000

0204*	Dicyclopentadiene	77-73-6	PC1050000
0204	1,3-Dicyclopentadiene dimer	77-73-6	PC1050000
0205*	Dicyclopentadienyl iron	102-54-5	LK0700000
0206*	Dieldrin	60-57-1	IO1750000
0207*	Diesel exhaust		
0209	Diethamine	109-89-7	HZ8750000
0208*	Diethanolamine	111-42-2	KL2975000
0068	Diethyl	106-97-8	EJ4200000
0375	Diethyl (dimethoxyphosphinothioylthio) s	121-75-5	WM8400000
0248	Diethyl benzene	1321-74-0	CZ9370000
0213	Diethyl ester of phthalic acid	84-66-2	TI1050000
0277	Diethyl ether	60-29-7	KI5775000
0212*	Diethyl ketone	96-22-0	SA8050000
0277	Diethyl oxide	60-29-7	KI5775000
0479	Diethyl parathion	56-38-2	TF4550000
0213*	Diethyl phthalate	84-66-2	TI1050000
0210	Diethyl-(2-hydroxyethyl)amine	100-37-8	KK5075000
0209*	Diethylamine	109-89-7	HZ8750000
0210	Diethylaminoethanol	100-37-8	KK5075000
0210*	2-Diethylaminoethanol	100-37-8	KK5075000
0210	2-Diethylaminoethyl alcohol	100-37-8	KK5075000
0237	Diethylene dioxide	123-91-1	JG8225000
0237	Diethylene ether	123-91-1	JG8225000
0437	Diethylene imidoxide	110-91-8	OD6475000
0602	Diethylene oxide	109-99-9	LU5950000
0437	Diethylene oximide	110-91-8	OD6475000
0211*	Diethylenetriamine	111-40-0	IE1225000
0323	Diethylmethylethane		
0244	bis(Diethylthiocarbamoyl) disulfide	97-77-8	JO1225000
0475	Difluorine monoxide	7783-41-7	RS2100000
0595	2,2-Difluoro-1,1,1,2-tetrachloroethane	76-11-9	KI1425000
0596	1,2-Difluoro-1,1,2,2-tetrachloroethane	76-12-0	KI1420000
0662	Difluoro-1,1-ethylene	75-38-7	KW0560000
0124	Difluorochloromethane	75-45-6	PA6390000
0214*	Difluorodibromomethane	75-61-6	PA7525000
0192	Difluorodichloromethane	75-71-8	PA8200000
0662	1,1-Difluoroethene	75-38-7	KW0560000
0662	1,1-Difluoroethylene	75-38-7	KW0560000
0098	Difolatan®	2425-06-1	GS4900000
0215*	Diglycidyl ether	2238-07-5	KN2350000
0101	2,3-Dihydro-2,2-dimethyl-7-benzofuranyl	1563-66-2	FB9450000
0328	2,4-Dihydroxy-2-methylpentane	107-41-5	SA0810000
0338	Dihydroxybenzene	123-31-9	MX3500000
0543	m-Dihydroxybenzene	108-46-3	VG9625000
0109	o-Dihydroxybenzene	120-80-9	UX1050000
0543	1,3-Dihydroxybenzene	108-46-3	VG9625000
0109	1,2-Dihydroxybenzene	120-80-9	UX1050000
0338	1,4-Dihydroxybenzene	123-31-9	MX3500000
0208	2,2'-Dihydroxydiethylamine	111-42-2	KL2975000
0272	1,2-Dihydroxyethane	107-21-1	KW2975000
0216*	Diisobutyl ketone	108-83-8	MJ5775000
0320	1,6-Diisocyanatoheptane	822-06-0	MO1740000
0440	1,5-Diisocyanatonaphthalene	3173-72-6	NO9600000
0323	Diisopropyl		
0216	sym-Diisopropyl acetone	108-83-8	MJ5775000
0362	Diisopropyl ether	108-20-3	TZ5425000
0362	Diisopropyl oxide	108-20-3	TZ5425000
0217*	Diisopropylamine	108-18-9	IM4025000
0227	Dimazine	57-14-7	MV2450000
0180	3,3'-Dimethoxybenzidine	119-90-4	DD0875000
0388	p,p'-Dimethoxydiphenylftrichloroethane	72-43-5	KJ3675000
0396	Dimethoxymethane	109-87-5	PA8750000
0218*	Dimethyl acetamide	127-19-5	AB7700000
0224*	Dimethyl carbamoyl chloride	79-44-7	FD4200000
0359	Dimethyl carbinol	67-63-0	NT8050000
0203	2-Dimethyl cis-2-dimethylcarbamoyl-1-met	141-66-2	TC3850000
0228	Dimethyl ester of 1,2-benzenedicarboxyli	131-11-3	TI1575000
0229	Dimethyl ester of sulfuric acid	77-78-1	WS8225000
0226	Dimethyl formamide	68-12-2	LO2100000
0004	Dimethyl ketone	67-64-1	AL3150000
0524	Dimethyl methane	74-98-6	TX2275000
0229*	Dimethyl sulfate	77-78-1	WS8225000
0225*	Dimethyl-1,2-dibromo-2,2-dichlorethyl ph	300-76-5	TB9450000
0478	1,1'-Dimethyl-4,4'-bipyridinium dichlori	1910-42-5	DW2275000
0618	3,3'-Dimethyl-4,4'-diphenyldiamine	119-93-7	DD1225000
0216	2,6-Dimethyl-4-heptanone	108-83-8	MJ5775000
0212	Dimethylacetone	96-22-0	SA8050000
0219*	Dimethylamine	124-40-3	IP8750000
0219	Dimethylamine (anhydrous)	124-40-3	IP8750000
0221*	bis(2-(Dimethylamino)ethyl)ether	3033-62-3	KR9460000
0222	3-(Dimethylamino)propionitrile	1738-25-6	UG1575000

0220	p-Dimethylaminoazobenzene	60-11-7	BX7350000
0220*	4-Dimethylaminoazobenzene	60-11-7	BX7350000
0672	Dimethylaminobenzene	1300-73-8	ZE8575000
0222*	Dimethylaminopropionitrile	1738-25-6	UG1575000
0672	Dimethylaniline	1300-73-8	ZE8575000
0672	2,4-Dimethylaniline)	1300-73-8	ZE8575000
0670	1,4-Dimethylbenzene	106-42-3	ZE2625000
0669	1,3-Dimethylbenzene	108-38-3	ZE2275000
0668	1,2-Dimethylbenzene	95-47-6	ZE2450000
0618	3,3'-Dimethylbenzidine	119-93-7	DD1225000
0323	2,2-Dimethylbutane		
0323	2,3-Dimethylbutane		
0327	1,3-Dimethylbutyl acetate	108-84-9	SA7525000
0224	Dimethylcarbamic chloride	79-44-7	FD4200000
0129	Dimethylchloroether	107-30-2	KN6650000
0286	tris(Dimethyldithiocarbamato)iron	14484-64-1	NO8750000
0275	Dimethylene oxide	75-21-8	KX2450000
0274	Dimethyleneimine	151-56-4	KX5075000
0274	Dimethylenimine	151-56-4	KX5075000
0226*	Dimethylformamide	68-12-2	LO2100000
0227*	1,1-Dimethylhydrazine	57-14-7	MV2450000
0460	Dimethylnitromethane	79-46-9	TZ5250000
0461	Dimethylnitrosamine	62-75-9	IO0525000
0228*	Dimethylphthalate	131-11-3	TI1575000
0229	Dimethylsulfate	77-78-1	WS8225000
0612	bis(Dimethylthiocarbamoyl) disulfide	137-26-8	JO1400000
0573	Dinile	110-61-2	WN3850000
0230*	Dinitolmide	148-01-6	XS4200000
0234	3,5-Dinitro-2-hydroxytoluene	534-52-1	GO9625000
0234	4,6-Dinitro-2-methyl phenol	534-52-1	GO9625000
0234*	Dinitro-o-cresol	534-52-1	GO9625000
0234	4,6-Dinitro-o-cresol	534-52-1	GO9625000
0230	3,5-Dinitro-o-toluamide	148-01-6	XS4200000
0233*	p-Dinitrobenzene	100-25-4	CZ7525000
0231*	o-Dinitrobenzene	528-29-0	CZ7450000
0232*	m-Dinitrobenzene	99-65-0	CZ7350000
0233	1,4-Dinitrobenzene	100-25-4	CZ7525000
0231	1,2-Dinitrobenzene	528-29-0	CZ7450000
0232	1,3-Dinitrobenzene	99-65-0	CZ7350000
0233	para-Dinitrobenzene	100-25-4	CZ7525000
0232	meta-Dinitrobenzene	99-65-0	CZ7350000
0231	ortho-Dinitrobenzene	528-29-0	CZ7450000
0465	Dinitrogen monoxide	10024-97-2	OX1350000
0454	Dinitrogen tetroxide (N2O4)	10102-44-0	OW9800000
0235*	Dinitrotoluene	25321-14-6	XT1300000
0235	Dinitrotoluol	25321-14-6	XT1300000
0208	Diolamine	111-42-2	KL2975000
0237	Dioxan	123-91-1	JG8225000
0237*	Dioxane	123-91-1	JG8225000
0237	p-Dioxane	123-91-1	JG8225000
0237	1,4-Dioxane	123-91-1	JG8225000
0238	Dioxane phosphate	78-34-2	TE3350000
0238	p-Dioxane-2,3-diyl ethyl phosphorodithio	78-34-2	TE3350000
0238	2,3-p-Dioxanethiol S,S-bis(O,O-diethyl p	78-34-2	TE3350000
0238*	Dioxathion	78-34-2	TE3350000
0594	Dioxin	1746-01-6	HP3500000
0594	Dioxine	1746-01-6	HP3500000
0516	1,3-Dioxo-2-pivaloy-lindane	83-26-1	NK6300000
0239*	Diphenyl	92-52-4	DU8050000
0496	Diphenyl ether	101-84-8	KN8970000
0496	Diphenyl oxide	101-84-8	KN8970000
0497	Diphenyl oxide-diphenyl mixture	8004-13-5	DV1500000
0240*	Diphenylamine	122-39-4	JJ7800000
0591	o-Diphenylbenzene	84-15-1	WZ6472000
0592	m-Diphenylbenzene	92-06-8	WZ6470000
0593	p-Diphenylbenzene	92-94-4	WZ6475000
0591	1,2-Diphenylbenzene	84-15-1	WZ6472000
0592	1,3-Diphenylbenzene	92-06-8	WZ6470000
0593	1,4-Diphenylbenzene	92-94-4	WZ6475000
0413	4,4'-Diphenylmethane diisocyanate	101-68-8	NO9350000
0415	4,4'-Diphenylmethanediamine	101-77-9	BY5425000
0242*	Dipropyl ketone	123-19-3	MJ5600000
0241*	Dipropylene glycol methyl ether	34590-94-8	JM1575000
0241	Dipropylene glycol monomethyl ether	34590-94-8	JM1575000
0243*	Diquat (Diquat dibromide)	85-00-7	JM5690000
0243	Diquat dibromide	85-00-7	JM5690000
0247	Direx®	330-54-1	YS8925000
0566	Disodium pyrosulfite	7681-57-4	UX8225000
0057	Disodium salt of boric acid	1330-43-4	ED4588000
0057	Disodium tetrabromate	1330-43-4	ED4588000
0244*	Disulfiram	97-77-8	JO1225000

0245*	Disulfoton	298-04-4	TD9275000
0579	Disulfur decafluoride	5714-22-7	WS4480000
0020	4,5-Dithia-1-octene	2179-59-1	JO0350000
0586	Dithion@	3689-24-5	XN4375000
0247*	Diuron	330-54-1	YS8925000
0653	Divanadium pentoxide dust	1314-62-1	YW2450000
0654	Divanadium pentoxide fume	1314-62-1	YW2460000
0067	Divinyl	106-99-0	FI9275000
0248*	Divinyl benzene	1321-74-0	CZ9370000
0249*	1-Dodecanethiol	112-55-0	JR3155000
0249	Dodecyl mercaptan	112-55-0	JR3155000
0249	1-Dodecyl mercaptan	112-55-0	JR3155000
0249	n-Dodecyl mercaptan	112-55-0	JR3155000
0055	Doped bismuth sesquitelluride		
0055	Doped bismuth telluride		
0055	Doped bismuth tritelluride		
0055	Doped tellurobismuthite		
0241	Dowanol@ 50B	34590-94-8	JM1575000
0070	Dowanol@ EB	111-76-2	KJ8575000
0158	Dowco@ 132	299-86-5	TB3850000
0536	Dowtherm@ 209	107-98-2	UB7700000
0497	Dowtherm@ A	8004-13-5	DV1500000
0518	Dried calcium sulfate	26499-65-0	TP0700000
0569	Dry cleaning safety solvent	8052-41-3	WJ8925000
0103	Dry ice	124-38-9	FF6400000
0137	Dursban@	2921-88-2	TF6300000
0292	Dyfonate@	944-22-9	TA5950000
0292	Dyphonate	944-22-9	TA5950000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0070	EGBE	111-76-2	KJ8575000
0071	EGBEA	112-07-2	KJ8925000
0273	EGDN	628-96-6	KW5600000
0258	EGEE	110-80-5	KK8050000
0259	EGEEA	111-15-9	KK8225000
0401	EGME	109-86-4	KL5775000
0402	EGMEA	110-49-6	KL5950000
0279	ENB	16219-75-3	RB9450000
0255*	EPN	2104-64-5	TB1925000
0276	ETU	96-45-7	NI9625000
0070	Ektasolve EB@	111-76-2	KJ8575000
0071	Ektasolve EB@ acetate	112-07-2	KJ8925000
0022	Elemental aluminum	7429-90-5	BD0330000
0309	Elemental hafnium	7440-58-6	MG4600000
0507	Elemental phosphorus	7723-14-0	TH3500000
0550	Elemental selenium	7782-49-2	VS7700000
0554	Elemental silicon	7440-21-3	VW0400000
0250*	Emery	1302-74-5	GN0231000
0251*	Endosulfan	115-29-7	RB9275000
0251	Endosulphan	115-29-7	RB9275000
0252*	Endrin	72-20-8	IO1575000
0253*	Enflurane	13838-16-9	KN6800000
0447	Engravers acid	7697-37-2	OU5775000
0285	Entex	55-38-9	TF9625000
0254*	Epichlorohydrin	106-89-8	TX4900000
0275	1,2-Epoxy ethane	75-21-8	KX2450000
0538	1,2-Epoxy propane	75-56-9	TZ2975000
0303	2,3-Epoxy-1-propanol	556-52-5	UB4375000
0081	1,2-Epoxy-3-butoxypropane	2426-08-6	TX4200000
0363	1,2-Epoxy-3-isopropoxypropane	4016-14-2	TZ3500000
0498	1,2-Epoxy-3-phenoxy propane	122-60-1	TZ3675000
0602	1,4-Epoxybutane	109-99-9	LU5950000
0659	1-Epoxyethyl-3,4-epoxy-cyclohexane	106-87-6	RN8640000
0303	Epoxypropyl alcohol	556-52-5	UB4375000
0215	2-Epoxypropyl ether	2238-07-5	KN2350000
0215	bis(2,3-Epoxypropyl) ether	2238-07-5	KN2350000
0067	Erythrene	106-99-0	FI9275000
0450	Essence of mirbane	98-95-3	DA6475000
0262	EtOH	64-17-5	KO6300000
0001	Ethanal	75-07-0	AB1925000
0316	Ethane hexachloride	67-72-1	KI4025000
0482	Ethane pentachloride	76-01-7	KI6300000
0628	Ethane trichloride	79-00-5	KJ3150000
0529	Ethanecarboxylic acid	79-09-4	UE5950000
0269	1,2-Ethanediamine	107-15-3	KH8575000
0161	Ethanedinitrile	460-19-5	GT1925000
0474	Ethanedioic acid	144-62-7	RO2450000
0272	1,2-Ethanediol	107-21-1	KW2975000

0273	1,2-Ethanediol dinitrate	628-96-6	KW5600000
0280	Ethanethiol	75-08-1	K19625000
0002	Ethanoic acid	64-19-7	AF1225000
0003	Ethanoic anhydride	108-24-7	AK1925000
0262	Ethanol	64-17-5	KO6300000
0256*	Ethanolamine	141-43-5	KJ5775000
0367	Ethenone	463-51-4	OA7700000
0656	Ethenyl acetate	108-05-4	AK0875000
0571	Ethenyl benzene	100-42-5	WL3675000
0656	Ethenyl ethanoate	108-05-4	AK0875000
0663	Ethenylmethylbenzene	25013-15-4	WL5075000
0277	Ether	60-29-7	KI5775000
0008	Ethine	74-86-2	AO9600000
0257*	Ethion	563-12-2	TE4550000
0258*	2-Ethoxyethanol	110-80-5	KK8050000
0259*	2-Ethoxyethyl acetate	111-15-9	KK8225000
0253	Ethrane®	13838-16-9	KN6800000
0283	Ethyl 3-methyl-4-(methylthio)phenyl-(1-m	22224-92-6	TB3675000
0260*	Ethyl acetate	141-78-6	AH5425000
0488	Ethyl acetone	107-87-9	SA7875000
0261*	Ethyl acrylate	140-88-5	AT0700000
0261	Ethyl acrylate (inhibited)	140-88-5	AT0700000
0262*	Ethyl alcohol	64-17-5	KO6300000
0001	Ethyl aldehyde	75-07-0	AB1925000
0418	Ethyl amyl ketone	541-85-5	MJ7350000
0264*	Ethyl benzene	100-41-4	DA0700000
0265*	Ethyl bromide	74-96-4	KH6475000
0266*	Ethyl butyl ketone	106-35-4	MJ5250000
0533	Ethyl carbinol	71-23-8	UH8225000
0267*	Ethyl chloride	75-00-3	KH7525000
0530	Ethyl cyanide	107-12-0	UF9625000
0260	Ethyl ester of acetic acid	141-78-6	AH5425000
0261	Ethyl ester of acrylic acid	140-88-5	AT0700000
0278	Ethyl ester of formic acid	109-94-4	LQ8400000
0260	Ethyl ethanoate	141-78-6	AH5425000
0277*	Ethyl ether	60-29-7	KI5775000
0278*	Ethyl formate	109-94-4	LQ8400000
0212	Ethyl ketone	96-22-0	SA8050000
0280*	Ethyl mercaptan	75-08-1	K19625000
0278	Ethyl methanoate	109-94-4	LQ8400000
0069	Ethyl methyl ketone	78-93-3	EL6475000
0416	Ethyl methyl ketone peroxide	1338-23-4	EL9450000
0006	Ethyl nitrile	75-05-8	AL7700000
0282	Ethyl orthosilicate	78-10-4	VV9450000
0277	Ethyl oxide	60-29-7	KI5775000
0255	Ethyl p-nitrophenyl benzenethionophospho	2104-64-5	TB1925000
0479	Ethyl parathion	56-38-2	TF4550000
0213	Ethyl phthalate	84-66-2	TI1050000
0261	Ethyl propenoate	140-88-5	AT0700000
0590	Ethyl pyrophosphate	107-49-3	UX6825000
0282*	Ethyl silicate	78-10-4	VV9450000
0282	Ethyl silicate (condensed)	78-10-4	VV9450000
0280	Ethyl sulfhydrate	75-08-1	K19625000
0263*	Ethylamine	75-04-7	KH2100000
0263	Ethylamine (anhydrous)	75-04-7	KH2100000
0264	Ethylbenzol	100-41-4	DA0700000
0270	Ethylene bromide	106-93-4	KH9275000
0268	Ethylene chlorhydrin	107-07-3	KK0875000
0271	Ethylene chloride	107-06-2	KI0525000
0268*	Ethylene chlorohydrin	107-07-3	KK0875000
0573	Ethylene cyanide	110-61-2	WN3850000
0270*	Ethylene dibromide	106-93-4	KH9275000
0271*	Ethylene dichloride	107-06-2	KI0525000
0573	Ethylene dicyanide	110-61-2	WN3850000
0273	Ethylene dinitrate	628-96-6	KW5600000
0272*	Ethylene glycol	107-21-1	KW2975000
0273*	Ethylene glycol dinitrate	628-96-6	KW5600000
0357	Ethylene glycol isopropyl ether	109-59-1	KL5075000
0070	Ethylene glycol monobutyl ether	111-76-2	KJ8575000
0071	Ethylene glycol monobutyl ether acetate	112-07-2	KJ8925000
0258	Ethylene glycol monoethyl ether	110-80-5	KK8050000
0259	Ethylene glycol monoethyl ether acetate	111-15-9	KK8225000
0401	Ethylene glycol monomethyl ether	109-86-4	KL5775000
0402	Ethylene glycol monomethyl ether acetate	110-49-6	KL5950000
0658	Ethylene monochloride	75-01-4	KU9625000
0273	Ethylene nitrate	628-96-6	KW5600000
0275*	Ethylene oxide	75-21-8	KX2450000
0276*	Ethylene thiourea	96-45-7	NI9625000
0629	Ethylene trichloride	79-01-6	KX4550000
0243	1,1'-Ethylene-2,2'-bipyridyllium dibromi	85-00-7	JM5690000
0276	1,3-Ethylene-2-thiourea	96-45-7	NI9625000

0013	Ethylenecarboxylic acid	79-10-7	AS4375000
0269*	Ethylenediamine	107-15-3	KH8575000
0269	Ethylenediamine (anhydrous)	107-15-3	KH8575000
0274*	Ethyleneimine	151-56-4	KX5075000
0274	Ethylenimine	151-56-4	KX5075000
0529	Ethylformic acid	79-09-4	UE5950000
0236	bis-(2-Ethylhexyl)phthalate	117-81-7	TI0350000
0194	Ethylidene chloride	75-34-3	KI0175000
0194	1,1-Ethylidene dichloride	75-34-3	KI0175000
0279*	Ethylidene norbornene	16219-75-3	RB9450000
0279	5-Ethylidene-2-norbornene	16219-75-3	RB9450000
0279	5-Ethylidenebicyclo(2.2.1)-hept-2-ene	16219-75-3	RB9450000
0274	Ethylimine	151-56-4	KX5075000
0281	4-Ethylmorpholine	100-74-3	OE4025000
0256	Ethylolamine	141-43-5	KJ5775000
0008	Ethyne	74-86-2	AO9600000
0491	Expanded perlite	93763-70-3	SO5254000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0007	FAA	53-96-3	AB9450000
0007	2-FAA	53-96-3	AB9450000
0346	FeSO4: Ferrous sulfate		
0283*	Fenamiphos	22224-92-6	TB3675000
0546	Fenchlorophos	299-84-3	TG0525000
0494	Fenothiazine	92-84-2	SN5075000
0284*	Fensulfothion	115-90-2	TF3850000
0285*	Fenthion	55-38-9	TF9625000
0501	Fenylfosfin	638-21-1	SZ2100000
0286*	Ferbam	14484-64-1	NO8750000
0348	Fermentation amyl alcohol	123-51-3	EL5425000
0286	Ferric dimethyl dithiocarbamate	14484-64-1	NO8750000
0344	Ferric oxide	1309-37-1	NO7400000
0205	Ferrocene	102-54-5	LK0700000
0287	Ferrovandium	12604-58-9	LK2900000
0287*	Ferrovandium dust	12604-58-9	LK2900000
0288	Fiber glas®		LK3651000
0288	Fiberglass		LK3651000
0288*	Fibrous glass dust		LK3651000
0563	Floridine	7681-49-4	WB0350000
0105	Flue gas	630-08-0	FG3500000
0007	2-Fluorenylacetyamide	53-96-3	AB9450000
0289*	Fluorine	7782-41-4	LM6475000
0475	Fluorine monoxide	7783-41-7	RS2100000
0289	Fluorine-19	7782-41-4	LM6475000
0123	Fluorocarbon 1011	74-97-5	PA5250000
0192	Fluorocarbon 12	75-71-8	PA8200000
0634	Fluorocarbon 1301	75-63-8	PA5425000
0131	Fluorocarbon-115	76-15-3	KH7877500
0124	Fluorocarbon-22	75-45-6	PA6390000
0197	Fluorodichloromethane	75-43-4	PA8400000
0660	Fluoroethene	75-02-5	YZ7351000
0660	Fluoroethylene	75-02-5	YZ7351000
0108	Fluoroformyl fluoride	353-50-4	FG6125000
0108	Fluorophosgene	353-50-4	FG6125000
0290*	Fluorotrichloromethane	75-69-4	PB6125000
0291*	Fluoroxene	406-90-6	KO4250000
0292*	Fonofos	944-22-9	TA5950000
0292	Fonophos	944-22-9	TA5950000
0396	Formal	109-87-5	PA8750000
0293*	Formaldehyde	50-00-0	LP8925000
0304	Formaldehyde cyanohydrin	107-16-4	AM0350000
0396	Formaldehyde dimethylacetal	109-87-5	PA8750000
0294	Formaldehyde solution		
0294*	Formalin (as formaldehyde)		
0295*	Formamide	75-12-7	LO0525000
0296*	Formic acid	64-18-6	LO4900000
0296	Formic acid (85-95% in aqueous solution)	64-18-6	LO4900000
0333	Formonitrile	74-90-8	MW6825000
0107	Freon® 10	56-23-5	FG4900000
0290	Freon® 11	75-69-4	PB6125000
0596	Freon® 112	76-12-0	KI1420000
0595	Freon® 112a	76-11-9	KI1425000
0632	Freon® 113	76-13-1	KJ4000000
0201	Freon® 114	76-14-2	KI1101000
0131	Freon® 115	76-15-3	KH7877500
0192	Freon® 12	75-71-8	PA8200000
0214	Freon® 12B2	75-61-6	PA7525000
0634	Freon® 13B1	75-63-8	PA5425000

0197	Freon® 21	75-43-4	PA8400000
0124	Freon® 22	75-45-6	PA6390000
0366	Fuel Oil No. 1	8008-20-6	OA5500000
0101	Furacarb®	1563-66-2	FB9450000
0101	Furadan®	1563-66-2	FB9450000
0297	Fural	98-01-1	LT7000000
0297	2-Furancarboxaldehyde	98-01-1	LT7000000
0376	2,5-Furanedione	108-31-6	ON3675000
0297*	Furfural	98-01-1	LT7000000
0297	Furfuraldehyde	98-01-1	LT7000000
0297	2-Furfuraldehyde	98-01-1	LT7000000
0298*	Furfuryl alcohol	98-00-0	LU9100000
0102	Furnace black	1333-86-4	FF5800000
0298	2-Furylmethanol	98-00-0	LU9100000
0057	Fused borax	1330-43-4	ED4588000
0348	Fusel oil	123-51-3	EL5425000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0145	acridine	65996-93-2	GF8655000
0145	chrysene	65996-93-2	GF8655000
0145	anthracene & benzo(a)pyrene).	65996-93-2	GF8655000
0145	pyrene	65996-93-2	GF8655000
0145	phenanthrene	65996-93-2	GF8655000
0299*	Gasoline	8006-61-9	LX3300000
0632	Genetron® 113	76-13-1	KJ4000000
0201	Genetron® 114	76-14-2	KI1101000
0131	Genetron® 115	76-15-3	KH7877500
0192	Genetron® 12	75-71-8	PA8200000
0197	Genetron® 21	75-43-4	PA8400000
0124	Genetron® 22	75-45-6	PA6390000
0300	Germane	7782-65-2	LY4900000
0300	Germanium hydride	7782-65-2	LY4900000
0300*	Germanium tetrahydride	7782-65-2	LY4900000
0300	Germanomethane	7782-65-2	LY4900000
0002	Glacial acetic acid (pure compound)	64-19-7	AF1225000
0013	Glacial acrylic acid (98% in aqueous sol	79-10-7	AS4375000
0288	Glass fibers		LK3651000
0288	Glass wool		LK3651000
0301*	Glutaraldehyde	111-30-8	MA2450000
0301	Glutaric dialdehyde	111-30-8	MA2450000
0302	Glycerin (anhydrous)	56-81-5	MA8050000
0302*	Glycerin (mist)	56-81-5	MA8050000
0302	Glycerol	56-81-5	MA8050000
0631	Glycerol trichlorohydrin	96-18-4	TZ9275000
0631	Glyceryl trichlorohydrin	96-18-4	TZ9275000
0456	Glyceryl trinitrate	55-63-0	OX2100000
0303	Glycide	556-52-5	UB4375000
0303*	Glycidol	556-52-5	UB4375000
0019	Glycidyl allyl ether	106-92-3	RR0875000
0498	Glycidyl phenyl ether	122-60-1	TZ3675000
0272	Glycol	107-21-1	KW2975000
0272	Glycol alcohol	107-21-1	KW2975000
0270	Glycol dibromide	106-93-4	KH9275000
0271	Glycol dichloride	107-06-2	KI0525000
0273	Glycol dinitrate	628-96-6	KW5600000
0259	Glycol monoethyl ether acetate	111-15-9	KK8225000
0401	Glycol monomethyl ether	109-86-4	KL5775000
0402	Glycol monomethyl ether acetate	110-49-6	KL5950000
0304	Glycolic nitrile	107-16-4	AM0350000
0304*	Glycolonitrile	107-16-4	AM0350000
0304	Glyconitrile	107-16-4	AM0350000
0302	Glycyl alcohol	56-81-5	MA8050000
0262	Grain alcohol	64-17-5	KO6300000
0305*	Grain dust (oat, wheat, barley)		MD7900000
0574	Granulated sugar	57-50-1	WN6500000
0306*	Graphite (natural)	7782-42-5	MD9659600
0307*	Graphite (synthetic)	7440-44-0 (FF5250100
0096	Gum camphor	76-22-2	EX1225000
0648	Gum turpentine	8006-64-2	YO8400000
0648	Gumspirits	8006-64-2	YO8400000
0044	Guthion®	86-50-0	TE1925000
0308*	Gypsum	13397-24-5	MG2360000
0518	Gypsum hemihydrate	26499-65-0	TP0700000
0308	Gypsum stone	13397-24-5	MG2360000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0314	HCBD	87-68-3	EJ0700000
0315	HCCPD	77-47-4	GY1225000
0370	HCH	58-89-9	GV4900000
0320	HDI	822-06-0	MO1740000
0206	HEOD	60-57-1	IO1750000
0334	HF-A	7664-39-3	MW7875000
0319	HFA	684-16-2	UC2450000
0016	HHDN	309-00-2	IO2100000
0412	HMDI	5124-30-1	NO9250000
0320	HMDI	822-06-0	MO1740000
0321	HMPA	680-31-9	TD0875000
0339	HPA	999-61-1	AT1925000
0309*	Hafnium	7440-58-6	MG4600000
0309	Hafnium metal	7440-58-6	MG4600000
0193	Halane	118-52-5	MU0700000
0596	Halocarbon 112	76-12-0	KI1420000
0595	Halocarbon 112a	76-11-9	KI1425000
0632	Halocarbon 113	76-13-1	KJ4000000
0662	Halocarbon 1132A	75-38-7	KW0560000
0131	Halocarbon 115	76-15-3	KH7877500
0634	Halocarbon 13B1	75-63-8	PA5425000
0123	Halon® 1011	74-97-5	PA5250000
0107	Halon® 104	56-23-5	FG4900000
0197	Halon® 112	75-43-4	PA8400000
0214	Halon® 1202	75-61-6	PA7525000
0192	Halon® 122	75-71-8	PA8200000
0634	Halon® 1301	75-63-8	PA5425000
0201	Halon® 242	76-14-2	KI1101000
0310*	Halothane	151-67-7	KH6550000
0630	Halowax®	1321-65-9	OK4025000
0600	Halowax®	1335-88-2	OK3700000
0483	Halowax® 1013	1321-64-8	OK0300000
0317	Halowax® 1014	1335-87-1	OJ7350000
0468	Halowax® 1051	2234-13-1	OK0250000
0647	Hard metal	11107-01-0	Y07350000
0667	Hard wood dust		ZC9850000
0472	Heavy mineral oil mist	8012-95-1	PY8030000
0637	Hemellitol	526-73-8	DC330000
0518	Hemihydrate gypsum	26499-65-0	TP0700000
0311*	Heptachlor	76-44-8	PC0700000
0311	1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetr	76-44-8	PC0700000
0242	Heptan-4-one	123-19-3	MJ5600000
0312	Heptane	142-82-5	MI7700000
0312*	n-Heptane	142-82-5	MI7700000
0312	normal-Heptane	142-82-5	MI7700000
0313*	1-Heptanethiol	1639-09-4	MJ1400000
0266	3-Heptanone	106-35-4	MJ5250000
0399	2-Heptanone	110-43-0	MJ5075000
0242	4-Heptanone	123-19-3	MJ5600000
0313	Heptyl mercaptan	1639-09-4	MJ1400000
0313	n-Heptyl mercaptan	1639-09-4	MJ1400000
0314	Hexachloro-1,3-butadiene	87-68-3	EJ0700000
0315	Hexachloro-1,3-cyclopentadiene	77-47-4	GY1225000
0315	1,2,3,4,5,5-Hexachloro-1,3-cyclopentadie	77-47-4	GY1225000
0016	1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-h	309-00-2	IO2100000
0251	6,7,8,9,10-Hexachloro-1,5,5a,6,9,9a-hexa	115-29-7	RB9275000
0206	1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4	60-57-1	IO1750000
0252	1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4	72-20-8	IO1575000
0314*	Hexachlorobutadiene	87-68-3	EJ0700000
0314	1,3-Hexachlorobutadiene	87-68-3	EJ0700000
0370	gamma-Hexachlorocyclohexane	58-89-9	GV4900000
0315*	Hexachlorocyclopentadiene	77-47-4	GY1225000
0370	gamma isomer of 1,2,3,4,5,6-Hexachlorocy	58-89-9	GV4900000
0316*	Hexachloroethane	67-72-1	KI4025000
0317*	Hexachloronaphthalene	1335-87-1	OJ7350000
0318	n-Hexadecanethiol	2917-26-2	
0318*	1-Hexadecanethiol	2917-26-2	
0318	Hexadecanethiol-1	2917-26-2	
0318	Hexadecyl mercaptan	2917-26-2	
0252	Hexadrin®	72-20-8	IO1575000
0319	Hexafluoro-2-propanone	684-16-2	UC2450000
0319	1,1,1,3,3,3-Hexafluoro-2-propanone	684-16-2	UC2450000
0319*	Hexafluoroacetone	684-16-2	UC2450000
0169	Hexahydro-1,3,5-trinitro-s-triazine	121-82-4	XY9450000
0097	Hexahydro-2H-azepin-2-one	105-60-2	CM3675000
0168	Hexahydroaniline	108-91-8	GX0700000
0168	Hexahydrobenzenamine	108-91-8	GX0700000
0163	Hexahydrobenzene	110-82-7	GU6300000
0407	Hexahydrocresol	25639-42-3	GW0175000
0407	Hexahydromethylphenol	25639-42-3	GW0175000
0165	Hexahydrophenol	108-93-0	GV7875000

0406	Hexahydrotoluene	108-87-2	GV6125000
0165	Hexalin	108-93-0	GV7875000
0321*	Hexamethyl phosphoramidate	680-31-9	TD0875000
0163	Hexamethylene	110-82-7	GU6300000
0320*	Hexamethylene diisocyanate	822-06-0	MO1740000
0320	1,6-Hexamethylene diisocyanate	822-06-0	MO1740000
0320	Hexamethylene-1,6-diisocyanate	822-06-0	MO1740000
0321	Hexamethylphosphoric triamide	680-31-9	TD0875000
0321	Hexamethylphosphorotriamide	680-31-9	TD0875000
0163	Hexanaphthene	110-82-7	GU6300000
0322	Hexane	110-54-3	MN9275000
0322*	n-Hexane	110-54-3	MN9275000
0322	normal-Hexane	110-54-3	MN9275000
0323*	Hexane isomers (excluding n-Hexane)		
0015	Hexanedinitrile	111-69-3	AV2625000
0324*	n-Hexanethiol	111-31-9	MO4550000
0324	1-Hexanethiol	111-31-9	MO4550000
0325*	2-Hexanone	591-78-6	MP1400000
0326*	Hexone	108-10-1	SA9275000
0327*	sec-Hexyl acetate	108-84-9	SA7525000
0322	Hexyl hydride	110-54-3	MN9275000
0324	Hexyl mercaptan	111-31-9	MO4550000
0324	n-Hexyl mercaptan	111-31-9	MO4550000
0328*	Hexylene glycol	107-41-5	SA0810000
0324	n-Hexylthiol	111-31-9	MO4550000
0438	High solvent naphtha	8030-30-6	DE3030000
0335	High-strength hydrogen peroxide	7722-84-1	MX0900000
0165	Hydralin	108-93-0	GV7875000
0364	Hydrated aluminum silicate	1332-58-7	GF1670500
0308	Hydrated calcium sulfate	13397-24-5	MG2360000
0092	Hydrated lime	1305-62-0	EW2800000
0521	Hydraulic cement	65997-15-1	VV8770000
0329*	Hydrazine	302-01-2	MU7175000
0329	Hydrazine (anhydrous)	302-01-2	MU7175000
0329	Hydrazine base	302-01-2	MU7175000
0499	Hydrazinobenzene	100-63-0	MW8925000
0364	Hydrite	1332-58-7	GF1670500
0528	Hydroacrylic acid	57-57-8	RO7350000
0331	Hydrobromic acid)	10035-10-6	MW3850000
0332	Hydrochloric acid	7647-01-0	MW4025000
0267	Hydrochloric ether	75-00-3	KH7525000
0148	Hydrocobalt tetracarbonyl	16842-03-8	GG0900000
0333	Hydrocyanic acid	74-90-8	MW6825000
0334	Hydrofluoric acid)	7664-39-3	MW7875000
0568	Hydrogen antimonide	7803-52-3	WJ0700000
0040	Hydrogen arsenide	7784-42-1	CG6475000
0331*	Hydrogen bromide	10035-10-6	MW3850000
0296	Hydrogen carboxylic acid	64-18-6	LO4900000
0332*	Hydrogen chloride	7647-01-0	MW4025000
0160	Hydrogen cyanamide	420-04-2	GS5950000
0333*	Hydrogen cyanide	74-90-8	MW6825000
0335	Hydrogen dioxide	7722-84-1	MX0900000
0334*	Hydrogen fluoride	7664-39-3	MW7875000
0447	Hydrogen nitrate	7697-37-2	OU5775000
0335*	Hydrogen peroxide	7722-84-1	MX0900000
0335	Hydrogen peroxide (aqueous)	7722-84-1	MX0900000
0505	Hydrogen phosphide	7803-51-2	SY7525000
0336*	Hydrogen selenide	7783-07-5	MX1050000
0577	Hydrogen sulfate	7664-93-9	WS5600000
0337*	Hydrogen sulfide	7783-06-4	MX1225000
0412	Hydrogenated MDI	5124-30-1	NO9250000
0330	Hydrogenated diphenylbenzenes	61788-32-7	WZ6535000
0330	Hydrogenated phenylbiphenyls	61788-32-7	WZ6535000
0330*	Hydrogenated terphenyls	61788-32-7	WZ6535000
0330	Hydrogenated triphenyls	61788-32-7	WZ6535000
0373	Hydromagnesite	546-93-0	OM2470000
0335	Hydroperoxide	7722-84-1	MX0900000
0338*	Hydroquinone	123-31-9	MX3500000
0390	Hydroquinone monomethyl ether	150-76-5	SL7700000
0337	Hydrosulfuric acid	7783-06-4	MX1225000
0584	Hydrous magnesium silicate	14807-96-6	WW2710000
0525	3-Hydroxy-1-propanesulphonic acid sulton	1120-71-4	RP5425000
0005	2-Hydroxy-2-methyl-propionitrile	75-86-5	OD9275000
0154	1-Hydroxy-2-methylbenzene	95-48-7	GO6300000
0665	4-Hydroxy-3-(3-oxo-1-phenyl butyl)-2H-1-	81-81-2	GN4550000
0155	1-Hydroxy-3-methylbenzene	108-39-4	GO6125000
0178	4-Hydroxy-4-methyl-2-pentanone	123-42-2	SA9100000
0156	1-Hydroxy-4-methylbenzene	106-44-5	GO6475000
0435	3-Hydroxy-N-methylcrotonamide dimethylph	6923-22-4	TC4375000
0528	3-Hydroxy-beta-lactone	57-57-8	RO7350000
0528	3-Hydroxy-propionic acid	57-57-8	RO7350000

0304	Hydroxyacetoneitrile	107-16-4	AM0350000
0390	p-Hydroxyanisole	150-76-5	SL7700000
0493	Hydroxybenzene	108-95-2	ST3325000
0076	1-Hydroxybutane	71-36-3	EO1400000
0077	2-Hydroxybutane	78-92-2	EO1750000
0110	Hydroxycellulose	9004-34-6	FJ5691460
0165	Hydroxycyclohexane	108-93-0	GV7875000
0357	beta-Hydroxyethyl isopropyl ether	109-59-1	KL5075000
0208	bis(2-Hydroxyethyl)amine	111-42-2	KL2975000
0256	2-Hydroxyethylamine	141-43-5	KJ5775000
0005	alpha-Hydroxyisobutyronitrile	75-86-5	OD9275000
0303	Hydroxymethyl ethylene oxide	556-52-5	UB4375000
0303	2-Hydroxymethyl oxiran	556-52-5	UB4375000
0485	2,2-bis(Hydroxymethyl)-1,3-propanediol	115-77-5	RZ2490000
0298	2-Hydroxymethylfuran	98-00-0	LU9100000
0543	m-Hydroxyphenol	108-46-3	VG9625000
0543	3-Hydroxyphenol	108-46-3	VG9625000
0109	2-Hydroxyphenol	120-80-9	UX1050000
0339*	2-Hydroxypropyl acrylate	999-61-1	AT1925000
0339	beta-Hydroxypropyl acrylate	999-61-1	AT1925000
0303	3-Hydroxypropylene oxide	556-52-5	UB4375000
0156	4-Hydroxytoluene	106-44-5	GO6475000
0155	3-Hydroxytoluene	108-39-4	GO6125000
0154	2-Hydroxytoluene	95-48-7	GO6300000
0210	2-Hydroxytriethylamine	100-37-8	KK5075000
0465	Hyponitrous acid anhydride	10024-97-2	OX1350000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0352	IBA	78-83-1	NP9625000
0363	IGE	4016-14-2	TZ3500000
0359	IPA	67-63-0	NT8050000
0356	IPDI	4098-71-9	NO9370000
0276	2-Imidazolidine-2-thione	96-45-7	NI9625000
0208	2,2'-Iminodiethanol	111-42-2	KL2975000
0250	Impure corundum	1302-74-5	GN0231000
0340*	Indene	95-13-6	NK8225000
0341*	Indium	7440-74-6	NL1050000
0341	Indium metal	7440-74-6	NL1050000
0340	Indonaphthene	95-13-6	NK8225000
0480	"Inert" dusts		
0342*	Iodine	7553-56-2	NN1575000
0342	Iodine crystals	7553-56-2	NN1575000
0343*	Iodoform	75-47-8	PB7000000
0420	Iodomethane	74-88-4	PA9450000
0345	Iron carbonyl	13463-40-6	NO4900000
0205	Iron dicyclopentadienyl	102-54-5	LK0700000
0344*	Iron oxide dust and fume (as Fe)	1309-37-1	NO7400000
0549	Iron oxide red	1309-37-1	NO7400000
0345*	Iron pentacarbonyl (as Fe)	13463-40-6	NO4900000
0346*	Iron salts (soluble, as Fe)		
0355	Isoacetophorone	78-59-1	GW7700000
0347*	Isoamyl acetate	123-92-2	NS9800000
0348*	Isoamyl alcohol (primary)	123-51-3	EL5425000
0349*	Isoamyl alcohol (secondary)	6032-29-7	
0421	Isoamyl methyl ketone	110-12-3	MP3850000
0350*	Isobutane	75-28-5	TZ4300000
0352	Isobutanol	78-83-1	NP9625000
0385	Isobutenyl methyl ketone	141-79-7	SB4200000
0351*	Isobutyl acetate	110-19-0	AI4025000
0352*	Isobutyl alcohol	78-83-1	NP9625000
0348	Isobutyl carbinol	123-51-3	EL5425000
0351	Isobutyl ester of acetic acid	110-19-0	AI4025000
0326	Isobutyl methyl ketone	108-10-1	SA9275000
0422	Isobutylmethylcarbinol	108-11-2	SA7350000
0353*	Isobutyronitrile	78-82-0	TZ4900000
0412	bis(4-Isocyanatocyclohexyl)methane	5124-30-1	NO9250000
0356	3-Isocyanatomethyl-3,5,5-trimethylcyclohexane	4098-71-9	NO9370000
0592	Isodiphenylbenzene	92-06-8	WZ6470000
0323	Isohexane		
0354	Isooctanol	26952-21-6	NS7700000
0354*	Isooctyl alcohol	26952-21-6	NS7700000
0347	Isopentyl acetate	123-92-2	NS9800000
0348	Isopentyl alcohol	123-51-3	EL5425000
0421	Isopentyl methyl ketone	110-12-3	MP3850000
0355*	Isophorone	78-59-1	GW7700000
0356	Isophorone diamine diisocyanate	4098-71-9	NO9370000
0356*	Isophorone diisocyanate	4098-71-9	NO9370000
0513	Isophthalodinitrile	626-17-5	CZ1900000

0395	Isoprene cyanide	126-98-7	UD1400000
0359	Isopropanol	67-63-0	NT8050000
0429	Isopropenyl benzene	98-83-9	WL5075300
0395	Isopropenyl nitrile	126-98-7	UD1400000
0362	2-Isopropoxy propane	108-20-3	TZ5425000
0357*	2-Isopropoxyethanol	109-59-1	KL5075000
0363	Isopropoxymethyl oxirane	4016-14-2	TZ3500000
0531	o-Isopropoxyphenyl-N-methylcarbamate	114-26-1	FC3150000
0357	Isopropyl Cellosolve®	109-59-1	KL5075000
0358*	Isopropyl acetate	108-21-4	AI4930000
0359*	Isopropyl alcohol	67-63-0	NT8050000
0159	Isopropyl benzene	98-82-8	GR8575000
0353	Isopropyl cyanide	78-82-0	TZ4900000
0358	Isopropyl ester of acetic acid	108-21-4	AI4930000
0362*	Isopropyl ether	108-20-3	TZ5425000
0363*	Isopropyl glycidyl ether	4016-14-2	TZ3500000
0357	Isopropyl glycol	109-59-1	KL5075000
0424	Isopropyl methyl ketone	563-80-4	EL9100000
0360*	Isopropylamine	75-31-0	NT8400000
0361	Isopropylaniline	768-52-5	BY4190000
0352	Isopropylcarbinol	78-83-1	NP9625000
0385	Isopropylideneacetone	141-79-7	SB4200000
0216	Isovalerone	108-83-8	MJ5775000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0540	Jasmolin I or II	8003-34-7	UR4200000
0070	Jeffersol EB	111-76-2	KJ8575000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0364*	Kaolin	1332-58-7	GF1670500
0247	Karmex®	330-54-1	YS8925000
0365*	Kepone	143-50-0	PC8575000
0366*	Kerosene	8008-20-6	OA5500000
0367*	Ketene	463-51-4	OA7700000
0367	Keto-ethylene	463-51-4	OA7700000
0004	Ketone propane	67-64-1	AL3150000
0130	Korax®	600-25-9	TX5075000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0372*	L.P.G.	68476-85-7	SE7545000
0372	LPG	68476-85-7	SE7545000
0528	beta-Lactone	57-57-8	RO7350000
0102	Lamp black	1333-86-4	FF5800000
0387	Lannate®	16752-77-5	AK2975000
0130	Lanstan®	600-25-9	TX5075000
0465	Laughing gas	10024-97-2	OX1350000
0096	Laurel camphor	76-22-2	EX1225000
0249	Lauryl mercaptan	112-55-0	JR3155000
0249	n-Lauryl mercaptan	112-55-0	JR3155000
0368*	Lead	7439-92-1	OF7525000
0368	Lead metal	7439-92-1	OF7525000
0601	Lead tetraethyl	78-00-2	TP4550000
0603	Lead tetramethyl	75-74-1	TP4725000
0431	Lepidolite	12001-26-2	VV8760000
0144	Lignite coal dust		GF8281000
0664	Ligroin	8032-32-4	OI6180000
0093	Lime	1305-78-8	EW3100000
0091	Lime nitrogen	156-62-7	GS6000000
0369*	Limestone	1317-65-3	EY9580000
0370*	Lindane	58-89-9	GV4900000
0372	Liquefied hydrocarbon gas	68476-85-7	SE7545000
0372	Liquefied petroleum gas	68476-85-7	SE7545000
0371*	Lithium hydride	7580-67-8	OJ6300000
0371	Lithium monohydride	7580-67-8	OJ6300000
0523	Lye	1310-58-3	TT2100000
0565	Lye	1310-73-2	WB4900000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0436	MA	100-61-8	BY4550000
0393	MAPP gas	59355-75-8	UK4920000
0325	MBK	591-78-6	MP1400000
0411	MBOCA	101-14-4	CY1050000

0121	MCB	108-90-7	CZ0175000
0380	MCT	12079-65-1	OO9720000
0415	MDA	101-77-9	BY5425000
0413	MDI	101-68-8	NO9350000
0069	MEK	78-93-3	EL6475000
0416	MEK peroxide	1338-23-4	EL9450000
0416	MEKP	1338-23-4	EL9450000
0421	MIAC	110-12-3	MP3850000
0422	MIBC	108-11-2	SA7350000
0326	MIBK	108-10-1	SA9275000
0423	MIC	624-83-9	NO9450000
0424	MIPK	563-80-4	EL9100000
0419	MMH	60-34-4	MV5600000
0409	MMT	12108-13-3	OP1450000
0411	MOCA	101-14-4	CY1050000
0488	MPK	107-87-9	SA7875000
0671	MXDA	1477-55-0	PF8970000
0119	Mace®	532-27-4	AM6300000
0374	Magnesia fume	1309-48-4	OM3850000
0373*	Magnesite	546-93-0	OM2470000
0373	Magnesium carbonate	546-93-0	OM2470000
0374*	Magnesium oxide fume	1309-48-4	OM3850000
0373	Magnesium(II) carbonate	546-93-0	OM2470000
0375*	Malathion	121-75-5	WM8400000
0376	Maleic acid anhydride	108-31-6	ON3675000
0376*	Maleic anhydride	108-31-6	ON3675000
0377*	Malonaldehyde	542-78-9	TX6475000
0377	Malonic aldehyde	542-78-9	TX6475000
0378	Malonic dinitrile	109-77-3	OO3150000
0377	Malonodialdehyde	542-78-9	TX6475000
0378*	Malononitrile	109-77-3	OO3150000
0379*	Manganese compounds and fume (as Mn)	7439-96-5	OO9275000
0380*	Manganese cyclopentadienyl tricarbonyl	12079-65-1	OO9720000
0381	Manganese oxide	1317-35-7	OP0895000
0381*	Manganese tetroxide (as Mn)	1317-35-7	OP0895000
0409	Manganese tricarbonylmethylcyclopentadie	12108-13-3	OP1450000
0379	Manganese-55	7439-96-5	OO9275000
0381	Manganomanganic oxide	1317-35-7	OP0895000
0432	Manmade mineral fibers		PY8070000
0382*	Marble	1317-65-3	EY9580000
0431	Margarite	12001-26-2	VV8760000
0558	Massive talc		VV8780000
0405	Mecrylate	137-05-3	AS7000000
0390	Mequinol	150-76-5	SL7700000
0610	Mercaptoacetate	68-11-1	AI5950000
0610	Mercaptoacetic acid	68-11-1	AI5950000
0610	2-Mercaptoacetic acid	68-11-1	AI5950000
0050	Mercaptobenzene	108-98-5	DC0525000
0083	1-Mercaptobutane	109-79-5	EK6300000
0176	1-Mercaptodecane	143-10-2	
0249	1-Mercaptododecane	112-55-0	JR3155000
0280	Mercaptoethane	75-08-1	K19625000
0425	Mercaptomethane	74-93-1	PB4375000
0467	1-Mercaptononane	1455-21-6	
0469	1-Mercaptooctadecane	2885-00-9	
0471	1-Mercaptooctane	111-88-6	
0526	3-Mercaptopropane	107-03-9	TZ7300000
0384*	Mercury (organo) alkyl compounds (as Hg)		
0383*	Mercury compounds [except (organo) alkyl	7439-97-6	OV4550000
0383	Mercury metal: Colloidal mercury	7439-97-6	OV4550000
0385*	Mesityl oxide	141-79-7	SB4200000
0639	Mesitylene	108-67-8	OX6825000
0212	Metacetone	96-22-0	SA8050000
0529	Metacetic acid	79-09-4	UE5950000
0383	Metallic mercury	7439-97-6	OV4550000
0613	Metallic tin	7440-31-5	XP7320000
0587	Metallum problematum	13494-80-9	WY2625000
0410	Metasystox®	8022-00-2	TG1760000
0426	Methacrylate monomer	80-62-6	OZ5075000
0386*	Methacrylic acid	79-41-4	OZ2975000
0386	alpha-Methacrylic acid	79-41-4	OZ2975000
0386	Methacrylic acid (glacial)	79-41-4	OZ2975000
0386	Methacrylic acid (inhibited)	79-41-4	OZ2975000
0395	Methacrylonitrile	126-98-7	UD1400000
0293	Methanal	50-00-0	LP8925000
0295	Methanamide	75-12-7	LO0525000
0106	Methane tetrabromide	558-13-4	FG4725000
0485	Methane tetramethylol	115-77-5	RZ2490000
0127	Methane trichloride	67-66-3	FS9100000
0002	Methanecarboxylic acid	64-19-7	AF1225000
0425	Methanethiol	74-93-1	PB4375000

0296	Methanoic acid	64-18-6	LQ4900000
0397	Methanol	67-56-1	PC1400000
0389	Methoflurane	76-38-0	KN7820000
0387*	Methomyl	16752-77-5	AK2975000
0179	4-Methoxy-1,3-benzene-diamine	615-05-4	BZ8580500
0536	2-Methoxy-1-methylethanol	107-98-2	UB7700000
0536	1-Methoxy-2-hydroxypropane	107-98-2	UB7700000
0536	1-Methoxy-2-propanol	107-98-2	UB7700000
0388	Methoxy-DDT	72-43-5	KJ3675000
0179	4-Methoxy-m-phenylene-diamine	615-05-4	BZ8580500
0035	p-Methoxyaniline	104-94-9	BZ5450000
0034	o-Methoxyaniline	90-04-0	BZ5410000
0394	Methoxycarbonylethylene	96-33-3	AT2800000
0388*	Methoxychlor	72-43-5	KJ3675000
0401	2-Methoxyethanol	109-86-4	KL5775000
0402	2-Methoxyethyl acetate	110-49-6	KL5950000
0389	Methoxyfluorane	76-38-0	KN7820000
0389*	Methoxyflurane	76-38-0	KN7820000
0396	Methoxymethyl methyl ether	109-87-5	PA8750000
0390*	4-Methoxyphenol	150-76-5	SL7700000
0390	p-Methoxyphenol	150-76-5	SL7700000
0388	2,2-bis(p-Methoxyphenyl)-1,1,1-trichloro	72-43-5	KJ3675000
0048	Methyl 1-(butylcarbamoyl)-2-benzimidazol	17804-35-2	DD6475000
0326	4-Methyl 2-pentanone	108-10-1	SA9275000
0387	Methyl N-((methylamino)carbonyl)oxy)etha	16752-77-5	AK2975000
0391*	Methyl acetate	79-20-9	AI9100000
0529	Methyl acetic acid	79-09-4	UE5950000
0069	Methyl acetone	78-93-3	EL6475000
0392*	Methyl acetylene	74-99-7	UK4250000
0393	Methyl acetylene-allene mixture	59355-75-8	UK4920000
0393*	Methyl acetylene-propadiene mixture	59355-75-8	UK4920000
0393	Methyl acetylene-propadiene mixture (sta	59355-75-8	UK4920000
0157	beta-Methyl acrolein	4170-30-3	GP9499000
0394*	Methyl acrylate	96-33-3	AT2800000
0397*	Methyl alcohol	67-56-1	PC1400000
0293	Methyl aldehyde	50-00-0	LP8925000
0405	Methyl alpha-cyanoacrylate	137-05-3	AS7000000
0422	Methyl amyl alcohol	108-11-2	SA7350000
0399*	Methyl (n-amyl) ketone	110-43-0	MT5075000
0044	Methyl azinphos	86-50-0	TE1925000
0619	Methyl benzene	108-88-3	XS5250000
0619	Methyl benzol	108-88-3	XS5250000
0400*	Methyl bromide	74-83-9	PA4900000
0424	3-Methyl butan-2-one	563-80-4	EL9100000
0325	Methyl butyl ketone	591-78-6	MP1400000
0401*	Methyl Cellosolve®	109-86-4	KL5775000
0402*	Methyl Cellosolve® acetate	110-49-6	KL5950000
0403*	Methyl chloride	74-87-3	PA6300000
0123	Methyl chlorobromide	74-97-5	PA5250000
0404*	Methyl chloroform	71-55-6	KJ2975000
0006	Methyl cyanide	75-05-8	AL7700000
0405	Methyl cyanoacrylate	137-05-3	AS7000000
0409*	Methyl cyclopentadienyl manganese tricar	12108-13-3	OP1450000
0410*	Methyl demeton	8022-00-2	TG1760000
0405	Methyl ester of 2-cyanoacrylic acid	137-05-3	AS7000000
0391	Methyl ester of acetic acid	79-20-9	AI9100000
0394	Methyl ester of acrylic acid	96-33-3	AT2800000
0417	Methyl ester of formic acid	107-31-3	LQ8925000
0423	Methyl ester of isocyanic acid	624-83-9	NO9450000
0426	Methyl ester of methacrylic acid	80-62-6	OZ5075000
0391	Methyl ethanoate	79-20-9	AI9100000
0077	Methyl ethyl carbinol	78-92-2	EO1750000
0069	Methyl ethyl ketone	78-93-3	EL6475000
0416	Methyl ethyl ketone hydroperoxide	1338-23-4	EL9450000
0416*	Methyl ethyl ketone peroxide	1338-23-4	EL9450000
0538	Methyl ethylene oxide	75-56-9	TZ2975000
0417*	Methyl formate	107-31-3	LQ8925000
0419*	Methyl hydrazine	60-34-4	MV5600000
0420*	Methyl iodide	74-88-4	PA9450000
0421*	Methyl isoamyl ketone	110-12-3	MP3850000
0385	Methyl isobutenyl ketone	141-79-7	SB4200000
0422*	Methyl isobutyl carbinol	108-11-2	SA7350000
0326	Methyl isobutyl ketone	108-10-1	SA9275000
0423*	Methyl isocyanate	624-83-9	NO9450000
0424*	Methyl isopropyl ketone	563-80-4	EL9100000
0425*	Methyl mercaptan	74-93-1	PB4375000
0410	Methyl mercaptophos	8022-00-2	TG1760000
0426*	Methyl methacrylate	80-62-6	OZ5075000
0417	Methyl methanoate	107-31-3	LQ8925000
0325	Methyl n-butyl ketone	591-78-6	MP1400000
0428	Methyl orthosilicate	681-84-5	VV9800000

0427*	Methyl parathion	298-00-0	TG0175000
0156	4-Methyl phenol	106-44-5	GO6475000
0155	3-Methyl phenol	108-39-4	GO6125000
0154	2-Methyl phenol	95-48-7	GO6300000
0640	Methyl phosphite	121-45-9	TH1400000
0394	Methyl propenoate	96-33-3	AT2800000
0488	Methyl propyl ketone	107-87-9	SA7875000
0428*	Methyl silicate	681-84-5	VV9800000
0429*	alpha-Methyl styrene	98-83-9	WL5075300
0229	Methyl sulfate	77-78-1	WS8225000
0425	Methyl sulfhydrylate	74-93-1	PB4375000
0410	Methyl systox®	8022-00-2	TG1760000
0066	Methyl tribromide	75-25-2	PB5600000
0220	Methyl yellow	60-11-7	BX7350000
0348	3-Methyl-1-butanol	123-51-3	EL5425000
0347	3-Methyl-1-butanol acetate	123-92-2	NS9800000
0429	1-Methyl-1-phenylethylene	98-83-9	WL5075300
0352	2-Methyl-1-propanol	78-83-1	NP9625000
0641	1-Methyl-2,4,6-trinitrobenzene	118-96-7	XU0175000
0328	2-Methyl-2,4-pentanediol	107-41-5	SA0810000
0328	4-Methyl-2,4-pentanediol	107-41-5	SA0810000
0246	4-Methyl-2,6-di-tert-butyl phenol	128-37-0	GO7875000
0622	1-Methyl-2-aminobenzene	95-53-4	XU2975000
0349	3-Methyl-2-butanol	6032-29-7	<
0424	3-Methyl-2-butanone	563-80-4	EL9100000
0405*	Methyl-2-cyanoacrylate	137-05-3	AS7000000
0421	5-Methyl-2-hexanone	110-12-3	MP3850000
0426	Methyl-2-methyl-2-propenoate	80-62-6	OZ5075000
0422	4-Methyl-2-pentanol	108-11-2	SA7350000
0178	2-Methyl-2-pentanol-4-one	123-42-2	SA9100000
0078	2-Methyl-2-propanol	75-65-0	EO1925000
0446	3-(1-Methyl-2-pyrrolidyl)pyridine	54-11-5	OS5250000
0230	2-Methyl-3,5-dinitrobenzamide	148-01-6	XS4200000
0418*	5-Methyl-3-heptanone	541-85-5	MJ7350000
0385	4-Methyl-3-penten-2-one	141-79-7	SB4200000
0085	1-Methyl-4-tert-butylbenzene	98-51-1	XS8400000
0418	3-Methyl-5-heptanone	541-85-5	MJ7350000
0421	2-Methyl-5-hexanone	110-12-3	MP3850000
0386	2-Methylacrylic acid	79-41-4	OZ2975000
0395*	Methylacrylonitrile	126-98-7	UD1400000
0395	alpha-Methylacrylonitrile	126-98-7	UD1400000
0396*	Methylal	109-87-5	PA8750000
0398*	Methylamine	74-89-5	PF6300000
0398	Methylamine (anhydrous)	74-89-5	PF6300000
0398	Methylamine (aqueous)	74-89-5	PF6300000
0436	(Methylamino)benzene	100-61-8	BY4550000
0624	4-Methylaniline	106-49-0	XU3150000
0623	3-Methylaniline	108-44-1	XU2800000
0622	o-Methylaniline	95-53-4	XU2975000
0622	2-Methylaniline	95-53-4	XU2975000
0537	2-Methylaziridine	75-55-8	CM8050000
0624	4-Methylbenzenamine	106-49-0	XU3150000
0623	3-Methylbenzenamine	108-44-1	XU2800000
0032	1-Methylbutyl acetate	626-38-0	AJ2100000
0347	3-Methylbutyl ester of acetic acid	123-92-2	NS9800000
0347	3-Methylbutyl ethanoate	123-92-2	NS9800000
0129	Methylchloromethyl ether	107-30-2	KN6650000
0406*	Methylcyclohexane	108-87-2	GV6125000
0407*	Methylcyclohexanol	25639-42-3	GW0175000
0408	2-Methylcyclohexanone	583-60-8	GW1750000
0408*	o-Methylcyclohexanone	583-60-8	GW1750000
0409	2-Methylcyclopentadienyl manganese trica	12108-13-3	OP1450000
0235	Methyldinitrobenzene	25321-14-6	XT1300000
0412*	Methylene bis(4-cyclohexylisocyanate)	5124-30-1	NO9250000
0413	Methylene bis(4-phenyl isocyanate)	101-68-8	NO9350000
0413*	Methylene bisphenyl isocyanate	101-68-8	NO9350000
0414*	Methylene chloride	75-09-2	PA8050000
0413	Methylene di-p-phenylene ester of isocya	101-68-8	NO9350000
0414	Methylene dichloride	75-09-2	PA8050000
0396	Methylene dimethyl ether	109-87-5	PA8750000
0293	Methylene oxide	50-00-0	LP8925000
0411*	4,4'-Methylenebis(2-chloroaniline)	101-14-4	CY1050000
0411	4,4'-Methylenebis(2-chlorobenzenamine)	101-14-4	CY1050000
0411	4,4'-Methylenebis(o-chloro aniline)	101-14-4	CY1050000
0415*	4,4'-Methylenedianiline	101-77-9	BY5425000
0358	1-Methylethyl ester of acetic acid	108-21-4	AI4930000
0537	2-Methylethyleneimine	75-55-8	CM8050000
0068	Methylethylmethane	106-97-8	EJ4200000
0327	Methylisoamyl acetate	108-84-9	SA7525000
0005	2-Methylactonitrile	75-86-5	OD9275000
0462	o-Methylnitrobenzene	88-72-2	XT3150000

0462	2-Methylnitrobenzene	88-72-2	XT3150000
0463	3-Methylnitrobenzene	99-08-1	XT2975000
0463	m-Methylnitrobenzene	99-08-1	XT2975000
0464	4-Methylnitrobenzene	99-99-0	XT3325000
0464	p-Methylnitrobenzene	99-99-0	XT3325000
0538	Methyloxirane	75-56-9	TZ2975000
0323	3-Methylpentane		
0323	2-Methylpentane		
0328	2-Methylpentane-2,4-diol	107-41-5	SA0810000
0436	Methylphenylamine	100-61-8	BY4550000
0620	Methylphenylene diamine	25376-45-8	XS9445000
0350	2-Methylpropane	75-28-5	TZ4300000
0353	2-Methylpropanenitrile	78-82-0	TZ4900000
0395	2-Methylpropenenitrile	126-98-7	UD1400000
0386	2-Methylpropenoic acid	79-41-4	OZ2975000
0353	2-Methylpropionitrile	78-82-0	TZ4900000
0073	1-Methylpropyl acetate	105-46-4	AF7380000
0351	2-Methylpropyl acetate	110-19-0	AI4025000
0351	2-Methylpropyl ester of acetic acid	110-19-0	AI4025000
0351	beta-Methylpropyl ethanoate	110-19-0	AI4025000
0084	2-(1-Methylpropyl)phenol	89-72-5	SJ8920000
0663	Methylstyrene	25013-15-4	WL5075000
0430*	Metribuzin	21087-64-9	XZ2990000
0503	Mevinphos	7786-34-7	GO5250000
0431*	Mica (containing less than 1% quartz)	12001-26-2	VV8760000
0306	Mineral carbon	7782-42-5	MD9659600
0569	Mineral spirits	8052-41-3	WJ8925000
0308	Mineral white	13397-24-5	MG2360000
0432*	Mineral wool fiber		PY8070000
0064	Molecular bromine	7726-95-6	EF9100000
0115	Molecular chlorine	7782-50-5	FO2100000
0342	Molecular iodine	7553-56-2	NN1575000
0433*	Molybdenum	7439-98-7	OA4680000
0434*	Molybdenum (soluble compounds, as Mo)		
0433	Molybdenum metal	7439-98-7	OA4680000
0030	Monoammonium salt of sulfamic acid	7773-06-0	WO6125000
0265	Monobromoethane	74-96-4	KH6475000
0657	Monobromoethylene	593-60-2	KU8400000
0400	Monobromomethane	74-83-9	PA4900000
0634	Monobromotrifluoromethane	75-63-8	PA5425000
0120	Monochloroacetyl chloride	79-04-9	AO6475000
0121	Monochlorobenzene	108-90-7	CZ0175000
0124	Monochlorodifluoromethane	75-45-6	PA6390000
0267	Monochloroethane	75-00-3	KH7525000
0658	Monochloroethene	75-01-4	KU9625000
0658	Monochloroethylene	75-01-4	KU9625000
0403	Monochloromethane	74-87-3	PA6300000
0131	Monochloropentafluoroethane	76-15-3	KH7877500
0435	Monocron	6923-22-4	TC4375000
0435*	Monocrotophos	6923-22-4	TC4375000
0256	Monoethanolamine	141-43-5	KJ5775000
0263	Monoethylamine	75-04-7	KH2100000
0272	Monoethylene glycol	107-21-1	KW2975000
0660	Monofluoroethylene	75-02-5	YZ7351000
0290	Monofluorotrichloromethane	75-69-4	PB6125000
0300	Monogermane	7782-65-2	LY4900000
0493	Monohydroxybenzene	108-95-2	SJ3325000
0420	Monoiodomethane	74-88-4	PA9450000
0360	Monoisopropylamine	75-31-0	NT8400000
0436*	Monomethyl aniline	100-61-8	BY4550000
0390	Monomethyl ether hydroquinone	150-76-5	SL7700000
0398	Monomethylamine	74-89-5	PF6300000
0419	Monomethylhydrazine	60-34-4	MV5600000
0448	Mononitrogen monoxide	10102-43-9	OX0525000
0485	Monopentaerythritol	115-77-5	RZ2490000
0499	Monophenylhydrazine	100-63-0	MW8925000
0556	Monosilane	7803-62-5	VV1400000
0561	Monosodium salt of sulfurous acid	7631-90-5	VZ2000000
0105	Monoxide	630-08-0	FG3500000
0437*	Morpholine	110-91-8	OD6475000
0299	Motor fuel	8006-61-9	LX3300000
0299	Motor spirits	8006-61-9	LX3300000
0332	Muriatic acid)	7647-01-0	MW4025000
0267	Muriatic ether	75-00-3	KH7525000
0431	Muscovite	12001-26-2	VV8760000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0478	N,N'-Dimethyl-4,4'-bipyridinium dichloride	1910-42-5	DW2275000
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0185	N,N-Dibutylethanolamine	102-81-8	KK3850000
0209	N,N-Diethylamine	109-89-7	HZ8750000
0210	N,N-Diethylethanolamine	100-37-8	KK5075000
0218	N,N-Dimethyl acetamide	127-19-5	AB7700000
0220	N,N-Dimethyl-4-aminoazobenzene	60-11-7	BX7350000
0222	N,N-Dimethylamino-3-propionitrile	1738-25-6	UG1575000
0223*	N,N-Dimethylaniline	121-69-7	BX4725000
0223	N,N-Dimethylbenzeneamine	121-69-7	BX4725000
0224	N,N-Dimethylcarbamoyl chloride	79-44-7	FD4200000
0226	N,N-Dimethylformamide	68-12-2	LO2100000
0636	N,N-Dimethylmethanamine	75-50-3	PA0350000
0461	N,N-Dimethylnitrosamine	62-75-9	IO0525000
0223	N,N-Dimethylphenylamine	121-69-7	BX4725000
0643	N,N-Diphenylaniline	603-34-9	YK2680000
0643	N,N-Diphenylbenzenamine	603-34-9	YK2680000
0276	N,N-Ethylenethiourea	96-45-7	NI9625000
0098	N-((1,1,2,2-Tetrachloroethyl)thio)-4-cyc	2425-06-1	GS4900000
0217	N-(1-Methylethyl)-2-propanamine	108-18-9	IM4025000
0361	N-(1-Methylethyl)-benzenamine	768-52-5	BY4190000
0211	N-(2-Aminoethyl)1,2-ethanediamine	111-40-0	IE1225000
0007	N-Acetyl-2-aminofluorene	53-96-3	AB9450000
0185*	2-N-Dibutylaminoethanol	102-81-8	KK3850000
0209	N-Ethylethanolamine	109-89-7	HZ8750000
0281*	N-Ethylmorpholine	100-74-3	OE4025000
0361	N-IPA	768-52-5	BY4190000
0361*	N-Isopropylaniline	768-52-5	BY4190000
0436	N-Methyl aniline	100-61-8	BY4550000
0531	N-Methyl-2-isopropoxyphenyl-carbamate	114-26-1	FC3150000
0607	N-Methyl-N,2,4,6-tetranitroaniline	479-45-8	BY6300000
0461	N-Methyl-N-nitroso-methanamine	62-75-9	IO0525000
0219	N-Methylmethanamine	124-40-3	IP8750000
0461	N-Nitroso-N,N-dimethylamine	62-75-9	IO0525000
0461*	N-Nitrosodimethylamine	62-75-9	IO0525000
0500*	N-Phenyl-beta-naphthylamine	135-88-6	OM4550000
0240	N-Phenylaniline	122-39-4	JJ7800000
0240	N-Phenylbenzenamine	122-39-4	JJ7800000
0361	N-Phenylisopropylamine	768-52-5	BY4190000
0436	N-Phenylmethylamine	100-61-8	BY4550000
0099	N-Trichloromethylmercapto-4-cyclohexene-	133-06-2	GW5075000
0136	N-serve®	1929-82-4	US7525000
0440	NDI	3173-72-6	NO9600000
0461	NDMA	62-75-9	IO0525000
0456	NG	55-63-0	OX2100000
0221	NIAX® A99	3033-62-3	KR9460000
0221	NIAX® Catalyst A1	3033-62-3	KR9460000
0459	1-NP	108-03-2	TZ5075000
0460	2-NP	79-46-9	TZ5250000
0225	Naled	300-76-5	TB9450000
0438	Naphtha	8030-30-6	DE3030000
0438*	Naphtha (coal tar)	8030-30-6	DE3030000
0439*	Naphthalene	91-20-3	OJ0525000
0440*	Naphthalene diisocyanate	3173-72-6	NO9600000
0440	1,5-Naphthalene diisocyanate	3173-72-6	NO9600000
0440	1,5-Naphthalene ester of isocyanic acid	3173-72-6	NO9600000
0439	Naphthalin	91-20-3	OJ0525000
0100	1-Naphthyl N-Methyl-carbamate	63-25-2	FC5950000
0100	alpha-Naphthyl N-methyl-carbamate	63-25-2	FC5950000
0037	alpha-Naphthyl thiocarbamide	86-88-4	YT9275000
0037	1-Naphthyl thiourea	86-88-4	YT9275000
0037	alpha-Naphthyl thiourea	86-88-4	YT9275000
0441	1-Naphthylamine	134-32-7	OM1400000
0442	2-Naphthylamine	91-59-8	OM2100000
0442*	beta-Naphthylamine	91-59-8	OM2100000
0441*	alpha-Naphthylamine	134-32-7	OM1400000
0500	beta-Naphthylphenylamine	135-88-6	OM4550000
0250	Natural aluminum oxide	1302-74-5	GN0231000
0369	Natural calcium carbonate	1317-65-3	EV9580000
0382	Natural calcium carbonate	1317-65-3	EV9580000
0299	Natural gasoline	8006-61-9	LX3300000
0238	Navadel®	78-34-2	TE3350000
0283	Nemacur®	22224-92-6	TB3675000
0443*	Niax® Catalyst ESN	62765-93-9	OR3900000
0630	Nibren wax	1321-65-9	OK4025000
0600	Nibren wax	1335-88-2	OK3700000
0444*	Nickel carbonyl	13463-39-3	OR6300000
0445*	Nickel metal and other compounds (as Ni)	7440-02-0	OR5950000
0444	Nickel tetracarbonyl	13463-39-3	OR6300000
0446*	Nicotine	54-11-5	OS5250000
0607	Nitramine	479-45-8	BY6300000
0136	Nitrapyrin	1929-82-4	US7525000
0447*	Nitric acid	7697-37-2	OU5775000

0448*	Nitric oxide	10102-43-9	OX0525000
0449*	p-Nitroaniline	100-01-6	BY7000000
0449	4-Nitroaniline	100-01-6	BY7000000
0449	4-Nitrobenzenamine	100-01-6	BY7000000
0450*	Nitrobenzene	98-95-3	DA6475000
0450	Nitrobenzol	98-95-3	DA6475000
0451	p-Nitrobiphenyl	92-93-3	DV5600000
0451*	4-Nitrobiphenyl	92-93-3	DV5600000
0457	Nitrocarbol	75-52-5	PA9800000
0452	4-Nitrochlorobenzene	100-00-5	CZ1050000
0452*	p-Nitrochlorobenzene	100-00-5	CZ1050000
0132	Nitrochloroform	76-06-2	PB6300000
0451	p-Nitrodiphenyl	92-93-3	DV5600000
0451	4-Nitrodiphenyl	92-93-3	DV5600000
0453	Nitroetan	79-24-3	K15600000
0453*	Nitroethane	79-24-3	K15600000
0454*	Nitrogen dioxide	10102-44-0	OW9800000
0455	Nitrogen fluoride	7783-54-2	OX1925000
0091	Nitrogen lime	156-62-7	GS6000000
0448	Nitrogen monoxide	10102-43-9	OX0525000
0454	Nitrogen peroxide	10102-44-0	OW9800000
0455*	Nitrogen trifluoride	7783-54-2	OX1925000
0456*	Nitroglycerine	55-63-0	OX2100000
0273	Nitroglycol	628-96-6	KW5600000
0457*	Nitromethane	75-52-5	PA9800000
0458*	2-Nitronaphthalene	581-89-5	OJ9760000
0458	beta-Nitronaphthalene	581-89-5	OJ9760000
0449	p-Nitrophenylamine	100-01-6	BY7000000
0459	Nitropropane	108-03-2	TZ5075000
0459*	1-Nitropropane	108-03-2	TZ5075000
0460*	2-Nitropropane	79-46-9	TZ5250000
0460	iso-Nitropropane	79-46-9	TZ5250000
0462	2-Nitrotoluene	88-72-2	XT3150000
0462*	o-Nitrotoluene	88-72-2	XT3150000
0463	3-Nitrotoluene	99-08-1	XT2975000
0463*	m-Nitrotoluene	99-08-1	XT2975000
0464*	p-Nitrotoluene	99-99-0	XT3325000
0464	4-Nitrotoluene	99-99-0	XT3325000
0463	meta-Nitrotoluene	99-08-1	XT2975000
0464	para-Nitrotoluene	99-99-0	XT3325000
0462	ortho-Nitrotoluene	88-72-2	XT3150000
0132	Nitrotrichloromethane	76-06-2	PB6300000
0465*	Nitrous oxide	10024-97-2	OX1350000
0466*	Nonane	111-84-2	RA6115000
0466	n-Nonane	111-84-2	RA6115000
0467*	1-Nonanethiol	1455-21-6	
0305	None		MD7900000
0443	None	62765-93-9	OR3900000
0597	None	630-20-6	KI8450000
0466	Nonyl hydride	111-84-2	RA6115000
0467	n-Nonyl mercaptan	1455-21-6	
0467	Nonylthiol	1455-21-6	
0480	Nuisance dusts		
0570	Nux vomica	57-24-9	WL2275000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0257	O,O,O',O'-Tetraethyl S,S'-methylene di(p	563-12-2	TE4550000
0589	O,O,O'O'-Tetramethyl O,O'-thiodi-p-pheny	3383-96-8	TF6890000
0284	O,O-Diethyl O-(p-methylsulfinyl)phenyl)p	115-90-2	TF3850000
0137	O,O-Diethyl O-3,5,6-trichloro-2-pyridyl	2921-88-2	TF6300000
0502	O,O-Diethyl S-(ethylthio)methylphosphoro	298-02-2	TD9450000
0245	O,O-Diethyl S-2-(ethylthio)-ethyl phosph	298-04-4	TD9275000
0502	O,O-Diethyl S-ethylthiomethylthiothionop	298-02-2	TD9450000
0479	O,O-Diethyl-O(p-nitrophenyl) phosphoroth	56-38-2	TF4550000
0181	O,O-Diethyl-O-2-isopropyl-4-methyl-6-pyr	333-41-5	TF3325000
0410	O,O-Dimethyl 2-ethylmercaptoethyl thioph	8022-00-2	TG1760000
0546	O,O-Dimethyl S-(4-methylthiophenyl) p	299-84-3	TG0525000
0285	O,O-Dimethyl O-3-methyl-4-methylthiophen	55-38-9	TF9625000
0427	O,O-Dimethyl-O-p-nitrophenylphosphorothi	298-00-0	TG0175000
0044	O,O-Dimethyl-S-4-oxo-1,2,3-benzotriazin-	86-50-0	TE1925000
0582	O-Ethyl O-(4-methylthio)phenyl S-propylp	35400-43-2	TE4165000
0255	O-Ethyl O-(4-nitrophenyl) phenylphosphon	2104-64-5	TB1925000
0292	O-Ethyl-S-phenyl ethylphosphorothioate	944-22-9	TA5950000
0177	O-O-Diethyl-O(and S)-2-(ethylthio)ethyl	8065-48-3	TF3150000
0122	OCBM	2698-41-1	OO3675000
0147	Octacarbonyldicobalt	10210-68-1	GG0300000
0112	1,2,4,5,6,7,8,8-Octachloro-3a,4,7,7a-tet	57-74-9	PB9800000
0113	Octachlorocamphene	8001-35-2	XW5250000

0468*	Octachloronaphthalene	2234-13-1	OK0250000
0468	1,2,3,4,5,6,7,8-Octachloronaphthalene	2234-13-1	OK0250000
0469*	1-Octadecanethiol	2885-00-9	
0469	Octadecyl mercaptan	2885-00-9	
0016	Octalene	309-00-2	IO2100000
0470*	Octane	111-65-9	RG8400000
0470	n-Octane	111-65-9	RG8400000
0470	normal-Octane	111-65-9	RG8400000
0471*	1-Octanethiol	111-88-6	
0471	n-Octyl mercaptan	111-88-6	
0236	Octyl phthalate	117-81-7	TI0350000
0471	Octylthiol	111-88-6	
0471	1-Octylthiol	111-88-6	
0472*	Oil mist (mineral)	8012-95-1	PY8030000
0450	Oil of mirbane	98-95-3	DA6475000
0577	Oil of vitriol	7664-93-9	WS5600000
0020	Onion oil	2179-59-1	JO0350000
0506	Orthophosphoric acid	7664-38-2	TB6300000
0473	Osmic acid anhydride	20816-12-0	RN1140000
0473	Osmium oxide	20816-12-0	RN1140000
0473*	Osmium tetroxide	20816-12-0	RN1140000
0474*	Oxalic acid	144-62-7	RO2450000
0474	Oxalic acid (aqueous)	144-62-7	RO2450000
0474	Oxalic acid dihydrate	144-62-7	RO2450000
0161	Oxalonitrile	460-19-5	GT1925000
0528	2-Oxetanone	57-57-8	RO7350000
0275	Oxirane	75-21-8	KX2450000
0097	2-Oxohexamethyleneimine	105-60-2	CM3675000
0354	Oxoocetyl alcohol	26952-21-6	NS7700000
0221	2,2'-Oxybis(N,N-dimethyl ethylamine)	3033-62-3	KR9460000
0128	Oxybis(chloromethane)	542-88-1	KN1575000
0475*	Oxygen difluoride	7783-41-7	RS2100000
0475	Oxygen fluoride	7783-41-7	RS2100000
0476*	Ozone	10028-15-6	RS8225000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0512	PAN	85-44-9	TI3150000
0500	PBNA	135-88-6	OM4550000
0126	PCB	11097-69-1	TO1360000
0125	PCB	53469-21-9	TO1356000
0489	PCM	594-42-3	PB0370000
0452	PCNB	100-00-5	CZ1050000
0484	PCP	87-86-5	SM6300000
0513	m-PDN	626-17-5	CZ1900000
0485	PE	115-77-5	RZ2490000
0501	PF	638-21-1	SZ2100000
0535	PGDN	6423-43-4	TY6300000
0498	PGE	122-60-1	TZ3675000
0489	PMM	594-42-3	PB0370000
0449	PNA	100-01-6	BY7000000
0451	PNB	92-93-3	DV5600000
0452	PNCB	100-00-5	CZ1050000
0480	PNOR		
0664	Painters naphtha	8032-32-4	OI6180000
0477	Paraffin fume	8002-74-2	RV0350000
0472	Paraffin oil mist	8012-95-1	PY8030000
0477	Paraffin scale fume	8002-74-2	RV0350000
0477*	Paraffin wax fume	8002-74-2	RV0350000
0478*	Paraquat (Paraquat dichloride)	1910-42-5	DW2275000
0478	Paraquat chloride	1910-42-5	DW2275000
0478	Paraquat dichloride	1910-42-5	DW2275000
0479*	Parathion	56-38-2	TF4550000
0427	Parathion methyl	298-00-0	TG0175000
0479	Parathion-ethyl	56-38-2	TF4550000
0480*	Particulates not otherwise regulated		
0093	Pebble lime	1305-78-8	EW3100000
0484	Penta	87-86-5	SM6300000
0481*	Pentaborane	19624-22-7	RY8925000
0481	Pentaboron nonahydride	19624-22-7	RY8925000
0345	Pentacarbonyl iron	13463-40-6	NO4900000
0482*	Pentachloroethane	76-01-7	KI6300000
0483*	Pentachloronaphthalene	1321-64-8	OK0300000
0483	1,2,3,4,5-Pentachloronaphthalene	1321-64-8	OK0300000
0484*	Pentachlorophenol	87-86-5	SM6300000
0484	2,3,4,5,6-Pentachlorophenol	87-86-5	SM6300000
0509	Pentachlorophosphorus	10026-13-8	TB6125000
0485*	Pentaerythritol	115-77-5	RZ2490000
0482	Pentalin	76-01-7	KI6300000

0171	Pentamethylene	287-92-3	GY2390000
0652	Pentanal	110-62-3	YV3600000
0486	Pentane	109-66-0	RZ9450000
0486*	n-Pentane	109-66-0	RZ9450000
0486	normal-Pentane	109-66-0	RZ9450000
0301	1,5-Pentanedial	111-30-8	MA2450000
0487*	1-Pentanethiol	110-66-7	SA3150000
0032	2-Pentanol acetate	626-38-0	AJ2100000
0031	1-Pentanol acetate	628-63-7	AJ1925000
0488*	2-Pentanone	107-87-9	SA7875000
0212	3-Pentanone	96-22-0	SA8050000
0389	Penthrane	76-38-0	KN7820000
0031	Pentyl ester of acetic acid	628-63-7	AJ1925000
0032	2-Pentyl ester of acetic acid	626-38-0	AJ2100000
0487	Pentyl mercaptan	110-66-7	SA3150000
0599	Perchloroethylene	127-18-4	KX3850000
0314	Perchlorobutadiene	87-68-3	EJ0700000
0315	Perchlorocyclopentadiene	77-47-4	GY1225000
0316	Perchloroethane	67-72-1	KI4025000
0599	Perchloroethylene	127-18-4	KX3850000
0489*	Perchloromethyl mercaptan	594-42-3	PB0370000
0468	Perchloronaphthalene	2234-13-1	OK0250000
0490*	Perchloryl fluoride	7616-94-6	SD1925000
0319	Perfluoroacetone	684-16-2	UC2450000
0599	Perk	127-18-4	KX3850000
0491*	Perlite	93763-70-3	SO5254000
0335	Peroxide	7722-84-1	MX0900000
0299	Petrol	8006-61-9	LX3300000
0042	Petroleum asphalt	8052-42-4	CI9900000
0042	Petroleum bitumen	8052-42-4	CI9900000
0492*	Petroleum distillates (naphtha)	8002-05-9	SE7449000
0664	Petroleum ether	8032-32-4	OI6180000
0492	Petroleum naphtha	8002-05-9	SE7449000
0569	Petroleum solvent	8052-41-3	WJ8925000
0664	Petroleum spirit	8032-32-4	OI6180000
0119	Phenacyl chloride	532-27-4	AM6300000
0283	Phenamiphos	22224-92-6	TB3675000
0493*	Phenol	108-95-2	SJ3325000
0515	Phenol trinitrate	88-89-1	TJ7875000
0494*	Phenothiazine	92-84-2	SN5075000
0496	Phenoxy benzene	101-84-8	KN8970000
0498	Phenyl 2,3-epoxypropyl ether	122-60-1	TZ3675000
0493	Phenyl alcohol	108-95-2	SJ3325000
0239	Phenyl benzene	92-52-4	DU8050000
0121	Phenyl chloride	108-90-7	CZ0175000
0119	Phenyl chloromethyl ketone	532-27-4	AM6300000
0496*	Phenyl ether (vapor)	101-84-8	KN8970000
0497*	Phenyl ether-biphenyl mixture (vapor)	8004-13-5	DV1500>

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NT SIZE=3>	0498* Phenyl glycidyl ether	122-60-1	TZ3675000
0049	Phenyl hydride	71-43-2	CY1400000
0493	Phenyl hydroxide	108-95-2	SJ3325000
0050	Phenyl mercaptan	108-98-5	DC0525000
0619	Phenyl methane	108-88-3	XS5250000
0496	Phenyl oxide	101-84-8	KN8970000
0644	Phenyl phosphate	115-86-6	TC8400000
0159	2-Phenyl propane	98-82-8	GR8575000
0429	2-Phenyl propylene	98-83-9	WL5075300
0500	Phenyl-beta-naphthylamine	135-88-6	OM4550000
0033	Phenylamine	62-53-3	BW6650000
0500	2-Phenylaminonaphthalene	135-88-6	OM4550000
0240	Phenylaniline	122-39-4	JT7800000
0025	4-Phenylaniline	92-67-1	DU8925000
0591	2-Phenylbiphenyl	84-15-1	WZ6472000
0592	3-Phenylbiphenyl	92-06-8	WZ6470000
0593	4-Phenylbiphenyl	92-94-4	WZ6475000
0495*	p-Phenylene diamine	106-50-3	SS8050000
0495	1,4-Phenylene diamine	106-50-3	SS8050000
0671	m-Phenylenebis(methylamine)	1477-55-0	PF8970000
0264	Phenylethane	100-41-4	DA0700000
0571	Phenylethylene	100-42-5	WL3675000
0499*	Phenylhydrazine	100-63-0	MW8925000
0451	4-Phenylnitrobenzene	92-93-3	DV5600000
0451	p-Phenylnitrobenzene	92-93-3	DV5600000
0501*	Phenylphosphine	638-21-1	SZ2100000
0431	Phlogopite	12001-26-2	VV8760000

0502*	Phorate	298-02-2	TD9450000
0503*	Phosdrin	7786-34-7	GQ5250000
0504*	Phosgene	75-44-5	SY5600000
0501	Phosphaniline	638-21-1	SZ2100000
0505*	Phosphine	7803-51-2	SY7525000
0505	Phosphorated hydrogen	7803-51-2	SY7525000
0506*	Phosphoric acid	7664-38-2	TB6300000
0506	Phosphoric acid (aqueous)	7664-38-2	TB6300000
0509	Phosphoric chloride	10026-13-8	TB6125000
0507*	Phosphorus (yellow)	7723-14-0	TH3500000
0508	Phosphorus chloride	10025-87-3	TH4897000
0511	Phosphorus chloride	7719-12-2	TH3675000
0505	Phosphorus hydride	7803-51-2	SY7525000
0508*	Phosphorus oxychloride	10025-87-3	TH4897000
0508	Phosphorus oxytrichloride	10025-87-3	TH4897000
0509*	Phosphorus pentachloride	10026-13-8	TB6125000
0510*	Phosphorus pentasulfide	1314-80-3	TH4375000
0509	Phosphorus perchloride	10026-13-8	TB6125000
0510	Phosphorus persulfide	1314-80-3	TH4375000
0510	Phosphorus sulfide	1314-80-3	TH4375000
0511*	Phosphorus trichloride	7719-12-2	TH3675000
0505	Phosphorus trihydride	7803-51-2	SY7525000
0508	Phosphoryl chloride	10025-87-3	TH4897000
0512	Phthalic acid anhydride	85-44-9	TI3150000
0512*	Phthalic anhydride	85-44-9	TI3150000
0513*	m-Phthalodinitrile	626-17-5	CZ1900000
0514*	Picloram	1918-02-1	TJ7525000
0515*	Picric acid	88-89-1	TJ7875000
0166	Pimelic ketone	108-94-1	GW1050000
0516*	Pindone	83-26-1	NK6300000
0517*	Piperazine dihydrochloride	142-64-3	TL4025000
0517	Piperazine hydrochloride	142-64-3	TL4025000
0516	Pivalyl	83-26-1	NK6300000
0516	2-Pivalyl-1,3-indandione	83-26-1	NK6300000
0516	Pival®	83-26-1	NK6300000
0518*	Plaster of Paris	26499-65-0	TP0700000
0519*	Platinum	7440-06-4	TP2160000
0520*	Platinum (soluble salts, as Pt)		
0519	Platinum black	7440-06-4	TP2160000
0519	Platinum metal	7440-06-4	TP2160000
0519	Platinum sponge	7440-06-4	TP2160000
0306	Plumbago	7782-42-5	MD9659600
0368	Plumbum	7439-92-1	OF7525000
0126	Polychlorinated biphenyl	11097-69-1	TO1360000
0125	Polychlorinated biphenyl	53469-21-9	TO1356000
0113	Polychlorocamphene	8001-35-2	XW5250000
0364	Porcelain clay	1332-58-7	GF1670500
0521*	Portland cement	65997-15-1	VV8770000
0521	Portland cement silicate	65997-15-1	VV8770000
0522*	Potassium cyanide (as CN)	151-50-8	TS8750000
0523	Potassium hydrate	1310-58-3	TT2100000
0523*	Potassium hydroxide	1310-58-3	TT2100000
0522	Potassium salt of hydrocyanic acid	151-50-8	TS8750000
0552	Precipitated amorphous silica	7631-86-9	VV7310000
0031	Primary amyl acetate	628-63-7	AJ1925000
0348	Primary isoamyl alcohol	123-51-3	EL5425000
0393	Propadiene-methyl acetylene	59355-75-8	UK4920000
0524*	Propane	74-98-6	TX2275000
0524	n-Propane	74-98-6	TX2275000
0525*	Propane sultone	1120-71-4	RP5425000
0525	1,3-Propane sultone	1120-71-4	RP5425000
0526	Propane-1-thiol	107-03-9	TZ7300000
0377	Propanedial	542-78-9	TX6475000
0377	1,3-Propanedial	542-78-9	TX6475000
0530	Propanenitrile	107-12-0	UF9625000
0526*	1-Propanethiol	107-03-9	TZ7300000
0302	1,2,3-Propanetriol	56-81-5	MA8050000
0456	1,2,3-Propanetriol trinitrate	55-63-0	OX2100000
0529	Propanoic acid	79-09-4	UE5950000
0359	2-Propanol	67-63-0	NT8050000
0533	n-Propanol	71-23-8	UH8225000
0533	1-Propanol	71-23-8	UH8225000
0004	2-Propanone	67-64-1	AL3150000
0527*	Propargyl alcohol	107-19-7	UK5075000
0192	Propellant 12	75-71-8	PA8200000
0017	1-Propen-3-ol	107-18-6	BA5075000
0011	Propenal	107-02-8	AS1050000
0011	2-Propenal	107-02-8	AS1050000
0012	Propenamide	79-06-1	AS3325000
0012	2-Propenamide	79-06-1	AS3325000
0538	Propene oxide	75-56-9	TZ2975000

0014	Propenenitrile	107-13-1	AT5250000
0014	2-Propenenitrile	107-13-1	AT5250000
0013	2-Propenoic acid	79-10-7	AS4375000
0017	Propenol	107-18-6	BA5075000
0017	2-Propenol	107-18-6	BA5075000
0020	2-Propenyl propyl disulfide	2179-59-1	JO0350000
0019	[(2-Propenyloxy)methyl] oxirane	106-92-3	RR0875000
0392	Propine	74-99-7	UK4250000
0528	3-Propiolacetone	57-57-8	RO7350000
0528*	beta-Propiolactone	57-57-8	RO7350000
0212	Propione	96-22-0	SA8050000
0529*	Propionic acid	79-09-4	UE5950000
0530	Propionic nitrile	107-12-0	UF9625000
0530*	Propionitrile	107-12-0	UF9625000
0530	Propiononitrile	107-12-0	UF9625000
0531*	Propoxur	114-26-1	FC3150000
0358	2-Propyl acetate	108-21-4	AI4930000
0532*	n-Propyl acetate	109-60-4	AJ3675000
0533	Propyl alcohol	71-23-8	UH8225000
0533*	n-Propyl alcohol	71-23-8	UH8225000
0359	sec-Propyl alcohol	67-63-0	NT8050000
0020	Propyl allyl disulfide	2179-59-1	JO0350000
0076	n-Propyl carbinol	71-36-3	EO1400000
0086	Propyl cyanide	109-74-0	ET8750000
0086	n-Propyl cyanide	109-74-0	ET8750000
0532	n-Propyl ester of acetic acid	109-60-4	AJ3675000
0539	Propyl ester of nitric acid	627-13-4	UK0350000
0524	Propyl hydride	74-98-6	TX2275000
0242	Propyl ketone	123-19-3	MJ5600000
0526	Propyl mercaptan	107-03-9	TZ7300000
0526	n-Propyl mercaptan	107-03-9	TZ7300000
0539*	n-Propyl nitrate	627-13-4	UK0350000
0532	Propylacetate	109-60-4	AJ3675000
0360	2-Propylamine	75-31-0	NT8400000
0360	sec-Propylamine	75-31-0	NT8400000
0157	Propylene aldehyde	4170-30-3	GP9499000
0534*	Propylene dichloride	78-87-5	TX9625000
0535*	Propylene glycol dinitrate	6423-43-4	TY6300000
0535	1,2-Propylene glycol dinitrate	6423-43-4	TY6300000
0536	Propylene glycol methyl ether	107-98-2	UB7700000
0339	Propylene glycol monoacrylate	999-61-1	AT1925000
0536*	Propylene glycol monomethyl ether	107-98-2	UB7700000
0535	Propylene glycol-1,2-dinitrate	6423-43-4	TY6300000
0537*	Propylene imine	75-55-8	CM8050000
0537	Propylene imine (inhibited)	75-55-8	CM8050000
0538*	Propylene oxide	75-56-9	TZ2975000
0538	1,2-Propylene oxide	75-56-9	TZ2975000
0537	Propyleneimine	75-55-8	CM8050000
0537	Propylenimine	75-55-8	CM8050000
0527	2-Propyn-1-ol	107-19-7	UK5075000
0527	1-Propyn-3-ol	107-19-7	UK5075000
0392	Propyne	74-99-7	UK4250000
0392	1-Propyne	74-99-7	UK4250000
0393	Propyne-allene mixture	59355-75-8	UK4920000
0393	Propyne-propadiene mixture	59355-75-8	UK4920000
0527	2-Propynyl alcohol	107-19-7	UK5075000
0572	Proteolytic enzymes	1395-21-7 (CO9450000
0333	Prussic acid	74-90-8	MW6825000
0638	Pseudocumene	95-63-6	DC3325000
0540	Pyrethrin I or II	8003-34-7	UR4200000
0540*	Pyrethrum	8003-34-7	UR4200000
0540	Pyrethrum I or II	8003-34-7	UR4200000
0541*	Pyridine	110-86-1	UR8400000
0026	alpha-Pyridylamine	504-29-0	US1575000
0109	Pyrocatechol	120-80-9	UX1050000
0110	Pyrocellulose	9004-34-6	FJ5691460
0397	Pyroligneous spirit	67-56-1	PC1400000
0606	Pyrophosphate	7722-88-5	UX7350000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
0553	Quartz	14808-60-7	VV7330000
0093	Quick lime	1305-78-8	EW3100000
0383	Quicksilver	7439-97-6	OV4550000
0338	Quinol	123-31-9	MX3500000
0542*	Quinone	106-51-4	DK2625000
0542	p-Quinone	106-51-4	DK2625000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0169	RDX	121-82-4	XY9450000
0528	beta-lactone	57-57-8	RO7350000
0366	Range oil	8008-20-6	OA5500000
0152	Raw cotton dust		GN2275000
0447	Red fuming nitric acid (RFNA)	7697-37-2	OU5775000
0549	Red iron oxide	1309-37-1	NO7400000
0549	Red oxide	1309-37-1	NO7400000
0412	Reduced MDI	5124-30-1	NO9250000
0664	Refined solvent naphtha	8032-32-4	OI6180000
0290	Refrigerant 11	75-69-4	PB6125000
0596	Refrigerant 112	76-12-0	KI1420000
0595	Refrigerant 112a	76-11-9	KI1425000
0632	Refrigerant 113	76-13-1	KJ4000000
0201	Refrigerant 114	76-14-2	KI1101000
0192	Refrigerant 12	75-71-8	PA8200000
0634	Refrigerant 13B1	75-63-8	PA5425000
0197	Refrigerant 21	75-43-4	PA8400000
0124	Refrigerant 22	75-45-6	PA6390000
0543*	Resorcinol	108-46-3	VG9625000
0544*	Rhodium (metal fume and insoluble compou	7440-16-6	VI9069000
0545*	Rhodium (soluble compounds, as Rh)		
0567	Rice starch	9005-25-8	GM5090000
0244	Ro-Sulfiram®	97-77-8	JO1225000
0042	Road asphalt	8052-42-4	CI9900000
0574	Rock candy	57-50-1	WN6500000
0432	Rock wool		PY8070000
0546*	Ronnel	299-84-3	TG0525000
0042	Roofing asphalt	8052-42-4	CI9900000
0431	Roscoelite	12001-26-2	VV8760000
0547*	Rosin core solder, pyrolysis products (a		
0547	Rosin core soldering flux pyrolysis prod		
0547	Rosin flux pyrolysis products		
0548*	Rotenone	83-79-4	DJ2800000
0549*	Rouge	1309-37-1	NO7400000
0492	Rubber solvent	8002-05-9	SE7449000
0359	Rubbing alcohol	67-63-0	NT8050000
0158	Ruelene®	299-86-5	TB3850000
0617	Rutile	13463-67-7	XR2275000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0387	S-Methyl-N-(methylcarbamoxyloxy)thioaceti	16752-77-5	AK2975000
0375	S-[1,2-bis(ethoxycarbonyl) ethyl]O,O-dim	121-75-5	WM8400000
0564	SFA	62-74-8	AH9100000
0574	Saccharose	57-50-1	WN6500000
0029	Sal ammoniac fume	12125-02-9	BP4550000
0412	Saturated MDI	5124-30-1	NO9250000
0349	Secondary isoamyl alcohol	6032-29-7 <	
0630	Seekay wax	1321-65-9	OK4025000
0600	Seekay wax	1335-88-2	OK3700000
0550*	Selenium	7782-49-2	VS7700000
0550	Selenium alloy	7782-49-2	VS7700000
0336	Selenium dihydride	7783-07-5	MX1050000
0551	Selenium fluoride	7783-79-1	VS9450000
0551*	Selenium hexafluoride	7783-79-1	VS9450000
0336	Selenium hydride	7783-07-5	MX1050000
0153	Sesone	136-78-7	KK4900000
0100	Sevin®	63-25-2	FC5950000
0337	Sewer gas	7783-06-4	MX1225000
0556	Silane	7803-62-5	VV1400000
0552	Silica gel	7631-86-9	VV7310000
0552*	Silica, amorphous	7631-86-9	VV7310000
0553*	Silica, crystalline (as respirable dust)	14808-60-7	VV7330000
0556	Silicane	7803-62-5	VV1400000
0554*	Silicon	7440-21-3	VW0400000
0555*	Silicon carbide	409-21-2	VW0450000
0552	Silicon dioxide (amorphous)	7631-86-9	VV7310000
0555	Silicon monocarbide	409-21-2	VW0450000
0556*	Silicon tetrahydride	7803-62-5	VV1400000
0557*	Silver (metal dust and soluble compounds	7440-22-4	VW3500000
0306	Silver graphite	7782-42-5	MD9659600
0432	Slag wool		PY8070000
0092	Slaked lime	1305-62-0	EW2800000
0558*	Soapstone (containing less than 1% quart		VV8780000
0558	Soapstone silicate		VV8780000
0565	Soda lye	1310-73-2	WB4900000
0561	Sodium acid bisulfite	7631-90-5	VZ2000000

0559*	Sodium aluminum fluoride (as F)	15096-52-3	WA9625000
0560*	Sodium azide	26628-22-8	VY8050000
0561*	Sodium bisulfite	7631-90-5	VZ2000000
0561	Sodium bisulphite	7631-90-5	VZ2000000
0057	Sodium borate (anhydrous)	1330-43-4	ED4588000
0058	Sodium borate decahydrate	1303-96-4	VZ2275000
0059	Sodium borate pentahydrate	12179-04-3	
0562*	Sodium cyanide (as CN)	143-33-9	VZ7530000
0563*	Sodium fluoride (as F)	7681-49-4	WB0350000
0564*	Sodium fluoroacetate	62-74-8	AH9100000
0559	Sodium hexafluoroaluminate	15096-52-3	WA9625000
0565	Sodium hydrate	1310-73-2	WB4900000
0561	Sodium hydrogen sulfite	7631-90-5	VZ2000000
0565*	Sodium hydroxide	1310-73-2	WB4900000
0566*	Sodium metabisulfite	7681-57-4	UX8225000
0566	Sodium metabisulphite	7681-57-4	UX8225000
0563	Sodium monofluoride	7681-49-4	WB0350000
0564	Sodium monofluoroacetate	62-74-8	AH9100000
0606	Sodium pyrophosphate	7722-88-5	UX7350000
0566	Sodium pyrosulfite	7681-57-4	UX8225000
0560	Sodium salt of hydrazoic acid	26628-22-8	VY8050000
0562	Sodium salt of hydrocyanic acid	143-33-9	VZ7530000
0057	Sodium tetraborate	1330-43-4	ED4588000
0058	Sodium tetraborate decahydrate	1303-96-4	VZ2275000
0059	Sodium tetraborate pentahydrate	12179-04-3	
0667	Soft wood dust		ZC9850000
0277	Solvent ether	60-29-7	KI5775000
0567	Sorghum gum	9005-25-8	GM5090000
0181	Spectracide®	333-41-5	TF3325000
0648	Spirits of turpentine	8006-64-2	YO8400000
0569	Spotting naphtha	8052-41-3	WJ8925000
0616	Stannic dioxide	18282-10-5	XO4000000
0616	Stannic oxide	18282-10-5	XO4000000
0615	Stannous oxide	21651-19-4	
0567*	Starch	9005-25-8	GM5090000
0567	alpha-Starch	9005-25-8	GM5090000
0567	Starch gum	9005-25-8	GM5090000
0648	Steam distilled turpentine	8006-64-2	YO8400000
0469	Stearyl mercaptan	2885-00-9	
0558	Steatite		VV8780000
0584	Steatite talc	14807-96-6	WW2710000
0568*	Stibine	7803-52-3	WJ0700000
0036	Stibium	7440-36-0	CC4025000
0569*	Stoddard solvent	8052-41-3	WJ8925000
0306	Stove black	7782-42-5	MD9659600
0570*	Strychnine	57-24-9	WL2275000
0570	Strychnos	57-24-9	WL2275000
0571*	Styrene	100-42-5	WL3675000
0571	Styrene monomer	100-42-5	WL3675000
0571	Styrol	100-42-5	WL3675000
0572	Subtilisin BPN	1395-21-7	CO9450000
0572	Subtilisin Carlsburg	1395-21-7	CO9450000
0572*	Subtilisins	1395-21-7	CO9450000
0573	Succinic dinitrile	110-61-2	WN3850000
0573*	Succinonitrile	110-61-2	WN3850000
0574*	Sucrose	57-50-1	WN6500000
0574	Sugar	57-50-1	WN6500000
0030	Sulfamate	7773-06-0	WO6125000
0648	Sulfate wood turpentine	8006-64-2	YO8400000
0611	Sulfinyl chloride	7719-09-7	XM5150000
0586	Sulfotep	3689-24-5	XN4375000
0578	Sulfur chloride	10025-67-9	WS4300000
0611	Sulfur chloride oxide	7719-09-7	XM5150000
0579	Sulfur decafluoride	5714-22-7	WS4480000
0581	Sulfur difluoride dioxide	2699-79-8	WT5075000
0575*	Sulfur dioxide	7446-09-5	WS4550000
0576	Sulfur fluoride	2551-62-4	WS4900000
0576*	Sulfur hexafluoride	2551-62-4	WS4900000
0578*	Sulfur monochloride	10025-67-9	WS4300000
0575	Sulfur oxide	7446-09-5	WS4550000
0579*	Sulfur pentafluoride	5714-22-7	WS4480000
0510	Sulfur phosphide	1314-80-3	TH4375000
0578	Sulfur subchloride	10025-67-9	WS4300000
0580*	Sulfur tetrafluoride	7783-60-0	WT4800000
0337	Sulfuretted hydrogen	7783-06-4	MX1225000
0577*	Sulfuric acid	7664-93-9	WS5600000
0577	Sulfuric acid (aqueous)	7664-93-9	WS5600000
0575	Sulfurous acid anhydride	7446-09-5	WS4550000
0611	Sulfurous dichloride	7719-09-7	XM5150000
0575	Sulfurous oxide	7446-09-5	WS4550000
0611	Sulfurous oxychloride	7719-09-7	XM5150000

0581*	Sulfuryl fluoride	2699-79-8	WT5075000
0582*	Sulprofos	35400-43-2	TE4165000
0009	Symmetrical tetrabromoethane	79-27-6	KI8225000
0598	Symmetrical tetrachloroethane	79-34-5	KI8575000
0639	Symmetrical trimethylbenzene	108-67-8	OX6825000
0096	Synthetic camphor	76-22-2	EX1225000
0432	Synthetic vitreous fibers		PY8070000
0177	Systox®	8065-48-3	TF3150000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0583*	2,4,5-T	93-76-5	AJ8400000
0009	TBE	79-27-6	KI8225000
0625	TBP	126-73-8	TC7700000
0626	TCA	76-03-9	AJ7875000
0594	TCDBD	1746-01-6	HP3500000
0594	TCDD	1746-01-6	HP3500000
0594	2,3,7,8-TCDD	1746-01-6	HP3500000
0629	TCE	79-01-6	KX4550000
0172	TCHH	13121-70-5	WH8750000
0642	TCP	78-30-8	TD0350000
0620	TDA	25376-45-8	XS9445000
0621	TDI	584-84-9	CZ6300000
0621	2,4-TDI	584-84-9	CZ6300000
0633	TEA	121-44-8	YEO175000
0586*	TEDP	3689-24-5	XN4375000
0601	TEL	78-00-2	TP4550000
0590*	TEPP	107-49-3	UX6825000
0244	TETD	97-77-8	JO1225000
0602	THF	109-99-9	LU5950000
0635	TMA	552-30-7	DC2050000
0636	TMA	75-50-3	PA0350000
0635	TMAN	552-30-7	DC2050000
0603	TML	75-74-1	TP4725000
0604	TMSN	3333-52-6	WN4025000
0605	TNM	509-14-8	PB4025000
0641	TNT	118-96-7	XU0175000
0642	TOCP	78-30-8	TD0350000
0644	TPP	115-86-6	TC8400000
0606	TSPP	7722-88-5	UX7350000
0632	TTE	76-13-1	KJ4000000
0574	Table sugar	57-50-1	WN6500000
0584*	Talc (containing no asbestos and less th	14807-96-6	WW2710000
0585*	Tantalum (metal and oxide dust, as Ta)	7440-25-7	WW5505000
0585	Tantalum-181	7440-25-7	WW5505000
0567	Tapioca starch	9005-25-8	GM5090000
0439	Tar camphor	91-20-3	OJ0525000
0119	Tear gas	532-27-4	AM6300000
0587*	Tellurium	13494-80-9	WY2625000
0588	Tellurium fluoride	7783-80-4	WY2800000
0588*	Tellurium hexafluoride	7783-80-4	WY2800000
0056	Tellurobismuthite	1304-82-1	EB3110000
0199	Telone®	542-75-6	UC8310000
0589	Temefos	3383-96-8	TF6890000
0589*	Temephos	3383-96-8	TF6890000
0591*	o-Terphenyl	84-15-1	WZ6472000
0592*	m-Terphenyl	92-06-8	WZ6470000
0593*	p-Terphenyl	92-94-4	WZ6475000
0591	1,2-Terphenyl	84-15-1	WZ6472000
0592	1,3-Terphenyl	92-06-8	WZ6470000
0593	1,4-Terphenyl	92-94-4	WZ6475000
0592	meta-Terphenyl	92-06-8	WZ6470000
0593	para-Terphenyl	92-94-4	WZ6475000
0591	ortho-Terphenyl	84-15-1	WZ6472000
0284	Terracur P®	115-90-2	TF3850000
0605	Tetan	509-14-8	PB4025000
0009	Tetrabromoacetylene	79-27-6	KI8225000
0009	Tetrabromoethane	79-27-6	KI8225000
0009	1,1,2,2-Tetrabromoethane	79-27-6	KI8225000
0106	Tetrabromomethane	558-13-4	FG4725000
0444	Tetracarbonyl nickel	13463-39-3	OR6300000
0148	Tetracarbonylhydridocobalt	16842-03-8	GG0900000
0148	Tetracarbonylhydrocobalt	16842-03-8	GG0900000
0599	Tetrachlorethylene	127-18-4	KX3850000
0596*	1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	KI1420000
0595*	1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	KI1425000
0136	2,2,2,6-Tetrachloro-2-picoline	1929-82-4	US7525000
0594*	2,3,7,8-Tetrachloro-dibenzo-p-dioxin	1746-01-6	HP3500000
0597*	1,1,1,2-Tetrachloroethane	630-20-6	KI8450000

0598*	1,1,2,2-Tetrachloroethane	79-34-5	KI8575000
0599*	Tetrachloroethylene	127-18-4	KX3850000
0107	Tetrachloromethane	56-23-5	FG4900000
0600*	Tetrachloronaphthalene	1335-88-2	OK3700000
0282	Tetraethoxysilane	78-10-4	VV9450000
0586	Tetraethyl dithionopyrophosphate	3689-24-5	XN4375000
0586	Tetraethyl dithiopyrophosphate	3689-24-5	XN4375000
0601*	Tetraethyl lead (as Pb)	78-00-2	TP4550000
0282	Tetraethyl orthosilicate	78-10-4	VV9450000
0590	Tetraethyl pyrophosphate	107-49-3	UX6825000
0282	Tetraethyl silicate	78-10-4	VV9450000
0601	Tetraethylplumbane	78-00-2	TP4550000
0244	Tetraethylthiuram disulfide	97-77-8	JO1225000
0580	Tetrafluorosulfurane	7783-60-0	WT4800000
0437	Tetrahydro-1,4-oxazine	110-91-8	OD6475000
0204	3a,4,7,7a-Tetrahydro-4,7-methanoindene	77-73-6	PC1050000
0548	1,2,12,12a-Tetrahydro-8,9-dimethoxy-2-(1	83-79-4	DJ2800000
0437	Tetrahydro-p-oxazine	110-91-8	OD6475000
0167	Tetrahydrobenzene	110-83-8	GW2500000
0602*	Tetrahydrofuran	109-99-9	LU5950000
0485	Tetrahydroxymethylolmethane	115-77-5	RZ2490000
0428	Tetramethoxysilane	681-84-5	VV9800000
0428	Tetramethyl ester of silicic acid	681-84-5	VV9800000
0603*	Tetramethyl lead (as Pb)	75-74-1	TP4725000
0428	Tetramethyl silicate	681-84-5	VV9800000
0604	Tetramethyl succinodinitrile	3333-52-6	WN4025000
0604*	Tetramethyl succinonitrile	3333-52-6	WN4025000
0015	Tetramethylene cyanide	111-69-3	AV2625000
0602	Tetramethylene oxide	109-99-9	LU5950000
0485	Tetramethylolmethane	115-77-5	RZ2490000
0603	Tetramethylplumbane	75-74-1	TP4725000
0612	Tetramethylthiuram disulfide	137-26-8	JO1400000
0605*	Tetranitromethane	509-14-8	PB4025000
0606	Tetrasodium diphosphate	7722-88-5	UX7350000
0606*	Tetrasodium pyrophosphate	7722-88-5	UX7350000
0606	Tetrasodium pyrophosphate (anhydrous)	7722-88-5	UX7350000
0590	Tetron®	107-49-3	UX6825000
0607*	Tetryl	479-45-8	BY6300000
0607	2,4,6-Tetryl	479-45-8	BY6300000
0608*	Thallium (soluble compounds, as Tl)		
0102	Thermal black	1333-86-4	FF5800000
0502	Thimet	298-02-2	TD9450000
0609	1,1'-Thiobis(2-methyl-4-hydroxy-5-tert-b	96-69-5	GP3150000
0609	4,4'-Thiobis(3-methyl-6-tert-butylphenol	96-69-5	GP3150000
0609*	4,4'-Thiobis(6-tert-butyl-m-cresol)	96-69-5	GP3150000
0251	Thiodan®	115-29-7	RB9275000
0245	Thiodemeton	298-04-4	TD9275000
0494	Thiodiphenylamine	92-84-2	SN5075000
0610*	Thioglycolic acid	68-11-1	AI5950000
0610	2-Thioglycolic acid	68-11-1	AI5950000
0611*	Thionyl chloride	7719-09-7	XM5150000
0611	Thionyl dichloride	7719-09-7	XM5150000
0050	Thiophenol	108-98-5	DC0525000
0578	Thiosulfurous dichloride	10025-67-9	WS4300000
0586	Thiotepp®	3689-24-5	XN4375000
0610	Thiovanic acid	68-11-1	AI5950000
0612*	Thiram	137-26-8	JO1400000
0502	Timet	298-02-2	TD9450000
0613*	Tin	7440-31-5	XP7320000
0614*	Tin (organic compounds, as Sn)		
0613	Tin flake	7440-31-5	XP7320000
0613	Tin metal	7440-31-5	XP7320000
0613	Tin powder	7440-31-5	XP7320000
0615	Tin protoxide	21651-19-4	
0615*	Tin(II) oxide (as Sn)	21651-19-4	
0616*	Tin(IV) oxide (as Sn)	18282-10-5	XO4000000
0617*	Titanium dioxide	13463-67-7	XR2275000
0617	Titanium oxide	13463-67-7	XR2275000
0617	Titanium peroxide	13463-67-7	XR2275000
0618*	o-Tolidine	119-93-7	DD1225000
0618	3,3'-Tolidine	119-93-7	DD1225000
0619*	Toluene	108-88-3	XS5250000
0621	2,4-Toluene diisocyanate	584-84-9	CZ6300000
0621*	Toluene-2,4-diisocyanate	584-84-9	CZ6300000
0620*	Toluenediamine	25376-45-8	XS9445000
0620	Toluenediamine isomers	25376-45-8	XS9445000
0624	4-Toluidine	106-49-0	XU3150000
0624*	p-Toluidine	106-49-0	XU3150000
0623	3-Toluidine	108-44-1	XU2800000
0623*	m-Toluidine	108-44-1	XU2800000
0622*	o-Toluidine	95-53-4	XU2975000

0622	ortho-Toluidine	95-53-4	XU2975000
0619	Toluol	108-88-3	XS5250000
0663	Tolyethylene	25013-15-4	WL5075000
0135	o-Tolyl chloride	95-49-8	XS9000000
0624	Tolylamine	106-49-0	XU3150000
0623	m-Tolylamine	108-44-1	XU2800000
0620	Tolylenediamine	25376-45-8	XS9445000
0514	Tordon®	1918-02-1	TJ7525000
0113	Toxaphene	8001-35-2	XW5250000
0376	Toxilic anhydride	108-31-6	ON3675000
0041	Tremolite	1332-21-4	CI6475000
0041	Tremolite asbestos	1332-21-4	CI6475000
0625	Tri-n-butyl phosphate	126-73-8	TC7700000
0642	Tri-o-cresyl ester of phosphoric acid	78-30-8	TD0350000
0642	Tri-o-cresyl phosphate	78-30-8	TD0350000
0476	Triatomic oxygen	10028-15-6	RS8225000
0061	Tribromoborane	10294-33-4	ED7400000
0066	Tribromomethane	75-25-2	PB5600000
0625	Tributyl ester of phosphoric acid	126-73-8	TC7700000
0625*	Tributyl phosphate	126-73-8	TC7700000
0089	Tricalcium arsenate	7778-44-1	CG0830000
0089	Tricalcium ortho-arsenate	7778-44-1	CG0830000
0632*	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	KJ4000000
0174	1,1,1-Trichloro-2,2-bis(p-chlorophenyl)e	50-29-3	KJ3325000
0388	1,1,1-Trichloro-2,2-bis-(p-methoxyphenyl	72-43-5	KJ3675000
0626*	Trichloroacetic acid	76-03-9	AJ7875000
0627	unsym-Trichlorobenzene	120-82-1	DC2100000
0627*	1,2,4-Trichlorobenzene	120-82-1	DC2100000
0627	1,2,4-Trichlorobenzol	120-82-1	DC2100000
0628	beta-Trichloroethane	79-00-5	KJ3150000
0404	1,1,1-Trichloroethane	71-55-6	KJ2975000
0628*	1,1,2-Trichloroethane	79-00-5	KJ3150000
0404	1,1,1-Trichloroethane (stabilized)	71-55-6	KJ2975000
0626	Trichloroethanoic acid	76-03-9	AJ7875000
0629	Trichloroethene	79-01-6	KX4550000
0629*	Trichloroethylene	79-01-6	KX4550000
0290	Trichlorofluoromethane	75-69-4	PB6125000
0631	Trichlorohydrin	96-18-4	TZ9275000
0127	Trichloromethane	67-66-3	FS9100000
0489	Trichloromethane sulfenyl chloride	594-42-3	PB0370000
0489	Trichloromethyl sulfur chloride	594-42-3	PB0370000
0290	Trichloromonofluoromethane	75-69-4	PB6125000
0630*	Trichloronaphthalene	1321-65-9	OK4025000
0132	Trichloronitromethane	76-06-2	PB6300000
0583	2,4,5-Trichlorophenoxyacetic acid	93-76-5	AJ8400000
0631*	1,2,3-Trichloropropane	96-18-4	TZ9275000
0172	Tricyclohexylhydroxystannane	13121-70-5	WH8750000
0172	Tricyclohexylhydroxytin	13121-70-5	WH8750000
0172	Tricyclohexylstannium hydroxide	13121-70-5	WH8750000
0172	Tricyclohexyltin hydroxide	13121-70-5	WH8750000
0553	Tridymite	14808-60-7	VV7330000
0633*	Triethylamine	121-44-8	YE0175000
0455	Trifluoramine	7783-54-2	OX1925000
0455	Trifluorammonia	7783-54-2	OX1925000
0310	2,2,2-Trifluoro-1-bromo-1-chloroethane	151-67-7	KH6550000
0310	1,1,1-Trifluoro-2-bromo-2-chloroethane	151-67-7	KH6550000
0062	Trifluoroborane	7637-07-2	ED2275000
0634*	Trifluorobromomethane	75-63-8	PA5425000
0291	2,2,2-Trifluoroethoxyethene	406-90-6	KO4250000
0291	2,2,2-Trifluoroethyl vinyl ether	406-90-6	KO4250000
0634	Trifluoromonobromomethane	75-63-8	PA5425000
0302	Trihydroxypropane	56-81-5	MA8050000
0343	Triiodomethane	75-47-8	PB7000000
0629	Trilene	79-01-6	KX4550000
0381	Trimanganese tetraoxide	1317-35-7	OP0895000
0381	Trimanganese tetroxide	1317-35-7	OP0895000
0635	Trimellitic acid anhydride	552-30-7	DC2050000
0635*	Trimellitic anhydride	552-30-7	DC2050000
0640	Trimethoxyphosphine	121-45-9	TH1400000
0078	Trimethyl carbinol	75-65-0	EO1925000
0640	Trimethyl ester of phosphorous acid	121-45-9	TH1400000
0640*	Trimethyl phosphite	121-45-9	TH1400000
0355	3,5,5-Trimethyl-2-cyclo-hexen-1-one	78-59-1	GW7700000
0355	3,5,5-Trimethyl-2-cyclohexenone	78-59-1	GW7700000
0636*	Trimethylamine	75-50-3	PA0350000
0639	sym-Trimethylbenzene	108-67-8	OX6825000
0639*	1,3,5-Trimethylbenzene	108-67-8	OX6825000
0637*	1,2,3-Trimethylbenzene	526-73-8	DC3300000
0638*	1,2,4-Trimethylbenzene	95-63-6	DC3325000
0169	Trimethylenetrinitramine	121-82-4	XY9450000
0169	1,3,5-Trinitro-1,3,5-triazacyclohexane	121-82-4	XY9450000

0456	Trinitroglycerine	55-63-0	OX2100000
0515	2,4,6-Trinitrophenol	88-89-1	TJ7875000
0607	2,4,6-Trinitrophenyl-N-methylnitramine	479-45-8	BY6300000
0641	Trinitrotoluene	118-96-7	XU0175000
0641	sym-Trinitrotoluene	118-96-7	XU0175000
0641*	2,4,6-Trinitrotoluene	118-96-7	XU0175000
0641	Trinitrotoluol	118-96-7	XU0175000
0642*	Triorthocresyl phosphate	78-30-8	TD0350000
0490	Trioxychlorofluoride	7616-94-6	SD1925000
0591	o-Triphenyl	84-15-1	WZ6472000
0592	m-Triphenyl	92-06-8	WZ6470000
0593	p-Triphenyl	92-94-4	WZ6475000
0644	Triphenyl ester of phosphoric acid	115-86-6	TC8400000
0644*	Triphenyl phosphate	115-86-6	TC8400000
0643*	Triphenylamine	603-34-9	YK2680000
0553	Tripoli	14808-60-7	VV7330000
0321	Tris(dimethylamino)phosphine oxide	680-31-9	TD0875000
0645*	Tungsten	7440-33-7	YO7175000
0646*	Tungsten (soluble compounds, as W)		
0647*	Tungsten carbide (cemented)	11107-01-0	Y07350000
0645	Tungsten metal	7440-33-7	YO7175000
0648*	Turpentine	8006-64-2	YO8400000
0648	Turps	8006-64-2	YO8400000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0227	UDMH	57-14-7	MV2450000
0649*	1-Undecanethiol	5332-52-5	
0649	Undecyl mercaptan	5332-52-5	
0093	Unslaked lime	1305-78-8	EW3100000
0227	Unsymmetrical dimethylhydrazine	57-14-7	MV2450000
0650*	Uranium (insoluble compounds, as U)	7440-61-1	YR3490000
0651*	Uranium (soluble compounds, as U)		
0650	Uranium I	7440-61-1	YR3490000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0656	VAC	108-05-4	AK0875000
0658	VC	75-01-4	KU9625000
0014	VCN	107-13-1	AT5250000
0661	VDC	75-35-4	KV9275000
0662	VDF	75-38-7	KW0560000
0664*	VM & P Naphtha	8032-32-4	OI6180000
0652	Valeral	110-62-3	YV3600000
0652	Valeraldehyde	110-62-3	YV3600000
0652*	n-Valeraldehyde	110-62-3	YV3600000
0652	Valeric aldehyde	110-62-3	YV3600000
0216	Valerone	108-83-8	MJ5775000
0653	Vanadic anhydride dust	1314-62-1	YW2450000
0654	Vanadic anhydride fume	1314-62-1	YW2460000
0653*	Vanadium dust	1314-62-1	YW2450000
0654*	Vanadium fume	1314-62-1	YW2460000
0653	Vanadium oxide dust	1314-62-1	YW2450000
0654	Vanadium oxide fume	1314-62-1	YW2460000
0653	Vanadium pentaoxide dust	1314-62-1	YW2450000
0654	Vanadium pentaoxide fume	1314-62-1	YW2460000
0664	Varnish makers' & painters' naphtha	8032-32-4	OI6180000
0655	Vegetable mist	68956-68-3	YX1850000
0655*	Vegetable oil mist	68956-68-3	YX1850000
0581	Vikane®	2699-79-8	WT5075000
0656*	Vinyl acetate	108-05-4	AK0875000
0656	Vinyl acetate monomer	108-05-4	AK0875000
0571	Vinyl benzene	100-42-5	WL3675000
0657*	Vinyl bromide	593-60-2	KU8400000
0017	Vinyl carbinol	107-18-6	BA5075000
0658*	Vinyl chloride	75-01-4	KU9625000
0658	Vinyl chloride monomer (VCM)	75-01-4	KU9625000
0014	Vinyl cyanide	107-13-1	AT5250000
0659*	Vinyl cyclohexene dioxide	106-87-6	RN8640000
0656	Vinyl ethanoate	108-05-4	AK0875000
0660*	Vinyl fluoride	75-02-5	YZ7351000
0660	Vinyl fluoride monomer	75-02-5	YZ7351000
0663*	Vinyl toluene	25013-15-4	WL5075000
0628	Vinyl trichloride	79-00-5	KJ3150000
0659	4-Vinyl-1-cyclohexene dioxide	106-87-6	RN8640000
0659	4-Vinylcyclohexene diepoxide	106-87-6	RN8640000
0067	Vinylethylene	106-99-0	ET9275000
0661*	Vinylidene chloride	75-35-4	KV9275000

0661	Vinylidene chloride monomer	75-35-4	KV9275000
0661	Vinylidene dichloride	75-35-4	KV9275000
0662	Vinylidene difluoride	75-38-7	KW0560000
0662*	Vinylidene fluoride	75-38-7	KW0560000
0248	Vinylstyrene	1321-74-0	CZ9370000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0665	WARF	81-81-2	GN4550000
0665*	Warfarin	81-81-2	GN4550000
0666*	Welding fumes		ZC2550000
0667	Western red cedar dust		ZC9850000
0447	White fuming nitric acid (WFNA)	7697-37-2	OU5775000
0472	White mineral oil mist	8012-95-1	PY8030000
0506	White phosphoric acid	7664-38-2	TB6300000
0507	White phosphorus	7723-14-0	TH3500000
0439	White tar	91-20-3	OJ0525000
0616	White tin oxide	18282-10-5	XO4000000
0645	Wolfram	7440-33-7	YO7175000
0094	Wollastonite (mineral)	1344-95-2	VV9150000
0397	Wood alcohol	67-56-1	PC1400000
0667*	Wood dust		ZC9850000
0397	Wood naphtha	67-56-1	PC1400000
0397	Wood spirit	67-56-1	PC1400000
0648	Wood turpentine	8006-64-2	YO8400000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0670*	p-Xylene	106-42-3	ZE2625000
0669*	m-Xylene	108-38-3	ZE2275000
0668*	o-Xylene	95-47-6	ZE2450000
0670	para-Xylene	106-42-3	ZE2625000
0669	meta-Xylene	108-38-3	ZE2275000
0668	ortho-Xylene	95-47-6	ZE2450000
0671*	m-Xylene-alpha, alpha'-diamine	1477-55-0	PF8970000
0672*	Xylidine	1300-73-8	ZE8575000
0672	Xylidine isomers (e.g.	1300-73-8	ZE8575000
0670	p-Xylol	106-42-3	ZE2625000
0669	m-Xylol	108-38-3	ZE2275000
0668	o-Xylol	95-47-6	ZE2450000
0671	m-Xylylenediamine	1477-55-0	PF8970000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0673*	Yttrium	7440-65-5	ZG2980000
0673	Yttrium metal	7440-65-5	ZG2980000

GUIDE	CHEMICAL NAME	CAS NO	RTECS NO
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0431	Zimwaldite	12001-26-2	VV8760000
0674*	Zinc chloride fume	7646-85-7	ZH1400000
0674	Zinc dichloride fume	7646-85-7	ZH1400000
0676	Zinc distearate	557-05-1	ZH5200000
0675*	Zinc oxide	1314-13-2	ZH4810000
0675	Zinc peroxide	1314-13-2	ZH4810000
0676	Zinc salt of stearic acid	557-05-1	ZH5200000
0676*	Zinc stearate	557-05-1	ZH5200000
0677	Zirconium	7440-67-7	ZH7070000
0677*	Zirconium compounds (as Zr)	7440-67-7	ZH7070000
0230	Zoalene	148-01-6	XS4200000

*primary chemical name

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acetaldehyde			CAS 75-07-0
CH ₃ CHO			RTECS AB1925000
Synonyms & Trade Names Acetic aldehyde, Ethanal, Ethyl aldehyde			DOT ID & Guide 1089 129
Exposure Limits	NIOSH REL: Ca See Appendix A See Appendix C (Aldehydes)		
	OSHA PEL†: TWA 200 ppm (360 mg/m ³)		
IDLH Ca [2000 ppm]		Conversion 1 ppm = 1.80 mg/m ³	
Physical Description Colorless liquid or gas (above 69°F) with a pungent, fruity odor.			
MW: 44.1	BP: 69°F	FRZ: -190°F	Sol: Miscible
VP: 740 mmHg	IP: 10.22 eV		Sp.Gr: 0.79
Fl.P: -36°F	UEL: 60%	LEL: 4.0%	
Class IA Flammable Liquid: Fl.P. below 73°F and BP below 100°F.			
Incompatibilities & Reactivities Strong oxidizers, acids, bases, alcohols, ammonia & amines, phenols, ketones, HCN, H ₂ S [Note: Prolonged contact with air may cause formation of peroxides that may explode and burst containers; easily undergoes polymerization.]			
Measurement Methods NIOSH 2538; OSHA 68			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose, throat; eye, skin burns; dermatitis; conjunctivitis; cough; central nervous system depression; delayed pulmonary edema; in animals: kidney, reproductive, teratogenic effects; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, kidneys, central nervous system, reproductive system
Cancer Site [in animals: nasal cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acetic acid			CAS 64-19-7
CH ₃ COOH			RTECS AF1225000
Synonyms & Trade Names Acetic acid (aqueous), Ethanoic acid, Glacial acetic acid (pure compound), Methanecarboxylic acid [Note: Can be found in concentrations of 5-8% in vinegar.]			DOT ID & Guide 2790 153 (10-80% acid) 2789 132 (>80% acid)
Exposure Limits	NIOSH REL: TWA 10 ppm (25 mg/m ³) ST 15 ppm (37 mg/m ³)		
	OSHA PEL: TWA 10 ppm (25 mg/m ³)		
IDLH 50 ppm		Conversion 1 ppm = 2.46 mg/m ³	
Physical Description Colorless liquid or crystals with a sour, vinegar-like odor. [Note: Pure compound is a solid below 62°F. Often used in an aqueous solution.]			
MW: 60.1	BP: 244°F	FRZ: 62°F	Sol: Miscible
VP: 11 mmHg	IP: 10.66 eV		Sp.Gr: 1.05
Fl.P: 103°F	UEL(200°F): 19.9%	LEL: 4.0%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers (especially chromic acid, sodium peroxide & nitric acid), strong caustics [Note: Corrosive to metals.]			
Measurement Methods NIOSH 1603; OSHA ID186SG			
Personal Protection & Sanitation Skin: Prevent skin contact (>10%) Eyes: Prevent eye contact Wash skin: When contaminated (>10%) Remove: When wet or contaminated (>10%) Change: No recommendation Provide: Eyewash (>5%), Quick drench (>50%)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 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

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, skin, nose, throat; eye, skin burns; skin sensitization; dental erosion; black skin, hyperkeratosis; conjunctivitis, lacrimation (discharge of tears); pharyngeal edema, chronic bronchitis

Target Organs Eyes, skin, respiratory system, teeth

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acetic anhydride			CAS 108-24-7
(CH ₃ CO) ₂ O			RTECS AK1925000
Synonyms & Trade Names Acetic acid anhydride, Acetic oxide, Acetyl oxide, Ethanoic anhydride			DOT ID & Guide 1715 137
Exposure Limits	NIOSH REL: C 5 ppm (20 mg/m ³)		
	OSHA PEL†: TWA 5 ppm (20 mg/m ³)		
IDLH 200 ppm		Conversion 1 ppm = 4.18 mg/m ³	
Physical Description Colorless liquid with a strong, pungent, vinegar-like odor.			
MW: 102.1	BP: 282°F	FRZ: -99°F	Sol: 12%
VP: 4 mmHg	IP: 10.00 eV		Sp.Gr: 1.08
Fl.P: 120°F	UEL: 10.3%	LEL: 2.7%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Water, alcohols, strong oxidizers (especially chromic acid), amines, strong caustics [Note: Corrosive to iron, steel & other metals. Reacts with water to form acetic acid.]			
Measurement Methods NIOSH 3506; OSHA 82, 102			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 125 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 200 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
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

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

Symptoms Conjunctivitis, lacrimation (discharge of tears), corneal edema, opacity, photophobia (abnormal visual intolerance to light); nasal, pharyngeal irritation; cough, dyspnea (breathing difficulty), bronchitis; skin burns, vesiculation, sensitization dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acetone			CAS 67-64-1
(CH ₃) ₂ CO			RTECS AL3150000
Synonyms & Trade Names Dimethyl ketone, Ketone propane, 2-Propanone			DOT ID & Guide 1090 127
Exposure Limits	NIOSH REL: TWA 250 ppm (590 mg/m ³)		
	OSHA PEL†: TWA 1000 ppm (2400 mg/m ³)		
IDLH 2500 ppm [10%LEL]		Conversion 1 ppm = 2.38 mg/m ³	
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			
Measurement Methods NIOSH 1300, 3800; OSHA 69			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
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
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
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acetone cyanohydrin			CAS 75-86-5
CH ₃ C(OH)CNCH ₃			RTECS OD9275000
Synonyms & Trade Names Cyanohydrin-2-propanone, 2-Cyano-2-propanol, alpha-Hydroxyisobutyronitrile, 2-Hydroxy-2-methyl-propionitrile, 2-Methylactonitrile			DOT ID & Guide 1541 155 (stabilized)
Exposure Limits	NIOSH REL: C 1 ppm (4 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 3.48 mg/m ³	
Physical Description Colorless liquid with a faint odor of bitter almond. [Note: Forms cyanide in the body.]			
MW: 85.1	BP: 203°F	FRZ: -4°F	Sol: Miscible
VP: 0.8 mmHg	IP: ?		Sp.Gr(77°F): 0.93
Fl.P: 165°F	UEL: 12.0%	LEL: 2.2%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Sulfuric acid, caustics [Note: Slowly decomposes to acetone & HCN at room temperatures; rate is accelerated by an increase in pH, water content, or temperature.]			
Measurement Methods NIOSH 2506			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush 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 self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 250 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

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

Symptoms Irritation eyes, skin, respiratory system; dizziness, lassitude (weakness, exhaustion), headache, confusion, convulsions; liver, kidney injury; pulmonary edema, asphyxia

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acetonitrile			CAS 75-05-8
CH ₃ CN			RTECS AL7700000
Synonyms & Trade Names Cyanomethane, Ethyl nitrile, Methyl cyanide [Note: Forms cyanide in the body.]			DOT ID & Guide 1648 131
Exposure Limits	NIOSH REL: TWA 20 ppm (34 mg/m ³)		
	OSHA PEL†: TWA 40 ppm (70 mg/m ³)		
IDLH 500 ppm		Conversion 1 ppm = 1.68 mg/m ³	
Physical Description Colorless liquid with an aromatic odor.			
MW: 41.1	BP: 179°F	FRZ: -49°F	Sol: Miscible
VP: 73 mmHg	IP: 12.20 eV		Sp.Gr: 0.78
Fl.P(oc): 42°F	UEL: 16.0%	LEL: 3.0%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1606			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 200 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator Up to 500 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

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

Symptoms Irritation nose, throat; asphyxia; nausea, vomiting; chest pain; lassitude (weakness, exhaustion); stupor, convulsions; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Acetylaminofluorene			CAS 53-96-3
C ₁₅ H ₁₃ NO			RTECS AB9450000
Synonyms & Trade Names AAF, 2-AAF, 2-Acetaminofluorene, N-Acetyl-2-aminofluorene, FAA, 2-FAA, 2-Fluorenylacetamide			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1014] See Appendix B		
IDLH Ca [N.D.]		Conversion	
Physical Description Tan, crystalline powder.			
MW: 223.3	BP: ?	MLT: 381°F	Sol: Insoluble
VP: ?	IP:?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods None available			
Personal Protection & Sanitation 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) 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 with a high-efficiency particulate filter/Any			

appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Reduced function of liver, kidneys, bladder, pancreas; [potential occupational carcinogen]
Target Organs Liver, bladder, kidneys, pancreas, skin
Cancer Site [in animals: tumors of the liver, bladder, lungs, skin & pancreas]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acetylene			CAS 74-86-2
C ₂ H ₂			RTECS AO9600000
Synonyms & Trade Names Ethine, Ethyne [Note: A compressed gas used in the welding & cutting of metals.]			DOT ID & Guide 1001 116
Exposure Limits	NIOSH REL: C 2500 ppm (2662 mg/m ³)		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 1.06 mg/m ³	
Physical Description Colorless gas with a faint, ethereal odor. [Note: Commercial grade has a garlic-like odor. Shipped under pressure dissolved in acetone.]			
MW: 26.0	BP: Sublimes	FRZ: -119°F (Sublimes)	Sol: 2%
VP: 44.2 atm	IP: 11.40 eV	RGasD: 0.91	
Fl.P: NA (Gas)	UEL: 100%	LEL: 2.5%	
Flammable Gas			
Incompatibilities & Reactivities Zinc; oxygen & other oxidizing agents such as halogens [Note: Forms explosive acetylide compounds with copper, mercury, silver & brasses (containing more than 66% copper).]			
Measurement Methods NIOSH Acetylene Crit. Doc.			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact (liquid)			
Symptoms Headache, dizziness; asphyxia; liquid: frostbite			
Target Organs central nervous system, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acetylene tetrabromide			CAS 79-27-6
CHBr ₂ CHBr ₂			RTECS KI8225000
Synonyms & Trade Names Symmetrical tetrabromoethane; TBE; Tetrabromoacetylene; Tetrabromoethane; 1,1,2,2-Tetrabromoethane			DOT ID & Guide 2504 159
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL: TWA 1 ppm (14 mg/m ³)		
IDLH 8 ppm		Conversion 1 ppm = 14.14 mg/m ³	
Physical Description Pale-yellow liquid with a pungent odor similar to camphor or iodoform. [Note: A solid below 32°F.]			
MW: 345.7	BP: 474°F (Decomposes)	FRZ: 32°F	Sol: 0.07%
VP: 0.02 mmHg	IP: ?		Sp.Gr: 2.97
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Strong caustics; hot iron; reducing metals such as aluminum, magnesium & zinc			
Measurement Methods NIOSH 2003			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations OSHA Up to 8 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose; anorexia, nausea; headache; abdominal pain; jaundice; leukocytosis (increased blood leukocytes); central nervous system depression
Target Organs Eyes, respiratory system, liver, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acetylsalicyclic acid			CAS 50-78-2
CH ₃ COOC ₆ H ₄ COOH			RTECS VO0700000
Synonyms & Trade Names Acetal, o-Acetoxybenzoic acid, 2-Acetoxybenzoic acid, Aspirin			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Odorless, colorless to white, crystal-line powder. [aspirin] [Note: Develops the vinegar-like odor of acetic acid on contact with moisture.]			
MW: 180.2	BP: 284°F (Decomposes)	MLT: 275°F	Sol(77°F): 0.3%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.35
Fl.P: NA	UEL: NA	LEL: NA	MEC: 40 g/m ³
Combustible Powder; explosion hazard if dispersed in air.			
Incompatibilities & Reactivities Solutions of alkali hydroxides or carbonates, strong oxidizers, moisture [Note: Slowly hydrolyzes in moist air to salicyclic & acetic acids.]			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: No recommendation Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; increased blood clotting time; nausea, vomiting; liver, kidney injury			
Target Organs			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acrolein			CAS 107-02-8
CH ₂ =CHCHO			RTECS AS1050000
Synonyms & Trade Names Acraldehyde, Acrylaldehyde, Acrylic aldehyde, Allyl aldehyde, Propenal, 2-Propenal			DOT ID & Guide 1092 131P (inhibited)
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.25 mg/m ³) ST 0.3 ppm (0.8 mg/m ³) See Appendix C (Aldehydes)		
	OSHA PEL†: TWA 0.1 ppm (0.25 mg/m ³)		
IDLH 2 ppm		Conversion 1 ppm = 2.29 mg/m ³	
Physical Description Colorless or yellow liquid with a piercing, disagreeable odor.			
MW: 56.1	BP: 127°F	FRZ: -126°F	Sol: 40%
VP: 210 mmHg	IP: 10.13 eV		Sp.Gr: 0.84
Fl.P: -15°F	UEL: 31%	LEL: 2.8%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Oxidizers, acids, alkalis, ammonia, amines [Note: Polymerizes readily unless inhibited--usually with hydroquinone. May form shock-sensitive peroxides over time.]			
Measurement Methods NIOSH 2501; OSHA 52			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2 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

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

Symptoms Irritation eyes, skin, mucous membrane; decreased pulmonary function; delayed pulmonary edema; chronic respiratory disease

Target Organs Eyes, skin, respiratory system, heart

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acrylamide			CAS 79-06-1
CH ₂ =CHCONH ₂			RTECS AS3325000
Synonyms & Trade Names Acrylamide monomer, Acrylic amide, Propenamide, 2-Propenamide			DOT ID & Guide 2074 153P
Exposure Limits	NIOSH REL: Ca TWA 0.03 mg/m ³ [skin] See Appendix A		
	OSHA PEL†: TWA 0.3 mg/m ³ [skin]		
IDLH Ca [60 mg/m ³]		Conversion	
Physical Description White crystalline, odorless solid.			
MW: 71.1	BP: 347-572°F (Decomposes)	MLT: 184°F	Sol(86°F): 216%
VP: 0.007 mmHg	IP: 9.50 eV		Sp.Gr: 1.12
Fl.P: 280°F	UEL: ?	LEL: ?	
Combustible Solid (may also be dissolved in flammable liquids).			
Incompatibilities & Reactivities Strong oxidizers [Note: May polymerize violently upon melting.]			
Measurement Methods OSHA 21, PV2004			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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 (gas mask) with a chin-style, front- or back-			

mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; ataxia, numb limbs, paresthesia; muscle weakness; absent deep tendon reflex; hand sweating; lassitude (weakness, exhaustion), drowsiness; reproductive effects; [potential occupational carcinogen]
Target Organs Eyes, skin, central nervous system, peripheral nervous system, reproductive system
Cancer Site [in animals: tumors of the lungs, testes, thyroid & adrenal glands]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acrylic acid			CAS 79-10-7
CH ₂ =CHCOOH			RTECS AS4375000
Synonyms & Trade Names Acroleic acid, Aqueous acrylic acid (technical grade is 94%), Ethylenecarboxylic acid, Glacial acrylic acid (98% in aqueous solution), 2-Propenoic acid			DOT ID & Guide 2218 132P (inhibited)
Exposure Limits	NIOSH REL: TWA 2 ppm (6 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 2.95 mg/m ³	
Physical Description Colorless liquid or solid (below 55°F) with a distinctive, acrid odor. [Note: Shipped with an inhibitor (e.g., hydroquinone) since it readily polymerizes.]			
MW: 72.1	BP: 286°F	FRZ: 55°F	Sol: Miscible
VP: 3 mmHg	IP: ?		Sp.Gr: 1.05
FLP: 121°F	UEL: 8.02%	LEL: 2.4%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Oxidizers, amines, alkalis, ammonium hydroxide, chloro-sulfonic acid, oleum, ethylene diamine, ethyleneimine, 2-aminoethanol [Note: Corrosive to many metals.]			
Measurement Methods OSHA 28, PV2005			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; eye, skin burns; skin sensitization; in animals: lung, liver, kidney injury			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Acrylonitrile			CAS 107-13-1
CH ₂ =CHCN			RTECS AT5250000
Synonyms & Trade Names Acrylonitrile monomer, AN, Cyanoethylene, Propenenitrile, 2-Propenenitrile, VCN, Vinyl cyanide			DOT ID & Guide 1093 131P (inhibited)
Exposure Limits	NIOSH REL: Ca TWA 1 ppm C 10 ppm [15-minute] [skin] See Appendix A		
	OSHA PEL: [1910.1045] TWA 2 ppm C 10 ppm [15-minute] [skin]		
IDLH Ca [85 ppm]		Conversion 1 ppm = 2.17 mg/m ³	
Physical Description Colorless to pale-yellow liquid with an unpleasant odor. [Note: Odor can only be detected above the PEL.]			
MW: 53.1	BP: 171°F	FRZ: -116°F	Sol: 7%
VP: 83 mmHg	IP: 10.91 eV		Sp.Gr: 0.81
Fl.P: 30°F	UEL: 17%	LEL: 3.0%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, acids & alkalis; bromine; amines [Note: Unless inhibited (usually with methylhydroquinone), may polymerize spontaneously or when heated or in presence of strong alkali. Attacks copper.]			
Measurement Methods NIOSH 1604; OSHA 37			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; asphyxia; headache; sneezing; nausea, vomiting; lassitude (weakness, exhaustion), dizziness; skin vesiculation; scaling dermatitis; [potential occupational carcinogen]
Target Organs Eyes, skin, cardiovascular system, liver, kidneys, central nervous system
Cancer Site [brain tumors, lung & bowel cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Adiponitrile			CAS 111-69-3
NC(CH ₂) ₄ CN			RTECS AV2625000
Synonyms & Trade Names 1,4-Dicyanobutane; Hexanedinitrile; Tetramethylene cyanide			DOT ID & Guide 2205 153
Exposure Limits	NIOSH REL: TWA 4 ppm (18 mg/m ³)		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 4.43 mg/m ³	
Physical Description Water-white, practically odorless, oily liquid. [Note: A solid below 34°F. Forms cyanide in the body.]			
MW: 108.2	BP: 563°F	FRZ: 34°F	Sol: 4.5%
VP: 0.002 mmHg	IP: ?		Sp.Gr: 0.97
Fl.P(o.c.): 199°F	UEL: 5.0%	LEL: 1.7%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Oxidizers (e.g., perchlorates, nitrates), strong acids (e.g., sulfuric acid) [Note: Decomposes above 194°F, forming hydrogen cyanide.]			
Measurement Methods NIOSH Nitriles Crit. Doc.			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 40 ppm: (APF = 10) Any supplied-air respirator Up to 100 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 200 ppm: (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 250 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

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

Symptoms Irritation eyes, skin, respiratory system; headache, dizziness, lassitude (weakness, exhaustion), confusion, convulsions; blurred vision; dyspnea (breathing difficulty); abdominal pain, nausea, vomiting

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Aldrin			CAS 309-00-2
C ₁₂ H ₈ Cl ₆			RTECS IO2100000
Synonyms & Trade Names 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-endo-1,4-exo-5,8-dimethanonaphthalene; HHDN; Octalene			DOT ID & Guide 2761 151
Exposure Limits	NIOSH REL: Ca TWA 0.25 mg/m ³ [skin] See Appendix A		
	OSHA PEL: TWA 0.25 mg/m ³ [skin]		
IDLH Ca [25 mg/m ³]		Conversion	
Physical Description Colorless to dark-brown crystalline solid with a mild chemical odor. [Note: Formerly used as an insecticide.]			
MW: 364.9	BP: Decomposes	MLT: 219°F	Sol: 0.003%
VP: 0.00008 mmHg	IP: ?		Sp.Gr: 1.60
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Concentrated mineral acids, active metals, acid catalysts, acid oxidizing agents, phenol			
Measurement Methods NIOSH 5502			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort); myoclonic jerks of limbs; clonic, tonic convulsions; coma; hematuria (blood in the urine), azotemia; [potential occupational carcinogen]
Target Organs central nervous system, liver, kidneys, skin
Cancer Site [in animals: tumors of the lungs, liver, thyroid & adrenal glands]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Allyl alcohol			CAS 107-18-6
CH ₂ =CHCH ₂ OH			RTECS BA5075000
Synonyms & Trade Names AA, Allylic alcohol, Propenol, 1-Propen-3-ol, 2-Propenol, Vinyl carbinol			DOT ID & Guide 1098 131
Exposure Limits	NIOSH REL: TWA 2 ppm (5 mg/m ³) ST 4 ppm (10 mg/m ³) [skin]		
	OSHA PEL†: TWA 2 ppm (5 mg/m ³) [skin]		
IDLH 20 ppm		Conversion 1 ppm = 2.38 mg/m ³	
Physical Description Colorless liquid with a pungent, mustard-like odor.			
MW: 58.1	BP: 205°F	FRZ: -200°F	Sol: Miscible
VP: 17 mmHg	IP: 9.63 eV		Sp.Gr: 0.85
Fl.P: 70°F	UEL: 18.0%	LEL: 2.5%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, acids, carbon tetrachloride [Note: Polymerization may be caused by elevated temperatures, oxidizers, or peroxides.]			
Measurement Methods NIOSH 1402			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 20 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

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

Symptoms Eye irritation, tissue damage; irritation upper respiratory system, skin; pulmonary edema

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Allyl chloride			CAS 107-05-1
CH ₂ =CHCH ₂ Cl			RTECS UC7350000
Synonyms & Trade Names 3-Chloropropene, 1-Chloro-2-propene, 3-Chloropropylene			DOT ID & Guide 1100 131
Exposure Limits	NIOSH REL: TWA 1 ppm (3 mg/m ³) ST 2 ppm (6 mg/m ³)		
	OSHA PEL†: TWA 1 ppm (3 mg/m ³)		
IDLH 250 ppm		Conversion 1 ppm = 3.13 mg/m ³	
Physical Description Colorless, brown, yellow, or purple liquid with a pungent, unpleasant odor.			
MW: 76.5	BP: 113°F	MLT: -210°F	Sol: 0.4%
VP: 295 mmHg	IP: 10.05 eV		Sp.Gr: 0.94
Fl.P: -25°F	UEL: 11.1%	LEL: 2.9%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, acids, amines, iron & aluminum chlorides, magnesium, zinc			
Measurement Methods NIOSH 1000; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 25 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 50 ppm : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 250 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, mucous membrane; pulmonary edema; in animals: liver, kidney injury
Target Organs Eyes, skin, respiratory system, liver, kidneys
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Allyl glycidyl ether			CAS 106-92-3
C ₆ H ₁₀ O ₂			RTECS RR0875000
Synonyms & Trade Names AGE; 1-Allyloxy-2,3-epoxypropane; Glycidyl allyl ether; [(2-Propenyloxy)methyl] oxirane			DOT ID & Guide 2219 129
Exposure Limits	NIOSH REL: TWA 5 ppm (22 mg/m ³) ST 10 ppm (44 mg/m ³) [skin]		
	OSHA PEL†: C 10 ppm (45 mg/m ³)		
IDLH 50 ppm		Conversion 1 ppm = 4.67 mg/m ³	
Physical Description Colorless liquid with a pleasant odor.			
MW: 114.2	BP: 309°F	FRZ: -148°F [forms glass]	Sol: 14%
VP: 2 mmHg	IP: ?		Sp.Gr: 0.97
Fl.P: 135°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 2545			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 50 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, respiratory system; dermatitis; pulmonary edema; narcosis; possible hematopoietic, reproductive effects
Target Organs Eyes, skin, respiratory system, blood, reproductive system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Allyl propyl disulfide			CAS 2179-59-1
H ₂ C=CHCH ₂ S ₂ CH ₂ CH ₂ CH ₃			RTECS JO0350000
Synonyms & Trade Names 4,5-Dithia-1-octene; Onion oil; 2-Propenyl propyl disulfide; Propyl allyl disulfide			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 2 ppm (12 mg/m ³) ST 3 ppm (18 mg/m ³)		
	OSHA PEL†: TWA 2 ppm (12 mg/m ³)		
IDLH N.D. See: IDLH INDEX		Conversion 1 ppm = 6.07 mg/m ³	
Physical Description Pale-yellow liquid with a strong & irritating onion-like odor. [Note: The chief volatile component of onion oil.]			
MW: 148.3	BP: ?	FRZ: 5°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr(59°F): 0.93
FLP: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, nose, respiratory system; lacrimation (discharge of tears)			
Target Organs Eyes, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

alpha-Alumina			CAS 1344-28-1
Al ₂ O ₃			RTECS BD1200000
Synonyms & Trade Names Alumina, Aluminum oxide, Aluminum trioxide [Note: alpha-Alumina is the main component of technical grade alumina. Corundum is natural Al ₂ O ₃ . Emery is an impure crystalline variety of Al ₂ O ₃ .]			DOT ID & Guide
Exposure Limits		NIOSH REL: See Appendix D OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)	
IDLH N.D.		Conversion	
Physical Description White, odorless, crystalline powder.			
MW: 101.9	BP: 5396°F	MLT: 3632°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 4.0
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible solid, but dusts may form explosive mixtures in air.			
Incompatibilities & Reactivities Chlorine trifluoride, hot chlorinated rubber, acids, oxidizers [Note: Hydrogen gas may be formed when finely divided iron contacts moisture during crushing & milling operations.]			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Blot/brush away Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes Irritation eyes, skin, respiratory system			
Symptoms irritation eyes, skin, respiratory system			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Aluminum			CAS 7429-90-5
Al			RTECS BD0330000
Synonyms & Trade Names Aluminium, Aluminum metal, Aluminum powder, Elemental aluminum			DOT ID & Guide 1309 170 (powder, coated) 1396 138 (powder, uncoated) 9260 169 (molten)
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Silvery-white, malleable, ductile, odorless metal.			
MW: 27.0	BP: 4221°F	MLT: 1220°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.70
Fl.P: NA	UEL: NA	LEL: NA	
Combustible Solid, finely divided dust is easily ignited; may cause explosions.			
Incompatibilities & Reactivities Strong oxidizers & acids, halogenated hydrocarbons [Note: Corrodes in contact with acids & other metals. Ignition may occur if powders are mixed with halogens, carbon disulfide, or methyl chloride.]			
Measurement Methods NIOSH 7013, 7300; OSHA ID121			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Aluminum (pyro powders and welding fumes, as Al)			CAS
			RTECS
Synonyms & Trade Names Synonyms vary depending upon the specific aluminum compound.			DOT ID & Guide 1383 135 (powder, pyrophoric)
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Appearance and odor vary depending upon the specific aluminum compound.			
Properties vary depending upon the specific aluminum compound.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 7300			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation skin, respiratory system; pulmonary fibrosis			
Target Organs Skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Aluminum (soluble salts and alkyls, as Al)		CAS	
		RTECS	
Synonyms & Trade Names Synonyms vary depending upon the specific aluminum compound.		DOT ID & Guide 3051 135 (alkyls)	
Exposure Limits	NIOSH REL: TWA 2 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Appearance and odor vary depending upon the specific aluminum compound.			
Properties vary depending upon the specific aluminum compound.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 7300; OSHA ID121			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation skin, respiratory system; skin burns			
Target Organs Skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

4-Aminodiphenyl			CAS 92-67-1
C ₆ H ₅ C ₆ H ₄ NH ₂			RTECS DU8925000
Synonyms & Trade Names 4-Aminobiphenyl, p-Aminobiphenyl, p-Aminodiphenyl, 4-Phenylaniline			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1011] See Appendix B		
IDLH Ca [N.D.]		Conversion	
Physical Description Colorless crystals with a floral odor. [Note: Turns purple on contact with air.]			
MW: 169.2	BP: 576°F	MLT: 127°F	Sol: Slight
VP(227°F): 1 mmHg	IP: ?		Sp.Gr: 1.16
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid, but must be preheated before ignition possible.			
Incompatibilities & Reactivities Oxidized by air			
Measurement Methods NIOSH P&CAM269 (II-4); OSHA 93			
Personal Protection & Sanitation 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) 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Headache, dizziness; drowsiness, dyspnea (breathing difficulty); ataxia, lassitude (weakness, exhaustion); methemoglobinemia; urinary burning; acute hemorrhagic cystitis; [potential occupational carcinogen]
Target Organs Bladder, skin
Cancer Site [bladder cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Aminopyridine			CAS 504-29-0
NH ₂ C ₅ H ₄ N			RTECS US1575000
Synonyms & Trade Names alpha-Aminopyridine, alpha-Pyridylamine			DOT ID & Guide 2671 153
Exposure Limits	NIOSH REL: TWA 0.5 ppm (2 mg/m ³)		
	OSHA PEL: TWA 0.5 ppm (2 mg/m ³)		
IDLH 5 ppm		Conversion 1 ppm = 3.85 mg/m ³	
Physical Description White powder, leaflets, or crystals with a characteristic odor.			
MW: 94.1	BP: 411°F	MLT: 137°F	Sol: >100%
VP(77°F): 0.8 mmHg	IP: 8.00 eV		Sp.Gr: ?
Fl.P: 154°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH S158 (II-4)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose, throat; headache, dizziness; excitement; nausea; high blood pressure; respiratory distress; lassitude (weakness, exhaustion); convulsions; stupor
Target Organs central nervous system, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Amitrole			CAS 61-82-5
C ₂ H ₄ N ₄			RTECS XZ3850000
Synonyms & Trade Names Aminotriazole; 3-Aminotriazole; 2-Amino-1,3,4-triazole; 3-Amino-1,2,4-triazole			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca TWA 0.2 mg/m ³ See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Colorless to white, crystalline powder. [herbicide] [Note: Odorless when pure.]			
MW: 84.1	BP: ?	MLT: 318°F	Sol(77°F): 28%
VP: <0.000008 mmHg	IP: ?		Sp.Gr: 1.14
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Light (decomposes), strong oxidizers [Note: Corrosive to iron, aluminum & copper.]			
Measurement Methods NIOSH 0500; OSHA PV2006			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-			

contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; dyspnea (breathing difficulty), muscle spasms, ataxia, anorexia, salivation, increased body temperature; lassitude (weakness, exhaustion), skin dryness, depression (thyroid function suppression)
Target Organs Eyes, skin, thyroid
Cancer Site [in animals: liver, thyroid & pituitary gland tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ammonia			CAS 7664-41-7
NH ₃			RTECS BO0875000
Synonyms & Trade Names Anhydrous ammonia, Aqua ammonia, Aqueous ammonia [Note: Often used in an aqueous solution.]			DOT ID & Guide 1005 125 (anhydrous) 2672 154 (10-35% solution) 2073 125 (>35-50% solution) 1005 125 (>50% solution)
Exposure Limits	NIOSH REL: TWA 25 ppm (18 mg/m ³) ST 35 ppm (27 mg/m ³)		
	OSHA PEL†: TWA 50 ppm (35 mg/m ³)		
IDLH 300 ppm		Conversion 1 ppm = 0.70 mg/m ³	
Physical Description Colorless gas with a pungent, suffocating odor. [Note: Shipped as a liquefied compressed gas. Easily liquefied under pressure.]			
MW: 17.0	BP: -28°F	FRZ: -108°F	Sol: 34%
VP: 8.5 atm	IP: 10.18 eV	RGasD: 0.60	
Fl.P: NA (Gas)	UEL: 28%	LEL: 15%	
[Note: Although NH ₃ does not meet the DOT definition of a Flammable Gas (for labeling purposes), it should be treated as one.]			
Incompatibilities & Reactivities Strong oxidizers, acids, halogens, salts of silver & zinc [Note: Corrosive to copper & galvanized surfaces.]			
Measurement Methods NIOSH 6015, 6016; OSHA ID188			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated (solution) Remove: When wet or contaminated (solution) Change: No recommendation Provide: Eyewash (>10%), Quick drench (>10%)		First Aid (See procedures) Eye: Irrigate immediately (solution/liquid) Skin: Water flush immediately (solution/liquid) Breathing: Respiratory support Swallow: Medical attention immediately (solution)	
Respirator Recommendations NIOSH Up to 250 ppm : (APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the			

compound of concern*/(APF = 10) Any supplied-air respirator*
Up to 300 ppm: (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*/(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 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, nose, throat; dyspnea (breathing difficulty), wheezing, chest pain; pulmonary edema; pink frothy sputum; skin burns, vesiculation; liquid: frostbite

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ammonium chloride fume			CAS 12125-02-9
NH ₄ Cl			RTECS BP4550000
Synonyms & Trade Names Ammonium chloride, Ammonium muriate fume, Sal ammoniac fume			DOT ID & Guide 9085 171
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ ST 20 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Finely divided, odorless, white particulate dispersed in air.			
MW: 53.5	BP: Sublimes	MLT: 662°F (Sublimes)	Sol: 37%
VP(321°F): 1 mmHg	IP: NA		Sp.Gr: 1.53
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Alkalis & their carbonates, lead & silver salts, strong oxidizers, ammonium nitrate, potassium chlorate, bromine trifluoride [Note: Corrodes most metals at high (i.e., fire) temperatures.]			
Measurement Methods OSHA ID188			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; cough, dyspnea (breathing difficulty), pulmonary sensitization			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ammonium sulfamate			CAS 7773-06-0
NH ₄ OSO ₂ NH ₂			RTECS WO6125000
Synonyms & Trade Names Ammate herbicide, Ammonium amidosulfonate, AMS, Monoammonium salt of sulfamic acid, Sulfamate			DOT ID & Guide 9089 171
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH 1500 mg/m ³		Conversion	
Physical Description Colorless to white crystalline, odorless solid. [herbicide]			
MW: 114.1	BP: 320°F (Decomposes)	MLT: 268°F	Sol: 200%
VP: 0 mmHg (approx)	IP: ?		Sp.Gr: 1.77
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Acids, hot water [Note: Elevated temperatures cause a highly exothermic reaction with water.]			
Measurement Methods NIOSH S348 (II-5)			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 50 mg/m³ : (APF = 5) Any dust and mist respirator Up to 100 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 250 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter			

Up to 500 mg/m : (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 air-purifying, full-facepiece respirator 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

Up to 1500 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, nose, throat; cough, dyspnea (breathing difficulty)

Target Organs Eyes, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Amyl acetate			CAS 628-63-7
CH ₃ COO[CH ₂] ₄ CH ₃			RTECS AJ1925000
Synonyms & Trade Names Amyl acetic ester, Amyl acetic ether, 1-Pentanol acetate, Pentyl ester of acetic acid, Primary amyl acetate			DOT ID & Guide 1104 129
Exposure Limits	NIOSH REL: TWA 100 ppm (525 mg/m ³)		
	OSHA PEL: TWA 100 ppm (525 mg/m ³)		
IDLH 1000 ppm		Conversion 1 ppm = 5.33 mg/m ³	
Physical Description Colorless liquid with a persistent banana-like odor.			
MW: 130.2	BP: 301°F	FRZ: -95°F	Sol: 0.2%
VP: 4 mmHg	IP: ?		Sp.Gr: 0.88
Fl.P: 77°F	UEL: 7.5%	LEL: 1.1%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1450, 2549; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1000 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

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

Symptoms Irritation eyes, nose; dermatitis; possible central nervous system depression, narcosis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

sec-Amyl acetate			CAS 626-38-0
CH ₃ COOCH(CH ₃)C ₃ H ₇			RTECS AJ2100000
Synonyms & Trade Names 1-Methylbutyl acetate, 2-Pentanol acetate, 2-Pentyl ester of acetic acid			DOT ID & Guide 1104 129
Exposure Limits	NIOSH REL: TWA 125 ppm (650 mg/m ³)		
	OSHA PEL: TWA 125 ppm (650 mg/m ³)		
IDLH 1000 ppm		Conversion 1 ppm = 5.33 mg/m ³	
Physical Description Colorless liquid with a mild odor.			
MW: 130.2	BP: 249°F	FRZ: -109°F	Sol: Slight
VP: 7 mmHg	IP: ?		Sp.Gr: 0.87
Fl.P: 89°F	UEL: 7.5%	LEL: 1%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1450, 2549; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1000 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

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

Symptoms Irritation eyes, skin, nose; narcosis; dermatitis; possible kidney, liver injury; possible central nervous system depression

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Aniline (and homologs)		CAS 62-53-3	
C₆H₅NH₂		RTECS BW6650000	
Synonyms & Trade Names Aminobenzene, Aniline oil, Benzenamine, Phenylamine		DOT ID & Guide 1547 153	
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: TWA 5 ppm (19 mg/m ³) [skin]		
IDLH Ca [100 ppm]		Conversion 1 ppm = 3.81 mg/m ³	
Physical Description Colorless to brown, oily liquid with an aromatic amine-like odor. [Note: A solid below 21°F.]			
MW: 93.1	BP: 363°F	FRZ: 21°F	Sol: 4%
VP: 0.6 mmHg	IP: 7.70 eV		Sp.Gr: 1.02
Fl.P: 158°F	UEL: 11%	LEL: 1.3%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids, toluene diisocyanate, alkalis			
Measurement Methods NIOSH 2002, 2017			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) 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			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Headache, lassitude (weakness, exhaustion), dizziness; cyanosis; ataxia; dyspnea (breathing difficulty) on effort; tachycardia; irritation eyes; methemoglobinemia; cirrhosis; [potential occupational carcinogen]
Target Organs Blood, cardiovascular system, eyes, liver, kidneys, respiratory system
Cancer Site [bladder cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Anisidine			CAS 90-04-0
NH ₂ C ₆ H ₄ OCH ₃			RTECS BZ5410000
Synonyms & Trade Names ortho-Aminoanisole, 2-Anisidine, o-Methoxyaniline [Note: o-Anisidine has been used as a basis for many dyes.]			DOT ID & Guide 2431 153
Exposure Limits	NIOSH REL: Ca 0.5 mg/m ³ [skin] See Appendix A		
	OSHA PEL: TWA 0.5 mg/m ³ [skin]		
IDLH Ca [50 mg/m ³]		Conversion	
Physical Description Red or yellow, oily liquid with an amine-like odor. [Note: A solid below 41°F.]			
MW: 123.2	BP: 437°F	FRZ: 41°F	Sol(77°F): 1%
VP: <0.1 mmHg	IP: 7.44 eV		Sp.Gr: 1.10
Fl.P(oc): 244°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 2514			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Headache, dizziness; cyanosis; red blood cell Heinz bodies; [potential occupational carcinogen]
Target Organs Blood, kidneys, liver, cardiovascular system, central nervous system
Cancer Site [in animals: tumors of the thyroid gland, bladder & kidneys]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

p-Anisidine			CAS 104-94-9
NH₂C₆H₄OCH₃			RTECS BZ5450000
Synonyms & Trade Names para-Aminoanisole, 4-Anisidine, p-Methoxyaniline			DOT ID & Guide 2431 153
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³ [skin]		
	OSHA PEL: TWA 0.5 mg/m ³ [skin]		
IDLH 50 mg/m ³		Conversion	
Physical Description Yellow to brown, crystalline solid with an amine-like odor.			
MW: 123.2	BP: 475°F	MLT: 135°F	Sol: Moderate
VP(77°F): 0.006 mmHg	IP: 7.44 eV		Sp.Gr: 1.07
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 2514			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 12.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter Up to 25 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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*

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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Headache, dizziness; cyanosis; red blood cell Heinz bodies

Target Organs Blood, kidneys, liver, cardiovascular system, central nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Antimony			CAS 7440-36-0
Sb			RTECS CC4025000
Synonyms & Trade Names Antimony metal, Antimony powder, Stibium			DOT ID & Guide 1549 157 (inorganic compounds, n.o.s.) 2871 170 (powder) 3141 157 (inorganic liquid compounds, n.o.s.)
Exposure Limits	NIOSH REL*: TWA 0.5 mg/m ³ [*Note: The REL also applies to other antimony compounds (as Sb).]		
	OSHA PEL*: TWA 0.5 mg/m ³ [*Note: The PEL also applies to other antimony compounds (as Sb).]		
IDLH 50 mg/m ³ (as Sb)		Conversion	
Physical Description Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder.			
MW: 121.8	BP: 2975°F	MLT: 1166°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 6.69
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form, but a moderate explosion hazard in the form of dust when exposed to flame.			
Incompatibilities & Reactivities Strong oxidizers, acids, halogenated acids [Note: Stibine is formed when antimony is exposed to nascent (freshly formed) hydrogen.]			
Measurement Methods NIOSH P&CAM261 (II-4); OSHA ID121, ID125G, ID206			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA			

3

Up to 5 mg/m : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators^/(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 dust and mist filter^

Up to 25 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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

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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly

Target Organs Eyes, skin, respiratory system, cardiovascular system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

ANTU			CAS 86-88-4
C ₁₀ H ₇ NHC(NH ₂)S			RTECS YT9275000
Synonyms & Trade Names alpha-Naphthyl thiocarbamide, 1-Naphthyl thiourea, alpha-Naphthyl thiourea			DOT ID & Guide 1651 153
Exposure Limits	NIOSH REL: TWA 0.3 mg/m ³		
	OSHA PEL: TWA 0.3 mg/m ³		
IDLH 100 mg/m ³		Conversion	
Physical Description White crystalline or gray, odorless powder. [rodenticide]			
MW: 202.3	BP: Decomposes	MLT: 388°F	Sol: 0.06%
VP: Low	IP: ?		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers, silver nitrate			
Measurement Methods NIOSH S276 (II-5)			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 3 mg/m ³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter/(APF = 10) Any supplied-air respirator Up to 7.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter Up to 15 mg/m ³ : (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas			

mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(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 100 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 organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, ingestion

Symptoms After ingestion of large doses: vomiting, dyspnea (breathing difficulty), cyanosis, coarse pulmonary rales; liver damage

Target Organs respiratory system, blood, liver

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Arsenic (inorganic compounds, as As)			CAS 7440-38-2 (metal)
As (metal)			RTECS CG0525000 (metal)
Synonyms & Trade Names Arsenic metal: Arsenia Other synonyms vary depending upon the specific As compound. [Note: OSHA considers "Inorganic Arsenic" to mean copper acetoarsenite & all inorganic compounds containing arsenic except ARSINE.]			DOT ID & Guide 1558 152 (metal) 1562 152 (dust)
Exposure Limits	NIOSH REL: Ca C 0.002 mg/m ³ [15-minute] See Appendix A		
	OSHA PEL: [1910.1018] TWA 0.010 mg/m ³		
IDLH Ca [5 mg/m ³ (as As)]		Conversion	
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.]			
Measurement Methods NIOSH 7300, 7900; OSHA ID105			
Personal Protection & Sanitation 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) 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 acid gas canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

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

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

Cancer Site [lung & lymphatic cancer]

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Arsenic, organic compounds (as As)		CAS	
		RTECS	
Synonyms & Trade Names Synonyms vary depending upon the specific organic arsenic compound.		DOT ID & Guide	
Exposure Limits	NIOSH REL: none		
	OSHA PEL: TWA 0.5 mg/m ³		
IDLH N.D.		Conversion	
Physical Description Appearance and odor vary depending upon the specific organic arsenic compound.			
Properties vary depending upon the specific organic arsenic compound.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 5022			
Personal Protection & Sanitation Recommendations regarding personal protective clothing vary depending upon the specific compound. Recommendations regarding eye protection vary depending upon the specific compound. Recommendations regarding washing the skin vary depending upon the specific compound. Recommendations regarding the removal of personal protective clothing that becomes wet or contaminated vary depending upon the specific compound. Recommendations regarding the daily changing of personal protective clothing vary depending upon the specific compound. Recommendations regarding the need for eyewash or quick drench facilities vary depending upon the specific		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	

compound.	
Respirator Recommendations To be added later	
Exposure Routes inhalation, ingestion, skin and/or eye contact	
Symptoms In animals: irritation skin, possible dermatitis; respiratory distress; diarrhea; kidney damage; muscle tremor, convulsions; possible gastrointestinal tract, reproductive effects; possible liver damage	
Target Organs Skin, respiratory system, kidneys, central nervous system, liver, gastrointestinal tract, reproductive system	
See also: INTRODUCTION	

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Arsine			CAS 7784-42-1
AsH ₃			RTECS CG6475000
Synonyms & Trade Names Arsenic hydride, Arsenic trihydride, Arseniuretted hydrogen, Arsenous hydride, Hydrogen arsenide			DOT ID & Guide 2188 119
Exposure Limits	NIOSH REL: Ca C 0.002 mg/m ³ [15-minute] See Appendix A		
	OSHA PEL: TWA 0.05 ppm (0.2 mg/m ³)		
IDLH Ca [3 ppm]		Conversion 1 ppm = 3.19 mg/m ³	
Physical Description Colorless gas with a mild, garlic-like odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 78.0	BP: -81°F	FRZ: -179°F	Sol: 20%
VP(70°F): 14.9 atm	IP: 9.89 eV	RGasD: 2.69	
Fl.P: NA (Gas)	UEL: 78%	LEL: 5.1%	
Flammable Gas			
Incompatibilities & Reactivities Strong oxidizers, chlorine, nitric acid [Note: Decomposes above 446°F. There is a high potential for the generation of arsine gas when inorganic arsenic is exposed to nascent (freshly formed) hydrogen.]			
Measurement Methods NIOSH 6001; OSHA ID105			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) 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: (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
Exposure Routes inhalation, skin and/or eye contact (liquid)
Symptoms Headache, malaise (vague feeling of discomfort), lassitude (weakness, exhaustion), dizziness; dyspnea (breathing difficulty); abdominal, back pain; nausea, vomiting; bronze skin; hematuria (blood in the urine); jaundice; peripheral neuropathy; liquid: frostbite; [potential occupational carcinogen]
Target Organs Blood, kidneys, liver
Cancer Site [lung & lymphatic cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Asbestos			CAS 1332-21-4
Hydrated mineral silicates			RTECS CI6475000
Synonyms & Trade Names Actinolite, Actinolite asbestos, Amosite (cummingtonite-grunerite), Anthophyllite, Anthophyllite asbestos, Chrysotile, Crocidolite (Riebeckite), Tremolite, Tremolite asbestos			DOT ID & Guide 2212 171 (blue, brown) 2590 171 (white)
Exposure Limits	NIOSH REL: Ca See Appendix A See Appendix C		
	OSHA PEL: [1910.1001] [1910.1101] See Appendix C		
IDLH Ca [N.D.]		Conversion	
Physical Description White or greenish (chrysotile), blue (crocidolite), or gray-green (amosite) fibrous, odorless solids.			
MW: Varies	BP: Decomposes	MLT: 1112°F (Decomposes)	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solids			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 7400, 7402; OSHA ID160, ID191			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Asbestosis (chronic exposure): dyspnea (breathing difficulty), interstitial fibrosis, restricted pulmonary function, finger clubbing; irritation eyes; [potential occupational carcinogen]
Target Organs respiratory system, eyes
Cancer Site [lung cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Asphalt fumes		CAS 8052-42-4	
		RTECS CI9900000	
Synonyms & Trade Names Asphalt: Asphaltum, Bitumen (European term), Petroleum asphalt, Petroleum bitumen, Road asphalt, Roofing asphalt		DOT ID & Guide 1999 130 (asphalt)	
Exposure Limits	NIOSH REL: Ca C 5 mg/m ³ [15-minute] See Appendix A		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Fumes generated during the production or application of asphalt (a dark-brown to black cement-like substance manufactured by the vacuum distillation of crude petroleum oil).			
Properties vary depending upon the specific asphalt formulation or mixture.			
Asphalt: Combustible Solid			
Incompatibilities & Reactivities None reported [Note: Asphalt becomes molten at about 200°F.]			
Measurement Methods NIOSH 5042			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, skin and/or eye contact
Symptoms Irritation eyes, respiratory system; [potential occupational carcinogen]
Target Organs Eyes, respiratory system
Cancer Site [in animals: skin tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Atrazine			CAS 1912-24-9
C ₈ H ₁₄ ClN ₅			RTECS XY5600000
Synonyms & Trade Names 2-Chloro-4-ethylamino-6-isopropylamino-s-triazine; 6-Chloro-N-ethyl-N'- (1-methylethyl)-1,3,5-triazine-2,4-diamine			DOT ID & Guide 2763 151 (triazine pesticide)
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless or white, odorless, crystalline powder. [herbicide]			
MW: 215.7	BP: Decomposes	MLT: 340°F	Sol: 0.003%
VP: 0.0000003 mmHg	IP: NA		Sp.Gr: 1.19
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be mixed with flammable liquids.			
Incompatibilities & Reactivities Strong acids, strong bases			
Measurement Methods NIOSH 5602			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; dermatitis, sensitization skin; dyspnea (breathing difficulty), lassitude (weakness, exhaustion), incoordination, salivation; hypothermia; liver injury			
Target Organs Eyes, skin, respiratory system, central nervous system, liver			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Azinphos-methyl		CAS 86-50-0	
C ₁₀ H ₁₂ O ₃ PS ₂ N ₃		RTECS TE1925000	
Synonyms & Trade Names O,O-Dimethyl-S-4-oxo-1,2,3-benzotriazin-3(4H)-ylmethyl phosphorodithioate; Guthion®; Methyl azinphos		DOT ID & Guide 2783 152	
Exposure Limits	NIOSH REL: TWA 0.2 mg/m ³ [skin]		
	OSHA PEL: TWA 0.2 mg/m ³ [skin]		
IDLH 10 mg/m ³		Conversion	
Physical Description Colorless crystals or a brown, waxy solid. [insecticide]			
MW: 317.3	BP: Decomposes	MLT: 163°F	Sol: 0.003%
VP: 8 x 10 ⁻⁹ mmHg	IP: ?		Sp.Gr: 1.44
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers, acids			
Measurement Methods NIOSH 5600			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2 mg/m ³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter/(APF = 10) Any supplied-air respirator Up to 5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter Up to 10 mg/m ³ : (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)			

in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(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

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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Miosis; ache eyes; blurred vision, lacrimation (discharge of tears), rhinorrhea (discharge of thin mucus); headache; tightness chest, wheezing, laryngeal spasm; salivation; cyanosis; anorexia; nausea, vomiting, diarrhea; sweating; twitching, paralysis, convulsions; low blood pressure, cardiac irregularities

Target Organs respiratory system, central nervous system, cardiovascular system, blood cholinesterase

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Barium chloride (as Ba)			CAS 10361-37-2
BaCl ₂			RTECS CQ8750000
Synonyms & Trade Names Barium dichloride			DOT ID & Guide 1564 154 (barium compounds, n.o.s.)
Exposure Limits	NIOSH REL*: TWA 0.5 mg/m ³ [*Note: The REL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]		
	OSHA PEL*: TWA 0.5 mg/m ³ [*Note: The PEL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]		
IDLH 50 mg/m ³ (as Ba)		Conversion	
Physical Description White, odorless solid.			
MW: 208.2	BP: 2840°F	MLT: 1765°F	Sol: 38%
VP: Low	IP: ?		Sp.Gr: 3.86
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Acids, oxidizers			
Measurement Methods NIOSH 7056; OSHA ID121			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 12.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter			

Up to 25 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Barium nitrate (as Ba)			CAS 10022-31-8
Ba(NO ₃) ₂			RTECS CQ9625000
Synonyms & Trade Names Barium dinitrate, Barium(II) nitrate (1:2), Barium salt of nitric acid			DOT ID & Guide 1446 141
Exposure Limits	NIOSH REL*: TWA 0.5 mg/m ³ [*Note: The REL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]		
	OSHA PEL*: TWA 0.5 mg/m ³ [*Note: The PEL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]		
IDLH 50 mg/m ³ (as Ba)		Conversion	
Physical Description White, odorless solid.			
MW: 261.4	BP: Decomposes	MLT: 1094°F	Sol: 9%
VP: Low	IP: ?		Sp.Gr: 3.24
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but will accelerate the burning of combustible materials.			
Incompatibilities & Reactivities Acids, oxidizers, aluminum-magnesium alloys, (barium dioxide + zinc) [Note: Contact with combustible material may cause fire.]			
Measurement Methods NIOSH 7056; OSHA ID121			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 12.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter			

Up to 25 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Barium sulfate			CAS 7727-43-7
BaSO ₄			RTECS CR0600000
Synonyms & Trade Names Artificial barite, Barite, Barium salt of sulfuric acid, Barytes (natural)			DOT ID & Guide 1564 154 (barium compounds, n.o.s.)
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description White or yellowish, odorless powder.			
MW: 233.4	BP: 2912°F (Decomposes)	MLT: 2876°F	Sol(64°F): 0.0002%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 4.25-4.5
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Phosphorus, aluminum [Note: Aluminum in the presence of heat can cause an explosion.]			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: No recommendation Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, nose, upper respiratory system; benign pneumoconiosis (baritosis)			
Target Organs Eyes, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Benomyl			CAS 17804-35-2
C₁₄H₁₈N₄O₃			RTECS DD6475000
Synonyms & Trade Names Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate			DOT ID & Guide 2757 151 (carbamate pesticide, solid)
Exposure Limits		NIOSH REL: See Appendix D	
		OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)	
IDLH N.D.		Conversion	
Physical Description White crystalline solid with a faint, acrid odor. [fungicide] [Note: Decomposes without melting above 572°F.]			
MW: 290.4	BP: Decomposes	MLT: >572°F (Decomposes)	Sol: 0.0004%
VP: <0.00001 mmHg	IP: NA		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Heat, strong acids, strong alkalis			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
		Respirator Recommendations To be added later	
		Exposure Routes inhalation, ingestion, skin and/or eye contact	
		Symptoms Irritation eyes, skin, upper respiratory system; skin sensitization; possible reproductive, teratogenic effects	
		Target Organs Eyes, skin, respiratory system, reproductive system	

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Benzene			CAS 71-43-2
C ₆ H ₆			RTECS CY1400000
Synonyms & Trade Names Benzol, Phenyl hydride			DOT ID & Guide 1114 130
Exposure Limits	NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm See Appendix A		
	OSHA PEL: [1910.1028] TWA 1 ppm ST 5 ppm See Appendix F		
IDLH Ca [500 ppm]		Conversion 1 ppm = 3.19 mg/m ³	
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			
Measurement Methods NIOSH 1500, 1501, 3700, 3800; OSHA 12			
Personal Protection & Sanitation 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) 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			

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]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Benzenethiol			CAS 108-98-5
C ₆ H ₅ SH			RTECS DC0525000
Synonyms & Trade Names Mercaptobenzene, Phenyl mercaptan, Thiophenol			DOT ID & Guide 2337 131
Exposure Limits	NIOSH REL: C 0.1 ppm (0.5 mg/m ³) [15-minute]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.51 mg/m ³	
Physical Description Water-white liquid with an offensive, garlic-like odor. [Note: A solid below 5°F.]			
MW: 110.2	BP: 336°F	FRZ: 5°F	Sol(77°F): 0.08%
VP(65°F): 1 mmHg	IP: 8.33 eV		Sp.Gr: 1.08
Fl.P: 132°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong acids & bases, calcium hypochlorite, alkali metals [Note: Oxidizes on exposure to air.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 1 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator Up to 2.5 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 5 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
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

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

Symptoms Irritation eyes, skin, respiratory system; dermatitis; cyanosis; cough, wheezing, dyspnea (breathing difficulty), pulmonary edema, pneumonitis; headache, dizziness, central nervous system depression; nausea, vomiting; kidney, liver, spleen damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Benzidine			CAS 92-87-5
NH ₂ C ₆ H ₄ C ₆ H ₄ NH ₂			RTECS DC9625000
Synonyms & Trade Names Benzidine-based dyes; 4,4'-Bianiline; 4,4'-Biphenyldiamine; 1,1'-Biphenyl-4,4'-diamine; 4,4'-Diaminobiphenyl; p-Diaminodiphenyl [Note: Benzidine has been used as a basis for many dyes.]			DOT ID & Guide 1885 153
Exposure Limits	NIOSH REL: Ca See Appendix A See Appendix C		
	OSHA PEL: [1910.1010] See Appendix B See Appendix C		
IDLH Ca [N.D.]		Conversion	
Physical Description Grayish-yellow, reddish-gray, or white crystalline powder. [Note: Darkens on exposure to air and light.]			
MW: 184.3	BP: 752°F	MLT: 239°F	Sol(54°F): 0.04%
VP: Low	IP: ?		Sp.Gr: 1.25
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid, but difficult to burn.			
Incompatibilities & Reactivities Red fuming nitric acid			
Measurement Methods NIOSH 5509; OSHA 65			
Personal Protection & Sanitation 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) 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Hematuria (blood in the urine); secondary anemia from hemolysis; acute cystitis; acute liver disorders; dermatitis; painful, irregular urination; [potential occupational carcinogen]
Target Organs Bladder, skin, kidneys, liver, blood
Cancer Site [liver, kidney & bladder cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Benzoyl peroxide			CAS 94-36-0
(C ₆ H ₅ CO) ₂ O ₂			RTECS DM8575000
Synonyms & Trade Names Benzoperoxide, Dibenzoyl peroxide			DOT ID & Guide 2085 146 2087 146 2088 146 2089 146 2090 146
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL: TWA 5 mg/m ³		
IDLH 1500 mg/m ³		Conversion	
Physical Description Colorless to white crystals or a granular powder with a faint, benzaldehyde-like odor.			
MW: 242.2	BP: Decomposes explosively	MLT: 217°F	Sol: <1%
VP: <1 mmHg	IP: ?		Sp.Gr: 1.33
Fl.P: 176°F	UEL: ?	LEL: ?	
Combustible Solid (easily ignited and burns very rapidly).			
Incompatibilities & Reactivities Combustible substances (wood, paper, etc.), acids, alkalis, alcohols, amines, ethers [Note: Containers may explode when heated. Extremely explosion-sensitive to shock, heat & friction.]			
Measurement Methods NIOSH 5009			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(APF = 10) Any supplied-air respirator*			

Up to 125 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter*

Up to 250 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 1500 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; sensitization dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Benzyl chloride			CAS 100-44-7
C ₆ H ₅ CH ₂ Cl			RTECS XS8925000
Synonyms & Trade Names Chloromethylbenzene, alpha-Chlorotoluene			DOT ID & Guide 1738 156
Exposure Limits	NIOSH REL: C 1 ppm (5 mg/m ³) [15-minute]		
	OSHA PEL: TWA 1 ppm (5 mg/m ³)		
IDLH 10 ppm		Conversion 1 ppm = 5.18 mg/m ³	
Physical Description Colorless to slightly yellow liquid with a pungent, aromatic odor.			
MW: 126.6	BP: 354°F	FRZ: -38°F	Sol: 0.05%
VP: 1 mmHg	IP: ?		Sp.Gr: 1.10
Fl.P: 153°F	UEL: ?	LEL: 1.1%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Oxidizers, acids, copper, aluminum, magnesium, iron, zinc, tin [Note: Can polymerize when in contact with all common metals except nickel & lead. Hydrolyzes in H ₂ O to benzyl alcohol.]			
Measurement Methods NIOSH 1003; OSHA 7			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 10 ppm : (APF = 10) Any chemical cartridge respirator with organic vapor and acid gas cartridge(s)*/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor and acid gas canister/(APF = 25) Any powered, air-purifying respirator with organic vapor and acid gas 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 and acid gas canister/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, nose; lassitude (weakness, exhaustion); irritability; headache; skin eruption; pulmonary edema

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Beryllium & beryllium compounds (as Be)			CAS 7440-41-7 (metal)
Be (metal)			RTECS DS1750000 (metal)
Synonyms & Trade Names Beryllium metal: Beryllium Other synonyms vary depending upon the specific beryllium compound.			DOT ID & Guide 1566 154 (compounds) 1567 134 (powder)
Exposure Limits	NIOSH REL: Ca Not to exceed 0.0005 mg/m ³ See Appendix A		
	OSHA PEL: TWA 0.002 mg/m ³ C 0.005 mg/m ³ 0.025 mg/m ³ [30-minute maximum peak]		
IDLH Ca [4 mg/m ³ (as Be)]		Conversion	
Physical Description Metal: A hard, brittle, gray-white solid.			
MW: 9.0	BP: 4532°F	MLT: 2349°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.85 (metal)
FLP: NA	UEL: NA	LEL: NA	
Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of a powder or dust.			
Incompatibilities & Reactivities Acids, caustics, chlorinated hydrocarbons, oxidizers, molten lithium			
Measurement Methods NIOSH 7102, 7300; OSHA ID125G, ID206			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: Daily Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact
Symptoms Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system
Cancer Site [lung cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Bismuth telluride, doped with Selenium sulfide (as Bi ₂ Te ₃)			CAS
			RTECS
Synonyms & Trade Names Doped bismuth sesquitelluride, Doped bismuth telluride, Doped bismuth tritelluride, Doped tellurobismuthite [Note: Doped with selenium sulfide. Commercial mix may contain 80% Bi ₂ Te ₃ , 20% stannous telluride, plus some tellurium.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Gray, crystalline solid that has been enhanced (doped) with a small amount of selenium sulfide (SeS). [Note: Doping alters the conductivity of a semiconductor.]			
Properties are unavailable but should be similar to Bismuth telluride, undoped.			
			Sp.Gr: ?
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers, moisture			
Measurement Methods NIOSH 0500; OSHA ID121			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			

Exposure Routes	inhalation, skin and/or eye contact
Symptoms	Irritation eyes, skin, upper respiratory system; garlic breath; in animals: pulmonary lesions (nonfibrotic)
Target Organs	Eyes, skin, respiratory system
See also: INTRODUCTION	

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Bismuth telluride, undoped			CAS 1304-82-1
Bi₂Te₃			RTECS EB3110000
Synonyms & Trade Names Bismuth sesqu telluride, Bismuth telluride, Bismuth tritelluride, Tellurobismuthite			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Gray, crystalline solid.			
MW: 800.8	BP: ?	MLT: 1063°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 7.7
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers (e.g., bromine, chlorine, or fluorine), moisture, nitric acid (decomposes)			
Measurement Methods NIOSH 0500, 0600; OSHA ID121			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; garlic breath			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Borates, tetra, sodium salts (Anhydrous)			CAS 1330-43-4
Na ₂ B ₄ O ₇			RTECS ED4588000
Synonyms & Trade Names Anhydrous borax, Borax dehydrated, Disodium salt of boric acid, Disodium tetrabromate, Fused borax, Sodium borate (anhydrous), Sodium tetraborate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White to gray, odorless powder. [herbicide] [Note: Becomes opaque on exposure to air.]			
MW: 201.2	BP: 2867°F (Decomposes)	MLT: 1366°F	Sol: 4%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.37
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Moisture [Note: Forms partial hydrate in moist air.]			
Measurement Methods NIOSH 0500; OSHA ID125G			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; dermatitis; epistaxis (nosebleed); cough, dyspnea (breathing difficulty)			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Borates, tetra, sodium salts (Decahydrate)			CAS 1303-96-4
Na₂B₄O₇ • 10H₂O			RTECS VZ2275000
Synonyms & Trade Names Borax, Borax decahydrate, Sodium borate decahydrate, Sodium tetraborate decahydrate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White, odorless, crystalline solid. [herbicide] [Note: Becomes anhydrous at 608°F.]			
MW: 381.4	BP: 608°F	MLT: 167°F	Sol: 6%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.73
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid (an inherent fire retardant).			
Incompatibilities & Reactivities Zirconium, strong acids, metallic salts			
Measurement Methods NIOSH 0500; OSHA ID125G			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; dermatitis; epistaxis (nosebleed); cough, dyspnea (breathing difficulty)			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Borates, tetra, sodium salts (Pentahydrate)			CAS 12179-04-3
Na ₂ B ₄ O ₇ • 5H ₂ O			RTECS
Synonyms & Trade Names Borax pentahydrate, Sodium borate pentahydrate, Sodium tetraborate pentahydrate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless or white, odorless crystals or free-flowing powder. [herbicide] [Note: Begins to lose water of hydration at 252°F.]			
MW: 291.4	BP: ?	MLT: 392°F	Sol: 3%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.82
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported [However, see the reactivities & incompatibilities reported for the related substance Borax decahydrate above.]			
Measurement Methods NIOSH 0500; OSHA ID125G			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; dermatitis; epistaxis (nosebleed); cough, dyspnea (breathing difficulty)			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Boron oxide			CAS 1303-86-2
B ₂ O ₃			RTECS ED7900000
Synonyms & Trade Names Boric anhydride, Boric oxide, Boron trioxide			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³		
	OSHA PEL†: TWA 15 mg/m ³		
IDLH 2000 mg/m ³		Conversion	
Physical Description Colorless, semitransparent lumps or hard, white, odorless crystals.			
MW: 69.6	BP: 3380°F	MLT: 842°F	Sol: 3%
VP: 0 mmHg (approx)	IP: 13.50 eV		Sp.Gr: 2.46
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Water [Note: Reacts slowly with water to form boric acid.]			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 50 mg/m³ : (APF = 5) Any dust and mist respirator* Up to 100 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators^*/(APF = 10) Any supplied-air respirator* Up to 250 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter^* Up to 500 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate			

filter/(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 2000 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; cough; conjunctivitis; skin erythema (skin redness)

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Boron tribromide			CAS 10294-33-4
BBr ₃			RTECS ED7400000
Synonyms & Trade Names Boron bromide, Tribromoborane			DOT ID & Guide 2692 157
Exposure Limits	NIOSH REL: C 1 ppm (10 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 10.25 mg/m ³	
Physical Description Colorless, fuming liquid with a sharp, irritating odor.			
MW: 250.5	BP: 194°F	FRZ: -51°F	Sol: Decomposes
VP(57°F): 40 mmHg	IP: 9.70 eV		Sp.Gr(65°F): 2.64
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Moisture, water, heat, potassium, sodium, alcohols [Note: Attacks metals, wood & rubber. Reacts with water to form boric acid and hydrogen bromide.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; eye, skin burns; dyspnea (breathing difficulty), pulmonary edema			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Boron trifluoride			CAS 7637-07-2
BF ₃			RTECS ED2275000
Synonyms & Trade Names Boron fluoride, Trifluoroborane			DOT ID & Guide 1008 125
Exposure Limits	NIOSH REL: C 1 ppm (3 mg/m ³)		
	OSHA PEL: C 1 ppm (3 mg/m ³)		
IDLH 25 ppm		Conversion 1 ppm = 2.77 mg/m ³	
Physical Description Colorless gas with a pungent, suffocating odor. [Note: Forms dense white fumes in moist air. Shipped as a nonliquefied compressed gas.]			
MW: 67.8	BP: -148°F	FRZ: -196°F	Sol: 106% (in cold H ₂ O)
VP: >50 atm	IP: 15.50 eV	RGasD: 2.38	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Alkali metals, calcium oxide [Note: Hydrolyzes in moist air or hot water to form boric acid, hydrogen fluoride & fluoboric acid.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA 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*/(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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, skin, nose, respiratory system; epistaxis (nosebleed); eye, skin burns; in animals: pneumonitis; kidney damage

Target Organs Eyes, skin, respiratory system, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Bromacil			CAS 314-40-9
C₉H₁₃BrN₂O₂			RTECS YQ9100000
Synonyms & Trade Names 5-Bromo-3-sec-butyl-6-methyluracil, 5-Bromo-6-methyl-3-(1-methylpropyl)uracil			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 ppm (10 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 10.68 mg/m ³	
Physical Description Odorless, colorless to white, crystalline solid. [herbicide] [Note: Commercially available as a wettable powder or in liquid formulations.]			
MW: 261.2	BP: Sublimes	MLT: 317°F (Sublimes)	Sol(77°F): 0.08%
VP(212°F): 0.0008 mmHg	IP: ?		Sp.Gr: 1.55
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Strong acids (decomposes slowly), oxidizers, heat, sparks, open flames			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; in animals: thyroid injury			
Target Organs Eyes, skin, respiratory system, thyroid			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Bromine			CAS 7726-95-6
Br₂			RTECS EF9100000
Synonyms & Trade Names Molecular bromine			DOT ID & Guide 1744 154
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.7 mg/m ³) ST 0.3 ppm (2 mg/m ³)		
	OSHA PEL†: TWA 0.1 ppm (0.7 mg/m ³)		
IDLH 3 ppm		Conversion 1 ppm = 6.54 mg/m ³	
Physical Description Dark reddish-brown, fuming liquid with suffocating, irritating fumes.			
MW: 159.8	BP: 139°F	FRZ: 19°F	Sol: 4%
VP: 172 mmHg	IP: 10.55 eV		Sp.Gr: 3.12
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but accelerates the burning of combustibles.			
Incompatibilities & Reactivities Combustible organics (sawdust, wood, cotton, straw, etc.), aluminum, readily oxidizable materials, ammonia, hydrogen, acetylene, phosphorus, potassium, sodium [Note: Corrodes iron, steel, stainless steel & copper.]			
Measurement Methods NIOSH 6011; OSHA ID108			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2.5 ppm: (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 [£] Up to 3 ppm: (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 powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern⁶/(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 canister providing protection against the compound of concern⁶/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Dizziness, headache; lacrimation (discharge of tears), epistaxis (nosebleed); cough, feeling of oppression, pulmonary edema, pneumonitis; abdominal pain, diarrhea; measles-like eruptions; eye, skin burns

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Bromine pentafluoride			CAS 7789-30-2
BrF₅			RTECS EF9350000
Synonyms & Trade Names Bromine fluoride			DOT ID & Guide 1745 144
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.7 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 7.15 mg/m ³	
Physical Description Colorless to pale-yellow, fuming liquid with a pungent odor. [Note: A colorless gas above 105°F. Shipped as a compressed gas.]			
MW: 174.9	BP: 105°F	FRZ: -77°F	Sol: Reacts violently
VP: 328 mmHg	IP: ?		Sp.Gr: 2.48
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but a very powerful oxidizer.			
Incompatibilities & Reactivities Acids, halogens, arsenic, selenium, sulfur, glass, organic materials, water [Note: Reacts with all elements except inert gases, nitrogen & oxygen.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; corneal necrosis; skin burns; cough, dyspnea (breathing difficulty), pulmonary edema; liver, kidney injury			
Target Organs Eyes, skin, respiratory system, liver, kidneys			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Bromoform			CAS 75-25-2
CHBr ₃			RTECS PB5600000
Synonyms & Trade Names Methyl tribromide, Tribromomethane			DOT ID & Guide 2515 159
Exposure Limits	NIOSH REL: TWA 0.5 ppm (5 mg/m ³) [skin]		
	OSHA PEL: TWA 0.5 ppm (5 mg/m ³) [skin]		
IDLH 850 ppm		Conversion 1 ppm = 10.34 mg/m ³	
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
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Lithium, sodium, potassium, calcium, aluminum, zinc, magnesium, strong caustics, acetone [Note: Gradually decomposes, acquiring yellow color; air & light accelerate decomposition.]			
Measurement Methods NIOSH 1003; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support 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

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,3-Butadiene		CAS 106-99-0	
CH ₂ =CHCH=CH ₂		RTECS EI9275000	
Synonyms & Trade Names Biethylene, Bivinyl, Butadiene, Divinyl, Erythrene, Vinylethylene		DOT ID & Guide 1010 116P (inhibited)	
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1051] TWA 1 ppm ST 5 ppm		
IDLH Ca [2000 ppm] [10%LEL]		Conversion 1 ppm = 2.21 mg/m ³	
Physical Description Colorless gas with a mild aromatic or gasoline-like odor. [Note: A liquid below 24°F. Shipped as a liquefied compressed gas.]			
MW: 54.1	BP: 24°F	FRZ: -164°F	Sol: Insoluble
VP: 2.4 atm	IP: 9.07 eV	RGasD: 1.88	Sp.Gr: 0.65 (Liquid at 24°F)
Fl.P: NA (Gas) -105°F (Liquid)	UEL: 12.0%	LEL: 2.0%	
Flammable Gas Class IA Flammable Liquid			
Incompatibilities & Reactivities Phenol, chlorine dioxide, copper, crotonaldehyde [Note: May contain inhibitors (such as tributylcatechol) to prevent self-polymerization. May form explosive peroxides upon exposure to air.]			
Measurement Methods NIOSH 1024; OSHA 56			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) 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: (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
Exposure Routes inhalation, skin and/or eye contact (liquid)
Symptoms Irritation eyes, nose, throat; drowsiness, dizziness; liquid: frostbite; teratogenic, reproductive effects; [potential occupational carcinogen]
Target Organs Eyes, respiratory system, central nervous system, reproductive system
Cancer Site [hematopoietic cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Butane			CAS 106-97-8
CH ₃ CH ₂ CH ₂ CH ₃			RTECS EJ4200000
Synonyms & Trade Names normal-Butane, Butyl hydride, Diethyl, Methylethylmethane [Note: Also see specific listing for Isobutane.]			DOT ID & Guide 1011 115 1075 115
Exposure Limits	NIOSH REL: TWA 800 ppm (1900 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 2.38 mg/m ³	
Physical Description Colorless gas with a gasoline-like or natural gas odor. [Note: Shipped as a liquefied compressed gas. A liquid below 31°F.]			
MW: 58.1	BP: 31°F	FRZ: -217°F	Sol: Slight
VP: 2.05 atm	IP: 10.63 eV	RGasD: 2.11	Sp.Gr: 0.6 (Liquid at 31°F)
Fl.P: NA (Gas)	UEL: 8.4%	LEL: 1.6%	
Flammable Gas Class IA Flammable Liquid			
Incompatibilities & Reactivities Strong oxidizers (e.g., nitrates & perchlorates), chlorine, fluorine, (nickel carbonyl + oxygen)			
Measurement Methods OSHA 56			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact (liquid)			
Symptoms Drowsiness, narcosis, asphyxia; liquid: frostbite			
Target Organs central nervous system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Butanone			CAS 78-93-3
CH ₃ COCH ₂ CH ₃			RTECS EL6475000
Synonyms & Trade Names Ethyl methyl ketone, MEK, Methyl acetone, Methyl ethyl ketone			DOT ID & Guide 1193 127 1232 127
Exposure Limits	NIOSH REL: TWA 200 ppm (590 mg/m ³) ST 300 ppm (885 mg/m ³)		
	OSHA PEL†: TWA 200 ppm (590 mg/m ³)		
IDLH 3000 ppm		Conversion 1 ppm = 2.95 mg/m ³	
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			
Measurement Methods NIOSH 2500, 3800; OSHA 16, 84			
Personal Protection & Sanitation 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) 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

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Butoxyethanol			CAS 111-76-2
C4H9OCH2CH2OH			RTECS KJ8575000
Synonyms & Trade Names Butyl Cellosolve®, Butyl oxitol, Dowanol® EB, EGBE, Ektasolve EB®, Ethylene glycol monobutyl ether, Jeffersol EB			DOT ID & Guide 2369 152
Exposure Limits	NIOSH REL: TWA 5 ppm (24 mg/m³) [skin]		
	OSHA PEL†: TWA 50 ppm (240 mg/m³) [skin]		
IDLH 700 ppm		Conversion 1 ppm = 4.83 mg/m³	
Physical Description Colorless liquid with a mild, ether-like odor.			
MW: 118.2	BP: 339°F	FRZ: -107°F	Sol: Miscible
VP: 0.8 mmHg	IP: 10.00 eV		Sp.Gr: 0.90
Fl.P: 143°F	UEL(275°F): 12.7%	LEL(200°F): 1.1%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers, strong caustics			
Measurement Methods NIOSH 1403; OSHA 83			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 50 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* Up to 125 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 250 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 700 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

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

Symptoms Irritation eyes, skin, nose, throat; hemolysis, hematuria (blood in the urine); central nervous system depression, headache; vomiting

Target Organs Eyes, skin, respiratory system, central nervous system, hematopoietic system, blood, kidneys, liver, lymphoid system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Butoxyethanol acetate			CAS 112-07-2
C4H9O(CH2)2OCOCH3			RTECS KJ8925000
Synonyms & Trade Names 2-Butoxyethyl acetate, Butyl Cellosolve® acetate, Butyl glycol acetate, EGBEA, Ektasolve EB® acetate, Ethylene glycol monobutyl ether acetate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 ppm (33 mg/m³)		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 6.55 mg/m³	
Physical Description Colorless liquid with a pleasant, sweet, fruity odor.			
MW: 160.2	BP: 378°F	FRZ: -82°F	Sol: 1.5%
VP: 0.3 mmHg	IP: ?		Sp.Gr: 0.94
Fl.P: 71°F	UEL(275°F): 8.54%	LEL(200°F): 0.88%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods OSHA 83			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 50 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* Up to 125 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 250 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 700 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

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

Symptoms Irritation eyes, skin, nose, throat; hemolysis, hematuria (blood in the urine); central nervous system depression, headache; vomiting

Target Organs Eyes, skin, respiratory system, central nervous system, hematopoietic system, blood, kidneys, liver, lymphoid system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Butyl acetate			CAS 123-86-4
CH ₃ COO[CH ₂] ₃ CH ₃			RTECS AF7350000
Synonyms & Trade Names Butyl acetate, n-Butyl ester of acetic acid, Butyl ethanoate			DOT ID & Guide 1123 129
Exposure Limits	NIOSH REL: TWA 150 ppm (710 mg/m ³) ST 200 ppm (950 mg/m ³)		
	OSHA PEL†: TWA 150 ppm (710 mg/m ³)		
IDLH 1700 ppm [10%LEL]		Conversion 1 ppm = 4.75 mg/m ³	
Physical Description Colorless liquid with a fruity odor.			
MW: 116.2	BP: 258°F	FRZ: -107°F	Sol: 1%
VP: 10 mmHg	IP: 10.00 eV		Sp.Gr: 0.88
Fl.P: 72°F	UEL: 7.6%	LEL: 1.7%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1450; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1500 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* Up to 1700 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

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

Symptoms Irritation eyes, skin, upper respiratory system; headache, drowsiness, narcosis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

sec-Butyl acetate			CAS 105-46-4
CH ₃ COOCH(CH ₃)CH ₂ CH ₃			RTECS AF7380000
Synonyms & Trade Names sec-Butyl ester of acetic acid, 1-Methylpropyl acetate			DOT ID & Guide 1123 129
Exposure Limits	NIOSH REL: TWA 200 ppm (950 mg/m ³)		
	OSHA PEL: TWA 200 ppm (950 mg/m ³)		
IDLH 1700 ppm [10%LEL]		Conversion 1 ppm = 4.75 mg/m ³	
Physical Description Colorless liquid with a pleasant, fruity odor.			
MW: 116.2	BP: 234°F	FRZ: -100°F	Sol: 0.8%
VP: 10 mmHg	IP: 9.91 eV		Sp.Gr: 0.86
Fl.P: 62°F	UEL: 9.8%	LEL: 1.7%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1450; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1700 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

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

Symptoms Irritation eyes; headache; drowsiness; dryness upper respiratory system, skin; narcosis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

tert-Butyl acetate			CAS 540-88-5
CH ₃ COOC(CH ₃) ₃			RTECS AF7400000
Synonyms & Trade Names tert-Butyl ester of acetic acid			DOT ID & Guide 1123 129
Exposure Limits	NIOSH REL: TWA 200 ppm (950 mg/m ³)		
	OSHA PEL: TWA 200 ppm (950 mg/m ³)		
IDLH 1500 ppm [10%LEL]		Conversion 1 ppm = 4.75 mg/m ³	
Physical Description Colorless liquid with a fruity odor.			
MW: 116.2	BP: 208°F	FRZ: ?	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: 0.87
Fl.P: 72°F	UEL: ?	LEL: 1.5%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1450; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1500 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Itch, inflammation eyes; irritation upper respiratory tract; headache; narcosis; dermatitis
Target Organs respiratory system, eyes, skin, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Butyl acrylate			CAS 141-32-2
CH ₂ =CHCOOC ₄ H ₉			RTECS UD3150000
Synonyms & Trade Names n-Butyl acrylate, Butyl ester of acrylic acid, Butyl 2-propenoate			DOT ID & Guide 2348 129P
Exposure Limits	NIOSH REL: TWA 10 ppm (55 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 5.24 mg/m ³	
Physical Description Clear, colorless liquid with a strong, fruity odor. [Note: Highly reactive; may contain an inhibitor to prevent spontaneous polymerization.]			
MW: 128.2	BP: 293°F	FRZ: -83°F	Sol: 0.1%
VP: 4 mmHg	IP: ?		Sp.Gr: 0.89
Fl.P: 103°F	UEL: 9.9%	LEL: 1.5%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong acids & alkalis, amines, halogens, hydrogen compounds, oxidizers, heat, flame, sunlight [Note: Polymerizes readily on heating.]			
Measurement Methods OSHA PV2011			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; sensitization dermatitis; dyspnea (breathing difficulty)			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Butyl alcohol			CAS 71-36-3
CH ₃ CH ₂ CH ₂ CH ₂ OH			RTECS EO1400000
Synonyms & Trade Names 1-Butanol, n-Butanol, Butyl alcohol, 1-Hydroxybutane, n-Propyl carbinol			DOT ID & Guide 1120 129
Exposure Limits	NIOSH REL: C 50 ppm (150 mg/m ³) [skin]		
	OSHA PEL†: TWA 100 ppm (300 mg/m ³)		
IDLH 1400 ppm [10%LEL]		Conversion 1 ppm = 3.03 mg/m ³	
Physical Description Colorless liquid with a strong, characteristic, mildly alcoholic odor.			
MW: 74.1	BP: 243°F	FRZ: -129°F	Sol: 9%
VP: 6 mmHg	IP: 10.04 eV		Sp.Gr: 0.81
Fl.P: 84°F	UEL: 11.2%	LEL: 1.4%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers, strong mineral acids, alkali metals, halogens			
Measurement Methods NIOSH 1450; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 1250 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 1400 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
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

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

Symptoms Irritation eyes, nose, throat; headache, dizziness, drowsiness; corneal inflammation, blurred vision, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light); dermatitis; possible auditory nerve damage, hearing loss; central nervous system depression

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

sec-Butyl alcohol			CAS 78-92-2
CH ₃ CH(OH)CH ₂ CH ₃			RTECS EO1750000
Synonyms & Trade Names 2-Butanol, Butylene hydrate, 2-Hydroxybutane, Methyl ethyl carbinol			DOT ID & Guide 1120 129
Exposure Limits	NIOSH REL: TWA 100 ppm (305 mg/m ³) ST 150 ppm (455 mg/m ³)		
	OSHA PEL†: TWA 150 ppm (450 mg/m ³)		
IDLH 2000 ppm		Conversion 1 ppm = 3.03 mg/m ³	
Physical Description Colorless liquid with a strong, pleasant odor.			
MW: 74.1	BP: 211°F	FRZ: -175°F	Sol: 16%
VP: 12 mmHg	IP: 10.10 eV		Sp.Gr: 0.81
Fl.P: 75°F	UEL(212°F): 9.8%	LEL(212°F): 1.7%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers, organic peroxides, perchloric & permonosulfuric acids			
Measurement Methods NIOSH 1450; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 1000 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* Up to 2000 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

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

Symptoms Irritation eyes, skin, nose, throat; narcosis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

tert-Butyl alcohol			CAS 75-65-0
(CH ₃) ₃ COH			RTECS EO1925000
Synonyms & Trade Names 2-Methyl-2-propanol, Trimethyl carbinol			DOT ID & Guide 1120 129
Exposure Limits	NIOSH REL: TWA 100 ppm (300 mg/m ³) ST 150 ppm (450 mg/m ³)		
	OSHA PEL†: TWA 100 ppm (300 mg/m ³)		
IDLH 1600 ppm		Conversion 1 ppm = 3.03 mg/m ³	
Physical Description Colorless solid or liquid (above 77°F) with a camphor-like odor. [Note: Often used in aqueous solutions.]			
MW: 74.1	BP: 180°F	FRZ: 78°F	Sol: Miscible
VP(77°F): 42 mmHg	IP: 9.70 eV		Sp.Gr: 0.79 (Solid)
Fl.P: 52°F	UEL: 8.0%	LEL: 2.4%	
Combustible Solid Class IB Flammable Liquid			
Incompatibilities & Reactivities Strong mineral acids, strong hydrochloric acid, oxidizers			
Measurement Methods NIOSH 1450; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1600 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

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

Symptoms Irritation eyes, skin, nose, throat; drowsiness, narcosis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Butylamine			CAS 109-73-9
CH ₃ CH ₂ CH ₂ CH ₂ NH ₂			RTECS EO2975000
Synonyms & Trade Names 1-Aminobutane, Butylamine			DOT ID & Guide 1125 132
Exposure Limits	NIOSH REL: C 5 ppm (15 mg/m ³) [skin]		
	OSHA PEL: C 5 ppm (15 mg/m ³) [skin]		
IDLH 300 ppm		Conversion 1 ppm = 2.99 mg/m ³	
Physical Description Colorless liquid with a fishy, ammonia-like odor.			
MW: 73.2	BP: 172°F	FRZ: -58°F	Sol: Miscible
VP: 82 mmHg	IP: 8.71 eV		Sp.Gr: 0.74
Fl.P: 10°F	UEL: 9.8%	LEL: 1.7%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids [Note: May corrode some metals in presence of water.]			
Measurement Methods NIOSH 2012			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 ppm : (APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern*/(APF = 10) Any supplied-air respirator* Up to 125 ppm : (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* Up to 250 ppm : (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 powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern*/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece

Up to 300 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, nose, throat; headache; skin flush, burns

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

tert-Butyl chromate			CAS 1189-85-1
[(CH ₃) ₃ CO] ₂ CrO ₂			RTECS GB2900000
Synonyms & Trade Names di-tert-Butyl ester of chromic acid			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca TWA 0.001 mg Cr(VI)/m ³ See Appendix A See Appendix C		
	OSHA PEL: C 0.1 mg CrO ₃ /m ³ [skin] See Appendix C		
IDLH Ca [15 mg/m ³ {as Cr(VI)}]		Conversion	
Physical Description Liquid. [Note: Solidifies at 32-23°F.]			
MW: 230.3	BP: ?	FRZ: 32-23°F	Sol: ?
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities Reducing agents, moisture, acids, alcohols, hydrazine, combustible materials			
Measurement Methods NIOSH 7604; OSHA ID103, ID215			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: No recommendation Provide: Eyewash, Quick drench		First Aid (See procedures) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; eye, skin burns; drowsiness, muscle weakness; skin ulcers; lung changes; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system
Cancer Site [lung cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Butyl glycidyl ether			CAS 2426-08-6
C7H14O2			RTECS TX4200000
Synonyms & Trade Names BGE; 1,2-Epoxy-3-butoxypropane			DOT ID & Guide
Exposure Limits	NIOSH REL: C 5.6 ppm (30 mg/m³) [15-minute]		
	OSHA PEL†: TWA 50 ppm (270 mg/m³)		
IDLH 250 ppm		Conversion 1 ppm = 5.33 mg/m³	
Physical Description Colorless liquid with an irritating odor.			
MW: 130.2	BP: 327°F	FRZ: ?	Sol: 2%
VP(77°F): 3 mmHg	IP: ?		Sp.Gr: 0.91
Fl.P: 130°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers, strong caustics			
Measurement Methods NIOSH 1616; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 56 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* Up to 140 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 250 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
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

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

Symptoms Irritation eyes, skin, nose; skin sensitization; narcosis; possible hematopoietic effects; central nervous system depression

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Butyl lactate			CAS 138-22-7
CH ₃ CH(OH)COOC ₄ H ₉			RTECS OD4025000
Synonyms & Trade Names Butyl ester of 2-hydroxypropanoic acid, Butyl ester of lactic acid, Butyl lactate			DOT ID & Guide 1993 128 (combustible liquid, n.o.s.)
Exposure Limits	NIOSH REL: TWA 5 ppm (25 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 5.98 mg/m ³	
Physical Description Clear, colorless to white liquid with a mild, transient odor.			
MW: 146.2	BP: 370°F	FRZ: -45°F	Sol: Slight
VP: 0.4 mmHg	IP: ?		Sp.Gr: 0.98
Fl.P: 160°F	UEL: ?	LEL: 1.15%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong acids & bases, strong oxidizers, heat, sparks, open flames			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; drowsiness, headache, central nervous system depression; nausea, vomiting			
Target Organs Eyes, skin, respiratory system, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Butyl mercaptan			CAS 109-79-5
CH ₃ CH ₂ CH ₂ CH ₂ SH			RTECS EK6300000
Synonyms & Trade Names Butanethiol, 1-Butanethiol, n-Butanethiol, 1-Mercaptobutane			DOT ID & Guide 2347 130
Exposure Limits	NIOSH REL: C 0.5 ppm (1.8 mg/m ³) [15-minute]		
	OSHA PEL†: TWA 10 ppm (35 mg/m ³)		
IDLH 500 ppm		Conversion 1 ppm = 3.69 mg/m ³	
Physical Description Colorless liquid with a strong, garlic-, cabbage-, or skunk-like odor.			
MW: 90.2	BP: 209°F	FRZ: -176°F	Sol: 0.06%
VP: 35 mmHg	IP: 9.15 eV		Sp.Gr: 0.83
Fl.P: 35°F	UEL: ?	LEL: ?	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers (such as dry bleaches), acids			
Measurement Methods NIOSH 2525, 2542			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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 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

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

Symptoms Irritation eyes, skin; muscle weakness, malaise (vague feeling of discomfort), sweating, nausea, vomiting, headache, confusion; in animals: narcosis, incoordination, lassitude (weakness, exhaustion); cyanosis, pulmonary irritation; liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-sec-Butylphenol			CAS 89-72-5
CH ₃ CH ₂ CH(CH ₃)C ₆ H ₄ OH			RTECS SJ8920000
Synonyms & Trade Names 2-sec-Butylphenol, 2-(1-Methylpropyl)phenol			DOT ID & Guide 2228 153 (liquid) 2229 153 (solid)
Exposure Limits	NIOSH REL: TWA 5 ppm (30 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 6.14 mg/m ³	
Physical Description Colorless liquid or solid (below 61°F).			
MW: 150.2	BP: 227°F	FRZ: 61°F	Sol: Insoluble
VP: Low	IP: ?		Sp.Gr: 0.89
Fl.P: 225°F	UEL: ?	LEL: ?	
Class IIB Combustible Liquid Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; skin burns			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

p-tert-Butyltoluene		CAS 98-51-1	
(CH₃)₃CC₆H₄CH₃		RTECS XS8400000	
Synonyms & Trade Names 4-tert-Butyltoluene, 1-Methyl-4-tert-butylbenzene		DOT ID & Guide 2667 131	
Exposure Limits	NIOSH REL: TWA 10 ppm (60 mg/m ³) ST 20 ppm (120 mg/m ³)		
	OSHA PEL†: TWA 10 ppm (60 mg/m ³)		
IDLH 100 ppm		Conversion 1 ppm = 6.07 mg/m ³	
Physical Description Colorless liquid with a distinct aromatic odor, somewhat like gasoline.			
MW: 148.3	BP: 379°F	FRZ: -62°F	Sol: Insoluble
VP(77°F): 0.7 mmHg	IP: 8.28 eV		Sp.Gr: 0.86
Fl.P: 155°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods NIOSH 1501; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 100 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; dry nose, throat; headache; low blood pressure, tachycardia, abnormalities cardiovascular system stress; central nervous system, hematopoietic depression; metallic taste; liver, kidney injury
Target Organs Eyes, skin, respiratory system, cardiovascular system, central nervous system, bone marrow, liver, kidneys
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Butyronitrile			CAS 109-74-0
CH ₃ CH ₂ CH ₂ CN			RTECS ET8750000
Synonyms & Trade Names Butanenitrile, Butyronitrile, 1-Cyanopropane, Propyl cyanide, n-Propyl cyanide			DOT ID & Guide 2411 131
Exposure Limits	NIOSH REL: TWA 8 ppm (22 mg/m ³)		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 2.83 mg/m ³	
Physical Description Colorless liquid with a sharp, suffocating odor. [Note: Forms cyanide in the body.]			
MW: 69.1	BP: 244°F	FRZ: -170°F	Sol(77°F): 3%
VP: 14 mmHg	IP: 11.67 eV		Sp.Gr: 0.81
Fl.P: 62°F	UEL: ?	LEL: 1.65%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers & reducing agents, strong acids & bases			
Measurement Methods NIOSH 1606 (adapt)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 80 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator Up to 200 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 400 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 1000 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

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

Symptoms Irritation eyes, skin, respiratory system; headache, dizziness, lassitude (weakness, exhaustion), confusion, convulsions; dyspnea (breathing difficulty); abdominal pain, nausea, vomiting

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cadmium dust (as Cd)		CAS 7440-43-9 (metal)	
Cd (metal)		RTECS EU9800000 (metal)	
Synonyms & Trade Names Cadmium metal: Cadmium Other synonyms vary depending upon the specific cadmium compound.		DOT ID & Guide 2570 154 (compounds)	
Exposure Limits	NIOSH REL*: Ca See Appendix A [*Note: The REL applies to all Cadmium compounds (as Cd).]		
	OSHA PEL*: [1910.1027] TWA 0.005 mg/m ³ [*Note: The PEL applies to all Cadmium compounds (as Cd).]		
IDLH Ca [9 mg/m ³ (as Cd)]		Conversion	
Physical Description Metal: Silver-white, blue-tinged lustrous, odorless solid.			
MW: 112.4	BP: 1409°F	MLT: 610°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 8.65 (metal)
Fl.P: NA	UEL: NA	LEL: NA	
Metal: Noncombustible Solid in bulk form, but will burn in powder form.			
Incompatibilities & Reactivities Strong oxidizers; elemental sulfur, selenium & tellurium			
Measurement Methods NIOSH 7048; OSHA ID121, ID125G, ID189, ID206			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
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]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cadmium fume (as Cd)			CAS 1306-19-0 (CdO)
CdO/Cd			RTECS EV1930000 (CdO)
Synonyms & Trade Names CdO: Cadmium monoxide, Cadmium oxide fume Cd: Cadmium			DOT ID & Guide
Exposure Limits	NIOSH REL*: Ca See Appendix A [*Note: The REL applies to all Cadmium compounds (as Cd).]		
	OSHA PEL*: [1910.1027] TWA 0.005 mg/m ³ [*Note: The PEL applies to all Cadmium compounds (as Cd).]		
IDLH Ca [9 mg/m ³ (as Cd)]		Conversion	
Physical Description Odorless, yellow-brown, finely divided particulate dispersed in air. [Note: See listing for Cadmium dust for properties of Cd.]			
MW: 128.4	BP: Decomposes	MLT: 2599°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 8.15 (crystalline form)/6.95 (amorphous form)
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Not applicable			
Measurement Methods NIOSH 7048; OSHA ID121, ID125G, ID189, ID206			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation

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

Target Organs respiratory system, kidneys, blood

Cancer Site [prostatic & lung cancer]

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Calcium arsenate (as As)			CAS 7778-44-1
Ca ₃ (AsO ₄) ₂			RTECS CG0830000
Synonyms & Trade Names Calcium salt (2:3) of arsenic acid, Cucumber dust, Tricalcium arsenate, Tricalcium ortho-arsenate [Note: Also see specific listing for Arsenic (inorganic compounds, as As).]			DOT ID & Guide 1573 151
Exposure Limits	NIOSH REL: Ca C 0.002 mg/m ³ [15-minute] See Appendix A		
	OSHA PEL: [1910.1018] TWA 0.010 mg/m ³		
IDLH Ca [5 mg/m ³ (as As)]		Conversion	
Physical Description Colorless to white, odorless solid. [insecticide/herbicide]			
MW: 398.1	BP: Decomposes	MLT: ?	Sol(77°F): 0.01%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 3.62
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported [Note: Produces toxic fumes of arsenic when heated to decomposition.]			
Measurement Methods NIOSH 7900; OSHA ID105			
Personal Protection & Sanitation 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) 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Lassitude (weakness, exhaustion); gastrointestinal disturbance; peripheral neuropathy; skin hyperpigmentation, palmar planter hyperkeratoses; dermatitis; [potential occupational carcinogen]; in animals: liver damage
Target Organs Eyes, respiratory system, liver, skin, central nervous system, lymphatic system
Cancer Site [lymphatic & lung cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Calcium carbonate			CAS 1317-65-3
CaCO ₃			RTECS EV9580000
Synonyms & Trade Names Calcium salt of carbonic acid [Note: Occurs in nature as as limestone, chalk, marble, dolomite, aragonite, calcite & oyster shells.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description White, odorless powder or colorless crystals.			
MW: 100.1	BP: Decomposes	MLT: 1517-2442°F (Decomposes)	Sol: 0.001%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.7-2.95
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Acids, alum, ammonium salts, mercury & hydrogen, fluorine, magnesium			
Measurement Methods NIOSH 7020; OSHA ID121			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; cough			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Calcium cyanamide			CAS 156-62-7
CaCN ₂			RTECS GS6000000
Synonyms & Trade Names Calcium carbimide, Cyanamide, Lime nitrogen, Nitrogen lime [Note: Cyanamide is also a synonym for Hydrogen cyanamide, NH ₂ CN.]			DOT ID & Guide 1403 138 (with >0.1% calcium carbide)
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless, gray, or black crystals or powder. [fertilizer] [Note: Commercial grades may contain calcium carbide.]			
MW: 80.1	BP: Sublimes	MLT: 2444°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.29
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but a fire risk if it contains calcium carbide.			
Incompatibilities & Reactivities Water [Note: May polymerize in water or alkaline solutions to dicyanamide. Decomposes in water to form acetylene & ammonia.]			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; headache, dizziness, rapid breathing, low blood pressure, nausea, vomiting; skin burns, sensitization; cough; Antabuse-like effects			
Target Organs Eyes, skin, respiratory system, vasomotor system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Calcium hydroxide			CAS 1305-62-0
Ca(OH) ₂			RTECS EW2800000
Synonyms & Trade Names Calcium hydrate, Caustic lime, Hydrated lime, Slaked lime			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL: TWA 15 mg/m ³ (total) 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description White, odorless powder. [Note: Readily absorbs CO ₂ from the air to form calcium carbonate.]			
MW: 74.1	BP: Decomposes	MLT: 1076°F (Decomposes) (Loses H ₂ O)	Sol(32°F): 0.2%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.24
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Maleic anhydride, phosphorus, nitroethane, nitromethane, nitroparaffins, nitropropane [Note: Attacks some metals.]			
Measurement Methods NIOSH 7020; ID121			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; eye, skin burns; skin vesiculation; cough, bronchitis, pneumonitis			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Calcium oxide			CAS 1305-78-8
CaO			RTECS EW3100000
Synonyms & Trade Names Burned lime, Burnt lime, Lime, Pebble lime, Quick lime, Unslaked lime			DOT ID & Guide 1910 157
Exposure Limits	NIOSH REL: TWA 2 mg/m ³		
	OSHA PEL: TWA 5 mg/m ³		
IDLH 25 mg/m ³		Conversion	
Physical Description White or gray, odorless lumps or granular powder.			
MW: 56.1	BP: 5162°F	MLT: 4662°F	Sol: Reacts
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 3.34
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but will support combustion by liberation of oxygen.			
Incompatibilities & Reactivities Water (liberates heat), fluorine, ethanol [Note: Reacts with water to form calcium hydroxide.]			
Measurement Methods NIOSH 7020; OSHA ID121			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 10 mg/m ³ : (APF = 5) Any dust and mist respirator Up to 20 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 25 mg/m ³ : (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/(APF = 50) Any air-purifying, full-facepiece respirator 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, upper respiratory tract; ulcer, perforation nasal septum; pneumonitis; dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Calcium silicate			CAS 1344-95-2
CaSiO ₃			RTECS VV9150000
Synonyms & Trade Names Calcium hydrosilicate, Calcium metasilicate, Calcium monosilicate, Calcium salt of silicic acid, Wollastonite (mineral)			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description White or cream-colored, free-flowing powder. [Note: The commercial product is prepared from diatomaceous earth & lime.]			
MW: 116.2	BP: ?	MLT: 2804°F	Sol: 0.01%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.9
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported [Note: After prolonged contact with water, solution reverts to soluble calcium salts & amorphous silica.]			
Measurement Methods NIOSH 7020; OSHA ID121			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Calcium sulfate			CAS 7778-18-9
CaSO ₄			RTECS WS6920000
Synonyms & Trade Names Anhydrous calcium sulfate, Anhydrous gypsum, Anhydrous sulfate of lime, Calcium salt of sulfuric acid [Note: Gypsum is the dihydrate form & Plaster of Paris is the hemihydrate form.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Odorless, white powder or colorless, crystalline solid. [Note: May have blue, gray, or reddish tinge.]			
MW: 136.1	BP: Decomposes	MLT: 2840°F (Decomposes)	Sol: 0.3%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.96
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Diazomethane, aluminum, phosphorus, water [Note: Hygroscopic (i.e., absorbs moisture from the air). Reacts with water to form Gypsum & Plaster of Paris.]			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; conjunctivitis; rhinitis, epistaxis (nosebleed)			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Camphor (synthetic)			CAS 76-22-2
C ₁₀ H ₁₆ O			RTECS EX1225000
Synonyms & Trade Names 2-Camphonone, Gum camphor, Laurel camphor, Synthetic camphor			DOT ID & Guide 2717 133
Exposure Limits	NIOSH REL: TWA 2 mg/m ³		
	OSHA PEL: TWA 2 mg/m ³		
IDLH 200 mg/m ³		Conversion	
Physical Description Colorless or white crystals with a penetrating, aromatic odor.			
MW: 152.3	BP: 399°F	MLT: 345°F	Sol: Insoluble
VP: 0.2 mmHg	IP: 8.76 eV		Sp.Gr: 0.99
Fl.P: 150°F	UEL: 3.5%	LEL: 0.6%	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers (especially chromic anhydride & potassium permanganate)			
Measurement Methods NIOSH 1301; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust and mist filter [£] Up to 100 mg/m ³ : (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s)			

£

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
[Up to 200 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; nausea, vomiting, diarrhea; headache, dizziness, excitement, epileptiform convulsions

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Caprolactam			CAS 105-60-2
C ₂ H ₁₁ NO			RTECS CM3675000
Synonyms & Trade Names Aminocaproic lactam, epsilon-Caprolactam, Hexahydro-2H-azepin-2-one, 2-Oxohexamethyleneimine			DOT ID & Guide
Exposure Limits	NIOSH REL: Dust: TWA 1 mg/m ³ ST 3 mg/m ³ Vapor: TWA 0.22 ppm (1 mg/m ³) ST 0.66 ppm (3 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.63 mg/m ³	
Physical Description White, crystalline solid or flakes with an unpleasant odor. [Note: Significant vapor concentrations would be expected only at elevated temperatures.]			
MW: 113.2	BP: 515°F	MLT: 156°F	Sol: 53%
VP: 0.00000008 mmHg	IP: ?		Sp.Gr: 1.01
Fl.P: 282°F	UEL: 8.0%	LEL: 1.4%	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, (acetic acid + dinitrogen trioxide)			
Measurement Methods OSHA PV2012			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation skin, eyes, respiratory system; epistaxis (nosebleed); dermatitis, skin sensitization; asthma; irritability, confusion, dizziness, headache; abdominal cramps, diarrhea, nausea, vomiting; liver, kidney injury			

Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system, liver, kidneys
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See also: INTRODUCTION
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NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Captafol			CAS 2425-06-1
C ₁₀ H ₉ Cl ₁₄ NO ₂ S			RTECS GS4900000
Synonyms & Trade Names Captofol; Difolatan®; N-((1,1,2,2-Tetrachloroethyl)thio)-4-cyclohexene-1,2-dicarboximide			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca TWA 0.1 mg/m ³ [skin] See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion	
Physical Description White, crystalline solid with a slight, characteristic pungent odor. [fungicide] [Note: Available commercially as a wettable powder or in liquid form.]			
MW: 349.1	BP: Decomposes	MLT: 321°F (Decomposes)	Sol: 0.0001%
VP: 0.000008 mmHg	IP: NA	Sp.Gr: ?	
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Acids, acid vapors, strong oxidizers			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; dermatitis, skin sensitization; conjunctivitis; bronchitis, wheezing; diarrhea, vomiting; liver, kidney injury; high blood pressure; in animals: teratogenic effects; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys, cardiovascular system
Cancer Site [in animals: tumors at many sites]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Captan			CAS 133-06-2
C ₉ H ₈ Cl ₃ NO ₂ S			RTECS GW5075000
Synonyms & Trade Names Captane; N-Trichloromethylmercapto-4-cyclohexene-1,2-dicarboximide			DOT ID & Guide 9188 171
Exposure Limits	NIOSH REL: Ca TWA 5 mg/m ³ See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Odorless, white, crystalline powder. [fungicide] [Note: Commercial product is a yellow powder with a pungent odor.]			
MW: 300.6	BP: Decomposes	MLT: 352°F (Decomposes)	Sol(77°F): 0.0003%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.74
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid; may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Strong alkaline materials (e.g., hydrated lime) [Note: Corrosive to metals.]			
Measurement Methods NIOSH 5601			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, upper respiratory system; blurred vision; dermatitis, skin sensitization; dyspnea (breathing difficulty); diarrhea, vomiting; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, gastrointestinal tract, liver, kidneys
Cancer Site [in animals: duodenal tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Carbaryl			CAS 63-25-2
CH ₃ NHCOOC ₁₀ H ₇			RTECS FC5950000
Synonyms & Trade Names alpha-Naphthyl N-methyl-carbamate, 1-Naphthyl N-Methyl-carbamate, Sevin®			DOT ID & Guide 2757 151
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL: TWA 5 mg/m ³		
IDLH 100 mg/m ³		Conversion	
Physical Description White or gray, odorless solid. [pesticide]			
MW: 201.2	BP: Decomposes	MLT: 293°F	Sol: 0.01%
VP(77°F): <0.00004 mmHg	IP: ?		Sp.Gr: 1.23
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Strong oxidizers, strongly alkaline pesticides			
Measurement Methods NIOSH 5006, 5601; OSHA 63			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m³ : (APF = 10) Any supplied-air respirator* Up to 100 mg/m³ : (APF = 25) Any supplied-air respirator 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 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Miosis, blurred vision, tear; rhinorrhea (discharge of thin mucus), salivation; sweating; abdominal cramps, nausea, vomiting, diarrhea; tremor; cyanosis; convulsions; irritation skin; possible reproductive effects
Target Organs respiratory system, central nervous system, cardiovascular system, skin, blood cholinesterase, reproductive system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Carbofuran			CAS 1563-66-2
C ₁₂ H ₁₅ NO ₃			RTECS FB9450000
Synonyms & Trade Names 2,3-Dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate; Furacarb®; Furadan®			DOT ID & Guide 2757 151
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Odorless, white or grayish, crystalline solid. [insecticide] [Note: May be dissolved in a liquid carrier.]			
MW: 221.3	BP: ?	MLT: 304°F	Sol(77°F): 0.07%
VP(77°F): 0.000003 mmHg	IP: NA		Sp.Gr: 1.18
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Alkaline substances, acid, strong oxidizers (e.g., perchlorates, peroxides, chlorates, nitrates, permanganates)			
Measurement Methods NIOSH 5006, 5601; OSHA 63			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Miosis, blurred vision; sweating, salivation, abdominal cramps, diarrhea, headache, nausea, vomiting; lassitude (weakness, exhaustion), muscle twitching, incoordination, convulsions			
Target Organs central nervous system, peripheral nervous system, blood cholinesterase			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Carbon black			CAS 1333-86-4
C			RTECS FF5800000
Synonyms & Trade Names Acetylene black, Channel black, Furnace black, Lamp black, Thermal black			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 3.5 mg/m ³ Ca TWA 0.1 mg PAHs/m ³ [Carbon black in presence of polycyclic aromatic hydrocarbons (PAHs)] See Appendix A See Appendix C		
	OSHA PEL: TWA 3.5 mg/m ³		
IDLH 1750 mg/m ³		Conversion	
Physical Description Black, odorless solid.			
MW: 12.0	BP: Sublimes	MLT: Sublimes	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.8-2.1
Fl.P: NA	UEL: NA	LEL: NA	
Combustible Solid that may contain flammable hydrocarbons.			
Incompatibilities & Reactivities Strong oxidizers such as chlorates, bromates & nitrates			
Measurement Methods NIOSH 5000; OSHA ID196			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate promptly Breathing: Fresh air	
Respirator Recommendations NIOSH/OSHA Up to 17.5 mg/m³ : (APF = 5) Any dust and mist respirator Up to 35 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 87.5 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter Up to 175 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate			

<p>filter/(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</p> <p>Up to 1750 mg/m³: (APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode</p> <p>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</p> <p>Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus</p> <p>In presence of polycyclicaromatic hydrocarbons:</p> <p>NIOSH</p> <p>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</p> <p>Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus</p>
<p>Exposure Routes inhalation, skin and/or eye contact</p>
<p>Symptoms Cough; irritation eyes; in presence of polycyclic aromatic hydrocarbons: [potential occupational carcinogen]</p>
<p>Target Organs respiratory system, eyes</p>
<p>Cancer Site [lymphatic cancer (in presence of PAHs)]</p>
<p>See also: INTRODUCTION</p>

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Carbon dioxide			CAS 124-38-9
CO ₂			RTECS FF6400000
Synonyms & Trade Names Carbonic acid gas, Dry ice [Note: Normal constituent of air (about 300 ppm)].			DOT ID & Guide 1013 120 1845 120 (dry ice) 2187 120 (liquid)
Exposure Limits	NIOSH REL: TWA 5000 ppm (9000 mg/m ³) ST 30,000 ppm (54,000 mg/m ³)		
	OSHA PEL†: TWA 5000 ppm (9000 mg/m ³)		
IDLH 40,000 ppm		Conversion 1 ppm = 1.80 mg/m ³	
Physical Description Colorless, odorless gas. [Note: Shipped as a liquefied compressed gas. Solid form is utilized as dry ice.]			
MW: 44.0	BP: Sublimes	MLT: -109°F (Sublimes)	Sol(77°F): 0.2%
VP: 56.5 atm	IP: 13.77 eV	RGasD: 1.53	
FLP: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Dusts of various metals, such as magnesium, zirconium, titanium, aluminum, chromium & manganese are ignitable and explosive when suspended in carbon dioxide. Forms carbonic acid in water.			
Measurement Methods NIOSH 6603; OSHA ID172			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 40,000 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: Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact (liquid/solid)
Symptoms Headache, dizziness, restlessness, paresthesia; dyspnea (breathing difficulty); sweating, malaise (vague feeling of discomfort); increased heart rate, cardiac output, blood pressure; coma; asphyxia; convulsions; frostbite (liquid, dry ice)
Target Organs respiratory system, cardiovascular system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Carbon disulfide			CAS 75-15-0
CS ₂			RTECS FF6650000
Synonyms & Trade Names Carbon bisulfide			DOT ID & Guide 1131 131
Exposure Limits	NIOSH REL: TWA 1 ppm (3 mg/m ³) ST 10 ppm (30 mg/m ³) [skin]		
	OSHA PEL†: TWA 20 ppm C 30 ppm 100 ppm (30-minute maximum peak)		
IDLH 500 ppm		Conversion 1 ppm = 3.11 mg/m ³	
Physical Description Colorless to faint-yellow liquid with a sweet ether-like odor. [Note: Reagent grades are foul smelling.]			
MW: 76.1	BP: 116°F	FRZ: -169°F	Sol: 0.3%
VP: 297 mmHg	IP: 10.08 eV		Sp.Gr: 1.26
Fl.P: -22°F	UEL: 50.0%	LEL: 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 ordinary light bulb.]			
Measurement Methods NIOSH 1600			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) 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

Exposure Routes inhalation, skin absorption, 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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Carbon monoxide			CAS 630-08-0
CO			RTECS FG3500000
Synonyms & Trade Names Carbon oxide, Flue gas, Monoxide			DOT ID & Guide 1016 119 9202 168 (cryogenic liquid)
Exposure Limits	NIOSH REL: TWA 35 ppm (40 mg/m ³) C 200 ppm (229 mg/m ³)		
	OSHA PEL†: TWA 50 ppm (55 mg/m ³)		
IDLH 1200 ppm		Conversion 1 ppm = 1.15 mg/m ³	
Physical Description Colorless, odorless gas. [Note: Shipped as a nonliquefied or liquefied compressed gas.]			
MW: 28.0	BP: -313°F	MLT: -337°F	Sol: 2%
VP: >35 atm	IP: 14.01 eV	RGasD: 0.97	
Fl.P: NA (Gas)	UEL: 74%	LEL: 12.5%	
Flammable Gas			
Incompatibilities & Reactivities Strong oxidizers, bromine trifluoride, chlorine trifluoride, lithium			
Measurement Methods NIOSH 6604; OSHA ID209			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH Up to 350 ppm : (APF = 10) Any supplied-air respirator Up to 875 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 1200 ppm : (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 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 canister providing protection against the compound of concern†/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Headache, tachypnea, nausea, lassitude (weakness, exhaustion), dizziness, confusion, hallucinations; cyanosis; depressed S-T segment of electrocardiogram, angina, syncope

Target Organs cardiovascular system, lungs, blood, central nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Carbon tetrabromide			CAS 558-13-4
CBr ₄			RTECS FG4725000
Synonyms & Trade Names Carbon bromide, Methane tetrabromide, Tetrabromomethane			DOT ID & Guide 2516 151
Exposure Limits	NIOSH REL: TWA 0.1 ppm (1.4 mg/m ³) ST 0.3 ppm (4 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 13.57 mg/m ³	
Physical Description Colorless to yellow-brown crystals with a slight odor.			
MW: 331.7	BP: 374°F	MLT: 194°F	Sol: 0.02%
VP(205°F): 40 mmHg	IP: 10.31 eV		Sp.Gr: 3.42
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers, hexacyclohexyldilead, lithium			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: Daily Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; lacrimation (discharge of tears); lung, liver, kidney injury; in animals: corneal damage			
Target Organs Eyes, skin, respiratory system, liver, kidneys			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Carbon tetrachloride			CAS 56-23-5
CCl ₄			RTECS FG4900000
Synonyms & Trade Names Carbon chloride, Carbon tet, Freon® 10, Halon® 104, Tetrachloromethane			DOT ID & Guide 1846 151
Exposure Limits	NIOSH REL: Ca ST 2 ppm (12.6 mg/m ³) [60-minute] See Appendix A		
	OSHA PEL†: TWA 10 ppm C 25 ppm 200 ppm (5-minute maximum peak in any 4 hours)		
IDLH Ca [200 ppm]		Conversion 1 ppm = 6.29 mg/m ³	
Physical Description Colorless liquid with a 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.]			
Measurement Methods NIOSH 1003; OSHA 7			
Personal Protection & Sanitation 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) 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
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]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Carbonyl fluoride			CAS 353-50-4
COF ₂			RTECS FG6125000
Synonyms & Trade Names Carbon difluoride oxide, Carbon fluoride oxide, Carbon oxyfluoride, Carbonyl difluoride, Fluoroformyl fluoride, Fluorophosgene			DOT ID & Guide 2417 125
Exposure Limits	NIOSH REL: TWA 2 ppm (5 mg/m ³) ST 5 ppm (15 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 2.70 mg/m ³	
Physical Description Colorless gas with a pungent and very irritating odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 66.0	BP: -118°F	FRZ: -173°F	Sol: Reacts
VP: 55.4 atm	IP: 13.02 eV	RGasD: 2.29	
FLP: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Heat, moisture, hexafluoroisopropyl-ideneamino-lithium [Note: Reacts with water to form hydrogen fluoride & carbon dioxide.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane, respiratory system; eye, skin burns; lacrimation (discharge of tears); cough, pulmonary edema, dyspnea (breathing difficulty); chronic exposure: gastrointestinal pain, muscle fibrosis, skeletal fluorosis; liquid: frostbite			

Target Organs Eyes, skin, respiratory system, bone

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Catechol			CAS 120-80-9
C ₆ H ₄ (OH) ₂			RTECS UX1050000
Synonyms & Trade Names 1,2-Benzenediol; o-Benzenediol; 1,2-Dihydroxybenzene; o-Dihydroxybenzene; 2-Hydroxyphenol; Pyrocatechol			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 ppm (20 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.50 mg/m ³	
Physical Description Colorless, crystalline solid with a faint odor. [Note: Discolors to brown in air & light.]			
MW: 110.1	BP: 474°F	MLT: 221°F	Sol: 44%
VP(244°F): 10 mmHg	IP: ?		Sp.Gr: 1.34
Fl.P: 261°F	UEL: ?	LEL: 1.4%	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, nitric acid			
Measurement Methods OSHA PV2014			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; skin sensitization, dermatitis; lacrimation (discharge of tears), burns eyes; convulsions, increased blood pressure, kidney injury			
Target Organs Eyes, skin, respiratory system, central nervous system, kidneys			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cellulose			CAS 9004-34-6
(C ₆ H ₁₀ O ₅) _n			RTECS FJ5691460
Synonyms & Trade Names Hydroxycellulose, Pyrocellulose			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Odorless, white substance. [Note: The principal fiber cell wall material of vegetable tissues (wood, cotton, flax, grass, etc.).]			
MW: 160,000-560,000	BP: Decomposes	MLT: 500-518°F (Decomposes)	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.27-1.61
Fl.P: NA	UEL: NA	LEL: NA	
Combustible Solid			
Incompatibilities & Reactivities Water, bromine pentafluoride, sodium nitrate, fluorine, strong oxidizers			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cesium hydroxide			CAS 21351-79-1
CsOH			RTECS FK9800000
Synonyms & Trade Names Cesium hydrate, Cesium hydroxide dimer			DOT ID & Guide 2682 157 2681 154 (solution)
Exposure Limits	NIOSH REL: TWA 2 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless or yellowish, crystalline solid. [Note: Hygroscopic (i.e., absorbs moisture from the air).]			
MW: 149.9	BP: ?	MLT: 522°F	Sol(59°F): 395%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 3.68
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Water, acids, CO ₂ , metals (e.g., Al, Pb, Sn, Zn), oxygen [Note: CsOH is a strong base, causing the generation of considerable heat in contact with water or moisture.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; eye, skin burns			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chlordane			CAS 57-74-9
C ₁₀ H ₆ Cl ₈			RTECS PB9800000
Synonyms & Trade Names Chlordan; Chlordano; 1,2,4,5,6,7,8,8-Octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindane			DOT ID & Guide 2762 131
Exposure Limits	NIOSH REL: Ca TWA 0.5 mg/m ³ [skin] See Appendix A		
	OSHA PEL: TWA 0.5 mg/m ³ [skin]		
IDLH Ca [100 mg/m ³]		Conversion	
Physical Description Amber-colored, viscous liquid with a pungent, chlorine-like odor. [insecticide]			
MW: 409.8	BP: Decomposes	FRZ: 217-228°F	Sol: 0.0001%
VP: 0.00001 mmHg	IP: ?		Sp.Gr(77°F): 1.6
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but may be utilized in flammable solutions.			
Incompatibilities & Reactivities Strong oxidizers, alkaline reagents			
Measurement Methods NIOSH 5510; OSHA 67			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsions; anuria; in animals: lung, liver, kidney damage; [potential occupational carcinogen]
Target Organs central nervous system, eyes, lungs, liver, kidneys
Cancer Site [in animals: liver cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chlorinated camphene			CAS 8001-35-2
C ₁₀ H ₁₀ Cl ₈			RTECS XW5250000
Synonyms & Trade Names Chlorocamphene, Octachlorocamphene, Polychlorocamphene, Toxaphene			DOT ID & Guide 2761 151
Exposure Limits	NIOSH REL: Ca [skin] See Appendix A		
	OSHA PEL†: TWA 0.5 mg/m ³ [skin]		
IDLH Ca [200 mg/m ³]		Conversion	
Physical Description Amber, waxy solid with a mild, piney, chlorine- and camphor-like odor. [insecticide]			
MW: 413.8	BP: Decomposes	MLT: 149-194°F	Sol: 0.0003%
VP(77°F): 0.4 mmHg	IP: ?		Sp.Gr: 1.65
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Strong oxidizers [Note: Slightly corrosive to metals under moist conditions.]			
Measurement Methods NIOSH 5039			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-			

contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Nausea, confusion, agitation, tremor, convulsions, unconsciousness; dry, red skin; [potential occupational carcinogen]
Target Organs central nervous system, skin
Cancer Site [in animals: liver cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chlorinated diphenyl oxide		CAS	
C ₁₂ H _{10-n} Cl _n O		RTECS	
Synonyms & Trade Names Synonyms depend on the degree of chlorination of diphenyl oxide [(C ₆ H ₅) ₂ O], ranging from monochlorodiphenyl oxide [(C ₆ H ₄ Cl)O(C ₆ H ₅)] to decachlorodiphenyl oxide [(C ₆ Cl ₅)O(C ₆ Cl ₅)].		DOT ID & Guide	
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³		
	OSHA PEL: TWA 0.5 mg/m ³		
IDLH 5 mg/m ³		Conversion	
Physical Description Appearance and odor vary depending upon the specific compound.			
Properties vary depending upon the specific compound.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 5025			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m³ : (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 and acid gas canister having a high efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Acne-form dermatitis, liver damage

Target Organs Skin, liver

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chlorine			CAS 7782-50-5
Cl ₂			RTECS FO2100000
Synonyms & Trade Names Molecular chlorine			DOT ID & Guide 1017 124
Exposure Limits	NIOSH REL: C 0.5 ppm (1.45 mg/m ³) [15-minute]		
	OSHA PEL†: C 1 ppm (3 mg/m ³)		
IDLH 10 ppm See: 7782505		Conversion 1 ppm = 2.90 mg/m ³	
Physical Description Greenish-yellow gas with a pungent, irritating odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 70.9	BP: -29°F	FRZ: -150°F	Sol: 0.7%
VP: 6.8 atm	IP: 11.48 eV	RGasD: 2.47	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas, but a strong oxidizer.			
Incompatibilities & Reactivities Reacts explosively or forms explosive compounds with many common substances such as acetylene, ether, turpentine, ammonia, fuel gas, hydrogen & finely divided metals.			
Measurement Methods NIOSH 6011; OSHA ID101			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern*/(APF = 10) Any supplied-air respirator* Up to 10 ppm: (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*/(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 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Burning of eyes, nose, mouth; lacrimation (discharge of tears), rhinorrhea (discharge of thin mucus); cough, choking, substernal (occurring beneath the sternum) pain; nausea, vomiting; headache, dizziness; syncope; pulmonary edema; pneumonitis; hypoxemia (reduced oxygen in the blood); dermatitis; liquid: frostbite

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chlorine dioxide			CAS 10049-04-4
ClO ₂			RTECS FO3000000
Synonyms & Trade Names Chlorine oxide, Chlorine peroxide			DOT ID & Guide 9191 143 (hydrate, frozen)
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.3 mg/m ³) ST 0.3 ppm (0.9 mg/m ³)		
	OSHA PEL†: TWA 0.1 ppm (0.3 mg/m ³)		
IDLH 5 ppm		Conversion 1 ppm = 2.76 mg/m ³	
Physical Description Yellow to red gas or a red-brown liquid (below 52°F) with an unpleasant odor similar to chlorine and nitric acid.			
MW: 67.5	BP: 52°F	FRZ: -74°F	Sol(77°F): 0.3%
VP: >1 atm	IP: 10.36 eV	RGasD: 2.33	Sp.Gr: 1.6 (Liquid at 32°F)
Fl.P: NA (Gas) ? (Liquid)	UEL: ?	LEL: ?	
Flammable Gas/Combustible Liquid			
Incompatibilities & Reactivities Organic materials, heat, phosphorus, potassium hydroxide, sulfur, mercury, carbon monoxide [Note: Unstable in light. A powerful oxidizer.]			
Measurement Methods OSHA ID202			
Personal Protection & Sanitation Skin: Prevent skin contact (liquid) Eyes: Prevent eye contact (liquid) Wash skin: When contaminated (liquid) Remove: When wet (flammable) Change: No recommendation Provide: Eyewash (liquid), Quick drench (liquid)		First Aid (See procedures) Eye: Irrigate immediately (liquid) Skin: Soap wash immediately (liquid) Breathing: Respiratory support Swallow: Medical attention immediately (liquid)	
Respirator Recommendations NIOSH/OSHA Up to 1 ppm: (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 ppm: (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 [£] Up to 5 ppm: (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 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, nose, throat; cough, wheezing, bronchitis, pulmonary edema; chronic bronchitis

Target Organs Eyes, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chlorine trifluoride			CAS 7790-91-2
ClF ₃			RTECS FO2800000
Synonyms & Trade Names Chlorine fluoride, Chlorotrifluoride			DOT ID & Guide 1749 124
Exposure Limits	NIOSH REL: C 0.1 ppm (0.4 mg/m ³)		
	OSHA PEL: C 0.1 ppm (0.4 mg/m ³)		
IDLH 20 ppm		Conversion 1 ppm = 3.78 mg/m ³	
Physical Description Colorless gas or a greenish-yellow liquid (below 53°F) with a somewhat sweet, suffocating odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 92.5	BP: 53°F	FRZ: -105°F	Sol: Reacts
VP: 1.4 atm	IP: 13.00 eV	RGasD: 3.21	Sp.Gr: 1.77 (Liquid at 53°F)
FLP: NA	UEL: NA	LEL: NA	
Nonflammable Gas Noncombustible Liquid, but contact with organic materials may result in SPONTANEOUS ignition.			
Incompatibilities & Reactivities Oxidizers, water, acids, combustible materials, sand, glass, metals (corrosive) [Note: Reacts with water to form chlorine & hydrofluoric acid.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated (liquid) Remove: When wet or contaminated (liquid) Change: No recommendation Provide: Eyewash (liquid), Quick drench (liquid)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately (liquid)	
Respirator Recommendations NIOSH/OSHA Up to 2.5 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] Up to 5 ppm : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece			

Up to 20 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Eye, skin burns (liquid or high vapor concentration); respiratory irritation; in animals: lacrimation (discharge of tears), corneal ulcer; pulmonary edema

Target Organs Skin, eyes, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chloroacetaldehyde			CAS 107-20-0
ClCH ₂ CHO			RTECS AB2450000
Synonyms & Trade Names Chloroacetaldehyde (40% aqueous solution), 2-Chloroacetaldehyde, 2-Chloroethanal			DOT ID & Guide 2232 153
Exposure Limits	NIOSH REL: C 1 ppm (3 mg/m ³)		
	OSHA PEL: C 1 ppm (3 mg/m ³)		
IDLH 45 ppm		Conversion 1 ppm = 3.21 mg/m ³	
Physical Description Colorless liquid with an acrid, penetrating odor. [Note: Typically found as a 40% aqueous solution.]			
MW: 78.5	BP: 186°F	FRZ: -3°F (40% solution)	Sol: Miscible
VP: 100 mmHg	IP: 10.61 eV		Sp.Gr: 1.19 (40% solution)
Fl.P: 190°F (40% solution)	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Oxidizers, acids			
Measurement Methods NIOSH 2015; OSHA 76			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA 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 45 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
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

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

Symptoms Irritation skin, eyes, mucous membrane; skin burns; eye damage; pulmonary edema; skin, respiratory system sensitization

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

alpha-Chloroacetophenone			CAS 532-27-4
C6H5COCH2Cl			RTECS AM6300000
Synonyms & Trade Names 2-Chloroacetophenone, Chloromethyl phenyl ketone, Mace®, Phenacyl chloride, Phenyl chloromethyl ketone, Tear gas			DOT ID & Guide 1697 153
Exposure Limits	NIOSH REL: TWA 0.3 mg/m ³ (0.05 ppm)		
	OSHA PEL: TWA 0.3 mg/m ³ (0.05 ppm)		
IDLH 15 mg/m ³		Conversion 1 ppm = 6.32 mg/m ³	
Physical Description Colorless to gray crystalline solid with a sharp, irritating odor.			
MW: 154.6	BP: 472°F	MLT: 134°F	Sol: Insoluble
VP: 0.005 mmHg	IP: 9.44 eV		Sp.Gr: 1.32
Fl.P: 244°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Water, steam, strong oxidizers [Note: Slowly corrodes metals.]			
Measurement Methods NIOSH P&CAM291 (II-5)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 3 mg/m³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust and mist filter/(APF = 10) Any supplied-air respirator Up to 7.5 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust and mist filter [£] Up to 15 mg/m³ : (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)			

in combination with a high-efficiency particulate filter/(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 and having 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 canister providing protection against the compound of concern and having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; pulmonary edema

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chloroacetyl chloride			CAS 79-04-9
ClCH ₂ COCl			RTECS AO6475000
Synonyms & Trade Names Chloroacetic acid chloride, Chloroacetic chloride, Monochloroacetyl chloride			DOT ID & Guide 1752 156
Exposure Limits	NIOSH REL: TWA 0.05 ppm (0.2 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.62 mg/m ³	
Physical Description Colorless to yellowish liquid with a strong, pungent odor.			
MW: 112.9	BP: 223°F	FRZ: -7°F	Sol: Decomposes
VP: 19 mmHg	IP: 10.30 eV		Sp.Gr: 1.42
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Water, alcohols, bases, metals (corrosive), amines [Note: Decomposes in water to form chloroacetic acid & hydrogen chloride gas.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; eye, skin burns; cough, wheezing, dyspnea (breathing difficulty); lacrimation (discharge of tears)			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chlorobenzene			CAS 108-90-7
C ₆ H ₅ Cl			RTECS CZ0175000
Synonyms & Trade Names Benzene chloride, Chlorobenzol, MCB, Monochlorobenzene, Phenyl chloride			DOT ID & Guide 1134 130
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL: TWA 75 ppm (350 mg/m ³)		
IDLH 1000 ppm		Conversion 1 ppm = 4.61 mg/m ³	
Physical Description Colorless liquid with an almond-like odor.			
MW: 112.6	BP: 270°F	FRZ: -50°F	Sol: 0.05%
VP: 9 mmHg	IP: 9.07 eV		Sp.Gr: 1.11
Fl.P: 82°F	UEL: 9.6%	LEL: 1.3%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1003; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
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
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
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Chlorobenzylidene malononitrile			CAS 2698-41-1
ClC6H4CH=C(CN)2			RTECS OO3675000
Synonyms & Trade Names 2-Chlorobenzalmalonitrile, CS, OCBM			DOT ID & Guide 2810 153
Exposure Limits	NIOSH REL: C 0.05 ppm (0.4 mg/m³) [skin]		
	OSHA PEL†: TWA 0.05 ppm (0.4 mg/m³)		
IDLH 2 mg/m³		Conversion 1 ppm = 7.71 mg/m³	
Physical Description White crystalline solid with a pepper-like odor.			
MW: 188.6	BP: 590-599°F	MLT: 203-205°F	Sol: Insoluble
VP: 0.00003 mmHg	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	MEC: 25 g/m³
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH P&CAM304 (II-5)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode£/(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 and having 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 canister providing protection against the compound of concern and having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Pain, burn eyes, lacrimation (discharge of tears), conjunctivitis; erythema (skin redness) eyelids, blepharospasm; irritation throat, cough, chest tightness; headache; erythema (skin redness), skin vesiculation
Target Organs Eyes, skin, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chlorobromomethane			CAS 74-97-5
CH ₂ BrCl			RTECS PA5250000
Synonyms & Trade Names Bromochloromethane, CB, CBM, Fluorocarbon 1011, Halon® 1011, Methyl chlorobromide			DOT ID & Guide 1887 160
Exposure Limits	NIOSH REL: TWA 200 ppm (1050 mg/m ³)		
	OSHA PEL: TWA 200 ppm (1050 mg/m ³)		
IDLH 2000 ppm		Conversion 1 ppm = 5.29 mg/m ³	
Physical Description Colorless to pale-yellow liquid with a chloroform-like odor. [Note: May be used as a fire extinguishing agent.]			
MW: 129.4	BP: 155°F	FRZ: -124°F	Sol: Insoluble
VP: 115 mmHg	IP: 10.77 eV		Sp.Gr: 1.93
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Chemically-active metals such as calcium, powdered aluminum, zinc & magnesium			
Measurement Methods NIOSH 1003			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2000 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

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

Symptoms Irritation eyes, skin, throat; confusion, dizziness, central nervous system depression; pulmonary edema

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chlorodifluoromethane			CAS 75-45-6
CHClF ₂			RTECS PA6390000
Synonyms & Trade Names Difluorochloromethane, Fluorocarbon-22, Freon® 22, Genetron® 22, Monochlorodifluoromethane, Refrigerant 22			DOT ID & Guide 1018 126
Exposure Limits	NIOSH REL: TWA 1000 ppm (3500 mg/m ³) ST 1250 ppm (4375 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D. See: IDLH INDEX		Conversion 1 ppm = 3.54 mg/m ³	
Physical Description Colorless gas with a faint, sweetish odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 86.5	BP: -41°F	FRZ: -231°F	Sol(77°F): 0.3%
VP: 9.4 atm	IP: 12.45 eV	RGasD: 3.11	
FLP: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Alkalis, alkaline earth metals (e.g., powdered aluminum, sodium, potassium, zinc)			
Measurement Methods NIOSH 1018			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact (liquid)			
Symptoms Irritation respiratory system; confusion, drowsiness, ringing in ears; heart palpitations, cardiac arrhythmias; asphyxia; liver, kidney, spleen injury; liquid: frostbite			
Target Organs respiratory system, cardiovascular system, central nervous system, liver, kidneys, spleen			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chlorodiphenyl (42% chlorine)			CAS 53469-21-9
C₆H₄ClC₆H₃Cl₂ (approx)			RTECS TQ1356000
Synonyms & Trade Names Aroclor® 1242, PCB, Polychlorinated biphenyl			DOT ID & Guide 2315 171
Exposure Limits	NIOSH REL*: Ca TWA 0.001 mg/m ³ See Appendix A [*Note: The REL also applies to other PCBs.]		
	OSHA PEL: TWA 1 mg/m ³ [skin]		
IDLH Ca [5 mg/m ³]		Conversion	
Physical Description Colorless to light-colored, viscous liquid with a mild, hydrocarbon odor.			
MW: 258 (approx)	BP: 617-691°F	FRZ: -2°F	Sol: Insoluble
VP: 0.001 mmHg	IP: ?		Sp.Gr(77°F): 1.39
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans & chlorinated dibenzo-p-dioxins.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 5503			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes; chloracne; liver damage; reproductive effects; [potential occupational carcinogen]
Target Organs Skin, eyes, liver, reproductive system
Cancer Site [in animals: tumors of the pituitary gland & liver, leukemia]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chlorodiphenyl (54% chlorine)			CAS 11097-69-1
C ₆ H ₃ Cl ₂ C ₆ H ₂ Cl ₃ (approx)			RTECS TQ1360000
Synonyms & Trade Names Aroclor® 1254, PCB, Polychlorinated biphenyl			DOT ID & Guide 2315 171
Exposure Limits	NIOSH REL*: Ca TWA 0.001 mg/m ³ See Appendix A [*Note: The REL also applies to other PCBs.]		
	OSHA PEL: TWA 0.5 mg/m ³ [skin]		
IDLH Ca [5 mg/m ³]		Conversion	
Physical Description Colorless to pale-yellow, viscous liquid or solid (below 50°F) with a mild, hydrocarbon odor.			
MW: 326 (approx)	BP: 689-734°F	FRZ: 50°F	Sol: Insoluble
VP: 0.00006 mmHg	IP: ?		Sp.Gr(77°F): 1.38
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans, and chlorinated dibenzo-p-dioxins.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 5503 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]
Target Organs Skin, eyes, liver, reproductive system
Cancer Site [in animals: tumors of the pituitary gland & liver, leukemia]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chloroform			CAS 67-66-3
CHCl ₃			RTECS FS9100000
Synonyms & Trade Names Methane trichloride, Trichloromethane			DOT ID & Guide 1888 151
Exposure Limits	NIOSH REL: Ca ST 2 ppm (9.78 mg/m ³) [60-minute] See Appendix A		
	OSHA PEL†: C 50 ppm (240 mg/m ³)		
IDLH Ca [500 ppm]		Conversion 1 ppm = 4.88 mg/m ³	
Physical Description Colorless liquid with a pleasant odor.			
MW: 119.4	BP: 143°F	FRZ: -82°F	Sol(77°F): 0.5%
VP: 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.]			
Measurement Methods NIOSH 1003			
Personal Protection & Sanitation 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) 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
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]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

bis-Chloromethyl ether			CAS 542-88-1
(CH ₂ Cl) ₂ O			RTECS KN1575000
Synonyms & Trade Names BCME, bis-CME, Chloromethyl ether, Dichlorodimethyl ether, Dichloromethyl ether, Oxybis(chloromethane)			DOT ID & Guide 2249 153
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1008] See Appendix B		
IDLH Ca [N.D.]		Conversion	
Physical Description Colorless liquid with a suffocating odor.			
MW: 115.0	BP: 223°F	FRZ: -43°F	Sol: Reacts
VP(72°F): 30 mmHg	IP: ?		Sp.Gr: 1.32
Fl.P: <66°F	UEL: ?	LEL: ?	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Acids, water [Note: Reacts with water to form hydrochloric acid & formaldehyde.]			
Measurement Methods OSHA 10			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet (flammable) Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, mucous membrane, respiratory system; pulmonary congestion, edema; corneal damage, necrosis; decreased pulmonary function, cough, dyspnea (breathing difficulty), wheezing; blood-stained sputum, bronchial secretions; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system
Cancer Site [lung cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chloromethyl methyl ether			CAS 107-30-2
CH ₃ OCH ₂ Cl			RTECS KN6650000
Synonyms & Trade Names Chlorodimethyl ether, Chloromethoxymethane, CMME, Dimethylchloroether, Methylchloromethyl ether			DOT ID & Guide 1239 131
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1006] See Appendix B		
IDLH Ca [N.D.]		Conversion	
Physical Description Colorless liquid with an irritating odor.			
MW: 80.5	BP: 138°F	FRZ: -154°F	Sol: Reacts
VP(70°F): 192 mmHg	IP: 10.25 eV		Sp.Gr: 1.06
Fl.P(oc): 32°F	UEL: ?	LEL: ?	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Water [Note: Reacts with water to form hydrochloric acid & formaldehyde.]			
Measurement Methods NIOSH P&CAM220 (II-1); OSHA 10			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet (flammable) Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, mucous membrane; pulmonary edema, pulmonary congestion, pneumonitis; skin burns, necrosis; cough, wheezing, pulmonary congestion; blood stained-sputum; weight loss; bronchial secretions; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system
Cancer Site [in animals: skin & lung cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1-Chloro-1-nitropropane			CAS 600-25-9
CH ₃ CH ₂ CHClNO ₂			RTECS TX5075000
Synonyms & Trade Names Korax®, Lanstan®			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 2 ppm (10 mg/m ³)		
	OSHA PEL†: TWA 20 ppm (100 mg/m ³)		
IDLH 100 ppm		Conversion 1 ppm = 5.06 mg/m ³	
Physical Description Colorless liquid with an unpleasant odor. [fungicide]			
MW: 123.6	BP: 289°F	FRZ: ?	Sol: 0.5%
VP(77°F): 6 mmHg	IP: 9.90 eV		Sp.Gr: 1.21
Fl.P(oc): 144°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers, acids			
Measurement Methods NIOSH S211 (II-5)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 20 ppm: (APF = 10) Any supplied-air respirator* Up to 50 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 100 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 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms In animals: irritation eyes; pulmonary edema; liver, kidney, heart damage
Target Organs respiratory system, liver, kidneys, cardiovascular system, eyes
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chloropentafluoroethane			CAS 76-15-3
CClF ₂ CF ₃			RTECS KH7877500
Synonyms & Trade Names Fluorocarbon-115, Freon® 115, Genetron® 115, Halocarbon 115, Monochloropentafluoroethane			DOT ID & Guide 1020 126
Exposure Limits	NIOSH REL: TWA 1000 ppm (6320 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 6.32 mg/m ³	
Physical Description Colorless gas with a slight, ethereal odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 154.5	BP: -38°F	FRZ: -223°F	Sol(77°F): 0.006%
VP(70°F): 7.9 atm	IP: 12.96 eV	RGasD: 5.55	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Alkalis, alkaline earth metals (e.g., aluminum powder, sodium, potassium, zinc)			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact (liquid)			
Symptoms Dyspnea (breathing difficulty); dizziness, incoordination, narcosis; nausea, vomiting; heart palpitations, cardiac arrhythmias, asphyxia; liquid: frostbite, dermatitis			
Target Organs Skin, central nervous system, cardiovascular system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chloropicrin			CAS 76-06-2
CCl ₃ NO ₂			RTECS PB6300000
Synonyms & Trade Names Nitrochloroform, Nitrotrichloromethane, Trichloronitromethane			DOT ID & Guide 1580 154 1583 154 (mixture, n.o.s.) 2929 131 (flammable mixture)
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.7 mg/m ³)		
	OSHA PEL: TWA 0.1 ppm (0.7 mg/m ³)		
IDLH 2 ppm		Conversion 1 ppm = 6.72 mg/m ³	
Physical Description Colorless to faint-yellow, oily liquid with an intensely irritating odor. [pesticide]			
MW: 164.4	BP: 234°F	FRZ: -93°F	Sol: 0.2%
VP: 18 mmHg	IP: ?		Sp.Gr: 1.66
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Strong oxidizers [Note: The material may explode when heated under confinement.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2 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

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

Symptoms Irritation eyes, skin, respiratory system; lacrimation (discharge of tears); cough, pulmonary edema; nausea, vomiting

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

beta-Chloroprene			CAS 126-99-8
CH ₂ =CClCH=CH ₂			RTECS EI9625000
Synonyms & Trade Names 2-Chloro-1,3-butadiene; Chlorobutadiene; Chloroprene			DOT ID & Guide 1991 131P (inhibited)
Exposure Limits	NIOSH REL: Ca C 1 ppm (3.6 mg/m ³) [15-minute] See Appendix A		
	OSHA PEL†: TWA 25 ppm (90 mg/m ³) [skin]		
IDLH Ca [300 ppm]		Conversion 1 ppm = 3.62 mg/m ³	
Physical Description Colorless liquid with a pungent, ether-like odor.			
MW: 88.5	BP: 139°F	FRZ: -153°F	Sol: Slight
VP: 188 mmHg	IP: 8.79 eV		Sp.Gr: 0.96
Fl.P: -4°F	UEL: 11.3%	LEL: 1.9%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Peroxides & other oxidizers [Note: Polymerizes at room temperature unless inhibited with antioxidants.]			
Measurement Methods NIOSH 1002; OSHA 112			
Personal Protection & Sanitation 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) 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			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; anxiety, irritability; dermatitis; alopecia; reproductive effects; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, reproductive system
Cancer Site [lung & skin cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Chlorostyrene			CAS 2039-87-4
ClC6H4CH=CH2			RTECS WL4160000
Synonyms & Trade Names 2-Chlorostyrene, ortho-Chlorostyrene, 1-Chloro-2-ethenylbenzene			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 50 ppm (285 mg/m ³) ST 75 ppm (428 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 5.67 mg/m ³	
Physical Description Colorless liquid.			
MW: 138.6	BP: 372°F	FRZ: -82°F	Sol: Insoluble
VP(77°F): 0.96 mmHg	IP: ?		Sp.Gr: 1.10
Fl.P: 138°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities None reported			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms In animals: irritation eyes, skin; hematuria (blood in the urine), proteinuria, acidosis; enlarged liver, jaundice			
Target Organs Eyes, skin, liver, kidneys, central nervous system, peripheral nervous system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Chlorotoluene			CAS 95-49-8
ClC6H4CH3			RTECS XS9000000
Synonyms & Trade Names 1-Chloro-2-methylbenzene, 2-Chloro-1-methylbenzene, 2-Chlorotoluene, o-Tolyl chloride			DOT ID & Guide 2238 130
Exposure Limits	NIOSH REL: TWA 50 ppm (250 mg/m³) ST 75 ppm (375 mg/m³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 5.18 mg/m³	
Physical Description Colorless liquid with an aromatic odor.			
MW: 126.6	BP: 320°F	FRZ: -31°F	Sol(77°F): 0.009%
VP(77°F): 4 mmHg	IP: 8.83 eV		Sp.Gr: 1.08
Fl.P: 96°F	UEL: ?	LEL: ?	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Acids, alkalis, oxidizers, reducing materials, water			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane; dermatitis; drowsiness, incoordination, anesthesia; cough; liver, kidney injury			
Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Chloro-6-trichloromethyl pyridine			CAS 1929-82-4
ClC5H3NCCl3			RTECS US7525000
Synonyms & Trade Names 2-Chloro-6-(trichloro-methyl)pyridine; Nitrapyrin; N-serve®; 2,2,2,6-Tetrachloro-2-picoline			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m³ (total) ST 20 mg/m³ (total) TWA 5 mg/m³ (resp)		
	OSHA PEL: TWA 15 mg/m³ (total) TWA 5 mg/m³ (resp)		
IDLH N.D.		Conversion	
Physical Description Colorless or white, crystalline solid with a mild, sweet odor.			
MW: 230.9	BP: ?	MLT: 145°F	Sol: Insoluble
VP(73°F): 0.003 mmHg	IP: ?		Sp.Gr: ?
FLP: ?	UEL: ?	LEL: ?	
Combustible Solid [Explosive]			
Incompatibilities & Reactivities Aluminum, magnesium [Note: Emits oxides of nitrogen and chloride ion when heated to decomposition.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms No adverse effects noted in ingestion studies with animals.			
Target Organs Eyes, skin			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chlorpyrifos			CAS 2921-88-2
C9H11Cl3NO3PS			RTECS TF6300000
Synonyms & Trade Names Chlorpyrifos-ethyl; O,O-Diethyl O-3,5,6-trichloro-2-pyridyl phosphorothioate; Dursban®			DOT ID & Guide 2783 152
Exposure Limits	NIOSH REL: TWA 0.2 mg/m ³ ST 0.6 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless to white, crystalline solid with a mild, mercaptan-like odor. [pesticide] [Note: Commercial formulations may be combined with combustible liquids.]			
MW: 350.6	BP: 320°F (Decomposes)	MLT: 108°F	Sol: 0.0002%
VP: 0.00002 mmHg	IP: ?		Sp.Gr: 1.40 (Liquid at 110°F)
FLP: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong acids, caustics, amines [Note: Corrosive to copper & brass.]			
Measurement Methods NIOSH 5600; OSHA 62			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Wheezing, laryngeal spasms, salivation; bluish lips, skin; miosis, blurred vision; nausea, vomiting, abdominal cramps, diarrhea			

Target Organs respiratory system, central nervous system, peripheral nervous system, plasma cholinesterase

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chromic acid and chromates			CAS 1333-82-0 (CrO ₃)
CrO ₃ (acid)			RTECS GB6650000 (CrO ₃)
Synonyms & Trade Names Chromic acid (CrO ₃): Chromic anhydride, Chromic oxide, Chromium(VI) oxide (1:3), Chromium trioxide Synonyms of chromates (i.e., chromium(VI) compounds) such as zinc chromate vary depending upon the specific compound.			DOT ID & Guide 1755 154 (acid solution) 1463 141 (acid, solid)
Exposure Limits	NIOSH REL (as Cr): Ca TWA 0.001 mg/m ³ See Appendix A See Appendix C		
	OSHA PEL (as CrO ₃): C 0.1 mg/m ³ See Appendix C		
IDLH Ca [15 mg/m ³ {as Cr(VI)}]		Conversion	
Physical Description CrO ₃ : Dark-red, odorless flakes or powder. [Note: Often used in an aqueous solution (H ₂ CrO ₄).]			
MW: 100.0	BP: 482°F (Decomposes)	MLT: 387°F (Decomposes)	Sol: 63%
VP: Very low	IP: NA		Sp.Gr: 2.70 (CrO ₃)
FLP: NA	UEL: NA	LEL: NA	
CrO ₃ : Noncombustible Solid, but will accelerate the burning of combustible materials.			
Incompatibilities & Reactivities Combustible, organic, or other readily oxidizable materials (paper, wood, sulfur, aluminum, plastics, etc.); corrosive to metals			
Measurement Methods NIOSH 7600, 7604; OSHA ID103, ID215			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation respiratory system; nasal septum perforation; liver, kidney damage; leukocytosis (increased blood leukocytes), leukopenia (reduced blood leukocytes), eosinophilia; eye injury, conjunctivitis; skin ulcer, sensitization dermatitis; [potential occupational carcinogen]

Target Organs Blood, respiratory system, liver, kidneys, eyes, skin

Cancer Site [lung cancer]

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chromium(II) compounds (as Cr)		CAS	
		RTECS	
Synonyms & Trade Names Synonyms vary depending upon the specific Chromium(II) compound. [Note: Chromium(II) compounds include soluble chromous salts.]		DOT ID & Guide	
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³ See Appendix C		
	OSHA PEL: TWA 0.5 mg/m ³ See Appendix C		
IDLH 250 mg/m ³ [as Cr(II)]		Conversion	
Physical Description Appearance and odor vary depending upon the specific compound.			
Properties vary depending upon the specific compound.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 7024; OSHA ID121, ID125G			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2.5 mg/m³ : (APF = 5) Any dust and mist respirator* Up to 5 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(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 dust and mist filter*			

Up to 25 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes; sensitization dermatitis

Target Organs Eyes, skin

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chromium(III) compounds (as Cr)		CAS	
		RTECS	
Synonyms & Trade Names Synonyms vary depending upon the specific Chromium(III) compound. [Note: Chromium(III) compounds include soluble chromic salts.]		DOT ID & Guide	
Exposure Limits	NIOSH REL: TWA 0.5 mg/m³ See Appendix C		
	OSHA PEL: TWA 0.5 mg/m³ See Appendix C		
IDLH 25 mg/m³ [as Cr(III)]		Conversion	
Physical Description Appearance and odor vary depending upon the specific compound.			
Properties vary depending upon the specific compound.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 7024; OSHA ID121, ID125G			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2.5 mg/m³ : (APF = 5) Any dust and mist respirator* Up to 5 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(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 dust and mist filter*			

Up to 25 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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

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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes; sensitization dermatitis

Target Organs Eyes, skin

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chromium metal			CAS 7440-47-3
Cr			RTECS GB4200000
Synonyms & Trade Names Chrome, Chromium			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³ See Appendix C		
	OSHA PEL*: TWA 1 mg/m ³ See Appendix C [*Note: The PEL also applies to insoluble chromium salts.]		
IDLH 250 mg/m ³ (as Cr)		Conversion	
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: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form, but finely divided dust burns rapidly if heated in a flame.			
Incompatibilities & Reactivities Strong oxidizers (such as hydrogen peroxide), alkalis			
Measurement Methods NIOSH 7024; OSHA ID121, ID125G			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) 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 dust and mist respirator* Up to 5 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(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 dust and mist filter* Up to 25 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate			

filter/(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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin; lung fibrosis (histologic)

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Chromyl chloride			CAS 14977-61-8
Cr(OCl) ₂			RTECS GB5775000
Synonyms & Trade Names Chlorochromic anhydride, Chromic oxychloride, Chromium chloride oxide, Chromium dichloride dioxide, Chromium dioxide dichloride, Chromium dioxychloride, Chromium oxychloride, Dichlorodioxochromium			DOT ID & Guide 1758 137
Exposure Limits	NIOSH REL: Ca 0.001 mg Cr(VI)/m ³ See Appendix A See Appendix C		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Deep-red liquid with a musty, burning, acrid odor. [Note: Fumes in moist air.]			
MW: 154.9	BP: 243°F	FRZ: -142°F	Sol: Reacts
VP: 20 mmHg	IP: 12.60 eV		Sp.Gr(77°F): 1.91
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but a powerful oxidizer.			
Incompatibilities & Reactivities Water, combustible substances, halides, phosphorus, turpentine [Note: Reacts violently in water; forms chromic acid, chromic chloride, hydrochloric acid & chlorine. Corrodes common metals.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, upper respiratory system; eye, skin burns
Target Organs Eyes, skin, respiratory system
Cancer Site [lung cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Clopidol			CAS 2971-90-6
C ₇ H ₇ Cl ₂ NO			RTECS UU7711500
Synonyms & Trade Names Coyden®; 3,5-Dichloro-2,6-dimethyl-4-pyridinol			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) ST 20 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description White to light-brown, crystalline solid.			
MW: 192.1	BP: ?	MLT: >608°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but dust may explode in cloud form.			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; cough			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Coal dust			CAS
			RTECS GF8281000
Synonyms & Trade Names Anthracite coal dust, Bituminous coal dust, Lignite coal dust			DOT ID & Guide 1361 133
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 2.4 mg/m ³ (<5% SiO ₂) TWA 10 mg/m ³ /(%SiO ₂ + 2) (>5% SiO ₂)		
IDLH N.D.		Conversion	
Physical Description Dark-brown to black solid dispersed in air.			
Properties vary depending upon the specific coal type.			
Combustible Solid; slightly explosive when exposed to flame.			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0600, 7500			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation			
Symptoms Chronic bronchitis, decreased pulmonary function, emphysema			
Target Organs respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Coal tar pitch volatiles		CAS 65996-93-2	
		RTECS GF8655000	
Synonyms & Trade Names Synonyms vary depending upon the specific compound (e.g., pyrene, phenanthrene, acridine, chrysene, anthracene & benzo(a)pyrene). [Note: NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products.]		DOT ID & Guide	
Exposure Limits	NIOSH REL: Ca TWA 0.1 mg/m ³ (cyclohexane-extractable fraction) See Appendix A See Appendix C		
	OSHA PEL: TWA 0.2 mg/m ³ (benzene-soluble fraction) [1910.1002] See Appendix C		
IDLH Ca [80 mg/m ³]		Conversion	
Physical Description Black or dark-brown amorphous residue.			
Properties vary depending upon the specific compound.			
Combustible Solids			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods OSHA 58			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Dermatitis, bronchitis, [potential occupational carcinogen]

Target Organs respiratory system, skin, bladder, kidneys

Cancer Site [lung, kidney & skin cancer]

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cobalt metal dust and fume (as Co)			CAS 7440-48-4
Co			RTECS GF8750000
Synonyms & Trade Names Cobalt metal dust, Cobalt metal fume			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.05 mg/m ³		
	OSHA PEL†: TWA 0.1 mg/m ³		
IDLH 20 mg/m ³ (as Co)		Conversion	
Physical Description Odorless, silver-gray to black solid.			
MW: 58.9	BP: 5612°F	MLT: 2719°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 8.92
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form, but finely divided dust will burn at high temperatures.			
Incompatibilities & Reactivities Strong oxidizers, ammonium nitrate			
Measurement Methods NIOSH 7027, 7300; OSHA ID121, ID125G, ID213			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 0.25 mg/m³ : (APF = 5) Any dust and mist respirator^ Up to 0.5 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(APF = 10) Any dust, mist, and fume respirator*/(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 dust and mist filter*/(APF = 25) Any powered, air-purifying respirator with a dust, mist, and fume filter*			

Up to 2.5 mg/m : (APF = 50) Any air-purifying, full-facepiece respirator 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

Up to 20 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; respiratory hypersensitivity, asthma

Target Organs Skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cobalt carbonyl (as Co)			CAS 10210-68-1
C ₈ Co ₂ O ₈			RTECS GG0300000
Synonyms & Trade Names di-mu-Carbonylhexacarbonyldicobalt, Cobalt octacarbonyl, Cobalt tetracarbonyl dimer, Dicobalt carbonyl, Dicobalt Octacarbonyl, Octacarbonyldicobalt			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Orange to dark-brown, crystalline solid. [Note: The pure substance is white.]			
MW: 341.9	BP: 126°F (Decomposes)	MLT: 124°F	Sol: Insoluble
VP: 0.7 mmHg	IP: ?		Sp.Gr: 1.87
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but flammable carbon monoxide is emitted during decomposition.			
Incompatibilities & Reactivities Air [Note: Decomposes on exposure to air or heat; stable in atmosphere of hydrogen & carbon monoxide.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane; cough, decreased pulmonary function, wheezing, dyspnea (breathing difficulty); in animals: liver, kidney injury, pulmonary edema			
Target Organs Eyes, skin, respiratory system, blood, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cobalt hydrocarbonyl (as Co)			CAS 16842-03-8
HCo(CO) ₄			RTECS GG0900000
Synonyms & Trade Names Hydrocobalt tetracarbonyl, Tetracarbonylhydridocobalt, Tetracarbonylhydrocobalt			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Gas with an offensive odor.			
MW: 172.0	BP: ?	FRZ: -15°F	Sol: 0.05%
VP: >1 atm	IP: ?	RGasD: 5.93	
Fl.P: NA (Gas)	UEL: ?	LEL: ?	
Flammable Gas			
Incompatibilities & Reactivities Air [Note: Unstable gas that decomposes rapidly in air at room temperature to cobalt carbonyl & hydrogen.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms In animals: irritation respiratory system; dyspnea (breathing difficulty), cough, decreased pulmonary function, pulmonary edema			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Coke oven emissions		CAS	
		RTECS GH0346000	
Synonyms & Trade Names Synonyms vary depending upon the specific constituent.		DOT ID & Guide	
Exposure Limits	NIOSH REL: Ca TWA 0.2 mg/m ³ (benzene-soluble fraction) See Appendix A See Appendix C		
	OSHA PEL: [1910.1029] TWA 0.150 mg/m ³ (benzene-soluble fraction)		
IDLH Ca [N.D.]		Conversion	
Physical Description Emissions released during the carbonization of bituminous coal for the production of coke. [Note: See Appendix C for more information.]			
Properties vary depending upon the constituent.			
Incompatibilities & Reactivities None reported			
Measurement Methods OSHA 58			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact
Symptoms Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing; [potential occupational carcinogen]
Target Organs Skin, respiratory system, urinary system
Cancer Site [skin, lung, kidney & bladder cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Copper (dusts and mists, as Cu)			CAS 7440-50-8
Cu			RTECS GL5325000
Synonyms & Trade Names Copper metal dusts, Copper metal fumes			DOT ID & Guide
Exposure Limits	NIOSH REL*: TWA 1 mg/m ³ [*Note: The REL also applies to other copper compounds (as Cu) except Copper fume.]		
	OSHA PEL*: TWA 1 mg/m ³ [*Note: The PEL also applies to other copper compounds (as Cu) except copper fume.]		
IDLH 100 mg/m ³ (as Cu)		Conversion	
Physical Description Reddish, lustrous, malleable, odorless solid.			
MW: 63.5	BP: 4703°F	MLT: 1981°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 8.94
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form, but powdered form may ignite.			
Incompatibilities & Reactivities Oxidizers, alkalis, sodium azide, acetylene			
Measurement Methods NIOSH 7029; OSHA ID121, ID125G			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m³ : (APF = 5) Any dust and mist respirator* Up to 10 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(APF = 10) Any supplied-air respirator* Up to 25 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter*			

Up to 50 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, liver, kidneys (increase(d) risk with Wilson's disease)

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Copper fume (as Cu)			CAS 1317-38-0 (CuO)
CuO/Cu			RTECS GL7900000 (CuO)
Synonyms & Trade Names CuO: Black copper oxide fume, Copper monoxide fume, Copper(II) oxide fume, Cupric oxide fume Cu: Copper fume [Note: Also see specific listing for Copper (dusts and mists).]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³		
	OSHA PEL: TWA 0.1 mg/m ³		
IDLH 100 mg/m ³ (as Cu)		Conversion	
Physical Description Finely divided black particulate dispersed in air. [Note: Exposure may occur in copper & brass plants and during the welding of copper alloys.]			
MW: 79.5	BP: Decomposes	MLT: 1879°F (Decomposes)	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 6.4 (CuO)
FLP: NA	UEL: NA	LEL: NA	
CuO: Noncombustible Solid			
Incompatibilities & Reactivities CuO: Acetylene, zirconium [Note: See Copper (dusts and mists) for properties of Copper metal.]			
Measurement Methods NIOSH 7029; OSHA ID121, ID125G, ID206			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 1 mg/m³ : (APF = 10) Any dust, mist, and fume respirator/(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 a dust, mist, and fume filter			

Up to 5 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, upper respiratory system; metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough, lassitude (weakness, exhaustion); metallic or sweet taste; discoloration skin, hair

Target Organs Eyes, skin, respiratory system (increase(d) risk with Wilson's disease)

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- INTRODUCTION
- INDEX with CHEMICAL NAMES and SYNONYMS
- INDEX with CHEMICAL NAMES
- INDEX with CAS NUMBERS
- APPENDICES

NIOSH Pocket Guide to Chemical Hazards

Cotton dust (raw)			CAS
			RTECS GN2275000
Synonyms & Trade Names Raw cotton dust			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA <0.200 mg/m ³ See Appendix C		
	OSHA PEL: [Z-1-A & 1910.1043] TWA 1 mg/m ³ (waste processing during waste recycling [sorting, blending, cleaning & willowing] & garnetting) TWA 0.200 mg/m ³ (textile yarn manufacturing) TWA 0.750 mg/m ³ (textile slashing & weaving) TWA 0.500 mg/m ³ (all other operations) See Appendix C		
IDLH 100 mg/m ³		Conversion	
Physical Description Colorless, odorless solid.			
MW: ?	BP: Decomposes	MLT: Decomposes	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods OSHA [1910.1043]			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Fresh air	
Respirator Recommendations NIOSH Up to 1 mg/m ³ : (APF = 5) Any dust respirator Up to 2 mg/m ³ : (APF = 10) Any dust respirator except single-use and quarter-mask respirators/(APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator			

Up to 5 mg/m : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust filter

Up to 10 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 100 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation

Symptoms Byssinosis: chest tightness, cough, wheezing, dyspnea (breathing difficulty); decreased forced expiratory volume; bronchitis; malaise (vague feeling of discomfort); fever, chills, upper respiratory symptoms after initial exposure

Target Organs cardiovascular system, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Crag® herbicide			CAS 136-78-7
<chem>C6H3Cl2OCH2CH2OSO3Na</chem>			RTECS KK4900000
Synonyms & Trade Names Crag® herbicide No. 1; 2-(2,4-Dichlorophenoxy)ethyl sodium sulfate; Sesone			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH 500 mg/m ³		Conversion	
Physical Description Colorless to white crystalline, odorless solid. [herbicide]			
MW: 309.1	BP: Decomposes	MLT: 473°F (Decomposes)	Sol(77°F): 26%
VP: 0.1 mmHg	IP: ?		Sp.Gr: 1.70
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers, acids			
Measurement Methods NIOSH S356 (II-5)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 50 mg/m³ : (APF = 5) Any dust and mist respirator Up to 100 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 250 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter Up to 500 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate			

filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter*/(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

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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin; liver, kidney damage; in animals: central nervous system effects, convulsions

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Cresol			CAS 95-48-7
CH3C6H4OH			RTECS GO6300000
Synonyms & Trade Names ortho-Cresol, 2-Cresol, o-Cresylic acid, 1-Hydroxy-2-methylbenzene, 2-Hydroxytoluene, 2-Methyl phenol			DOT ID & Guide 2076 153
Exposure Limits	NIOSH REL: TWA 2.3 ppm (10 mg/m³)		
	OSHA PEL: TWA 5 ppm (22 mg/m³) [skin]		
IDLH 250 ppm		Conversion 1 ppm = 4.43 mg/m³	
Physical Description White crystals with a sweet, tarry odor. [Note: A liquid above 88°F.]			
MW: 108.2	BP: 376°F	MLT: 88°F	Sol: 2%
VP(77°F): 0.29 mmHg	IP: 8.93 eV		Sp.Gr: 1.05
Fl.P: 178°F	UEL: ?	LEL(300°F): 1.4%	
Combustible Solid Class IIIA Combustible Liquid			
Incompatibilities & Reactivities Strong oxidizers, acids			
Measurement Methods NIOSH 2546; OSHA 32			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 23 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust and mist filter/(APF = 10) Any supplied-air respirator Up to 57.5 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) in combination with a dust and mist filter Up to 115 ppm: (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas			

mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter*/(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 250 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; central nervous system effects: confusion, depression, respiratory failure; dyspnea (breathing difficulty), irregular rapid respiration, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

m-Cresol			CAS 108-39-4
CH ₃ C ₆ H ₄ OH			RTECS GO6125000
Synonyms & Trade Names meta-Cresol, 3-Cresol, m-Cresylic acid, 1-Hydroxy-3-methylbenzene, 3-Hydroxytoluene, 3-Methyl phenol			DOT ID & Guide 2076 153
Exposure Limits	NIOSH REL: TWA 2.3 ppm (10 mg/m ³)		
	OSHA PEL: TWA 5 ppm (22 mg/m ³) [skin]		
IDLH 250 ppm		Conversion 1 ppm = 4.43 mg/m ³	
Physical Description Colorless to yellowish liquid with a sweet, tarry odor. [Note: A solid below 54°F.]			
MW: 108.2	BP: 397°F	FRZ: 54°F	Sol: 2%
VP(77°F): 0.14 mmHg	IP: 8.98 eV		Sp.Gr: 1.03
Fl.P: 187°F	UEL: ?	LEL(300°F): 1.1%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers, acids			
Measurement Methods NIOSH 2546; OSHA 32			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 23 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust and mist filter/(APF = 10) Any supplied-air respirator Up to 57.5 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) in combination with a dust and mist filter Up to 115 ppm: (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas			

mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter*/(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 250 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; central nervous system effects: confusion, depression, respiratory failure; dyspnea (breathing difficulty), irregular rapid respiration, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

p-Cresol			CAS 106-44-5
CH₃C₆H₄OH			RTECS GO6475000
Synonyms & Trade Names para-Cresol, 4-Cresol, p-Cresylic acid, 1-Hydroxy-4-methylbenzene, 4-Hydroxytoluene, 4-Methyl phenol			DOT ID & Guide 2076 153
Exposure Limits	NIOSH REL: TWA 2.3 ppm (10 mg/m ³)		
	OSHA PEL: TWA 5 ppm (22 mg/m ³) [skin]		
IDLH 250 ppm		Conversion 1 ppm = 4.43 mg/m ³	
Physical Description Crystalline solid with a sweet, tarry odor. [Note: A liquid above 95°F.]			
MW: 108.2	BP: 396°F	MLT: 95°F	Sol: 2%
VP(77°F): 0.11 mmHg	IP: 8.97 eV		Sp.Gr: 1.04
Fl.P: 187°F	UEL: ?	LEL(300°F): 1.1%	
Combustible Solid Class IIIA Combustible Liquid			
Incompatibilities & Reactivities Strong oxidizers, acids			
Measurement Methods NIOSH 2546; OSHA 32			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 23 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust and mist filter/(APF = 10) Any supplied-air respirator Up to 57.5 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) in combination with a dust and mist filter Up to 115 ppm: (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas			

mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter*/(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 250 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; central nervous system effects: confusion, depression, respiratory failure; dyspnea (breathing difficulty), irregular rapid respiration, weak pulse; eye, skin burns; dermatitis; lung, liver, kidney, pancreas damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Crotonaldehyde			CAS 4170-30-3
CH ₃ CH=CHCHO			RTECS GP9499000
Synonyms & Trade Names 2-Butenal, beta-Methyl acrolein, Propylene aldehyde			DOT ID & Guide 1143 131P (inhibited)
Exposure Limits	NIOSH REL: TWA 2 ppm (6 mg/m ³) See Appendix C (Aldehydes)		
	OSHA PEL: TWA 2 ppm (6 mg/m ³)		
IDLH 50 ppm		Conversion 1 ppm = 2.87 mg/m ³	
Physical Description Water-white liquid with a suffocating odor. [Note: Turns pale-yellow on contact with air.]			
MW: 70.1	BP: 219°F	FRZ: -101°F	Sol: 18%
VP: 19 mmHg	IP: 9.73 eV		Sp.Gr: 0.87
Fl.P: 45°F	UEL: 15.5%	LEL: 2.1%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Caustics, ammonia, strong oxidizers, nitric acid, amines [Note: Polymerization may occur at elevated temperatures, such as in fire conditions.]			
Measurement Methods NIOSH 3516; OSHA 81			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 20 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* Up to 50 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

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

Symptoms Irritation eyes, respiratory system; in animals: dyspnea (breathing difficulty), pulmonary edema, irritation skin

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Crufomate			CAS 299-86-5
C ₁₂ H ₁₉ ClNO ₃ P			RTECS TB3850000
Synonyms & Trade Names 4-t-Butyl-2-chlorophenylmethyl methylphosphoramidate, Dowco® 132, Ruelene®			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³ ST 20 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White, crystalline solid in pure form. [pesticide] [Note: Commercial product is a yellow oil.]			
MW: 291.7	BP: Decomposes	MLT: 140°F	Sol: Insoluble
VP(243°F): 0.01 mmHg	IP: ?		Sp.Gr: 1.16
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strongly alkaline & strongly acidic media [Note: Unstable over long periods in aqueous preparations or above 140°F.]			
Measurement Methods NIOSH 0500; OSHA PV2015			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; wheezing, dyspnea (breathing difficulty); blurred vision, lacrimation (discharge of tears); sweating; abdominal cramps, diarrhea, nausea, anorexia			
Target Organs Eyes, skin, respiratory system, blood cholinesterase			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cumene			CAS 98-82-8
C ₆ H ₅ CH(CH ₃) ₂			RTECS GR8575000
Synonyms & Trade Names Cumol, Isopropyl benzene, 2-Phenyl propane			DOT ID & Guide 1918 130
Exposure Limits	NIOSH REL: TWA 50 ppm (245 mg/m ³) [skin]		
	OSHA PEL: TWA 50 ppm (245 mg/m ³) [skin]		
IDLH 900 ppm [10%LEL]		Conversion 1 ppm = 4.92 mg/m ³	
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.]			
Measurement Methods NIOSH 1501			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) 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

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

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

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyanamide			CAS 420-04-2
NH ₂ CN			RTECS GS5950000
Synonyms & Trade Names Amidocyanogen, Carbimide, Carbodiimide, Cyanogen nitride, Hydrogen cyanamide [Note: Cyanamide is also a synonym for Calcium cyanamide.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 2 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Crystalline solid.			
MW: 42.1	BP: 500°F (Decomposes)	MLT: 113°F	Sol(59°F): 78%
VP: ?	IP: 10.65 eV		Sp.Gr: 1.28
Fl.P: 286°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Above 104°F: Moisture, acids, or alkalis; 1,2-phenylene diamine salts [Note: Polymerization may occur on evaporation of aqueous solutions.]			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; eye, skin burns; miosis, salivation, lacrimation (discharge of tears), twitching; Antabuse-like effects			
Target Organs Eyes, skin, respiratory system, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyanogen			CAS 460-19-5
NCCN			RTECS GT1925000
Synonyms & Trade Names Carbon nitride, Dicyan, Dicyanogen, Ethanedinitrile, Oxalonitrile			DOT ID & Guide 1026 119
Exposure Limits	NIOSH REL: TWA 10 ppm (20 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 2.13 mg/m ³	
Physical Description Colorless gas with a pungent, almond-like odor. [Note: Shipped as a liquefied compressed gas. Forms cyanide in the body.]			
MW: 52.0	BP: -6°F	FRZ: -18°F	Sol: 1%
VP(70°F): 5.1 atm	IP: 13.57 eV	RGasD: 1.82	Sp.Gr: 0.95 (Liquid at -6°F)
Fl.P: NA (Gas)	UEL: 32%	LEL: 6.6%	
Flammable Gas			
Incompatibilities & Reactivities Acids, water, strong oxidizers (e.g., dichlorine oxide, fluorine) [Note: Slowly hydrolyzed in water to form hydrogen cyanide, oxalic acid, or ammonia.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Frostbite Eyes: Prevent eye contact/Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, nose, upper respiratory system; lacrimation (discharge of tears); cherry red lips, tachypnea, hypernea, bradycardia; headache, convulsions; dizziness, loss of appetite, weight loss; liquid: frostbite			
Target Organs Eyes, respiratory system, central nervous system, cardiovascular system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyanogen chloride			CAS 506-77-4
CICN			RTECS GT2275000
Synonyms & Trade Names Chlorcyan, Chlorine cyanide, Chlorocyanide, Chlorocyanogen			DOT ID & Guide 1589 125 (inhibited)
Exposure Limits	NIOSH REL: C 0.3 ppm (0.6 mg/m³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 2.52 mg/m³	
Physical Description Colorless gas or liquid (below 55°F) with an irritating odor. [Note: Shipped as a liquefied gas. A solid below 20°F. Forms cyanide in the body.]			
MW: 61.5	BP: 55°F	FRZ: 20°F	Sol: 7%
VP: 1010 mmHg	IP: 12.49 eV	RGasD: 2.16	Sp.Gr: 1.22 (Liquid at 32°F)
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Water, acids, alkalis, ammonia, alcohols [Note: Can react very slowly with water to form hydrogen cyanide. May be stabilized to prevent polymerization.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact (liquid) Eyes: Prevent eye contact (liquid) Wash skin: When contaminated (liquid) Remove: When wet or contaminated (liquid) Change: No recommendation Provide: Eyewash (liquid), Quick drench (liquid)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately (liquid) Breathing: Respiratory support Swallow: Medical attention immediately (liquid)	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact (liquid)			
Symptoms Irritation eyes, upper respiratory system; cough, delayed pulmonary edema; lassitude (weakness, exhaustion), headache, dizziness, confusion, nausea, vomiting; irregular heartbeat; irritation skin (liquid)			

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyclohexane			CAS 110-82-7
C ₆ H ₁₂			RTECS GU6300000
Synonyms & Trade Names Benzene hexahydride, Hexahydrobenzene, Hexamethylene, Hexanaphthene			DOT ID & Guide 1145 128
Exposure Limits	NIOSH REL: TWA 300 ppm (1050 mg/m ³)		
	OSHA PEL: TWA 300 ppm (1050 mg/m ³)		
IDLH 1300 ppm [10%LEL]		Conversion 1 ppm = 3.44 mg/m ³	
Physical Description Colorless liquid with a sweet, chloroform-like odor. [Note: A solid below 44°F.]			
MW: 84.2	BP: 177°F	FRZ: 44°F	Sol: Insoluble
VP: 78 mmHg	IP: 9.88 eV		Sp.Gr: 0.78
Fl.P: 0°F	UEL: 8%	LEL: 1.3%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods NIOSH 1500; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1300 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

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

Symptoms Irritation eyes, skin, respiratory system; drowsiness; dermatitis; narcosis, coma

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyclohexanethiol			CAS 1569-69-3
C ₆ H ₁₁ SH			RTECS GV7525000
Synonyms & Trade Names Cyclohexylmercaptan, Cyclohexylthiol			DOT ID & Guide 3054 131
Exposure Limits	NIOSH REL: C 0.5 ppm (2.4 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 4.75 mg/m ³	
Physical Description Colorless liquid with a strong, offensive odor.			
MW: 116.2	BP: 316°F	FRZ: -181°F	Sol: Insoluble
VP: 10 mmHg	IP: ?		Sp.Gr: 0.98
Fl.P: 110°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Oxidizers, reducing agents, strong acids, alkali metals			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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
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

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

Symptoms Irritation eyes, skin, respiratory system; headache, dizziness, lassitude (weakness, exhaustion), nausea, vomiting, convulsions; cough, wheezing, laryngitis, dyspnea (breathing difficulty)

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyclohexanol			CAS 108-93-0
C ₆ H ₁₁ OH			RTECS GV7875000
Synonyms & Trade Names Anol, Cyclohexyl alcohol, Hexahydrophenol, Hexalin, Hydralin, Hydroxycyclohexane			DOT ID & Guide 1993 128 (combustible liquid, n.o.s.)
Exposure Limits	NIOSH REL: TWA 50 ppm (200 mg/m ³) [skin]		
	OSHA PEL†: TWA 50 ppm (200 mg/m ³)		
IDLH 400 ppm		Conversion 1 ppm = 4.10 mg/m ³	
Physical Description Sticky solid or colorless to light-yellow liquid (above 77°F) with a camphor-like odor.			
MW: 100.2	BP: 322°F	MLT: 77°F	Sol: 4%
VP: 1 mmHg	IP: 10.00 eV		Sp.Gr: 0.96
Fl.P: 154°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers (such as hydrogen peroxide & nitric acid)			
Measurement Methods NIOSH 1402; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 400 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

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

Symptoms Irritation eyes, skin, nose, throat; narcosis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyclohexanone			CAS 108-94-1
C ₆ H ₁₀ O			RTECS GW1050000
Synonyms & Trade Names Anone, Cyclohexyl ketone, Pimelic ketone			DOT ID & Guide 1915 127
Exposure Limits	NIOSH REL: TWA 25 ppm (100 mg/m ³) [skin]		
	OSHA PEL†: TWA 50 ppm (200 mg/m ³)		
IDLH 700 ppm		Conversion 1 ppm = 4.02 mg/m ³	
Physical Description Water-white to pale-yellow liquid with a peppermint- or acetone-like odor.			
MW: 98.2	BP: 312°F	FRZ: -49°F	Sol: 15%
VP: 5 mmHg	IP: 9.14 eV		Sp.Gr: 0.95
Fl.P: 146°F	UEL: 9.4%	LEL(212°F): 1.1%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Oxidizers, nitric acid			
Measurement Methods NIOSH 1300; OSHA 1			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 625 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 700 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 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, mucous membrane; headache; narcosis, coma; dermatitis; in animals: liver, kidney damage
Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyclohexene			CAS 110-83-8
C ₆ H ₁₀			RTECS GW2500000
Synonyms & Trade Names Benzene tetrahydride, Tetrahydrobenzene			DOT ID & Guide 2256 130
Exposure Limits	NIOSH REL: TWA 300 ppm (1015 mg/m ³)		
	OSHA PEL: TWA 300 ppm (1015 mg/m ³)		
IDLH 2000 ppm		Conversion 1 ppm = 3.36 mg/m ³	
Physical Description Colorless liquid with a sweet odor.			
MW: 82.2	BP: 181°F	FRZ: -154°F	Sol: Insoluble
VP: 67 mmHg	IP: 8.95 eV		Sp.Gr: 0.81
Fl.P: 11°F	UEL: ?	LEL: ?	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers [Note: Forms explosive peroxides with oxygen upon storage.]			
Measurement Methods NIOSH 1500; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2000 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

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

Symptoms Irritation eyes, skin, respiratory system; drowsiness

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyclohexylamine			CAS 108-91-8
C ₆ H ₁₁ NH ₂			RTECS GX0700000
Synonyms & Trade Names Aminocyclohexane, Aminohexahydrobenzene, Hexahydroaniline, Hexahydrobenzenamine			DOT ID & Guide 2357 132
Exposure Limits	NIOSH REL: TWA 10 ppm (40 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.06 mg/m ³	
Physical Description Colorless or yellow liquid with a strong, fishy, amine-like odor.			
MW: 99.2	BP: 274°F	FRZ: 0°F	Sol: Miscible
VP: 11 mmHg	IP: 8.37 eV		Sp.Gr: 0.87
Fl.P: 88°F	UEL: 9.4%	LEL: 1.5%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Oxidizers, organic compounds, acid anhydrides, acid chlorides, acids, lead [Note: Corrosive to copper, aluminum, zinc & galvanized steel.]			
Measurement Methods NIOSH 2010; OSHA PV2016			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane, respiratory system; eye, skin burns; skin sensitization; cough, pulmonary edema; drowsiness, dizziness; diarrhea, nausea, vomiting			
Target Organs Eyes, skin, respiratory system, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyclonite			CAS 121-82-4
C ₃ H ₆ N ₆ O ₆			RTECS XY9450000
Synonyms & Trade Names Cyclotrimethylenetrinitramine; Hexahydro-1,3,5-trinitro-s-triazine; RDX; Trimethylenetrinitramine; 1,3,5-Trinitro-1,3,5-triazacyclohexane			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1.5 mg/m ³ ST 3 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White, crystalline powder. [Note: A powerful high explosive.]			
MW: 222.2	BP: ?	MLT: 401°F	Sol: Insoluble
VP(230°F): 0.0004 mmHg	IP: ?		Sp.Gr: 1.82
Fl.P: Explodes	UEL: ?	LEL: ?	
Combustible Solid [EXPLOSIVE!]			
Incompatibilities & Reactivities Strong oxidizers, combustible materials, heat [Note: Detonates on contact with mercury fulminate.]			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; headache, irritability, lassitude (weakness, exhaustion), tremor, nausea, dizziness, vomiting, insomnia, convulsions			
Target Organs Eyes, skin, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyclopentadiene			CAS 542-92-7
C ₅ H ₆			RTECS GY1000000
Synonyms & Trade Names 1,3-Cyclopentadiene			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 75 ppm (200 mg/m ³)		
	OSHA PEL: TWA 75 ppm (200 mg/m ³)		
IDLH 750 ppm		Conversion 1 ppm = 2.70 mg/m ³	
Physical Description Colorless liquid with an irritating, terpene-like odor.			
MW: 66.1	BP: 107°F	FRZ: -121°F	Sol: Insoluble
VP: 400 mmHg	IP: 8.56 eV		Sp.Gr: 0.80
Fl.P(oc): 77°F	UEL: ?	LEL: ?	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers, fuming nitric acid, sulfuric acid [Note: Polymerizes to dicyclopentadiene upon standing.]			
Measurement Methods NIOSH 2523			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 750 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose
Target Organs Eyes, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyclopentane			CAS 287-92-3
C ₅ H ₁₀			RTECS GY2390000
Synonyms & Trade Names Pentamethylene			DOT ID & Guide 1146 128
Exposure Limits	NIOSH REL: TWA 600 ppm (1720 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 2.87 mg/m ³	
Physical Description Colorless liquid with a mild, sweet odor.			
MW: 70.2	BP: 121°F	FRZ: -137°F	Sol: Insoluble
VP(88°F): 400 mmHg	IP: 10.52 eV		Sp.Gr: 0.75
Fl.P: -35°F	UEL: 8.7%	LEL: 1.1%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers (e.g., chlorine, bromine, fluorine)			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; dizziness, euphoria, incoordination, nausea, vomiting, stupor; dry, cracking skin			
Target Organs Eyes, skin, respiratory system, central nervous system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Cyhexatin			CAS 13121-70-5
(C ₆ H ₁₁) ₃ SnOH			RTECS WH8750000
Synonyms & Trade Names TCHH, Tricyclohexylhydroxystannane, Tricyclohexylhydroxytin, Tricyclohexylstannium hydroxide, Tricyclohexyltin hydroxide			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: TWA 0.32 mg/m ³ [0.1 mg/m ³ (as Sn)]		
IDLH 80 mg/m ³ [25 mg/m ³ (as Sn)]		Conversion	
Physical Description Colorless to white, nearly odorless, crystalline powder. [insecticide]			
MW: 385.2	BP: 442°F (Decomposes)	MLT: 383°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Incompatibilities & Reactivities Strong oxidizers, ultraviolet light			
Measurement Methods NIOSH 5504			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations OSHA Up to 3.2 mg/m ³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust and mist filter/(APF = 10) Any supplied-air respirator Up to 8 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust and mist filter Up to 16 mg/m ³ : (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas			

mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(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 80 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; headache, dizziness; sore throat, cough; abdominal pain, vomiting; skin burns, pruritus; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2,4-D		CAS 94-75-7	
Cl ₂ C ₆ H ₃ OCH ₂ COOH		RTECS AG6825000	
Synonyms & Trade Names Dichlorophenoxyacetic acid; 2,4-Dichlorophenoxyacetic acid		DOT ID & Guide 2765 152	
Exposure Limits	NIOSH REL: TWA 10 mg/m ³		
	OSHA PEL: TWA 10 mg/m ³		
IDLH 100 mg/m ³		Conversion	
Physical Description White to yellow, crystalline, odorless powder. [herbicide]			
MW: 221.0	BP: Decomposes	MLT: 280°F	Sol: 0.05%
VP(320°F): 0.4 mmHg	IP: ?		Sp.Gr: 1.57
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 5001			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 100 mg/m³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Lassitude (weakness, exhaustion), stupor, hyporeflexia, muscle twitching; convulsions; dermatitis; in animals: liver, kidney injury

Target Organs Skin, central nervous system, liver, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

DDT			CAS 50-29-3
(C ₆ H ₄ Cl) ₂ CHCl ₃			RTECS KJ3325000
Synonyms & Trade Names p,p'-DDT; Dichlorodiphenyltrichloroethane; 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane			DOT ID & Guide 2761 151
Exposure Limits	NIOSH REL: Ca TWA 0.5 mg/m ³ See Appendix A		
	OSHA PEL: TWA 1 mg/m ³ [skin]		
IDLH Ca [500 mg/m ³]		Conversion	
Physical Description Colorless crystals or off-white powder with a slight, aromatic odor. [pesticide]			
MW: 354.5	BP: 230°F (Decomposes)	MLT: 227°F	Sol: Insoluble
VP: 0.0000002 mmHg	IP: ?		Sp.Gr: 0.99
Fl.P: 162-171°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, alkalis			
Measurement Methods NIOSH S274 (II-3)			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]
Target Organs Eyes, skin, central nervous system, kidneys, liver, peripheral nervous system
Cancer Site [in animals: liver, lung & lymphatic tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Decaborane			CAS 17702-41-9
B ₁₀ H ₁₄			RTECS HD1400000
Synonyms & Trade Names Decaboron tetradecahydride			DOT ID & Guide 1868 134
Exposure Limits	NIOSH REL: TWA 0.3 mg/m ³ (0.05 ppm) ST 0.9 mg/m ³ (0.15 ppm) [skin]		
	OSHA PEL†: TWA 0.3 mg/m ³ (0.05 ppm) [skin]		
IDLH 15 mg/m ³		Conversion 1 ppm = 5.00 mg/m ³	
Physical Description Colorless to white crystalline solid with an intense, bitter, chocolate-like odor.			
MW: 122.2	BP: 415°F	MLT: 211°F	Sol: Slight
VP: 0.2 mmHg	IP: 9.88 eV		Sp.Gr: 0.94
Fl.P: 176°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Oxidizers, water, halogenated compounds (especially carbon tetrachloride) [Note: May ignite SPONTANEOUSLY on exposure to air. Decomposes slowly in hot water.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 3 mg/m ³ : (APF = 10) Any supplied-air respirator Up to 7.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 15 mg/m ³ : (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			

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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Dizziness, headache, nausea, drowsiness; incoordination, localized muscle spasm, tremor, convulsions; lassitude (weakness, exhaustion); in animals: dyspnea (breathing difficulty); lassitude (weakness, exhaustion); liver, kidney damage

Target Organs central nervous system, liver, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1-Decanethiol			CAS 143-10-2
CH3(CH2)9SH			RTECS
Synonyms & Trade Names Decylmercaptan, n-Decylmercaptan, 1-Mercaptodecane			DOT ID & Guide 1228 131
Exposure Limits	NIOSH REL: C 0.5 ppm (3.6 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 7.13 mg/m ³	
Physical Description Colorless liquid with a strong odor.			
MW: 174.4	BP: 465°F	FRZ: -15°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: 0.84
Fl.P: 209°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Oxidizers, strong acids & bases, alkali metals, nitric acid			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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
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

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

Symptoms Irritation eyes, skin, respiratory system; confusion, dizziness, headache, drowsiness, nausea, vomiting, lassitude (weakness, exhaustion), convulsions

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Demeton			CAS 8065-48-3
(C ₂ H ₅ O) ₂ PSOC ₂ H ₄ SC ₂ H ₅			RTECS TF3150000
Synonyms & Trade Names O-O-Diethyl-O(and S)-2-(ethylthio)ethyl phosphorothioate mixture, Systox®			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ [skin]		
	OSHA PEL: TWA 0.1 mg/m ³ [skin]		
IDLH 10 mg/m ³		Conversion	
Physical Description Amber, oily liquid with a sulfur-like odor. [insecticide]			
MW: 258.3	BP: Decomposes	FRZ: <-13°F	Sol: 0.01%
VP: 0.0003 mmHg	IP: ?		Sp.Gr: 1.12
Fl.P: 113°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers, alkalis, water			
Measurement Methods NIOSH 5514			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1 mg/m ³ : (APF = 10) Any supplied-air respirator Up to 2.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 5 mg/m ³ : (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 10 mg/m ³ : (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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin; miosis, ache eyes, rhinorrhea (discharge of thin mucus), headache; chest tightness, wheezing, laryngeal spasm, salivation, cyanosis; anorexia, nausea, vomiting, abdominal cramps, diarrhea; localized sweating; muscle fasciculation, lassitude (weakness, exhaustion), paralysis; dizziness, confusion, ataxia; convulsions, coma; low blood pressure; cardiac irregularities

Target Organs Eyes, skin, respiratory system, cardiovascular system, central nervous system, blood cholinesterase

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diacetone alcohol			CAS 123-42-2
CH₃COCH₂C(CH₃)₂OH			RTECS SA9100000
Synonyms & Trade Names Diacetone, 4-Hydroxy-4-methyl-2-pentanone, 2-Methyl-2-pentanol-4-one			DOT ID & Guide 1148 129
Exposure Limits	NIOSH REL: TWA 50 ppm (240 mg/m ³)		
	OSHA PEL: TWA 50 ppm (240 mg/m ³)		
IDLH 1800 ppm [10%LEL]		Conversion 1 ppm = 4.75 mg/m ³	
Physical Description Colorless liquid with a faint, minty odor.			
MW: 116.2	BP: 334°F	FRZ: -47°F	Sol: Miscible
VP: 1 mmHg	IP: ?		Sp.Gr: 0.94
Fl.P: 125°F	UEL: 6.9%	LEL: 1.8%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers, strong alkalis			
Measurement Methods NIOSH 1402; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1250 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 1800 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 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; corneal damage; in animals: narcosis, liver damage
Target Organs Eyes, skin, respiratory system, central nervous system, liver
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2,4-Diaminoanisole (and its salts)			CAS 615-05-4
(NH ₂) ₂ C ₆ H ₃ OCH ₃			RTECS BZ8580500
Synonyms & Trade Names 1,3-Diamino-4-methoxybenzene; 4-Methoxy-1,3-benzene-diamine; 4-Methoxy-m-phenylene-diamine Synonyms of salts vary depending upon the specific compound.			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca Minimize occupational exposure (especially skin exposures) See Appendix A		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Colorless solid (needles). [Note: The primary use (including its salts such as 2,4-diaminoanisole sulfate) is a component of hair & fur dye formulations.]			
MW: 138.2	BP: ?	MLT: 153°F	Sol: ?
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods None available			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms In animals: irritation skin; thyroid, liver changes; teratogenic effects; [potential occupational carcinogen]
Target Organs Skin, thyroid, liver, reproductive system
Cancer Site [in animals: thyroid, liver, skin & lymphatic system tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Dianisidine			CAS 119-90-4
(NH ₂ C ₆ H ₃ OCH ₃) ₂			RTECS DD0875000
Synonyms & Trade Names Dianisidine; 3,3'-Dianisidine; 3,3'-Dimethoxybenzidine			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca See Appendix A See Appendix C		
	OSHA PEL: See Appendix C		
IDLH Ca [N.D.]		Conversion	
Physical Description Colorless crystals that turn a violet color on standing. [Note: Used as a basis for many dyes.]			
MW: 244.3	BP: ?	MLT: 279°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: 403°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods NIOSH 5013; OSHA 71			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-			

contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation skin; in animals: kidney, liver damage; thyroid, spleen changes; [potential occupational carcinogen]
Target Organs Skin, kidneys, liver, thyroid, liver
Cancer Site [in animals: bladder, liver, stomach & mammary gland tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diazinon®			CAS 333-41-5
C ₁₂ H ₂₁ N ₂ O ₃ PS			RTECS TF3325000
Synonyms & Trade Names Basudin®; Diazide®; O,O-Diethyl-O-2-isopropyl-4-methyl-6-pyrimidinyl-phosphorothioate; Spectracide®			DOT ID & Guide 2783 152
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless liquid with a faint ester-like odor. [insecticide] [Note: Technical grade is pale to dark brown.]			
MW: 304.4	BP: Decomposes	FRZ: ?	Sol: 0.004%
VP: 0.0001 mmHg	IP: ?		Sp.Gr: 1.12
Fl.P: 180°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong acids & alkalis, copper-containing compounds [Note: Hydrolyzes slowly in water & dilute acid.]			
Measurement Methods NIOSH 5600; OSHA 62			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes; miosis, blurred vision; dizziness, confusion, lassitude (weakness, exhaustion), convulsions; dyspnea (breathing difficulty); salivation, abdominal cramps, nausea, vomiting			
Target Organs Eyes, respiratory system, central nervous system, cardiovascular system, blood cholinesterase			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diazomethane			CAS 334-88-3
CH2N2			RTECS PA7000000
Synonyms & Trade Names Azimethylene, Azomethylene, Diazirine			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.2 ppm (0.4 mg/m³)		
	OSHA PEL: TWA 0.2 ppm (0.4 mg/m³)		
IDLH 2 ppm		Conversion 1 ppm = 1.72 mg/m³	
Physical Description Yellow gas with a musty odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 42.1	BP: -9°F	FRZ: -229°F	Sol: Reacts
VP: >1 atm	IP: 9.00 eV	RGasD: 1.45	
Fl.P: NA (Gas)	UEL: ?	LEL: ?	
Flammable Gas [EXPLOSIVE!]			
Incompatibilities & Reactivities Alkali metals, water, drying agents such as calcium arsenate [Note: May explode violently on heating, exposure to sunlight, or contact with rough edges such as ground glass.]			
Measurement Methods NIOSH 2515			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 2 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
Exposure Routes inhalation, skin and/or eye contact (liquid)
Symptoms Irritation eyes; cough, shortness breath; headache, lassitude (weakness, exhaustion); flush skin, fever; chest pain, pulmonary edema, pneumonitis; asthma; liquid: frostbite
Target Organs Eyes, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diborane			CAS 19287-45-7
B ₂ H ₆			RTECS HQ9275000
Synonyms & Trade Names Boroethane, Boron hydride, Diboron hexahydride			DOT ID & Guide 1911 119
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.1 mg/m ³)		
	OSHA PEL: TWA 0.1 ppm (0.1 mg/m ³)		
IDLH 15 ppm		Conversion 1 ppm = 1.13 mg/m ³	
Physical Description Colorless gas with a repulsive, sweet odor. [Note: Usually shipped in pressurized cylinders diluted with hydrogen, argon, nitrogen, or helium.]			
MW: 27.7	BP: -135°F	FRZ: -265°F	Sol: Reacts
VP(62°F): 39.5 atm	IP: 11.38 eV	RGasD: 0.97	
Fl.P: NA (Gas)	UEL: 88%	LEL: 0.8%	
Flammable Gas			
Incompatibilities & Reactivities Water, halogenated compounds, aluminum, lithium, oxidized surfaces, acids [Note: Will ignite spontaneously in moist air at room temperature. Reacts with water to form hydrogen & boric acid.]			
Measurement Methods NIOSH 6006			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 1 ppm : (APF = 10) Any supplied-air respirator Up to 2.5 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 5 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 15 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation

Symptoms Chest tightness, precordial pain, shortness breath, nonproductive cough, nausea; headache, dizziness, chills, fever, lassitude (weakness, exhaustion), tremor, muscle fasciculation; in animals: liver, kidney damage; pulmonary edema; hemorrhage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,2-Dibromo-3-chloropropane			CAS 96-12-8
CH ₂ BrCHBrCH ₂ Cl			RTECS TX8750000
Synonyms & Trade Names 1-Chloro-2,3-dibromopropane; DBCP; Dibromochloropropane			DOT ID & Guide 2872 159
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1044] TWA 0.001 ppm		
IDLH Ca [N.D.]		Conversion 1 ppm = 9.67 mg/m ³	
Physical Description Dense yellow or amber liquid with a pungent odor at high concentrations. [pesticide] [Note: A solid below 43°F.]			
MW: 236.4	BP: 384°F	FRZ: 43°F	Sol: 0.1%
VP: 0.8 mmHg	IP: ?		Sp.Gr: 2.05
Fl.P(oc): 170°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Chemically-active metals such as aluminum, magnesium & tin alloys [Note: Corrosive to metals.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-			

contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; drowsiness; nausea, vomiting; pulmonary edema; liver, kidney injury; sterility; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys, spleen, reproductive system, digestive system
Cancer Site [in animals: cancer of the nasal cavity, tongue, pharynx, lungs, stomach, adrenal & mammary glands]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-N-Dibutylaminoethanol			CAS 102-81-8
(C ₄ H ₉) ₂ NCH ₂ CH ₂ OH			RTECS KK3850000
Synonyms & Trade Names Dibutylaminoethanol; 2-Dibutylaminoethanol; 2-Di-N-butylaminoethanol; 2-Di-N-butylaminoethyl alcohol; N,N-Dibutylethanolamine			DOT ID & Guide 2873 153
Exposure Limits	NIOSH REL: TWA 2 ppm (14 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 7.09 mg/m ³	
Physical Description Colorless liquid with a faint, amine-like odor.			
MW: 173.3	BP: 446°F	FRZ: ?	Sol: 0.4%
VP: 0.1 mmHg	IP: ?		Sp.Gr: 0.86
FLP: 195°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: FLP. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods NIOSH 2007			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms In animals: irritation eyes, skin, nose; dermatitis; skin, corneal necrosis; weight loss			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dibutyl phosphate			CAS 107-66-4
(C ₄ H ₉ O) ₂ (OH)PO			RTECS TB9605000
Synonyms & Trade Names Dibutyl acid o-phosphate, Di-n-butyl hydrogen phosphate, Dibutyl phosphoric acid			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 ppm (5 mg/m ³) ST 2 ppm (10 mg/m ³)		
	OSHA PEL†: TWA 1 ppm (5 mg/m ³)		
IDLH 30 ppm		Conversion 1 ppm = 8.60 mg/m ³	
Physical Description Pale-amber, odorless liquid.			
MW: 210.2	BP: 212°F (Decomposes)	FRZ: ?	Sol: Insoluble
VP: 1 mmHg (approx)	IP: ?		Sp.Gr: 1.06
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 5017			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA 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 30 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 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; headache

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dibutyl phthalate			CAS 84-74-2
C ₆ H ₄ (COOC ₄ H ₉) ₂			RTECS TI0875000
Synonyms & Trade Names DBP; Dibutyl 1,2-benzene-dicarboxylate; Di-n-butyl phthalate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL: TWA 5 mg/m ³		
IDLH 4000 mg/m ³		Conversion 1 ppm = 11.57 mg/m ³	
Physical Description Colorless to faint-yellow, oily liquid with a slight, aromatic odor.			
MW: 278.3	BP: 644°F	FRZ: -31°F	Sol(77°F): 0.001%
VP: 0.00007 mmHg	IP: ?		Sp.Gr: 1.05
Fl.P: 315°F	UEL: ?	LEL(456°F): 0.5%	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids; liquid chlorine			
Measurement Methods NIOSH 5020; OSHA 104			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Wash regularly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m ³ : (APF = 10) Any dust and mist respirator with a full facepiece Up to 125 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(APF = 25) Any powered, air-purifying respirator with a dust and mist filter [£] Up to 250 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator 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			

Up to 4000 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, upper respiratory system, stomach

Target Organs Eyes, respiratory system, gastrointestinal tract

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dichloroacetylene			CAS 7572-29-4
C ₂ Cl ₂			RTECS AP1080000
Synonyms & Trade Names DCA, Dichloroethyne [Note: DCA is a possible decomposition product of trichloroethylene or trichloroethane.]			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca C 0.1 ppm (0.4 mg/m ³) See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion 1 ppm = 3.88 mg/m ³	
Physical Description Volatile oil with a disagreeable, sweetish odor. [Note: A gas above 90°F. DCA is not produced commercially.]			
MW: 94.9	BP: 90°F (Explodes)	FRZ: -58 to -87°F	Sol: ?
VP: ?	IP: ?		Sp.Gr: 1.26
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Oxidizers, heat, shock			
Measurement Methods None available			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Headache, loss of appetite, nausea, vomiting, intense jaw pain, cranial nerve palsy; in animals: kidney, liver, brain injury; weight loss; [potential occupational carcinogen]
Target Organs central nervous system
Cancer Site [in animals: kidney tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Dichlorobenzene			CAS 95-50-1
C6H4Cl2			RTECS CZ4500000
Synonyms & Trade Names o-DCB; 1,2-Dichlorobenzene; ortho-Dichlorobenzene; o-Dichlorobenzol			DOT ID & Guide 1591 152
Exposure Limits	NIOSH REL: C 50 ppm (300 mg/m³)		
	OSHA PEL: C 50 ppm (300 mg/m³)		
IDLH 200 ppm		Conversion 1 ppm = 6.01 mg/m³	
Physical Description Colorless to pale-yellow liquid with a pleasant, aromatic odor. [herbicide]			
MW: 147.0	BP: 357°F	FRZ: 1°F	Sol: 0.01%
VP: 1 mmHg	IP: 9.06 eV		Sp.Gr: 1.30
Fl.P: 151°F	UEL: 9.2%	LEL: 2.2%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers, aluminum, chlorides, acids, acid fumes			
Measurement Methods NIOSH 1003; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 200 ppm : (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)/(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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose; liver, kidney damage; skin blisters
Target Organs Eyes, skin, respiratory system, liver, kidneys
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

p-Dichlorobenzene		CAS 106-46-7	
C₆H₄Cl₂		RTECS CZ4550000	
Synonyms & Trade Names p-DCB; 1,4-Dichlorobenzene; para-Dichlorobenzene; Dichlorocide		DOT ID & Guide 1592 152	
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: TWA 75 ppm (450 mg/m ³)		
IDLH Ca [150 ppm]		Conversion 1 ppm = 6.01 mg/m ³	
Physical Description Colorless or white crystalline solid with a mothball-like odor. [insecticide]			
MW: 147.0	BP: 345°F	MLT: 128°F	Sol: 0.008%
VP: 1.3 mmHg	IP: 8.98 eV		Sp.Gr: 1.25
Fl.P: 150°F	UEL: ?	LEL: 2.5%	
Combustible Solid, but may take some effort to ignite.			
Incompatibilities & Reactivities Strong oxidizers (such as chlorine or permanganate)			
Measurement Methods NIOSH 1003; OSHA 7			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash 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			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]
Target Organs Liver, respiratory system, eyes, kidneys, skin
Cancer Site [in animals: liver & kidney cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

3,3'-Dichlorobenzidine (and its salts)			CAS 91-94-1
NH₂ClC₆H₃C₆H₃CINH₂			RTECS DD0525000
Synonyms & Trade Names 4,4'-Diamino-3,3'-dichlorobiphenyl; Dichlorobenzidine base; o,o'-Dichlorobenzidine; 3,3'-Dichlorobiphenyl-4,4'-diamine; 3,3'-Dichloro-4,4'-biphenyldiamine; 3,3'-Dichloro-4,4'-diaminobiphenyl			DOT ID & Guide
Exposure Limits		NIOSH REL: Ca See Appendix A OSHA PEL: [1910.1007] See Appendix B	
IDLH Ca [N.D.]		Conversion	
Physical Description Gray to purple, crystalline solid.			
MW: 253.1	BP: 788°F	MLT: 271°F	Sol(59°F): 0.07%
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 5509; OSHA 65			
Personal Protection & Sanitation 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) 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 with a high-efficiency particulate filter/Any			

appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Skin sensitization, dermatitis; headache, dizziness; caustic burns; frequent urination, dysuria; hematuria (blood in the urine); gastrointestinal upset; upper respiratory infection; [potential occupational carcinogen]
Target Organs Bladder, liver, lung, skin, gastrointestinal tract
Cancer Site [in animals: liver & bladder cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dichlorodifluoromethane			CAS 75-71-8
CCl2F2			RTECS PA8200000
Synonyms & Trade Names Difluorodichloromethane, Fluorocarbon 12, Freon® 12, Genetron® 12, Halon® 122, Propellant 12, Refrigerant 12			DOT ID & Guide 1028 126
Exposure Limits	NIOSH REL: TWA 1000 ppm (4950 mg/m³)		
	OSHA PEL: TWA 1000 ppm (4950 mg/m³)		
IDLH 15,000 ppm		Conversion 1 ppm = 4.95 mg/m³	
Physical Description Colorless gas with an ether-like odor at extremely high concentrations. [Note: Shipped as a liquefied compressed gas.]			
MW: 120.9	BP: -22°F	FRZ: -252°F	Sol(77°F): 0.03%
VP: 5.7 atm	IP: 11.75 eV	RGasD: 4.2	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium			
Measurement Methods NIOSH 1018			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 10,000 ppm: (APF = 10) Any supplied-air respirator Up to 15,000 ppm: (APF = 25) Any supplied-air respirator 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 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

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

Symptoms Dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite

Target Organs cardiovascular system, peripheral nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,3-Dichloro-5,5-dimethylhydantoin			CAS 118-52-5
C ₅ H ₆ Cl ₂ N ₂ O ₂			RTECS MU0700000
Synonyms & Trade Names Dactin, DDH, Halane			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.2 mg/m ³ ST 0.4 mg/m ³		
	OSHA PEL†: TWA 0.2 mg/m ³		
IDLH 5 mg/m ³		Conversion	
Physical Description White powder with a chlorine-like odor.			
MW: 197.0	BP: ?	MLT: 270°F	Sol: 0.2%
VP: ?	IP: ?		Sp.Gr: 1.5
Fl.P: 346°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Water, strong acids, easily oxidized materials such as ammonia salts & sulfides			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2 mg/m³ : (APF = 10) Any supplied-air respirator Up to 5 mg/m³ : (APF = 25) Any supplied-air respirator 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 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 and having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, mucous membrane, respiratory system
Target Organs Eyes, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,1-Dichloroethane		CAS 75-34-3	
CHCl ₂ CH ₃		RTECS KI0175000	
Synonyms & Trade Names Asymmetrical dichloroethane; Ethylidene chloride; 1,1-Ethylidene dichloride		DOT ID & Guide 2362 130	
Exposure Limits	NIOSH REL: TWA 100 ppm (400 mg/m ³) See Appendix C (Chloroethanes)		
	OSHA PEL: TWA 100 ppm (400 mg/m ³)		
IDLH 3000 ppm		Conversion 1 ppm = 4.05 mg/m ³	
Physical Description Colorless, oily liquid with a chloroform-like odor.			
MW: 99.0	BP: 135°F	FRZ: -143°F	Sol: 0.6%
VP: 182 mmHg	IP: 11.06 eV		Sp.Gr: 1.18
Fl.P: 2°F	UEL: 11.4%	LEL: 5.4%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, strong caustics			
Measurement Methods NIOSH 1003; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) 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
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
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,2-Dichloroethylene			CAS 540-59-0
ClCH=CHCl			RTECS KV9360000
Synonyms & Trade Names Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene			DOT ID & Guide 1150 132P
Exposure Limits	NIOSH REL: TWA 200 ppm (790 mg/m ³)		
	OSHA PEL: TWA 200 ppm (790 mg/m ³)		
IDLH 1000 ppm		Conversion 1 ppm = 3.97 mg/m ³	
Physical Description Colorless liquid (usually a mixture of the cis & trans 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.]			
Measurement Methods NIOSH 1003; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2000 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

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dichloroethyl ether			CAS 111-44-4
(ClCH ₂ CH ₂) ₂ O			RTECS KN0875000
Synonyms & Trade Names bis(2-Chloroethyl)ether; 2,2'-Dichlorodiethyl ether, 2,2'-Dichloroethyl ether			DOT ID & Guide 1916 152
Exposure Limits	NIOSH REL: Ca TWA 5 ppm (30 mg/m ³) ST 10 ppm (60 mg/m ³) [skin] See Appendix A		
	OSHA PEL†: TWA 15 ppm (90 mg/m ³) [skin]		
IDLH Ca [100 ppm]		Conversion 1 ppm = 5.85 mg/m ³	
Physical Description Colorless liquid with a chlorinated solvent-like odor.			
MW: 143.0	BP: 352°F	FRZ: -58°F	Sol: 1%
VP: 0.7 mmHg	IP: ?		Sp.Gr: 1.22
Fl.P: 131°F	UEL: ?	LEL: 2.7%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers [Note: Decomposes in presence of moisture to form hydrochloric acid.]			
Measurement Methods NIOSH 1004; OSHA 7			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation nose, throat, respiratory system; lacrimation (discharge of tears); cough; nausea, vomiting; in animals: pulmonary edema; liver damage; [potential occupational carcinogen]
Target Organs Eyes, respiratory system, liver
Cancer Site [in animals: liver tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dichloromonofluoromethane			CAS 75-43-4
CHCl2F			RTECS PA8400000
Synonyms & Trade Names Dichlorofluoromethane, Fluorodichloromethane, Freon® 21, Genetron® 21, Halon® 112, Refrigerant 21			DOT ID & Guide 1029 126
Exposure Limits	NIOSH REL: TWA 10 ppm (40 mg/m³)		
	OSHA PEL†: TWA 1000 ppm (4200 mg/m³)		
IDLH 5000 ppm		Conversion 1 ppm = 4.21 mg/m³	
Physical Description Colorless gas with a slight, ether-like odor. [Note: A liquid below 48°F. Shipped as a liquefied compressed gas.]			
MW: 102.9	BP: 48°F	FRZ: -211°F	Sol(86°F): 0.7%
VP(70°F): 1.6 atm	IP: 12.39 eV	RGasD: 3.57	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium; acid; acid fumes			
Measurement Methods NIOSH 2516			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH Up to 100 ppm: (APF = 10) Any supplied-air respirator Up to 250 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 500 ppm: (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 5000 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
Exposure Routes inhalation, skin and/or eye contact (liquid)
Symptoms Asphyxia, cardiac arrhythmias, cardiac arrest; liquid: frostbite
Target Organs respiratory system, cardiovascular system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,1-Dichloro-1-nitroethane			CAS 594-72-9
CH ₃ CCl ₂ NO ₂			RTECS KI1050000
Synonyms & Trade Names Dichloronitroethane			DOT ID & Guide 2650 153
Exposure Limits	NIOSH REL: TWA 2 ppm (10 mg/m ³)		
	OSHA PEL†: C 10 ppm (60 mg/m ³)		
IDLH 25 ppm		Conversion 1 ppm = 5.89 mg/m ³	
Physical Description Colorless liquid with an unpleasant odor. [fumigant]			
MW: 143.9	BP: 255°F	FRZ: ?	Sol: 0.3%
VP: 15 mmHg	IP: ?		Sp.Gr: 1.43
Fl.P: 136°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers [Note: Corrosive to iron in presence of moisture.]			
Measurement Methods NIOSH 1601; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 20 ppm: (APF = 10) Any supplied-air respirator Up to 25 ppm: (APF = 25) Any supplied-air respirator 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 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms In animals: irritation eyes, skin; liver, heart, kidney damage; pulmonary edema, hemorrhage
Target Organs Eyes, skin, respiratory system, liver, kidneys, cardiovascular system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,3-Dichloropropene			CAS 542-75-6
ClHC=CHCH ₂ Cl			RTECS UC8310000
Synonyms & Trade Names 3-Chloroallyl chloride; DCP; 1,3-Dichloro-1-propene; 1,3-Dichloropropylene; Telone®			DOT ID & Guide 2047 132
Exposure Limits	NIOSH REL: Ca TWA 1 ppm (5 mg/m ³) [skin] See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion 1 ppm = 4.54 mg/m ³	
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: 111.0	BP: 226°F	FRZ: -119°F	Sol: 0.2%
VP: 28 mmHg	IP: ?		Sp.Gr: 1.21
Fl.P: 77°F	UEL: 14.5%	LEL: 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.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) 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
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]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2,2-Dichloropropionic acid			CAS 75-99-0
CH ₃ CCl ₂ COOH			RTECS UF0690000
Synonyms & Trade Names Dalapon; 2,2-Dichloropropanoic acid; alpha,alpha-Dichloropropionic acid			DOT ID & Guide 1760 154
Exposure Limits	NIOSH REL: TWA 1 ppm (6 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 5.85 mg/m ³	
Physical Description Colorless liquid with an acrid odor. [herbicide] [Note: A white to tan powder below 46°F. The sodium salt, a white powder, is often used.]			
MW: 143.0	BP: 374°F	FRZ: 46°F	Sol: 50%
VP: ?	IP: ?		Sp.Gr: 1.40
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Metals [Note: Very corrosive to aluminum & copper alloys. Reacts slowly in water to form hydrochloric & pyruvic acids.]			
Measurement Methods OSHA PV2017			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; skin burns; lassitude (weakness, exhaustion), loss of appetite, diarrhea, vomiting, slowing of pulse; central nervous system depression			
Target Organs Eyes, skin, respiratory system, gastrointestinal tract, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dichlorotetrafluoroethane			CAS 76-14-2
CClF ₂ CClF ₂			RTECS KI1101000
Synonyms & Trade Names 1,2-Dichlorotetrafluoroethane; Freon® 114; Genetron® 114; Halon® 242; Refrigerant 114			DOT ID & Guide 1958 126
Exposure Limits	NIOSH REL: TWA 1000 ppm (7000 mg/m ³)		
	OSHA PEL: TWA 1000 ppm (7000 mg/m ³)		
IDLH 15,000 ppm		Conversion 1 ppm = 6.99 mg/m ³	
Physical Description Colorless gas with a faint, ether-like odor at high concentrations. [Note: A liquid below 38°F. Shipped as a liquefied compressed gas.]			
MW: 170.9	BP: 38°F	FRZ: -137°F	Sol: 0.01%
VP(70°F): 1.9 atm	IP: 12.20 eV	RGasD: 5.93	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium; acids; acid fumes			
Measurement Methods NIOSH 1018			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 10,000 ppm: (APF = 10) Any supplied-air respirator Up to 15,000 ppm: (APF = 25) Any supplied-air respirator 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			

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

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

Symptoms Irritation respiratory system; asphyxia; cardiac arrhythmias, cardiac arrest; liquid: frostbite

Target Organs respiratory system, cardiovascular system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dichlorvos			CAS 62-73-7
$(\text{CH}_3\text{O})_2\text{P}(\text{O})\text{OCH}=\text{CCl}_2$			RTECS TC0350000
Synonyms & Trade Names DDVP; 2,2-Dichlorovinyl dimethyl phosphate			DOT ID & Guide 2783 152
Exposure Limits	NIOSH REL: TWA 1 mg/m ³ [skin]		
	OSHA PEL: TWA 1 mg/m ³ [skin]		
IDLH 100 mg/m ³		Conversion 1 ppm = 9.04 mg/m ³	
Physical Description Colorless to amber liquid with a mild, chemical odor. [Note: Insecticide that may be absorbed on a dry carrier.]			
MW: 221.0	BP: Decomposes	FRZ: ?	Sol: 0.5%
VP: 0.01 mmHg	IP: ?		Sp.Gr(77°F): 1.42
Fl.P: >175°F	UEL: ?	LEL: ?	
Class III Combustible Liquid			
Incompatibilities & Reactivities Strong acids, strong alkalis [Note: Corrosive to iron & mild steel.]			
Measurement Methods NIOSH P&CAM295 (II-5); OSHA 62			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 10 mg/m ³ : (APF = 10) Any supplied-air respirator Up to 25 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 50 mg/m ³ : (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 100 mg/m ³ : (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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin; miosis, ache eyes; rhinorrhea (discharge of thin mucus); headache; chest tightness, wheezing, laryngeal spasm, salivation; cyanosis; anorexia, nausea, vomiting, diarrhea; sweating; muscle fasciculation, paralysis, dizziness, ataxia; convulsions; low blood pressure, cardiac irregularities

Target Organs Eyes, skin, respiratory system, cardiovascular system, central nervous system, blood cholinesterase

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dicrotophos			CAS 141-66-2
C₈H₁₆NO₅P			RTECS TC3850000
Synonyms & Trade Names Bidrin®, Carbicron®, 2-Dimethyl cis-2-dimethylcarbamoyl-1-methylvinylphosphate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.25 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 9.70 mg/m ³	
Physical Description Yellow-brown liquid with a mild, ester odor. [insecticide]			
MW: 237.2	BP: 752°F	FRZ: ?	Sol: Miscible
VP: 0.0001 mmHg	IP: ?		Sp.Gr(59°F): 1.22
Fl.P: >200°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Metals [Note: Corrosive to cast iron, mild steel, brass & stainless steel.]			
Measurement Methods NIOSH 5600			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Headache, nausea, dizziness, anxiety, restlessness, muscle twitching, lassitude (weakness, exhaustion), tremor, incoordination, vomiting, abdominal cramps, diarrhea; salivation, sweating, lacrimation (discharge of tears), rhinitis; anorexia, malaise (vague feeling of discomfort)			
Target Organs central nervous system, blood cholinesterase			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dicyclopentadiene			CAS 77-73-6
C₁₀H₁₂			RTECS PC1050000
Synonyms & Trade Names Bicyclopentadiene; DCPD; 1,3-Dicyclopentadiene dimer; 3a,4,7,7a-Tetrahydro-4,7-methanoindene [Note: Exists in two stereoisomeric forms.]			DOT ID & Guide 2048 129
Exposure Limits	NIOSH REL: TWA 5 ppm (30 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 5.41 mg/m ³	
Physical Description Colorless, crystalline solid with a disagreeable, camphor-like odor. [Note: A liquid above 90°F.]			
MW: 132.2	BP: 342°F	FRZ: 90°F	Sol: 0.02%
VP: 1.4 mmHg	IP: ?		Sp.Gr: 0.98 (Liquid at 95°F)
Fl.P(oc): 90°F	UEL: 6.3%	LEL: 0.8%	
Class IC Flammable Liquid Combustible Solid			
Incompatibilities & Reactivities Oxidizers [Note: Depolymerizes at boiling point and forms two molecules of cyclopentadiene. Must be inhibited and maintained under an inert atmosphere to prevent polymerization.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; incoordination, headache; sneezing, cough; skin blisters; in animals:			

kidney, lung damage
Target Organs Eyes, skin, respiratory system, central nervous system, kidneys
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dicyclopentadienyl iron			CAS 102-54-5
(C ₅ H ₅) ₂ Fe			RTECS LK0700000
Synonyms & Trade Names bis(Cyclopentadienyl)iron, Ferrocene, Iron dicyclopentadienyl			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Orange, crystalline solid with a camphor-like odor.			
MW: 186.1	BP: 480°F	MLT: 343°F	Sol: Insoluble
VP: ?	IP: 6.88 eV		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Ammonium perchlorate, tetranitromethane, mercury(II) nitrate			
Measurement Methods OSHA ID125G			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Possible irritation eyes, skin, respiratory system; in animals: liver, red blood cell, testicular changes			
Target Organs Eyes, skin, respiratory system, liver, blood, reproductive system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dieldrin			CAS 60-57-1
C₁₂H₈Cl₆O			RTECS IO1750000
Synonyms & Trade Names HEOD; 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,exo-5,8-dimethanonaphthalene			DOT ID & Guide 2761 151
Exposure Limits	NIOSH REL: Ca TWA 0.25 mg/m ³ [skin] See Appendix A		
	OSHA PEL: TWA 0.25 mg/m ³ [skin]		
IDLH Ca [50 mg/m ³]		Conversion	
Physical Description Colorless to light-tan crystals with a mild, chemical odor. [insecticide]			
MW: 380.9	BP: Decomposes	MLT: 349°F	Sol: 0.02%
VP(77°F): 8 x 10-7 mmHg	IP: ?		Sp.Gr: 1.75
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers, active metals such as sodium, strong acids, phenols			
Measurement Methods NIOSH S283 (II-3)			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; [potential occupational carcinogen]; in animals: liver, kidney damage
Target Organs central nervous system, liver, kidneys, skin
Cancer Site [in animals: lung, liver, thyroid & adrenal gland tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diesel exhaust		CAS	
		RTECS	
Synonyms & Trade Names Synonyms vary depending upon the specific diesel exhaust component.		DOT ID & Guide	
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Appearance and odor vary depending upon the specific diesel exhaust component.			
Properties vary depending upon the specific component diesel exhaust component.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 5040			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact
Symptoms Eye irritation, pulmonary function changes; [potential occupational carcinogen]
Target Organs Eyes, respiratory system
Cancer Site [in animals: lung tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diethanolamine			CAS 111-42-2
(HOCH ₂ CH ₂) ₂ NH			RTECS KL2975000
Synonyms & Trade Names DEA; Di(2-hydroxyethyl)amine; 2,2'-Dihydroxydiethyamine; Diolamine; bis(2-Hydroxyethyl)amine; 2,2'-Iminodiethanol			DOT ID & Guide
Exposure Limits		NIOSH REL: TWA 3 ppm (15 mg/m ³) OSHA PEL†: none	
IDLH N.D.		Conversion 1 ppm = 4.30 mg/m ³	
Physical Description Colorless crystals or a syrupy, white liquid (above 82°F) with a mild, ammonia-like odor.			
MW: 105.2	BP: 516°F (Decomposes)	MLT: 82°F	Sol: 95%
VP: <0.01 mmHg	IP: ?		Sp.Gr: 1.10
Fl.P: 279°F	UEL: 9.8%	LEL: 1.6%	
Class IIIB Combustible Liquid Combustible Solid			
Incompatibilities & Reactivities Oxidizers, strong acids, acid anhydrides, halides [Note: Reacts with CO ₂ in the air. Hygroscopic (i.e., absorbs moisture from the air). Corrosive to copper, zinc & galvanized iron.]			
Measurement Methods NIOSH 3509; OSHA PV2018			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; eye burns, corneal necrosis; skin burns; lacrimation (discharge of tears), cough, sneezing			

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diethylamine			CAS 109-89-7
(C ₂ H ₅) ₂ NH			RTECS HZ8750000
Synonyms & Trade Names Diethamine; N,N-Diethylamine; N-Ethylethanamine			DOT ID & Guide 1154 132
Exposure Limits	NIOSH REL: TWA 10 ppm (30 mg/m ³) ST 25 ppm (75 mg/m ³)		
	OSHA PEL†: TWA 25 ppm (75 mg/m ³)		
IDLH 200 ppm		Conversion 1 ppm = 2.99 mg/m ³	
Physical Description Colorless liquid with a fishy, ammonia-like odor.			
MW: 73.1	BP: 132°F	FRZ: -58°F	Sol: Miscible
VP: 192 mmHg	IP: 8.01 eV		Sp.Gr: 0.71
Fl.P: -15°F	UEL: 10.1%	LEL: 1.8%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids, cellulose nitrate			
Measurement Methods NIOSH 2010; OSHA 41			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Eyewash (>0.5%), Quick drench (liquid)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 200 ppm : (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 [‡] /(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 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; in animals; myocardial degeneration

Target Organs Eyes, skin, respiratory system, cardiovascular system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Diethylaminoethanol			CAS 100-37-8
(C ₂ H ₅) ₂ NCH ₂ CH ₂ OH			RTECS KK5075000
Synonyms & Trade Names Diethylaminoethanol; 2-Diethylaminoethyl alcohol; N,N-Diethylethanolamine; Diethyl-(2-hydroxyethyl)amine; 2-Hydroxytriethylamine			DOT ID & Guide 2686 132
Exposure Limits	NIOSH REL: TWA 10 ppm (50 mg/m ³) [skin]		
	OSHA PEL: TWA 10 ppm (50 mg/m ³) [skin]		
IDLH 100 ppm		Conversion 1 ppm = 4.79 mg/m ³	
Physical Description Colorless liquid with a nauseating, ammonia-like odor.			
MW: 117.2	BP: 325°F	FRZ: -94°F	Sol: Miscible
VP: 1 mmHg	IP: ?		Sp.Gr: 0.89
Fl.P: 126°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids			
Measurement Methods NIOSH 2007			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash (>5%), Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 100 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

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

Symptoms Irritation eyes, skin, respiratory system; nausea, vomiting

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diethylenetriamine			CAS 111-40-0
(NH ₂ CH ₂ CH ₂) ₂ NH			RTECS IE1225000
Synonyms & Trade Names N-(2-Aminoethyl)1,2-ethanediamine; bis(2-Aminoethyl)amine; DETA; 2,2'-Diaminodiethylamine			DOT ID & Guide 2079 154
Exposure Limits	NIOSH REL: TWA 1 ppm (4 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.22 mg/m ³	
Physical Description Colorless to yellow liquid with a strong, ammonia-like odor. [Note: Hygroscopic (i.e., absorbs moisture from the air).]			
MW: 103.2	BP: 405°F	FRZ: -38°F	Sol: Miscible
VP: 0.4 mmHg	IP: ?		Sp.Gr: 0.96
FLP: 208°F	UEL: 6.7%	LEL: 2%	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Oxidizers, strong acids, cellulose nitrate [Note: May form explosive complexes with silver, cobalt, or chromium compounds. Corrosive to aluminum copper, brass & zinc.]			
Measurement Methods NIOSH 2540; OSHA 60			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane, upper respiratory system; dermatitis, skin sensitization; eye, skin necrosis; cough, dyspnea (breathing difficulty), pulmonary sensitization			

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diethyl ketone			CAS 96-22-0
CH ₃ CH ₂ COCH ₂ CH ₃			RTECS SA8050000
Synonyms & Trade Names DEK, Dimethylacetone, Ethyl ketone, Metacetone, 3-Pentanone, Propione			DOT ID & Guide 1156 127
Exposure Limits	NIOSH REL: TWA 200 ppm (705 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 3.53 mg/m ³	
Physical Description Colorless liquid with an acetone-like odor.			
MW: 86.2	BP: 215°F	FRZ: -44°F	Sol: 5%
VP(77°F): 35 mmHg	IP: 9.32 eV		Sp.Gr: 0.81
Fl.P(oc): 55°F	UEL: 6.4%	LEL: 1.6%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, alkalis, mineral acids, (hydrogen peroxide + nitric acid)			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: Daily Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane, respiratory system; cough, sneezing			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diethyl phthalate			CAS 84-66-2
C6H4(COOC2H5)2			RTECS TI1050000
Synonyms & Trade Names DEP, Diethyl ester of phthalic acid, Ethyl phthalate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless to water-white, oily liquid with a very slight, aromatic odor. [pesticide]			
MW: 222.3	BP: 563°F	FRZ: -41°F	Sol(77°F): 0.1%
VP(77°F): 0.002 mmHg	IP: ?		Sp.Gr: 1.12
FL.P(oc): 322°F	UEL: ?	LEL(368°F): 0.7%	
Class IIIB Combustible Liquid; however, ignition is difficult.			
Incompatibilities & Reactivities Strong oxidizers, strong acids, nitric acid, permanganates, water			
Measurement Methods OSHA 104			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Wash regularly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; headache, dizziness, nausea; lacrimation (discharge of tears); possible polyneuropathy, vestibular dysfunc; pain, numbness, lassitude (weakness, exhaustion), spasms in arms & legs; in animals: reproductive effects			
Target Organs Eyes, skin, respiratory system, central nervous system, peripheral nervous system, reproductive system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Difluorodibromomethane			CAS 75-61-6
CBr ₂ F ₂			RTECS PA7525000
Synonyms & Trade Names Dibromodifluoromethane, Freon® 12B2, Halon® 1202			DOT ID & Guide 1941 171
Exposure Limits	NIOSH REL: TWA 100 ppm (860 mg/m ³)		
	OSHA PEL: TWA 100 ppm (860 mg/m ³)		
IDLH 2000 ppm		Conversion 1 ppm = 8.58 mg/m ³	
Physical Description Colorless, heavy liquid or gas (above 76°F) with a characteristic odor.			
MW: 209.8	BP: 76°F	FRZ: -231°F	Sol: Insoluble
VP: 620 mmHg	IP: 11.07 eV		Sp.Gr(59°F): 2.29
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid Nonflammable Gas			
Incompatibilities & Reactivities Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium			
Measurement Methods NIOSH 1012; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: No recommendation Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1000 ppm : (APF = 10) Any supplied-air respirator Up to 2000 ppm : (APF = 25) Any supplied-air respirator 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 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms In animals: irritation respiratory system; central nervous system symptoms; liver damage
Target Organs respiratory system, central nervous system, liver
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diglycidyl ether			CAS 2238-07-5
C₆H₁₀O₃			RTECS KN2350000
Synonyms & Trade Names Diallyl ether dioxide; DGE; Di(2,3-epoxypropyl) ether; 2-Epoxypropyl ether; bis(2,3-Epoxypropyl) ether			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca TWA 0.1 ppm (0.5 mg/m ³) See Appendix A		
	OSHA PEL†: C 0.5 ppm (2.8 mg/m ³)		
IDLH Ca [10 ppm]		Conversion 1 ppm = 5.33 mg/m ³	
Physical Description Colorless liquid with a strong, irritating odor.			
MW: 130.2	BP: 500°F	FRZ: ?	Sol: ?
VP(77°F): 0.09 mmHg	IP: ?		Sp.Gr: 1.12
Fl.P: 147°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods None available			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; skin burns; in animals: hematopoietic system, lung, liver, kidney damage; reproductive effects; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, reproductive system
Cancer Site [in animals: skin tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diisobutyl ketone			CAS 108-83-8
[(CH ₃) ₂ CHCH ₂] ₂ CO			RTECS MJ5775000
Synonyms & Trade Names DIBK; sym-Diisopropyl acetone; 2,6-Dimethyl-4-heptanone; Isovalerone; Valerone			DOT ID & Guide 1157 127
Exposure Limits	NIOSH REL: TWA 25 ppm (150 mg/m ³)		
	OSHA PEL†: TWA 50 ppm (290 mg/m ³)		
IDLH 500 ppm		Conversion 1 ppm = 5.82 mg/m ³	
Physical Description Colorless liquid with a mild, sweet odor.			
MW: 142.3	BP: 334°F	FRZ: -43°F	Sol: 0.05%
VP: 2 mmHg	IP: 9.04 eV		Sp.Gr: 0.81
Fl.P: 120°F	UEL(200°F): 7.1%	LEL(200°F): 0.8%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1300; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 500 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

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

Symptoms Irritation eyes, skin, nose, throat; headache, dizziness; dermatitis; liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diisopropylamine			CAS 108-18-9
[(CH ₃) ₂ CH] ₂ NH			RTECS IM4025000
Synonyms & Trade Names DIPA, N-(1-Methylethyl)-2-propanamine			DOT ID & Guide 1158 132
Exposure Limits	NIOSH REL: TWA 5 ppm (20 mg/m ³) [skin]		
	OSHA PEL: TWA 5 ppm (20 mg/m ³) [skin]		
IDLH 200 ppm See: 108189		Conversion 1 ppm = 4.14 mg/m ³	
Physical Description Colorless liquid with an ammonia- or fish-like odor.			
MW: 101.2	BP: 183°F	FRZ: -141°F	Sol: Miscible
VP: 70 mmHg	IP: 7.73 eV		Sp.Gr: 0.72
Fl.P: 20°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, strong acids			
Measurement Methods NIOSH S141 (II-4)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact (>5%) Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Eyewash (>5%)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 125 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 200 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 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; nausea, vomiting; headache; visual disturbance
Target Organs Eyes, skin, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dimethyl acetamide			CAS 127-19-5
CH ₃ CON(CH ₃) ₂			RTECS AB7700000
Synonyms & Trade Names N,N-Dimethyl acetamide; DMAC			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 ppm (35 mg/m ³) [skin]		
	OSHA PEL: TWA 10 ppm (35 mg/m ³) [skin]		
IDLH 300 ppm		Conversion 1 ppm = 3.56 mg/m ³	
Physical Description Colorless liquid with a weak, ammonia- or fish-like odor.			
MW: 87.1	BP: 329°F	FRZ: -4°F	Sol: Miscible
VP: 2 mmHg	IP: 8.81 eV		Sp.Gr: 0.94
Fl.P(oc): 158°F	UEL(320°F): 11.5%	LEL(212°F): 1.8%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Carbon tetrachloride, other halogenated compounds when in contact with iron, oxidizers			
Measurement Methods NIOSH 2004			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 100 ppm : (APF = 10) Any supplied-air respirator Up to 250 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 300 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation skin; jaundice, liver damage; depression, drowsiness, hallucinations, delusions
Target Organs Skin, liver, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dimethylamine			CAS 124-40-3
(CH ₃) ₂ NH			RTECS IP8750000
Synonyms & Trade Names Dimethylamine (anhydrous), N-Methylmethanamine			DOT ID & Guide 1032 118 (anhydrous) 1160 129 (solution)
Exposure Limits	NIOSH REL: TWA 10 ppm (18 mg/m ³)		
	OSHA PEL: TWA 10 ppm (18 mg/m ³)		
IDLH 500 ppm		Conversion 1 ppm = 1.85 mg/m ³	
Physical Description Colorless gas with an ammonia- or fish-like odor. [Note: A liquid below 44°F. Shipped as a liquefied compressed gas.]			
MW: 45.1	BP: 44°F	FRZ: -134°F	Sol(140°F): 24%
VP: 1.7 atm	IP: 8.24 eV	RGasD: 1.56	Sp.Gr: 0.67 (Liquid at 44°F)
Fl.P: NA (Gas) 20°F (Liquid)	UEL: 14.4%	LEL: 2.8%	
Flammable Gas Class IA Flammable Liquid			
Incompatibilities & Reactivities Strong oxidizers, chlorine, mercury, acraldehyde, fluorides, maleic anhydride, aluminum, brass, copper, zinc			
Measurement Methods NIOSH 2010; OSHA 34			
Personal Protection & Sanitation Skin: Prevent skin contact (liquid)/Frostbite Eyes: Prevent eye contact (liquid)/Frostbite Wash skin: When contaminated (liquid) Remove: When wet (flammable) Change: No recommendation Provide: Eyewash (liquid), Quick drench (liquid), Frostbite		First Aid (See procedures) Eye: Irrigate immediately (liquid)/Frostbite Skin: Water flush immediately (liquid)/Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 250 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] Up to 500 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation nose, throat; sneezing, cough, dyspnea (breathing difficulty); pulmonary edema; conjunctivitis; dermatitis; liquid: frostbite

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

4-Dimethylaminoazobenzene			CAS 60-11-7
C6H5NNC6H4N(CH3)2			RTECS BX7350000
Synonyms & Trade Names Butter yellow; DAB; p-Dimethylaminoazobenzene; N,N-Dimethyl-4-aminoazobenzene; Methyl yellow			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1015] See Appendix B		
IDLH Ca [N.D.]		Conversion	
Physical Description Yellow, leaf-shaped crystals.			
MW: 225.3	BP: Sublimes	MLT: 237°F	Sol: 0.001%
VP: 0.0000003 mmHg (est.)	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH P&CAM284 (II-4)			
Personal Protection & Sanitation 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) 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Enlarged liver; liver, kidney disturbance; contact dermatitis; cough, wheezing, dyspnea (breathing difficulty); bloody sputum; bronchial secretions; frequent urination, hematuria (blood in the urine), dysuria; [potential occupational carcinogen]
Target Organs Skin, respiratory system, liver, kidneys, bladder
Cancer Site [in animals: liver & bladder tumors]

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

bis(2-(Dimethylamino)ethyl)ether			CAS 3033-62-3
C ₈ H ₂₀ N ₂ O			RTECS KR9460000
Synonyms & Trade Names NIAX® A99; NIAX® Catalyst A1; 2,2'-Oxybis(N,N-dimethyl ethylamine) [Note: A component (5%) of NIAX® Catalyst ESN, along with dimethylaminopropionitrile (95%).]			DOT ID & Guide
Exposure Limits	NIOSH REL: See Appendix C (NIAX® Catalyst ESN)		
	OSHA PEL: See Appendix C (NIAX® Catalyst ESN)		
IDLH N.D.		Conversion	
Physical Description Liquid.			
MW: 160.3	BP: 372°F	FRZ: ?	Sol: ?
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities None reported			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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 (gas mask) with a chin-style, front- or back-			

mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Possible urinary disturbance, neurological disorders; in animals: irritation eyes, skin
Target Organs Eyes, skin, urinary tract, peripheral nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dimethylaminopropionitrile			CAS 1738-25-6
(CH₃)₂NCH₂CH₂CN			RTECS UG1575000
Synonyms & Trade Names 3-(Dimethylamino)propionitrile; N,N-Dimethylamino-3-propionitrile [Note: A component (95%) of NIAX® Catalyst ESN, along with bis(2-(dimethylamino)ethyl) ether (5%).]			DOT ID & Guide
Exposure Limits	NIOSH REL: See Appendix C (NIAX® Catalyst ESN)		
	OSHA PEL: See Appendix C (NIAX® Catalyst ESN)		
IDLH N.D.		Conversion	
Physical Description Colorless liquid.			
MW: 98.2	BP: 342°F	FRZ: -48°F	Sol: Miscible
VP(135°F): 10 mmHg	IP: ?		Sp.Gr(86°F): 0.86
Fl.P: 147°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Oxidizers [Note: Emits toxic oxides of nitrogen and cyanide fumes when heated to decomposition.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; urinary disturbance; neurological disorders; pins & needles in hands & feet; muscle weakness, lassitude (weakness, exhaustion), nausea, vomiting; decreased nerve conduction in lower legs
Target Organs Eyes, skin, central nervous system, urinary tract
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

N,N-Dimethylaniline			CAS 121-69-7
C₆H₅N(CH₃)₂			RTECS BX4725000
Synonyms & Trade Names N,N-Dimethylbenzeneamine; N,N-Dimethylphenylamine [Note: Also known as Dimethylaniline which is a correct synonym for Xylidine.]			DOT ID & Guide 2253 153
Exposure Limits	NIOSH REL: TWA 5 ppm (25 mg/m ³) ST 10 ppm (50 mg/m ³) [skin]		
	OSHA PEL†: TWA 5 ppm (25 mg/m ³) [skin]		
IDLH 100 ppm		Conversion 1 ppm = 4.96 mg/m ³	
Physical Description Pale yellow, oily liquid with an amine-like odor. [Note: A solid below 36°F.]			
MW: 121.2	BP: 378°F	FRZ: 36°F	Sol: 2%
VP: 1 mmHg	IP: 7.14 eV		Sp.Gr: 0.96
Fl.P: 142°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids, benzoyl peroxide			
Measurement Methods NIOSH 2002; OSHA PV2064			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 50 ppm : (APF = 10) Any supplied-air respirator Up to 100 ppm : (APF = 25) Any supplied-air respirator 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 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Anoxia symptoms: cyanosis, lassitude (weakness, exhaustion), dizziness, ataxia; methemoglobinemia
Target Organs Blood, kidneys, liver, cardiovascular system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dimethyl carbamoyl chloride			CAS 79-44-7
(CH ₃) ₂ NCOCI			RTECS FD4200000
Synonyms & Trade Names Chloroformic acid dimethylamide; Dimethylcarbamic chloride; N,N-Dimethylcarbamoyl chloride; DMCC			DOT ID & Guide 2262 156
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Clear, colorless liquid.			
MW: 107.6	BP: 329°F	FRZ: -27°F	Sol: Reacts
VP: ?	IP: ?		Sp.Gr: 1.17
Fl.P: 155°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Acids, water [Note: Rapidly hydrolyzes in water to dimethylamine, carbon dioxide, and hydrogen chloride.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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 (gas mask) with a chin-style, front- or back-			

mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat, respiratory system; eye, skin burns; cough, wheezing, larnygitis, dyspnea (breathing difficulty); headache, nausea, vomiting; liver injury; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, liver
Cancer Site [in animals: nasal cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dimethyl-1,2-dibromo-2,2-dichlorethyl phosphate			CAS 300-76-5
<chem>(CH3O)2P(O)OCHBrCBrCl2</chem>			RTECS TB9450000
Synonyms & Trade Names Dibrom®; 1,2-Dibromo-2,2-dichloroethyl dimethyl phosphate; Naled			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 3 mg/m ³ [skin]		
	OSHA PEL†: TWA 3 mg/m ³		
IDLH 200 mg/m ³		Conversion	
Physical Description Colorless to white solid or straw-colored liquid (above 80°F) with a slightly pungent odor. [insecticide]			
MW: 380.8	BP: Decomposes	MLT: 80°F	Sol: Insoluble
VP: 0.0002 mmHg	IP: ?		Sp.Gr(77°F): 1.96
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers, acids, sunlight, water [Note: Corrosive to metals. Hydrolyzed in presence of water.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 30 mg/m ³ : (APF = 10) Any dust, mist, and fume respirator/(APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator Up to 75 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust, mist, and fume filter Up to 150 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 200 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin; miosis, lacrimation (discharge of tears); headache; chest tightness, wheezing, laryngeal spasm; salivation; cyanosis; anorexia, nausea, vomiting, abdominal cramp, diarrhea; lassitude (weakness, exhaustion), twitching, paralysis; dizziness, ataxia, convulsions; low blood pressure; cardiac irregularities

Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system, blood cholinesterase

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dimethylformamide			CAS 68-12-2
HCON(CH ₃) ₂			RTECS LQ2100000
Synonyms & Trade Names Dimethyl formamide; N,N-Dimethylformamide; DMF			DOT ID & Guide 2265 129
Exposure Limits	NIOSH REL: TWA 10 ppm (30 mg/m ³) [skin]		
	OSHA PEL: TWA 10 ppm (30 mg/m ³) [skin]		
IDLH 500 ppm		Conversion 1 ppm = 2.99 mg/m ³	
Physical Description Colorless to pale-yellow liquid with a faint, amine-like odor.			
MW: 73.1	BP: 307°F	FRZ: -78°F	Sol: Miscible
VP: 3 mmHg	IP: 9.12 eV		Sp.Gr: 0.95
Fl.P: 136°F	UEL: 15.2%	LEL(212°F): 2.2%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Carbon tetrachloride; other halogenated compounds when in contact with iron; strong oxidizers; alkyl aluminums; inorganic nitrates			
Measurement Methods NIOSH 2004; OSHA 66			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 100 ppm : (APF = 10) Any supplied-air respirator* Up to 250 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 500 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 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

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

Symptoms Irritation eyes, skin, respiratory system; nausea, vomiting, colic; liver damage, enlarged liver; high blood pressure; face flush; dermatitis; in animals: kidney, heart damage

Target Organs Eyes, skin, respiratory system, liver, kidneys, cardiovascular system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,1-Dimethylhydrazine		CAS 57-14-7	
(CH3)2NNH2		RTECS MV2450000	
Synonyms & Trade Names Dimazine, DMH, UDMH, Unsymmetrical dimethylhydrazine		DOT ID & Guide 1163 131	
Exposure Limits	NIOSH REL: Ca C 0.06 ppm (0.15 mg/m³) [2-hr] See Appendix A		
	OSHA PEL: TWA 0.5 ppm (1 mg/m³) [skin]		
IDLH Ca [15 ppm]		Conversion 1 ppm = 2.46 mg/m³	
Physical Description Colorless liquid with an ammonia- or fish-like odor.			
MW: 60.1	BP: 147°F	FRZ: -72°F	Sol: Miscible
VP: 103 mmHg	IP: 8.05 eV		Sp.Gr: 0.79
Fl.P: 5°F	UEL: 95%	LEL: 2%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Oxidizers, halogens, metallic mercury, fuming nitric acid, hydrogen peroxide [Note: May ignite SPONTANEOUSLY in contact with oxidizers.]			
Measurement Methods NIOSH 3515			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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 (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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; choking, chest pain, dyspnea (breathing difficulty); drowsiness; nausea; anoxia; convulsions; liver injury; [potential occupational carcinogen]
Target Organs central nervous system, liver, gastrointestinal tract, blood, respiratory system, eyes, skin
Cancer Site [in animals: tumors of the lungs, liver, blood vessels & intestines]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dimethylphthalate		CAS 131-11-3	
C ₆ H ₄ (COOCH ₃) ₂		RTECS TI1575000	
Synonyms & Trade Names Dimethyl ester of 1,2-benzenedicarboxylic acid; DMP		DOT ID & Guide 9188 171 (hazardous substance, n.o.s.)	
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL: TWA 5 mg/m ³		
IDLH 2000 mg/m ³		Conversion	
Physical Description Colorless, oily liquid with a slight, aromatic odor. [Note: A solid below 42°F.]			
MW: 194.2	BP: 543°F	FRZ: 42°F	Sol: 0.4%
VP: 0.01 mmHg	IP: 9.64 eV		Sp.Gr: 1.19
Fl.P: 295°F	UEL: ?	LEL(358°F): 0.9%	
Class IIIB Combustible Liquid; however, ignition is difficult.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods OSHA 104			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate promptly Skin: Wash regularly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m³ : (APF = 10) Any dust and mist respirator with a full facepiece Up to 125 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(APF = 25) Any powered, air-purifying respirator with a dust and mist filter [£] Up to 250 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator 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

Up to 2000 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, upper respiratory system; stomach pain

Target Organs Eyes, respiratory system, gastrointestinal tract

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dimethyl sulfate			CAS 77-78-1
(CH ₃) ₂ SO ₄			RTECS WS8225000
Synonyms & Trade Names Dimethyl ester of sulfuric acid, Dimethylsulfate, Methyl sulfate			DOT ID & Guide 1595 156
Exposure Limits	NIOSH REL: Ca TWA 0.1 ppm (0.5 mg/m ³) [skin] See Appendix A		
	OSHA PEL†: TWA 1 ppm (5 mg/m ³) [skin]		
IDLH Ca [7 ppm]		Conversion 1 ppm = 5.16 mg/m ³	
Physical Description Colorless, oily liquid with a faint, onion-like odor.			
MW: 126.1	BP: 370°F (Decomposes)	FRZ: -25°F	Sol(64°F): 3%
VP: 0.1 mmHg	IP: ?		Sp.Gr: 1.33
Fl.P: 182°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers, ammonia solutions [Note: Decomposes in water to sulfuric acid; corrosive to metals.]			
Measurement Methods NIOSH 2524			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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 (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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose; headache; dizziness; conjunctivitis; photophobia (abnormal visual intolerance to light); periorbital (situated around the eye) edema; dysphonia, aphonia, dysphagia, productive cough; chest pain; dyspnea (breathing difficulty), cyanosis; vomiting, diarrhea; dysuria; analgesia; fever; proteinuria, hematuria (blood in the urine); eye, skin burns; delirium; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, liver, kidneys, central nervous system
Cancer Site [in animals: nasal & lung cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dinitolmide			CAS 148-01-6
(NO ₂) ₂ C ₆ H ₂ (CH ₃)CONH ₂			RTECS XS4200000
Synonyms & Trade Names 3,5-Dinitro-o-toluamide; 2-Methyl-3,5-dinitrobenzamide; Zoalene			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Yellowish, crystalline solid.			
MW: 225.2	BP: ?	MLT: 351°F	Sol: Slight
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Contact eczema; in animals: methemoglobinemia, liver changes			
Target Organs Skin, liver, blood			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Dinitrobenzene			CAS 528-29-0
C₆H₄(NO₂)₂			RTECS CZ7450000
Synonyms & Trade Names ortho-Dinitrobenzene; 1,2-Dinitrobenzene			DOT ID & Guide 1597 152
Exposure Limits	NIOSH REL: TWA 1 mg/m ³ [skin]		
	OSHA PEL: TWA 1 mg/m ³ [skin]		
IDLH 50 mg/m ³		Conversion	
Physical Description Pale-white or yellow solid.			
MW: 168.1	BP: 606°F	MLT: 244°F	Sol: 0.05%
VP: ?	IP: 10.71 eV		Sp.Gr: 1.57
Fl.P: 302°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, caustics, metals such as tin & zinc [Note: Prolonged exposure to fire and heat may result in an explosion due to SPONTANEOUS decomposition.]			
Measurement Methods NIOSH S214 (II-4)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m³: (APF = 5) Any dust and mist respirator Up to 10 mg/m³: (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator Up to 25 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter			

Up to 50 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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

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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Anoxia, cyanosis; visual disturbance, central scotomas; bad taste, burning mouth, dry throat, thirst; yellowing hair, eyes, skin; anemia; liver damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

m-Dinitrobenzene			CAS 99-65-0
C₆H₄(NO₂)₂			RTECS CZ7350000
Synonyms & Trade Names meta-Dinitrobenzene; 1,3-Dinitrobenzene			DOT ID & Guide 1597 152
Exposure Limits	NIOSH REL: TWA 1 mg/m ³ [skin]		
	OSHA PEL: TWA 1 mg/m ³ [skin]		
IDLH 50 mg/m ³		Conversion	
Physical Description Pale-white or yellow solid.			
MW: 168.1	BP: 572°F	MLT: 192°F	Sol: 0.02%
VP: ?	IP: 10.43 eV		Sp.Gr: 1.58
Fl.P: 302°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, caustics, metals such as tin & zinc [Note: Prolonged exposure to fire and heat may result in an explosion due to SPONTANEOUS decomposition.]			
Measurement Methods NIOSH S214 (II-4)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m ³ : (APF = 5) Any dust and mist respirator Up to 10 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator Up to 25 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter			

Up to 50 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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

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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Anoxia, cyanosis; visual disturbance, central scotomas; bad taste, burning mouth, dry throat, thirst; yellowing hair, eyes, skin; anemia; liver damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

p-Dinitrobenzene			CAS 100-25-4
C₆H₄(NO₂)₂			RTECS CZ7525000
Synonyms & Trade Names para-Dinitrobenzene; 1,4-Dinitrobenzene			DOT ID & Guide 1597 152
Exposure Limits	NIOSH REL: TWA 1 mg/m ³ [skin]		
	OSHA PEL: TWA 1 mg/m ³ [skin]		
IDLH 50 mg/m ³		Conversion	
Physical Description Pale-white or yellow solid.			
MW: 168.1	BP: 570°F	MLT: 343°F	Sol: 0.01%
VP: ?	IP: 10.50 eV		Sp.Gr: 1.63
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, caustics, metals such as tin & zinc [Note: Prolonged exposure to fire and heat may result in an explosion due to SPONTANEOUS decomposition.]			
Measurement Methods NIOSH S214 (II-4)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m³: (APF = 5) Any dust and mist respirator Up to 10 mg/m³: (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator Up to 25 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter			

Up to 50 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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

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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Anoxia, cyanosis; visual disturbance, central scotomas; bad taste, burning mouth, dry throat, thirst; yellowing hair, eyes, skin; anemia; liver damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dinitro-o-cresol			CAS 534-52-1
CH ₃ C ₆ H ₂ OH(NO ₂) ₂			RTECS GO9625000
Synonyms & Trade Names 4,6-Dinitro-o-cresol; 3,5-Dinitro-2-hydroxytoluene; 4,6-Dinitro-2-methyl phenol; DNC; DNOC			DOT ID & Guide 1598 153
Exposure Limits	NIOSH REL: TWA 0.2 mg/m ³ [skin]		
	OSHA PEL: TWA 0.2 mg/m ³ [skin]		
IDLH 5 mg/m ³		Conversion	
Physical Description Yellow, odorless solid. [insecticide]			
MW: 198.1	BP: 594°F	MLT: 190°F	Sol: 0.01%
VP: 0.00005 mmHg	IP: ?		Sp.Gr: 1.1 (estimated)
Fl.P: NA	UEL: NA	LEL: NA	MEC: 30 g/m ³
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH S166 (II-5)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2 mg/m ³ : (APF = 10) Any dust and mist respirator with a full facepiece Up to 5 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(APF = 25) Any powered, air-purifying respirator with a dust and mist 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Sense of well being; headache, fever, lassitude (weakness, exhaustion), profuse sweating, excess thirst, tachycardia, hyperpnea, cough, shortness breath, coma
Target Organs cardiovascular system, endocrine system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dinitrotoluene			CAS 25321-14-6
CH ₃ C ₆ H ₃ (NO ₂) ₂			RTECS XT1300000
Synonyms & Trade Names Dinitrotoluol, DNT, Methyl dinitrobenzene [Note: Various isomers of DNT exist.]			DOT ID & Guide 1600 152 (molten) 2038 152 (solid)
Exposure Limits	NIOSH REL: Ca TWA 1.5 mg/m ³ [skin] See Appendix A		
	OSHA PEL: TWA 1.5 mg/m ³ [skin]		
IDLH Ca [50 mg/m ³]		Conversion	
Physical Description Orange-yellow crystalline solid with a characteristic odor. [Note: Often shipped molten.]			
MW: 182.2	BP: 572°F	MLT: 158°F	Sol: Insoluble
VP: 1 mmHg	IP: ?		Sp.Gr: 1.32
Fl.P: 404°F	UEL: ?	LEL: ?	
Combustible Solid, but difficult to ignite.			
Incompatibilities & Reactivities Strong oxidizers, caustics, metals such as tin & zinc [Note: Commercial grades will decompose at 482°F, with self-sustaining decomposition at 536°F.]			
Measurement Methods OSHA 44			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Anoxia, cyanosis; anemia, jaundice; reproductive effects; [potential occupational carcinogen]
Target Organs Blood, liver, cardiovascular system, reproductive system
Cancer Site [in animals: liver, skin & kidney tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Di-sec octyl phthalate			CAS 117-81-7
C ₂₄ H ₃₈ O ₄			RTECS TI0350000
Synonyms & Trade Names DEHP, Di(2-ethylhexyl)phthalate, DOP, bis-(2-Ethylhexyl)phthalate, Octyl phthalate			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca TWA 5 mg/m ³ ST 10 mg/m ³ See Appendix A		
	OSHA PEL†: TWA 5 mg/m ³		
IDLH Ca [5000 mg/m ³]		Conversion	
Physical Description Colorless, oily liquid with a slight odor.			
MW: 390.5	BP: 727°F	FRZ: -58°F	Sol(75°F): 0.00003%
VP: <0.01 mmHg	IP: ?		Sp.Gr: 0.99
Fl.P(oc): 420°F	UEL: ?	LEL(474°F): 0.3%	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, acids & alkalis			
Measurement Methods NIOSH 5020			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, mucous membrane; in animals: liver damage; teratogenic effects; [potential occupational carcinogen]
Target Organs Eyes, respiratory system, central nervous system, liver, reproductive system, gastrointestinal tract
Cancer Site [in animals: liver tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dioxane			CAS 123-91-1
C ₄ H ₈ O ₂			RTECS JG8225000
Synonyms & Trade Names Diethylene dioxide; Diethylene ether; Dioxan; p-Dioxane; 1,4-Dioxane			DOT ID & Guide 1165 127
Exposure Limits	NIOSH REL: Ca C 1 ppm (3.6 mg/m ³) [30-minute] See Appendix A		
	OSHA PEL†: TWA 100 ppm (360 mg/m ³) [skin]		
IDLH Ca [500 ppm]		Conversion 1 ppm = 3.60 mg/m ³	
Physical Description Colorless liquid or solid (below 53°F) with a mild, ether-like odor.			
MW: 88.1	BP: 214°F	FRZ: 53°F	Sol: Miscible
VP: 29 mmHg	IP: 9.13 eV		Sp.Gr: 1.03
Fl.P: 55°F	UEL: 22%	LEL: 2.0%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, decaborane, triethynyl aluminum			
Measurement Methods NIOSH 1602; OSHA 7			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water 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			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; drowsiness, headache; nausea, vomiting; liver damage; kidney failure; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, liver, kidneys
Cancer Site [in animals: lung, liver & nasal cavity tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dioxathion			CAS 78-34-2
C4H6O2[SPS(OC2H5)2]2			RTECS TE3350000
Synonyms & Trade Names Delnav®; p-Dioxane-2,3-diyl ethyl phosphorodithioate; Dioxane phosphate; 2,3-p-Dioxanethiol S,S-bis(O,O-diethyl phosphoro-dithioate); Navadel®			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.2 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Viscous, brown, tan, or dark-amber liquid. [insecticide] [Note: Technical product is a mixture of cis- & trans-isomers.]			
MW: 456.6	BP: ?	FRZ: -4°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr(79°F): 1.26
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Alkalis, iron or tin surfaces, heat			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; headache, dizziness, lassitude (weakness, exhaustion); rhinorrhea (discharge of thin mucus), chest tightness; miosis; nausea, vomiting, abdominal cramps, diarrhea, salivation; muscle fasciculation; confusion, drowsiness			

Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system, blood cholinesterase

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diphenyl			CAS 92-52-4
C ₆ H ₅ C ₆ H ₅			RTECS DU8050000
Synonyms & Trade Names Biphenyl, Phenyl benzene			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 mg/m ³ (0.2 ppm)		
	OSHA PEL: TWA 1 mg/m ³ (0.2 ppm)		
IDLH 100 mg/m ³		Conversion 1 ppm = 6.31 mg/m ³	
Physical Description Colorless to pale-yellow solid with a pleasant, characteristic odor. [fungicide]			
MW: 154.2	BP: 489°F	MLT: 156°F	Sol: Insoluble
VP: 0.005 mmHg	IP: 7.95 eV		Sp.Gr: 1.04
Fl.P: 235°F	UEL(311°F): 5.8%	LEL(232°F): 0.6%	
Combustible Solid			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods NIOSH 2530; OSHA PV2022			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash (molten), Quick drench (molten)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 10 mg/m ³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust and mist filter/(APF = 10) Any supplied-air respirator Up to 25 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust and mist filter* Up to 50 mg/m ³ : (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas			

mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) 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 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, throat; headache, nausea, lassitude (weakness, exhaustion), numb limbs; liver damage
Target Organs Eyes, respiratory system, liver, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diphenylamine			CAS 122-39-4
(C ₆ H ₅) ₂ NH			RTECS JJ7800000
Synonyms & Trade Names Anilinobenzene, DPA, Phenylaniline, N-Phenylaniline, N-Phenylbenzenamine [Note: The carcinogen 4-Aminodiphenyl may be present as an impurity in the commercial product.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless, tan, amber, or brown crystalline solid with a pleasant, floral odor. [fungicide]			
MW: 169.2	BP: 576°F	MLT: 127°F	Sol: 0.03%
VP(227°F): 1 mmHg	IP: 7.40 eV		Sp.Gr: 1.16
Fl.P: 307°F	UEL: ?	LEL: ?	
Combustible Solid; explosive if a cloud of dust is exposed to a source of ignition.			
Incompatibilities & Reactivities Oxidizers, hexachloromelamine, trichloromelamine			
Measurement Methods OSHA 22, 78			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane; eczema; tachycardia, hypertension; cough, sneezing; methemoglobinemia; increased blood pressure, heart rate; proteinuria, hematuria (blood in the urine), bladder injury; in animals: teratogenic effects			

Target Organs Eyes, skin, respiratory system, cardiovascular system, blood, bladder, reproductive system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dipropylene glycol methyl ether			CAS 34590-94-8
CH3OC3H6OC3H6OH			RTECS JM1575000
Synonyms & Trade Names Dipropylene glycol monomethyl ether, Dowanol® 50B			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 100 ppm (600 mg/m³) ST 150 ppm (900 mg/m³) [skin]		
	OSHA PEL†: TWA 100 ppm (600 mg/m³) [skin]		
IDLH 600 ppm		Conversion 1 ppm = 6.06 mg/m³	
Physical Description Colorless liquid with a mild, ether-like odor.			
MW: 148.2	BP: 408°F	FRZ: -112°F	Sol: Miscible
VP: 0.5 mmHg	IP: ?		Sp.Gr: 0.95
Fl.P: 180°F	UEL: 3.0%	LEL(392°F): 1.1%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH S69 (II-2)			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 600 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose, throat; lassitude (weakness, exhaustion), dizziness, headache
Target Organs Eyes, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Dipropyl ketone			CAS 123-19-3
(CH ₃ CH ₂ CH ₂) ₂ CO			RTECS MJ5600000
Synonyms & Trade Names Butyrone, DPK, 4-Heptanone, Heptan-4-one, Propyl ketone			DOT ID & Guide 2710 127
Exposure Limits	NIOSH REL: TWA 50 ppm (235 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.67 mg/m ³	
Physical Description Colorless liquid with a pleasant odor.			
MW: 114.2	BP: 291°F	FRZ: -27°F	Sol: Insoluble
VP: 5 mmHg	IP: 9.10 eV		Sp.Gr: 0.82
Fl.P: 120°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion,skin and/or eye contact			
Symptoms Irritation eyes, skin; central nervous system depression, dizziness, drowsiness, decreased breathing; in animals: liver injury; narcosis			
Target Organs Eyes, skin, central nervous system, liver			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diquat (Diquat dibromide)			CAS 85-00-7
C₁₂H₁₂N₂Br₂			RTECS JM5690000
Synonyms & Trade Names Diquat dibromide; 1,1'-Ethylene-2,2'-bipyridyllium dibromide [Note: Diquat is a cation (C ₁₂ H ₁₂ N ₂ ⁺⁺ ; 1,1'-Ethylene-2,2'-bipyridyllium ion). Various diquat salts are commercially available.]			DOT ID & Guide 2781 151 (solid) 2782 131 (liquid)
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Dibromide salt: Yellow crystals. [herbicide] [Note: Commercial product may be found in a liquid concentrate or a solution.]			
MW: 344.1	BP: Decomposes	MLT: 635°F	Sol: 70%
VP: <0.00001 mmHg	IP: ?		Sp.Gr: 1.22-1.27
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid, but does not readily ignite and burns with difficulty.			
Incompatibilities & Reactivities Alkalis, UV light, basic solutions [Note: Concentrated diquat solutions corrode aluminum.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane, respiratory system; rhinorrhea (discharge of thin mucus), epistaxis (nosebleed); skin burns; nausea, vomiting, diarrhea, malaise (vague feeling of discomfort); kidney, liver			

injury; cough, chest pain, dyspnea (breathing difficulty), pulmonary edema; tremor, convulsions; delayed healing of wounds

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- INTRODUCTION
- INDEX with CHEMICAL NAMES and SYNONYMS
- INDEX with CHEMICAL NAMES
- INDEX with CAS NUMBERS
- APPENDICES

NIOSH Pocket Guide to Chemical Hazards

Disulfiram			CAS 97-77-8
[(C ₂ H ₅) ₂ NCS] ₂ S ₂			RTECS JO1225000
Synonyms & Trade Names Antabuse®, bis(Diethylthiocarbamoyl) disulfide, Ro-Sulfiram®, TETD, Tetraethylthiuram disulfide			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 2 mg/m ³ [Precautions should be taken to avoid concurrent exposure to ethylene dibromide.]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White, yellowish, or light-gray powder with a slight odor. [fungicide]			
MW: 296.6	BP: ?	MLT: 158°F	Sol: 0.02%
VP: ?	IP: ?		Sp.Gr: 1.30
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; sensitization dermatitis; lassitude (weakness, exhaustion), tremor, restlessness, headache, dizziness; metallic taste; peripheral neuropathy; liver damage			
Target Organs Eyes, skin, respiratory system, central nervous system, peripheral nervous system, liver			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Disulfoton			CAS 298-04-4
C ₈ H ₁₉ O ₂ PS ₃			RTECS TD9275000
Synonyms & Trade Names O,O-Diethyl S-2-(ethylthio)-ethyl phosphorodithioate; Di-Syston®; Thiodemeton			DOT ID & Guide 2783 152
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Oily, colorless to yellow liquid with a characteristic, sulfur odor. [insecticide] [Note: Technical product is a brown liquid.]			
MW: 274.4	BP: ?	FRZ: >-13°F	Sol(73°F): 0.003%
VP: 0.0002 mmHg	IP: ?		Sp.Gr: 1.14
Fl.P: >180°F	UEL: ?	LEL: ?	
Combustible Liquid, but will not ignite easily.			
Incompatibilities & Reactivities Alkalis			
Measurement Methods NIOSH 5600			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; nausea, vomiting, abdominal cramps, diarrhea, salivation; headache, dizziness, lassitude (weakness, exhaustion); rhinorrhea (discharge of thin mucus), chest tightness; blurred vision, miosis; cardiac irregularities; muscle fasciculation; dyspnea (breathing difficulty); eye, skin burns			
Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system, blood cholinesterase			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2,6-Di-tert-butyl-p-cresol			CAS 128-37-0
[C(CH ₃) ₃] ₂ CH ₃ C ₆ H ₂ OH			RTECS GO7875000
Synonyms & Trade Names BHT; Butylated hydroxytoluene; Dibutylated hydroxytoluene; 4-Methyl-2,6-di-tert-butyl phenol			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White to pale-yellow, crystalline solid with a slight, phenolic odor. [food preservative]			
MW: 220.4	BP: 509°F	MLT: 158°F	Sol: 0.00004%
VP: 0.01 mmHg	IP: ?		Sp.Gr: 1.05
Fl.P: 261°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods NIOSH P&CAM226 (II-1)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; in animals: decreased growth rate, increased liver weight			
Target Organs Eyes, skin			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Diuron			CAS 330-54-1
C6H3Cl2NHCON(CH3)2			RTECS YS8925000
Synonyms & Trade Names 3-(3,4-Dichlorophenyl)-1,1-dimethylurea; Direx®; Karmex®			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White, odorless, crystalline solid. [herbicide]			
MW: 233.1	BP: 356°F (Decomposes)	MLT: 316°F	Sol: 0.004%
VP: 0.000000002 mmHg	IP:?		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong acids			
Measurement Methods NIOSH 5601			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; in animals: anemia, methemoglobinemia			
Target Organs Eyes, skin, respiratory system, blood			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Divinyl benzene			CAS 1321-74-0 (mixed isomers)
C ₆ H ₄ (HC=CH ₂) ₂			RTECS CZ9370000
Synonyms & Trade Names Diethyl benzene, DVB, Vinylstyrene [Note: Commercial product contains all 3 isomers, but m-isomer predominates. Usually contains an inhibitor to prevent polymerization.]			DOT ID & Guide 2049 130
Exposure Limits	NIOSH REL: TWA 10 ppm (50 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 5.33 mg/m ³	
Physical Description Pale, straw-colored liquid.			
MW: 130.2	BP: 392°F	FRZ: -88°F	Sol: 0.005%
VP: 0.7 mmHg	IP: ?		Sp.Gr: 0.93
Fl.P(oc): 169°F	UEL: 6.2%	LEL: 1.1%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities None reported			
Measurement Methods OSHA 89			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; skin burns; in animals: central nervous system depression			
Target Organs Eyes, skin, respiratory system, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1-Dodecanethiol			CAS 112-55-0
CH3(CH2)11SH			RTECS JR3155000
Synonyms & Trade Names Dodecyl mercaptan, 1-Dodecyl mercaptan, n-Dodecyl mercaptan, Lauryl mercaptan, n-Lauryl mercaptan, 1-Mercaptododecane			DOT ID & Guide 1228 131
Exposure Limits	NIOSH REL: C 0.5 ppm (4.1 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 8.28 mg/m ³	
Physical Description Colorless, water-white, or pale-yellow, oily liquid with a mild, skunk-like odor. [Note: A solid below 15°F.]			
MW: 202.4	BP: 441-478°F	FRZ: 15°F	Sol: Insoluble
VP(77°F): 3 mmHg	IP: ?		Sp.Gr: 0.85
Fl.P(oc): 190°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers & acids, strong bases, reducing agents, alkali metals, water, steam			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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

[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

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

Symptoms Irritation eyes, skin, respiratory system; cough; dizziness, dyspnea (breathing difficulty), lassitude (weakness, exhaustion), confusion, cyanosis; abdominal pain, nausea; skin sensitization

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Emery		CAS 1302-74-5 (corundum)	
Al ₂ O ₃		RTECS GN0231000 (corundum)	
Synonyms & Trade Names Aluminum oxide, Aluminum trioxide, Corundum, Impure corundum, Natural aluminum oxide [Note: Emery is an impure variety of Al ₂ O ₃ which may contain small impurities of iron, magnesium & silica Corundum is natural Al ₂ O		DOT ID & Guide	
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Odorless, white, crystalline powder.			
See alpha-Alumina for physical & chemical properties.			
Incompatibilities & Reactivities			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system			

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Endosulfan			CAS 115-29-7
C ₉ H ₆ Cl ₆ O ₃ S			RTECS RB9275000
Synonyms & Trade Names Benzoepin; Endosulphan; 6,7,8,9,10-Hexachloro-1,5,5a,6,9,9a-hexachloro-6,9-methano- 2,4,3-benzo-dioxathiepin-3-oxide; Thiodan®			DOT ID & Guide 2761 151
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Brown crystals with a slight, sulfur dioxide odor. [insecticide] [Note: Technical product is a tan, waxy, isomer mixture.]			
MW: 406.9	BP: Decomposes	MLT: 223°F	Sol: 0.00001%
VP(77°F): 0.00001 mmHg	IP: ?		Sp.Gr: 1.74
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Alkalis, acids, water [Note: Corrosive to iron. Hydrolyzes slowly on contact with water or decomposes in presence of alkalis and acids to form sulfur dioxide.]			
Measurement Methods OSHA PV2023			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation skin; nausea, confusion, agitation, flushing, dry mouth, tremor, convulsions, headache; in animals: kidney, liver injury; decreased testis weight			

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Endrin			CAS 72-20-8
C₁₂H₈Cl₆O			RTECS I01575000
Synonyms & Trade Names 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro- 1,4-endo,endo-5,8-dimethanonaphthalene; Hexadrin®			DOT ID & Guide 2761 151 (mixture)
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ [skin]		
	OSHA PEL: TWA 0.1 mg/m ³ [skin]		
IDLH 2 mg/m ³		Conversion	
Physical Description Colorless to tan, crystalline solid with a mild, chemical odor. [insecticide]			
MW: 380.9	BP: Decomposes	MLT: 392°F (Decomposes)	Sol: Insoluble
VP: Low	IP: ?		Sp.Gr: 1.70
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Strong oxidizers, strong acids, parathion [Note: May emit hydrogen chloride & phosgene when heated or burned.]			
Measurement Methods NIOSH 5519			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1 mg/m³: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter/(APF = 10) Any supplied-air respirator Up to 2 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter/(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas			

mask) with a chin-style, front- or back-mounted organic vapor canister having 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Epileptiform convulsions; stupor, headache, dizziness; abdominal discomfort, nausea, vomiting; insomnia; aggressiveness, confusion; drowsiness, lassitude (weakness, exhaustion); anorexia; in animals: liver damage

Target Organs central nervous system, liver

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Enflurane			CAS 13838-16-9
CHF ₂ OCF ₂ CHClF			RTECS KN6800000
Synonyms & Trade Names 2-Chloro-1-(difluoromethoxy)-1,1,2-trifluoroethane; 2-Chloro-1,1,2-trifluoroethyl difluoromethyl ether; Ethrane®			DOT ID & Guide
Exposure Limits	NIOSH REL*: C 2 ppm (15.1 mg/m ³) [60-minute] [*Note: REL for exposure to waste anesthetic gas.]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 7.55 mg/m ³	
Physical Description Clear, colorless liquid with a mild, sweet odor. [inhalation anesthetic]			
MW: 184.5	BP: 134°F	FRZ: ?	Sol: Low
VP: 175 mmHg	IP: ?		Sp.Gr(77°F): 1.52
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities None reported			
Measurement Methods OSHA 29, 103			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes; central nervous system depression, analgesia, anesthesia, convulsions, respiratory depression			
Target Organs Eyes, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Epichlorohydrin			CAS 106-89-8
C ₃ H ₅ OCl			RTECS TX4900000
Synonyms & Trade Names 1-Chloro-2,3-epoxypropane; 2-Chloropropylene oxide; gamma-Chloropropylene oxide			DOT ID & Guide 2023 131P
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: TWA 5 ppm (19 mg/m ³) [skin]		
IDLH Ca [75 ppm]		Conversion 1 ppm = 3.78 mg/m ³	
Physical Description Colorless liquid with a slightly irritating, chloroform-like odor.			
MW: 92.5	BP: 242°F	FRZ: -54°F	Sol: 7%
VP: 13 mmHg	IP: 10.60 eV		Sp.Gr: 1.18
Fl.P: 93°F	UEL: 21.0%	LEL: 3.8%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids, certain salts, caustics, zinc, aluminum, water [Note: May polymerize in presence of strong acids and bases, particularly when hot.]			
Measurement Methods NIOSH 1010; OSHA 7			
Personal Protection & Sanitation 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) 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 and acid gas canister/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin with deep pain; nausea, vomiting; abdominal pain; respiratory distress, cough; cyanosis; reproductive effects; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, kidneys, liver, reproductive system
Cancer Site [in animals: nasal cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

EPN			CAS 2104-64-5
C ₁₄ H ₁₄ O ₄ NSP			RTECS TB1925000
Synonyms & Trade Names Ethyl p-nitrophenyl benzenethionophosphonate, O-Ethyl O-(4-nitrophenyl) phenylphosphonothioate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³ [skin]		
	OSHA PEL: TWA 0.5 mg/m ³ [skin]		
IDLH 5 mg/m ³		Conversion	
Physical Description Yellow solid with an aromatic odor. [pesticide] [Note: A brown liquid above 97°F.]			
MW: 323.3	BP: ?	MLT: 97°F	Sol: Insoluble
VP(212°F): 0.0003 mmHg	IP: ?		Sp.Gr(77°F): 1.27
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 5012			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m³ : (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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; miosis, lacrimation (discharge of tears); rhinorrhea (discharge of thin mucus); headache; chest tightness, wheezing, laryngeal spasm; salivation; cyanosis; anorexia, nausea, abdominal cramps, diarrhea; paralysis, convulsions; low blood pressure, cardiac irregularities
Target Organs Eyes, skin, respiratory system, cardiovascular system, central nervous system, blood cholinesterase
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethanolamine			CAS 141-43-5
NH ₂ CH ₂ CH ₂ OH			RTECS KJ5775000
Synonyms & Trade Names 2-Aminoethanol, beta-Aminoethyl alcohol, Ethylolamine, 2-Hydroxyethylamine, Monoethanolamine			DOT ID & Guide 2491 153
Exposure Limits	NIOSH REL: TWA 3 ppm (8 mg/m ³) ST 6 ppm (15 mg/m ³)		
	OSHA PEL†: TWA 3 ppm (6 mg/m ³)		
IDLH 30 ppm		Conversion 1 ppm = 2.50 mg/m ³	
Physical Description Colorless, viscous liquid or solid (below 51°F) with an unpleasant, ammonia-like odor.			
MW: 61.1	BP: 339°F	FRZ: 51°F	Sol: Miscible
VP: 0.4 mmHg	IP: 8.96 eV		Sp.Gr: 1.02
Fl.P: 186°F	UEL: 23.5%	LEL(284°F): 3.0%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids, iron [Note: May attack copper, brass, and rubber.]			
Measurement Methods NIOSH 2007			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 30 ppm : (APF = 10) Any chemical cartridge respirator with 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 = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern*/(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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; drowsiness

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- INTRODUCTION
- INDEX with CHEMICAL NAMES and SYNONYMS
- INDEX with CHEMICAL NAMES
- INDEX with CAS NUMBERS
- APPENDICES

NIOSH Pocket Guide to Chemical Hazards

Ethion			CAS 563-12-2
[(C ₂ H ₅ O) ₂ P(S)S] ₂ CH ₂			RTECS TE4550000
Synonyms & Trade Names O,O,O',O'-Tetraethyl S,S'-methylene di(phosphorodithioate)			DOT ID & Guide 2783 152
Exposure Limits	NIOSH REL: 0.4 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless to amber-colored, odorless liquid. [insecticide] [Note: A solid below 10°F. The technical product has a very disagreeable odor.]			
MW: 384.5	BP: >302°F (Decomposes)	FRZ: 10°F	Sol: 0.0001%
VP: 0.0000015 mmHg	IP: ?		Sp.Gr: 1.22
Fl.P: 349°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Acids, alkalis			
Measurement Methods NIOSH 5600			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; nausea, vomiting, abdominal cramps, diarrhea, salivation; headache, dizziness, lassitude (weakness, exhaustion); rhinorrhea (discharge of thin mucus), chest tightness; blurred vision, miosis; cardiac irregularities; muscle fasciculation; dyspnea (breathing difficulty)			
Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system, blood cholinesterase			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Ethoxyethanol			CAS 110-80-5
C ₂ H ₅ OCH ₂ CH ₂ OH			RTECS KK8050000
Synonyms & Trade Names Cellosolve®, EGEE, Ethylene glycol monoethyl ether			DOT ID & Guide 1171 127
Exposure Limits	NIOSH REL: TWA 0.5 ppm (1.8 mg/m ³) [skin]		
	OSHA PEL: TWA 200 ppm (740 mg/m ³) [skin]		
IDLH 500 ppm		Conversion 1 ppm = 3.69 mg/m ³	
Physical Description Colorless liquid with a sweet, pleasant, ether-like odor.			
MW: 90.1	BP: 275°F	FRZ: -130°F	Sol: Miscible
VP: 4 mmHg	IP: ?		Sp.Gr: 0.93
Fl.P: 110°F	UEL(200°F): 15.6%	LEL(200°F): 1.7%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1403; OSHA 53, 79			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm : (APF = 10) Any supplied-air respirator* Up to 12.5 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 25 ppm : (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

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

Symptoms In animals: irritation eyes, respiratory system; blood changes; liver, kidney, lung damage; reproductive, teratogenic effects

Target Organs Eyes, respiratory system, blood, kidneys, liver, reproductive system, hematopoietic system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Ethoxyethyl acetate			CAS 111-15-9
CH ₃ COOCH ₂ CH ₂ OC ₂ H ₅			RTECS KK8225000
Synonyms & Trade Names Cellosolve® acetate, EGEEA, Ethylene glycol monoethyl ether acetate, Glycol monoethyl ether acetate			DOT ID & Guide 1172 129
Exposure Limits	NIOSH REL: TWA 0.5 ppm (2.7 mg/m ³) [skin]		
	OSHA PEL: TWA 100 ppm (540 mg/m ³) [skin]		
IDLH 500 ppm		Conversion 1 ppm = 5.41 mg/m ³	
Physical Description Colorless liquid with a mild odor.			
MW: 132.2	BP: 313°F	FRZ: -79°F	Sol: 23%
VP: 2 mmHg	IP: ?		Sp.Gr: 0.98
Fl.P: 124°F	UEL: ?	LEL: 1.7%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1450; OSHA 53			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* 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 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

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

Symptoms Irritation eyes, nose; vomiting; kidney damage; paralysis; in animals: reproductive, teratogenic effects

Target Organs Eyes, respiratory system, gastrointestinal tract, reproductive system, hematopoietic system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethyl acetate			CAS 141-78-6
CH ₃ COOC ₂ H ₅			RTECS AH5425000
Synonyms & Trade Names Acetic ester, Acetic ether, Ethyl ester of acetic acid, Ethyl ethanoate			DOT ID & Guide 1173 129
Exposure Limits	NIOSH REL: TWA 400 ppm (1400 mg/m ³)		
	OSHA PEL: TWA 400 ppm (1400 mg/m ³)		
IDLH 2000 ppm [10%LEL]		Conversion 1 ppm = 3.60 mg/m ³	
Physical Description Colorless liquid with an ether-like, fruity odor.			
MW: 88.1	BP: 171°F	FRZ: -117°F	Sol(77°F): 10%
VP: 73 mmHg	IP: 10.01 eV		Sp.Gr: 0.90
Fl.P: 24°F	UEL: 11.5%	LEL: 2.0%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1457; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2000 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

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

Symptoms Irritation eyes, skin, nose, throat; narcosis; dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethyl acrylate			CAS 140-88-5
CH ₂ =CHCOOC ₂ H ₅			RTECS AT0700000
Synonyms & Trade Names Ethyl acrylate (inhibited), Ethyl ester of acrylic acid, Ethyl propenoate			DOT ID & Guide 1917 129P (inhibited)
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: TWA 25 ppm (100 mg/m ³) [skin]		
IDLH Ca [300 ppm]		Conversion 1 ppm = 4.09 mg/m ³	
Physical Description Colorless liquid with an acrid odor.			
MW: 100.1	BP: 211°F	FRZ: -96°F	Sol: 2%
VP: 29 mmHg	IP: 10.30 eV		Sp.Gr: 0.92
Fl.P: 48°F	UEL: 14%	LEL: 1.4%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Oxidizers, peroxides, polymerizers, strong alkalis, moisture, chlorosulfonic acid [Note: Polymerizes readily unless an inhibitor such as hydroquinone is added.]			
Measurement Methods NIOSH 1450; OSHA 92			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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 (gas mask) with a chin-style, front- or back-			

mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system
Cancer Site [in animals: tumors of the forestomach]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethyl alcohol			CAS 64-17-5
CH ₃ CH ₂ OH			RTECS KQ6300000
Synonyms & Trade Names Alcohol, Cologne spirit, Ethanol, EtOH, Grain alcohol			DOT ID & Guide 1170 127
Exposure Limits	NIOSH REL: TWA 1000 ppm (1900 mg/m ³)		
	OSHA PEL: TWA 1000 ppm (1900 mg/m ³)		
IDLH 3300 ppm [10%LEL]		Conversion 1 ppm = 1.89 mg/m ³	
Physical Description Clear, colorless liquid with a weak, ethereal, vinous odor.			
MW: 46.1	BP: 173°F	FRZ: -173°F	Sol: Miscible
VP: 44 mmHg	IP: 10.47 eV		Sp.Gr: 0.79
Fl.P: 55°F	UEL: 19%	LEL: 3.3%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, potassium dioxide, bromine pentafluoride, acetyl bromide, acetyl chloride, platinum, sodium			
Measurement Methods NIOSH 1400; OSHA 100			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 3300 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 : Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose; headache, drowsiness, lassitude (weakness, exhaustion), narcosis; cough; liver damage; anemia; reproductive, teratogenic effects
Target Organs Eyes, skin, respiratory system, central nervous system, liver, blood, reproductive system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethylamine			CAS 75-04-7
CH ₃ CH ₂ NH ₂			RTECS KH2100000
Synonyms & Trade Names Aminoethane, Ethylamine (anhydrous), Monoethylamine			DOT ID & Guide 1036 118
Exposure Limits	NIOSH REL: TWA 10 ppm (18 mg/m ³)		
	OSHA PEL: TWA 10 ppm (18 mg/m ³)		
IDLH 600 ppm		Conversion 1 ppm = 1.85 mg/m ³	
Physical Description Colorless gas or water-white liquid (below 62°F) with an ammonia-like odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 45.1	BP: 62°F	FRZ: -114°F	Sol: Miscible
VP: 874 mmHg	IP: 8.86 eV	RGasD: 1.61	Sp.Gr: 0.69 (Liquid)
Fl.P: 1°F	UEL: 14.0%	LEL: 3.5%	
Flammable Gas Class IA Flammable Liquid			
Incompatibilities & Reactivities Strong acids; strong oxidizers; copper, tin & zinc in presence of moisture; cellulose nitrate; chlorine; hypochlorites			
Measurement Methods NIOSH S144 (II-3); OSHA 36			
Personal Protection & Sanitation Skin: Prevent skin contact (liquid) Eyes: Prevent eye contact (liquid) Wash skin: When contaminated (liquid) Remove: When wet or contaminated (liquid) Change: No recommendation Provide: Eyewash (liquid), Quick drench (liquid)		First Aid (See procedures) Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support Swallow: Medical attention immediately (liquid)	
Respirator Recommendations NIOSH/OSHA Up to 250 ppm : (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 [£] Up to 500 ppm : (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 self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full			

facepiece
Up to 600 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; skin burns, dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethyl benzene			CAS 100-41-4
CH ₃ CH ₂ C ₆ H ₅			RTECS DA0700000
Synonyms & Trade Names Ethylbenzol, Phenylethane			DOT ID & Guide 1175 129
Exposure Limits	NIOSH REL: TWA 100 ppm (435 mg/m ³) ST 125 ppm (545 mg/m ³)		
	OSHA PEL†: TWA 100 ppm (435 mg/m ³)		
IDLH 800 ppm [10%LEL]		Conversion 1 ppm = 4.34 mg/m ³	
Physical Description Colorless liquid with an aromatic odor.			
MW: 106.2	BP: 277°F	FRZ: -139°F	Sol: 0.01%
VP: 7 mmHg	IP: 8.76 eV		Sp.Gr: 0.87
Fl.P: 55°F	UEL: 6.7%	LEL: 0.8%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1501; OSHA 7, 1002			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) 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
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
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethyl bromide			CAS 74-96-4
CH ₃ CH ₂ Br			RTECS KH6475000
Synonyms & Trade Names Bromoethane, Monobromoethane			DOT ID & Guide 1891 131
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 200 ppm (890 mg/m ³)		
IDLH 2000 ppm		Conversion 1 ppm = 4.46 mg/m ³	
Physical Description Colorless to yellow liquid with an ether-like odor. [Note: A gas above 101°F.]			
MW: 109.0	BP: 101°F	FRZ: -182°F	Sol: 0.9%
VP: 375 mmHg	IP: 10.29 eV		Sp.Gr: 1.46
Fl.P: <4°F	UEL: 8.0%	LEL: 6.8%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium			
Measurement Methods NIOSH 1011; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations OSHA Up to 2000 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; central nervous system depression; pulmonary edema; liver, kidney disease; cardiac arrhythmias, cardiac arrest
Target Organs Eyes, skin, respiratory system, liver, kidneys, cardiovascular system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethyl butyl ketone			CAS 106-35-4
CH ₃ CH ₂ CO[CH ₂] ₃ CH ₃			RTECS MJ5250000
Synonyms & Trade Names Butyl ethyl ketone, 3-Heptanone			DOT ID & Guide 1224 127
Exposure Limits	NIOSH REL: TWA 50 ppm (230 mg/m ³)		
	OSHA PEL: TWA 50 ppm (230 mg/m ³)		
IDLH 1000 ppm		Conversion 1 ppm = 4.67 mg/m ³	
Physical Description Colorless liquid with a powerful, fruity odor.			
MW: 114.2	BP: 298°F	FRZ: -38°F	Sol: 1%
VP: 4 mmHg	IP: 9.02 eV		Sp.Gr: 0.82
Fl.P(oc): 115°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Oxidizers, acetaldehyde, perchloric acid			
Measurement Methods NIOSH 1301; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush 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 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

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

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

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethyl chloride			CAS 75-00-3
CH ₃ CH ₂ Cl			RTECS KH7525000
Synonyms & Trade Names Chloroethane, Hydrochloric ether, Monochloroethane, Muriatic ether			DOT ID & Guide 1037 115
Exposure Limits	NIOSH REL: Handle with caution in the workplace. See Appendix C (Chloroethanes)		
	OSHA PEL: TWA 1000 ppm (2600 mg/m ³)		
IDLH 3800 ppm [10%LEL]		Conversion 1 ppm = 2.64 mg/m ³	
Physical Description Colorless gas or liquid (below 54°F) with a pungent, ether-like odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 64.5	BP: 54°F	FRZ: -218°F	Sol: 0.6%
VP: 1000 mmHg	IP: 10.97 eV	RGasD: 2.23	Sp.Gr: 0.92 (Liquid at 32°F)
Fl.P: NA (Gas) -58°F (Liquid)	UEL: 15.4%	LEL: 3.8%	
Flammable Gas Class IA Flammable Liquid			
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.]			
Measurement Methods NIOSH 2519			
Personal Protection & Sanitation 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) 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

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethylene chlorohydrin			CAS 107-07-3
CH ₂ ClCH ₂ OH			RTECS KK0875000
Synonyms & Trade Names 2-Chloroethanol, 2-Chloroethyl alcohol, Ethylene chlorhydrin			DOT ID & Guide 1135 131
Exposure Limits	NIOSH REL: C 1 ppm (3 mg/m ³) [skin]		
	OSHA PEL†: TWA 5 ppm (16 mg/m ³) [skin]		
IDLH 7 ppm		Conversion 1 ppm = 3.29 mg/m ³	
Physical Description Colorless liquid with a faint, ether-like odor.			
MW: 80.5	BP: 262°F	FRZ: -90°F	Sol: Miscible
VP: 5 mmHg	IP: 10.90 eV		Sp.Gr: 1.20
Fl.P: 140°F	UEL: 15.9%	LEL: 4.9%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers, strong caustics, water or steam			
Measurement Methods NIOSH 2513; OSHA 7			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 7 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation mucous membrane; nausea, vomiting; dizziness, incoordination; numbness; visual disturbance; headache; thirst; delirium; low blood pressure; collapse, shock, coma; liver, kidney damage
Target Organs respiratory system, liver, kidneys, central nervous system, cardiovascular system, eyes
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethylenediamine			CAS 107-15-3
NH ₂ CH ₂ CH ₂ NH ₂			RTECS KH8575000
Synonyms & Trade Names 1,2-Diaminoethane; 1,2-Ethanediamine; Ethylenediamine (anhydrous)			DOT ID & Guide 1604 132
Exposure Limits	NIOSH REL: TWA 10 ppm (25 mg/m ³)		
	OSHA PEL: TWA 10 ppm (25 mg/m ³)		
IDLH 1000 ppm		Conversion 1 ppm = 2.46 mg/m ³	
Physical Description Colorless, viscous liquid with an ammonia-like odor. [fungicide] [Note: A solid below 47°F.]			
MW: 60.1	BP: 241°F	FRZ: 47°F	Sol: Miscible
VP: 11 mmHg	IP: 8.60 eV		Sp.Gr: 0.91
Fl.P: 93°F	UEL(212°F): 12%	LEL(212°F): 2.5%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong acids & oxidizers, carbon tetrachloride & other chlorinated organic compounds, carbon disulfide [Note: Corrosive to metals.]			
Measurement Methods NIOSH 2540; OSHA 60			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet (flammable) Change: No recommendation Provide: Eyewash (>5%), Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 250 ppm : (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 [£] Up to 500 ppm : (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 powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the			

compound of concern[£]/(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece
Up to 1000 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation nose, respiratory system; sensitization dermatitis; asthma; liver, kidney damage

Target Organs Skin, respiratory system, liver, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethylene dibromide			CAS 106-93-4
BrCH ₂ CH ₂ Br			RTECS KH9275000
Synonyms & Trade Names 1,2-Dibromoethane; Ethylene bromide; Glycol dibromide			DOT ID & Guide 1605 154
Exposure Limits	NIOSH REL: Ca TWA 0.045 ppm C 0.13 ppm [15-minute] See Appendix A		
	OSHA PEL: TWA 20 ppm C 30 ppm 50 ppm [5-minute maximum peak]		
IDLH Ca [100 ppm]		Conversion 1 ppm = 7.69 mg/m ³	
Physical Description Colorless liquid or solid (below 50°F) with a sweet odor. [fumigant]			
MW: 187.9	BP: 268°F	FRZ: 50°F	Sol: 0.4%
VP: 12 mmHg	IP: 9.45 eV		Sp.Gr: 2.17
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Chemically-active metals such as sodium, potassium, calcium, hot aluminum & magnesium; liquid ammonia; strong oxidizers			
Measurement Methods NIOSH 1008; OSHA 2			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; dermatitis with vesiculation; liver, heart, spleen, kidney damage; reproductive effects; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, liver, kidneys, reproductive system
Cancer Site [in animals: skin & lung tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethylene dichloride		CAS 107-06-2	
ClCH ₂ CH ₂ Cl		RTECS KI0525000	
Synonyms & Trade Names 1,2-Dichloroethane; Ethylene chloride; Glycol dichloride		DOT ID & Guide 1184 129	
Exposure Limits	NIOSH REL: Ca TWA 1 ppm (4 mg/m ³) ST 2 ppm (8 mg/m ³) See Appendix A See Appendix C (Chloroethanes)		
	OSHA PEL†: TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]		
IDLH Ca [50 ppm]		Conversion 1 ppm = 4.05 mg/m ³	
Physical Description Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.]			
MW: 99.0	BP: 182°F	FRZ: -32°F	Sol: 0.9%
VP: 64 mmHg	IP: 11.05 eV		Sp.Gr: 1.24
Fl.P: 56°F	UEL: 16%	LEL: 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.]			
Measurement Methods NIOSH 1003; OSHA 3			
Personal Protection & Sanitation 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) 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
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 system cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethylene glycol			CAS 107-21-1
HOCH ₂ CH ₂ OH			RTECS KW2975000
Synonyms & Trade Names 1,2-Dihydroxyethane; 1,2-Ethanediol; Glycol; Glycol alcohol; Monoethylene glycol			DOT ID & Guide
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Clear, colorless, syrupy, odorless liquid. [antifreeze] [Note: A solid below 9°F.]			
MW: 62.1	BP: 388°F	FRZ: 9°F	Sol: Miscible
VP: 0.06 mmHg	IP: ?		Sp.Gr: 1.11
Fl.P: 232°F	UEL: 15.3%	LEL: 3.2%	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers, chromium trioxide, potassium permanganate, sodium peroxide [Note: Hygroscopic (i.e., absorbs moisture from the air).]			
Measurement Methods NIOSH 5523; OSHA PV2024			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; nausea, vomiting, abdominal pain, lassitude (weakness, exhaustion); dizziness, stupor, convulsions, central nervous system depression; skin sensitization			
Target Organs Eyes, skin, respiratory system, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethylene glycol dinitrate			CAS 628-96-6
O ₂ NOCH ₂ CH ₂ ONO ₂			RTECS KW5600000
Synonyms & Trade Names EGDN; 1,2-Ethanediol dinitrate; Ethylene dinitrate; Ethylene nitrate; Glycol dinitrate; Nitroglycol			DOT ID & Guide
Exposure Limits	NIOSH REL: ST 0.1 mg/m ³ [skin]		
	OSHA PEL†: C 0.2 ppm (1 mg/m ³) [skin]		
IDLH 75 mg/m ³		Conversion 1 ppm = 6.22 mg/m ³	
Physical Description Colorless to yellow, oily, odorless liquid. [Note: An explosive ingredient (60-80%) in dynamite along with nitroglycerine (40-20%).]			
MW: 152.1	BP: 387°F	FRZ: -8°F	Sol: Insoluble
VP: 0.05 mmHg	IP: ?		Sp.Gr: 1.49
FLP: 419°F	UEL: ?	LEL: ?	
Explosive Liquid			
Incompatibilities & Reactivities Acids, alkalis			
Measurement Methods NIOSH 2507; OSHA 43			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 1 mg/m ³ : (APF = 10) Any supplied-air respirator* Up to 2.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 5 mg/m ³ : (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 75 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Throbbing headache; dizziness; nausea, vomiting, abdominal pain; hypotension, flush, palpitations, angina; methemoglobinemia; delirium, central nervous system depression; irritation skin; in animals: anemia; liver, kidney damage

Target Organs Skin, cardiovascular system, blood, liver, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethyleneimine			CAS 151-56-4
C ₂ H ₅ N			RTECS KX5075000
Synonyms & Trade Names Aminoethylene, Azirane, Aziridine, Dimethyleneimine, Dimethylenimine, Ethylenimine, Ethylimine			DOT ID & Guide 1185 131P (inhibited)
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1012] See Appendix B		
IDLH Ca [100 ppm]		Conversion 1 ppm = 1.76 mg/m ³	
Physical Description Colorless liquid with an ammonia-like odor. [Note: Usually contains inhibitors to prevent polymerization.]			
MW: 43.1	BP: 133°F	FRZ: -97°F	Sol: Miscible
VP: 160 mmHg	IP: 9.20 eV		Sp.Gr: 0.83
Fl.P: 12°F	UEL: 54.8%	LEL: 3.3%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Polymerizes explosively in presence of acids [Note: Explosive silver derivatives may be formed with silver alloys (e.g., silver solder).]			
Measurement Methods NIOSH 3514			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; nausea, vomiting; headache, dizziness; pulmonary edema; liver, kidney damage; eye burns; skin sensitization; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, liver, kidneys
Cancer Site [in animals: lung & liver tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethylene oxide			CAS 75-21-8
C ₂ H ₄ O			RTECS KX2450000
Synonyms & Trade Names Dimethylene oxide; 1,2-Epoxy ethane; Oxirane			DOT ID & Guide 1040 119
Exposure Limits	NIOSH REL: Ca TWA <0.1 ppm (0.18 mg/m ³) C 5 ppm (9 mg/m ³) [10-min/day] See Appendix A		
	OSHA PEL: [1910.1047] TWA 1 ppm 5 ppm [15-minute Excursion]		
IDLH Ca [800 ppm]		Conversion 1 ppm = 1.80 mg/m ³	
Physical Description Colorless gas or liquid (below 51°F) with an ether-like odor.			
MW: 44.1	BP: 51°F	FRZ: -171°F	Sol: Miscible
VP: 1.46 atm	IP: 10.56 eV	RGasD: 1.49	Sp.Gr: 0.82 (Liquid at 50°F)
Fl.P: NA (Gas) -20°F (Liquid)	UEL: 100%	LEL: 3.0%	
Flammable Gas Class IA Flammable Liquid			
Incompatibilities & Reactivities Strong acids, alkalis & oxidizers; chlorides of iron, aluminum & tin; oxides of iron & aluminum; water			
Measurement Methods NIOSH 1614, 3800; OSHA 30, 49, 50			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately (liquid)	
Respirator Recommendations NIOSH Up to 5 ppm : (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 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 canister providing protection against the compound of concern[†]/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, nose, throat; peculiar taste; headache; nausea, vomiting, diarrhea; dyspnea (breathing difficulty), cyanosis, pulmonary edema; drowsiness, lassitude (weakness, exhaustion), incoordination; EKG abnormalities; eye, skin burns (liquid or high vapor concentration); liquid: frostbite; reproductive effects; [potential occupational carcinogen]; in animals: convulsions; liver, kidney damage

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

Cancer Site [peritoneal cancer, leukemia]

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethylene thiourea			CAS 96-45-7
C ₃ H ₆ N ₂ S			RTECS NI9625000
Synonyms & Trade Names 1,3-Ethylene-2-thiourea; N,N-Ethylenethiourea; ETU; 2-Imidazolidine-2-thione			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca Use encapsulated form. See Appendix A		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description White to pale-green, crystalline solid with a faint, amine odor. [Note: Used as an accelerator in the curing of polychloroprene & other elastomers.]			
MW: 102.2	BP: 446-595°F	MLT: 392°F	Sol(86°F): 2%
VP: 16 mmHg	IP: 8.15 eV		Sp.Gr: ?
Fl.P: 486°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Acrolein			
Measurement Methods NIOSH 5011; OSHA 95			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes; in animals: thickening of the skin; goiter; teratogenic effects; [potential occupational carcinogen]
Target Organs Eyes, skin, thyroid, reproductive system
Cancer Site [in animals: liver, thyroid & lymphatic system tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethyl ether			CAS 60-29-7
C ₂ H ₅ OC ₂ H ₅			RTECS KI5775000
Synonyms & Trade Names Diethyl ether, Diethyl oxide, Ethyl oxide, Ether, Solvent ether			DOT ID & Guide 1155 127
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 400 ppm (1200 mg/m ³)		
IDLH 1900 ppm [10%LEL]		Conversion 1 ppm = 3.03 mg/m ³	
Physical Description Colorless liquid with a pungent, sweetish odor. [Note: A gas above 94°F.]			
MW: 74.1	BP: 94°F	FRZ: -177°F	Sol: 8%
VP: 440 mmHg	IP: 9.53 eV		Sp.Gr: 0.71
Fl.P: -49°F	UEL: 36.0%	LEL: 1.9%	
Class IA Flammable Liquid: Fl.P. below 73°F and BP below 100°F.			
Incompatibilities & Reactivities Strong oxidizers, halogens, sulfur, sulfur compounds [Note: Tends to form explosive peroxides under influence of air and light.]			
Measurement Methods NIOSH 1610; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations OSHA Up to 1900 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, upper respiratory system; dizziness, drowsiness, headache, excited, narcosis; nausea, vomiting
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethyl formate			CAS 109-94-4
CH ₃ CH ₂ OCHO			RTECS LQ8400000
Synonyms & Trade Names Ethyl ester of formic acid, Ethyl methanoate			DOT ID & Guide 1190 129
Exposure Limits	NIOSH REL: TWA 100 ppm (300 mg/m ³)		
	OSHA PEL: TWA 100 ppm (300 mg/m ³)		
IDLH 1500 ppm		Conversion 1 ppm = 3.03 mg/m ³	
Physical Description Colorless liquid with a fruity odor.			
MW: 74.1	BP: 130°F	FRZ: -113°F	Sol(64°F): 9%
VP: 200 mmHg	IP: 10.61 eV		Sp.Gr: 0.92
Fl.P: -4°F	UEL: 16.0%	LEL: 2.8%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids [Note: Decomposes slowly in water to form ethyl alcohol and formic acid.]			
Measurement Methods NIOSH 1452; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1500 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

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

Symptoms Irritation eyes, upper respiratory system; in animals: narcosis

Target Organs Eyes, respiratory system, central nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethylidene norbornene			CAS 16219-75-3
C ₉ H ₁₂			RTECS RB9450000
Synonyms & Trade Names ENB, 5-Ethylidenebicyclo(2.2.1)-hept-2-ene, 5-Ethylidene-2-norbornene [Note: Due to its reactivity, ENB may be stabilized with tert-butyl catechol.]			DOT ID & Guide
Exposure Limits	NIOSH REL: C 5 ppm (25 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.92 mg/m ³	
Physical Description Colorless to white liquid with a turpentine-like odor.			
MW: 120.2	BP: 298°F	FRZ: -112°F	Sol: ?
VP: 4 mmHg	IP: ?		Sp.Gr: 0.90
Fl.P(oc): 101°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Oxygen [Note: ENB should be stored in a nitrogen atmosphere since it reacts with oxygen.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; headache; cough, dyspnea (breathing difficulty); nausea, vomiting; olfactory, taste changes; chemical pneumonitis (aspiration liquid); in animals: liver, kidney, urogenital injury; bone marrow effects			
Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys, urogenital system, bone			

marrow

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethyl mercaptan			CAS 75-08-1
CH ₃ CH ₂ SH			RTECS K19625000
Synonyms & Trade Names Ethanethiol, Ethyl sulfhydrate, Mercaptoethane			DOT ID & Guide 2363 130
Exposure Limits	NIOSH REL: C 0.5 ppm (1.3 mg/m ³) [15-minute]		
	OSHA PEL†: C 10 ppm (25 mg/m ³)		
IDLH 500 ppm		Conversion 1 ppm = 2.54 mg/m ³	
Physical Description Colorless liquid with a strong, skunk-like odor. [Note: A gas above 95°F.]			
MW: 62.1	BP: 95°F	FRZ: -228°F	Sol: 0.7%
VP: 442 mmHg	IP: 9.29 eV		Sp.Gr: 0.84
Fl.P: -55°F	UEL: 18.0%	LEL: 2.8%	
Class IA Flammable Liquid: Fl.P. below 73°F and BP below 100°F.			
Incompatibilities & Reactivities Strong oxidizers [Note: Reacts violently with calcium hypochlorite.]			
Measurement Methods NIOSH 2542			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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 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 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

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

Symptoms Irritation mucous membrane; headache, nausea; in animals: incoordination, lassitude (weakness, exhaustion); liver, kidney damage; cyanosis; narcosis

Target Organs Eyes, respiratory system, liver, kidneys, blood

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

N-Ethylmorpholine			CAS 100-74-3
C4H8ONCH2CH3			RTECS QE4025000
Synonyms & Trade Names 4-Ethylmorpholine			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 ppm (23 mg/m³) [skin]		
	OSHA PEL†: TWA 20 ppm (94 mg/m³) [skin]		
IDLH 100 ppm		Conversion 1 ppm = 4.71 mg/m³	
Physical Description Colorless liquid with an ammonia-like odor.			
MW: 115.2	BP: 281°F	FRZ: -81°F	Sol: Miscible
VP: 6 mmHg	IP: ?		Sp.Gr: 0.90
Fl.P(oc): 90°F	UEL: ?	LEL: ?	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong acids, strong oxidizers			
Measurement Methods NIOSH S146 (II-3)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Eyewash (>15%), Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 50 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator* Up to 100 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

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

Symptoms Irritation eyes, nose, throat; visual disturbance: corneal edema, blue-gray vision, colored haloes

Target Organs Eyes, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ethyl silicate			CAS 78-10-4
(C ₂ H ₅) ₄ SiO ₄			RTECS VV9450000
Synonyms & Trade Names Ethyl orthosilicate, Ethyl silicate (condensed), Tetraethoxysilane, Tetraethyl orthosilicate, Tetraethyl silicate			DOT ID & Guide 1292 132
Exposure Limits	NIOSH REL: TWA 10 ppm (85 mg/m ³)		
	OSHA PEL†: TWA 100 ppm (850 mg/m ³)		
IDLH 700 ppm		Conversion 1 ppm = 8.52 mg/m ³	
Physical Description Colorless liquid with a sharp, alcohol-like odor.			
MW: 208.3	BP: 336°F	FRZ: -117°F	Sol: Reacts
VP: 1 mmHg	IP: 9.77 eV		Sp.Gr: 0.93
Fl.P: 99°F	UEL: ?	LEL: ?	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers, water [Note: Reacts with water to form a silicone adhesive (a milky-white mass).]			
Measurement Methods NIOSH S264 (II-3)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 100 ppm: (APF = 10) Any supplied-air respirator* Up to 250 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 500 ppm: (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 700 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
Exposure Routes inhalation, ingestion skin, and/or eye contact
Symptoms Irritation eyes, nose; in animals: lacrimation (discharge of tears); dyspnea (breathing difficulty), pulmonary edema; tremor, narcosis; liver, kidney damage; anemia
Target Organs Eyes, respiratory system, liver, kidneys, blood, skin
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Fenamiphos			CAS 22224-92-6
C ₁₃ H ₂₂ NO ₃ PS			RTECS TB3675000
Synonyms & Trade Names Ethyl 3-methyl-4-(methylthio)phenyl-(1-methylethyl)phosphoramidate, Nemacur®, Phenamiphos			DOT ID & Guide
Exposure Limits		NIOSH REL: TWA 0.1 mg/m ³ [skin] OSHA PEL†: none	
IDLH N.D.		Conversion	
Physical Description Off-white to tan, waxy solid. [insecticide] [Note: Found commercially as a granular ingredient (5-15%) or in an emulsifiable concentrate (400 g/l).]			
MW: 303.4	BP: ?	MLT: 121°F	Sol: 0.03%
VP: 0.00005 mmHg	IP: ?		Sp.Gr: 1.14
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities None reported [Note: May hydrolyze under alkaline conditions.]			
Measurement Methods NIOSH 5600			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Nausea, vomiting, abdominal cramps, diarrhea, salivation; headache, dizziness, lassitude (weakness, exhaustion); rhinorrhea (discharge of thin mucus), chest tightness; blurred vision, miosis; cardiac irregularities; muscle fasciculation; dyspnea (breathing difficulty)			
Target Organs respiratory system, central nervous system, cardiovascular system, blood cholinesterase			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Fensulfothion			CAS 115-90-2
C ₁₁ H ₁₇ O ₄ PS ₂			RTECS TF3850000
Synonyms & Trade Names Dasanit®; O,O-Diethyl O-(p-methylsulfinyl)phenyl)phosphorothioate; Terracur P®			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Brown liquid or yellow oil. [pesticide]			
MW: 308.4	BP: ?	FRZ: ?	Sol(77°F): 0.2%
VP: ?	IP: ?		Sp.Gr: 1.20
FLP: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Alkalis			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation skin; nausea, vomiting, abdominal cramps, diarrhea, salivation; headache, dizziness, lassitude (weakness, exhaustion); rhinorrhea (discharge of thin mucus), chest tightness; blurred vision, miosis; cardiac irregular; muscle fasciculation; dyspnea (breathing difficulty)			
Target Organs Skin, respiratory system, central nervous system, cardiovascular system, blood cholinesterase			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Fenthion			CAS 55-38-9
C₁₀H₁₅O₃PS			RTECS TF9625000
Synonyms & Trade Names Baytex; Entex; O,O-Dimethyl O-3-methyl-4-methylthiophenyl phosphorothioate			DOT ID & Guide
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless to brown liquid with a slight, garlic-like odor. [insecticide]			
MW: 278.3	BP: ?	FRZ: 43°F	Sol: 0.006%
VP: 0.0003 mmHg	IP: ?		Sp.Gr: 1.25
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Nausea, vomiting, abdominal cramps, diarrhea, salivation; headache, dizziness, lassitude (weakness, exhaustion); rhinorrhea (discharge of thin mucus), chest tightness; blurred vision, miosis; cardiac irregularities; muscle fasciculation; dyspnea (breathing difficulty)			
Target Organs respiratory system, central nervous system, cardiovascular system, plasma cholinesterase			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ferbam			CAS 14484-64-1
[(CH ₃) ₂ NCS ₂] ₃ Fe			RTECS NO8750000
Synonyms & Trade Names tris(Dimethyldithiocarbamato)iron, Ferric dimethyl dithiocarbamate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³		
	OSHA PEL†: TWA 15 mg/m ³		
IDLH 800 mg/m ³		Conversion	
Physical Description Dark brown to black, odorless solid. [fungicide]			
MW: 416.5	BP: Decomposes	MLT: >356°F (Decomposes)	Sol: 0.01%
VP: 0 mmHg (approx)	IP: 7.72 eV		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	MEC: 55 g/m ³
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, moisture			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 50 mg/m ³ : (APF = 5) Any dust respirator Up to 100 mg/m ³ : (APF = 10) Any dust respirator except single-use and quarter-mask respirators*/(APF = 10) Any air-purifying respirator with a high-efficiency particulate filter*/(APF = 10) Any supplied-air respirator* Up to 250 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust filter*			

Up to 500 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 800 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, respiratory tract; dermatitis; gastrointestinal disturbance

Target Organs Eyes, skin, respiratory system, gastrointestinal tract

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ferrovanadium dust			CAS 12604-58-9
FeV			RTECS LK2900000
Synonyms & Trade Names Ferrovanadium			DOT ID & Guide
Exposure Limits	NIOSH REL*: TWA 1 mg/m ³ ST 3 mg/m ³ [*Note: The REL also applies to Vanadium metal and Vadium carbide.]		
	OSHA PEL†: TWA 1 mg/m ³		
IDLH 500 mg/m ³		Conversion	
Physical Description Dark, odorless particulate dispersed in air. [Note: Ferrovanadium metal is an alloy usually containing 50-80% vanadium.]			
MW: 106.8	BP: ?	MLT: 2696-2768°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	MEC: 1.3 g/m ³
Metal: Noncombustible Solid, but dust may be an explosion hazard.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods OSHA ID121, ID125G			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m³ : (APF = 5) Any dust and mist respirator* Up to 10 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(APF = 10) Any supplied-air respirator* Up to 25 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter*			

Up to 50 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 500 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, respiratory system; in animals: bronchitis, pneumonitis

Target Organs Eyes, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Fibrous glass dust			CAS
			RTECS LK3651000
Synonyms & Trade Names Fiber glas®, Fiberglass, Glass fibers, Glass wool [Note: Usually produced from borosilicate & low alkali silicate glasses.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 3 fibers/cm ³ (fibers 3.5 m in diameter & 10 m in length) TWA 5 mg/m ³ (total)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Typically, glass filaments >3 m in diameter or glass "wool" with diameters down to 0.05 m & >1 m in length.			
MW: NA	BP: NA	MLT: ?	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.5
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Fibers			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 7400			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations NIOSH Up to 5X REL: (APF = 5) Any dust respirator Up to 10X REL: (APF = 10) Any dust respirator except single-use and quarter-mask respirators/(APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator Up to 25X REL: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust filter Up to 50X REL: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate			

filter/(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 1000X REL: (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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, skin, nose, throat; dyspnea (breathing difficulty)

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Fluorine			CAS 7782-41-4
F ₂			RTECS LM6475000
Synonyms & Trade Names Fluorine-19			DOT ID & Guide 9192 167 (cryogenic liquid) 1045 124 (compressed)
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.2 mg/m ³)		
	OSHA PEL: TWA 0.1 ppm (0.2 mg/m ³)		
IDLH 25 ppm		Conversion 1 ppm = 1.55 mg/m ³	
Physical Description Pale-yellow to greenish gas with a pungent, irritating odor.			
MW: 38.0	BP: -307°F	FRZ: -363°F	Sol: Reacts
VP: >1 atm	IP: 15.70 eV	RGasD: 1.31	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas, but an extremely strong oxidizer.			
Incompatibilities & Reactivities Water, nitric acid, oxidizers, organic compounds [Note: Reacts violently with all combustible materials, except the metal containers in which it is shipped. Reacts with H ₂ O to form hydrofluoric acid.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact (liquid) Eyes: Prevent eye contact (liquid) Wash skin: When contaminated (liquid) Remove: When wet or contaminated (liquid) Change: No recommendation Provide: Eyewash (liquid), Quick drench (liquid)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 1 ppm : (APF = 10) Any supplied-air respirator* Up to 2.5 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 5 ppm : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 25 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 canister providing protection against the compound of concern⁶/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, nose, respiratory system; laryngeal spasm, wheezing; pulmonary edema; eye, skin burns; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Fluorotrichloromethane			CAS 75-69-4
CCl ₃ F			RTECS PB6125000
Synonyms & Trade Names Freon® 11, Monofluorotrichloromethane, Refrigerant 11, Trichlorofluoromethane, Trichloromonofluoromethane			DOT ID & Guide
Exposure Limits	NIOSH REL: C 1000 ppm (5600 mg/m ³)		
	OSHA PEL†: TWA 1000 ppm (5600 mg/m ³)		
IDLH 2000 ppm		Conversion 1 ppm = 5.62 mg/m ³	
Physical Description Colorless to water-white, nearly odorless liquid or gas (above 75°F).			
MW: 137.4	BP: 75°F	FRZ: -168°F	Sol(75°F): 0.1%
VP: 690 mmHg	IP: 11.77 eV	RGasD: 4.74	Sp.Gr: 1.47 (Liquid at 75°F)
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid Nonflammable Gas			
Incompatibilities & Reactivities Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc, magnesium & lithium shavings; granular barium			
Measurement Methods NIOSH 1006			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: No recommendation Remove: When wet or contaminated Change: No recommendation Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2000 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

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

Symptoms Incoordination, tremor; dermatitis; cardiac arrhythmias, cardiac arrest; asphyxia; liquid: frostbite

Target Organs Skin, respiratory system, cardiovascular system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Fluoroxene			CAS 406-90-6
CF ₃ CH ₂ OCH=CH ₂			RTECS KO4250000
Synonyms & Trade Names 2,2,2-Trifluoroethoxyethene; 2,2,2-Trifluoroethyl vinyl ether			DOT ID & Guide
Exposure Limits	NIOSH REL*: C 2 ppm (10.3 mg/m ³) [60-minute] [*Note: REL for exposure to waste anesthetic gas.]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 5.16 mg/m ³	
Physical Description Liquid. [inhalation anesthetic] [Note: A gas above 109°F.]			
MW: 126.1	BP: 109°F	FRZ: ?	Sol: ?
VP: 286 mmHg	IP: ?		Sp.Gr: 1.14
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid [potentially EXPLOSIVE!]			
Incompatibilities & Reactivities None reported			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes; central nervous system depression, analgesia, anesthesia, convulsions, respiratory depression			
Target Organs Eyes, central nervous system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Fonofos			CAS 944-22-9
C ₁₀ H ₁₅ OPS ₂			RTECS TA5950000
Synonyms & Trade Names Dyfonate®, Dyphonate, O-Ethyl-S-phenyl ethylphosphorothioate, Fonophos			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 10.07 mg/m ³	
Physical Description Light-yellow liquid with an aromatic odor. [insecticide]			
MW: 246.3	BP: ?	FRZ: ?	Sol: 0.001%
VP(77°F): 0.0002 mmHg	IP: ?		Sp.Gr: 1.15
Fl.P: >201°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 5600; OSHA PV2027			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Nausea, vomiting, abdominal cramps, diarrhea, salivation; headache, dizziness, lassitude (weakness, exhaustion); rhinorrhea (discharge of thin mucus), chest tightness; blurred vision, miosis; cardiac irregularities; muscle fasciculation; dyspnea (breathing difficulty)			
Target Organs respiratory system, central nervous system, cardiovascular system, blood cholinesterase			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Formaldehyde			CAS 50-00-0
HCHO			RTECS LP8925000
Synonyms & Trade Names Methanal, Methyl aldehyde, Methylene oxide			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca TWA 0.016 ppm C 0.1 ppm [15-minute] See Appendix A		
	OSHA PEL: [1910.1048] TWA 0.75 ppm ST 2 ppm		
IDLH Ca [20 ppm]		Conversion 1 ppm = 1.23 mg/m ³	
Physical Description Nearly colorless gas with a pungent, suffocating odor. [Note: Often used in an aqueous solution (see specific listing for Formalin).]			
MW: 30.0	BP: -6°F	FRZ: -134°F	Sol: Miscible
VP: >1 atm	IP: 10.88 eV	RGasD: 1.04	
Fl.P: NA (Gas)	UEL: 73%	LEL: 7.0%	
Flammable Gas			
Incompatibilities & Reactivities Strong oxidizers, alkalis & acids; phenols; urea [Note: Pure formaldehyde has a tendency to polymerize. Reacts with HCl to form bis-Chloromethyl ether.]			
Measurement Methods NIOSH 2016, 2541, 3500, 3800; OSHA ID205, 52			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact
Symptoms Irritation eyes, nose, throat, respiratory system; lacrimation (discharge of tears); cough; wheezing; [potential occupational carcinogen]
Target Organs Eyes, respiratory system
Cancer Site [nasal cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Formalin (as formaldehyde)			CAS
			RTECS
Synonyms & Trade Names Formaldehyde solution [Note: Formalin is an aqueous solution that is 37% formaldehyde by weight; inhibited solutions usually contain 6-12% methyl alcohol. Also see specific listings for Formaldehyde and Methyl alcohol.]			DOT ID & Guide 1198 132 2209 132
Exposure Limits	NIOSH REL: Ca TWA 0.016 ppm C 0.1 ppm [15-minute] See Appendix A		
	OSHA PEL: [1910.1048] TWA 0.75 ppm ST 2 ppm		
IDLH Ca [20 ppm]		Conversion	
Physical Description Colorless liquid with a pungent odor.			
MW: Varies	BP: 214°F	FRZ: ?	Sol: Miscible
VP: 1 mmHg	IP: ?		Sp.Gr(77°F): 1.08
Fl.P: 185°F	UEL: 73%	LEL: 7%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers, alkalis & acids; phenols; urea; oxides; isocyanates; caustics; anhydrides			
Measurement Methods NIOSH 2016, 2541, 3500, 3800; OSHA ID205, 52			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose, throat, respiratory system; lacrimation (discharge of tears); cough; wheezing, dermatitis; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system
Cancer Site [nasal cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Formamide			CAS 75-12-7
HCONH ₂			RTECS LQ0525000
Synonyms & Trade Names Carbamaldehyde, Methanamide			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 ppm (15 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 1.85 mg/m ³	
Physical Description Colorless, oily liquid. [Note: A solid below 37°F.]			
MW: 45.1	BP: 411°F (Decomposes)	FRZ: 37°F	Sol: Miscible
VP(86°F): 0.1 mmHg	IP: 10.20 eV		Sp.Gr: 1.13
Fl.P(oc): 310°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Oxidizers, iodine, pyridine, sulfur trioxide, copper, brass, lead [Note: Hygroscopic (i.e., absorbs moisture from the air).]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane; drowsiness, lassitude (weakness, exhaustion); nausea; acidosis; skin eruptions; in animals: reproductive effects			
Target Organs Eyes, skin, respiratory system, central nervous system, reproductive system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Formic acid			CAS 64-18-6
HCOOH			RTECS LQ4900000
Synonyms & Trade Names Formic acid (85-95% in aqueous solution); Hydrogen carboxylic acid; Methanoic acid			DOT ID & Guide 1779 153
Exposure Limits	NIOSH REL: TWA 5 ppm (9 mg/m ³)		
	OSHA PEL: TWA 5 ppm (9 mg/m ³)		
IDLH 30 ppm		Conversion 1 ppm = 1.88 mg/m ³	
Physical Description Colorless liquid with a pungent, penetrating odor. [Note: Often used in an aqueous solution.]			
MW: 46.0	BP: 224°F (90% solution)	FRZ: 20°F (90% solution)	Sol: Miscible
VP: 35 mmHg	IP: 11.05 eV		Sp.Gr: 1.22 (90% solution)
Fl.P(oc): 122°F (90% solution)	UEL: 57% (90% solution)	LEL: 18% (90% solution)	
Class II Combustible Liquid (90% solution)			
Incompatibilities & Reactivities Strong oxidizers, strong caustics, concentrated sulfuric acid [Note: Corrosive to metals.]			
Measurement Methods NIOSH 2011; OSHA ID186SG			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 30 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes; skin, throat; skin burns, dermatitis; lacrimation (discharge of tears); rhinorrhea (discharge of thin mucus); cough, dyspnea (breathing difficulty); nausea
Target Organs Eyes, skin, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Furfural			CAS 98-01-1
C ₅ H ₄ O ₂			RTECS LT7000000
Synonyms & Trade Names Fural, 2-Furancarboxaldehyde, Furfuraldehyde, 2-Furfuraldehyde			DOT ID & Guide 1199 132P
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 5 ppm (20 mg/m ³) [skin]		
IDLH 100 ppm		Conversion 1 ppm = 3.93 mg/m ³	
Physical Description Colorless to amber liquid with an almond-like odor. [Note: Darkens in light and air.]			
MW: 96.1	BP: 323°F	FRZ: -34°F	Sol: 8%
VP: 2 mmHg	IP: 9.21 eV		Sp.Gr: 1.16
Fl.P: 140°F	UEL: 19.3%	LEL: 2.1%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong acids, oxidizers, strong alkalis [Note: May polymerize on contact with strong acids or strong alkalis.]			
Measurement Methods NIOSH 2529; OSHA 72			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations OSHA Up to 50 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* Up to 100 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 = 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 = 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

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

Symptoms Irritation eyes, skin, upper respiratory system; headache; dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Furfuryl alcohol			CAS 98-00-0
C ₅ H ₆ O ₂			RTECS LU9100000
Synonyms & Trade Names 2-Furylmethanol, 2-Hydroxymethylfuran			DOT ID & Guide 2874 153
Exposure Limits	NIOSH REL: TWA 10 ppm (40 mg/m ³) ST 15 ppm (60 mg/m ³) [skin]		
	OSHA PEL†: TWA 50 ppm (200 mg/m ³)		
IDLH 75 ppm		Conversion 1 ppm = 4.01 mg/m ³	
Physical Description Colorless to amber liquid with a faint, burning odor. [Note: Darkens on exposure to light.]			
MW: 98.1	BP: 338°F	FRZ: 6°F	Sol: Miscible
VP(77°F): 0.6 mmHg	IP: ?		Sp.Gr: 1.13
Fl.P: 149°F	UEL: 16.3%	LEL: 1.8%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers & acids [Note: Contact with organic acids may lead to polymerization.]			
Measurement Methods NIOSH 2505			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 75 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, mucous membrane; dizziness; nausea, diarrhea; diuresis; respiratory, body temperature depression; vomiting; dermatitis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Gasoline			CAS 8006-61-9
			RTECS LX3300000
Synonyms & Trade Names Motor fuel, Motor spirits, Natural gasoline, Petrol [Note: A complex mixture of volatile hydrocarbons (paraffins, cycloparaffins & aromatics).]			DOT ID & Guide 1203 128
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion 1 ppm 2.95 mg/m ³ (approx)	
Physical Description Clear liquid with a characteristic odor.			
MW: 72 (approx)	BP: 102°F	FRZ: ?	Sol: Insoluble
VP: 38-300 mmHg	IP: ?		Sp.Gr(60°F): 0.72-0.76
Fl.P: -45°F	UEL: 7.6%	LEL: 1.4%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers such as peroxides, nitric acid & perchlorates			
Measurement Methods OSHA PV2028			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys
Cancer Site [in animals: liver & kidney cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Germanium tetrahydride			CAS 7782-65-2
GeH ₄			RTECS LY4900000
Synonyms & Trade Names Germane, Germanium hydride, Germanomethane, Monogermane [Note: Used chiefly for the production of high purity germanium for use in semiconductors.]			DOT ID & Guide 2192 119
Exposure Limits	NIOSH REL: TWA 0.2 ppm (0.6 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 3.13 mg/m ³	
Physical Description Colorless gas with a pungent odor. [Note: Shipped as a compressed gas.]			
MW: 76.6	BP: -127°F	FRZ: -267°F	Sol: Insoluble
VP: >1 atm	IP: 11.34 eV	RGasD: 2.65	
FLP: NA (Gas)	UEL: ?	LEL: ?	
Flammable Gas (may ignite SPONTANEOUSLY in air).			
Incompatibilities & Reactivities Bromine			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation			
Symptoms Malaise (vague feeling of discomfort), headache, dizziness, fainting; dyspnea (breathing difficulty); nausea, vomiting; kidney injury; hemolytic effects			
Target Organs central nervous system, kidneys, blood			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Glutaraldehyde			CAS 111-30-8
OCH(CH ₂) ₃ CHO			RTECS MA2450000
Synonyms & Trade Names Glutaric dialdehyde; 1,5-Pentanedial			DOT ID & Guide
Exposure Limits	NIOSH REL: C 0.2 ppm (0.8 mg/m ³) See Appendix C (Aldehydes)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.09 mg/m ³	
Physical Description Colorless liquid with a pungent odor.			
MW: 100.1	BP: 212°F	FRZ: 7°F	Sol: Miscible
VP: 17 mmHg	IP: ?		Sp.Gr: 1.10
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Strong oxidizers, strong bases [Note: Alkaline solutions of glutaraldehyde (i.e., activated glutaraldehyde) react with alcohol, ketones, amines, hydrazines & proteins.]			
Measurement Methods NIOSH 2532; OSHA 64			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; dermatitis, sensitization skin; cough, asthma; nausea, vomiting			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Glycerin (mist)			CAS 56-81-5
HOCH ₂ CH(OH)CH ₂ OH			RTECS MA8050000
Synonyms & Trade Names Glycerin (anhydrous); Glycerol; Glycyl alcohol; 1,2,3-Propanetriol; Trihydroxypropane			DOT ID & Guide
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Clear, colorless, odorless, syrupy liquid or solid (below 64°F). [Note: The solid form melts above 64°F but the liquid form freezes at a much lower temperature.]			
MW: 92.1	BP: 554°F (Decomposes)	MLT: 64°F	Sol: Miscible
VP(122°F): 0.003 mmHg	IP: ?		Sp.Gr: 1.26
Fl.P: 320°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers (e.g., chromium trioxide, potassium chlorate, potassium permanganate) [Note: Hygroscopic (i.e., absorbs moisture from the air).]			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; headache, nausea, vomiting; kidney injury			
Target Organs Eyes, skin, respiratory system, kidneys			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Glycidol			CAS 556-52-5
C3H6O2			RTECS UB4375000
Synonyms & Trade Names 2,3-Epoxy-1-propanol; Epoxypropyl alcohol; Glycide; Hydroxymethyl ethylene oxide; 2-Hydroxymethyl oxiran; 3-Hydroxypropylene oxide			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 25 ppm (75 mg/m³)		
	OSHA PEL†: TWA 50 ppm (150 mg/m³)		
IDLH 150 ppm		Conversion 1 ppm = 3.03 mg/m³	
Physical Description Colorless liquid.			
MW: 74.1	BP: 320°F (Decomposes)	FRZ: -49°F	Sol: Miscible
VP(77°F): 0.9 mmHg	IP: ?		Sp.Gr: 1.12
Fl.P: 162°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers, nitrates			
Measurement Methods NIOSH 1608; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 150 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; narcosis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Glycolonitrile			CAS 107-16-4
HOCH ₂ CN			RTECS AM0350000
Synonyms & Trade Names Cyanomethanol, Formaldehyde cyanohydrin, Glycolic nitrile, Glyconitrile, Hydroxyacetonitrile			DOT ID & Guide
Exposure Limits	NIOSH REL: C 2 ppm (5 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 2.34 mg/m ³	
Physical Description Colorless, odorless, oily liquid. [Note: Forms cyanide in the body.]			
MW: 57.1	BP: 361°F (Decomposes)	FRZ: <-98°F	Sol: Soluble
VP(145°F): 1 mmHg	IP: ?		Sp.Gr(66°F): 1.10
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Traces of alkalis (promote violent polymerization)			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 20 ppm: (APF = 10) Any supplied-air respirator Up to 50 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 100 ppm: (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 250 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

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

Symptoms Irritation eyes, skin, respiratory system; headache, dizziness, lassitude (weakness, exhaustion), confusion, convulsions; dyspnea (breathing difficulty); abdominal pain, nausea, vomiting

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Grain dust (oat, wheat, barley)			CAS
			RTECS MD7900000
Synonyms & Trade Names None [Note: Grain dust consists of 60-75% organic materials (cereal grains) & 25-40% inorganic materials (soil), and includes fertilizers, pesticides & microorganisms.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 4 mg/m ³		
	OSHA PEL: TWA 10 mg/m ³		
IDLH N.D.		Conversion	
Physical Description Mixture of grain and all the other substances associated with its cultivation & harvesting.			
Properties depend upon the specific component of the grain dust.			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; cough, dyspnea (breathing difficulty), wheezing, asthma, bronchitis, chronic obstructive pulmonary disease; conjunctivitis, dermatitis, rhinitis, grain fever			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Graphite (natural)			CAS 7782-42-5
C			RTECS MD9659600
Synonyms & Trade Names Black lead, Mineral carbon, Plumbago, Silver graphite, Stove black [Note: Also see specific listing for Graphite (synthetic).]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 2.5 mg/m ³ (resp)		
	OSHA PEL†: TWA 15 mppcf		
IDLH 1250 mg/m ³		Conversion	
Physical Description Steel gray to black, greasy feeling, odorless solid.			
MW: 12.0	BP: Sublimes	MLT: 6602°F (Sublimes)	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.0-2.25
Fl.P: NA	UEL: NA	LEL: NA	
Combustible Solid			
Incompatibilities & Reactivities Very strong oxidizers such as fluorine, chlorine trifluoride & potassium peroxide			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations NIOSH Up to 12.5 mg/m³ : (APF = 5) Any dust respirator Up to 25 mg/m³ : (APF = 10) Any dust respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 62.5 mg/m³ : (APF = 25) Any powered, air-purifying respirator with a dust filter/(APF = 25) Any supplied-air respirator operated in a continuous-flow mode			

<p>Up to 125 mg/m : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter/(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</p> <p>Up to 1250 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</p> <p>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</p> <p>Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus</p>
<p>Exposure Routes inhalation, skin and/or eye contact</p>
<p>Symptoms Cough, dyspnea (breathing difficulty), black sputum, decreased pulmonary function, lung fibrosis</p>
<p>Target Organs respiratory system, cardiovascular system</p>
<p>See also: INTRODUCTION</p>

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Graphite (synthetic)			CAS 7440-44-0 (synthetic)
C			RTECS FF5250100 (synthetic)
Synonyms & Trade Names Activated carbon [Note: Also see specific listing for Graphite (natural).]			DOT ID & Guide 1362 133 (activated carbon)
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D. See: IDLH INDEX		Conversion	
Physical Description Steel gray to black, greasy feeling, odorless solid.			
MW: 12.0	BP: Sublimes	MLT: 6602°F (Sublimes)	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.5-1.8
Fl.P: NA	UEL: NA	LEL: NA	
Combustible Solid			
Incompatibilities & Reactivities Very strong oxidizers such as fluorine, chlorine trifluoride & potassium peroxide			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Cough, dyspnea (breathing difficulty), black sputum, decreased pulmonary function, lung fibrosis			
Target Organs respiratory system, cardiovascular system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Gypsum			CAS 13397-24-5
CaSO ₄ • 2H ₂ O			RTECS MG2360000
Synonyms & Trade Names Calcium(II) sulfate dihydrate, Gypsum stone, Hydrated calcium sulfate, Mineral white [Note: Gypsum is the dihydrate form of calcium sulfate; Plaster of Paris is the hemihydrate form.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description White or nearly white, odorless, crystalline solid.			
MW: 172.2	BP: ?	MLT: 262-325°F (Loses H ₂ O)	Sol(77°F): 0.2%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.32
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Aluminum (at high temperatures), diazomethane			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane, upper respiratory system; cough, sneezing, rhinorrhea (discharge of thin mucus)			

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hafnium			CAS 7440-58-6
Hf			RTECS MG4600000
Synonyms & Trade Names Celtium, Elemental hafnium, Hafnium metal			DOT ID & Guide 1326 170 (powder, wet) 2545 135 (powder, dry)
Exposure Limits	NIOSH REL*: TWA 0.5 mg/m ³ [*Note: The REL also applies to other hafnium compounds (as Hf).]		
	OSHA PEL*: TWA 0.5 mg/m ³ [*Note: The PEL also applies to other hafnium compounds (as Hf).]		
IDLH 50 mg/m ³ (as Hf)		Conversion	
Physical Description Highly lustrous, ductile, grayish solid.			
MW: 178.5	BP: 8316°F	MLT: 4041°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 13.31
Fl.P: NA	UEL: NA	LEL: NA	
Explosive in powder form (either dry or with <25% water); finely divided powder can be ignited by static electricity or even SPONTANEOUSLY.			
Incompatibilities & Reactivities Strong oxidizers, chlorine			
Measurement Methods NIOSH S194 (II-5); OSHA ID121			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2.5 mg/m³ : (APF = 5) Any dust and mist respirator Up to 5 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(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 dust and mist filter*

Up to 25 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms In animals: irritation eyes, skin, mucous membrane; liver damage

Target Organs Eyes, skin, mucous membrane, liver

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Halothane			CAS 151-67-7
CF ₃ CHBrCl			RTECS KH6550000
Synonyms & Trade Names 1-Bromo-1-chloro-2,2,2-trifluoroethane; 2-Bromo-2-chloro-1,1,1-trifluoroethane; 1,1,1-Trifluoro-2-bromo-2-chloroethane; 2,2,2-Trifluoro-1-bromo-1-chloroethane			DOT ID & Guide
Exposure Limits	NIOSH REL*: C 2 ppm (16.2 mg/m ³) [60-minute] [*Note: REL for exposure to waste anesthetic gas.]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 8.07 mg/m ³	
Physical Description Clear, colorless liquid with a sweetish, pleasant odor. [inhalation anesthetic]			
MW: 197.4	BP: 122°F	FRZ: -180°F	Sol: 0.3%
VP: 243 mmHg	IP: ?		Sp.Gr: 1.87
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities May attack rubber & some plastics; sensitive to light. [Note: Light causes decomposition. May be stabilized with 0.01% thymol.]			
Measurement Methods OSHA 29			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; confusion, drowsiness, dizziness, nausea, analgesia, anesthesia; cardiac arrhythmias; liver, kidney damage; decreased audio-visual performance; in animals: reproductive effects			

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Heptachlor			CAS 76-44-8
C ₁₀ H ₅ Cl ₇			RTECS PC0700000
Synonyms & Trade Names 1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene			DOT ID & Guide 2761 151 (organochlorine pesticide, solid)
Exposure Limits	NIOSH REL: Ca TWA 0.5 mg/m ³ [skin] See Appendix A		
	OSHA PEL: TWA 0.5 mg/m ³ [skin]		
IDLH Ca [35 mg/m ³]		Conversion	
Physical Description White to light-tan crystals with a camphor-like odor. [insecticide]			
MW: 373.4	BP: 293°F (Decomposes)	MLT: 203°F	Sol: 0.0006%
VP(77°F): 0.0003 mmHg	IP: ?		Sp.Gr: 1.66
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Iron, rust			
Measurement Methods NIOSH S287 (II-5); OSHA PV2029			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms In animals: tremor, convulsions; liver damage; [potential occupational carcinogen]
Target Organs central nervous system, liver
Cancer Site [in animals: liver cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Heptane			CAS 142-82-5
CH ₃ [CH ₂] ₅ CH ₃			RTECS MI7700000
Synonyms & Trade Names Heptane, normal-Heptane			DOT ID & Guide 1206 128
Exposure Limits	NIOSH REL: TWA 85 ppm (350 mg/m ³) C 440 ppm (1800 mg/m ³) [15-minute]		
	OSHA PEL†: TWA 500 ppm (2000 mg/m ³)		
IDLH 750 ppm		Conversion 1 ppm = 4.10 mg/m ³	
Physical Description Colorless liquid with a gasoline-like odor.			
MW: 100.2	BP: 209°F	FRZ: -131°F	Sol: 0.0003%
VP(72°F): 40 mmHg	IP: 9.90 eV		Sp.Gr: 0.68
Fl.P: 25°F	UEL: 6.7%	LEL: 1.05%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1500; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 750 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Dizziness, stupor, incoordination; loss of appetite, nausea; dermatitis; chemical pneumonitis (aspiration liquid); unconsciousness
Target Organs Skin, respiratory system, central nervous system
See also: INTRODUCTION See ICSC CARD: 0657

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1-Heptanethiol			CAS 1639-09-4
CH ₃ [CH ₂] ₆ SH			RTECS MJ1400000
Synonyms & Trade Names Heptyl mercaptan, n-Heptyl mercaptan			DOT ID & Guide 1228 131
Exposure Limits	NIOSH REL: C 0.5 ppm (2.7 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 5.41 mg/m ³	
Physical Description Colorless liquid with a strong odor.			
MW: 132.3	BP: 351°F	FRZ: -46°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: 0.84
Fl.P: 115°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Oxidizers, reducing agents, strong acids & bases, alkali metals			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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
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

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

Symptoms Irritation eyes, skin, nose, throat; lassitude (weakness, exhaustion), cyanosis, increased respiration, nausea, drowsiness, headache, vomiting

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hexachlorobutadiene		CAS 87-68-3	
$\text{Cl}_2\text{C}=\text{CClCCl}=\text{CCl}_2$		RTECS EJ0700000	
Synonyms & Trade Names HCBD; Hexachloro-1,3-butadiene; 1,3-Hexachlorobutadiene; Perchlorobutadiene		DOT ID & Guide 2279 151	
Exposure Limits	NIOSH REL: Ca TWA 0.02 ppm (0.24 mg/m ³) [skin] See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion 1 ppm = 10.66 mg/m ³	
Physical Description Clear, colorless liquid with a mild, turpentine-like odor.			
MW: 260.7	BP: 419°F	FRZ: -6°F	Sol: Insoluble
VP: 0.2 mmHg	IP: ?		Sp.Gr: 1.55
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods NIOSH 2543			
Personal Protection & Sanitation 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) 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			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms In animals: irritation eyes, skin, respiratory system; kidney damage; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, kidneys
Cancer Site [in animals: kidney tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hexachlorocyclopentadiene			CAS 77-47-4
C ₅ Cl ₆			RTECS GY1225000
Synonyms & Trade Names HCCPD; Hexachloro-1,3-cyclopentadiene; 1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene; Perchlorocyclopentadiene			DOT ID & Guide 2646 151
Exposure Limits	NIOSH REL: TWA 0.01 ppm (0.1 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 11.16 mg/m ³	
Physical Description Pale-yellow to amber-colored liquid with a pungent, unpleasant odor. [Note: A solid below 16°F.]			
MW: 272.8	BP: 462°F	FRZ: 16°F	Sol(77°F): 0.0002% (Reacts)
VP(77°F): 0.08 mmHg	IP: ?		Sp.Gr: 1.71
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Water, light [Note: Reacts slowly with water to form hydrochloric acid; will corrode iron & most metals in presence of moisture. Explosive hydrogen gas may collect in enclosed spaces in the presence of moisture.]			
Measurement Methods NIOSH 2518			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; eye, skin burns; lacrimation (discharge of tears); sneezing, cough, dyspnea (breathing difficulty), salivation, pulmonary edema; nausea, vomiting, diarrhea; in animals: liver,			

kidney injury
Target Organs Eyes, skin, respiratory system, liver, kidneys
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hexachloroethane			CAS 67-72-1
Cl ₃ CCCl ₃			RTECS KI4025000
Synonyms & Trade Names Carbon hexachloride, Ethane hexachloride, Perchloroethane			DOT ID & Guide 9037 151
Exposure Limits	NIOSH REL: Ca TWA 1 ppm (10 mg/m ³) [skin] See Appendix A See Appendix C (Chloroethanes)		
	OSHA PEL: TWA 1 ppm (10 mg/m ³) [skin]		
IDLH Ca [300 ppm]		Conversion 1 ppm = 9.68 mg/m ³	
Physical Description Colorless crystals with a camphor-like odor.			
MW: 236.7	BP: Sublimes	MLT: 368°F (Sublimes)	Sol(72°F): 0.005%
VP: 0.2 mmHg	IP: 11.22 eV		Sp.Gr: 2.09
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Alkalis; metals such as zinc, cadmium, aluminum, hot iron & mercury			
Measurement Methods NIOSH 1003; OSHA 7			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, mucous membrane; in animals: kidney damage; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, kidneys
Cancer Site [in animals: liver cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hexachloronaphthalene			CAS 1335-87-1
C ₁₀ H ₂ Cl ₆			RTECS QJ7350000
Synonyms & Trade Names Halowax® 1014			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.2 mg/m ³ [skin]		
	OSHA PEL: TWA 0.2 mg/m ³ [skin]		
IDLH 2 mg/m ³		Conversion	
Physical Description White to light-yellow solid with an aromatic odor.			
MW: 334.9	BP: 650-730°F	MLT: 279°F	Sol: Insoluble
VP: <1 mmHg	IP: ?		Sp.Gr: 1.78
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH S100 (II-2)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2 mg/m³ : (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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Acne-form dermatitis, nausea, confusion, jaundice, coma
Target Organs Skin, liver
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1-Hexadecanethiol			CAS 2917-26-2
CH ₃ [CH ₂] ₁₅ SH			RTECS
Synonyms & Trade Names Cetyl mercaptan, Hexadecanethiol-1, n-Hexadecanethiol, Hexadecyl mercaptan			DOT ID & Guide 1228 131 (liquid)
Exposure Limits	NIOSH REL: C 0.5 ppm (5.3 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 10.59 mg/m ³	
Physical Description Colorless liquid or solid (below 64-68°F) with a strong odor.			
MW: 258.5	BP: ?	FRZ: 64-68°F	Sol: Insoluble
VP: 0.1 mmHg	IP: ?		Sp.Gr: 0.85
Fl.P: 215°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Oxidizers, strong acids & bases, alkali metals, reducing agents			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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
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

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

Symptoms Irritation eyes, skin, respiratory system; headache, dizziness, lassitude (weakness, exhaustion), cyanosis, nausea, convulsions

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hexafluoroacetone			CAS 684-16-2
(CF ₃) ₂ CO			RTECS UC2450000
Synonyms & Trade Names Hexafluoro-2-propanone; 1,1,1,3,3,3-Hexafluoro-2-propanone; HFA; Perfluoroacetone			DOT ID & Guide 2420 125
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.7 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 6.79 mg/m ³	
Physical Description Colorless gas with a musty odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 166.0	BP: -18°F	FRZ: -188°F	Sol: Reacts
VP: 5.8 atm	IP: 11.81 eV	RGasD: 5.76	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas, but highly reactive with water & other substances, releasing heat.			
Incompatibilities & Reactivities Water, acids [Note: Hygroscopic (i.e., absorbs moisture from the air); reacts with moisture to form a highly acidic sesquihydrate.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact/Frostbite Eyes: Prevent eye contact/Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane, respiratory system; pulmonary edema; liquid: frostbite; in animals: teratogenic, reproductive effects; kidney injury			
Target Organs Eyes, skin, respiratory system, kidneys, reproductive system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hexamethylene diisocyanate			CAS 822-06-0
OCN[CH ₂] ₆ NCO			RTECS MO1740000
Synonyms & Trade Names 1,6-Diisocyanatohexane; HDI; Hexamethylene-1,6-diisocyanate; 1,6-Hexamethylene diisocyanate; HMDI			DOT ID & Guide 2281 156
Exposure Limits	NIOSH REL: TWA 0.005 ppm (0.035 mg/m ³) C 0.020 ppm (0.140 mg/m ³) [10-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 6.88 mg/m ³	
Physical Description Clear, colorless to slightly yellow liquid with a sharp, pungent odor.			
MW: 168.2	BP: 415°F	FRZ: -89°F	Sol: Low (Reacts)
VP(77°F): 0.5 mmHg	IP:?		Sp.Gr(77°F): 1.04
Fl.P: 284°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Water, alcohols, strong bases, amines, carboxylic acids, organotin catalysts [Note: Reacts slowly with water to form carbon dioxide. Avoid heating above 392°F (polymerizes).]			
Measurement Methods NIOSH 5521, 5522; OSHA 42			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 0.05 ppm: (APF = 10) Any supplied-air respirator* Up to 0.125 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 0.25 ppm: (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 1 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

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

Symptoms Irritation eyes, skin, respiratory system; cough, dyspnea (breathing difficulty), bronchitis, wheezing, pulmonary edema, asthma; corneal damage, skin blisters

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hexamethyl phosphoramide			CAS 680-31-9
[(CH3)2N]3PO			RTECS TD0875000
Synonyms & Trade Names Hexamethylphosphoric triamide, Hexamethylphosphorotriamide, HMPA, Tris(dimethylamino)phosphine oxide			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Clear, colorless liquid with an aromatic or mild, amine-like odor. [Note: A solid below 43°F.]			
MW: 179.2	BP: 451°F	FRZ: 43°F	Sol: Miscible
VP: 0.03 mmHg	IP: ?		Sp.Gr: 1.03
Fl.P: 220°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Oxidizers, strong acids, chemically-active metals (e.g., potassium, sodium, magnesium, zinc)			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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 (gas mask) with a chin-style, front- or back-			

mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; dyspnea (breathing difficulty); abdominal pain; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system, gastrointestinal tract
Cancer Site [in animals: cancer of the nasal cavity]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Hexane			CAS 110-54-3
CH ₃ [CH ₂] ₄ CH ₃			RTECS MN9275000
Synonyms & Trade Names Hexane, Hexyl hydride, normal-Hexane			DOT ID & Guide 1208 128
Exposure Limits	NIOSH REL: TWA 50 ppm (180 mg/m ³)		
	OSHA PEL†: TWA 500 ppm (1800 mg/m ³)		
IDLH 1100 ppm [10%LEL]		Conversion 1 ppm = 3.53 mg/m ³	
Physical Description Colorless liquid with a gasoline-like odor.			
MW: 86.2	BP: 156°F	FRZ: -219°F	Sol: 0.002%
VP: 124 mmHg	IP: 10.18 eV		Sp.Gr: 0.66
Fl.P: -7°F	UEL: 7.5%	LEL: 1.1%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1500, 3800; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 500 ppm : (APF = 10) Any supplied-air respirator* Up to 1100 ppm : (APF = 25) Any supplied-air respirator 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 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose; nausea, headache; peripheral neuropathy: numb extremities, muscle weakness; dermatitis; dizziness; chemical pneumonitis (aspiration liquid)
Target Organs Eyes, skin, respiratory system, central nervous system, peripheral nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hexane isomers (excluding n-Hexane)			CAS
C ₆ H ₁₄			RTECS
Synonyms & Trade Names Diethylmethylethane; Diisopropyl; 2,2-Dimethylbutane; 2,3-Dimethylbutane; Isohexane; 2-Methylpentane; 3-Methylpentane [Note: Also see specific listing for n-Hexane.]			DOT ID & Guide 1208 128
Exposure Limits	NIOSH REL: TWA 100 ppm (350 mg/m ³) C 510 ppm (1800 mg/m ³) [15-minute]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 3.53 mg/m ³	
Physical Description Clear liquids with mild, gasoline-like odors. [Note: Includes all the isomers of hexane except n-hexane.]			
MW: 86.2	BP: 122-145°F	FRZ: -245 to -148°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: 0.65-0.66
Fl.P: -54 to 19°F	UEL: ?	LEL: ?	
Class IB Flammable Liquids			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH 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 5000 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			

[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

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

Symptoms Irritation eyes, skin, respiratory system; headache, dizziness; nausea; chemical pneumonitis (aspiration liquid); dermatitis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Hexanethiol			CAS 111-31-9
CH ₃ [CH ₂] ₅ SH			RTECS MO4550000
Synonyms & Trade Names 1-Hexanethiol, Hexyl mercaptan, n-Hexyl mercaptan, n-Hexylthiol			DOT ID & Guide 1228 131
Exposure Limits	NIOSH REL: C 0.5 ppm (2.7 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 4.83 mg/m ³	
Physical Description Colorless liquid with an unpleasant odor.			
MW: 118.2	BP: 304°F	FRZ: -113°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: 0.84
Fl.P: 68°F	UEL: ?	LEL: ?	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Oxidizers, reducing agents, strong acids & bases, alkali metals			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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
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

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

Symptoms Irritation eyes, skin, nose, throat; lassitude (weakness, exhaustion), cyanosis, increased respiration, nausea, drowsiness, headache, vomiting

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Hexanone			CAS 591-78-6
CH3CO[CH2]3CH3			RTECS MP1400000
Synonyms & Trade Names Butyl methyl ketone, MBK, Methyl butyl ketone, Methyl n-butyl ketone			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 ppm (4 mg/m³)		
	OSHA PEL†: TWA 100 ppm (410 mg/m³)		
IDLH 1600 ppm		Conversion 1 ppm = 4.10 mg/m³	
Physical Description Colorless liquid with an acetone-like odor.			
MW: 100.2	BP: 262°F	FRZ: -71°F	Sol: 2%
VP: 11 mmHg	IP: 9.34 eV		Sp.Gr: 0.81
Fl.P: 77°F	UEL: 8%	LEL: ?	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1300; OSHA PV2031			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) 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
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
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hexone			CAS 108-10-1
CH₃COCH₂CH(CH₃)₂			RTECS SA9275000
Synonyms & Trade Names Isobutyl methyl ketone, Methyl isobutyl ketone, 4-Methyl 2-pentanone, MIBK			DOT ID & Guide 1245 127
Exposure Limits	NIOSH REL: TWA 50 ppm (205 mg/m ³) ST 75 ppm (300 mg/m ³)		
	OSHA PEL†: TWA 100 ppm (410 mg/m ³)		
IDLH 500 ppm		Conversion 1 ppm = 4.10 mg/m ³	
Physical Description Colorless liquid with a pleasant odor.			
MW: 100.2	BP: 242°F	FRZ: -120°F	Sol: 2%
VP: 16 mmHg	IP: 9.30 eV		Sp.Gr: 0.80
Fl.P: 64°F	UEL(200°F): 8.0%	LEL(200°F): 1.2%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, potassium tert-butoxide			
Measurement Methods NIOSH 1300; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly 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 = 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 = 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

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

Symptoms Irritation eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

sec-Hexyl acetate			CAS 108-84-9
C ₈ H ₁₆ O ₂			RTECS SA7525000
Synonyms & Trade Names 1,3-Dimethylbutyl acetate; Methylisoamyl acetate			DOT ID & Guide 1233 129
Exposure Limits	NIOSH REL: TWA 50 ppm (300 mg/m ³)		
	OSHA PEL: TWA 50 ppm (300 mg/m ³)		
IDLH 500 ppm		Conversion 1 ppm = 5.90 mg/m ³	
Physical Description Colorless liquid with a mild, pleasant, fruity odor.			
MW: 144.2	BP: 297°F	FRZ: -83°F	Sol: 0.08%
VP: 3 mmHg	IP: ?		Sp.Gr: 0.86
Fl.P: 113°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1450; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) 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 = 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; headache; in animals: narcosis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hexylene glycol			CAS 107-41-5
(CH ₃) ₂ COHCH ₂ CHOHCH ₃			RTECS SA0810000
Synonyms & Trade Names 2,4-Dihydroxy-2-methylpentane; 2-Methyl-2,4-pentanediol; 4-Methyl-2,4-pentanediol; 2-Methylpentane-2,4-diol			DOT ID & Guide
Exposure Limits	NIOSH REL: C 25 ppm (125 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.83 mg/m ³	
Physical Description Colorless liquid with a mild, sweetish odor.			
MW: 118.2	BP: 388°F	FRZ: -58°F (Sets to glass)	Sol: Miscible
VP: 0.05 mmHg	IP: ?		Sp.Gr: 0.92
Fl.P: 209°F	UEL(est): 7.4%	LEL(calc): 1.3%	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids [Note: Hygroscopic (i.e., absorbs moisture from the air).]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; headache, dizziness, nausea, incoordination, central nervous system depression; dermatitis, skin sensitization			
Target Organs Eyes, skin, respiratory system, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hydrazine			CAS 302-01-2
H ₂ NNH ₂			RTECS MU7175000
Synonyms & Trade Names Diamine, Hydrazine (anhydrous), Hydrazine base			DOT ID & Guide 2029 132 (anhydrous) 3293 152 (</=37% solution) 2030 153 (37-64% solution) 2029 132 (>64% solution)
Exposure Limits	NIOSH REL: Ca C 0.03 ppm (0.04 mg/m ³) [2-hour] See Appendix A		
	OSHA PEL†: TWA 1 ppm (1.3 mg/m ³) [skin]		
IDLH Ca [50 ppm]		Conversion 1 ppm = 1.31 mg/m ³	
Physical Description Colorless, fuming, oily liquid with an ammonia-like odor. [Note: A solid below 36°F.]			
MW: 32.1	BP: 236°F	FRZ: 36°F	Sol: Miscible
VP: 10 mmHg	IP: 8.93 eV		Sp.Gr: 1.01
Fl.P: 99°F	UEL: 98%	LEL: 2.9%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Oxidizers, hydrogen peroxide, nitric acid, metallic oxides, acids [Note: Can ignite SPONTANEOUSLY on contact with oxidizers or porous materials such as earth, wood & cloth.]			
Measurement Methods NIOSH 3503; OSHA 20, 108			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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: Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; temporary blindness; dizziness, nausea; dermatitis; eye, skin burns; in animals: bronchitis, pulmonary edema; liver, kidney damage; convulsions; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys
Cancer Site [in animals: tumors of the lungs, liver, blood vessels & intestine]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hydrogenated terphenyls			CAS 61788-32-7
(C ₆ H _n) ₃			RTECS WZ6535000
Synonyms & Trade Names Hydrogenated diphenylbenzenes, Hydrogenated phenylbiphenyls, Hydrogenated triphenyls [Note: Complex mixture of terphenyl isomers that are partially hydrogenated.]			DOT ID & Guide
Exposure Limits			
NIOSH REL: TWA 0.5 ppm (5 mg/m ³)		OSHA PEL†: none	
IDLH N.D.		Conversion 1 ppm = 12.19 mg/m ³ (40% hydrogenated)	
Physical Description Clear, oily, pale-yellow liquids with a faint odor. [plasticizer/heat-transfer media]			
MW: 298 (40% hydrogenated)	BP: 644°F (40% hydrogenated)	FRZ: ?	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr(77°F): 1.003-1.009 (40% hydrogenated)
Fl.P: 315°F (40% hydrogenated)	UEL: ?	LEL: ?	
Class IIIB Combustible Liquids			
Incompatibilities & Reactivities None reported [Note: When heated, irritating vapors will be released.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			

Symptoms	Irritation eyes, skin, respiratory system; liver, kidney, hematopoietic damage
Target Organs	Eyes, skin, respiratory system, liver, kidneys, hematopoietic system
See also: INTRODUCTION	

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hydrogen bromide			CAS 10035-10-6
HBr			RTECS MW3850000
Synonyms & Trade Names Anhydrous hydrogen bromide; Aqueous hydrogen bromide (i.e., Hydrobromic acid)			DOT ID & Guide 1048 125 (anhydrous) 1788 154 (solution)
Exposure Limits	NIOSH REL: C 3 ppm (10 mg/m³)		
	OSHA PEL†: TWA 3 ppm (10 mg/m³)		
IDLH 30 ppm		Conversion 1 ppm = 3.31 mg/m³	
Physical Description Colorless gas with a sharp, irritating odor. [Note: Shipped as a liquefied compressed gas. Often used in an aqueous solution.]			
MW: 80.9	BP: -88°F	FRZ: -124°F	Sol: 49%
VP: 20 atm	IP: 11.62 eV	RGasD: 2.81	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Strong oxidizers, strong caustics, moisture, copper, brass, zinc [Note: Hydrobromic acid is highly corrosive to most metals.]			
Measurement Methods NIOSH 7903; OSHA ID165SG			
Personal Protection & Sanitation Skin: Prevent skin contact (solution)/Frostbite Eyes: Prevent eye contact (solution)/Frostbite Wash skin: When contaminated (solution) Remove: When wet or contaminated (solution) Change: No recommendation Provide: Eyewash (liquid), Quick drench (solution), Frostbite		First Aid (See procedures) Eye: Irrigate immediately (solution)/Frostbite Skin: Water flush immediately (solution)/Frostbite Breathing: Respiratory support Swallow: Medical attention immediately (solution)	
Respirator Recommendations NIOSH/OSHA Up to 30 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [‡] /(APF = 25) Any powered, air-purifying respirator with acid gas cartridge(s) [‡] /(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas 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 acid gas canister/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion (solution), skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; solution: eye, skin burns; liquid: frostbite
Target Organs Eyes, skin, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hydrogen chloride			CAS 7647-01-0
HCl			RTECS MW4025000
Synonyms & Trade Names Anhydrous hydrogen chloride; Aqueous hydrogen chloride (i.e., Hydrochloric acid, Muriatic acid) [Note: Often used in an aqueous solution.]			DOT ID & Guide 1050 125 (anhydrous) 1789 157 (solution)
Exposure Limits	NIOSH REL: C 5 ppm (7 mg/m ³)		
	OSHA PEL: C 5 ppm (7 mg/m ³)		
IDLH 50 ppm		Conversion 1 ppm = 1.49 mg/m ³	
Physical Description Colorless to slightly yellow gas with a pungent, irritating odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 36.5	BP: -121°F	FRZ: -174°F	Sol(86°F): 67%
VP: 40.5 atm	IP: 12.74 eV	RGasD: 1.27	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Hydroxides, amines, alkalis, copper, brass, zinc [Note: Hydrochloric acid is highly corrosive to most metals.]			
Measurement Methods NIOSH 7903; OSHA ID174SG			
Personal Protection & Sanitation Skin: Prevent skin contact (solution)/Frostbite Eyes: Prevent eye contact/Frostbite Wash skin: When contaminated (solution) Remove: When wet or contaminated (solution) Change: No recommendation Provide: Eyewash (solution), Quick drench (solution), Frostbite		First Aid (See procedures) Eye: Irrigate immediately (solution)/Frostbite Skin: Water flush immediately (solution)/Frostbite Breathing: Respiratory support Swallow: Medical attention immediately (solution)	
Respirator Recommendations NIOSH/OSHA Up to 50 ppm: (APF = 10) Any chemical cartridge respirator with 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 = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern*/(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 acid gas canister/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation nose, throat, larynx; cough, choking; dermatitis; solution: eye, skin burns; liquid: frostbite; in animals: laryngeal spasm; pulmonary edema

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hydrogen cyanide			CAS 74-90-8
HCN			RTECS MW6825000
Synonyms & Trade Names Formonitrile, Hydrocyanic acid, Prussic acid			DOT ID & Guide 1051 117 (>20% solution) 1051 117 (anhydrous) 1613 154 (</=20% solution)
Exposure Limits	NIOSH REL: ST 4.7 ppm (5 mg/m³) [skin]		
	OSHA PEL†: TWA 10 ppm (11 mg/m³) [skin]		
IDLH 50 ppm		Conversion 1 ppm = 1.10 mg/m³	
Physical Description Colorless or pale-blue liquid or gas (above 78°F) with a bitter, almond-like odor. [Note: Often used as a 96% solution in water.]			
MW: 27.0	BP: 78°F (96%)	FRZ: 7°F (96%)	Sol: Miscible
VP: 630 mmHg	IP: 13.60 eV		Sp.Gr: 0.69
FLP: 0°F (96%)	UEL: 40.0%	LEL: 5.6%	
Class IA Flammable Liquid Flammable Gas			
Incompatibilities & Reactivities Amines, oxidizers, acids, sodium hydroxide, calcium hydroxide, sodium carbonate, caustics, ammonia [Note: Can polymerize at 122-140°F.]			
Measurement Methods NIOSH 6010			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 47 ppm: (APF = 10) Any supplied-air respirator Up to 50 ppm: (APF = 25) Any supplied-air respirator 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			

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

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

Symptoms Asphyxia; lassitude (weakness, exhaustion), headache, confusion; nausea, vomiting; increased rate and depth of respiration or respiration slow and gasping; thyroid, blood changes

Target Organs central nervous system, cardiovascular system, thyroid, blood

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hydrogen fluoride		CAS 7664-39-3	
HF		RTECS MW7875000	
Synonyms & Trade Names Anhydrous hydrogen fluoride; Aqueous hydrogen fluoride (i.e., Hydrofluoric acid); HF-A		DOT ID & Guide 1052 125 (anhydrous) 1790 157 (solution)	
Exposure Limits	NIOSH REL: TWA 3 ppm (2.5 mg/m ³) C 6 ppm (5 mg/m ³) [15-minute]		
	OSHA PEL†: TWA 3 ppm		
IDLH 30 ppm		Conversion 1 ppm = 0.82 mg/m ³	
Physical Description Colorless gas or fuming liquid (below 67°F) with a strong, irritating odor. [Note: Shipped in cylinders.]			
MW: 20.0	BP: 67°F	FRZ: -118°F	Sol: Miscible
VP: 783 mmHg	IP: 15.98 eV	RGasD: 1.86	Sp.Gr: 1.00 (Liquid at 67°F)
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Metals, water or steam [Note: Corrosive to metals. Will attack glass and concrete.]			
Measurement Methods NIOSH 7902, 7903, 7906; OSHA ID110			
Personal Protection & Sanitation Skin: Prevent skin contact (liquid) Eyes: Prevent eye contact (liquid) Wash skin: When contaminated (liquid) Remove: When wet or contaminated (liquid) Change: No recommendation Provide: Eyewash (liquid), Quick drench (liquid)		First Aid (See procedures) Eye: Irrigate immediately (solution/liquid) Skin: Water flush immediately (solution/liquid) Breathing: Respiratory support Swallow: Medical attention immediately (solution)	
Respirator Recommendations NIOSH/OSHA Up to 30 ppm: (APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern*/(APF = 25) Any powered, air-purifying respirator with 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 = 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption (liquid), ingestion (solution), skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; pulmonary edema; eye, skin burns; rhinitis; bronchitis; bone changes
Target Organs Eyes, skin, respiratory system, bones
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hydrogen peroxide			CAS 7722-84-1
H ₂ O ₂			RTECS MX0900000
Synonyms & Trade Names High-strength hydrogen peroxide, Hydrogen dioxide, Hydrogen peroxide (aqueous), Hydroperoxide, Peroxide			DOT ID & Guide 2984 140 (8-20% solution) 2014 140 (20-60% solution) 2015 143 (>60% solution)
Exposure Limits	NIOSH REL: TWA 1 ppm (1.4 mg/m ³)		
	OSHA PEL: TWA 1 ppm (1.4 mg/m ³)		
IDLH 75 ppm		Conversion 1 ppm = 1.39 mg/m ³	
Physical Description Colorless liquid with a slightly sharp odor. [Note: The pure compound is a crystalline solid below 12°F. Often used in an aqueous solution.]			
MW: 34.0	BP: 286°F	FRZ: 12°F	Sol: Miscible
VP(86°F): 5 mmHg	IP: 10.54 eV		Sp.Gr: 1.39
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but a powerful oxidizer.			
Incompatibilities & Reactivities Oxidizable materials, iron, copper, brass, bronze, chromium, zinc, lead, silver, manganese. [Note: Contact with combustible material may result in SPONTANEOUS combustion.]			
Measurement Methods OSHA ID126SG			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA 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 self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-			

air respirator with a full facepiece
Up to 75 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, nose, throat; corneal ulcer; erythema (skin redness), skin vesiculation; bleaching hair

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hydrogen selenide			CAS 7783-07-5
H ₂ Se			RTECS MX1050000
Synonyms & Trade Names Selenium dihydride, Selenium hydride			DOT ID & Guide 2202 117 (anhydrous)
Exposure Limits	NIOSH REL: TWA 0.05 ppm (0.2 mg/m ³)		
	OSHA PEL: TWA 0.05 ppm (0.2 mg/m ³)		
IDLH 1 ppm		Conversion 1 ppm = 3.31 mg/m ³	
Physical Description Colorless gas with an odor resembling decayed horse radish. [Note: Shipped as a liquefied compressed gas.]			
MW: 81.0	BP: -42°F	FRZ: -87°F	Sol(73°F): 0.9%
VP(70°F): 9.5 atm	IP: 9.88 eV	RGasD: 2.80	
Fl.P: NA (Gas)	UEL: ?	LEL: ?	
Flammable Gas			
Incompatibilities & Reactivities Strong oxidizers, acids, water, halogenated hydrocarbons			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 0.5 ppm: (APF = 10) Any supplied-air respirator Up to 1 ppm: (APF = 25) Any supplied-air respirator 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 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 ⁱ /Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact
Symptoms Irritation eyes, nose, throat; nausea, vomiting, diarrhea; metallic taste, garlic breath; dizziness, lassitude (weakness, exhaustion); liquid: frostbite; in animals: pneumonitis; liver damage
Target Organs Eyes, respiratory system, liver
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hydrogen sulfide			CAS 7783-06-4
H ₂ S			RTECS MX1225000
Synonyms & Trade Names Hydrosulfuric acid, Sewer gas, Sulfuretted hydrogen			DOT ID & Guide 1053 117
Exposure Limits	NIOSH REL: C 10 ppm (15 mg/m ³) [10-minute]		
	OSHA PEL†: C 20 ppm 50 ppm [10-minute maximum peak]		
IDLH 100 ppm		Conversion 1 ppm = 1.40 mg/m ³	
Physical Description Colorless gas with a strong odor of rotten eggs. [Note: Sense of smell becomes rapidly fatigued & can NOT be relied upon to warn of the continuous presence of H ₂ S. Shipped as a liquefied compressed gas.]			
MW: 34.1	BP: -77°F	FRZ: -122°F	Sol: 0.4%
VP: 17.6 atm	IP: 10.46 eV	RGasD: 1.19	
Fl.P: NA (Gas)	UEL: 44.0%	LEL: 4.0%	
Flammable Gas			
Incompatibilities & Reactivities Strong oxidizers, strong nitric acid, metals			
Measurement Methods NIOSH 6013; OSHA ID141			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH Up to 100 ppm : (APF = 25) Any powered, air-purifying respirator with 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 = 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact
Symptoms Irritation eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation; dizziness, headache, lassitude (weakness, exhaustion), irritability, insomnia; gastrointestinal disturbance; liquid: frostbite
Target Organs Eyes, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Hydroquinone			CAS 123-31-9
C ₆ H ₄ (OH) ₂			RTECS MX3500000
Synonyms & Trade Names p-Benzenediol; 1,4-Benzenediol; Dihydroxybenzene; 1,4-Dihydroxybenzene; Quinol			DOT ID & Guide 2662 153
Exposure Limits	NIOSH REL: C 2 mg/m ³ [15-minute]		
	OSHA PEL: TWA 2 mg/m ³		
IDLH 50 mg/m ³		Conversion	
Physical Description Light-tan, light-gray, or colorless crystals.			
MW: 110.1	BP: 545°F	MLT: 338°F	Sol: 7%
VP: 0.00001 mmHg	IP: 7.95 eV		Sp.Gr: 1.33
Fl.P: 329°F (Molten)	UEL: ?	LEL: ?	
Combustible Solid; dust cloud may explode if ignited in an enclosed area.			
Incompatibilities & Reactivities Strong oxidizers, alkalis			
Measurement Methods NIOSH 5004			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash (>7%)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m ³ : (APF = 25) Any powered, air-purifying respirator with a dust filter [£] /(APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes: conjunctivitis; keratitis (inflammation of the cornea); central nervous system excitement; colored urine, nausea, dizziness, suffocation, rapid breathing; muscle twitching, delirium; collapse; skin irritation, sensitization, dermatitis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Hydroxypropyl acrylate			CAS 999-61-1
CH ₂ =CHCOOCH ₂ CHOHCH ₃			RTECS AT1925000
Synonyms & Trade Names HPA, beta-Hydroxypropyl acrylate, Propylene glycol monoacrylate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.5 ppm (3 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 5.33 mg/m ³	
Physical Description Clear to light-yellow liquid wiith a sweetish, solvent odor.			
MW: 130.2	BP: 376°F	FRZ: ?	Sol: ?
VP: ?	IP: ?		Sp.Gr: 1.05
Fl.P: 149°F	UEL: ?	LEL: 1.8%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Water [Note: Can become unstable at high temperatures & pressures or may react with water with some release of energy, but not violently.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; eye, skin burns; cough, dyspnea (breathing difficulty)			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Indene			CAS 95-13-6
C ₉ H ₈			RTECS NK8225000
Synonyms & Trade Names Indonaphthene			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 ppm (45 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.75 mg/m ³	
Physical Description Colorless liquid. [Note: A solid below 29°F.]			
MW: 116.2	BP: 359°F	FRZ: 29°F	Sol: Insoluble
VP: ?	IP: 8.81 eV		Sp.Gr: 0.997
Fl.P: 173°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities None reported [Note: Polymerizes & oxidizes on standing. It has exploded during nitration with (H ₂ SO ₄ + HNO ₃).]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms In animals: irritation eyes, skin, mucous membrane; dermatitis, skin sensitization; chemical pneumonitis (aspiration liquid); liver, kidney, spleen injury			
Target Organs Eyes, skin, respiratory system, liver, kidneys, spleen			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Indium			CAS 7440-74-6
In			RTECS NL1050000
Synonyms & Trade Names Indium metal			DOT ID & Guide
Exposure Limits	NIOSH REL*: TWA 0.1 mg/m ³ [*Note: The REL also applies to other indium compounds (as In).]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Ductile, shiny, silver-white metal that is softer than lead.			
MW: 114.8	BP: 3767°F	MLT: 314°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 7.31
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form, but may ignite in powdered or dust form.			
Incompatibilities & Reactivities (Dinitrogen tetraoxide + acetonitrile), mercury(II) bromide (at 662°F), sulfur (mixtures ignite when heated) [Note: oxidizes readily at higher temperatures.]			
Measurement Methods NIOSH P&CAM173 (II-5); OSHA ID121			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; possible liver, kidney, heart, blood effects; pulmonary edema			
Target Organs Eyes, skin, respiratory system, liver, kidneys, heart, blood			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Iodine			CAS 7553-56-2
I₂			RTECS NN1575000
Synonyms & Trade Names Iodine crystals, Molecular iodine			DOT ID & Guide
Exposure Limits	NIOSH REL: C 0.1 ppm (1 mg/m ³)		
	OSHA PEL: C 0.1 ppm (1 mg/m ³)		
IDLH 2 ppm		Conversion 1 ppm = 10.38 mg/m ³	
Physical Description Violet solid with a sharp, characteristic odor.			
MW: 253.8	BP: 365°F	MLT: 236°F	Sol: 0.01%
VP(77°F): 0.3 mmHg	IP: 9.31 eV		Sp.Gr: 4.93
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Ammonia, acetylene, acetaldehyde, powdered aluminum, active metals, liquid chlorine			
Measurement Methods NIOSH 6005; OSHA ID212			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash (>7%), Quick drench (>7%)		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1 ppm: (APF = 10) Any supplied-air respirator* Up to 2 ppm: (APF = 25) Any supplied-air respirator 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 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 acid gas canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose; lacrimation (discharge of tears); headache; chest tightness; skin burns, rash; cutaneous hypersensitivity
Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Iodoform			CAS 75-47-8
CHI ₃			RTECS PB7000000
Synonyms & Trade Names Triiodomethane			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.6 ppm (10 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 16.10 mg/m ³	
Physical Description Yellow to greenish-yellow powder or crystalline solid with a pungent, disagreeable odor. [antiseptic for external use]			
MW: 393.7	BP: 410°F (Decomposes)	MLT: 246°F	Sol: 0.01%
VP: ?	IP: ?		Sp.Gr: 4.01
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers, lithium, metallic salts (e.g., mercuric oxide, silver nitrate), strong bases, calomel, tannin			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; lassitude (weakness, exhaustion), dizziness, nausea, incoordination, central nervous system depression; dyspnea (breathing difficulty); liver, kidney, heart damage; visual disturbance			
Target Organs Eyes, skin, respiratory system, liver, kidneys, heart			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Iron oxide dust and fume (as Fe)			CAS 1309-37-1
Fe ₂ O ₃			RTECS NO7400000 NO7525000 (fume)
Synonyms & Trade Names Ferric oxide, Iron(III) oxide			DOT ID & Guide 1376 135 (spent)
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL: TWA 10 mg/m ³		
IDLH 2500 mg/m ³ (as Fe)		Conversion	
Physical Description Reddish-brown solid. [Note: Exposure to fume may occur during the arc-welding of iron.]			
MW: 159.7	BP: ?	MLT: 2664°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 5.24
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Calcium hypochlorite			
Measurement Methods NIOSH 7300; OSHA ID121, ID125G			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations NIOSH Up to 50 mg/m³ : (APF = 10) Any dust, mist, and fume respirator/(APF = 10) Any supplied-air respirator Up to 125 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust, mist, and fume filter Up to 250 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 2500 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation

Symptoms Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis)

Target Organs respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Iron pentacarbonyl (as Fe)			CAS 13463-40-6
Fe(CO) ₅			RTECS NO4900000
Synonyms & Trade Names Iron carbonyl, Pentacarbonyl iron			DOT ID & Guide 1994 131
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.23 mg/m ³) ST 0.2 ppm (0.45 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 2.28 mg/m ³ (as Fe)	
Physical Description Colorless to yellow to dark-red, oily liquid.			
MW: 195.9	BP(749 mmHg): 217°F	FRZ: -6°F	Sol: Insoluble
VP(87°F): 40 mmHg	IP: ?		Sp.Gr: 1.46-1.52
Fl.P: 5°F	UEL: ?	LEL: ?	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Oxidizers, nitrogen oxide, (zinc + cobalt halides) [Note: Pyrophoric (i.e., ignites spontaneously in air). Decomposed by light or air, releasing carbon monoxide.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, mucous membrane, respiratory system; headache, dizziness, nausea, vomiting; fever, cyanosis, cough, dyspnea (breathing difficulty); liver, kidney, lung injury; degenerative changes in central nervous system			
Target Organs Eyes, respiratory system, central nervous system, liver, kidneys			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Iron salts (soluble, as Fe)			CAS
			RTECS
Synonyms & Trade Names FeSO ₄ : Ferrous sulfate, Iron(II) sulfate FeCl ₂ : Ferrous chloride, Iron(II) chloride Fe(NO ₃) ₃ : Ferric nitrate, Iron(III) nitrate Fe(SO ₄) ₃ : Ferric sulfate, Iron(III) sulfate FeCl ₃ : Ferric chloride, Iron(III) chloride			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Appearance and odor vary depending upon the specific soluble iron salt.			
Properties vary depending upon the specific soluble iron salt.			
Varies			
Noncombustible Solids			
Incompatibilities & Reactivities			
Measurement Methods NIOSH 7300; OSHA ID121, ID125G			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			

Symptoms	Irritation eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting; possible liver damage
Target Organs	Eyes, skin, respiratory system, liver, gastrointestinal tract
See also: INTRODUCTION	

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isoamyl acetate			CAS 123-92-2
CH ₃ COOCH ₂ CH ₂ CH(CH ₃) ₂			RTECS NS9800000
Synonyms & Trade Names Banana oil, Isopentyl acetate, 3-Methyl-1-butanol acetate, 3-Methylbutyl ester of acetic acid, 3-Methylbutyl ethanoate			DOT ID & Guide 1104 129
Exposure Limits	NIOSH REL: TWA 100 ppm (525 mg/m ³)		
	OSHA PEL: TWA 100 ppm (525 mg/m ³)		
IDLH 1000 ppm		Conversion 1 ppm = 5.33 mg/m ³	
Physical Description Colorless liquid with a banana-like odor.			
MW: 130.2	BP: 288°F	FRZ: -109°F	Sol: 0.3%
VP: 4 mmHg	IP: ?		Sp.Gr: 0.87
Fl.P: 77°F	UEL: 7.5%	LEL(212°F): 1.0%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1450; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1000 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

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

Symptoms Irritation eyes, skin, nose, throat; dermatitis; in animals: narcosis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isoamyl alcohol (primary)			CAS 123-51-3
(CH ₃) ₂ CHCH ₂ CH ₂ OH			RTECS EL5425000
Synonyms & Trade Names Fermentation amyl alcohol, Fusel oil, Isobutyl carbinol, Isopentyl alcohol, 3-Methyl-1-butanol, Primary isoamyl alcohol			DOT ID & Guide 1105 129
Exposure Limits	NIOSH REL: TWA 100 ppm (360 mg/m ³) ST 125 ppm (450 mg/m ³)		
	OSHA PEL†: TWA 100 ppm (360 mg/m ³)		
IDLH 500 ppm		Conversion 1 ppm = 3.61 mg/m ³	
Physical Description Colorless liquid with a disagreeable odor.			
MW: 88.2	BP: 270°F	FRZ: -179°F	Sol(57°F): 2%
VP: 28 mmHg	IP: ?		Sp.Gr(57°F): 0.81
Fl.P: 109°F	UEL(212°F): 9.0%	LEL: 1.2%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1402			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 500 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

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

Symptoms Irritation eyes, skin, nose, throat; headache, dizziness; cough, dyspnea (breathing difficulty), nausea, vomiting, diarrhea; skin cracking; in animals: narcosis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isoamyl alcohol (secondary)			CAS 6032-29-7
(CH ₃) ₂ CHCH(OH)CH ₃			RTECS
Synonyms & Trade Names 3-Methyl-2-butanol, Secondary isoamyl alcohol			DOT ID & Guide 1105 129
Exposure Limits	NIOSH REL: TWA 100 ppm (360 mg/m ³) ST 125 ppm (450 mg/m ³)		
	OSHA PEL†: TWA 100 ppm (360 mg/m ³)		
IDLH 500 ppm		Conversion 1 ppm = 3.61 mg/m ³	
Physical Description Colorless liquid with a disagreeable odor.			
MW: 88.2	BP: 234°F	FRZ: ?	Sol: ?
VP: 1 mmHg	IP: ?		Sp.Gr: 0.82
Fl.P(oc): 95°F	UEL: ?	LEL: ?	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1402			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 500 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; headache, dizziness; cough, dyspnea (breathing difficulty), nausea, vomiting, diarrhea; skin cracking; in animals: narcosis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isobutane			CAS 75-28-5
CH ₃ CH(CH ₃) ₂			RTECS TZ4300000
Synonyms & Trade Names 2-Methylpropane [Note: Also see specific listing for n-Butane.]			DOT ID & Guide 1075 115 1969 115
Exposure Limits	NIOSH REL: TWA 800 ppm (1900 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 2.38 mg/m ³	
Physical Description Colorless gas with a gasoline-like or natural gas odor. [Note: Shipped as a liquefied compressed gas. A liquid below 11°F.]			
MW: 58.1	BP: 11°F	FRZ: -255°F	Sol: Slight
VP(70°F): 3.1 atm	IP: 10.74 eV	RGasD: 2.06	
Fl.P: NA (Gas)	UEL: 8.4%	LEL: 1.6%	
Flammable Gas Class IA Flammable Liquid			
Incompatibilities & Reactivities Strong oxidizers (e.g., nitrates & perchlorates), chlorine, fluorine, (nickel carbonyl + oxygen)			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact (liquid)			
Symptoms Drowsiness, narcosis, asphyxia; liquid: frostbite			
Target Organs central nervous system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isobutyl acetate			CAS 110-19-0
CH ₃ COOCH ₂ CH(CH ₃) ₂			RTECS AI4025000
Synonyms & Trade Names Isobutyl ester of acetic acid, 2-Methylpropyl acetate, 2-Methylpropyl ester of acetic acid, beta-Methylpropyl ethanoate			DOT ID & Guide 1213 129
Exposure Limits	NIOSH REL: TWA 150 ppm (700 mg/m ³)		
	OSHA PEL: TWA 150 ppm (700 mg/m ³)		
IDLH 1300 ppm [10%LEL]		Conversion 1 ppm = 4.75 mg/m ³	
Physical Description Colorless liquid with a fruity, floral odor.			
MW: 116.2	BP: 243°F	FRZ: -145°F	Sol(77°F): 0.6%
VP: 13 mmHg	IP: 9.97 eV		Sp.Gr: 0.87
Fl.P: 64°F	UEL: 10.5%	LEL: 1.3%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1450; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1300 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

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

Symptoms Irritation eyes, skin, upper respiratory system; headache, drowsiness, anesthesia; in animals: narcosis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isobutyl alcohol			CAS 78-83-1
(CH ₃) ₂ CHCH ₂ OH			RTECS NP9625000
Synonyms & Trade Names IBA, Isobutanol, Isopropylcarbinol, 2-Methyl-1-propanol			DOT ID & Guide 1212 129
Exposure Limits	NIOSH REL: TWA 50 ppm (150 mg/m ³)		
	OSHA PEL†: TWA 100 ppm (300 mg/m ³)		
IDLH 1600 ppm		Conversion 1 ppm = 3.03 mg/m ³	
Physical Description Colorless, oily liquid with a sweet, musty odor.			
MW: 74.1	BP: 227°F	FRZ: -162°F	Sol: 10%
VP: 9 mmHg	IP: 10.12 eV		Sp.Gr: 0.80
Fl.P: 82°F	UEL(202°F): 10.6%	LEL(123°F): 1.7%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1401; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly 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 1250 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 1600 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

[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

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

Symptoms Irritation eyes, skin, throat; headache, drowsiness; skin cracking; in animals: narcosis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isobutyronitrile			CAS 78-82-0
(CH ₃) ₂ CHCN			RTECS TZ4900000
Synonyms & Trade Names Isopropyl cyanide, 2-Methylpropanenitrile, 2-Methylpropionitrile			DOT ID & Guide 2284 131
Exposure Limits	NIOSH REL: TWA 8 ppm (22 mg/m ³)		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 2.83 mg/m ³	
Physical Description Colorless liquid with an almond-like odor. [Note: Forms cyanide in the body.]			
MW: 69.1	BP: 219°F	FRZ: -97°F	Sol: Slight
VP(130°F): 100 mmHg	IP: ?		Sp.Gr: 0.76
Fl.P: 47°F	UEL: ?	LEL: ?	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Oxidizers, reducing agents, strong acids & bases			
Measurement Methods NIOSH 1606 (adapt)			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 80 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator Up to 200 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 400 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 1000 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

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

Symptoms Irritation eyes, skin, nose, throat; headache, dizziness, lassitude (weakness, exhaustion), confusion, convulsions; dyspnea (breathing difficulty); abdominal pain, nausea, vomiting

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isooctyl alcohol			CAS 26952-21-6
C ₇ H ₁₅ CH ₂ OH			RTECS NS7700000
Synonyms & Trade Names Isooctanol, Oxooctyl alcohol [Note: A mixture of closely related isomeric, primary alcohols with branched chains such as 2-Ethylhexanol, CH ₃ (CH ₂) ₃ CH(CH ₂ CH ₃)CH ₂ OH.]			DOT ID & Guide
Exposure Limits		NIOSH REL: TWA 50 ppm (270 mg/m ³) [skin]	
		OSHA PEL†: none	
IDLH N.D.		Conversion 1 ppm = 5.33 mg/m ³	
Physical Description Clear, colorless liquid.			
MW: 130.3	BP: 367°F	FRZ: <-105°F	Sol: Insoluble
VP: 0.4 mmHg	IP: ?		Sp.Gr: 0.83
Fl.P(oc): 180°F	UEL(est.): 5.7%	LEL(calc.): 0.9%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities None reported			
Measurement Methods OSHA PV2033			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: No recommendation Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; eye, skin burns			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isophorone			CAS 78-59-1
C ₉ H ₁₄ O			RTECS GW7700000
Synonyms & Trade Names Isoacetophorone; 3,5,5-Trimethyl-2-cyclohexenone; 3,5,5-Trimethyl-2-cyclo-hexen-1-one			DOT ID & Guide 1993 128 (combustible liquid, n.o.s.)
Exposure Limits	NIOSH REL: TWA 4 ppm (23 mg/m ³)		
	OSHA PEL†: TWA 25 ppm (140 mg/m ³)		
IDLH 200 ppm		Conversion 1 ppm = 5.65 mg/m ³	
Physical Description Colorless to white liquid with a peppermint-like odor.			
MW: 138.2	BP: 419°F	FRZ: 17°F	Sol: 1%
VP: 0.3 mmHg	IP: 9.07 eV		Sp.Gr: 0.92
Fl.P: 184°F	UEL: 3.8%	LEL: 0.8%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Oxidizers, strong alkalis, amines			
Measurement Methods NIOSH 2508; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 40 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* Up to 100 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 200 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 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

[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

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

Symptoms Irritation eyes, nose, throat; headache, nausea, dizziness, lassitude (weakness, exhaustion), malaise (vague feeling of discomfort), narcosis; dermatitis; in animals: kidney, liver damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isophorone diisocyanate			CAS 4098-71-9
C ₁₂ H ₁₈ N ₂ O ₂			RTECS NQ9370000
Synonyms & Trade Names IPDI; 3-Isocyanatomethyl-3,5,5-trimethylcyclohexyl-isocyanate; Isophorone diamine diisocyanate			DOT ID & Guide 2290 156
Exposure Limits	NIOSH REL: TWA 0.005 ppm (0.045 mg/m ³) ST 0.02 ppm (0.180 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 9.09 mg/m ³	
Physical Description Colorless to slightly yellow liquid with a pungent odor.			
MW: 222.3	BP: ?	FRZ: -76°F	Sol: Decomposes
VP: 0.0003 mmHg	IP: ?		Sp.Gr: 1.06
Fl.P: 311°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Water, alcohols, phenols, amines, mercaptans, amides, urethanes, ureas [Note: Reacts with water to form carbon dioxide.]			
Measurement Methods OSHA PV2034			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 0.05 ppm: (APF = 10) Any supplied-air respirator* Up to 0.125 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 0.25 ppm: (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 1 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

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

Symptoms Irritation eyes, skin, respiratory system; chest tightness, dyspnea (breathing difficulty), cough, sore throat; bronchitis, wheezing, pulmonary edema; possible respiratory sensitization, asthma

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Isopropoxyethanol			CAS 109-59-1
(CH ₃) ₂ CHOCH ₂ CH ₂ OH			RTECS KL5075000
Synonyms & Trade Names Ethylene glycol isopropyl ether, beta-Hydroxyethyl isopropyl ether, Isopropyl Cellosolve®, Isopropyl glycol			DOT ID & Guide
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless liquid with a mild, ethereal odor.			
MW: 104.2	BP: 283°F	FRZ: ?	Sol: Miscible
VP: 3 mmHg	IP: ?		Sp.Gr: 0.90
Fl.P(oc): 92°F	UEL: ?	LEL: ?	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms In animals: irritation eyes, skin; hematuria (blood in the urine), anemia, pulmonary edema			
Target Organs Eyes, skin, respiratory system, blood			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isopropyl acetate			CAS 108-21-4
CH ₃ COOCH(CH ₃) ₂			RTECS AI4930000
Synonyms & Trade Names Isopropyl ester of acetic acid, 1-Methylethyl ester of acetic acid, 2-Propyl acetate			DOT ID & Guide 1220 129
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 250 ppm (950 mg/m ³)		
IDLH 1800 ppm		Conversion 1 ppm = 4.18 mg/m ³	
Physical Description Colorless liquid with a fruity odor.			
MW: 102.2	BP: 194°F	FRZ: -92°F	Sol: 3%
VP: 42 mmHg	IP: 9.95 eV		Sp.Gr: 0.87
Fl.P: 36°F	UEL: 8%	LEL(100°F): 1.8%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1454; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations OSHA Up to 1800 ppm : (APF = 25) Any supplied-air respirator 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 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose; dermatitis; in animals: narcosis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isopropyl alcohol			CAS 67-63-0
(CH ₃) ₂ CHOH			RTECS NT8050000
Synonyms & Trade Names Dimethyl carbinol, IPA, Isopropanol, 2-Propanol, sec-Propyl alcohol, Rubbing alcohol			DOT ID & Guide 1219 129
Exposure Limits	NIOSH REL: TWA 400 ppm (980 mg/m ³) ST 500 ppm (1225 mg/m ³)		
	OSHA PEL†: TWA 400 ppm (980 mg/m ³)		
IDLH 2000 ppm [10%LEL]		Conversion 1 ppm = 2.46 mg/m ³	
Physical Description Colorless liquid with the odor of rubbing alcohol.			
MW: 60.1	BP: 181°F	FRZ: -127°F	Sol: Miscible
VP: 33 mmHg	IP: 10.10 eV		Sp.Gr: 0.79
Fl.P: 53°F	UEL(200°F): 12.7%	LEL: 2.0%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, acetaldehyde, chlorine, ethylene oxide, acids, isocyanates			
Measurement Methods NIOSH 1400; OSHA 109			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2000 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

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

Symptoms Irritation eyes, nose, throat; drowsiness, dizziness, headache; dry cracking skin; in animals: narcosis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isopropylamine			CAS 75-31-0
(CH ₃) ₂ CHNH ₂			RTECS NT8400000
Synonyms & Trade Names 2-Aminopropane, Monoisopropylamine, 2-Propylamine, sec-Propylamine			DOT ID & Guide 1221 132
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 5 ppm (12 mg/m ³)		
IDLH 750 ppm		Conversion 1 ppm = 2.42 mg/m ³	
Physical Description Colorless liquid with an ammonia-like odor. [Note: A gas above 91°F.]			
MW: 59.1	BP: 91°F	FRZ: -150°F	Sol: Miscible
VP: 460 mmHg	IP: 8.72 eV		Sp.Gr: 0.69
Fl.P(oc): -35°F	UEL: ?	LEL: ?	
Class IA Flammable Liquid: Fl.P. below 73°F and BP below 100°F.			
Incompatibilities & Reactivities Strong acids, strong oxidizers, aldehydes, ketones, epoxides			
Measurement Methods NIOSH S147 (II-3)			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations OSHA Up to 125 ppm : (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 [£] Up to 250 ppm : (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 powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) providing protection against the compound of concern [£]			

compound of concern /(APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece
Up to 750 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, nose, throat; pulmonary edema; visual disturbance; eye, skin burns; dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

N-Isopropylaniline			CAS 768-52-5
C ₆ H ₅ NHCH(CH ₃) ₂			RTECS BY4190000
Synonyms & Trade Names N-IPA, Isopropylaniline, N-(1-Methylethyl)-benzenamine, N-Phenylisopropylamine			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 2 ppm (10 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 5.53 mg/m ³	
Physical Description Clear, yellowish liquid with a sweet, aromatic odor.			
MW: 135.2	BP: 397°F	FRZ: -58°F	Sol: ?
VP(77°F): 0.03 mmHg	IP: ?		Sp.Gr(60°F): 0.93
Fl.P(oc): 190°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities None reported			
Measurement Methods OSHA 78			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; headache, lassitude (weakness, exhaustion), dizziness; cyanosis; ataxia; dyspnea (breathing difficulty) on effort; tachycardia; methemoglobinemia			
Target Organs Eyes, skin, respiratory system, blood, cardiovascular system, liver, kidneys			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isopropyl ether			CAS 108-20-3
(CH ₃) ₂ CHOCH(CH ₃) ₂			RTECS TZ5425000
Synonyms & Trade Names Diisopropyl ether, Diisopropyl oxide, 2-Isopropoxy propane			DOT ID & Guide 1159 127
Exposure Limits	NIOSH REL: TWA 500 ppm (2100 mg/m ³)		
	OSHA PEL: TWA 500 ppm (2100 mg/m ³)		
IDLH 1400 ppm [10%LEL]		Conversion 1 ppm = 4.18 mg/m ³	
Physical Description Colorless liquid with a sharp, sweet, ether-like odor.			
MW: 102.2	BP: 154°F	FRZ: -76°F	Sol: 0.2%
VP: 119 mmHg	IP: 9.20 eV		Sp.Gr: 0.73
Fl.P: -18°F	UEL: 7.9%	LEL: 1.4%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, acids [Note: Unstable peroxides may form on long contact with air.]			
Measurement Methods NIOSH 1618; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1400 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose; respiratory discomfort; dermatitis; in animals: drowsiness, dizziness, unconsciousness, narcosis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Isopropyl glycidyl ether			CAS 4016-14-2
C ₆ H ₁₂ O ₂			RTECS TZ3500000
Synonyms & Trade Names 1,2-Epoxy-3-isopropoxypropane; IGE; Isopropoxymethyl oxirane			DOT ID & Guide
Exposure Limits	NIOSH REL: C 50 ppm (240 mg/m ³) [15-minute]		
	OSHA PEL†: TWA 50 ppm (240 mg/m ³)		
IDLH 400 ppm		Conversion 1 ppm = 4.75 mg/m ³	
Physical Description Colorless liquid.			
MW: 116.2	BP: 279°F	FRZ: ?	Sol: 19%
VP(77°F): 9 mmHg	IP: ?		Sp.Gr: 0.92
Fl.P: 92°F	UEL: ?	LEL: ?	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers, strong caustics [Note: May form explosive peroxides upon exposure to air or light.]			
Measurement Methods NIOSH 1620; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 400 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, upper respiratory system; skin sensitization; possible hematopoietic, reproductive effects
Target Organs Eyes, skin, respiratory system, blood, reproductive system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Kaolin			CAS 1332-58-7
			RTECS GF1670500
Synonyms & Trade Names China clay, Clay, Hydrated aluminum silicate, Hydrite, Porcelain clay [Note: Main constituent of Kaolin is Kaolinite (Al ₂ Si ₂ O ₅ (OH) ₄ .]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description White to yellowish or grayish powder. [Note: When moistened, darkens & develops a clay-like odor.]			
MW: varies	BP: ?	MLT: ?	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.8-2.6
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Chronic pulmonary fibrosis, stomach granuloma			
Target Organs respiratory system, stomach			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Kepone			CAS 143-50-0
C ₁₀ Cl ₁₀ O			RTECS PC8575000
Synonyms & Trade Names Chlordecone; Decachlorooctahydro-1,3,4-metheno-2H-cyclobuta(cd)-pentalen-2-one; Decachlorooctahydro-kepone-2-one; Decachlorotetrahydro-4,7-methanoindeneone			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca TWA 0.001 mg/m ³ See Appendix A		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Tan to white, crystalline, odorless solid. [insecticide]			
MW: 490.6	BP: Sublimes	MLT: 662°F (Sublimes)	Sol(212°F): 0.5%
VP(77°F): 3 x 10-7 mmHg	IP: ?		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Acids, acid fumes			
Measurement Methods NIOSH 5508			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Headache, anxiety, tremor; liver, kidney damage; visual disturbance; ataxia, chest pain, skin erythema (skin redness); testicular atrophy, low sperm count; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys, reproductive system
Cancer Site [in animal: liver cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Kerosene			CAS 8008-20-6
			RTECS OA5500000
Synonyms & Trade Names Fuel Oil No. 1, Range oil [Note: A refined petroleum solvent (predominantly C9-C16), which typically is 25% normal paraffins, 11% branched paraffins, 30% monocycloparaffins, 12% dicycloparaffins, 1% tricycloparaffins, 16% mononuclear aromatics & 5% dinuclear aromatics.]			DOT ID & Guide 1223 128
Exposure Limits	NIOSH REL: TWA 100 mg/m ³		
	OSHA PEL: none		
IDLH N.D.		Conversion	
Physical Description Colorless to yellowish, oily liquid with a strong, characteristic odor.			
MW: 170 (approx)	BP: 347-617°F	FRZ: -50°F	Sol: Insoluble
VP(100°F): 5 mmHg	IP: ?		Sp.Gr: 0.81
Fl.P: 100-162°F	UEL: 5%	LEL: 0.7%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1550			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 1000 mg/m³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator Up to 2500 mg/m³ : (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 5000 mg/m³: (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

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

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

Symptoms Irritation eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ketene			CAS 463-51-4
CH ₂ =CO			RTECS OA7700000
Synonyms & Trade Names Carbomethene, Ethenone, Keto-ethylene			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.5 ppm (0.9 mg/m ³) ST 1.5 ppm (3 mg/m ³)		
	OSHA PEL†: TWA 0.5 ppm (0.9 mg/m ³)		
IDLH 5 ppm		Conversion 1 ppm = 1.72 mg/m ³	
Physical Description Colorless gas with a penetrating odor.			
MW: 42.0	BP: -69°F	FRZ: -238°F	Sol: Reacts
VP: >1 atm	IP: 9.61 eV	RGasD: 1.45	
Fl.P: NA (Gas)	UEL: ?	LEL: ?	
Flammable Gas			
Incompatibilities & Reactivities Water, alcohols, ammonia [Note: Readily polymerizes. Reacts with water to form acetic acid.]			
Measurement Methods NIOSH S92 (II-2)			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 5 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
Exposure Routes inhalation, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat, respiratory system; pulmonary edema
Target Organs Eyes, skin, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Lead			CAS 7439-92-1
Pb			RTECS OF7525000
Synonyms & Trade Names Lead metal, Plumbum			DOT ID & Guide
Exposure Limits	NIOSH REL*: TWA 0.050 mg/m ³ See Appendix C [*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]		
	OSHA PEL*: [1910.1025] TWA 0.050 mg/m ³ See Appendix C [*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]		
IDLH 100 mg/m ³ (as Pb)		Conversion	
Physical Description A heavy, ductile, soft, gray solid.			
MW: 207.2	BP: 3164°F	MLT: 621°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 11.34
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form.			
Incompatibilities & Reactivities Strong oxidizers, hydrogen peroxide, acids			
Measurement Methods NIOSH 7082, 7105, 7300, 7700, 7701, 7702; OSHA ID121, ID125G, ID206			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.5 mg/m³ : (APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(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 a high-efficiency particulate			

filter/(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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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; hypotension

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Limestone			CAS 1317-65-3
CaCO ₃			RTECS EV9580000
Synonyms & Trade Names Calcium carbonate, Natural calcium carbonate [Note: Calcite & aragonite are commercially important natural calcium carbonates.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Odorless, white to tan powder.			
MW: 100.1	BP: Decomposes	MLT: 1517-2442°F (Decomposes)	Sol: 0.001%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.7-2.9
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Fluorine, magnesium, acids, alum, ammonium salts			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane; cough, sneezing, rhinorrhea (discharge of thin mucus); lacrimation (discharge of tears)			
Target Organs Eyes, skin, respiratory system			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Lindane			CAS 58-89-9
C ₆ H ₆ Cl ₆			RTECS GV4900000
Synonyms & Trade Names BHC; HCH; gamma-Hexachlorocyclohexane; gamma isomer of 1,2,3,4,5,6-Hexachlorocyclohexane			DOT ID & Guide 2761 151
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³ [skin]		
	OSHA PEL: TWA 0.5 mg/m ³ [skin]		
IDLH 50 mg/m ³		Conversion	
Physical Description White to yellow, crystalline powder with a slight, musty odor. [pesticide]			
MW: 290.8	BP: 614°F	MLT: 235°F	Sol: 0.001%
VP: 0.00001 mmHg	IP: ?		Sp.Gr: 1.85
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Corrosive to metals			
Measurement Methods NIOSH 5502			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter/(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 organic vapor cartridge(s) in combination with a dust, mist, and fume filter* Up to 25 mg/m³ : (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)			

in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) 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

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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, nose, throat; headache; nausea; clonic convulsions; respiratory difficulty; cyanosis; aplastic anemia; muscle spasm; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Lithium hydride		CAS 7580-67-8	
LiH		RTECS OJ6300000	
Synonyms & Trade Names Lithium monohydride		DOT ID & Guide 1414 138 2805 138 (fused, solid)	
Exposure Limits	NIOSH REL: TWA 0.025 mg/m ³		
	OSHA PEL: TWA 0.025 mg/m ³		
IDLH 0.5 mg/m ³		Conversion	
Physical Description Odorless, off-white to gray, translucent, crystalline mass or white powder.			
MW: 7.95	BP: Decomposes	MLT: 1256°F	Sol: Reacts
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 0.78
Fl.P: NA	UEL: NA	LEL: NA	
Combustible Solid that can form airborne dust clouds which may explode on contact with flame, heat, or oxidizers.			
Incompatibilities & Reactivities Strong oxidizers, halogenated hydrocarbons, acids, water [Note: May ignite SPONTANEOUSLY in air and may reignite after fire is extinguished. Reacts with water to form hydrogen & lithium hydroxide.]			
Measurement Methods OSHA ID121			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Brush (DO NOT WASH) Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench (>0.5 mg/m ³)		First Aid (See procedures) Eye: Irrigate immediately Skin: Brush (DO NOT WASH) Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.25 mg/m³ : (APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator Up to 0.5 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 25) Any powered, air-purifying respirator 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin; eye, skin burns; mouth, esophagus burns (if ingested); nausea; muscle twitches; mental confusion; blurred vision

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

L.P.G.			CAS 68476-85-7
C ₃ H ₈ /C ₃ H ₆ /C ₄ H ₁₀ /C ₄ H ₈			RTECS SE7545000
Synonyms & Trade Names Bottled gas, Compressed petroleum gas, Liquefied hydrocarbon gas, Liquefied petroleum gas, LPG [Note: A fuel mixture of propane, propylene, butanes & butylenes.]			DOT ID & Guide 1075 115
Exposure Limits	NIOSH REL: TWA 1000 ppm (1800 mg/m ³)		
	OSHA PEL: TWA 1000 ppm (1800 mg/m ³)		
IDLH 2000 ppm [10%LEL]		Conversion 1 ppm = 1.72-2.37 mg/m ³	
Physical Description Colorless, noncorrosive, odorless gas when pure. [Note: A foul-smelling odorant is usually added. Shipped as a liquefied compressed gas.]			
MW: 42-58	BP: >-44°F	FRZ: ?	Sol: Insoluble
VP: >1 atm	IP: 10.95 eV	RGasD: 1.45-2.00	
Fl.P: NA (Gas)	UEL: 9.5% (Propane) 8.5% (Butane)	LEL: 2.1% (Propane) 1.9% (Butane)	
Flammable Gas			
Incompatibilities & Reactivities Strong oxidizers, chlorine dioxide			
Measurement Methods NIOSH S93 (II-2)			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 2000 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](#): Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Dizziness, drowsiness, asphyxia; liquid: frostbite

Target Organs respiratory system, central nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Magnesite			CAS 546-93-0
MgCO₃			RTECS OM2470000
Synonyms & Trade Names Carbonate magnesium, Hydromagnesite, Magnesium carbonate, Magnesium(II) carbonate [Note: Magnesite is a naturally-occurring form of magnesium carbonate.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description White, odorless, crystalline powder.			
MW: 84.3	BP: Decomposes	MLT: 662°F (Decomposes)	Sol: 0.01%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.96
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Acids, formaldehyde			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; cough			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Magnesium oxide fume			CAS 1309-48-4
MgO			RTECS OM3850000
Synonyms & Trade Names Magnesia fume			DOT ID & Guide
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 15 mg/m³		
IDLH 750 mg/m³		Conversion	
Physical Description Finely divided white particulate dispersed in air. [Note: Exposure may occur when magnesium is burned, thermally cut, or welded upon.]			
MW: 40.3	BP: 6512°F	MLT: 5072°F	Sol(86°F): 0.009%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 3.58
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Chlorine trifluoride, phosphorus pentachloride			
Measurement Methods NIOSH 7300; OSHA ID121			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations OSHA Up to 150 mg/m³ : (APF = 10) Any dust, mist, and fume respirator/(APF = 10) Any supplied-air respirator Up to 375 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust, mist, and fume filter Up to 750 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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
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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, nose; metal fume fever: cough, chest pain, flu-like fever

Target Organs Eyes, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Malathion			CAS 121-75-5
C₁₀H₁₉O₆PS₂			RTECS WM8400000
Synonyms & Trade Names S-[1,2-bis(ethoxycarbonyl) ethyl]O,O-dimethyl-phosphorodithioate; Diethyl (dimethoxyphosphinothioylthio) succinate			DOT ID & Guide 2783 152
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ [skin]		
	OSHA PEL†: TWA 15 mg/m ³ [skin]		
IDLH 250 mg/m ³		Conversion	
Physical Description Deep-brown to yellow liquid with a garlic-like odor. [insecticide] [Note: A solid below 37°F.]			
MW: 330.4	BP: 140°F (Decomposes)	FRZ: 37°F	Sol: 0.02%
VP: 0.00004 mmHg	IP: ?		Sp.Gr: 1.21
Fl.P(oc): >325°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid, but may be difficult to ignite.			
Incompatibilities & Reactivities Strong oxidizers, magnesium, alkaline pesticides [Note: Corrosive to metals.]			
Measurement Methods NIOSH 5600; OSHA 62			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 100 mg/m³: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter/(APF = 10) Any supplied-air respirator Up to 250 mg/m³: (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) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 25) Any powered,			

air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin; miosis, aching eyes, blurred vision, lacrimation (discharge of tears); salivation; anorexia, nausea, vomiting, abdominal cramps, diarrhea, dizziness, confusion, ataxia; rhinorrhea (discharge of thin mucus), headache; chest tightness, wheezing, laryngeal spasm

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Maleic anhydride			CAS 108-31-6
C4H2O3			RTECS ON3675000
Synonyms & Trade Names cis-Butenedioic anhydride; 2,5-Furanedione; Maleic acid anhydride; Toxilic anhydride			DOT ID & Guide 2215 156
Exposure Limits	NIOSH REL: TWA 1 mg/m ³ (0.25 ppm)		
	OSHA PEL: TWA 1 mg/m ³ (0.25 ppm)		
IDLH 10 mg/m ³		Conversion 1 ppm = 4.01 mg/m ³	
Physical Description Colorless needles, white lumps, or pellets with an irritating, choking odor.			
MW: 98.1	BP: 396°F	MLT: 127°F	Sol: Reacts
VP: 0.2 mmHg	IP: 9.90 eV		Sp.Gr: 1.48
Fl.P: 218°F	UEL: 7.1%	LEL: 1.4%	
Combustible Solid, but may be difficult to ignite.			
Incompatibilities & Reactivities Strong oxidizers, water, alkalis, metals, caustics & amines above 150°F [Note: Reacts slowly with water (hydrolyzes) to form maleic acid.]			
Measurement Methods NIOSH 3512; OSHA 25, 86			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 10 mg/m³ : (APF = 25) Any supplied-air respirator 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 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation nose, upper respiratory system; conjunctivitis; photophobia (abnormal visual intolerance to light), double vision; bronchial asthma; dermatitis
Target Organs Eyes, skin, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Malonaldehyde			CAS 542-78-9
CHOCH ₂ CHO			RTECS TX6475000
Synonyms & Trade Names Malonic aldehyde; Malonodialdehyde; Propanedial; 1,3-Propanedial [Note: Pure Malonaldehyde is unstable and may be used as its sodium salt.]			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca See Appendix A See Appendix C (Aldehydes)		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Solid (needles).			
MW: 72.1	BP: ?	MLT: 161°F	Sol: ?
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities Proteins [Note: Pure compound is stable under neutral conditions, but not under acidic conditions.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; central nervous system depression; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system
Cancer Site [in animals: thyroid gland tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Malononitrile			CAS 109-77-3
NCCH ₂ CN			RTECS OO3150000
Synonyms & Trade Names Cyanoacetoneitrile, Dicyanomethane, Malonic dinitrile			DOT ID & Guide 2647 153
Exposure Limits	NIOSH REL: TWA 3 ppm (8 mg/m ³)		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 2.70 mg/m ³	
Physical Description White powder or colorless crystals. [Note: Melts above 90°F. Forms cyanide in the body.]			
MW: 66.1	BP: 426°F	MLT: 90°F	Sol: 13%
VP: ?	IP: 12.88 eV		Sp.Gr: 1.19
Fl.P(oc): 266°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong bases [Note: May polymerize violently on prolonged heating at 265°F, or in contact with strong bases at lower temperatures.]			
Measurement Methods NIOSH Nitriles Crit. Doc.			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 80 mg/m ³ : (APF = 10) Any supplied-air respirator Up to 200 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 400 mg/m ³ : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 667 mg/m ³ : (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

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

Symptoms Irritation eyes, skin, nose, throat; headache, dizziness, lassitude (weakness, exhaustion), confusion, convulsions; dyspnea (breathing difficulty); abdominal pain, nausea, vomiting

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Manganese compounds and fume (as Mn)			CAS 7439-96-5 (metal)
Mn (metal)			RTECS OO9275000 (metal)
Synonyms & Trade Names Manganese metal: Colloidal manganese, Manganese-55 Synonyms of other compounds vary depending upon the specific manganese compound.			DOT ID & Guide
Exposure Limits	NIOSH REL*: TWA 1 mg/m ³ ST 3 mg/m ³ [*Note: Also see specific listings for Manganese cyclopentadienyl tricarbonyl, Methyl cyclopentadienyl manganese tricarbonyl, and Manganese tetroxide.]		
	OSHA PEL*: C 5 mg/m ³ [*Note: Also see specific listings for Manganese cyclopentadienyl tricarbonyl and Methyl cyclopentadienyl manganese tricarbonyl.]		
IDLH 500 mg/m ³ (as Mn)		Conversion	
Physical Description A lustrous, brittle, silvery solid.			
MW: 54.9	BP: 3564°F	MLT: 2271°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 7.20 (metal)
Fl.P: NA	UEL: NA	LEL: NA	
Metal: Combustible Solid			
Incompatibilities & Reactivities Oxidizers [Note: Will react with water or steam to produce hydrogen.]			
Measurement Methods NIOSH 7300; OSHA ID121, ID125G			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 10 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators^(APF =			

10) Any supplied-air respirator

Up to 25 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter^

Up to 50 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 500 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, ingestion

Symptoms Parkinson's; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage

Target Organs respiratory system, central nervous system, blood, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Manganese cyclopentadienyl tricarbonyl (as Mn)			CAS 12079-65-1
C ₅ H ₅ Mn(CO) ₃			RTECS 009720000
Synonyms & Trade Names Cyclopentadienylmanganese tricarbonyl, Cyclopentadienyl tricarbonyl manganese, MCT			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ [skin]		
	OSHA PEL†: C 5 mg/m ³		
IDLH N.D.		Conversion	
Physical Description Yellow, crystalline solid with a characteristic odor. [Note: An antiknock additive for gasoline. May be found in an oil & gaseous solution.]			
MW: 204.1	BP: Sublimes	MLT: 167°F (Sublimes)	Sol: Slight
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Oxygen			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms In animals: irritation skin; pulmonary edema; convulsions; central nervous system, respiratory system, kidney changes; decreased resistance to infection			
Target Organs Skin, respiratory system, central nervous system, kidneys			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Manganese tetroxide (as Mn)			CAS 1317-35-7
Mn3O4			RTECS OP0895000
Synonyms & Trade Names Manganese oxide, Manganomanganic oxide, Trimanganese tetraoxide, Trimanganese tetroxide			DOT ID & Guide
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: C 5 mg/m³		
IDLH N.D.		Conversion	
Physical Description Brownish-black powder. [Note: Fumes are generated whenever manganese oxides are heated strongly in air.]			
MW: 228.8	BP: ?	MLT: 2847°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 4.88
Fl.P: NA	UEL: NA	LEL: NA	
Incompatibilities & Reactivities Soluble in hydrochloric acid (liberates chlorine gas)			
Measurement Methods NIOSH 7300; OSHA ID121, ID125G			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Asthenia, insomnia, mental confusion; low-back pain; vomiting; malaise (vague feeling of discomfort), lassitude (weakness, exhaustion); kidney damage; pneumonitis			
Target Organs respiratory system, central nervous system, blood, kidneys			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Marble			CAS 1317-65-3
CaCO ₃			RTECS EV9580000
Synonyms & Trade Names Calcium carbonate, Natural calcium carbonate [Note: Marble is a metamorphic form of calcium carbonate.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Odorless, white powder.			
MW: 100.1	BP: Decomposes	MLT: 1517-2442°F (Decomposes)	Sol: 0.001%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.7-2.9
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Fluorine, magnesium, acids, alum, ammonium salts			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane, upper respiratory system; cough, sneezing, rhinorrhea (discharge of thin mucus); lacrimation (discharge of tears)			
Target Organs Eyes, skin, respiratory system			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Mercury compounds [except (organo) alkyls] (as Hg)			CAS 7439-97-6 (metal)
Hg (metal)			RTECS OV4550000 (metal)
Synonyms & Trade Names Mercury metal: Colloidal mercury, Metallic mercury, Quicksilver Synonyms of "other" Hg compounds vary depending upon the specific compound.			DOT ID & Guide 2809 172 (metal)
Exposure Limits	NIOSH REL: Hg Vapor: TWA 0.05 mg/m ³ [skin]		
	Other: C 0.1 mg/m ³ [skin]		
	OSHA PEL†: C 0.1 mg/m ³		
IDLH 10 mg/m ³ (as Hg)		Conversion	
Physical Description Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.]			
MW: 200.6	BP: 674°F	FRZ: -38°F	Sol: Insoluble
VP: 0.0012 mmHg	IP: ?		Sp.Gr: 13.6 (metal)
Fl.P: NA	UEL: NA	LEL: NA	
Metal: Noncombustible Liquid			
Incompatibilities & Reactivities Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper			
Measurement Methods NIOSH 6009; OSHA ID140			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) 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-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/PAPRTS(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/PAPRTS(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

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
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Mercury (organo) alkyl compounds (as Hg)		CAS	
		RTECS	
Synonyms & Trade Names Synonyms vary depending upon the specific (organo) alkyl mercury compound.		DOT ID & Guide	
Exposure Limits	NIOSH REL: TWA 0.01 mg/m ³ ST 0.03 mg/m ³ [skin]		
	OSHA PEL†: TWA 0.01 mg/m ³ C 0.04 mg/m ³		
IDLH 2 mg/m ³ (as Hg)		Conversion	
Physical Description Appearance and odor vary depending upon the specific (organo) alkyl mercury compound.			
Properties vary depending upon the specific (organo) alkyl mercury compound.			
Incompatibilities & Reactivities Strong oxidizers such as chlorine			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.1 mg/m³ : (APF = 10) Any supplied-air respirator Up to 0.25 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 0.5 mg/m³ : (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 2 mg/m : (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: Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Paresthesia; ataxia, dysarthria; vision, hearing disturbance; spasticity, jerking limbs; dizziness; salivation; lacrimation (discharge of tears); nausea, vomiting, diarrhea, constipation; skin burns; emotional disturbance; kidney injury; possible teratogenic effects

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Mesityl oxide			CAS 141-79-7
(CH3)2C=CHCOCH3			RTECS SB4200000
Synonyms & Trade Names Isobutenyl methyl ketone, Isopropylideneacetone, Methyl isobutenyl ketone, 4-Methyl-3-penten-2-one			DOT ID & Guide 1229 129
Exposure Limits	NIOSH REL: TWA 10 ppm (40 mg/m³)		
	OSHA PEL†: TWA 25 ppm (100 mg/m³)		
IDLH 1400 ppm [10%LEL]		Conversion 1 ppm = 4.02 mg/m³	
Physical Description Oily, colorless to light-yellow liquid with a peppermint- or honey-like odor.			
MW: 98.2	BP: 266°F	FRZ: -52°F	Sol: 3%
VP: 9 mmHg	IP: 9.08 eV		Sp.Gr(59°F): 0.86
Fl.P: 87°F	UEL: 7.2%	LEL: 1.4%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Oxidizers, acids			
Measurement Methods NIOSH 1301; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 250 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 500 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 1400 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

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

Symptoms Irritation eyes, skin, mucous membrane; narcosis, coma; in animals: liver, kidney damage; central nervous system effects

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methacrylic acid			CAS 79-41-4
CH₂=C(CH₃)COOH			RTECS OZ2975000
Synonyms & Trade Names Methacrylic acid (glacial), Methacrylic acid (inhibited), alpha-Methacrylic acid, 2-Methylacrylic acid, 2-Methylpropenoic acid			DOT ID & Guide 2531 153P (inhibited)
Exposure Limits	NIOSH REL: TWA 20 ppm (70 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 3.52 mg/m ³	
Physical Description Colorless liquid or solid (below 61°F) with an acrid, repulsive odor.			
MW: 86.1	BP: 325°F	FRZ: 61°F	Sol(77°F): 9%
VP: 0.7 mmHg	IP: ?		Sp.Gr: 1.02 (Liquid)
Fl.P(oc): 171°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Oxidizers, elevated temperatures, hydrochloric acid [Note: Typically contains 100 ppm of the monomethyl ether of hydroquinone to prevent polymerization.]			
Measurement Methods OSHA PV2005			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane; eye, skin burns			
Target Organs Eyes, skin, respiratory system			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methomyl			CAS 16752-77-5
CH₃C(SCH₃)NOC(O)NHCH₃			RTECS AK2975000
Synonyms & Trade Names Lannate®, Methyl N-((methylamino)carbonyl)oxy)ethanimidothioate, S-Methyl-N-(methylcarbamoyloxy)thioacetimidate			DOT ID & Guide 2757 151 (carbamate pesticide, solid, n.o.s.)
Exposure Limits	NIOSH REL: TWA 2.5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White, crystalline solid with a slight, sulfur-like odor. [insecticide]			
MW: 162.2	BP: ?	MLT: 172°F	Sol(77°F): 6%
VP(77°F): 0.00005 mmHg	IP: ?		Sp.Gr(75°F): 1.29
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may be dissolved in flammable liquids.			
Incompatibilities & Reactivities Strong bases			
Measurement Methods NIOSH 5601			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes; blurred vision, miosis; salivation; abdominal cramps, nausea, vomiting; dyspnea (breathing difficulty); lassitude (weakness, exhaustion), muscle twitching; liver, kidney damage			
Target Organs Eyes, respiratory system, central nervous system, cardiovascular system, liver, kidneys, blood cholinesterase			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methoxychlor			CAS 72-43-5
(C ₆ H ₄ OCH ₃) ₂ CHCCl ₃			RTECS KJ3675000
Synonyms & Trade Names p,p'-Dimethoxydiphenyltrichloroethane; DMDT; Methoxy-DDT; 2,2-bis(p-Methoxyphenyl)-1,1,1-trichloroethane; 1,1,1-Trichloro-2,2-bis-(p-methoxyphenyl)ethane			DOT ID & Guide 2761 151 (organochlorine pesticide, solid, n.o.s.)
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: TWA 15 mg/m ³		
IDLH Ca [5000 mg/m ³]		Conversion	
Physical Description Colorless to light-yellow crystals with a slight, fruity odor. [insecticide]			
MW: 345.7	BP: Decomposes	MLT: 171°F	Sol: 0.00001%
VP: Very low	IP: ?		Sp.Gr: 1.41
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid, but difficult to burn.			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods NIOSH S371 (II-4); OSHA PV2038			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Skin: Soap wash Breathing: Fresh air 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion
Symptoms In animals: fasciculation, trembling, convulsions; kidney, liver damage; [potential occupational carcinogen]
Target Organs central nervous system, liver, kidneys
Cancer Site [in animals: liver & ovarian cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methoxyflurane			CAS 76-38-0
CHCl ₂ CF ₂ OCH ₃			RTECS KN7820000
Synonyms & Trade Names 2,2-Dichloro-1,1-difluoroethyl methyl ether; 2,2-Dichloro-1,1-difluoro-1-methoxyethane; Methoflurane; Methoxyfluorane; Penthrane			DOT ID & Guide
Exposure Limits	NIOSH REL*: C 2 ppm (13.5 mg/m ³) [60-minute] [*Note: REL for exposure to waste anesthetic gas.]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 6.75 mg/m ³	
Physical Description Colorless liquid with a fruity odor. [inhalation anesthetic]			
MW: 165.0	BP: 220°F	FRZ: -31°F	Sol: Slight
VP: 23 mmHg	IP: ?		Sp.Gr(77°F): 1.42
Fl.P: ?	UEL: ?	LEL(176°F): 7%	
Combustible Liquid			
Incompatibilities & Reactivities None reported			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes; central nervous system depression, analgesia, anesthesia, convulsions, respiratory depression; liver, kidney injury; in animals: reproductive, teratogenic effects			
Target Organs Eyes, central nervous system, liver, kidneys, reproductive system			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

4-Methoxyphenol			CAS 150-76-5
CH ₃ OC ₆ H ₄ OH			RTECS SL7700000
Synonyms & Trade Names Hydroquinone monomethyl ether, p-Hydroxyanisole, Mequinol, p-Methoxyphenol, Monomethyl ether hydroquinone			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless to white, waxy solid with an odor of caramel & phenol.			
MW: 124.2	BP: 469°F	MLT: 135°F	Sol(77°F): 4%
VP: <0.01 mmHg	IP: 7.50 eV		Sp.Gr: 1.55
Fl.P(oc): 270°F	UEL: ?	LEL: ?	
Combustible Solid; under certain conditions, a dust cloud can probably explode if ignited by a spark or flame.			
Incompatibilities & Reactivities Strong oxidizers, strong bases, acid chlorides, acid anhydrides			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat, upper respiratory system; eye, skin burns; central nervous system depression			
Target Organs Eyes, skin, respiratory system, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl acetate			CAS 79-20-9
CH ₃ COOCH ₃			RTECS AI9100000
Synonyms & Trade Names Methyl ester of acetic acid, Methyl ethanoate			DOT ID & Guide 1231 129
Exposure Limits	NIOSH REL: TWA 200 ppm (610 mg/m ³) ST 250 ppm (760 mg/m ³)		
	OSHA PEL†: TWA 200 ppm (610 mg/m ³)		
IDLH 3100 ppm [10%LEL]		Conversion 1 ppm = 3.03 mg/m ³	
Physical Description Colorless liquid with a fragrant, fruity odor.			
MW: 74.1	BP: 135°F	FRZ: -145°F	Sol: 25%
VP: 173 mmHg	IP: 10.27 eV		Sp.Gr: 0.93
Fl.P: 14°F	UEL: 16%	LEL: 3.1%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids; water [Note: Reacts slowly with water to form acetic acid & methanol.]			
Measurement Methods NIOSH 1458 ; OSHA 7 See: NMAM or OSHA Methods			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2000 ppm : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* Up to 3100 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

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

Symptoms Irritation eyes, skin, nose, throat; headache, drowsiness; optic nerve atrophy; chest tightness; in animals: narcosis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl acetylene			CAS 74-99-7
C ₃ H ₄			RTECS UK4250000
Synonyms & Trade Names Allylene, Propine, Propyne, 1-Propyne			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1000 ppm (1650 mg/m ³)		
	OSHA PEL: TWA 1000 ppm (1650 mg/m ³)		
IDLH 1700 ppm [10%LEL]		Conversion 1 ppm = 1.64 mg/m ³	
Physical Description Colorless gas with a sweet odor. [Note: A fuel that is shipped as a liquefied compressed gas.]			
MW: 40.1	BP: -10°F	FRZ: -153°F	Sol: Insoluble
VP: 5.2 atm	IP: 10.36 eV	RGasD: 1.41	
Fl.P: NA (Gas)	UEL: ?	LEL: 1.7%	
Flammable Gas			
Incompatibilities & Reactivities Strong oxidizers (such as chlorine), copper alloys [Note: Can decompose explosively at 4.5 to 5.6 atmospheres of pressure.]			
Measurement Methods NIOSH S84 (II-5)			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 1700 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
Exposure Routes inhalation, skin and/or eye contact (liquid)
Symptoms Irritation respiratory system; tremor, hyperexcitability, anesthesia; liquid: frostbite
Target Organs respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl acetylene-propadiene mixture			CAS 59355-75-8
C₃H₄			RTECS UK4920000
Synonyms & Trade Names MAPP gas, Methyl acetylene-allene mixture, Methyl acetylene-propadiene mixture (stabilized), Propadiene-methyl acetylene, Propyne-allene mixture, Propyne-propadiene mixture			DOT ID & Guide 1060 116P (stabilized)
Exposure Limits	NIOSH REL: TWA 1000 ppm (1800 mg/m ³) ST 1250 ppm (2250 mg/m ³)		
	OSHA PEL†: TWA 1000 ppm (1800 mg/m ³)		
IDLH 3400 ppm [10%LEL]		Conversion 1 ppm = 1.64 mg/m ³	
Physical Description Colorless gas with a strong, characteristic, foul odor. [Note: A fuel that is shipped as a liquefied compressed gas.]			
MW: 40.1	BP: -36 to -4°F	FRZ: -213°F	Sol: Insoluble
VP: >1 atm	IP: ?	RGasD: 1.48	
Fl.P: NA (Gas)	UEL: 10.8%	LEL: 3.4%	
Flammable Gas			
Incompatibilities & Reactivities Strong oxidizers, copper alloys [Note: Forms explosive compounds at high pressure in contact with alloys containing more than 67% copper.]			
Measurement Methods NIOSH S85 (II-6); OSHA 7			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 3400 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation respiratory system; excitement, confusion, anesthesia; liquid: frostbite

Target Organs respiratory system, central nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl acrylate			CAS 96-33-3
CH₂=CHCOOCH₃			RTECS AT2800000
Synonyms & Trade Names Methoxycarbonylethylene, Methyl ester of acrylic acid, Methyl propenoate			DOT ID & Guide 1919 129P (inhibited)
Exposure Limits	NIOSH REL: TWA 10 ppm (35 mg/m ³) [skin]		
	OSHA PEL: TWA 10 ppm (35 mg/m ³) [skin]		
IDLH 250 ppm		Conversion 1 ppm = 3.52 mg/m ³	
Physical Description Colorless liquid with an acrid odor.			
MW: 86.1	BP: 176°F	FRZ: -106°F	Sol: 6%
VP: 65 mmHg	IP: 9.90 eV		Sp.Gr: 0.96
Fl.P: 27°F	UEL: 25%	LEL: 2.8%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Nitrates, oxidizers such as peroxides, strong alkalis [Note: Polymerizes easily; usually contains an inhibitor such as hydroquinone.]			
Measurement Methods NIOSH 1459; OSHA 92			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 100 ppm : (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 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, upper respiratory system
Target Organs Eyes, skin, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methylacrylonitrile			CAS 126-98-7
CH ₂ =C(CH ₃)CN			RTECS UD1400000
Synonyms & Trade Names 2-Cyanopropene-1, 2-Cyano-1-propene, Isoprene cyanide, Isopropenyl nitrile, Methacrylonitrile, alpha-Methylacrylonitrile, 2-Methylpropenenitrile			DOT ID & Guide 3079 131P (inhibited)
Exposure Limits	NIOSH REL: TWA 1 ppm (3 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 2.74 mg/m ³	
Physical Description Colorless liquid with an odor like bitter almonds.			
MW: 67.1	BP: 195°F	FRZ: -32°F	Sol: 3%
VP(77°F): 71 mmHg	IP: ?		Sp.Gr: 0.80
Fl.P: 34°F	UEL: 6.8%	LEL: 2%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong acids, strong oxidizers, alkali, light [Note: Polymerization may occur due to elevated temperature, visible light, or contact with a concentrated alkali.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; lacrimation (discharge of tears); in animals: convulsions, loss of motor control in hind limbs			
Target Organs Eyes, skin, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methylal			CAS 109-87-5
CH₃OCH₂OCH₃			RTECS PA8750000
Synonyms & Trade Names Dimethoxymethane, Formal, Formaldehyde dimethylacetal, Methoxymethyl methyl ether, Methylene dimethyl ether			DOT ID & Guide 1234 127
Exposure Limits	NIOSH REL: TWA 1000 ppm (3100 mg/m ³)		
	OSHA PEL: TWA 1000 ppm (3100 mg/m ³)		
IDLH 2200 ppm [10%LEL]		Conversion 1 ppm = 3.11 mg/m ³	
Physical Description Colorless liquid with a chloroform-like odor.			
MW: 76.1	BP: 111°F	FRZ: -157°F	Sol: 33%
VP: 330 mmHg	IP: 10.00 eV		Sp.Gr: 0.86
Fl.P(oc): -26°F	UEL: 13.8%	LEL: 2.2%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, acids			
Measurement Methods NIOSH 1611			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2200 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, upper respiratory system; anesthesia
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl alcohol			CAS 67-56-1
CH3OH			RTECS PC1400000
Synonyms & Trade Names Carbinol, Columbian spirits, Methanol, Pyroligneous spirit, Wood alcohol, Wood naphtha, Wood spirit			DOT ID & Guide 1230 131
Exposure Limits	NIOSH REL: TWA 200 ppm (260 mg/m ³) ST 250 ppm (325 mg/m ³) [skin]		
	OSHA PEL†: TWA 200 ppm (260 mg/m ³)		
IDLH 6000 ppm		Conversion 1 ppm = 1.31 mg/m ³	
Physical Description Colorless liquid with a characteristic pungent odor.			
MW: 32.1	BP: 147°F	FRZ: -144°F	Sol: Miscible
VP: 96 mmHg	IP: 10.84 eV		Sp.Gr: 0.79
Fl.P: 52°F	UEL: 36%	LEL: 6.0%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 2000, 3800; OSHA 91			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2000 ppm : (APF = 10) Any supplied-air respirator Up to 5000 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 6000 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 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: Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, upper respiratory system; headache, drowsiness, dizziness, nausea, vomiting; visual disturbance, optic nerve damage (blindness); dermatitis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methylamine			CAS 74-89-5
CH₃NH₂			RTECS PF6300000
Synonyms & Trade Names Aminomethane, Methylamine (anhydrous), Methylamine (aqueous), Monomethylamine			DOT ID & Guide 1061 118 (anhydrous) 1235 132 (aqueous)
Exposure Limits	NIOSH REL: TWA 10 ppm (12 mg/m ³)		
	OSHA PEL: TWA 10 ppm (12 mg/m ³)		
IDLH 100 ppm		Conversion 1 ppm = 1.27 mg/m ³	
Physical Description Colorless gas with a fish- or ammonia-like odor. [Note: A liquid below 21°F. Shipped as a liquefied compressed gas.]			
MW: 31.1	BP: 21°F	FRZ: -136°F	Sol: Soluble
VP: 3.0 atm	IP: 8.97 eV	RGasD: 1.08	Sp.Gr: 0.70 (Liquid at 13°F)
Fl.P: NA (Gas) 14°F (Liquid)	UEL: 20.7%	LEL: 4.9%	
Flammable Gas Class IA Flammable Liquid			
Incompatibilities & Reactivities Mercury, strong oxidizers, nitromethane [Note: Corrosive to copper & zinc alloys, aluminum & galvanized surfaces.]			
Measurement Methods OSHA 40			
Personal Protection & Sanitation Skin: Prevent skin contact (solution)/Frostbite Eyes: Prevent eye contact (solution)/Frostbite Wash skin: When contaminated (solution) Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Irrigate immediately (solution)/Frostbite Skin: Water flush immediately (solution)/Frostbite Breathing: Respiratory support Swallow: Medical attention immediately (solution)	
Respirator Recommendations NIOSH/OSHA Up to 100 ppm: (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 = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern[£]/(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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; cough; skin, mucous membrane burns; dermatitis; conjunctivitis; liquid: frostbite

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl (n-amyl) ketone			CAS 110-43-0
CH₃CO[CH₂]₄CH₃			RTECS MJ5075000
Synonyms & Trade Names Amyl methyl ketone, n-Amyl methyl ketone, 2-Heptanone			DOT ID & Guide 1110 127
Exposure Limits	NIOSH REL: TWA 100 ppm (465 mg/m ³)		
	OSHA PEL: TWA 100 ppm (465 mg/m ³)		
IDLH 800 ppm		Conversion 1 ppm = 4.67 mg/m ³	
Physical Description Colorless to white liquid with a banana-like, fruity odor.			
MW: 114.2	BP: 305°F	FRZ: -32°F	Sol: 0.4%
VP: 3 mmHg	IP: 9.33 eV		Sp.Gr: 0.81
Fl.P: 102°F	UEL(250°F): 7.9%	LEL(151°F): 1.1%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong acids, alkalis & oxidizers [Note: Will attack some forms of plastic.]			
Measurement Methods NIOSH 1301			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 800 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, mucous membrane; headache; narcosis, coma; dermatitis
Target Organs Eyes, skin, respiratory system, central nervous system, peripheral nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl bromide			CAS 74-83-9
CH ₃ Br			RTECS PA4900000
Synonyms & Trade Names Bromomethane, Monobromomethane			DOT ID & Guide 1062 123
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: C 20 ppm (80 mg/m ³) [skin]		
IDLH Ca [250 ppm]		Conversion 1 ppm = 3.89 mg/m ³	
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: 95.0	BP: 38°F	FRZ: -137°F	Sol: 2%
VP: 1.9 atm	IP: 10.54 eV	RGasD: 3.36	Sp.Gr: 1.73 (Liquid at 32°F)
Fl.P: NA (Gas)	UEL: 16.0%	LEL: 10%	
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.]			
Measurement Methods NIOSH 2520; OSHA PV2040			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption (liquid), skin and/or eye contact (liquid)
Symptoms Irritation eyes, skin, respiratory system; muscle weakness, 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
Cancer Site [in animals: lung, kidney & forestomach tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl Cellosolve®			CAS 109-86-4
CH ₃ OCH ₂ CH ₂ OH			RTECS KL5775000
Synonyms & Trade Names EGME, Ethylene glycol monomethyl ether, Glycol monomethyl ether, 2-Methoxyethanol			DOT ID & Guide 1188 127
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.3 mg/m ³) [skin]		
	OSHA PEL: TWA 25 ppm (80 mg/m ³) [skin]		
IDLH 200 ppm		Conversion 1 ppm = 3.11 mg/m ³	
Physical Description Colorless liquid with a mild, ether-like odor.			
MW: 76.1	BP: 256°F	FRZ: -121°F	Sol: Miscible
VP: 6 mmHg	IP: 9.60 eV		Sp.Gr: 0.96
Fl.P: 102°F	UEL: 14%	LEL: 1.8%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers, caustics			
Measurement Methods NIOSH 1403; OSHA 53, 79			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 1 ppm: (APF = 10) Any supplied-air respirator* Up to 2.5 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 5 ppm: (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 100 ppm: (APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode*			

Up to 200 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

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

Symptoms Irritation eyes, nose, throat; headache, drowsiness, lassitude (weakness, exhaustion); ataxia, tremor; anemic pallor; in animals: reproductive, teratogenic effects

Target Organs Eyes, respiratory system, central nervous system, blood, kidneys, reproductive system, hematopoietic system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl Cellosolve® acetate			CAS 110-49-6
CH₃COOCH₂CH₂OCH₃			RTECS KL5950000
Synonyms & Trade Names EGMEA, Ethylene glycol monomethyl ether acetate, Glycol monomethyl ether acetate, 2-Methoxyethyl acetate			DOT ID & Guide 1189 129
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.5 mg/m ³) [skin]		
	OSHA PEL: TWA 25 ppm (120 mg/m ³) [skin]		
IDLH 200 ppm		Conversion 1 ppm = 4.83 mg/m ³	
Physical Description Colorless liquid with a mild, ether-like odor.			
MW: 118.1	BP: 293°F	FRZ: -85°F	Sol: Miscible
VP: 2 mmHg	IP: ?		Sp.Gr: 1.01
Fl.P: 120°F	UEL: 8.2%	LEL: 1.7%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1451; OSHA 53, 79			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 1 ppm: (APF = 10) Any supplied-air respirator* Up to 2.5 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 5 ppm: (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 100 ppm: (APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode*			

Up to 200 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

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

Symptoms Irritation eyes, nose, throat; kidney, brain damage; in animals: narcosis; reproductive, teratogenic effects

Target Organs Eyes, respiratory system, kidneys, brain, central nervous system, peripheral nervous system, reproductive system, hematopoietic system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl chloride		CAS 74-87-3	
CH₃Cl		RTECS PA6300000	
Synonyms & Trade Names Chloromethane, Monochloromethane		DOT ID & Guide 1063 115	
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3 hours)		
IDLH Ca [2000 ppm]		Conversion 1 ppm = 2.07 mg/m ³	
Physical Description Colorless gas with a faint, sweet odor which is not noticeable at dangerous concentrations. [Note: Shipped as a liquefied compressed gas.]			
MW: 50.5	BP: -12°F	FRZ: -144°F	Sol: 0.5%
VP: 5.0 atm	IP: 11.28 eV	RGasD: 1.78	
Fl.P: NA (Gas)	UEL: 17.4%	LEL: 8.1%	
Flammable Gas			
Incompatibilities & Reactivities Chemically-active metals such as potassium, powdered aluminum, zinc & magnesium; water [Note: Reacts with water (hydrolyzes) to form hydrochloric acid.]			
Measurement Methods NIOSH 1001			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) 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
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]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl chloroform			CAS 71-55-6
CH₃CCl₃			RTECS KJ2975000
Synonyms & Trade Names Chloroethene; 1,1,1-Trichloroethane; 1,1,1-Trichloroethane (stabilized)			DOT ID & Guide 2831 160
Exposure Limits	NIOSH REL: C 350 ppm (1900 mg/m ³) [15-minute] See Appendix C (Chloroethanes)		
	OSHA PEL†: TWA 350 ppm (1900 mg/m ³)		
IDLH 700 ppm		Conversion 1 ppm = 5.46 mg/m ³	
Physical Description Colorless liquid with a mild, chloroform-like odor.			
MW: 133.4	BP: 165°F	FRZ: -23°F	Sol: 0.4%
VP: 100 mmHg	IP: 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.]			
Measurement Methods NIOSH 1003			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) 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
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
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl-2-cyanoacrylate			CAS 137-05-3
CH₂=C(CN)COOCH₃			RTECS AS7000000
Synonyms & Trade Names Mecrylate, Methyl cyanoacrylate, Methyl alpha-cyanoacrylate, Methyl ester of 2-cyanoacrylic acid			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 2 ppm (8 mg/m ³) ST 4 ppm (16 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.54 mg/m ³	
Physical Description Colorless liquid with a characteristic odor.			
MW: 111.1	BP: ?	FRZ: ?	Sol: 30%
VP(77°F): 0.2 mmHg	IP: ?		Sp.Gr(81°F): 1.10
FLP: 174°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: FLP. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Moisture [Note: Contact with moisture causes rapid polymerization.]			
Measurement Methods OSHA 55			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: No recommendation Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose; blurred vision, lacrimation (discharge of tears); rhinitis			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methylcyclohexane			CAS 108-87-2
CH ₃ C ₆ H ₁₁			RTECS GV6125000
Synonyms & Trade Names Cyclohexylmethane, Hexahydrotoluene			DOT ID & Guide 2296 128
Exposure Limits	NIOSH REL: TWA 400 ppm (1600 mg/m ³)		
	OSHA PEL†: TWA 500 ppm (2000 mg/m ³)		
IDLH 1200 ppm [LEL]		Conversion 1 ppm = 4.02 mg/m ³	
Physical Description Colorless liquid with a faint, benzene-like odor.			
MW: 98.2	BP: 214°F	FRZ: -196°F	Sol: Insoluble
VP: 37 mmHg	IP: 9.85 eV		Sp.Gr: 0.77
Fl.P: 25°F	UEL: 6.7%	LEL: 1.2%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1500; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 1200 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; dizziness, drowsiness; in animals: narcosis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methylcyclohexanol			CAS 25639-42-3
CH₃C₆H₁₀OH			RTECS GW0175000
Synonyms & Trade Names Hexahydrocresol, Hexahydromethylphenol			DOT ID & Guide 2617 129
Exposure Limits	NIOSH REL: TWA 50 ppm (235 mg/m ³)		
	OSHA PEL†: TWA 100 ppm (470 mg/m ³)		
IDLH 500 ppm		Conversion 1 ppm = 4.67 mg/m ³	
Physical Description Straw-colored liquid with a weak odor like coconut oil.			
MW: 114.2	BP: 311-356°F	FRZ: -58°F	Sol: 4%
VP(86°F): 2 mmHg	IP: 9.80 eV		Sp.Gr: 0.92
Fl.P: 149-158°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1404			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 500 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, upper respiratory system; headache; in animals: narcosis; liver, kidney damage
Target Organs Eyes, skin, respiratory system, central nervous system, kidneys, liver
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Methylcyclohexanone			CAS 583-60-8
CH3C6H9O			RTECS GW1750000
Synonyms & Trade Names 2-Methylcyclohexanone			DOT ID & Guide 2297 127
Exposure Limits	NIOSH REL: TWA 50 ppm (230 mg/m ³) ST 75 ppm (345 mg/m ³) [skin]		
	OSHA PEL†: TWA 100 ppm (460 mg/m ³) [skin]		
IDLH 600 ppm		Conversion 1 ppm = 4.59 mg/m ³	
Physical Description Colorless liquid with a weak, peppermint-like odor.			
MW: 112.2	BP: 325°F	FRZ: 7°F	Sol: Insoluble
VP: 1 mmHg	IP: ?		Sp.Gr: 0.93
Fl.P: 118°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 2521			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 500 ppm : (APF = 10) Any supplied-air respirator* Up to 600 ppm : (APF = 25) Any supplied-air respirator 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 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms In animals: irritation eyes, mucous membrane; narcosis; dermatitis
Target Organs Skin, respiratory system, liver, kidneys, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl cyclopentadienyl manganese tricarbonyl (as Mn)			CAS 12108-13-3
CH3C5H4Mn(CO)3			RTECS OP1450000
Synonyms & Trade Names CI-2, Combustion Improver-2, Manganese tricarbonylmethylcyclopentadienyl, 2-Methylcyclopentadienyl manganese tricarbonyl, MMT			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.2 mg/m³ [skin]		
	OSHA PEL†: C 5 mg/m³		
IDLH N.D.		Conversion	
Physical Description Yellow to dark-orange liquid with a faint, pleasant odor. [Note: A solid below 36°F.]			
MW: 218.1	BP: 449°F	FRZ: 36°F	Sol: Insoluble
VP(212°F): 7 mmHg	IP: ?		Sp.Gr: 1.39
Fl.P: 230°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Light (decomposes)			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes; dizziness, nausea, headache; in animals: tremor, severe clonic spasms, lassitude (weakness, exhaustion), slow respiration; liver, kidney injury			

Target Organs Eyes, central nervous system, liver, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl demeton			CAS 8022-00-2
C ₆ H ₁₅ O ₃ PS ₂			RTECS TG1760000
Synonyms & Trade Names Demeton methyl; O,O-Dimethyl 2-ethylmercaptoethyl thiophosphate; Metasystox®; Methyl mercaptophos; Methyl systox®			DOT ID & Guide
Exposure Limits		NIOSH REL: TWA 0.5 mg/m ³ [skin] OSHA PEL†: none	
IDLH N.D.		Conversion	
Physical Description Oily, colorless to pale-yellow liquid with an unpleasant odor. [insecticide] [Note: Technical grade consists of 2 isomers: thiono & thiolo.]			
MW: 230.3	BP: Decomposes	FRZ: ?	Sol: 0.03-0.3%
VP: 0.0004 mmHg	IP: ?		Sp.Gr: 1.20
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Strong oxidizers, alkalis, water			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; ache eyes, rhinorrhea (discharge of thin mucus); nausea, headache, dizziness, vomiting			
Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system, blood cholinesterase			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

4,4'-Methylenebis(2-chloroaniline)		CAS 101-14-4	
CH2(C6H4CINH2)2		RTECS CY1050000	
Synonyms & Trade Names DACPM; 3,3'-Dichloro-4,4'-diaminodiphenylmethane; MBOCA; 4,4'-Methylenebis(o-chloro aniline); 4,4'-Methylenebis(2-chlorobenzenamine); MOCA		DOT ID & Guide	
Exposure Limits	NIOSH REL: Ca TWA 0.003 mg/m ³ [skin] See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Tan-colored pellets or flakes with a faint, amine-like odor.			
MW: 267.2	BP: ?	MLT: 230°F	Sol: Slight
VP(77°F): 0.00001 mmHg	IP: ?		Sp.Gr: 1.44
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities Chemically-active metals (e.g., potassium, sodium, magnesium, zinc)			
Measurement Methods OSHA 24, 71			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-			

contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Hematuria (blood in the urine), cyanosis, nausea, methemoglobinemia, kidney irritation; [potential occupational carcinogen]
Target Organs Liver, blood, kidneys
Cancer Site [in animals: liver, lung & bladder tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methylene bis(4-cyclohexylisocyanate)			CAS 5124-30-1
CH₂[(C₆H₁₀)NCO]₂			RTECS NQ9250000
Synonyms & Trade Names Dicyclohexylmethane 4,4'-diisocyanate; DMDI; bis(4-Isocyanatocyclohexyl)methane; HMDI; Hydrogenated MDI; Reduced MDI; Saturated MDI			DOT ID & Guide
Exposure Limits	NIOSH REL: C 0.01 ppm (0.11 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 10.73 mg/m ³	
Physical Description Clear, colorless to light-yellow liquid.			
MW: 262.4	BP: ?	FRZ: <14°F	Sol: Reacts
VP(77°F): 0.001 mmHg	IP: ?		Sp.Gr(77°F): 1.07
Fl.P: >395°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Water, ethanol, alcohols, amines, bases, acids, organotin catalysts [Note: May slowly polymerize if heated above 122°F.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 0.1 ppm : (APF = 10) Any supplied-air respirator* Up to 0.25 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 0.5 ppm : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 1 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

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

Symptoms Irritation eyes, skin, respiratory system; skin, respiratory sensitization; chest tightness, dyspnea (breathing difficulty), cough, dry throat, wheezing, pulmonary edema; skin blisters

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methylene bisphenyl isocyanate			CAS 101-68-8
CH₂(C₆H₄NCO)₂			RTECS NQ9350000
Synonyms & Trade Names 4,4'-Diphenylmethane diisocyanate; MDI; Methylene bis(4-phenyl isocyanate); Methylene di-p-phenylene ester of isocyanic acid			DOT ID & Guide 2489 156
Exposure Limits	NIOSH REL: TWA 0.05 mg/m ³ (0.005 ppm) C 0.2 mg/m ³ (0.020 ppm) [10-minute]		
	OSHA PEL: C 0.2 mg/m ³ (0.02 ppm)		
IDLH 75 mg/m ³		Conversion 1 ppm = 10.24 mg/m ³	
Physical Description White to light-yellow, odorless flakes. [Note: A liquid above 99°F.]			
MW: 250.3	BP: 597°F	MLT: 99°F	Sol: 0.2%
VP(77°F): 0.000005 mmHg	IP: ?		Sp.Gr: 1.23 (Solid at 77°F) 1.19 (Liquid at 122°F)
Fl.P: 390°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong alkalis, acids, alcohol [Note: Polymerizes at 450°F.]			
Measurement Methods NIOSH 5521, 5522; OSHA 18			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 0.5 mg/m³ : (APF = 10) Any supplied-air respirator* Up to 1.25 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 2.5 mg/m³ : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece			

Up to 75 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, nose, throat; respiratory sensitization; cough, pulmonary secretions, chest pain, dyspnea (breathing difficulty); asthma

Target Organs Eyes, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methylene chloride			CAS 75-09-2
CH ₂ Cl ₂			RTECS PA8050000
Synonyms & Trade Names Dichloromethane, Methylene dichloride			DOT ID & Guide 1593 160
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1052] TWA 25 ppm ST 125 ppm		
IDLH Ca [2300 ppm]		Conversion 1 ppm = 3.47 mg/m ³	
Physical Description Colorless liquid with a chloroform-like odor. [Note: A gas above 104°F.]			
MW: 84.9	BP: 104°F	FRZ: -139°F	Sol: 2%
VP: 350 mmHg	IP: 11.32 eV		Sp.Gr: 1.33
Fl.P: ?	UEL: 23%	LEL: 13%	
Combustible Liquid			
Incompatibilities & Reactivities Strong oxidizers; caustics; chemically-active metals such as aluminum, magnesium powders, potassium & sodium; concentrated nitric acid			
Measurement Methods NIOSH 1005, 3800; OSHA 59, 80			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numbness, 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]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

4,4'-Methylenedianiline		CAS 101-77-9	
CH₂(C₆H₄NH₂)₂		RTECS BY5425000	
Synonyms & Trade Names 4,4'-Diaminodiphenylmethane; para, para'-Diaminodiphenyl-methane; Dianilinomethane; 4,4'-Diphenylmethanediamine; MDA		DOT ID & Guide	
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1050] TWA 0.010 ppm ST 0.100 ppm		
IDLH Ca [N.D.]		Conversion	
Physical Description Pale-brown, crystalline solid with a faint, amine-like odor.			
MW: 198.3	BP: 748°F	MLT: 198°F	Sol: 0.1%
VP(77°F): 0.0000002 mmHg	IP: 10.70 eV		Sp.Gr: 1.06 (Liquid at 212°F)
Fl.P: 374°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 5029			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes; jaundice, hepatitis; myocardial damage; in animals: heart, liver, spleen damage; [potential occupational carcinogen]
Target Organs Eyes, liver, cardiovascular system, spleen
Cancer Site [in animals: bladder cancer]
See also: INTRODUCTION See ICSC CARD: 1111

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl ethyl ketone peroxide			CAS 1338-23-4
C ₈ H ₁₆ O ₄			RTECS EL9450000
Synonyms & Trade Names 2-Butanone peroxide, Ethyl methyl ketone peroxide, MEKP, MEK peroxide, Methyl ethyl ketone hydroperoxide			DOT ID & Guide 2550 147
Exposure Limits	NIOSH REL: C 0.2 ppm (1.5 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 7.21 mg/m ³	
Physical Description Colorless liquid with a characteristic odor. [Note: Explosive decomposition occurs at 230°F.]			
MW: 176.2	BP: 244°F (Decomposes)	FRZ: ?	Sol: Soluble
VP: ?	IP: ?		Sp.Gr(59°F): 1.12
Fl.P(oc): 125-200°F (60% MEKP)	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Organic materials, heat, flames, sunlight, trace contaminants [Note: A strong oxidizing agent. Pure MEKP is shock sensitive. Commercial product is diluted with 40% dimethyl phthalate, cyclohexane peroxide, or diallyl phthalate to reduce sensitivity to shock.]			
Measurement Methods NIOSH 3508; OSHA 77			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; cough, dyspnea (breathing difficulty), pulmonary edema; blurred			

vision; blisters, scars skin; abdominal pain, vomiting, diarrhea; dermatitis; in animals: liver, kidney damage
Target Organs Eyes, skin, respiratory system, liver, kidneys
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl formate			CAS 107-31-3
HCOOCH ₃			RTECS LQ8925000
Synonyms & Trade Names Methyl ester of formic acid, Methyl methanoate			DOT ID & Guide 1243 129
Exposure Limits	NIOSH REL: TWA 100 ppm (250 mg/m ³) ST 150 ppm (375 mg/m ³)		
	OSHA PEL†: TWA 100 ppm (250 mg/m ³)		
IDLH 4500 ppm		Conversion 1 ppm = 2.46 mg/m ³	
Physical Description Colorless liquid with a pleasant odor. [Note: A gas above 89°F.]			
MW: 60.1	BP: 89°F	FRZ: -148°F	Sol: 30%
VP: 476 mmHg	IP: 10.82 eV		Sp.Gr: 0.98
Fl.P: -2°F	UEL: 23%	LEL: 4.5%	
Class IA Flammable Liquid: Fl.P. below 73°F and BP below 100°F.			
Incompatibilities & Reactivities Strong oxidizers [Note: Reacts slowly with water to form methanol & formic acid.]			
Measurement Methods NIOSH S291 (II-5); OSHA PV2041			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately 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 4500 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose; chest tightness, dyspnea (breathing difficulty); visual disturbance; central nervous system depression; in animals: pulmonary edema; narcosis
Target Organs Eyes, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

5-Methyl-3-heptanone			CAS 541-85-5
C2H5COCH2CH(CH3)CH2CH3			RTECS MJ7350000
Synonyms & Trade Names Amyl ethyl ketone, Ethyl amyl ketone, 3-Methyl-5-heptanone			DOT ID & Guide 2271 127
Exposure Limits	NIOSH REL: TWA 25 ppm (130 mg/m³)		
	OSHA PEL: TWA 25 ppm (130 mg/m³)		
IDLH 100 ppm		Conversion 1 ppm = 5.24 mg/m³	
Physical Description Colorless liquid with a pungent odor.			
MW: 128.2	BP: 315°F	FRZ: -70°F	Sol: Insoluble
VP: 2 mmHg	IP: ?		Sp.Gr: 0.82
Fl.P: 138°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1301			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 100 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, mucous membrane; headache; narcosis, coma; dermatitis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl hydrazine			CAS 60-34-4
CH ₃ NHNH ₂			RTECS MV5600000
Synonyms & Trade Names MMH, Monomethylhydrazine			DOT ID & Guide 1244 131
Exposure Limits	NIOSH REL: Ca C 0.04 ppm (0.08 mg/m ³) [2-hr] See Appendix A		
	OSHA PEL: C 0.2 ppm (0.35 mg/m ³) [skin]		
IDLH Ca [20 ppm]		Conversion 1 ppm = 1.89 mg/m ³	
Physical Description Fuming, colorless liquid with an ammonia-like odor.			
MW: 46.1	BP: 190°F	FRZ: -62°F	Sol: Miscible
VP: 38 mmHg	IP: 8.00 eV		Sp.Gr(77°F): 0.87
Fl.P: 17°F	UEL: 92%	LEL: 2.5%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Oxides of iron; copper; manganese; lead; copper alloys; porous materials such as earth, asbestos, wood & cloth; strong oxidizers such as fluorine & chlorine; nitric acid; hydrogen peroxide			
Measurement Methods NIOSH 3510			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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: Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; vomiting, diarrhea, tremor, ataxia; anoxia, cyanosis; convulsions; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system, liver, blood, cardiovascular system
Cancer Site [in animals: lung, liver, blood vessel & intestine tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl iodide			CAS 74-88-4
CH₃I			RTECS PA9450000
Synonyms & Trade Names Iodomethane, Monoiodomethane			DOT ID & Guide 2644 151
Exposure Limits	NIOSH REL: Ca TWA 2 ppm (10 mg/m ³) [skin] See Appendix A		
	OSHA PEL: TWA 5 ppm (28 mg/m ³) [skin]		
IDLH Ca [100 ppm]		Conversion 1 ppm = 5.80 mg/m ³	
Physical Description Colorless liquid with a pungent, ether-like odor. [Note: Turns yellow, red, or brown on exposure to light & moisture.]			
MW: 141.9	BP: 109°F	FRZ: -88°F	Sol: 1%
VP: 400 mmHg	IP: 9.54 eV		Sp.Gr: 2.28
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Strong oxidizers [Note: Decomposes at 518°F.]			
Measurement Methods NIOSH 1014			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; nausea, vomiting; dizziness, ataxia; slurred speech, drowsiness; dermatitis; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system
Cancer Site [in animals: lung, kidney & forestomach tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl isoamyl ketone			CAS 110-12-3
CH₃COCH₂CH₂CH(CH₃)₂			RTECS MP3850000
Synonyms & Trade Names Isoamyl methyl ketone, Isopentyl methyl ketone, 2-Methyl-5-hexanone, 5-Methyl-2-hexanone, MIAK			DOT ID & Guide 2302 127
Exposure Limits	NIOSH REL: TWA 50 ppm (240 mg/m ³)		
	OSHA PEL†: TWA 100 ppm (475 mg/m ³)		
IDLH N.D.		Conversion 1 ppm = 4.67 mg/m ³	
Physical Description Colorless, clear liquid with a pleasant, fruity odor.			
MW: 114.2	BP: 291°F	FRZ: -101°F	Sol: 0.5%
VP: 5 mmHg	IP: 9.284 eV		Sp.Gr: 0.81
Fl.P: 97°F	UEL(200°F): 8.2%	LEL(200°F): 1.0%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods OSHA PV2042			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush promptly 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 1250 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 2500 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 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 5000 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

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

Symptoms Irritation eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl isobutyl carbinol			CAS 108-11-2
(CH ₃) ₂ CHCH ₂ CH(OH)CH ₃			RTECS SA7350000
Synonyms & Trade Names Isobutylmethylcarbinol, Methyl amyl alcohol, 4-Methyl-2-pentanol, MIBC			DOT ID & Guide 2053 129
Exposure Limits	NIOSH REL: TWA 25 ppm (100 mg/m ³) ST 40 ppm (165 mg/m ³) [skin]		
	OSHA PEL†: TWA 25 ppm (100 mg/m ³) [skin]		
IDLH 400 ppm		Conversion 1 ppm = 4.18 mg/m ³	
Physical Description Colorless liquid with a mild odor.			
MW: 102.2	BP: 271°F	FRZ: -130°F	Sol: 2%
VP: 3 mmHg	IP: ?		Sp.Gr: 0.81
Fl.P: 106°F	UEL: 5.5%	LEL: 1.0%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1402; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 250 ppm : (APF = 10) Any supplied-air respirator* Up to 400 ppm : (APF = 25) Any supplied-air respirator 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 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; headache, drowsiness; dermatitis; in animals: narcosis
Target Organs Eyes, skin, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl isocyanate			CAS 624-83-9
CH ₃ NCO			RTECS NQ9450000
Synonyms & Trade Names Methyl ester of isocyanic acid, MIC			DOT ID & Guide 2480 155
Exposure Limits	NIOSH REL: TWA 0.02 ppm (0.05 mg/m ³) [skin]		
	OSHA PEL: TWA 0.02 ppm (0.05 mg/m ³) [skin]		
IDLH 3 ppm		Conversion 1 ppm = 2.34 mg/m ³	
Physical Description Colorless liquid with a sharp, pungent odor.			
MW: 57.1	BP: 139°F	FRZ: -49°F	Sol(59°F): 10%
VP: 348 mmHg	IP: 10.67 eV		Sp.Gr: 0.96
Fl.P: 19°F	UEL: 26%	LEL: 5.3%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Water, oxidizers, acids, alkalis, amines, iron, tin, copper [Note: Usually contains inhibitors to prevent polymerization.]			
Measurement Methods OSHA 54			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.2 ppm: (APF = 10) Any supplied-air respirator* Up to 0.5 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 1 ppm: (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 3 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; respiratory sensitization, cough, pulmonary secretions, chest pain, dyspnea (breathing difficulty); asthma; eye, skin damage; in animals: pulmonary edema
Target Organs Eyes, skin, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl isopropyl ketone			CAS 563-80-4
CH₃COCH(CH₃)₂			RTECS EL9100000
Synonyms & Trade Names 2-Acetyl propane, Isopropyl methyl ketone, 3-Methyl-2-butanone, 3-Methyl butan-2-one, MIPK			DOT ID & Guide 2397 127
Exposure Limits	NIOSH REL: TWA 200 ppm (705 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D. See: IDLH INDEX		Conversion 1 ppm = 3.53 mg/m ³	
Physical Description Colorless liquid with an acetone-like odor.			
MW: 86.2	BP: 199°F	FRZ: -134°F	Sol: Very slight
VP: 42 mmHg	IP: 9.32 eV		Sp.Gr: 0.81
FLP: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane, respiratory system; cough			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl mercaptan			CAS 74-93-1
CH₃SH			RTECS PB4375000
Synonyms & Trade Names Mercaptomethane, Methanethiol, Methyl sulfhydrate			DOT ID & Guide 1064 117
Exposure Limits	NIOSH REL: C 0.5 ppm (1 mg/m ³) [15-minute]		
	OSHA PEL†: C 10 ppm (20 mg/m ³)		
IDLH 150 ppm		Conversion 1 ppm = 1.97 mg/m ³	
Physical Description Colorless gas with a disagreeable odor like garlic or rotten cabbage. [Note: A liquid below 43°F. Shipped as a liquefied compressed gas.]			
MW: 48.1	BP: 43°F	FRZ: -186°F	Sol: 2%
VP: 1.7 atm	IP: 9.44 eV	RGasD: 1.66	Sp.Gr: 0.90 (Liquid at 32°F)
Fl.P: NA (Gas) (oc) 0°F (Liquid)	UEL: 21.8%	LEL: 3.9%	
Flammable Gas Class IA Flammable Liquid			
Incompatibilities & Reactivities Strong oxidizers, bleaches, copper, aluminum, nickel-copper alloys			
Measurement Methods NIOSH 2542; OSHA 26			
Personal Protection & Sanitation Skin: Prevent skin contact (liquid)/Frostbite Eyes: Prevent eye contact (liquid)/Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Eyewash (liquid), Quick drench (liquid), Frostbite		First Aid (See procedures) Eye: Irrigate immediately (liquid)/Frostbite Skin: Water flush immediately (liquid)/Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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 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 150 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

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

Symptoms Irritation eyes, skin, respiratory system; narcosis; cyanosis; convulsions; liquid: frostbite

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl methacrylate			CAS 80-62-6
CH₂=C(CH₃)COOCH₃			RTECS OZ5075000
Synonyms & Trade Names Methacrylate monomer, Methyl ester of methacrylic acid, Methyl-2-methyl-2-propenoate			DOT ID & Guide 1247 129P (inhibited)
Exposure Limits	NIOSH REL: TWA 100 ppm (410 mg/m ³)		
	OSHA PEL: TWA 100 ppm (410 mg/m ³)		
IDLH 1000 ppm		Conversion 1 ppm = 4.09 mg/m ³	
Physical Description Colorless liquid with an acrid, fruity odor.			
MW: 100.1	BP: 214°F	FRZ: -54°F	Sol: 1.5%
VP: 29 mmHg	IP: 9.70 eV		Sp.Gr: 0.94
Fl.P(oc): 50°F	UEL: 8.2%	LEL: 1.7%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Nitrates, oxidizers, peroxides, strong alkalis, moisture [Note: May polymerize if subjected to heat, oxidizers, or ultraviolet light. Usually contains an inhibitor such as hydroquinone.]			
Measurement Methods NIOSH 2537; OSHA 94			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support 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 = 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

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

Symptoms Irritation eyes, skin, nose, throat; dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl parathion			CAS 298-00-0
(CH3O)2P(S)OC6H4NO2			RTECS TG0175000
Synonyms & Trade Names Azophos®; O,O-Dimethyl-O-p-nitrophenylphosphorothioate; Parathion methyl			DOT ID & Guide 2783 152
Exposure Limits	NIOSH REL: TWA 0.2 mg/m³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White to tan, crystalline solid or powder with a pungent, garlic-like odor. [pesticide] [Note: The commercial product in xylene is a tan liquid.]			
MW: 263.2	BP: 289°F	MLT: 99°F	Sol(77°F): 0.006%
VP: 0.00001 mmHg	IP: ?		Sp.Gr: 1.36
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, water [Note: Explosive risk when heated above 122°F.]			
Measurement Methods NIOSH 5600			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 2 mg/m³: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter/(APF = 10) Any supplied-air respirator Up to 5 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter Up to 10 mg/m³: (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas			

mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(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 200 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin; nausea, vomiting, abdominal cramps, diarrhea, salivation; headache, dizziness, lassitude (weakness, exhaustion); rhinorrhea (discharge of thin mucus), chest tightness; blurred vision, miosis; cardiac irregularities; muscle fasciculation; dyspnea (breathing difficulty)

Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system, blood cholinesterase

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Methyl silicate			CAS 681-84-5
(CH3O)4Si			RTECS VV9800000
Synonyms & Trade Names Methyl orthosilicate, Tetramethoxysilane, Tetramethyl ester of silicic acid, Tetramethyl silicate			DOT ID & Guide 2606 155
Exposure Limits	NIOSH REL: TWA 1 ppm (6 mg/m³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 6.23 mg/m³	
Physical Description Clear, colorless liquid. [Note: A solid below 28°F.]			
MW: 152.3	BP: 250°F	FRZ: 28°F	Sol: Soluble
VP(77°F): 12 mmHg	IP: ?		Sp.Gr: 1.02
Fl.P: 205°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Oxidizers; hexafluorides of rhenium, molybdenum & tungsten			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: No recommendation Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, corneal damage (following even short-term exposure to the vapor); lung, kidney injury; pulmonary edema			
Target Organs Eyes, respiratory system, kidneys			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

alpha-Methyl styrene			CAS 98-83-9
C6H5C(CH3)=CH2			RTECS WL5075300
Synonyms & Trade Names AMS, Isopropenyl benzene, 1-Methyl-1-phenylethylene, 2-Phenyl propylene			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 50 ppm (240 mg/m³) ST 100 ppm (485 mg/m³)		
	OSHA PEL†: C 100 ppm (480 mg/m³)		
IDLH 700 ppm		Conversion 1 ppm = 4.83 mg/m³	
Physical Description Colorless liquid with a characteristic odor.			
MW: 118.2	BP: 330°F	FRZ: -10°F	Sol: Insoluble
VP: 2 mmHg	IP: 8.35 eV		Sp.Gr: 0.91
Fl.P: 129°F	UEL: 6.1%	LEL: 1.9%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Oxidizers, peroxides, halogens, catalysts for vinyl or ionic polymers; aluminum, iron chloride, copper [Note: Usually contains an inhibitor such as tert-butyl catechol.]			
Measurement Methods NIOSH 1501; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly 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

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

Symptoms Irritation eyes, skin, nose, throat; drowsiness; dermatitis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Metribuzin			CAS 21087-64-9
C ₈ H ₁₄ N ₄ OS			RTECS XZ2990000
Synonyms & Trade Names 4-Amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless, crystalline solid. [herbicide]			
MW: 214.3	BP: ?	MLT: 257°F	Sol: 0.1%
VP: 0.0000004 mmHg	IP: ?		Sp.Gr: 1.31
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods OSHA PV2044			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms In animals: central nervous system depression; thyroid, liver enzyme changes			
Target Organs central nervous system, thyroid, liver			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Mica (containing less than 1% quartz)			CAS 12001-26-2
			RTECS VV8760000
Synonyms & Trade Names Biotite, Lepidolite, Margarite, Muscovite, Phlogopite, Roscoelite, Zimmwaldite			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 3 mg/m ³ (resp)		
	OSHA PEL†: TWA 20 mppcf		
IDLH 1500 mg/m ³		Conversion	
Physical Description Colorless, odorless flakes or sheets of hydrous silicates.			
MW: 797 (approx)	BP: ?	MLT: ?	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.6-3.2
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations NIOSH Up to 15 mg/m³ : (APF = 5) Any dust and mist respirator Up to 30 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 75 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter Up to 150 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate			

filter/(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 1500 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes; pneumoconiosis, cough, dyspnea (breathing difficulty); lassitude (weakness, exhaustion); weight loss

Target Organs respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Mineral wool fiber		CAS	
		RTECS PY8070000	
Synonyms & Trade Names Manmade mineral fibers, Rock wool, Slag wool, Synthetic vitreous fibers [Note: Produced by blowing steam or air through molten rock (rock wool) or various furnace slags that are by-products of metal smelting or refining processes (slag wool).]		DOT ID & Guide	
Exposure Limits	NIOSH REL: TWA 3 fibers/cm ³ (fibers 3.5 m diameter & 10 m in length) TWA 5 mg/m ³ (total)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Typically, a mineral "wool" with diameters >0.5 m & >1.5 m in length.			
MW: varies	BP: NA	MLT: ?	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Fibers			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0500, 7400			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations NIOSH Up to 5X REL: (APF = 5) Any dust respirator Up to 10X REL: (APF = 10) Any dust respirator except single-use and quarter-mask respirators/(APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator Up to 25X REL: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust filter			

Up to 50X REL: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 1000X REL: (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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, skin, respiratory system; dyspnea (breathing difficulty)

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Molybdenum			CAS 7439-98-7
Mo			RTECS QA4680000
Synonyms & Trade Names Molybdenum metal			DOT ID & Guide
Exposure Limits	NIOSH REL*: See Appendix D [*Note: The REL also applies to other insoluble molybdenum compounds (as Mo).]		
	OSHA PEL*†: TWA 15 mg/m ³ [*Note: The PEL also applies to other insoluble molybdenum compounds (as Mo).]		
IDLH 5000 mg/m ³ (as Mo)		Conversion	
Physical Description Dark gray or black powder with a metallic luster.			
MW: 95.9	BP: 8717°F	MLT: 4752°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 10.28
Fl.P: NA	UEL: NA	LEL: NA	
Combustible Solid in form of dust or powder.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 7300; OSHA ID121, ID125G			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations OSHA Up to 75 mg/m³ : (APF = 5) Any dust and mist respirator^ Up to 150 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators^/(APF = 10) Any supplied-air respirator Up to 375 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter^			

Up to 750 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 5000 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms In animals: irritation eyes, nose, throat; anorexia, diarrhea, weight loss; listlessness; liver, kidney damage

Target Organs Eyes, respiratory system, liver, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Molybdenum (soluble compounds, as Mo)		CAS	
		RTECS	
Synonyms & Trade Names Synonyms vary depending upon the specific soluble molybdenum compound.		DOT ID & Guide	
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL: TWA 5 mg/m ³		
IDLH 1000 mg/m ³ (as Mo)		Conversion	
Physical Description Appearance and odor vary depending upon the specific soluble molybdenum compound.			
Properties vary depending upon the specific soluble molybdenum compound.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 7300; OSHA ID121, ID125G			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations OSHA Up to 25 mg/m³ : (APF = 5) Any dust and mist respirator* Up to 50 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(APF = 10) Any supplied-air respirator* Up to 125 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter*			

<p>Up to 250 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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</p> <p>Up to 1000 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</p> <p>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</p> <p>Escape: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus</p>
<p>Exposure Routes inhalation, ingestion, skin and/or eye contact</p>
<p>Symptoms In animals: irritation eyes, nose, throat; anorexia; incoordination; dyspnea (breathing difficulty); anemia</p>
<p>Target Organs Eyes, respiratory system, kidneys, blood</p>
<p>See also: INTRODUCTION</p>

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Monocrotophos			CAS 6923-22-4
C7H14NO5P			RTECS TC4375000
Synonyms & Trade Names 3-Hydroxy-N-methylcrotonamide dimethylphosphate, Monocron			DOT ID & Guide 2783 152 (organophosphorus pesticide, solid)
Exposure Limits	NIOSH REL: TWA 0.25 mg/m³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless to reddish-brown solid with a mild, ester odor. [insecticide]			
MW: 223.2	BP: 257°F	MLT: 129°F	Sol: Miscible
VP: 0.000007 mmHg	IP: ?		Sp.Gr: ?
Fl.P: >200°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Metals, low molecular weight alcohols & glycols [Note: Corrosive to black iron, drum steel, stainless steel 304 & brass. Should be stored at 70-80°F.]			
Measurement Methods NIOSH 5600; OSHA PV2045			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, miosis, blurred vision; dizziness, convulsions; dyspnea (breathing difficulty); salivation, abdominal cramps, nausea, diarrhea, vomiting; in animals: possible teratogenic effects			

Target Organs Eyes, respiratory system, central nervous system, cardiovascular system, blood cholinesterase, reproductive system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Monomethyl aniline			CAS 100-61-8
C ₆ H ₅ NHCH ₃			RTECS BY4550000
Synonyms & Trade Names MA, (Methylamino)benzene, N-Methyl aniline, Methylphenylamine, N-Phenylmethylaniline			DOT ID & Guide 2294 153
Exposure Limits	NIOSH REL: TWA 0.5 ppm (2 mg/m ³) [skin]		
	OSHA PEL†: TWA 2 ppm (9 mg/m ³) [skin]		
IDLH 100 ppm		Conversion 1 ppm = 4.38 mg/m ³	
Physical Description Yellow to light-brown liquid with a weak, ammonia-like odor.			
MW: 107.2	BP: 384°F	FRZ: -71°F	Sol: Insoluble
VP: 0.3 mmHg	IP: 7.32 eV		Sp.Gr: 0.99
Fl.P: 175°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong acids, strong oxidizers			
Measurement Methods NIOSH 3511			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any supplied-air respirator Up to 12.5 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 25 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 100 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Lassitude (weakness, exhaustion), dizziness, headache; dyspnea (breathing difficulty), cyanosis; methemoglobinemia; pulmonary edema; liver, kidney damage

Target Organs respiratory system, liver, kidneys, blood, central nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Morpholine			CAS 110-91-8
C4H9ON			RTECS QD6475000
Synonyms & Trade Names Diethylene imidoxide; Diethylene oximide; Tetrahydro-1,4-oxazine; Tetrahydro-p-oxazine			DOT ID & Guide 1760 154 (aqueous) 2054 132
Exposure Limits	NIOSH REL: TWA 20 ppm (70 mg/m³) ST 30 ppm (105 mg/m³) [skin]		
	OSHA PEL†: TWA 20 ppm (70 mg/m³) [skin]		
IDLH 1400 ppm [10%LEL]		Conversion 1 ppm = 3.56 mg/m³	
Physical Description Colorless liquid with a weak, ammonia- or fish-like odor. [Note: A solid below 23°F.]			
MW: 87.1	BP: 264°F	FRZ: 23°F	Sol: Miscible
VP: 6 mmHg	IP: 8.88 eV		Sp.Gr: 1.007
Fl.P(oc): 98°F	UEL: 11.2%	LEL: 1.4%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong acids, strong oxidizers, metals, nitro compounds [Note: Corrosive to metals.]			
Measurement Methods NIOSH S150 (II-3)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Eyewash (>15%), Quick drench (>25%)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 500 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 1000 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 1400 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

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

Symptoms Irritation eyes, skin, nose, respiratory system; visual disturbance; cough; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Naphtha (coal tar)			CAS 8030-30-6
			RTECS DE3030000
Synonyms & Trade Names Crude solvent coal tar naphtha, High solvent naphtha, Naphtha			DOT ID & Guide 1256 128 (solvent) 2553 128
Exposure Limits	NIOSH REL: TWA 100 ppm (400 mg/m ³)		
	OSHA PEL: TWA 100 ppm (400 mg/m ³)		
IDLH 1000 ppm [10%LEL]		Conversion 1 ppm = 4.50 mg/m ³ (approx)	
Physical Description Reddish-brown, mobile liquid with an aromatic odor.			
MW: 110 (approx)	BP: 320-428°F	FRZ: ?	Sol: Insoluble
VP: <5 mmHg	IP: ?		Sp.Gr: 0.89-0.97
Fl.P: 100-109°F	UEL: ?	LEL: 1.0%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1550			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support 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 = 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

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

Symptoms Irritation eyes, skin, nose; dizziness, drowsiness; dermatitis; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Naphthalene			CAS 91-20-3
C ₁₀ H ₈			RTECS QJ0525000
Synonyms & Trade Names Naphthalin, Tar camphor, White tar			DOT ID & Guide 1334 133 (crude or refined) 2304 133 (molten)
Exposure Limits	NIOSH REL: TWA 10 ppm (50 mg/m ³) ST 15 ppm (75 mg/m ³)		
	OSHA PEL†: TWA 10 ppm (50 mg/m ³)		
IDLH 250 ppm		Conversion 1 ppm = 5.24 mg/m ³	
Physical Description Colorless to brown solid with an odor of mothballs. [Note: Shipped as a molten solid.]			
MW: 128.2	BP: 424°F	MLT: 176°F	Sol: 0.003%
VP: 0.08 mmHg	IP: 8.12 eV		Sp.Gr: 1.15
Fl.P: 174°F	UEL: 5.9%	LEL: 0.9%	
Combustible Solid, but will take some effort to ignite.			
Incompatibilities & Reactivities Strong oxidizers, chromic anhydride			
Measurement Methods NIOSH 1501; OSHA 35			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) 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 chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust and mist filter*/(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 chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust and mist 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Naphthalene diisocyanate			CAS 3173-72-6
C ₁₀ H ₆ (NCO) ₂			RTECS NQ9600000
Synonyms & Trade Names 1,5-Diisocyanatonaphthalene; 1,5-Naphthalene diisocyanate; 1,5-Naphthalene ester of isocyanic acid; NDI			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.040 mg/m ³ (0.005 ppm) C 0.170 mg/m ³ (0.020 ppm) [10-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 8.60 mg/m ³	
Physical Description White to light-yellow, crystalline flakes.			
MW: 210.2	BP: 505°F	MLT: 261°F	Sol: ?
VP(75°F): 0.003 mmHg	IP: ?		Sp.Gr: ?
Fl.P(oc): 311°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods OSHA PV2046			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 0.05 ppm : (APF = 10) Any supplied-air respirator* Up to 0.125 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 0.25 ppm : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 1 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

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

Symptoms Irritation eyes, nose, throat; respiratory sensitization, cough, pulmonary secretions, chest pain, dyspnea (breathing difficulty); asthma

Target Organs Eyes, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

alpha-Naphthylamine			CAS 134-32-7
C ₁₀ H ₇ NH ₂			RTECS QM1400000
Synonyms & Trade Names 1-Aminonaphthalene, 1-Naphthylamine			DOT ID & Guide 2077 153
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1004] See Appendix B		
IDLH Ca [N.D.]		Conversion	
Physical Description Colorless crystals with an ammonia-like odor. [Note: Darkens in air to a reddish-purple color.]			
MW: 143.2	BP: 573°F	MLT: 122°F	Sol: 0.002%
VP(220°F): 1 mmHg	IP: 7.30 eV		Sp.Gr: 1.12
Fl.P: 315°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Oxidizes in air			
Measurement Methods NIOSH 5518; OSHA 93			
Personal Protection & Sanitation 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) 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Dermatitis; hemorrhagic cystitis; dyspnea (breathing difficulty), ataxia, methemoglobinemia; hematuria (blood in the urine); dysuria; [potential occupational carcinogen]
Target Organs Bladder, skin
Cancer Site [bladder cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

beta-Naphthylamine			CAS 91-59-8
C ₁₀ H ₇ NH ₂			RTECS QM2100000
Synonyms & Trade Names 2-Aminonaphthalene, 2-Naphthylamine			DOT ID & Guide 1650 153
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1009] See Appendix B		
IDLH Ca [N.D.]		Conversion	
Physical Description Odorless, white to red crystals with a faint, aromatic odor. [Note: Darkens in air to a reddish-purple color.]			
MW: 143.2	BP: 583°F	MLT: 232°F	Sol: Miscible in hot water
VP(226°F): 1 mmHg	IP: 9.71 eV		Sp.Gr(208°F): 1.06
Fl.P: 315°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 5518; OSHA 93			
Personal Protection & Sanitation 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) 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Dermatitis; hemorrhagic cystitis; dyspnea (breathing difficulty); ataxia; methemoglobinemia, hematuria (blood in the urine); dysuria; [potential occupational carcinogen]
Target Organs Bladder, skin
Cancer Site [bladder cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Niax® Catalyst ESN			CAS 62765-93-9
			RTECS QR3900000
Synonyms & Trade Names None [Note: A mixture of 95% dimethylaminopropionitrile & 5% bis(2-dimethylamino)ethyl ether.]			DOT ID & Guide
Exposure Limits	NIOSH REL: See Appendix C		
	OSHA PEL: See Appendix C		
IDLH N.D.		Conversion	
Physical Description A liquid mixture. [Note: Used in the past as a catalyst in the manufacture of flexible polyurethane foams.			
MW: mixture	BP: ?	FRZ: ?	Sol: ?
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities Oxidizers			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) 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			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; urinary disturbance; neurological disorders; pins & needles in hands & feet; muscle weakness, lassitude (weakness, exhaustion), nausea, vomiting; decreased nerve conduction in lower legs
Target Organs Eyes, skin, urinary tract, peripheral nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nickel carbonyl			CAS 13463-39-3
Ni(CO) ₄			RTECS QR6300000
Synonyms & Trade Names Nickel tetracarbonyl, Tetracarbonyl nickel			DOT ID & Guide 1259 131
Exposure Limits	NIOSH REL: Ca TWA 0.001 ppm (0.007 mg/m ³) See Appendix A		
	OSHA PEL: TWA 0.001 ppm (0.007 mg/m ³)		
IDLH Ca [2 ppm]		Conversion 1 ppm = 6.98 mg/m ³	
Physical Description Colorless to yellow liquid with a musty odor. [Note: A gas above 110°F.]			
MW: 170.7	BP: 110°F	FRZ: -13°F	Sol: 0.05%
VP: 315 mmHg	IP: 8.28 eV		Sp.Gr(63°F): 1.32
Fl.P: <-4°F	UEL: ?	LEL: 2%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Nitric acid, bromine, chlorine & other oxidizers; flammable materials			
Measurement Methods NIOSH 6007			
Personal Protection & Sanitation 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) 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-			

contained breathing apparatus
Exposure Routes inhalation, ingestion, skin absorption, skin and/or eye contact
Symptoms Headache, dizziness; nausea, vomiting, epigastric pain; substernal pain; cough, hyperpnea; cyanosis; lassitude (weakness, exhaustion); leukocytosis (increased blood leukocytes), pneumonitis; delirium, convulsions; [potential occupational carcinogen]; in animals: reproductive, teratogenic effects
Target Organs Lungs, paranasal sinus, central nervous system, reproductive system
Cancer Site [lung & nasal cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nickel metal and other compounds (as Ni)			CAS 7440-02-0 (Metal)
Ni (Metal)			RTECS QR5950000 (Metal)
Synonyms & Trade Names Nickel metal: Elemental nickel, Nickel catalyst Synonyms of other nickel compounds vary depending upon the specific compound.			DOT ID & Guide
Exposure Limits	NIOSH REL*: Ca TWA 0.015 mg/m ³ See Appendix A [*Note: The REL does not apply to Nickel carbonyl.]		
	OSHA PEL*†: TWA 1 mg/m ³ [*Note: The PEL does not apply to Nickel carbonyl.]		
IDLH Ca [10 mg/m ³ (as Ni)]		Conversion	
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			
Measurement Methods NIOSH 7300; OSHA ID121, ID125G			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
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]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nicotine			CAS 54-11-5
C ₅ H ₄ NC ₄ H ₇ NCH ₃			RTECS QS5250000
Synonyms & Trade Names 3-(1-Methyl-2-pyrrolidyl)pyridine			DOT ID & Guide 1654 151
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³ [skin]		
	OSHA PEL: TWA 0.5 mg/m ³ [skin]		
IDLH 5 mg/m ³		Conversion	
Physical Description Pale-yellow to dark-brown liquid with a fish-like odor when warm. [insecticide]			
MW: 162.2	BP: 482°F (Decomposes)	FRZ: -110°F	Sol: Miscible
VP: 0.08 mmHg	IP: 8.01 eV		Sp.Gr: 1.01
Fl.P: 203°F	UEL: 4.0%	LEL: 0.7%	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids			
Measurement Methods NIOSH 2544, 2551			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m³ : (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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Nausea, salivation, abdominal pain, vomiting, diarrhea; headache, dizziness, hearing, visual disturbance; confusion, lassitude (weakness, exhaustion), incoordination; cardiac arrhythmias; convulsions, dyspnea (breathing difficulty); in animals: teratogenic effects
Target Organs central nervous system, cardiovascular system, lungs, gastrointestinal tract, reproductive system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nitric acid			CAS 7697-37-2
HNO ₃			RTECS QU5775000
Synonyms & Trade Names Aqua fortis, Engravers acid, Hydrogen nitrate, Red fuming nitric acid (RFNA), White fuming nitric acid (WFNA)			DOT ID & Guide 1760 154 (</=40% acid) 2031 157 (>40% acid) 2032 157 (fuming)
Exposure Limits	NIOSH REL: TWA 2 ppm (5 mg/m ³) ST 4 ppm (10 mg/m ³)		
	OSHA PEL†: TWA 2 ppm (5 mg/m ³)		
IDLH 25 ppm		Conversion 1 ppm = 2.58 mg/m ³	
Physical Description Colorless, yellow, or red, fuming liquid with an acrid, suffocating odor. [Note: Often used in an aqueous solution. Fuming nitric acid is concentrated nitric acid that contains dissolved nitrogen dioxide.]			
MW: 63.0	BP: 181°F	FRZ: -44°F	Sol: Miscible
VP: 48 mmHg	IP: 11.95 eV		Sp.Gr(77°F): 1.50
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but increases the flammability of combustible materials.			
Incompatibilities & Reactivities Combustible materials, metallic powders, hydrogen sulfide, carbides, alcohols [Note: Reacts with water to produce heat. Corrosive to metals.]			
Measurement Methods NIOSH 7903; OSHA ID165SG			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash (pH<2.5), Quick drench (pH<2.5)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 25 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(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 concernⁱ/(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 canister providing protection against the compound of concernⁱ/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; delayed pulmonary edema, pneumonitis, bronchitis; dental erosion

Target Organs Eyes, skin, respiratory system, teeth

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nitric oxide			CAS 10102-43-9
NO			RTECS QX0525000
Synonyms & Trade Names Mononitrogen monoxide, Nitrogen monoxide			DOT ID & Guide 1660 124
Exposure Limits	NIOSH REL: TWA 25 ppm (30 mg/m ³)		
	OSHA PEL: TWA 25 ppm (30 mg/m ³)		
IDLH 100 ppm		Conversion 1 ppm = 1.23 mg/m ³	
Physical Description Colorless gas. [Note: Shipped as a nonliquefied compressed gas.]			
MW: 30.0	BP: -241°F	FRZ: -263°F	Sol: 5%
VP: 34.2 atm	IP: 9.27 eV	RGasD: 1.04	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas, but will accelerate the burning of combustible materials.			
Incompatibilities & Reactivities Fluorine, combustible materials, ozone, NH ₃ , chlorinated hydrocarbons, metals, carbon disulfide [Note: Reacts with water to form nitric acid. Rapidly converted in air to nitrogen dioxide.]			
Measurement Methods NIOSH 6014; OSHA ID190			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 100 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern ¹ /(APF = 25) Any powered, air-purifying respirator with 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 ¹ /(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 canister providing protection against the compound of concern⁶/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation

Symptoms Irritation eyes, wet skin, nose, throat; drowsiness, unconsciousness; methemoglobinemia

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

p-Nitroaniline			CAS 100-01-6
NO₂C₆H₄NH₂			RTECS BY7000000
Synonyms & Trade Names para-Aminonitrobenzene, 4-Nitroaniline, 4-Nitrobenzenamine, p-Nitrophenylamine, PNA			DOT ID & Guide 1661 153
Exposure Limits	NIOSH REL: TWA 3 mg/m ³ [skin]		
	OSHA PEL†: TWA 6 mg/m ³ (1 ppm) [skin]		
IDLH 300 mg/m ³		Conversion	
Physical Description Bright yellow, crystalline powder with a slight ammonia-like odor.			
MW: 138.1	BP: 630°F	MLT: 295°F	Sol: 0.08%
VP: 0.00002 mmHg	IP: 8.85 eV		Sp.Gr: 1.42
Fl.P: 390°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, strong reducers [Note: May result in spontaneous heating of organic materials in the presence of moisture.]			
Measurement Methods NIOSH 5033			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 30 mg/m ³ : (APF = 10) Any supplied-air respirator* Up to 75 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 150 mg/m ³ : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece			

Up to 300 mg/m : (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 in combination with a dust, mist, and fume filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation nose, throat; cyanosis, ataxia; tachycardia, tachypnea; dyspnea (breathing difficulty); irritability; vomiting, diarrhea; convulsions; respiratory arrest; anemia; methemoglobinemia; jaundice

Target Organs respiratory system, blood, heart, liver

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nitrobenzene			CAS 98-95-3
C6H5NO2			RTECS DA6475000
Synonyms & Trade Names Essence of mirbane, Nitrobenzol, Oil of mirbane			DOT ID & Guide 1662 152
Exposure Limits	NIOSH REL: TWA 1 ppm (5 mg/m ³) [skin]		
	OSHA PEL: TWA 1 ppm (5 mg/m ³) [skin]		
IDLH 200 ppm		Conversion 1 ppm = 5.04 mg/m ³	
Physical Description Yellow, oily liquid with a pungent odor like paste shoe polish. [Note: A solid below 42°F.]			
MW: 123.1	BP: 411°F	FRZ: 42°F	Sol: 0.2%
VP(77°F): 0.3 mmHg	IP: 9.92 eV		Sp.Gr: 1.20
Fl.P: 190°F	UEL: ?	LEL(200°F): 1.8%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Concentrated nitric acid, nitrogen tetroxide, caustics, phosphorus pentachloride, chemically-active metals such as tin or zinc			
Measurement Methods NIOSH 2005, 2017			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: No recommendation Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA 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 200 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

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

Symptoms Irritation eyes, skin; anoxia; dermatitis; anemia; methemoglobinemia; in animals: liver, kidney damage; testicular effects

Target Organs Eyes, skin, blood, liver, kidneys, cardiovascular system, reproductive system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

4-Nitrobiphenyl			CAS 92-93-3
C ₆ H ₅ C ₆ H ₄ NO ₂			RTECS DV5600000
Synonyms & Trade Names p-Nitrobiphenyl, p-Nitrodiphenyl, 4-Nitrodiphenyl, p-Phenylnitrobenzene, 4-Phenylnitrobenzene, PNB			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1003] See Appendix B		
IDLH Ca [N.D.]		Conversion	
Physical Description White to yellow, needle-like, crystalline solid with a sweetish odor.			
MW: 199.2	BP: 644°F	MLT: 237°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: 290°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong reducers			
Measurement Methods NIOSH P&CAM273 (II-4)			
Personal Protection & Sanitation 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) 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 with a high-efficiency particulate filter/Any			

appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Headache, drowsiness, dizziness; dyspnea (breathing difficulty); ataxia, lassitude (weakness, exhaustion); methemoglobinemia; urinary burning; acute hemorrhagic cystitis; [potential occupational carcinogen]
Target Organs Bladder, blood
Cancer Site [in animals: bladder tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

p-Nitrochlorobenzene			CAS 100-00-5
ClC₆H₄NO₂			RTECS CZ1050000
Synonyms & Trade Names p-Chloronitrobenzene, 4-Chloronitrobenzene, 1-Chloro-4-nitrobenzene, 4-Nitrochlorobenzene, PCNB, PNCB			DOT ID & Guide 1578 152
Exposure Limits	NIOSH REL: Ca See Appendix A [skin]		
	OSHA PEL: TWA 1 mg/m ³ [skin]		
IDLH Ca [100 mg/m ³]		Conversion	
Physical Description Yellow, crystalline solid with a sweet odor.			
MW: 157.6	BP: 468°F	MLT: 182°F	Sol: Slight
VP(86°F): 0.2 mmHg	IP: 9.96 eV		Sp.Gr: 1.52
Fl.P: 261°F	UEL: ?	LEL: ?	
Solid that does not burn, or burns with difficulty.			
Incompatibilities & Reactivities Strong oxidizers, alkalis			
Measurement Methods NIOSH 2005			
Personal Protection & Sanitation 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) 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 with a high-efficiency particulate filter/Any			

appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Anoxia; unpleasant taste; anemia; methemoglobinemia; in animals: hematuria (blood in the urine); spleen, kidney, bone marrow changes; reproductive effects; [potential occupational carcinogen]
Target Organs Blood, liver, kidneys, cardiovascular system, spleen, bone marrow, reproductive system
Cancer Site [in animals: vascular & liver tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nitroethane			CAS 79-24-3
CH ₃ CH ₂ NO ₂			RTECS K15600000
Synonyms & Trade Names Nitroetan			DOT ID & Guide 2842 129
Exposure Limits	NIOSH REL: TWA 100 ppm (310 mg/m ³)		
	OSHA PEL: TWA 100 ppm (310 mg/m ³)		
IDLH 1000 ppm		Conversion 1 ppm = 3.07 mg/m ³	
Physical Description Colorless, oily liquid with a mild, fruity odor.			
MW: 75.1	BP: 237°F	FRZ: -130°F	Sol: 5%
VP(77°F): 21 mmHg	IP: 10.88 eV		Sp.Gr: 1.05
Fl.P: 82°F	UEL: ?	LEL: 3.4%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Amines; strong acids, alkalis & oxidizers; hydrocarbons; combustibles; metal oxides			
Measurement Methods NIOSH 2526			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1000 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 : Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Dermatitis; in animals: lacrimation (discharge of tears); dyspnea (breathing difficulty), pulmonary rales, edema; liver, kidney injury; narcosis
Target Organs Skin, respiratory system, central nervous system, kidneys, liver
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nitrogen dioxide			CAS 10102-44-0
NO ₂			RTECS QW9800000
Synonyms & Trade Names Dinitrogen tetroxide (N ₂ O ₄), Nitrogen peroxide			DOT ID & Guide 1067 124
Exposure Limits	NIOSH REL: ST 1 ppm (1.8 mg/m ³)		
	OSHA PEL†: C 5 ppm (9 mg/m ³)		
IDLH 20 ppm		Conversion 1 ppm = 1.88 mg/m ³	
Physical Description Yellowish-brown liquid or reddish-brown gas (above 70°F) with a pungent, acrid odor. [Note: In solid form (below 15°F) it is found structurally as N ₂ O ₄ .]			
MW: 46.0	BP: 70°F	FRZ: 15°F	Sol: Reacts
VP: 720 mmHg	IP: 9.75 eV	RGasD: 2.62	Sp.Gr: 1.44 (Liquid at 68°F)
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid/Gas, but will accelerate the burning of combustible materials.			
Incompatibilities & Reactivities Combustible material, water, chlorinated hydrocarbons, carbon disulfide, ammonia [Note: Reacts with water to form nitric acid.]			
Measurement Methods NIOSH 6014; OSHA ID182			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 20 ppm : (APF = 25) Any supplied-air respirator 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 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 concern⁶/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, nose, throat; cough, mucoid frothy sputum, decreased pulmonary function, chronic bronchitis, dyspnea (breathing difficulty); chest pain; pulmonary edema, cyanosis, tachypnea, tachycardia

Target Organs Eyes, respiratory system, cardiovascular system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nitrogen trifluoride			CAS 7783-54-2
NF ₃			RTECS QX1925000
Synonyms & Trade Names Nitrogen fluoride, Trifluoramine, Trifluorammonia			DOT ID & Guide 2451 122
Exposure Limits	NIOSH REL: TWA 10 ppm (29 mg/m ³)		
	OSHA PEL: TWA 10 ppm (29 mg/m ³)		
IDLH 1000 ppm		Conversion 1 ppm = 2.90 mg/m ³	
Physical Description Colorless gas with a moldy odor. [Note: Shipped as a nonliquefied compressed gas.]			
MW: 71.0	BP: -200°F	FRZ: -340°F	Sol: Slight
VP: >1 atm	IP: 12.97 eV	RGasD: 2.46	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Water, oil, grease, oxidizable materials, ammonia, carbon monoxide, methane, hydrogen, hydrogen sulfide, activated charcoal, diborane			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 100 ppm: (APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern/(APF = 10) Any supplied-air respirator Up to 250 ppm: (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 Up to 500 ppm: (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 powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) 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 self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece
Up to 1000 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation

Symptoms In animals: anoxia, cyanosis; methemoglobinemia; lassitude (weakness, exhaustion), dizziness, headache; liver, kidney injury

Target Organs Blood, liver, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nitroglycerine			CAS 55-63-0
CH ₂ NO ₃ CHNO ₃ CH ₂ NO ₃			RTECS QX2100000
Synonyms & Trade Names Glyceryl trinitrate; NG; 1,2,3-Propanetriol trinitrate; Trinitroglycerine			DOT ID & Guide 1204 127 (<= 1% solution in alcohol) 3064 127 (1-5% solution in alcohol)
Exposure Limits	NIOSH REL: ST 0.1 mg/m ³ [skin]		
	OSHA PEL†: C 0.2 ppm (2 mg/m ³) [skin]		
IDLH 75 mg/m ³		Conversion 1 ppm = 9.29 mg/m ³	
Physical Description Colorless to pale-yellow, viscous liquid or solid (below 56°F). [Note: An explosive ingredient in dynamite (20-40%) with ethylene glycol dinitrate (80-60%).]			
MW: 227.1	BP: Begins to decompose at 122-140°F	FRZ: 56°F	Sol: 0.1%
VP: 0.0003 mmHg	IP: ?		Sp.Gr: 1.60
Fl.P: Explodes	UEL: ?	LEL: ?	
Explosive Liquid			
Incompatibilities & Reactivities Heat, ozone, shock, acids [Note: An OSHA Class A Explosive (1910.109).]			
Measurement Methods NIOSH 2507; OSHA 43			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 1 mg/m ³ : (APF = 10) Any supplied-air respirator* Up to 2.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*			

Up to 5 mg/m³: (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 75 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Throbbing headache; dizziness; nausea, vomiting, abdominal pain; hypotension; flush; palpitations; methemoglobinemia; delirium, central nervous system depression; angina; skin irritation

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nitromethane			CAS 75-52-5
CH ₃ NO ₂			RTECS PA9800000
Synonyms & Trade Names Nitrocarbol			DOT ID & Guide 1261 129
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL: TWA 100 ppm (250 mg/m ³)		
IDLH 750 ppm		Conversion 1 ppm = 2.50 mg/m ³	
Physical Description Colorless, oily liquid with a disagreeable odor.			
MW: 61.0	BP: 214°F	FRZ: -20°F	Sol: 10%
VP: 28 mmHg	IP: 11.08 eV		Sp.Gr: 1.14
Fl.P: 95°F	UEL: ?	LEL: 7.3%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Amines; strong acids, alkalis & oxidizers; hydrocarbons & other combustible materials; metallic oxides [Note: Slowly corrodes steel & copper when wet.]			
Measurement Methods NIOSH 2527			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations OSHA Up to 750 ppm : (APF = 25) Any supplied-air respirator 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 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 : Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Dermatitis; in animals: irritation eyes, respiratory system; convulsions, narcosis; liver damage
Target Organs Eyes, skin, central nervous system, liver
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Nitronaphthalene			CAS 581-89-5
C ₁₀ H ₇ NO ₂			RTECS QJ9760000
Synonyms & Trade Names beta-Nitronaphthalene			DOT ID & Guide 2538 133
Exposure Limits	NIOSH REL: Ca* See Appendix A [*Note: Since metabolized to beta-Naphthylamine.]		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Colorless solid.			
MW: 178.2	BP: ?	MLT: 174°F	Sol: Insoluble
VP: ?	IP: 8.67 eV		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities For "Nitrates" in general: Aluminum, cyanides, esters, phosphorus, tin chlorides, thiocyanates, sodium hypophosphite			
Measurement Methods None available			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation skin, respiratory system; dermatitis; [potential occupational carcinogen]
Target Organs Skin, respiratory system
Cancer Site [bladder cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1-Nitropropane			CAS 108-03-2
CH3CH2CH2NO2			RTECS TZ5075000
Synonyms & Trade Names Nitropropane, 1-NP			DOT ID & Guide 2608 129
Exposure Limits	NIOSH REL: TWA 25 ppm (90 mg/m ³)		
	OSHA PEL: TWA 25 ppm (90 mg/m ³)		
IDLH 1000 ppm		Conversion 1 ppm = 3.64 mg/m ³	
Physical Description Colorless liquid with a somewhat disagreeable odor.			
MW: 89.1	BP: 269°F	FRZ: -162°F	Sol: 1%
VP: 8 mmHg	IP: 10.81 eV		Sp.Gr: 1.00
Fl.P: 96°F	UEL: ?	LEL: 2.2%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Amines; strong acids, alkalis & oxidizers; hydrocarbons & other combustible materials; metal oxides			
Measurement Methods OSHA 46			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 250 ppm : (APF = 10) Any supplied-air respirator* Up to 625 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 1000 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: Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes; headache, nausea, vomiting, diarrhea; in animals: liver, kidney damage
Target Organs Eyes, central nervous system, liver, kidneys
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Nitropropane			CAS 79-46-9
(CH ₃) ₂ CH(NO ₂)			RTECS TZ5250000
Synonyms & Trade Names Dimethylnitromethane, iso-Nitropropane, 2-NP			DOT ID & Guide 2608 129
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: TWA 25 ppm (90 mg/m ³)		
IDLH Ca [100 ppm]		Conversion 1 ppm = 3.64 mg/m ³	
Physical Description Colorless liquid with a pleasant, fruity odor.			
MW: 89.1	BP: 249°F	FRZ: -135°F	Sol: 2%
VP: 13 mmHg	IP: 10.71 eV		Sp.Gr: 0.99
Fl.P: 75°F	UEL: 11.0%	LEL: 2.6%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Amines; strong acids, alkalis & oxidizers; metal oxides; combustible materials			
Measurement Methods NIOSH 2528; OSHA 15, 46			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) 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: Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, ingestion, skin and/or eye contact			

Symptoms Irritation eyes, skin, nose, respiratory system; headache, anorexia, nausea, vomiting, diarrhea; kidney, liver damage; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system, kidneys, liver
Cancer Site [in animals: liver tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

N-Nitrosodimethylamine			CAS 62-75-9
(CH₃)₂N₂O			RTECS IQ0525000
Synonyms & Trade Names Dimethylnitrosamine; N,N-Dimethylnitrosamine; DMNA; N-Methyl-N-nitroso-methanamine; NDMA; N-Nitroso-N,N-dimethylamine			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1016] See Appendix B		
IDLH Ca [N.D.]		Conversion	
Physical Description Yellow, oily liquid with a faint, characteristic odor.			
MW: 74.1	BP: 306°F	FRZ: ?	Sol: Soluble
VP: 3 mmHg	IP: 8.69 eV		Sp.Gr: 1.005
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Strong oxidizers [Note: Should be stored in dark bottles.]			
Measurement Methods NIOSH 2522; OSHA 38			
Personal Protection & Sanitation 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) 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 with a high-efficiency particulate filter/Any			

appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Nausea, vomiting, diarrhea, abdominal cramps; headache; fever; enlarged liver, jaundice; decreased liver, kidney, pulmonary function; [potential occupational carcinogen]
Target Organs Liver, kidneys,lungs
Cancer Site [in animals; lung, kidney, liver & nasal cavity tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Nitrotoluene			CAS 88-72-2
NO ₂ C ₆ H ₄ CH ₃			RTECS XT3150000
Synonyms & Trade Names o-Methylnitrobenzene, 2-Methylnitrobenzene, ortho-Nitrotoluene, 2-Nitrotoluene			DOT ID & Guide 1664 152
Exposure Limits	NIOSH REL: TWA 2 ppm (11 mg/m ³) [skin]		
	OSHA PEL†: TWA 5 ppm (30 mg/m ³) [skin]		
IDLH 200 ppm		Conversion 1 ppm = 5.61 mg/m ³	
Physical Description Yellow liquid with a weak, aromatic odor. [Note: A solid below 25°F.]			
MW: 137.1	BP: 432°F	FRZ: 25°F	Sol: 0.07%
VP: 0.1 mmHg	IP: 9.43 eV		Sp.Gr: 1.16
Fl.P: 223°F	UEL: ?	LEL: 2.2%	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers, sulfuric acid			
Measurement Methods NIOSH 2005			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 20 ppm : (APF = 10) Any supplied-air respirator* Up to 50 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 100 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 200 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Anoxia, cyanosis; headache, lassitude (weakness, exhaustion), dizziness; ataxia; dyspnea (breathing difficulty); tachycardia; nausea, vomiting

Target Organs Blood, central nervous system, cardiovascular system, skin, gastrointestinal tract

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

m-Nitrotoluene			CAS 99-08-1
NO ₂ C ₆ H ₄ CH ₃			RTECS XT2975000
Synonyms & Trade Names m-Methylnitrobenzene, 3-Methylnitrobenzene, meta-Nitrotoluene, 3-Nitrotoluene			DOT ID & Guide 1664 152
Exposure Limits	NIOSH REL: TWA 2 ppm (11 mg/m ³) [skin]		
	OSHA PEL†: TWA 5 ppm (30 mg/m ³) [skin]		
IDLH 200 ppm		Conversion 1 ppm = 5.61 mg/m ³	
Physical Description Yellow liquid with a weak, aromatic odor. [Note: A solid below 59°F.]			
MW: 137.1	BP: 450°F	FRZ: 59°F	Sol: 0.05%
VP: 0.1 mmHg	IP: 9.48 eV		Sp.Gr: 1.16
Fl.P: 223°F	UEL: ?	LEL: 1.6%	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers, sulfuric acid			
Measurement Methods NIOSH 2005			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 20 ppm : (APF = 10) Any supplied-air respirator* Up to 50 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 100 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 200 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Anoxia, cyanosis; headache, lassitude (weakness, exhaustion), dizziness; ataxia; dyspnea (breathing difficulty); tachycardia; nausea, vomiting

Target Organs Blood, central nervous system, cardiovascular system, skin, gastrointestinal tract

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

p-Nitrotoluene			CAS 99-99-0
NO₂C₆H₄CH₃			RTECS XT3325000
Synonyms & Trade Names p-Methylnitrobenzene, 4-Methylnitrobenzene, para-Nitrotoluene, 4-Nitrotoluene			DOT ID & Guide 1664 152
Exposure Limits	NIOSH REL: TWA 2 ppm (11 mg/m ³) [skin]		
	OSHA PEL†: TWA 5 ppm (30 mg/m ³) [skin]		
IDLH 200 ppm		Conversion 1 ppm = 5.61 mg/m ³	
Physical Description Crystalline solid with a weak, aromatic odor.			
MW: 137.1	BP: 460°F	MLT: 126°F	Sol: 0.04%
VP: 0.1 mmHg	IP: 9.50 eV		Sp.Gr: 1.12
Fl.P: 223°F	UEL: ?	LEL: 1.6%	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, sulfuric acid			
Measurement Methods NIOSH 2005			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 20 ppm : (APF = 10) Any supplied-air respirator* Up to 50 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 100 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 200 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Anoxia, cyanosis; headache, lassitude (weakness, exhaustion), dizziness; ataxia; dyspnea (breathing difficulty); tachycardia; nausea, vomiting

Target Organs Blood, central nervous system, cardiovascular system, skin, gastrointestinal tract

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nitrous oxide			CAS 10024-97-2
N ₂ O			RTECS QX1350000
Synonyms & Trade Names Dinitrogen monoxide, Hyponitrous acid anhydride, Laughing gas			DOT ID & Guide 1070 122 2201 122 (refrigerated liquid)
Exposure Limits	NIOSH REL*: TWA 25 ppm (46 mg/m ³) (TWA over the time exposed) [*Note: REL for exposure to waste anesthetic gas.]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 1.80 mg/m ³	
Physical Description Colorless gas with a slightly sweet odor. [inhalation anesthetic] [Note: Shipped as a liquefied compressed gas.]			
MW: 44.0	BP: -127°F	FRZ: -132°F	Sol(77°F): 0.1%
VP: 51.3 atm	IP: 12.89 eV	RGasD: 1.53	
FLP: NA	UEL: NA	LEL: NA	
Nonflammable Gas, but supports combustion at elevated temperatures.			
Incompatibilities & Reactivities Aluminum, boron, hydrazine, lithium hydride, phosphine, sodium			
Measurement Methods NIOSH 3800, 6600; OSHA ID166			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact (liquid)			
Symptoms Dyspnea (breathing difficulty); drowsiness, headache; asphyxia; reproductive effects; liquid: frostbite			
Target Organs respiratory system, central nervous system, reproductive system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Nonane			CAS 111-84-2
CH ₃ (CH ₂) ₇ CH ₃			RTECS RA6115000
Synonyms & Trade Names n-Nonane, Nonyl hydride			DOT ID & Guide 1920 128
Exposure Limits	NIOSH REL: TWA 200 ppm (1050 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 5.25 mg/m ³	
Physical Description Colorless liquid with a gasoline-like odor.			
MW: 128.3	BP: 303°F	FRZ: -60°F	Sol: Insoluble
VP: 3 mmHg	IP: 10.21 eV		Sp.Gr: 0.72
Fl.P: 88°F	UEL: 2.9%	LEL: 0.8%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers (e.g., peroxides, nitrates, perchlorates)			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: Daily Remove: When wet (flammable) Change: No recommendation Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; headache, drowsiness, dizziness, confusion, nausea, tremor, incoordination; chemical pneumonitis (aspiration liquid)			
Target Organs Eyes, skin, respiratory system, central nervous system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1-Nonanethiol			CAS 1455-21-6
CH ₃ (CH ₂) ₈ SH			RTECS
Synonyms & Trade Names 1-Mercaptononane, n-Nonyl mercaptan, Nonylthiol			DOT ID & Guide 1228 131
Exposure Limits	NIOSH REL: C 0.5 ppm (3.3 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D. See: IDLH INDEX		Conversion 1 ppm = 6.56 mg/m ³	
Physical Description Liquid.			
MW: 160.3	BP: ?	FRZ: ?	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Oxidizers, reducing agents, strong acids & bases, alkali metals			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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
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

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

Symptoms Irritation eyes, skin, nose, throat; lassitude (weakness, exhaustion), cyanosis, increased respiration, nausea, drowsiness, headache, vomiting

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Octachloronaphthalene			CAS 2234-13-1
C ₁₀ Cl ₈			RTECS QK0250000
Synonyms & Trade Names Halowax® 1051; 1,2,3,4,5,6,7,8-Octachloronaphthalene; Perchloronaphthalene			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ ST 0.3 mg/m ³ [skin]		
	OSHA PEL†: TWA 0.1 mg/m ³ [skin]		
IDLH Unknown		Conversion	
Physical Description Waxy, pale-yellow solid with an aromatic odor.			
MW: 403.7	BP: 770°F	MLT: 365°F	Sol: Insoluble
VP: <1 mmHg	IP: ?		Sp.Gr: 2.00
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH S97 (II-2)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1 mg/m³ : (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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Acne-form dermatitis; liver damage, jaundice
Target Organs Skin, liver
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1-Octadecanethiol			CAS 2885-00-9
CH ₃ (CH ₂) ₁₇ SH			RTECS
Synonyms & Trade Names 1-Mercaptooctadecane, Octadecyl mercaptan, Stearyl mercaptan			DOT ID & Guide 1228 131 (liquid)
Exposure Limits	NIOSH REL: C 0.5 ppm (5.9 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 11.72 mg/m ³	
Physical Description Solid or liquid (above 77°F).			
MW: 286.6	BP: ?	MLT: 77°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: 0.85
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid Combustible Liquid			
Incompatibilities & Reactivities Oxidizers, reducing agents, strong acids & bases, alkali metals			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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

[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

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

Symptoms Irritation eyes, skin, respiratory system; headache, dizziness, lassitude (weakness, exhaustion), cyanosis, nausea, convulsions

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Octane			CAS 111-65-9
CH ₃ [CH ₂] ₆ CH ₃			RTECS RG8400000
Synonyms & Trade Names n-Octane, normal-Octane			DOT ID & Guide 1262 128
Exposure Limits	NIOSH REL: TWA 75 ppm (350 mg/m ³) C 385 ppm (1800 mg/m ³) [15-minute]		
	OSHA PEL†: TWA 500 ppm (2350 mg/m ³)		
IDLH 1000 ppm [10%LEL]		Conversion 1 ppm = 4.67 mg/m ³	
Physical Description Colorless liquid with a gasoline-like odor.			
MW: 114.2	BP: 258°F	FRZ: -70°F	Sol(77°F): 0.00007%
VP: 10 mmHg	IP: 9.82 eV		Sp.Gr: 0.70
Fl.P: 56°F	UEL: 6.5%	LEL: 1.0%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1500; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 750 ppm : (APF = 10) Any supplied-air respirator* Up to 1000 ppm : (APF = 25) Any supplied-air respirator 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 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose; drowsiness; dermatitis; chemical pneumonitis (aspiration liquid); in animals: narcosis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1-Octanethiol			CAS 111-88-6
CH ₃ (CH ₂) ₇ SH			RTECS
Synonyms & Trade Names 1-Mercaptooctane, n-Octyl mercaptan, Octylthiol, 1-Octylthiol			DOT ID & Guide 1228 131
Exposure Limits	NIOSH REL: C 0.5 ppm (3.0 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 5.98 mg/m ³	
Physical Description Water-white liquid with a mild odor.			
MW: 146.3	BP: 390°F	FRZ: -57°F	Sol: Insoluble
VP(212°F): 3 mmHg	IP: ?		Sp.Gr: 0.84
Fl.P(oc): 115°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Oxidizers, reducing agents, strong acids & bases, alkali metals			
Measurement Methods NIOSH 2510			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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
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

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

Symptoms Irritation eyes, skin, nose, throat; lassitude (weakness, exhaustion), cyanosis, increased respiration, nausea, drowsiness, headache, vomiting

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Oil mist (mineral)		CAS 8012-95-1	
		RTECS PY8030000	
Synonyms & Trade Names Heavy mineral oil mist, Paraffin oil mist, White mineral oil mist		DOT ID & Guide	
Exposure Limits	NIOSH REL: TWA 5 mg/m ³ ST 10 mg/m ³		
	OSHA PEL: TWA 5 mg/m ³		
IDLH 2500 mg/m ³		Conversion	
Physical Description Colorless, oily liquid aerosol dispersed in air. [Note: Has an odor like burned lubricating oil.]			
MW: Varies	BP: 680°F	FRZ: 0°F	Sol: Insoluble
VP: <0.5 mmHg	IP: ?		Sp.Gr: 0.90
Fl.P(oc): 380°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 5026			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Skin: Soap wash Breathing: Fresh air	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m³ : (APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator Up to 125 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 250 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 2500 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, skin, respiratory system

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Osmium tetroxide			CAS 20816-12-0
OsO ₄			RTECS RN1140000
Synonyms & Trade Names Osmic acid anhydride, Osmium oxide			DOT ID & Guide 2471 154
Exposure Limits	NIOSH REL: TWA 0.002 mg/m ³ (0.0002 ppm) ST 0.006 mg/m ³ (0.0006 ppm)		
	OSHA PEL†: TWA 0.002 mg/m ³		
IDLH 1 mg/m ³		Conversion 1 ppm = 10.40 mg/m ³	
Physical Description Colorless, crystalline solid or pale-yellow mass with an unpleasant, acrid, chlorine-like odor. [Note: A liquid above 105°F.]			
MW: 254.2	BP: 266°F	MLT: 105°F	Sol(77°F): 6%
VP: 7 mmHg	IP: 12.60 eV		Sp.Gr: 5.10
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Hydrochloric acid, easily oxidized organic materials [Note: Begins to sublime below BP. Contact with other materials may cause fire.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.1 mg/m³ : (APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern and having a high-efficiency particulate filter/(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 and having 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 1 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 (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern and having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, respiratory system; lacrimation (discharge of tears), visual disturbance; conjunctivitis; headache; cough, dyspnea (breathing difficulty); dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Oxalic acid			CAS 144-62-7
HOCCOOH • 2H ₂ O			RTECS RO2450000
Synonyms & Trade Names Ethanedioic acid, Oxalic acid (aqueous), Oxalic acid dihydrate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 mg/m ³ ST 2 mg/m ³		
	OSHA PEL†: TWA 1 mg/m ³		
IDLH 500 mg/m ³		Conversion	
Physical Description Colorless, odorless powder or granular solid. [Note: The anhydrous form (COOH) ₂ is an odorless, white solid.]			
MW: 126.1	BP: Sublimes	MLT: 215°F (Sublimes)	Sol: 14%
VP: <0.001 mmHg	IP: ?		Sp.Gr: 1.90
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, silver compounds, strong alkalis, chlorites [Note: Gives off water of crystallization at 215°F and begins to sublime.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 25 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [‡] /(APF = 25) Any powered, air-purifying respirator with a dust and mist filter [‡] Up to 50 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator 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			

Up to 500 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; eye burns; localized pain, cyanosis; shock, collapse, convulsions; kidney damage

Target Organs Eyes, skin, respiratory system, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Oxygen difluoride			CAS 7783-41-7
OF ₂			RTECS RS2100000
Synonyms & Trade Names Difluorine monoxide, Fluorine monoxide, Oxygen fluoride			DOT ID & Guide 2190 124
Exposure Limits	NIOSH REL: C 0.05 ppm (0.1 mg/m ³)		
	OSHA PEL†: TWA 0.05 ppm (0.1 mg/m ³)		
IDLH 0.5 ppm		Conversion 1 ppm = 2.21 mg/m ³	
Physical Description Colorless gas with a peculiar, foul odor. [Note: Shipped as a nonliquefied compressed gas.]			
MW: 54.0	BP: -230°F	FRZ: -371°F	Sol: 0.02%
VP: >1 atm	IP: 13.11 eV	RGasD: 1.88	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas, but a strong oxidizer.			
Incompatibilities & Reactivities Combustible materials, chlorine, bromine, iodine, platinum, metal oxides, moist air, hydrogen sulfide, hydrocarbons, water [Note: Reacts very slowly with water to form hydrofluoric acid.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 0.5 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 canister providing protection against the compound of concern ⁱ /Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; headache; pulmonary edema; eye, skin burns (from contact with the gas under pressure)
Target Organs Eyes, skin, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ozone			CAS 10028-15-6
O ₃			RTECS RS8225000
Synonyms & Trade Names Triatomic oxygen			DOT ID & Guide
Exposure Limits	NIOSH REL: C 0.1 ppm (0.2 mg/m ³)		
	OSHA PEL†: TWA 0.1 ppm (0.2 mg/m ³)		
IDLH 5 ppm		Conversion 1 ppm = 1.96 mg/m ³	
Physical Description Colorless to blue gas with a very pungent odor.			
MW: 48.0	BP: -169°F	FRZ: -315°F	Sol(32°F): 0.001%
VP: >1 atm	IP: 12.52 eV	RGasD: 1.66	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas, but a powerful oxidizer.			
Incompatibilities & Reactivities All oxidizable materials (both organic & inorganic)			
Measurement Methods OSHA ID214			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Medical attention Breathing: Fresh air; 100% O ₂	
Respirator Recommendations NIOSH/OSHA Up to 1 ppm : (APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern ⁱ /(APF = 10) Any supplied-air respirator Up to 2.5 ppm : (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 ⁱ Up to 5 ppm : (APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern ⁱ /(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 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 canister providing protection against the compound of concernⁱ/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, mucous membrane; pulmonary edema; chronic respiratory disease

Target Organs Eyes, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Paraffin wax fume			CAS 8002-74-2
C _n H _{2n+2}			RTECS RV0350000
Synonyms & Trade Names Paraffin fume, Paraffin scale fume			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 2 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Paraffin wax is a white to slightly yellowish, odorless solid. [Note: Consists of a mixture of high molecular weight hydrocarbons (e.g., C36H74).]			
MW: 350-420	BP: ?	MLT: 115-154°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: 0.88-0.92
Fl.P: 390°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods OSHA PV2047			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; discomfort, nausea			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Paraquat (Paraquat dichloride)			CAS 1910-42-5
CH₃(C₅H₄N)₂CH₃ • 2Cl			RTECS DW2275000
Synonyms & Trade Names 1,1'-Dimethyl-4,4'-bipyridinium dichloride; N,N'-Dimethyl-4,4'-bipyridinium dichloride; Paraquat chloride; Paraquat dichloride [Note: Paraquat is a cation (C ₁₂ H ₁₄ N ₂ ++; 1,1-Dimethyl-4,4-bipyridinium ion); the commercial product is the dichloride salt of paraquat.]			DOT ID & Guide
Exposure Limits			
NIOSH REL: TWA 0.1 mg/m ³ (resp) [skin]			
OSHA PEL†: TWA 0.5 mg/m ³ (resp) [skin]			
IDLH 1 mg/m ³		Conversion	
Physical Description Yellow solid with a faint, ammonia-like odor. [herbicide] [Note: Paraquat may also be found commercially as a methyl sulfate salt C ₁₂ H ₁₄ N ₂ • 2CH ₃ SO ₄ .]			
MW: 257.2	BP: Decomposes	MLT: 572°F (Decomposes)	Sol: Miscible
VP: <0.0000001 mmHg	IP: ?		Sp.Gr: 1.24
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers, alkylaryl-sulfonate wetting agents [Note: Corrosive to metals. Decomposes in presence of ultraviolet light.]			
Measurement Methods NIOSH 5003			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 1 mg/m ³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a			

dust, mist, and fume filter*/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, nose, throat, respiratory system; epistaxis (nosebleed); dermatitis; fingernail damage; irritation gastrointestinal tract; heart, liver, kidney damage

Target Organs Eyes, skin, respiratory system, heart, liver, kidneys, gastrointestinal tract

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Parathion			CAS 56-38-2
$(C_2H_5O)_2P(S)OC_6H_4NO_2$			RTECS TF4550000
Synonyms & Trade Names O,O-Diethyl-O(p-nitrophenyl) phosphorothioate; Diethyl parathion; Ethyl parathion; Parathion-ethyl			DOT ID & Guide 2783 152
Exposure Limits	NIOSH REL: TWA 0.05 mg/m ³ [skin]		
	OSHA PEL: TWA 0.1 mg/m ³ [skin]		
IDLH 10 mg/m ³		Conversion	
Physical Description Pale-yellow to dark-brown liquid with a garlic-like odor. [Note: A solid below 43°F. Pesticide that may be absorbed on a dry carrier.]			
MW: 291.3	BP: 707°F	FRZ: 43°F	Sol: 0.001%
VP: 0.00004 mmHg	IP: ?		Sp.Gr: 1.27
Fl.P(oc): 392°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers, alkaline materials			
Measurement Methods NIOSH 5600; OSHA 62			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 0.5 mg/m³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter/(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 organic vapor cartridge(s) in combination with a dust, mist, and fume filter			

Up to 2.5 mg/m : (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(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 organic vapor cartridge(s) 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

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 organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; miosis; rhinorrhea (discharge of thin mucus); headache; chest tightness, wheezing, laryngeal spasm, salivation, cyanosis; anorexia, nausea, vomiting, abdominal cramps, diarrhea; sweating; muscle fasciculation, lassitude (weakness, exhaustion), paralysis; dizziness, confusion, ataxia; convulsions, coma; low blood pressure; cardiac irregularities

Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system, blood cholinesterase

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Particulates not otherwise regulated			CAS
			RTECS
Synonyms & Trade Names "Inert" dusts, Nuisance dusts, PNOR [Note: Includes all inert or nuisance dusts, whether mineral, inorganic, not listed specifically in 1910.1000.]			DOT ID & Guide
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Dusts from solid substances without specific occupational exposure standards.			
Properties vary depending upon the specific solid.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, throat, upper respiratory system			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Pentaborane			CAS 19624-22-7
B ₅ H ₉			RTECS RY8925000
Synonyms & Trade Names Pentaboron nonahydride			DOT ID & Guide 1380 135
Exposure Limits	NIOSH REL: TWA 0.005 ppm (0.01 mg/m ³) ST 0.015 ppm (0.03 mg/m ³)		
	OSHA PEL†: TWA 0.005 ppm (0.01 mg/m ³)		
IDLH 1 ppm		Conversion 1 ppm = 2.58 mg/m ³	
Physical Description Colorless liquid with a pungent odor like sour milk.			
MW: 63.1	BP: 140°F	FRZ: -52°F	Sol: Reacts
VP: 171 mmHg	IP: 9.90 eV		Sp.Gr: 0.62
Fl.P: 86°F	UEL: ?	LEL: 0.42%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Oxidizers, halogens, water, halogenated hydrocarbons [Note: May ignite SPONTANEOUSLY in moist air. Corrosive to natural rubber. Hydrolyzes slowly with heat in water to form boric acid.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.05 ppm : (APF = 10) Any supplied-air respirator Up to 0.125 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 0.25 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 1 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; dizziness, headache, drowsiness, incoordination, tremor, convulsions, behavioral changes; tonic spasm face, neck, abdominal, limbs
Target Organs Eyes, skin, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Pentachloroethane			CAS 76-01-7
CHCl ₂ CCl ₃			RTECS KI6300000
Synonyms & Trade Names Ethane pentachloride, Pentalin			DOT ID & Guide 1669 151
Exposure Limits	NIOSH REL: Handle with care in the workplace. See Appendix C (Chloroethanes)		
	OSHA PEL: none		
IDLH N.D.		Conversion	
Physical Description Colorless liquid with a sweetish, chloroform-like odor.			
MW: 202.3	BP: 322°F	FRZ: -20°F	Sol: 0.05%
VP: 3 mmHg	IP: 11.28 eV		Sp.Gr: 1.68
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities (Sodium-potassium alloy + bromoform), alkalis, metals, water [Note: Hydrolysis produces dichloroacetic acid. Reaction with alkalis & metals produces spontaneously explosive chloroacetylenes.]			
Measurement Methods NIOSH 2517			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms In animals: irritation eyes, skin; lassitude (weakness, exhaustion), restlessness, irregular respiration, muscle incoordination; liver, kidney, lung changes			
Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Pentachloronaphthalene			CAS 1321-64-8
C₁₀H₃Cl₅			RTECS QK0300000
Synonyms & Trade Names Halowax® 1013; 1,2,3,4,5-Pentachloronaphthalene			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³ [skin]		
	OSHA PEL: TWA 0.5 mg/m ³ [skin]		
IDLH Unknown		Conversion	
Physical Description Pale-yellow or white solid or powder with an aromatic odor.			
MW: 300.4	BP: 636°F	MLT: 248°F	Sol: Insoluble
VP: <1 mmHg	IP: ?		Sp.Gr: 1.67
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH S96 (II-2)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap promptly/molten flush immediately Breathing: Respiratory support Swallow: Medical Attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m³: (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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Headache, lassitude (weakness, exhaustion), dizziness, anorexia; pruritus, acne-form skin eruptions; jaundice, liver necrosis
Target Organs Skin, liver, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Pentachlorophenol			CAS 87-86-5
C₆Cl₅OH			RTECS SM6300000
Synonyms & Trade Names PCP; Penta; 2,3,4,5,6-Pentachlorophenol			DOT ID & Guide 3155 154
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³ [skin]		
	OSHA PEL: TWA 0.5 mg/m ³ [skin]		
IDLH 2.5 mg/m ³		Conversion	
Physical Description Colorless to white, crystalline solid with a benzene-like odor. [fungicide]			
MW: 266.4	BP: 588°F (Decomposes)	MLT: 374°F	Sol: 0.001%
VP(77°F): 0.0001 mmHg	IP: NA		Sp.Gr: 1.98
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers, acids, alkalis			
Measurement Methods NIOSH 5512			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2.5 mg/m³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter*/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose, throat; sneezing, cough; lassitude (weakness, exhaustion), anorexia, weight loss; sweating; headache, dizziness; nausea, vomiting; dyspnea (breathing difficulty), chest pain; high fever; dermatitis
Target Organs Eyes, skin, respiratory system, cardiovascular system, liver, kidneys, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Pentaerythritol			CAS 115-77-5
C(CH ₂ OH) ₄			RTECS RZ2490000
Synonyms & Trade Names 2,2-bis(Hydroxymethyl)-1,3-propanediol; Methane tetramethylol; Monopentaerythritol; PE; Tetrahydroxymethylolmethane; Tetramethylolmethane			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Colorless to white, crystalline, odorless powder. [Note: Technical grade is 88% monopentaerythritol & 12% dipentaerythritol.]			
MW: 136.2	BP: Sublimes	MLT: 500°F (Sublimes)	Sol(59°F): 6%
VP: 0.00000008 mmHg	IP: ?		Sp.Gr: 1.38
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Organic acids, oxidizers [Note: Explosive compound is formed when a mixture of PE & thiophosphoryl chloride is heated.]			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, respiratory system			
Target Organs Eyes, respiratory system			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Pentane			CAS 109-66-0
CH ₃ [CH ₂] ₃ CH ₃			RTECS RZ9450000
Synonyms & Trade Names Pentane, normal-Pentane			DOT ID & Guide 1265 128
Exposure Limits	NIOSH REL: TWA 120 ppm (350 mg/m ³) C 610 ppm (1800 mg/m ³) [15-minute]		
	OSHA PEL†: TWA 1000 ppm (2950 mg/m ³)		
IDLH 1500 ppm [10%LEL]		Conversion 1 ppm = 2.95 mg/m ³	
Physical Description Colorless liquid with a gasoline-like odor. [Note: A gas above 97°F. May be utilized as a fuel.]			
MW: 72.2	BP: 97°F	FRZ: -202°F	Sol: 0.04%
VP: 420 mmHg	IP: 10.34 eV		Sp.Gr: 0.63
Fl.P: -57°F	UEL: 7.8%	LEL: 1.5%	
Class IA Flammable Liquid: Fl.P. below 73°F and BP below 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1500; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 1200 ppm : (APF = 10) Any supplied-air respirator Up to 1500 ppm : (APF = 25) Any supplied-air respirator 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 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose; dermatitis; chemical pneumonitis (aspiration liquid); drowsiness; in animals: narcosis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1-Pentanethiol			CAS 110-66-7
CH ₃ (CH ₂) ₄ SH			RTECS SA3150000
Synonyms & Trade Names Amyl hydrosulfide, Amyl mercaptan, Amyl sulfhydrate, Pentyl mercaptan			DOT ID & Guide 1111 130
Exposure Limits	NIOSH REL: C 0.5 ppm (2.1 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 4.26 mg/m ³	
Physical Description Water-white to yellowish liquid with a strong, garlic-like odor.			
MW: 104.2	BP: 260°F	FRZ: -104°F	Sol: Insoluble
VP(77°F): 14 mmHg	IP: ?		Sp.Gr: 0.84
Fl.P(oc): 65°F	UEL: ?	LEL: ?	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Oxidizers, reducing agents, alkali metals, calcium hypochlorite, concentrated nitric acid			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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
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

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

Symptoms Irritation eyes, skin, nose, throat, respiratory system; headache, nausea, dizziness; vomiting, diarrhea; dermatitis, skin sensitization

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2-Pentanone			CAS 107-87-9
CH ₃ COCH ₂ CH ₂ CH ₃			RTECS SA7875000
Synonyms & Trade Names Ethyl acetone, Methyl propyl ketone, MPK			DOT ID & Guide 1249 127
Exposure Limits	NIOSH REL: TWA 150 ppm (530 mg/m ³)		
	OSHA PEL†: TWA 200 ppm (700 mg/m ³)		
IDLH 1500 ppm		Conversion 1 ppm = 3.52 mg/m ³	
Physical Description Colorless to water-white liquid with a characteristic acetone-like odor.			
MW: 86.1	BP: 215°F	FRZ: -108°F	Sol: 6%
VP: 27 mmHg	IP: 9.39 eV		Sp.Gr: 0.81
Fl.P: 45°F	UEL: 8.2%	LEL: 1.5%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Oxidizers, bromine trifluoride			
Measurement Methods NIOSH 1300			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 1500 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
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
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Perchloromethyl mercaptan			CAS 594-42-3
Cl ₃ CSCI			RTECS PB0370000
Synonyms & Trade Names PCM, PMM, Trichloromethane sulfenyl chloride, Trichloromethyl sulfur chloride			DOT ID & Guide 1670 157
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.8 mg/m ³)		
	OSHA PEL: TWA 0.1 ppm (0.8 mg/m ³)		
IDLH 10 ppm		Conversion 1 ppm = 7.60 mg/m ³	
Physical Description Pale-yellow, oily liquid with an unbearable, acrid odor.			
MW: 185.9	BP: 297°F (Decomposes)	FRZ: ?	Sol: Insoluble
VP: 3 mmHg	IP: ?		Sp.Gr: 1.69
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but will support combustion.			
Incompatibilities & Reactivities Alkalis, amines, hot iron, water [Note: Corrosive to most metals. Forms HCl, sulfur & CO ₂ on contact with water.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1 ppm : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* Up to 2.5 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 5 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 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 10 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

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

Symptoms Irritation eyes, skin, nose, throat; lacrimation (discharge of tears); cough, dyspnea (breathing difficulty), deep breathing pain, coarse rales; vomiting; pallor, tachycardia; acidosis; anuria; liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Perchloryl fluoride			CAS 7616-94-6
ClO ₃ F			RTECS SD1925000
Synonyms & Trade Names Chlorine fluoride oxide, Chlorine oxyfluoride, Trioxychlorofluoride			DOT ID & Guide 3083 124
Exposure Limits	NIOSH REL: TWA 3 ppm (14 mg/m ³) ST 6 ppm (28 mg/m ³)		
	OSHA PEL†: TWA 3 ppm (13.5 mg/m ³)		
IDLH 100 ppm		Conversion 1 ppm = 4.19 mg/m ³	
Physical Description Colorless gas with a characteristic, sweet odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 102.5	BP: -52°F	FRZ: -234°F	Sol: 0.06%
VP: 10.5 atm	IP: 13.60 eV	RGasD: 3.64	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas, but will support combustion.			
Incompatibilities & Reactivities Combustibles, strong bases, amines, finely divided metals, reducing agents, alcohols			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 30 ppm: (APF = 10) Any supplied-air respirator Up to 75 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 100 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 canister providing protection against the compound of concern ⁶ /Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact (liquid)
Symptoms Irritation respiratory system; liquid: frostbite; in animals: methemoglobinemia; cyanosis; lassitude (weakness, exhaustion), dizziness, headache; pulmonary edema; pneumonitis; anoxia
Target Organs Skin, respiratory system, blood
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Perlite			CAS 93763-70-3
			RTECS SO5254000
Synonyms & Trade Names Expanded perlite [Note: An amorphous material consisting of fused sodium potassium aluminum silicate.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Odorless, light-gray to glassy-black solid. [Note: Expanded perlite is a fluffy, white particulate.]			
MW: varies	BP: ?	MLT: >2000°F	Sol: <1%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.2-2.4 (crude) 0.05-0.3 (expanded)
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, throat, upper respiratory system			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Petroleum distillates (naphtha)		CAS 8002-05-9	
		RTECS SE7449000	
Synonyms & Trade Names Aliphatic petroleum naphtha, Petroleum naphtha, Rubber solvent		DOT ID & Guide 1255 128	
Exposure Limits	NIOSH REL: TWA 350 mg/m ³ C 1800 mg/m ³ [15-minute]		
	OSHA PEL†: TWA 500 ppm (2000 mg/m ³)		
IDLH 1100 ppm [10%LEL]		Conversion 1 ppm = 4.05 mg/m ³	
Physical Description Colorless liquid with a gasoline- or kerosene-like odor. [Note: A mixture of paraffins (C5 to C13) that may contain a small amount of aromatic hydrocarbons.]			
MW: 99 (approx)	BP: 86-460°F	FRZ: -99°F	Sol: Insoluble
VP: 40 mmHg (approx)	IP: ?		Sp.Gr: 0.63-0.66
Fl.P: -40 to -86°F	UEL: 5.9%	LEL: 1.1%	
Flammable Liquid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1550			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 850 ppm : (APF = 10) Any supplied-air respirator Up to 1100 ppm : (APF = 25) Any supplied-air respirator 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 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

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

Symptoms Irritation eyes, nose, throat; dizziness, drowsiness, headache, nausea; dry cracked skin; chemical pneumonitis (aspiration liquid)

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phenol			CAS 108-95-2
C ₆ H ₅ OH			RTECS SJ3325000
Synonyms & Trade Names Carbolic acid, Hydroxybenzene, Monohydroxybenzene, Phenyl alcohol, Phenyl hydroxide			DOT ID & Guide 1671 153 (solid) 2312 153 (molten) 2821 153 (solution)
Exposure Limits	NIOSH REL: TWA 5 ppm (19 mg/m ³) C 15.6 ppm (60 mg/m ³) [15-minute] [skin]		
	OSHA PEL: TWA 5 ppm (19 mg/m ³) [skin]		
IDLH 250 ppm		Conversion 1 ppm = 3.85 mg/m ³	
Physical Description Colorless to light-pink, crystalline solid with a sweet, acrid odor. [Note: Phenol liquefies by mixing with about 8% water.]			
MW: 94.1	BP: 359°F	MLT: 109°F	Sol(77°F): 9%
VP: 0.4 mmHg	IP: 8.50 eV		Sp.Gr: 1.06
Fl.P: 175°F	UEL: 8.6%	LEL: 1.8%	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, calcium hypochlorite, aluminum chloride, acids			
Measurement Methods NIOSH 2546; OSHA 32			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust and mist filter/(APF = 10) Any supplied-air respirator Up to 125 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) in combination with a dust and mist filter			

Up to 250 ppm: (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, nose, throat; anorexia, weight loss; lassitude (weakness, exhaustion), muscle ache, pain; dark urine; cyanosis; liver, kidney damage; skin burns; dermatitis; ochronosis; tremor, convulsions, twitching

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phenothiazine			CAS 92-84-2
S(C ₆ H ₄) ₂ NH			RTECS SN5075000
Synonyms & Trade Names Dibenzothiazine, Fenothiazine, Thiodiphenylamine			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Grayish-green to greenish-yellow solid. [insecticide]			
MW: 199.3	BP: 700°F	MLT: 365°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid, but not a high fire risk.			
Incompatibilities & Reactivities None reported			
Measurement Methods OSHA PV2048			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Itching, irritation, reddening skin; hepatitis, hemolytic anemia, abdominal cramps, tachycardia; kidney damage; skin photo sensitization			
Target Organs Skin, cardiovascular system, liver, kidneys			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

p-Phenylene diamine			CAS 106-50-3
C₆H₄(NH₂)₂			RTECS SS8050000
Synonyms & Trade Names 4-Aminoaniline; 1,4-Benzenediamine; p-Diaminobenzene; 1,4-Diaminobenzene; 1,4-Phenylene diamine			DOT ID & Guide 1673 153
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ [skin]		
	OSHA PEL: TWA 0.1 mg/m ³ [skin]		
IDLH 25 mg/m ³		Conversion	
Physical Description White to slightly red, crystalline solid.			
MW: 108.2	BP: 513°F	MLT: 295°F	Sol(75°F): 4%
VP: <1 mmHg	IP: 6.89 eV		Sp.Gr: ?
Fl.P: 312°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods OSHA 87			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2.5 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [‡] Up to 5 mg/m³ : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 25 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 (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern and having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation pharynx, larynx; bronchial asthma; sensitization dermatitis

Target Organs respiratory system, skin

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phenyl ether (vapor)			CAS 101-84-8
C ₆ H ₅ OC ₆ H ₅			RTECS KN8970000
Synonyms & Trade Names Diphenyl ether, Diphenyl oxide, Phenoxy benzene, Phenyl oxide			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 ppm (7 mg/m ³)		
	OSHA PEL: TWA 1 ppm (7 mg/m ³)		
IDLH 100 ppm		Conversion 1 ppm = 6.96 mg/m ³	
Physical Description Colorless, crystalline solid or liquid (above 82°F) with a geranium-like odor.			
MW: 170.2	BP: 498°F	MLT: 82°F	Sol: Insoluble
VP(77°F): 0.02 mmHg	IP: 8.09 eV		Sp.Gr: 1.08
Fl.P: 239°F	UEL: 6.0%	LEL: 0.7%	
Combustible Solid Class IIIB Combustible Liquid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1617; OSHA PV2022			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA 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) in combination with a dust and mist filter [£] Up to 50 ppm: (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having 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 100 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, nose, skin; nausea

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phenyl ether-biphenyl mixture (vapor)			CAS 8004-13-5
C ₆ H ₅ OC ₆ H ₅ /C ₆ H ₅ C ₆ H ₅			RTECS DV1500000
Synonyms & Trade Names Diphenyl oxide-diphenyl mixture, Dowtherm® A			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 ppm (7 mg/m ³)		
	OSHA PEL: TWA 1 ppm (7 mg/m ³)		
IDLH 10 ppm		Conversion 1 ppm = 6.79 mg/m ³ (approx)	
Physical Description Colorless to straw-colored liquid or solid (below 54°F) with a disagreeable, aromatic odor. [Note: A mixture typically contains 75% phenyl ether & 25% biphenyl.]			
MW: 166 (approx)	BP: 495°F	FRZ: 54°F	Sol: Insoluble
VP(77°F): 0.08 mmHg	IP: ?		Sp.Gr(77°F): 1.06
Fl.P: 239°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 2013			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 10 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) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust and mist 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact
Symptoms Irritation eyes, nose, skin; nausea
Target Organs Eyes, skin, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phenyl glycidyl ether			CAS 122-60-1
C ₉ H ₁₀ O ₂			RTECS TZ3675000
Synonyms & Trade Names 1,2-Epoxy-3-phenoxy propane; Glycidyl phenyl ether; PGE; Phenyl 2,3-epoxypropyl ether			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca C 1 ppm (6 mg/m ³) [15-minute] See Appendix A		
	OSHA PEL†: TWA 10 ppm (60 mg/m ³)		
IDLH Ca [100 ppm]		Conversion 1 ppm = 6.14 mg/m ³	
Physical Description Colorless liquid. [Note: A solid below 38°F.]			
MW: 150.1	BP: 473°F	FRZ: 38°F	Sol: 0.2%
VP: 0.01 mmHg	IP: ?		Sp.Gr: 1.11
Fl.P: 248°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers, amines, strong acids, strong bases			
Measurement Methods NIOSH 1619; OSHA 7			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; upper respiratory system; skin sensitization; narcosis; possible hematopoietic, reproductive effects; [potential occupational carcinogen]
Target Organs Eyes, skin, central nervous system, hematopoietic system, reproductive system
Cancer Site [in animals: nasal cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phenylhydrazine			CAS 100-63-0
C6H5NHNH2			RTECS MW8925000
Synonyms & Trade Names Hydrazinobenzene, Monophenylhydrazine			DOT ID & Guide 2572 153
Exposure Limits	NIOSH REL: Ca C 0.14 ppm (0.6 mg/m³) [2-hr] [skin] See Appendix A		
	OSHA PEL†: TWA 5 ppm (22 mg/m³) [skin]		
IDLH Ca [15 ppm]		Conversion 1 ppm = 4.42 mg/m³	
Physical Description Colorless to pale-yellow liquid or solid (below 67°F) with a faint, aromatic odor.			
MW: 108.1	BP: 470°F (Decomposes)	FRZ: 67°F	Sol: Slight
VP(77°F): 0.04 mmHg	IP: 7.64 eV		Sp.Gr: 1.10
Fl.P: 190°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, lead dioxide			
Measurement Methods NIOSH 3518			
Personal Protection & Sanitation 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) 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: Any appropriate escape-type, self-contained breathing apparatus			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			

Symptoms Skin sensitization, hemolytic anemia, dyspnea (breathing difficulty), cyanosis; jaundice; kidney damage; vascular thrombosis; [potential occupational carcinogen]

Target Organs Blood, respiratory system, liver, kidneys, skin

Cancer Site [in animals: tumors of the lungs, liver, blood vessels & intestine]

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

N-Phenyl-beta-naphthylamine			CAS 135-88-6
C₁₀H₇NHC₆H₅			RTECS QM4550000
Synonyms & Trade Names 2-Anilinonaphthalene, beta-Naphthylphenylamine, PBNA, 2-Phenylaminonaphthalene, Phenyl-beta-naphthylamine			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca* See Appendix A [*Note: Since metabolized to beta-Naphthylamine.]		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description White to yellow crystals or gray to tan flakes or powder. [Note: Commercial product may contain 20-30 ppm of beta-Naphthylamine.]			
MW: 219.3	BP: 743°F	MLT: 226°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: 1.24
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods OSHA 96			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation; leucoplakia; acne, hypersensitivity to sunlight; [potential occupational carcinogen]
Target Organs Eyes, skin, bladder
Cancer Site [bladder cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phenylphosphine			CAS 638-21-1
C6H5PH2			RTECS SZ2100000
Synonyms & Trade Names Fenylfosfin, PF, Phosphaniline			DOT ID & Guide
Exposure Limits	NIOSH REL: C 0.05 ppm (0.25 mg/m³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.50 mg/m³	
Physical Description Clear, colorless liquid with a foul odor.			
MW: 110.1	BP: 320°F	FRZ: ?	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr(59°F): 1.001
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities None reported [Note: Spontaneously combustible in high concentrations in air. Potential exposure to gaseous PF when polyphosphinates are heated above 392°F.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms In animals: blood changes, anemia, testicular degeneration; loss of appetite, diarrhea, lacrimation (discharge of tears), hind leg tremor; dermatitis			
Target Organs Blood, central nervous system, skin, reproductive system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phorate			CAS 298-02-2
(C ₂ H ₅ O) ₂ P(S)SCH ₂ SC ₂ H ₅			RTECS TD9450000
Synonyms & Trade Names O,O-Diethyl S-(ethylthio)methylphosphorodithioate; O,O-Diethyl S-ethylthiomethylthionophosphate; Thimet; Timet			DOT ID & Guide 3018 152 (organophosphorus pesticide, liquid)
Exposure Limits	NIOSH REL: TWA 0.05 mg/m ³ ST 0.2 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Clear liquid with a skunk-like odor. [insecticide]			
MW: 260.4	BP: ?	FRZ: -45°F	Sol: 0.005%
VP: 0.0008 mmHg	IP: ?		Sp.Gr(77°F): 1.16
Fl.P(oc): 320°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid, but does not readily ignite.			
Incompatibilities & Reactivities Water, alkalis [Note: Hydrolyzed in the presence of moisture and by alkalis.]			
Measurement Methods NIOSH 5600			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; miosis; rhinorrhea (discharge of thin mucus); headache; chest tightness, wheezing, laryngeal spasm, salivation, cyanosis; anorexia, nausea, vomiting, abdominal cramps, diarrhea; sweating; muscle fasciculation, lassitude (weakness, exhaustion), paralysis; dizziness, confusion, ataxia;			

convulsions, coma; low blood pressure; cardiac irregularities
Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system, blood cholinesterase
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phosdrin			CAS 7786-34-7
C ₇ H ₁₃ PO ₆			RTECS GQ5250000
Synonyms & Trade Names 2-Carbomethoxy-1-methylvinyl dimethyl phosphate, Mevinphos [Note: Commercial product is a mixture of the cis- & trans-isomers.]			DOT ID & Guide 2783 152
Exposure Limits	NIOSH REL: TWA 0.01 ppm (0.1 mg/m ³) ST 0.03 ppm (0.3 mg/m ³) [skin]		
	OSHA PEL†: TWA 0.1 mg/m ³ [skin]		
IDLH 4 ppm		Conversion 1 ppm = 9.17 mg/m ³	
Physical Description Pale-yellow to orange liquid with a weak odor. [Note: Insecticide that may be absorbed on a dry carrier.]			
MW: 224.2	BP: Decomposes	FRZ: 44°F (trans-) 70°F (cis-)	Sol: Miscible
VP: 0.003 mmHg	IP: ?		Sp.Gr: 1.25
Fl.P(oc): 347°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers [Note: Corrosive to cast iron, some stainless steels & brass.]			
Measurement Methods NIOSH 5600			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.1 ppm : (APF = 10) Any supplied-air respirator Up to 0.25 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 0.5 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 4 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; miosis; rhinorrhea (discharge of thin mucus); headache; chest tightness, wheezing, laryngeal spasm, salivation, cyanosis; anorexia, nausea, vomiting, abdominal cramps, diarrhea; paralysis; ataxia, convulsions; low blood pressure, cardiac irregularities

Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system, blood cholinesterase

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phosgene			CAS 75-44-5
COCl ₂			RTECS SY5600000
Synonyms & Trade Names Carbon oxychloride, Carbonyl chloride, Carbonyl dichloride, Chloroformyl chloride			DOT ID & Guide 1076 125
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.4 mg/m ³) C 0.2 ppm (0.8 mg/m ³) [15-minute]		
	OSHA PEL: TWA 0.1 ppm (0.4 mg/m ³)		
IDLH 2 ppm		Conversion 1 ppm = 4.05 mg/m ³	
Physical Description Colorless gas with a suffocating odor like musty hay. [Note: A fuming liquid below 47°F. Shipped as a liquefied compressed gas.]			
MW: 98.9	BP: 47°F	FRZ: -198°F	Sol: Slight
VP: 1.6 atm	IP: 11.55 eV	RGasD: 3.48	Sp.Gr: 1.43 (Liquid at 32°F)
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Moisture, alkalis, ammonia, alcohols, copper [Note: Reacts slowly in water to form hydrochloric acid & carbon dioxide.]			
Measurement Methods OSHA 61			
Personal Protection & Sanitation Skin: Prevent skin contact (liquid) Eyes: Prevent eye contact (liquid) Wash skin: When contaminated (liquid) Remove: When wet or contaminated (liquid) Change: No recommendation Provide: Quick drench (liquid)		First Aid (See procedures) Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 1 ppm: (APF = 10) Any supplied-air respirator* Up to 2 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes; dry burning throat; vomiting; cough, foamy sputum, dyspnea (breathing difficulty), chest pain, cyanosis; liquid: frostbite

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phosphine			CAS 7803-51-2
PH ₃			RTECS SY7525000
Synonyms & Trade Names Hydrogen phosphide, Phosphorated hydrogen, Phosphorus hydride, Phosphorus trihydride			DOT ID & Guide 2199 119
Exposure Limits	NIOSH REL: TWA 0.3 ppm (0.4 mg/m ³) ST 1 ppm (1 mg/m ³)		
	OSHA PEL†: TWA 0.3 ppm (0.4 mg/m ³)		
IDLH 50 ppm		Conversion 1 ppm = 1.39 mg/m ³	
Physical Description Colorless gas with a fish- or garlic-like odor. [pesticide] [Note: Shipped as a liquefied compressed gas. Pure compound is odorless.]			
MW: 34.0	BP: -126°F	FRZ: -209°F	Sol: Slight
VP: 41.3 atm	IP: 9.96 eV	RGasD: 1.18	
Fl.P: NA (Gas)	UEL: ?	LEL: 1.79%	
Flammable Gas			
Incompatibilities & Reactivities Air, oxidizers, chlorine, acids, moisture, halogenated hydrocarbons, copper [Note: May ignite SPONTANEOUSLY on contact with air.]			
Measurement Methods OSHA 1003, ID180			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 3 ppm : (APF = 10) Any supplied-air respirator Up to 7.5 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 15 ppm : (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 self-contained breathing			

apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece
Up to 50 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Nausea, vomiting, abdominal pain, diarrhea; thirst; chest tightness, dyspnea (breathing difficulty); muscle pain, chills; stupor or syncope; pulmonary edema; liquid: frostbite

Target Organs respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phosphoric acid			CAS 7664-38-2
H3PO4			RTECS TB6300000
Synonyms & Trade Names Orthophosphoric acid, Phosphoric acid (aqueous), White phosphoric acid			DOT ID & Guide 1805 154
Exposure Limits	NIOSH REL: TWA 1 mg/m³ ST 3 mg/m³		
	OSHA PEL†: TWA 1 mg/m³		
IDLH 1000 mg/m³		Conversion	
Physical Description Thick, colorless, odorless, crystalline solid. [Note: Often used in an aqueous solution.]			
MW: 98.0	BP: 415°F	MLT: 108°F	Sol: Miscible
VP: 0.03 mmHg	IP: ?		Sp.Gr(77°F): 1.87 (pure) 1.33 (50% solution)
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong caustics, most metals [Note: Readily reacts with metals to form flammable hydrogen gas. DO NOT MIX WITH SOLUTIONS CONTAINING BLEACH OR AMMONIA.]			
Measurement Methods NIOSH 7903; OSHA ID165SG			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash (>1.6%), Quick drench (>1.6%)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 25 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 50 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator 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			

Up to 1000 mg/m : (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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, upper respiratory system; eye, skin, burns; dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phosphorus (yellow)			CAS 7723-14-0
P ₄			RTECS TH3500000
Synonyms & Trade Names Elemental phosphorus, White phosphorus			DOT ID & Guide 1381 136
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³		
	OSHA PEL: TWA 0.1 mg/m ³		
IDLH 5 mg/m ³		Conversion	
Physical Description White to yellow, soft, waxy solid with acrid fumes in air. [Note: Usually shipped or stored in water.]			
MW: 124.0	BP: 536°F	MLT: 111°F	Sol: 0.0003%
VP: 0.03 mmHg	IP: ?		Sp.Gr: 1.82
Fl.P: ?	UEL: ?	LEL: ?	
Flammable Solid			
Incompatibilities & Reactivities Air, oxidizers (including elemental sulfur & strong caustics), halogens [Note: Ignites SPONTANEOUSLY in moist air.]			
Measurement Methods NIOSH 7905			
Personal Protection & Sanitation Skin: Prevent skin contact* [*Note: Flame retardant personal protective equipment should be provided.] Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1 mg/m³ : (APF = 10) Any supplied-air respirator Up to 2.5 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] Up to 5 mg/m³ : (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: Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, respiratory tract; eye, skin burns; abdominal pain, nausea, jaundice; anemia; cachexia; dental pain, salivation, jaw pain, swelling
Target Organs Eyes, skin, respiratory system, liver, kidneys, jaw, teeth, blood
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phosphorus oxychloride			CAS 10025-87-3
POCl ₃			RTECS TH4897000
Synonyms & Trade Names Phosphorus chloride, Phosphorus oxytrichloride, Phosphoryl chloride			DOT ID & Guide 1810 137
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.6 mg/m ³) ST 0.5 ppm (3 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 6.27 mg/m ³	
Physical Description Clear, colorless to yellow, oily liquid with a pungent & musty odor. [Note: A solid below 34°F.]			
MW: 153.3	BP: 222°F	FRZ: 34°F	Sol: Decomposes
VP(81°F): 40 mmHg	IP: ?		Sp.Gr(77°F): 1.65
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but may set fire to combustible materials.			
Incompatibilities & Reactivities Water, combustible materials, carbon disulfide, dimethyl-formamide, metals (except nickel & lead) [Note: Decomposes in water to hydrochloric & phosphoric acids.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; eye, skin burns; dyspnea (breathing difficulty), cough, pulmonary edema; dizziness, headache, lassitude (weakness, exhaustion); abdominal pain, nausea, vomiting; nephritis			
Target Organs Eyes, skin, respiratory system, central nervous system, kidneys			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phosphorus pentachloride			CAS 10026-13-8
PCl ₅			RTECS TB6125000
Synonyms & Trade Names Pentachlorophosphorus, Phosphoric chloride, Phosphorus perchloride			DOT ID & Guide 1806 137
Exposure Limits	NIOSH REL: TWA 1 mg/m ³		
	OSHA PEL: TWA 1 mg/m ³		
IDLH 70 mg/m ³		Conversion	
Physical Description White to pale-yellow, crystalline solid with a pungent, unpleasant odor.			
MW: 208.3	BP: Sublimes	MLT: 324°F (Sublimes)	Sol: Reacts
VP(132°F): 1 mmHg	IP: ?		Sp.Gr: 3.60
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Water, magnesium oxide, chemically-active metals such as sodium & potassium, alkalis, amines [Note: Hydrolyzes in water (even in humid air) to form hydrochloric acid & phosphoric acid. Corrosive to metals.]			
Measurement Methods NIOSH S257 (II-5)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 10 mg/m ³ : (APF = 10) Any supplied-air respirator* Up to 25 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 50 mg/m ³ : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 70 mg/m ³ : (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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; bronchitis; dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phosphorus pentasulfide			CAS 1314-80-3
P ₂ S ₅ /P ₄ S ₁₀			RTECS TH4375000
Synonyms & Trade Names Phosphorus persulfide, Phosphorus sulfide, Sulfur phosphide			DOT ID & Guide 1340 139
Exposure Limits	NIOSH REL: TWA 1 mg/m ³ ST 3 mg/m ³		
	OSHA PEL†: TWA 1 mg/m ³		
IDLH 250 mg/m ³		Conversion	
Physical Description Greenish-gray to yellow, crystalline solid with an odor of rotten eggs.			
MW: 222.3/444.6	BP: 957°F	MLT: 550°F	Sol: Reacts
VP(572°F): 1 mmHg	IP: ?		Sp.Gr: 2.09
Fl.P: ?	UEL: ?	LEL: ?	
Flammable Solid, which may SPONTANEOUSLY ignite in presence of moisture.			
Incompatibilities & Reactivities Water, alcohols, strong oxidizers, acids, alkalis [Note: Reacts with water to form hydrogen sulfide, sulfur dioxide, and phosphoric acid.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Dust off solid; water flush Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 10 mg/m³ : (APF = 10) Any supplied-air respirator* Up to 25 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 50 mg/m³ : (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 (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern and having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; apnea, coma, convulsions; conjunctivitis pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), kerato-conjunctivity, corneal vesiculation; dizziness; headache; lassitude (weakness, exhaustion); irritability, insomnia; gastrointestinal disturbance

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phosphorus trichloride			CAS 7719-12-2
PCl ₃			RTECS TH3675000
Synonyms & Trade Names Phosphorus chloride			DOT ID & Guide 1809 137
Exposure Limits	NIOSH REL: TWA 0.2 ppm (1.5 mg/m ³) ST 0.5 ppm (3 mg/m ³)		
	OSHA PEL†: TWA 0.5 ppm (3 mg/m ³)		
IDLH 25 ppm		Conversion 1 ppm = 5.62 mg/m ³	
Physical Description Colorless to yellow, fuming liquid with an odor like hydrochloric acid.			
MW: 137.4	BP: 169°F	FRZ: -170°F	Sol: Reacts
VP: 100 mmHg	IP: 9.91 eV		Sp.Gr: 1.58
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid; however, a strong oxidizer that may ignite combustibles upon contact.			
Incompatibilities & Reactivities Water, chemically-active metals such as sodium & potassium, aluminum, strong nitric acid, acetic acid, organic matter [Note: Hydrolyzes in water to form hydrochloric acid and phosphoric acid.]			
Measurement Methods NIOSH 6402			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 10 ppm : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 25 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 canister providing protection against the compound of concern⁶/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, nose, throat; pulmonary edema; eye, skin burns

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Phthalic anhydride			CAS 85-44-9
C6H4(CO)2O			RTECS TI3150000
Synonyms & Trade Names 1,2-Benzenedicarboxylic anhydride; PAN; Phthalic acid anhydride			DOT ID & Guide 2214 156
Exposure Limits	NIOSH REL: TWA 6 mg/m ³ (1 ppm)		
	OSHA PEL†: TWA 12 mg/m ³ (2 ppm)		
IDLH 60 mg/m ³		Conversion 1 ppm = 6.06 mg/m ³	
Physical Description White solid (flake) or a clear, colorless, mobile liquid (molten) with a characteristic, acrid odor.			
MW: 148.1	BP: 563°F	MLT: 267°F	Sol: 0.6%
VP: 0.0015 mmHg	IP: 10.00 eV		Sp.Gr: 1.53 (Flake) 1.20 (Molten)
Fl.P: 305°F	UEL: 10.5%	LEL: 1.7%	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, water [Note: Converted to phthalic acid in hot water.]			
Measurement Methods NIOSH S179 (II-3); OSHA 90			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 30 mg/m³ : (APF = 5) Any dust and mist respirator* Up to 60 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 25) Any powered, air-purifying respirator with a dust and mist 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, upper respiratory system; conjunctivitis; nasal ulcer bleeding; bronchitis, bronchial asthma; dermatitis; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

m-Phthalodinitrile			CAS 626-17-5
C6H4(CN)2			RTECS CZ1900000
Synonyms & Trade Names 1,3-Benzenedicarbonitrile; m-Dicyanobenzene; 1,3-Dicyanobenzene; Isophthalodinitrile; m-PDN			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Needle-like, colorless to white, crystalline, flaky solid with an almond-like odor.			
MW: 128.1	BP: Sublimes	MLT: 324°F (Sublimes)	Sol: Slight
VP: 0.01 mmHg	IP: ?		Sp.Gr: 4.42
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid and a severe explosion hazard.			
Incompatibilities & Reactivities Strong oxidizers (e.g., chlorine, bromine, fluorine)			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Headache, nausea, confusion; in animals: irritation eyes, skin			
Target Organs Eyes, skin, central nervous system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Picloram			CAS 1918-02-1
C₆H₃Cl₃O₂N₂			RTECS TJ7525000
Synonyms & Trade Names 4-Amino-3,5,6-trichloropicolinic acid; 4-Amino-3,5,6-trichloro-2-picolinic acid; ATCP; Tordon®			DOT ID & Guide
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Colorless to white crystals with a chlorine-like odor. [herbicide]			
MW: 241.5	BP: Decomposes	MLT: 424°F (Decomposes)	Sol: 0.04%
VP(95°F): 0.0000006 mmHg	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Hot concentrated alkali (hydrolyzes)			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; nausea; in animals: liver, kidney changes			
Target Organs Eyes, skin, respiratory system, liver, kidneys			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Picric acid			CAS 88-89-1
$(\text{NO}_2)_3\text{C}_6\text{H}_2\text{OH}$			RTECS TJ7875000
Synonyms & Trade Names Phenol trinitrate; 2,4,6-Trinitrophenol [Note: An OSHA Class A Explosive (1910.109).]			DOT ID & Guide 1344 113 (>10% water)
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ ST 0.3 mg/m ³ [skin]		
	OSHA PEL: TWA 0.1 mg/m ³ [skin]		
IDLH 75 mg/m ³		Conversion 1 ppm = 9.37 mg/m ³	
Physical Description Yellow, odorless solid. [Note: Usually used as an aqueous solution.]			
MW: 229.1	BP: Explodes above 572°F	MLT: 252°F	Sol: 1%
VP(383°F): 1 mmHg	IP: ?		Sp.Gr: 1.76
Fl.P: 302°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Copper, lead, zinc & other metals; salts; plaster; concrete; ammonia [Note: Corrosive to metals. An explosive mixture results when the aqueous solution crystallizes.]			
Measurement Methods NIOSH S228 (II-4)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.5 mg/m³ : (APF = 5) Any dust and mist respirator Up to 1 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(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 a dust and mist filter

Up to 5 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 75 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin; sensitization dermatitis; yellow-stained hair, skin; lassitude (weakness, exhaustion), myalgia, anuria, polyuria; bitter taste, gastrointestinal disturbance; hepatitis, hematuria (blood in the urine), albuminuria, nephritis

Target Organs Eyes, skin, kidneys, liver, blood

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Pindone			CAS 83-26-1
$\text{C}_9\text{H}_5\text{O}_2\text{C}(\text{O})\text{C}(\text{CH}_3)_3$			RTECS NK6300000
Synonyms & Trade Names tert-Butyl valone; 1,3-Dioxo-2-pivaloy-lindane; Pival®; Pivalyl; 2-Pivalyl-1,3-indandione			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³		
	OSHA PEL: TWA 0.1 mg/m ³		
IDLH 100 mg/m ³		Conversion	
Physical Description Bright-yellow powder with almost no odor. [rodenticide]			
MW: 230.3	BP: Decomposes	MLT: 230°F	Sol(77°F): 0.002%
VP: Very low	IP: ?		Sp.Gr: 1.06
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities None reported			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.5 mg/m ³ : (APF = 5) Any dust and mist respirator Up to 1 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 2.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter Up to 5 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate			

filter/(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 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, ingestion

Symptoms Epistaxis (nosebleed), excess bleeding from minor cuts, bruises; smoky urine, black tarry stools; abdominal, back pain

Target Organs Blood prothrombin

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Piperazine dihydrochloride			CAS 142-64-3
C ₄ H ₁₀ N ₂ • 2HCl			RTECS TL4025000
Synonyms & Trade Names Piperazine hydrochloride [Note: The monochloride, C ₄ H ₁₀ N ₂ HCl, is also commercially available.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White to cream-colored needles or powder.			
MW: 159.1	BP: ?	MLT: 635°F	Sol: 41%
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid, but does not ignite easily.			
Incompatibilities & Reactivities Water [Note: Slightly hygroscopic (i.e., absorbs moisture from the air).]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; skin burns, sensitization; asthma; gastrointestinal upset, headache, nausea, vomiting, incoordination, muscle weakness			
Target Organs Eyes, skin, respiratory system, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Plaster of Paris			CAS 26499-65-0
CaSO ₄ • 0.5H ₂ O			RTECS TP0700000
Synonyms & Trade Names Calcium sulfate hemihydrate, Dried calcium sulfate, Gypsum hemihydrate, Hemihydrate gypsum [Note: Plaster of Paris is the hemihydrate form of Calcium Sulfate & Gypsum is the dihydrate form.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description White or yellowish, finely divided, odorless powder.			
MW: 145.2	BP: ?	MLT: 325°F (Loses H ₂ O)	Sol(77°F): 0.3%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.5
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Moisture, water [Note: Hygroscopic (i.e., absorbs moisture from the air). Reacts with water to form Gypsum.]			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane, respiratory system; cough			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Platinum			CAS 7440-06-4
Pt			RTECS TP2160000
Synonyms & Trade Names Platinum black, Platinum metal, Platinum sponge			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Silvery, whitish-gray, malleable, ductile metal.			
MW: 195.1	BP: 6921°F	MLT: 3222°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 21.45
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form, but finely divided powder can be dangerous to handle.			
Incompatibilities & Reactivities Aluminum, acetone, arsenic, ethane, hydrazine, hydrogen peroxide, lithium, phosphorus, selenium, tellurium, various fluorides			
Measurement Methods NIOSH 7300; OSHA ID121			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation skin, respiratory system; dermatitis			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Platinum (soluble salts, as Pt)		CAS	
		RTECS	
Synonyms & Trade Names Synonyms vary depending upon the specific soluble platinum salt.		DOT ID & Guide	
Exposure Limits	NIOSH REL: TWA 0.002 mg/m ³		
	OSHA PEL: TWA 0.002 mg/m ³		
IDLH 4 mg/m ³ (as Pt)		Conversion	
Physical Description Appearance and odor vary depending upon the specific soluble platinum salt.			
Properties vary depending upon the specific soluble platinum salt.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 7300, S191 (II-7)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.05 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] Up to 0.1 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator 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 Up to 4 mg/m ³ : (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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose; cough, dyspnea (breathing difficulty), wheezing, cyanosis; dermatitis, sensitization skin; lymphocytosis
Target Organs Eyes, skin, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Portland cement			CAS 65997-15-1
			RTECS VV8770000
Synonyms & Trade Names Cement, Hydraulic cement, Portland cement silicate [Note: A class of hydraulic cements containing tri- and dicalcium silicate in addition to alumina, tricalcium aluminate, and iron oxide.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL†: TWA 50 mppcf		
IDLH 5000 mg/m ³		Conversion	
Physical Description Gray, odorless powder.			
MW: ?	BP: NA	MLT: NA	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0500; OSHA ID207			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 50 mg/m³ : (APF = 5) Any dust respirator Up to 100 mg/m³ : (APF = 10) Any dust respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 250 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust filter			

Up to 500 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 5000 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, nose; cough, expectoraction; exertional dyspnea (breathing difficulty), wheezing, chronic bronchitis; dermatitis

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Potassium cyanide (as CN)			CAS 151-50-8
KCN			RTECS TS8750000
Synonyms & Trade Names Potassium salt of hydrocyanic acid			DOT ID & Guide 1680 157
Exposure Limits	NIOSH REL*: C 5 mg/m ³ (4.7 ppm) [10-minute] [*Note: The REL also applies to other cyanides (as CN) except Hydrogen cyanide.]		
	OSHA PEL*: TWA 5 mg/m ³ [*Note: The PEL also applies to other cyanides (as CN) except Hydrogen cyanide.]		
IDLH 25 mg/m ³ (as CN)		Conversion	
Physical Description White, granular or crystalline solid with a faint, almond-like odor.			
MW: 65.1	BP: 2957°F	MLT: 1173°F	Sol(77°F): 72%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.55
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but contact with acids releases highly flammable hydrogen cyanide.			
Incompatibilities & Reactivities Strong oxidizers (such as acids, acid salts, chlorates & nitrates) [Note: Absorbs moisture from the air forming a syrup.]			
Measurement Methods NIOSH 6010, 7904			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 25 mg/m³ : (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 canister providing protection against the compound of concern and having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, upper respiratory system; asphyxia; lassitude (weakness, exhaustion), headache, confusion; nausea, vomiting; increased respiratory rate, slow gasping respiration; thyroid, blood changes

Target Organs Eyes, skin, respiratory system, cardiovascular system, central nervous system, thyroid, blood

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Potassium hydroxide			CAS 1310-58-3
KOH			RTECS TT2100000
Synonyms & Trade Names Caustic potash, Lye, Potassium hydrate			DOT ID & Guide 1813 154 (dry, solid) 1814 154 (solution)
Exposure Limits	NIOSH REL: C 2 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Odorless, white or slightly yellow lumps, rods, flakes, sticks, or pellets. [Note: May be used as an aqueous solution.]			
MW: 56.1	BP: 2415°F	MLT: 716°F	Sol(59°F): 107%
VP(1317°F): 1 mmHg	IP: ?		Sp.Gr: 2.04
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid; however, may react with H ₂ O & other substances and generate sufficient heat to ignite combustible materials.			
Incompatibilities & Reactivities Acids, water, metals (when wet), halogenated hydrocarbons, maleic anhydride [Note: Heat is generated if KOH comes in contact with H ₂ O & CO ₂ from the air.]			
Measurement Methods NIOSH 7401			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; cough, sneezing; eye, skin burns; vomiting, diarrhea			

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Propane			CAS 74-98-6
CH ₃ CH ₂ CH ₃			RTECS TX2275000
Synonyms & Trade Names Bottled gas, Dimethyl methane, n-Propane, Propyl hydride			DOT ID & Guide 1075 115 1978 115
Exposure Limits	NIOSH REL: TWA 1000 ppm (1800 mg/m ³)		
	OSHA PEL: TWA 1000 ppm (1800 mg/m ³)		
IDLH 2100 ppm [10%LEL]		Conversion 1 ppm = 1.80 mg/m ³	
Physical Description Colorless, odorless gas. [Note: A foul-smelling odorant is often added when used for fuel purposes. Shipped as a liquefied compressed gas.]			
MW: 44.1	BP: -44°F	FRZ: -306°F	Sol: 0.01%
VP(70°F): 8.4 atm	IP: 11.07 eV	RGasD: 1.55	
Fl.P: NA (Gas)	UEL: 9.5%	LEL: 2.1%	
Flammable Gas			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH S87 (II-2)			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 2100 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 : Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact (liquid)
Symptoms Dizziness, confusion, excitation, asphyxia; liquid: frostbite
Target Organs central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Propane sultone			CAS 1120-71-4
C ₃ H ₆ O ₃ S			RTECS RP5425000
Synonyms & Trade Names 3-Hydroxy-1-propanesulphonic acid sultone; 1,3-Propane sultone			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description White, crystalline solid or a colorless liquid (above 86°F). [Note: Releases a foul odor as it melts.]			
MW: 122.2	BP: ?	MLT: 86°F	Sol: 10%
VP: ?	IP: ?		Sp.Gr: 1.39
Fl.P: >235°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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 d: (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 a high-efficiency particulate filter/Any appropriate escape-type, self-			

contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system
Cancer Site [in animals: skin tumors, leukemia, gliomas]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1-Propanethiol			CAS 107-03-9
CH ₃ CH ₂ CH ₂ SH			RTECS TZ7300000
Synonyms & Trade Names 3-Mercaptopropane, Propane-1-thiol, Propyl mercaptan, n-Propyl mercaptan			DOT ID & Guide 2402 130
Exposure Limits	NIOSH REL: C 0.5 ppm (1.6 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 3.12 mg/m ³	
Physical Description Colorless liquid with an offensive, cabbage-like odor.			
MW: 76.2	BP: 153°F	FRZ: -172°F	Sol: Slight
VP(77°F): 155 mmHg	IP: 9.195 eV		Sp.Gr: 0.84
Fl.P: -5°F	UEL: ?	LEL: ?	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Oxidizers, reducing agents, strong acids & bases, alkali metals, calcium hypochlorite			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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
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

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

Symptoms Irritation eyes, skin, nose, throat, respiratory system; headache, nausea, dizziness, cyanosis; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Propargyl alcohol			CAS 107-19-7
C ₃ H ₃ OH			RTECS UK5075000
Synonyms & Trade Names 1-Propyn-3-ol; 2-Propyn-1-ol; 2-Propynyl alcohol			DOT ID & Guide 1986 131
Exposure Limits	NIOSH REL: TWA 1 ppm (2 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 2.29 mg/m ³	
Physical Description Colorless to straw-colored liquid with a mild, geranium odor.			
MW: 56.1	BP: 237°F	FRZ: -62°F	Sol: Miscible
VP: 12 mmHg	IP: 10.51 eV		Sp.Gr: 0.97
Fl.P(oc): 97°F	UEL: ?	LEL: ?	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Phosphorus pentoxide, oxidizers			
Measurement Methods OSHA 97			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation skin, mucous membrane; central nervous system depression; in animals: liver, kidney damage			
Target Organs Skin, respiratory system, central nervous system, liver, kidneys			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

beta-Propiolactone			CAS 57-57-8
C ₃ H ₄ O ₂			RTECS RQ7350000
Synonyms & Trade Names BPL; Hydroacrylic acid, beta-lactone; 3-Hydroxy-beta-lactone; 3-Hydroxy-propionic acid; beta-Lactone; 2-Oxetanone; 3-Propiolactone			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1013] See Appendix B		
IDLH Ca [N.D]		Conversion	
Physical Description Colorless liquid with a slightly sweet odor.			
MW: 72.1	BP: 323°F (Decomposes)	FRZ: -28°F	Sol: 37%
VP(77°F): 3 mmHg	IP: ?		Sp.Gr: 1.15
Fl.P: 165°F	UEL: ?	LEL: 2.9%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Acetates, halogens, thiocyanates, thiosulfates [Note: May polymerize upon storage.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Skin irritation, blistering, burns; corneal opacity; frequent urination; dysuria; hematuria (blood in the urine); [potential occupational carcinogen]
Target Organs Kidneys, skin, lungs, eyes
Cancer Site [in animals: tumors of the liver, skin & stomach]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Propionic acid			CAS 79-09-4
CH ₃ CH ₂ COOH			RTECS UE5950000
Synonyms & Trade Names Carboxyethane, Ethanecarboxylic acid, Ethylformic acid, Metacetonc acid, Methyl acetic acid, Propanoic acid			DOT ID & Guide 1848 132
Exposure Limits	NIOSH REL: TWA 10 ppm (30 mg/m ³) ST 15 ppm (45 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 3.03 mg/m ³	
Physical Description Colorless, oily liquid with a pungent, disagreeable, rancid odor. [Note: A solid below 5°F.]			
MW: 74.1	BP: 286°F	FRZ: 5°F	Sol: Miscible
VP: 3 mmHg	IP: 10.24 eV		Sp.Gr: 0.99
Fl.P: 126°F	UEL: 12.1%	LEL: 2.9%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Alkalis, strong oxidizers (e.g., chromium trioxide) [Note: Corrosive to steel.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; blurred vision, corneal burns; skin burns; abdominal pain, nausea, vomiting			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Propionitrile			CAS 107-12-0
CH ₃ CH ₂ CN			RTECS UF9625000
Synonyms & Trade Names Cyanoethane, Ethyl cyanide, Propanenitrile, Propionic nitrile, Propiononitrile			DOT ID & Guide 2404 131
Exposure Limits	NIOSH REL: TWA 6 ppm (14 mg/m ³)		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 2.25 mg/m ³	
Physical Description Colorless liquid with a pleasant, sweetish, ethereal odor. [Note: Forms cyanide in the body.]			
MW: 55.1	BP: 207°F	FRZ: -133°F	Sol: 11.9%
VP: 35 mmHg	IP: 11.84 eV		Sp.Gr: 0.78
Fl.P: 36°F	UEL: ?	LEL: 3.1%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers & reducing agents, strong acids & bases [Note: Hydrogen cyanide is produced when propionitrile is heated to decomposition.]			
Measurement Methods NIOSH 1606 (adapt)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 60 ppm : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator Up to 150 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 300 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 1000 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

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

Symptoms Irritation eyes, skin, respiratory system; nausea, vomiting; chest pain; lassitude (weakness, exhaustion); stupor, convulsions; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Propoxur			CAS 114-26-1
CH₃NHCOOC₆H₄OCH(CH₃)₂			RTECS FC3150000
Synonyms & Trade Names Aprocarb®, o-Isopropoxyphenyl-N-methylcarbamate, N-Methyl-2-isopropoxyphenyl-carbamate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White to tan, crystalline powder with a faint, characteristic odor. [insecticide]			
MW: 209.3	BP: Decomposes	MLT: 187-197°F	Sol: 0.2%
VP: 0.000007 mmHg	IP: ?		Sp.Gr: ?
Fl.P: >300°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers, alkalis [Note: Emits highly toxic methyl isocyanate fumes when heated to decomposition.]			
Measurement Methods NIOSH 5601; OSHA PV2007			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Miosis, blurred vision; sweating, salivation; abdominal cramps, nausea, diarrhea, vomiting; headache, lassitude (weakness, exhaustion), muscle twitching			
Target Organs central nervous system, liver, kidneys, gastrointestinal tract, blood cholinesterase			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Propyl acetate			CAS 109-60-4
CH ₃ COOCH ₂ CH ₂ CH ₃			RTECS AJ3675000
Synonyms & Trade Names Propylacetate, n-Propyl ester of acetic acid			DOT ID & Guide 1276 129
Exposure Limits	NIOSH REL: TWA 200 ppm (840 mg/m ³) ST 250 ppm (1050 mg/m ³)		
	OSHA PEL†: TWA 200 ppm (840 mg/m ³)		
IDLH 1700 ppm		Conversion 1 ppm = 4.18 mg/m ³	
Physical Description Colorless liquid with a mild, fruity odor.			
MW: 102.2	BP: 215°F	FRZ: -134°F	Sol: 2%
VP: 25 mmHg	IP: 10.04 eV		Sp.Gr: 0.84
Fl.P: 55°F	UEL: 8%	LEL(100°F): 1.7%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Nitrates; strong oxidizers, alkalis & acids			
Measurement Methods NIOSH 1450; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1700 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

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

Symptoms In animals: irritation eyes, nose, throat; narcosis; dermatitis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Propyl alcohol			CAS 71-23-8
CH ₃ CH ₂ CH ₂ OH			RTECS UH8225000
Synonyms & Trade Names Ethyl carbinol, 1-Propanol, n-Propanol, Propyl alcohol			DOT ID & Guide 1274 129
Exposure Limits	NIOSH REL: TWA 200 ppm (500 mg/m ³) ST 250 ppm (625 mg/m ³) [skin]		
	OSHA PEL†: TWA 200 ppm (500 mg/m ³)		
IDLH 800 ppm		Conversion 1 ppm = 2.46 mg/m ³	
Physical Description Colorless liquid with a mild, alcohol-like odor.			
MW: 60.1	BP: 207°F	FRZ: -196°F	Sol: Miscible
VP: 15 mmHg	IP: 10.15 eV		Sp.Gr: 0.81
Fl.P: 72°F	UEL: 13.7%	LEL: 2.2%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1401; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush 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 = 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose, throat; dry cracking skin; drowsiness, headache; ataxia, gastrointestinal pain; abdominal cramps, nausea, vomiting, diarrhea; in animals: narcosis
Target Organs Eyes, skin, respiratory system, gastrointestinal tract, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Propylene dichloride			CAS 78-87-5
CH ₃ CHClCH ₂ Cl			RTECS TX9625000
Synonyms & Trade Names Dichloro-1,2-propane; 1,2-Dichloropropane			DOT ID & Guide 1279 130
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: TWA 75 ppm (350 mg/m ³)		
IDLH Ca [400 ppm]		Conversion 1 ppm = 4.62 mg/m ³	
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			
Measurement Methods NIOSH 1013; OSHA 7			
Personal Protection & Sanitation 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) 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			

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]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Propylene glycol dinitrate			CAS 6423-43-4
CH3CNO2OHCHNO2OH			RTECS TY6300000
Synonyms & Trade Names PGDN; Propylene glycol-1,2-dinitrate; 1,2-Propylene glycol dinitrate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.05 ppm (0.3 mg/m³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 6.79 mg/m³	
Physical Description Colorless liquid with a disagreeable odor. [Note: A solid below 18°F.]			
MW: 166.1	BP: ?	FRZ: 18°F	Sol: 0.1%
VP(72°F): 0.07 mmHg	IP: ?		Sp.Gr(77°F): 1.23
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Ammonia compounds, amines, oxidizers, reducing agents, combustible materials [Note: Similar to Ethylene glycol dinitrate in explosion potential.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes; conjunctivitis; methemoglobinemia; headache, impaired balance, visual disturbance; in animals: liver, kidney damage			
Target Organs Eyes, central nervous system, blood, liver, kidneys			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Propylene glycol monomethyl ether			CAS 107-98-2
CH ₃ OCH ₂ CHCH ₃			RTECS UB7700000
Synonyms & Trade Names Dowtherm® 209, 1-Methoxy-2-hydroxypropane, 1-Methoxy-2-propanol, 2-Methoxy-1-methylethanol, Propylene glycol methyl ether			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 100 ppm (360 mg/m ³) ST 150 ppm (540 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 3.69 mg/m ³	
Physical Description Clear, colorless liquid with a mild, ethereal odor.			
MW: 90.1	BP: 248°F	FRZ: -139°F (Sets to glass)	Sol: Miscible
VP(77°F): 12 mmHg	IP: ?		Sp.Gr: 0.96
Fl.P: 97°F	UEL(calc): 13.8%	LEL(calc.): 1.6%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Oxidizers, strong acids [Note: Hygroscopic (i.e., absorbs moisture from the air). May slowly form reactive peroxides during prolonged storage.]			
Measurement Methods OSHA 99			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; headache, nausea, dizziness, drowsiness, incoordination; vomiting, diarrhea			
Target Organs Eyes, skin, respiratory system, central nervous system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Propylene imine			CAS 75-55-8
C ₃ H ₇ N			RTECS CM8050000
Synonyms & Trade Names 2-Methylaziridine, 2-Methylethyleneimine, Propyleneimine, Propylene imine (inhibited), Propylenimine			DOT ID & Guide 1921 131P (inhibited)
Exposure Limits	NIOSH REL: Ca TWA 2 ppm (5 mg/m ³) [skin] See Appendix A		
	OSHA PEL: TWA 2 ppm (5 mg/m ³) [skin]		
IDLH Ca [100 ppm]		Conversion 1 ppm = 2.34 mg/m ³	
Physical Description Colorless, oily liquid with an ammonia-like odor.			
MW: 57.1	BP: 152°F	FRZ: -85°F	Sol: Miscible
VP: 112 mmHg	IP: 9.00 eV		Sp.Gr: 0.80
Fl.P: 25°F	UEL: ?	LEL: ?	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Acids, strong oxidizers, water, carbonyl compounds, quinones, sulfonyl halides [Note: Subject to violent polymerization in contact with acids. Hydrolyzes in water to form methylethanolamine.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Eye, skin burns; [potential occupational carcinogen]
Target Organs Eyes, skin
Cancer Site [in animals: nasal tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Propylene oxide			CAS 75-56-9
C ₃ H ₆ O			RTECS TZ2975000
Synonyms & Trade Names 1,2-Epoxy propane; Methyl ethylene oxide; Methyloxirane; Propene oxide; 1,2-Propylene oxide			DOT ID & Guide 1280 127P
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: TWA 100 ppm (240 mg/m ³)		
IDLH Ca [400 ppm]		Conversion 1 ppm = 2.38 mg/m ³	
Physical Description Colorless liquid with a benzene-like odor. [Note: A gas above 94°F.]			
MW: 58.1	BP: 94°F	FRZ: -170°F	Sol: 41%
VP: 445 mmHg	IP: 9.81 eV		Sp.Gr: 0.83
Fl.P: -35°F	UEL: 36%	LEL: 2.3%	
Class IA Flammable Liquid: Fl.P. below 73°F and BP below 100°F.			
Incompatibilities & Reactivities Anhydrous metal chlorides; iron; strong acids, caustics & peroxides [Note: Polymerization may occur due to high temperatures or contamination with alkalis, aqueous acids, amines & acidic alcohols.]			
Measurement Methods NIOSH 1612; OSHA 88			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately 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 (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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; skin blisters, burns; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system
Cancer Site [in animals: nasal tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Propyl nitrate			CAS 627-13-4
CH3CH2CH2ONO2			RTECS UK0350000
Synonyms & Trade Names Propyl ester of nitric acid			DOT ID & Guide 1865 131
Exposure Limits	NIOSH REL: TWA 25 ppm (105 mg/m ³) ST 40 ppm (170 mg/m ³)		
	OSHA PEL†: TWA 25 ppm (110 mg/m ³)		
IDLH 500 ppm		Conversion 1 ppm = 4.30 mg/m ³	
Physical Description Colorless to straw-colored liquid with an ether-like odor.			
MW: 105.1	BP: 231°F	FRZ: -148°F	Sol: Slight
VP: 18 mmHg	IP: 11.07 eV		Sp.Gr: 1.07
Fl.P: 68°F	UEL: 100%	LEL: 2%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, combustible materials [Note: Forms explosive mixtures with combustible materials.]			
Measurement Methods NIOSH S227 (II-3); OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 250 ppm : (APF = 10) Any supplied-air respirator Up to 500 ppm : (APF = 25) Any supplied-air respirator 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 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 ⁱ /Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms In animals: irritation eyes, skin; methemoglobinemia, anoxia, cyanosis; dyspnea (breathing difficulty), lassitude (weakness, exhaustion), dizziness, headache
Target Organs Eyes, skin, blood
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Pyrethrum			CAS 8003-34-7
C ₂₀ H ₂₈ O ₃ / C ₂₁ H ₂₈ O ₅ / C ₂₁ H ₃₀ O ₃ / C ₂₂ H ₃₀ O ₅ / C ₂₁ H ₂₈ O ₃ / C ₂₂ H ₂₈ O ₅			RTECS UR4200000
Synonyms & Trade Names Cinerin I or II, Jasmolin I or II, Pyrethrin I or II, Pyrethrum I or II [Note: Pyrethrum is a variable mixture of Cinerin, Jasmolin, and Pyrethrin.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL: TWA 5 mg/m ³		
IDLH 5000 mg/m ³		Conversion	
Physical Description Brown, viscous oil or solid. [insecticide]			
MW: 316-374	BP: ?	MLT: ?	Sol: Insoluble
VP: Low	IP: ?		Sp.Gr: 1 (approx)
Fl.P: 180-190°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 5008; OSHA 70			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m ³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter*/(APF = 10) Any supplied-air respirator* Up to 125 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter* Up to 250 mg/m ³ : (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)			

<p>in combination with a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) 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</p> <p>Up to 5000 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</p> <p>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</p> <p>Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus</p>
<p>Exposure Routes inhalation, ingestion, skin and/or eye contact</p>
<p>Symptoms Erythema, dermatitis, papules, pruritus, rhinorrhea (discharge of thin mucus); sneezing; asthma</p>
<p>Target Organs respiratory system, skin, central nervous system</p>
<p>See also: INTRODUCTION</p>

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Pyridine			CAS 110-86-1
C ₅ H ₅ N			RTECS UR8400000
Synonyms & Trade Names Azabenzene, Azine			DOT ID & Guide 1282 129
Exposure Limits	NIOSH REL: TWA 5 ppm (15 mg/m ³)		
	OSHA PEL: TWA 5 ppm (15 mg/m ³)		
IDLH 1000 ppm		Conversion 1 ppm = 3.24 mg/m ³	
Physical Description Colorless to yellow liquid with a nauseating, fish-like odor.			
MW: 79.1	BP: 240°F	FRZ: -44°F	Sol: Miscible
VP: 16 mmHg	IP: 9.27 eV		Sp.Gr: 0.98
Fl.P: 68°F	UEL: 12.4%	LEL: 1.8%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids			
Measurement Methods NIOSH 1613; OSHA 7			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 125 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 1000 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

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

Symptoms Irritation eyes; headache, anxiety, dizziness, insomnia; nausea, anorexia; dermatitis; liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Quinone			CAS 106-51-4
OC ₆ H ₄ O			RTECS DK2625000
Synonyms & Trade Names 1,4-Benzoquinone; p-Benzoquinone; 1,4-Cyclohexadiene dioxide; p-Quinone			DOT ID & Guide 2587 153
Exposure Limits	NIOSH REL: TWA 0.4 mg/m ³ (0.1 ppm)		
	OSHA PEL: TWA 0.4 mg/m ³ (0.1 ppm)		
IDLH 100 mg/m ³		Conversion 1 ppm = 4.42 mg/m ³	
Physical Description Pale-yellow solid with an acrid, chlorine-like odor.			
MW: 108.1	BP: Sublimes	MLT: 240°F	Sol: Slight
VP(77°F): 0.1 mmHg	IP: 9.68 eV		Sp.Gr: 1.32
Fl.P: 100-200°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH S181 (II-4)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 10 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] Up to 20 mg/m³ : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Eye irritation, conjunctivitis; keratitis (inflammation of the cornea); skin irritation

Target Organs Eyes, skin

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Resorcinol			CAS 108-46-3
C6H4(OH)2			RTECS VG9625000
Synonyms & Trade Names 1,3-Benzenediol; m-Benzenediol; 1,3-Dihydroxybenzene; m-Dihydroxybenzene; 3-Hydroxyphenol; m-Hydroxyphenol			DOT ID & Guide 2876 153
Exposure Limits	NIOSH REL: TWA 10 ppm (45 mg/m ³) ST 20 ppm (90 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.50 mg/m ³	
Physical Description White needles, plates, crystals, flakes, or powder with a faint odor. [Note: Turns pink on exposure to air or light, or contact with iron.]			
MW: 110.1	BP: 531°F	MLT: 228°F	Sol: 110%
VP(77°F): 0.0002 mmHg	IP: 8.63 eV		Sp.Gr: 1.27
Fl.P: 261°F	UEL: ?	LEL(392°F): 1.4%	
Class IIIB Combustible Liquid, but may be difficult to ignite.			
Incompatibilities & Reactivities Acetanilide, albumin, alkalis, antipyrine, camphor, ferric salts, menthol, spirit nitrous ether, strong oxidizers & bases [Note: Hygroscopic (i.e., absorbs moisture from the air).]			
Measurement Methods NIOSH 5701; OSHA PV2053			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat, upper respiratory system; methemoglobinemia; cyanosis, convulsions; restlessness, bluish skin, increased heart rate, dyspnea (breathing difficulty); dizziness, drowsiness, hypothermia,			

hematuria (blood in the urine); spleen, kidney, liver changes; dermatitis

Target Organs Eyes, skin, respiratory system, cardiovascular system, central nervous system, blood, spleen, liver, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Rhodium (metal fume and insoluble compounds, as Rh)			CAS 7440-16-6 (metal)
Rh (metal)			RTECS VI9069000 (metal)
Synonyms & Trade Names Rhodium metal: Elemental rhodium Synonyms of other insoluble rhodium compounds vary depending upon the specific compound.			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³		
	OSHA PEL: TWA 0.1 mg/m ³		
IDLH 100 mg/m ³ (as Rh)		Conversion	
Physical Description Metal: White, hard, ductile, malleable solid with a bluish-gray luster.			
MW: 102.9	BP: 6741°F	MLT: 3571°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 12.41 (metal)
Fl.P: NA	UEL: NA	LEL: NA	
Metal: Noncombustible Solid in bulk form, but flammable as dust or powder.			
Incompatibilities & Reactivities Chlorine trifluoride, oxygen difluoride			
Measurement Methods NIOSH S188 (II-3)			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.5 mg/m ³ : (APF = 5) Any dust and mist respirator^ Up to 1 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators^/(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 a dust, mist, and fume filter

Up to 5 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 100 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation

Symptoms Possible respiratory sensitization

Target Organs respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Rhodium (soluble compounds, as Rh)		CAS	
		RTECS	
Synonyms & Trade Names Synonyms vary depending upon the specific soluble rhodium compound.		DOT ID & Guide	
Exposure Limits	NIOSH REL: TWA 0.001 mg/m ³		
	OSHA PEL: TWA 0.001 mg/m ³		
IDLH 2 mg/m ³ (as Rh)		Conversion	
Physical Description Appearance and odor vary depending upon the specific soluble rhodium compound.			
Properties vary depending upon the specific soluble rhodium compound.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH S189 (II-3)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.01 mg/m³ : (APF = 10) Any air-purifying respirator with a high-efficiency particulate filter*/(APF = 10) Any supplied-air respirator* Up to 0.025 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 0.05 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 2 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms In animals: irritation eyes; central nervous system damage

Target Organs Eyes, central nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Ronnel			CAS 299-84-3
$(\text{CH}_3\text{O})_2\text{P}(\text{S})\text{OC}_6\text{H}_2\text{Cl}_3$			RTECS TG0525000
Synonyms & Trade Names O,O-Dimethyl O-(2,4,5-trichlorophenyl) phosphorothioate; Fenchlorophos			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³		
	OSHA PEL†: TWA 15 mg/m ³		
IDLH 300 mg/m ³		Conversion	
Physical Description White to light-tan, crystalline solid. [insecticide] [Note: A liquid above 106°F.]			
MW: 321.6	BP: Decomposes	MLT: 106°F	Sol(77°F): 0.004%
VP(77°F): 0.0008 mmHg	IP: ?		Sp.Gr(77°F): 1.49
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 5600; OSHA PV2054			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 100 mg/m³: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter/(APF = 10) Any supplied-air respirator Up to 250 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter Up to 300 mg/m³: (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas			

mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms In animals: irritation eyes; cholinesterase inhibition; liver, kidney damage

Target Organs Eyes, liver, kidneys, blood plasma

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Rosin core solder, pyrolysis products (as formaldehyde)		CAS	
		RTECS	
Synonyms & Trade Names Rosin flux pyrolysis products, Rosin core soldering flux pyrolysis products		DOT ID & Guide	
Exposure Limits	NIOSH REL*: TWA 0.1 mg/m ³ [*Note: "Ca" in the presence of formaldehyde, acetaldehyde, or malonaldehyde. See Appendices A & C (Aldehydes).]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Pyrolysis products of rosin core solder include acetone, aliphatic aldehydes, methyl alcohol, methane, ethane, various abietic acids (the major components of rosin), CO & CO ₂ .			
Properties vary depending upon the specific rosin core solder being used.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 2541, 3500			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Respiratory support	
Respirator Recommendations To be added later In the presence of Formaldeyde, Acetaldehyde, or Malonaldehyde: 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation

Symptoms Irritation eyes, nose, throat, upper respiratory system

Target Organs Eyes, respiratory system

Cancer Site [nasal cancer; thyroid gland tumors in animals (in presence of Formaldehyde, Acetaldehyde, or Malonaldehyde)]

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Rotenone		CAS 83-79-4	
C₂₃H₂₂O₆		RTECS DJ2800000	
Synonyms & Trade Names 1,2,12,12a-Tetrahydro-8,9-dimethoxy-2-(1-methyl-ethenyl)-[1]benzopyrano [3,4-b]furo[2,3-h][1] benzopyran-6(6aH)-one		DOT ID & Guide	
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL: TWA 5 mg/m ³		
IDLH 2500 mg/m ³		Conversion	
Physical Description Colorless to red, odorless, crystalline solid. [insecticide]			
MW: 394.4	BP: Decomposes	MLT: 330°F	Sol: Insoluble
VP: <0.00004 mmHg	IP: ?		Sp.Gr: 1.27
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, alkalis			
Measurement Methods NIOSH 5007			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m³: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter/(APF = 10) Any supplied-air respirator Up to 125 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter Up to 250 mg/m³: (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)			

in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(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 2500 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 organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; numb mucous membrane; nausea, vomiting, abdominal pain; muscle tremor, incoordination, clonic convulsions, stupor

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Rouge			CAS 1309-37-1
Fe ₂ O ₃			RTECS NO7400000
Synonyms & Trade Names Iron(III)oxide, Iron oxide red, Red iron oxide, Red oxide			DOT ID & Guide
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description A fine, red powder of ferric oxide. [Note: Usually used in cake form or impregnated in paper or cloth.]			
MW: 159.7	BP: ?	MLT: 2849°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 5.24
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Calcium hypochlorite, carbon monoxide, hydrogen peroxide			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Selenium		CAS 7782-49-2	
Se		RTECS VS7700000	
Synonyms & Trade Names Elemental selenium, Selenium alloy		DOT ID & Guide 2658 152 (powder)	
Exposure Limits	NIOSH REL*: TWA 0.2 mg/m ³ [*Note: The REL also applies to other selenium compounds (as Se) except Selenium hexafluoride.]		
	OSHA PEL*: TWA 0.2 mg/m ³ [*Note: The PEL also applies to other selenium compounds (as Se) except Selenium hexafluoride.]		
IDLH 1 mg/m ³ (as Se)		Conversion	
Physical Description Amorphous or crystalline, red to gray solid. [Note: Occurs as an impurity in most sulfide ores.]			
MW: 79.0	BP: 1265°F	MLT: 392°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 4.28
Fl.P: NA	UEL: NA	LEL: NA	
Combustible Solid			
Incompatibilities & Reactivities Acids, strong oxidizers, chromium trioxide, potassium bromate, cadmium			
Measurement Methods NIOSH 7300, S190 (II-7); OSHA ID121			
Personal Protection & Sanitation 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) 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 dust and mist respirator^*/(APF = 10) Any dust, mist, and fume respirator*/(APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter^*/(APF = 25) Any powered, air-purifying respirator with a dust, mist, and fume 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Selenium hexafluoride			CAS 7783-79-1
SeF ₆			RTECS VS9450000
Synonyms & Trade Names Selenium fluoride			DOT ID & Guide 2194 125
Exposure Limits	NIOSH REL: TWA 0.05 ppm		
	OSHA PEL: TWA 0.05 ppm (0.4 mg/m ³)		
IDLH 2 ppm		Conversion 1 ppm = 7.89 mg/m ³	
Physical Description Colorless gas.			
MW: 193.0	BP: -30°F	FRZ: -59°F	Sol: Insoluble
VP: >1 atm	IP: ?	RGasD: 6.66	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Water [Note: Hydrolyzes very slowly in cold water.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 0.5 ppm : (APF = 10) Any supplied-air respirator Up to 1.25 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 2 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 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

Exposure Routes inhalation

Symptoms In animals: pulmonary irritation, edema

Target Organs respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Silica, amorphous			CAS 7631-86-9
SiO ₂			RTECS VV7310000
Synonyms & Trade Names Diatomaceous earth, Diatomaceous silica, Diatomite, Precipitated amorphous silica, Silica gel, Silicon dioxide (amorphous)			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 6 mg/m ³		
	OSHA PEL†: TWA 20 mppcf (80 mg/m ³ /%SiO ₂)		
IDLH 3000 mg/m ³		Conversion	
Physical Description Transparent to gray, odorless powder. [Note: Amorphous silica is the non-crystalline form of SiO ₂ .]			
MW: 60.1	BP: 4046°F	MLT: 3110°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.20
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Fluorine, oxygen difluoride, chlorine trifluoride			
Measurement Methods NIOSH 7501			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations NIOSH Up to 30 mg/m ³ : (APF = 5) Any dust and mist respirator Up to 60 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 150 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter			

Up to 300 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 3000 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, pneumoconiosis

Target Organs Eyes, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Silica, crystalline (as respirable dust)			CAS 14808-60-7
SiO ₂			RTECS VV7330000
Synonyms & Trade Names Cristobalite, Quartz, Tridymite, Tripoli			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca TWA 0.05 mg/m ³ See Appendix A		
	OSHA PEL: Crystalline Quartz (respirable): TWA 250 mppcf/(%SiO ₂ +5); TWA 10 mg/m ³ /(%SiO ₂ + 2)		
	Quartz (total dust): TWA 30 mg/m ³ /(%SiO ₂ + 2)		
	Cristobalite: Use ½ the value calculated from the count or mass formulae for quartz. Tridymite: Use ½ the value calculated from the formulae for quartz.		
IDLH Ca [25 mg/m ³ (cristobalite, tridymite); 50 mg/m ³ (quartz, tripoli)]		Conversion	
Physical Description Colorless, odorless solid. [Note: A component of many mineral dusts.]			
MW: 60.1	BP: 4046°F	MLT: 3110°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.66
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Powerful oxidizers: fluorine, chlorine trifluoride, manganese trioxide, oxygen difluoride, hydrogen peroxide, etc.; acetylene; ammonia			
Measurement Methods NIOSH 7500, 7601, 7602; OSHA ID142			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations NIOSH			

3

Up to 0.5 mg/m : (APF = 10) Any air-purifying respirator with a high-efficiency particulate filter

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

Up to 2.5 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

Up to 25 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Cough, dyspnea (breathing difficulty), wheezing; decreased pulmonary function, progressive respiratory symptoms (silicosis); irritation eyes; [potential occupational carcinogen]

Target Organs Eyes, respiratory system

Cancer Site [in animals: lung cancer]

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Silicon			CAS 7440-21-3
Si			RTECS VW0400000
Synonyms & Trade Names Elemental silicon [Note: Does not occur free in nature, but is found in silicon dioxide (silica) & in various silicates.]			DOT ID & Guide 1346 170 (amorphous powder)
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Black to gray, lustrous, needle-like crystals. [Note: The amorphous form is a dark-brown powder.]			
MW: 28.1	BP: 4271°F	MLT: 2570°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr(77°F): 2.33
Fl.P: NA	UEL: NA	LEL: NA	MEC: 160 g/m ³
Combustible Solid in powder form.			
Incompatibilities & Reactivities Chlorine, fluorine, oxidizers, calcium, cesium carbide, alkaline carbonates			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: Prevent eye contact Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; cough			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Silicon carbide			CAS 409-21-2
SiC			RTECS VW0450000
Synonyms & Trade Names Carbon silicide, Carborundum®, Silicon monocarbide			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Yellow to green to bluish-black, iridescent crystals.			
MW: 40.1	BP: Sublimes	MLT: 4892°F (Sublimes)	Sol: Insoluble
VP: 0 mmHg (approx)	IP: 9.30 eV		Sp.Gr: 3.23
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported [Note: Sublimes with decomposition at 4892°F.]			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; cough			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Silicon tetrahydride			CAS 7803-62-5
SiH ₄			RTECS VV1400000
Synonyms & Trade Names Monosilane, Silane, Silicane			DOT ID & Guide 2203 116
Exposure Limits	NIOSH REL: TWA 5 ppm (7 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 1.31 mg/m ³	
Physical Description Colorless gas with a repulsive odor.			
MW: 32.1	BP: -169°F	FRZ: -301°F	Sol: Decomposes
VP: >1 atm	IP: ?	RGasD: 1.11	
Fl.P: NA (Gas)	UEL: ?	LEL: ?	
Flammable Gas (may ignite SPONTANEOUSLY in air).			
Incompatibilities & Reactivities Halogens (bromine, chlorine, carbonyl chloride, antimony pentachloride, tin(IV) chloride), water			
Measurement Methods None available			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation			
Symptoms Irritation eyes, skin, mucous membrane; nausea, headache			
Target Organs Eyes, skin, respiratory system, central nervous system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Silver (metal dust and soluble compounds, as Ag)			CAS 7440-22-4 (metal)
Ag (metal)			RTECS VW3500000 (metal)
Synonyms & Trade Names Silver metal: Argentum Synonyms of soluble silver compounds such as Silver nitrate (AgNO ₃) vary depending upon the specific compound.			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.01 mg/m ³		
	OSHA PEL: TWA 0.01 mg/m ³		
IDLH 10 mg/m ³ (as Ag)		Conversion	
Physical Description Metal: White, lustrous solid.			
MW: 107.9	BP: 3632°F	MLT: 1761°F	Sol: Insoluble
VP: 0 mmHg (approx)	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			
Measurement Methods NIOSH 7300; OSHA ID121			
Personal Protection & Sanitation 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) 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 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 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Soapstone (containing less than 1% quartz)			CAS
3MgO-4SiO ₂ -H ₂ O			RTECS VV8780000
Synonyms & Trade Names Massive talc, Soapstone silicate, Steatite			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 6 mg/m ³ (total) TWA 3 mg/m ³ (resp)		
	OSHA PEL†: TWA 20 mppcf		
IDLH 3000 mg/m ³		Conversion	
Physical Description Odorless, white-gray powder.			
MW: 379.3	BP: ?	MLT: ?	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.7-2.8
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Respiratory support	
Respirator Recommendations NIOSH Up to 30 mg/m ³ : (APF = 5) Any dust and mist respirator Up to 60 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 150 mg/m ³ : (APF = 25) Any powered, air-purifying respirator with a dust and mist filter Up to 300 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 3000 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Pneumoconiosis: cough, dyspnea (breathing difficulty); digital clubbing; cyanosis; basal crackles, cor pulmonale

Target Organs respiratory system, cardiovascular system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sodium aluminum fluoride (as F)			CAS 15096-52-3
Na3AlF6			RTECS WA9625000
Synonyms & Trade Names Cryocide, Cryodust, Cryolite, Sodium hexafluoroaluminate			DOT ID & Guide
Exposure Limits	NIOSH REL*: TWA 2.5 mg/m ³ [*Note: The REL also applies to other inorganic, solid fluorides (as F).]		
	OSHA PEL*: TWA 2.5 mg/m ³ [*Note: The PEL also applies to other inorganic, solid fluorides (as F).]		
IDLH 250 mg/m ³ (as F)		Conversion	
Physical Description Colorless to dark odorless solid. [pesticide] [Note: Loses color on heating.]			
MW: 209.9	BP: Decomposes	MLT: 1832°F	Sol: 0.04%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.90
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 7902; OSHA ID110			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 12.5 mg/m³ : (APF = 5) Any dust and mist respirator Up to 25 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(APF = 10) Any supplied-air respirator* Up to 62.5 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter*+			

Up to 125 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator 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

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 a high-efficiency particulate filter+ /Any appropriate escape-type, self-contained breathing apparatus

+Note: May need acid gas sorbent

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

Symptoms Irritation eyes, respiratory system; nausea, abdominal pain, diarrhea; salivation, thirst, sweating; stiff spine; dermatitis; calcification of ligaments of ribs, pelvis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sodium azide			CAS 26628-22-8
NaN ₃			RTECS VY8050000
Synonyms & Trade Names Azide, Azium, Sodium salt of hydrazoic acid			DOT ID & Guide 1687 153
Exposure Limits	NIOSH REL: C 0.1 ppm (as HN ₃) [skin] C 0.3 mg/m ³ (as NaN ₃) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless to white, odorless, crystalline solid. [pesticide] [Note: Forms hydrazoic acid (HN3) in water.]			
MW: 65.0	BP: Decomposes	MLT: 527°F (Decomposes)	Sol(63°F): 42%
VP: ?	IP: 11.70 eV		Sp.Gr: 1.85
FLP: ?	UEL: ?	LEL: ?	
Combustible Solid (if heated above 572°F).			
Incompatibilities & Reactivities Acids, metals, water [Note: Over a period of time, sodium azide may react with copper, lead, brass, or solder in plumbing systems to form an accumulation of the HIGHLY EXPLOSIVE compounds of lead azide & copper azide.]			
Measurement Methods OSHA ID121, ID211			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; headache, dizziness, lassitude (weakness, exhaustion), blurred vision; low blood pressure, bradycardia; kidney changes			
Target Organs Eyes, skin, central nervous system, cardiovascular system, kidneys			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sodium bisulfite			CAS 7631-90-5
NaHSO ₃			RTECS VZ2000000
Synonyms & Trade Names Monosodium salt of sulfurous acid, Sodium acid bisulfite, Sodium bisulphite, Sodium hydrogen sulfite			DOT ID & Guide 2693 154 (solution)
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White crystals or powder with a slight odor of sulfur dioxide.			
MW: 104.1	BP: Decomposes	MLT: Decomposes	Sol: 29%
VP: ?	IP: NA		Sp.Gr: 1.48
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Heat (decomposes) [Note: Slowly oxidized to the sulfate on exposure to air.]			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sodium cyanide (as CN)			CAS 143-33-9
NaCN			RTECS VZ7530000
Synonyms & Trade Names Sodium salt of hydrocyanic acid			DOT ID & Guide 1689 157
Exposure Limits	NIOSH REL*: C 5 mg/m ³ (4.7 ppm) [10-minute] [*Note: The REL also applies to other cyanides (as CN) except Hydrogen cyanide.]		
	OSHA PEL*: TWA 5 mg/m ³ [*Note: The PEL also applies to other cyanides (as CN) except Hydrogen cyanide.]		
IDLH 25 mg/m ³ (as CN)		Conversion	
Physical Description White, granular or crystalline solid with a faint, almond-like odor.			
MW: 49.0	BP: 2725°F	MLT: 1047°F	Sol(77°F): 58%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.60
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but contact with acids releases highly flammable hydrogen cyanide.			
Incompatibilities & Reactivities Strong oxidizers (such as acids, acid salts, chlorates & nitrates) [Note: Absorbs moisture from the air forming a syrup.]			
Measurement Methods NOISH 6010, 7904			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 25 mg/m³ : (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 canister providing protection against the compound of concern and having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin; asphyxia; lassitude (weakness, exhaustion), headache, confusion; nausea, vomiting; increased respiratory rate; slow gasping respiration; thyroid, blood changes

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sodium fluoride (as F)			CAS 7681-49-4
NaF			RTECS WB0350000
Synonyms & Trade Names Floridine, Sodium monofluoride			DOT ID & Guide 1690 154
Exposure Limits	NIOSH REL*: TWA 2.5 mg/m ³ [*Note: The REL also applies to other inorganic, solid fluorides (as F).]		
	OSHA PEL*: TWA 2.5 mg/m ³ [*Note: The PEL also applies to other inorganic, solid fluorides (as F).]		
IDLH 250 mg/m ³ (as F)		Conversion	
Physical Description Odorless, white powder or colorless crystals. [Note: Pesticide grade is often dyed blue.]			
MW: 42.0	BP: 3099°F	MLT: 1819°F	Sol: 4%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.78
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 7902, 7906; OSHA ID110			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 12.5 mg/m ³ : (APF = 5) Any dust and mist respirator Up to 25 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(APF = 10) Any supplied-air respirator* Up to 62.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter*+			

Up to 125 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator 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

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 a high-efficiency particulate filter+ /Any appropriate escape-type, self-contained breathing apparatus

+Note: May need acid gas sorbent

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

Symptoms Irritation eyes, respiratory system; nausea, abdominal pain, diarrhea; salivation, thirst, sweating; stiff spine; dermatitis; calcification of ligaments of ribs, pelvis

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sodium fluoroacetate			CAS 62-74-8
FCH ₂ COONa			RTECS AH9100000
Synonyms & Trade Names SFA, Sodium monofluoroacetate			DOT ID & Guide 2629 151
Exposure Limits	NIOSH REL: TWA 0.05 mg/m ³ ST 0.15 mg/m ³ [skin]		
	OSHA PEL†: TWA 0.05 mg/m ³ [skin]		
IDLH 2.5 mg/m ³		Conversion	
Physical Description Fluffy, colorless to white (sometimes dyed black), odorless powder. [Note: A liquid above 95°F.] [rodenticide]			
MW: 100.0	BP: Decomposes	MLT: 392°F	Sol: Miscible
VP: Low	IP: ?		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH S301 (II-5)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.25 mg/m³ : (APF = 5) Any dust and mist respirator Up to 0.5 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(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 dust and mist filter Up to 2.5 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate			

filter/(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

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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Vomiting; anxiety, auditory hallucinations; facial paresthesia; twitching face muscle; pulsus alternans, ectopic heartbeat, tachycardia, cardiac arrhythmias; pulmonary edema; nystagmus; convulsions; liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sodium hydroxide			CAS 1310-73-2
NaOH			RTECS WB4900000
Synonyms & Trade Names Caustic soda, Lye, Soda lye, Sodium hydrate			DOT ID & Guide 1823 154 (dry, solid) 1824 154 (solution)
Exposure Limits	NIOSH REL: C 2 mg/m ³		
	OSHA PEL†: TWA 2 mg/m ³		
IDLH 10 mg/m ³		Conversion	
Physical Description Colorless to white, odorless solid (flakes, beads, granular form).			
MW: 40.0	BP: 2534°F	MLT: 605°F	Sol: 111%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.13
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but when in contact with water may generate sufficient heat to ignite combustible materials.			
Incompatibilities & Reactivities Water; acids; flammable liquids; organic halogens; metals such as aluminum, tin & zinc; nitromethane [Note: Corrosive to metals.]			
Measurement Methods NIOSH 7401			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 10 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [‡] /(APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 25) Any powered, air-purifying respirator with a dust and mist 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sodium metabisulfite			CAS 7681-57-4
Na ₂ S ₂ O ₅			RTECS UX8225000
Synonyms & Trade Names Disodium pyrosulfite, Sodium metabisulphite, Sodium pyrosulfite			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White to yellowish crystals or powder with an odor of sulfur dioxide.			
MW: 190.1	BP: Decomposes	MLT: >302°F (Decomposes)	Sol: 54%
VP: ?	IP: NA		Sp.Gr: 1.4
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Heat (decomposes) [Note: Slowly oxidized to the sulfate on exposure to air & moisture.]			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Starch			CAS 9005-25-8
(C ₆ H ₁₀ O ₅) _n			RTECS GM5090000
Synonyms & Trade Names Corn starch, Rice starch, Sorghum gum, alpha-Starch, Starch gum, Tapioca starch			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Fine, white, odorless powder. [Note: A carbohydrate polymer composed of 25% amylose & 75% amylopectin.]			
MW: varies	BP: Decomposes	MLT: Decomposes	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.45
FLP: NA	UEL: NA	LEL: NA	MEC: 50 g/m ³
Noncombustible Solid, but may form explosive mixture with air.			
Incompatibilities & Reactivities Oxidizers, acids, iodine, alkalis			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane; cough, chest pain; dermatitis; rhinorrhea (discharge of thin mucus)			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Stibine			CAS 7803-52-3
SbH ₃			RTECS WJ0700000
Synonyms & Trade Names Antimony hydride, Antimony trihydride, Hydrogen antimonide			DOT ID & Guide 2676 119
Exposure Limits	NIOSH REL: TWA 0.1 ppm (0.5 mg/m ³)		
	OSHA PEL: TWA 0.1 ppm (0.5 mg/m ³)		
IDLH 5 ppm		Conversion 1 ppm = 5.10 mg/m ³	
Physical Description Colorless gas with a disagreeable odor like hydrogen sulfide.			
MW: 124.8	BP: -1°F	FRZ: -126°F	Sol: Slight
VP: >1 atm	IP: 9.51 eV	RGasD: 4.31	
Fl.P: NA (Gas)	UEL: ?	LEL: ?	
Flammable Gas			
Incompatibilities & Reactivities Acids, halogenated hydrocarbons, oxidizers, moisture, chlorine, ozone, ammonia			
Measurement Methods NIOSH 6008			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 1 ppm : (APF = 10) Any supplied-air respirator Up to 2.5 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 5 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 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

Exposure Routes inhalation

Symptoms Headache, lassitude (weakness, exhaustion); nausea, abdominal pain; lumbar pain, hematuria (blood in the urine), hemolytic anemia; jaundice; pulmonary irritation

Target Organs Blood, liver, kidneys, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Stoddard solvent			CAS 8052-41-3
			RTECS WJ8925000
Synonyms & Trade Names Dry cleaning safety solvent, Mineral spirits, Petroleum solvent, Spotting naphtha [Note: A refined petroleum solvent with a flash point of 102-110°F, boiling point of 309-396°F, and containing >65% C10 or higher hydrocarbons.]			DOT ID & Guide 1268 128 (petroleum distillate)
Exposure Limits	NIOSH REL: TWA 350 mg/m ³ C 1800 mg/m ³ [15-minute]		
	OSHA PEL†: TWA 500 ppm (2900 mg/m ³)		
IDLH 20,000 mg/m ³		Conversion	
Physical Description Colorless liquid with a kerosene-like odor.			
MW: Varies	BP: 309-396°F	FRZ: ?	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: 0.78
Fl.P: 102-110°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 1550			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 3500 mg/m ³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* Up to 8750 mg/m ³ : (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 17,500 mg/m ³ : (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 20,000 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose, throat; dizziness; dermatitis; chemical pneumonitis (aspiration liquid); in animals: kidney damage
Target Organs Eyes, skin, respiratory system, central nervous system, kidneys
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Strychnine			CAS 57-24-9
C ₂₁ H ₂₂ N ₂ O ₂			RTECS WL2275000
Synonyms & Trade Names Nux vomica, Strychnos			DOT ID & Guide 1692 151
Exposure Limits	NIOSH REL: TWA 0.15 mg/m ³		
	OSHA PEL: TWA 0.15 mg/m ³		
IDLH 3 mg/m ³		Conversion	
Physical Description Colorless to white, odorless, crystalline solid. [pesticide]			
MW: 334.4	BP: Decomposes	MLT: 514°F	Sol: 0.02%
VP: Low	IP: ?		Sp.Gr: 1.36
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid, but difficult to ignite.			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 5016			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.75 mg/m³ : (APF = 5) Any dust and mist respirator Up to 1.5 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 3 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter/(APF = 50) Any air-purifying, full-facepiece respirator 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Stiff neck, facial muscle; restlessness, anxiety, increased acuity of perception; increased reflex excitability; cyanosis; tetanic convulsions with opisthotonos

Target Organs central nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Styrene			CAS 100-42-5
C ₆ H ₅ CH=CH ₂			RTECS WL3675000
Synonyms & Trade Names Ethenyl benzene, Phenylethylene, Styrene monomer, Styrol, Vinyl benzene			DOT ID & Guide 2055 128P (inhibited)
Exposure Limits	NIOSH REL: TWA 50 ppm (215 mg/m ³) ST 100 ppm (425 mg/m ³)		
	OSHA PEL†: TWA 100 ppm C 200 ppm 600 ppm (5-minute maximum peak in any 3 hours)		
IDLH 700 ppm		Conversion 1 ppm = 4.26 mg/m ³	
Physical Description Colorless to yellow, oily liquid with a sweet, floral odor.			
MW: 104.2	BP: 293°F	FRZ: -23°F	Sol: 0.03%
VP: 5 mmHg	IP: 8.40 eV		Sp.Gr: 0.91
Fl.P: 88°F	UEL: 6.8%	LEL: 0.9%	
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.]			
Measurement Methods NIOSH 1501, 3800; OSHA 9, 89			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush 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

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Subtilisins		CAS 1395-21-7 (BPN) 9014-01-1 (Carlsburg)	
		RTECS CO9450000 (BPN) CO9550000 (Carlsburg)	
Synonyms & Trade Names Bacillus subtilis, Bacillus subtilis BPN, Bacillus subtilis Carlsburg, Proteolytic enzymes, Subtilisin BPN, Subtilisin Carlsburg [Note: Commercial proteolytic enzymes are used in laundry detergents.]		DOT ID & Guide	
Exposure Limits	NIOSH REL: ST 0.00006 mg/m ³ [60-minute]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Light-colored, free-flowing powders. [Note: A protein containing numerous amino acids.]			
MW: 28,000 (approx)	BP: ?	MLT: ?	Sol: ?
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Incompatibilities & Reactivities None reported			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; respiratory sensitization (enzyme asthma): sweating, headache, chest pain, flu-like symptoms, cough, breathlessness, wheezing			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Succinonitrile			CAS 110-61-2
NCCH ₂ CH ₂ CN			RTECS WN3850000
Synonyms & Trade Names Butanedinitrile; 1,2-Dicyanoethane; Dinile; Ethylene cyanide; Ethylene dicyanide; Succinic dinitrile			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 6 ppm (20 mg/m ³)		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 3.28 mg/m ³	
Physical Description Colorless, odorless, waxy solid. [Note: Forms cyanide in the body.]			
MW: 80.1	BP: 509°F	MLT: 134°F	Sol: 13%
VP(212°F): 2 mmHg	IP: ?		Sp.Gr: 0.99
Fl.P: 270°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods NIOSH Nitriles Crit. Doc.			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 60 ppm : (APF = 10) Any supplied-air respirator Up to 150 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 250 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; headache, dizziness, lassitude (weakness, exhaustion), confusion, convulsions; blurred vision; dyspnea (breathing difficulty); abdominal pain, nausea, vomiting
Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sucrose			CAS 57-50-1
C ₁₂ H ₂₂ O ₁₁			RTECS WN6500000
Synonyms & Trade Names Beet sugar, Cane sugar, Confectioner's sugar, Granulated sugar, Rock candy, Saccarose, Sugar, Table sugar			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Hard, white, odorless crystals, lumps, or powder. [Note: May have a characteristic, caramel odor when heated.]			
MW: 342.3	BP: Decomposes	MLT: 320-367°F (Decomposes)	Sol: 200%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.59
Fl.P: NA	UEL: NA	LEL: NA	MEC: 45 g/m ³
Noncombustible Solid, but fine airborne dust may explode.			
Incompatibilities & Reactivities Oxidizers, sulfuric acid, nitric acid			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; cough			
Target Organs Eyes, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sulfur dioxide			CAS 7446-09-5
SO ₂			RTECS WS4550000
Synonyms & Trade Names Sulfurous acid anhydride, Sulfurous oxide, Sulfur oxide			DOT ID & Guide 1079 125
Exposure Limits	NIOSH REL: TWA 2 ppm (5 mg/m ³) ST 5 ppm (13 mg/m ³)		
	OSHA PEL†: TWA 5 ppm (13 mg/m ³)		
IDLH 100 ppm		Conversion 1 ppm = 2.62 mg/m ³	
Physical Description Colorless gas with a characteristic, irritating, pungent odor. [Note: A liquid below 14°F. Shipped as a liquefied compressed gas.]			
MW: 64.1	BP: 14°F	FRZ: -104°F	Sol: 10%
VP: 3.2 atm	IP: 12.30 eV	RGasD: 2.26	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Powdered alkali metals (such as sodium & potassium), water, ammonia, zinc, aluminum, brass, copper [Note: Reacts with water to form sulfurous acid (H ₂ SO ₃).]			
Measurement Methods NIOSH 6004; OSHA ID104, ID200			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet or contaminated (liquid) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH Up to 20 ppm: (APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern*/(APF = 10) Any supplied-air respirator* Up to 50 ppm: (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* Up to 100 ppm: (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 powered, air-purifying respirator with a tight-fitting facepiece and cartridge(s) 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 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, nose, throat; rhinorrhea (discharge of thin mucus); choking, cough; reflex bronchoconstriction; liquid: frostbite

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sulfur hexafluoride			CAS 2551-62-4
SF ₆			RTECS WS4900000
Synonyms & Trade Names Sulfur fluoride [Note: May contain highly toxic sulfur pentafluoride as an impurity.]			DOT ID & Guide 1080 126
Exposure Limits	NIOSH REL: TWA 1000 ppm (6000 mg/m ³)		
	OSHA PEL: TWA 1000 ppm (6000 mg/m ³)		
IDLH N.D.		Conversion 1 ppm = 5.98 mg/m ³	
Physical Description Colorless, odorless gas. [Note: Shipped as a liquefied compressed gas. Condenses directly to a solid upon cooling.]			
MW: 146.1	BP: Sublimes	FRZ: -83°F (Sublimes)	Sol(77°F): 0.003%
VP: 21.5 atm	IP: 19.30 eV	RGasD: 5.11	
FLP: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Disilane			
Measurement Methods NIOSH 6602			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation			
Symptoms Asphyxia: increased breathing rate, pulse rate; slight muscle incoordination, emotional upset; lassitude (weakness, exhaustion), nausea, vomiting, convulsions; liquid: frostbite			
Target Organs respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sulfuric acid			CAS 7664-93-9
H ₂ SO ₄			RTECS WS5600000
Synonyms & Trade Names Battery acid, Hydrogen sulfate, Oil of vitriol, Sulfuric acid (aqueous)			DOT ID & Guide 1830 137 1831 137 (fuming) 1832 137 (spent)
Exposure Limits	NIOSH REL: TWA 1 mg/m ³		
	OSHA PEL: TWA 1 mg/m ³		
IDLH 15 mg/m ³		Conversion	
Physical Description Colorless to dark-brown, oily, odorless liquid. [Note: Pure compound is a solid below 51°F. Often used in an aqueous solution.]			
MW: 98.1	BP: 554°F	FRZ: 51°F	Sol: Miscible
VP: 0.001 mmHg	IP: ?		Sp.Gr: 1.84 (96-98% acid)
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but capable of igniting finely divided combustible materials.			
Incompatibilities & Reactivities Organic materials, chlorates, carbides, fulminates, water, powdered metals [Note: Reacts violently with water with evolution of heat. Corrosive to metals.]			
Measurement Methods NIOSH 7903; OSHA ID165SG			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash (>1%), Quick drench (>1%)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 15 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(APF = 25) Any powered, air-purifying respirator with acid gas cartridge(s) in combination with a high-efficiency particulate filter [£] (APF = 50) Any chemical cartridge respirator with a full facepiece and acid gas cartridge(s) in combination with a			

high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having 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 acid gas canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, nose, throat; pulmonary edema, bronchitis; emphysema; conjunctivitis; stomatis; dental erosion; eye, skin burns; dermatitis

Target Organs Eyes, skin, respiratory system, teeth

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sulfur monochloride			CAS 10025-67-9
S ₂ Cl ₂			RTECS WS4300000
Synonyms & Trade Names Sulfur chloride, Sulfur subchloride, Thiosulfurous dichloride			DOT ID & Guide 1828 137
Exposure Limits	NIOSH REL: C 1 ppm (6 mg/m ³)		
	OSHA PEL†: TWA 1 ppm (6 mg/m ³)		
IDLH 5 ppm		Conversion 1 ppm = 5.52 mg/m ³	
Physical Description Light-amber to yellow-red, oily liquid with a pungent, nauseating, irritating odor.			
MW: 135.0	BP: 280°F	FRZ: -107°F	Sol: Decomposes
VP: 7 mmHg	IP: 9.40 eV		Sp.Gr: 1.68
Fl.P: 245°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Peroxides, oxides of phosphorous, organics, water [Note: Decomposes violently in water to form hydrochloric acid, sulfur dioxide, sulfur, sulfite, thiosulfate, and hydrogen sulfide. Corrosive to metals.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 ppm: (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 = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern [‡] /(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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; lacrimation (discharge of tears); cough; eye, skin burns; pulmonary edema

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sulfur pentafluoride			CAS 5714-22-7
S ₂ F ₁₀			RTECS WS4480000
Synonyms & Trade Names Disulfur decafluoride, Sulfur decafluoride			DOT ID & Guide
Exposure Limits	NIOSH REL: C 0.01 ppm (0.1 mg/m ³)		
	OSHA PEL†: TWA 0.025 ppm (0.25 mg/m ³)		
IDLH 1 ppm		Conversion 1 ppm = 10.39 mg/m ³	
Physical Description Colorless liquid or gas (above 84°F) with an odor like sulfur dioxide.			
MW: 254.1	BP: 84°F	FRZ: -134°F	Sol: Insoluble
VP: 561 mmHg	IP: ?	RGasD: 8.77	Sp.Gr(32°F): 2.08
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid Nonflammable Gas			
Incompatibilities & Reactivities None reported			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: No recommendation Remove: When wet or contaminated Change: No recommendation Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 0.1 ppm : (APF = 10) Any supplied-air respirator Up to 0.25 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 0.5 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 1 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 acid gas canister/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; in animals: pulmonary edema, hemorrhage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sulfur tetrafluoride			CAS 7783-60-0
SF ₄			RTECS WT4800000
Synonyms & Trade Names Tetrafluorosulfurane			DOT ID & Guide 2418 125
Exposure Limits	NIOSH REL: C 0.1 ppm (0.4 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.42 mg/m ³	
Physical Description Colorless gas with an odor like sulfur dioxide. [Note: Shipped as a liquefied compressed gas.]			
MW: 108.1	BP: -41°F	FRZ: -185°F	Sol: Reacts
VP(70°F): 10.5 atm	IP: 12.63 eV	RGasD: 3.78	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Moisture, concentrated sulfuric acid, dioxygen difluoride [Note: Readily hydrolyzed by moisture, forming hydrofluoric acid & thionyl fluoride.]			
Measurement Methods OSHA ID110			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane; eye, skin burns (from SF ₄ releasing hydrofluoric acid on exposure to moisture); liquid: frostbite; in animals: dyspnea (breathing difficulty), lassitude (weakness, exhaustion), rhinorrhea (discharge of thin mucus)			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sulfuryl fluoride			CAS 2699-79-8
SO ₂ F ₂			RTECS WT5075000
Synonyms & Trade Names Sulfur difluoride dioxide, Vikane®			DOT ID & Guide 2191 123
Exposure Limits	NIOSH REL: TWA 5 ppm (20 mg/m ³) ST 10 ppm (40 mg/m ³)		
	OSHA PEL†: TWA 5 ppm (20 mg/m ³)		
IDLH 200 ppm		Conversion 1 ppm = 4.18 mg/m ³	
Physical Description Colorless, odorless gas. [insecticide/fumigant] [Note: Shipped as a liquefied compressed gas.]			
MW: 102.1	BP: -68°F	FRZ: -212°F	Sol(32°F): 0.2%
VP(70°F): 15.8 atm	IP: 13.04 eV	RGasD: 3.72	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 6012			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 50 ppm : (APF = 10) Any supplied-air respirator* Up to 125 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 200 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 canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact (liquid)
Symptoms Conjunctivitis, rhinitis, pharyngitis, paresthesia; liquid: frostbite: in animals: narcosis, tremor, convulsions; pulmonary edema; kidney injury
Target Organs Eyes, skin, respiratory system, central nervous system, kidneys
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Sulprofos			CAS 35400-43-2
C ₁₂ H ₁₉ O ₂ PS ₃			RTECS TE4165000
Synonyms & Trade Names Bolstar®, O-Ethyl O-(4-methylthio)phenyl S-propylphosphorodithioate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 13.19 mg/m ³	
Physical Description Tan-colored liquid with a sulfide-like odor.			
MW: 322.5	BP: ?	FRZ: ?	Sol: Low
VP: <8 mmHg	IP: ?		Sp.Gr: 1.20
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 5600; PV2037			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion			
Symptoms Nausea, vomiting, abdominal cramps, diarrhea, salivation; headache, dizziness, lassitude (weakness, exhaustion); rhinorrhea (discharge of thin mucus), chest tightness; blurred vision, miosis; cardiac irregularities; muscle fasciculation; dyspnea (breathing difficulty)			
Target Organs respiratory system, central nervous system, cardiovascular system, blood cholinesterase			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2,4,5-T			CAS 93-76-5
Cl ₃ C ₆ H ₂ OCH ₂ COOH			RTECS AJ8400000
Synonyms & Trade Names 2,4,5-Trichlorophenoxyacetic acid			DOT ID & Guide 2765 152
Exposure Limits	NIOSH REL: TWA 10 mg/m ³		
	OSHA PEL: TWA 10 mg/m ³		
IDLH 250 mg/m ³		Conversion	
Physical Description Colorless to tan, odorless, crystalline solid. [herbicide]			
MW: 255.5	BP: Decomposes	MLT: 307°F	Sol(77°F): 0.03%
VP: 1 x 10-7 mmHg	IP: ?		Sp.Gr: 1.80
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid, but burns with difficulty.			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 5001			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m³ : (APF = 5) Any dust and mist respirator Up to 100 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 250 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(APF = 25) Any powered, air-purifying respirator with a dust and mist 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms In animals: ataxia; skin irritation, acne-like rash; liver damage

Target Organs Skin, liver, gastrointestinal tract

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Talc (containing no asbestos and less than 1% quartz)			CAS 14807-96-6
Mg₃Si₄O₁₀(OH)₂			RTECS WW2710000
Synonyms & Trade Names Hydrous magnesium silicate, Steatite talc			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 2 mg/m ³ (resp)		
	OSHA PEL†: TWA 20 mppcf		
IDLH 1000 mg/m ³		Conversion	
Physical Description Odorless, white powder.			
MW: Varies	BP: ?	MLT: 1652 to 1832°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.70-2.80
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH P&CAM355 (III)			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations NIOSH Up to 10 mg/m³ : (APF = 5) Any dust and mist respirator Up to 20 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 50 mg/m³ : (APF = 25) Any powered, air-purifying respirator with a dust and mist filter/(APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 100 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate			

filter/(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 1000 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Fibrotic pneumoconiosis; irritation eyes

Target Organs Eyes, respiratory system, cardiovascular system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tantalum (metal and oxide dust, as Ta)			CAS 7440-25-7 (metal)
Ta (metal)			RTECS WW5505000 (metal)
Synonyms & Trade Names Tantalum metal: Tantalum-181 Synonyms of other tantalum dusts (including oxide dusts) vary depending upon the specific compound.			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³ ST 10 mg/m ³		
	OSHA PEL: TWA 5 mg/m ³		
IDLH 2500 mg/m ³ (as Ta)		Conversion	
Physical Description Metal: Steel-blue to gray solid or black, odorless powder.			
MW: 180.9	BP: 9797°F	MLT: 5425°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 16.65 (metal) 14.40 (powder)
Fl.P: NA	UEL: NA	LEL: NA	MEC: <200 g/m ³
Metal: Combustible Solid; powder ignites SPONTANEOUSLY in air.			
Incompatibilities & Reactivities Strong oxidizers, bromine trifluoride, fluorine			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 25 mg/m ³ : (APF = 5) Any dust and mist respirator^ Up to 50 mg/m ³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators^/(APF = 10) Any dust, mist, and fume respirator/(APF = 10) Any supplied-air respirator			

Up to 125 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter^

Up to 250 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 2500 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, skin; in animals: pulmonary irritation

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

TEDP			CAS 3689-24-5
[(CH ₃ CH ₂ O) ₂ PS] ₂ O			RTECS XN4375000
Synonyms & Trade Names Bladafum®, Dithion®, Sulfotep, Tetraethyl dithionopyrophosphate, Tetraethyl dithiopyrophosphate, Thiotepp®			DOT ID & Guide 1704 153
Exposure Limits	NIOSH REL: TWA 0.2 mg/m ³ [skin]		
	OSHA PEL: TWA 0.2 mg/m ³ [skin]		
IDLH 10 mg/m ³		Conversion 1 ppm = 13.18 mg/m ³	
Physical Description Pale-yellow liquid with a garlic-like odor. [Note: A pesticide that may be absorbed on a solid carrier or mixed in a more flammable liquid.]			
MW: 322.3	BP: Decomposes	FRZ: ?	Sol: 0.0007%
VP: 0.0002 mmHg	IP: ?		Sp.Gr(77°F): 1.20
FLP: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Strong oxidizers, iron [Note: Corrosive to iron.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2 mg/m ³ : (APF = 10) Any supplied-air respirator Up to 5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 10 mg/m ³ : (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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin; eye pain, blurred vision, lacrimation (discharge of tears); rhinorrhea (discharge of thin mucus); headache; cyanosis; anorexia, nausea, vomiting, diarrhea; localized sweating, lassitude (weakness, exhaustion), twitching, paralysis, Cheyne-Stokes respiration, convulsions, low blood pressure, cardiac irregularities

Target Organs Eyes, skin, respiratory system, central nervous system, cardiovascular system, blood cholinesterase

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tellurium			CAS 13494-80-9
Te			RTECS WY2625000
Synonyms & Trade Names Aurum paradoxum, Metallum problematum			DOT ID & Guide
Exposure Limits	NIOSH REL*: TWA 0.1 mg/m ³ [*Note: The REL also applies to other tellurium compounds (as Te) except Tellurium hexafluoride and Bismuth telluride.]		
	OSHA PEL*: TWA 0.1 mg/m ³ [*Note: The PEL also applies to other tellurium compounds (as Te) except Tellurium hexafluoride and Bismuth telluride.]		
IDLH 25 mg/m ³ (as Te)		Conversion	
Physical Description Odorless, dark-gray to brown, amorphous powder or grayish-white, brittle solid.			
MW: 127.6	BP: 1814°F	MLT: 842°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 6.24
Fl.P: NA	UEL: NA	LEL: NA	
Combustible Solid			
Incompatibilities & Reactivities Oxidizers, chlorine, cadmium			
Measurement Methods NIOSH 7300; OSHA ID121			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.5 mg/m³ : (APF = 5) Any dust and mist respirator^ Up to 1 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators^/(APF = 10) Any dust, mist, and fume respirator/(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 a dust and mist filter^			

Up to 5 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 25 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Garlic breath, sweating; dry mouth, metallic taste; drowsiness; anorexia, nausea, no sweating; dermatitis; in animals: central nervous system, red blood cell changes

Target Organs Skin, central nervous system, blood

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tellurium hexafluoride			CAS 7783-80-4
TeF ₆			RTECS WY2800000
Synonyms & Trade Names Tellurium fluoride			DOT ID & Guide 2195 125
Exposure Limits	NIOSH REL: TWA 0.02 ppm (0.1 mg/m ³)		
	OSHA PEL: TWA 0.02 ppm (0.2 mg/m ³)		
IDLH 1 ppm		Conversion 1 ppm = 9.88 mg/m ³	
Physical Description Colorless gas with a repulsive odor. MW: 241.6			
	BP: Sublimes	FRZ: -36°F (Sublimes)	Sol: Decomposes
VP: >1 atm	IP: ?	RGasD: 8.34	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Water [Note: Hydrolyzes slowly in water to telluric acid.]			
Measurement Methods NIOSH S187 (II-3)			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 0.2 ppm : (APF = 10) Any supplied-air respirator Up to 0.5 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 1 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 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

Exposure Routes inhalation

Symptoms Headache; dyspnea (breathing difficulty); garlic breath; in animals: pulmonary edema

Target Organs respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Temephos			CAS 3383-96-8
S[C ₆ H ₄ OP(S)(OCH ₃) ₂] ₂			RTECS TF6890000
Synonyms & Trade Names Abate®; Temefos; O,O,O'O'-Tetramethyl O,O'-thiodi-p-phenylene phosphorothioate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description White, crystalline solid or liquid (above 87°F). [insecticide] [Note: Technical grade is a viscous, brown liquid.]			
MW: 466.5	BP: 248-257°F (Decomposes)	MLT: 87°F	Sol: Insoluble
VP(77°F): 0.00000007 mmHg	IP: ?		Sp.Gr: 1.32
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0500, 0600; OSHA PV2056			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, blurred vision; dizziness; dyspnea (breathing difficulty); salivation; abdominal cramps, nausea, diarrhea, vomiting			
Target Organs Eyes, respiratory system, central nervous system, cardiovascular system, blood cholinesterase			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

TEPP			CAS 107-49-3
[(CH ₃ CH ₂ O) ₂ PO] ₂ O			RTECS UX6825000
Synonyms & Trade Names Ethyl pyrophosphate, Tetraethyl pyrophosphate, Tetron®			DOT ID & Guide 2783 152 3018 152 (liquid)
Exposure Limits	NIOSH REL: TWA 0.05 mg/m ³ [skin]		
	OSHA PEL: TWA 0.05 mg/m ³ [skin]		
IDLH 5 mg/m ³		Conversion 1 ppm = 11.87 mg/m ³	
Physical Description Colorless to amber liquid with a faint, fruity odor. [insecticide] [Note: A solid below 32°F.]			
MW: 290.2	BP: Decomposes	FRZ: 32°F	Sol: Miscible
VP: 0.0002 mmHg	IP: ?		Sp.Gr: 1.19
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Strong oxidizers, alkalis, water [Note: Hydrolyzes quickly in water to form pyrophosphoric acid.]			
Measurement Methods NIOSH 2504			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.5 mg/m ³ : (APF = 10) Any supplied-air respirator Up to 1.25 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 2.5 mg/m ³ : (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 5 mg/m : (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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Eye pain, blurred vision, lacrimation (discharge of tears); rhinorrhea (discharge of thin mucus); headache, chest tightness, cyanosis; anorexia, nausea, vomiting, diarrhea; lassitude (weakness, exhaustion), twitching, paralysis, Cheyne-Stokes respiration, convulsions; low blood pressure, cardiac irregularities; sweating

Target Organs Eyes, respiratory system, central nervous system, cardiovascular system, gastrointestinal tract, blood cholinesterase

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Terphenyl			CAS 84-15-1
C6H5C6H4C6H5			RTECS WZ6472000
Synonyms & Trade Names o-Diphenylbenzene; 1,2-Diphenylbenzene; 2-Phenylbiphenyl; 1,2-Terphenyl; ortho-Terphenyl; o-Triphenyl			DOT ID & Guide
Exposure Limits	NIOSH REL: C 5 mg/m³ (0.5 ppm)		
	OSHA PEL†: C 9 mg/m³ (1 ppm)		
IDLH 500 mg/m³		Conversion 1 ppm = 9.42 mg/m³	
Physical Description Colorless or light-yellow solid.			
MW: 230.3	BP: 630°F	MLT: 136°F	Sol: Insoluble
VP(200°F): 0.09 mmHg	IP: 7.99 eV		Sp.Gr: 1.1
Fl.P(oc): 325°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 5021			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 25 mg/m³ : (APF = 5) Any dust and mist respirator [£] Up to 50 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators [£] /(APF = 10) Any supplied-air respirator [£] Up to 125 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(APF = 25) Any powered, air-purifying respirator with a dust and mist filter [£]			

[Up to 250 mg/m³](#): (APF = 50) Any air-purifying, full-facepiece respirator 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

[Up to 500 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; thermal skin burns; headache; sore throat; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

m-Terphenyl			CAS 92-06-8
C6H5C6H4C6H5			RTECS WZ6470000
Synonyms & Trade Names m-Diphenylbenzene; 1,3-Diphenylbenzene; Isodiphenylbenzene; 3-Phenylbiphenyl; 1,3-Terphenyl; meta-Terphenyl; m-Triphenyl			DOT ID & Guide
Exposure Limits	NIOSH REL: C 5 mg/m³ (0.5 ppm)		
	OSHA PEL†: C 9 mg/m³ (1 ppm)		
IDLH 500 mg/m³		Conversion 1 ppm = 9.57 mg/m³	
Physical Description Yellow solid (needles).			
MW: 230.3	BP: 689°F	MLT: 192°F	Sol: Insoluble
VP(200°F): 0.01 mmHg	IP: 8.01		Sp.Gr: 1.23
Fl.P(oc): 375°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 5021			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 25 mg/m³: (APF = 5) Any dust and mist respirator [£] Up to 50 mg/m³: (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators [£] /(APF = 10) Any supplied-air respirator [£] Up to 125 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(APF = 25) Any powered, air-purifying respirator with a dust and mist filter [£]			

[Up to 250 mg/m³](#): (APF = 50) Any air-purifying, full-facepiece respirator 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

[Up to 500 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; thermal skin burns; headache; sore throat; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

p-Terphenyl			CAS 92-94-4
C₆H₅C₆H₄C₆H₅			RTECS WZ6475000
Synonyms & Trade Names p-Diphenylbenzene; 1,4-Diphenylbenzene; 4-Phenylbiphenyl; 1,4-Terphenyl; para-Terphenyl; p-Triphenyl			DOT ID & Guide
Exposure Limits	NIOSH REL: C 5 mg/m ³ (0.5 ppm)		
	OSHA PEL†: C 9 mg/m ³ (1 ppm)		
IDLH 500 mg/m ³		Conversion 1 ppm = 9.57 mg/m ³	
Physical Description White or light-yellow solid.			
MW: 230.3	BP: 761°F	MLT: 415°F	Sol: Insoluble
VP: Very low	IP: 7.78		Sp.Gr: 1.23
Fl.P: 405°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 5021			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 25 mg/m³: (APF = 5) Any dust and mist respirator [£] Up to 50 mg/m³: (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators [£] /(APF = 10) Any supplied-air respirator [£] Up to 125 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(APF = 25) Any powered, air-purifying respirator with a dust and mist filter [£]			

[Up to 250 mg/m³](#): (APF = 50) Any air-purifying, full-facepiece respirator 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

[Up to 500 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; thermal skin burns; headache; sore throat; in animals: liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2,3,7,8-Tetrachloro-dibenzo-p-dioxin			CAS 1746-01-6
C ₁₂ H ₄ Cl ₄ O ₂			RTECS HP3500000
Synonyms & Trade Names Dioxin; Dioxine; TCDBD; TCDD; 2,3,7,8-TCDD [Note: Formed during past production of 2,4,5-trichlorophenol, 2,4,5-T & 2(2,4,5-trichlorophenoxy)propionic acid.]			DOT ID & Guide
Exposure Limits		NIOSH REL: Ca See Appendix A OSHA PEL: none	
IDLH Ca [N.D.]		Conversion	
Physical Description Colorless to white, crystalline solid. [Note: Exposure may occur through contact at previously contaminated worksites.]			
MW: 322.0	BP: Decomposes	MLT: 581°F	Sol: 0.00000002%
VP(77°F): 0.000002 mmHg	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities UV light (decomposes)			
Measurement Methods None available			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes; allergic dermatitis, chloracne; porphyria; gastrointestinal disturbance; possible reproductive, teratogenic effects; in animals: liver, kidney damage; hemorrhage; [potential occupational carcinogen]
Target Organs Eyes, skin, liver, kidneys, reproductive system
Cancer Site [in animals: tumors at many sites]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,1,1,2-Tetrachloro-2,2-difluoroethane			CAS 76-11-9
CCl ₃ CCIF ₂			RTECS KI1425000
Synonyms & Trade Names 2,2-Difluoro-1,1,1,2-tetrachloroethane; Freon® 112a; Halocarbon 112a; Refrigerant 112a			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 500 ppm (4170 mg/m ³)		
	OSHA PEL: TWA 500 ppm (4170 mg/m ³)		
IDLH 2000 ppm		Conversion 1 ppm = 8.34 mg/m ³	
Physical Description Colorless solid with a slight, ether-like odor. [Note: A liquid above 105°F.]			
MW: 203.8	BP: 197°F	MLT: 105°F	Sol: 0.01%
VP: 40 mmHg	IP: ?		Sp.Gr: 1.65
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Chemically-active metals such as potassium, beryllium, powdered aluminum, zinc, calcium, magnesium & sodium; acids			
Measurement Methods NIOSH 1016; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2000 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; central nervous system depression; pulmonary edema; drowsiness; dyspnea (breathing difficulty)
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,1,2,2-Tetrachloro-1,2-difluoroethane			CAS 76-12-0
CCl ₂ FCCl ₂ F			RTECS KI1420000
Synonyms & Trade Names 1,2-Difluoro-1,1,2,2-tetrachloroethane; Freon® 112; Halocarbon 112; Refrigerant 112			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 500 ppm (4170 mg/m ³)		
	OSHA PEL: TWA 500 ppm (4170 mg/m ³)		
IDLH 2000 ppm		Conversion 1 ppm = 8.34 mg/m ³	
Physical Description Colorless solid or liquid (above 77°F) with a slight, ether-like odor.			
MW: 203.8	BP: 199°F	MLT: 77°F	Sol(77°F): 0.01%
VP: 40 mmHg	IP: 11.30 eV		Sp.Gr: 1.65
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Chemically-active metals such as potassium, beryllium, powdered aluminum, zinc, magnesium, calcium & sodium; acids			
Measurement Methods NIOSH 1016; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2000 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms In animals: irritation eyes, skin; conjunctivitis; pulmonary edema; narcosis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,1,1,2-Tetrachloroethane			CAS 630-20-6
CCl ₃ CH ₂ Cl			RTECS KI8450000
Synonyms & Trade Names None			DOT ID & Guide 1702 151
Exposure Limits	NIOSH REL: Handle with caution in the workplace. See Appendix C (Chloroethanes)		
	OSHA PEL: none		
IDLH N.D.		Conversion	
Physical Description Yellowish-red liquid.			
MW: 167.9	BP: 267°F	FRZ: -94°F	Sol: 0.1%
VP(77°F): 14 mmHg	IP: ?		Sp.Gr: 1.54
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities Potassium; sodium; dinitrogen tetroxide; potassium hydroxide; nitrogen tetroxide; sodium potassium alloy; 2,4-dinitrophenyl disulfide			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; lassitude (weakness, exhaustion), restlessness, irregular respiration, muscle incoordination; in animals: liver changes			
Target Organs Eyes, skin, central nervous system, liver			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,1,2,2-Tetrachloroethane			CAS 79-34-5
CHCl ₂ CHCl ₂			RTECS KI8575000
Synonyms & Trade Names Acetylene tetrachloride, Symmetrical tetrachloroethane			DOT ID & Guide 1702 151
Exposure Limits	NIOSH REL: Ca TWA 1 ppm (7 mg/m ³) [skin] See Appendix A See Appendix C (Chloroethanes)		
	OSHA PEL†: TWA 5 ppm (35 mg/m ³) [skin]		
IDLH Ca [100 ppm]		Conversion 1 ppm = 6.87 mg/m ³	
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.]			
Measurement Methods NIOSH 1019; OSHA 7			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
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			

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]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tetrachloroethylene			CAS 127-18-4
Cl₂C=CCl₂			RTECS KX3850000
Synonyms & Trade Names Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene			DOT ID & Guide 1897 160
Exposure Limits	NIOSH REL: Ca Minimize workplace exposure concentrations. See Appendix A		
	OSHA PEL†: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3-hours)		
IDLH Ca [150 ppm]		Conversion 1 ppm = 6.78 mg/m ³	
Physical Description Colorless liquid with a mild, chloroform-like odor.			
MW: 165.8	BP: 250°F	FRZ: -2°F	Sol: 0.02%
VP: 14 mmHg	IP: 9.32 eV		Sp.Gr: 1.62
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.			
Incompatibilities & Reactivities Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash			
Measurement Methods NIOSH 1003; OSHA 1001			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, liver, kidneys, central nervous system
Cancer Site [in animals: liver tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tetrachloronaphthalene			CAS 1335-88-2
C10H4Cl4			RTECS QK3700000
Synonyms & Trade Names Halowax®, Nibren wax, Seekay wax			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 2 mg/m³ [skin]		
	OSHA PEL: TWA 2 mg/m³ [skin]		
IDLH Unknown		Conversion	
Physical Description Colorless to pale-yellow solid with an aromatic odor.			
MW: 265.9	BP: 599-680°F	MLT: 360°F	Sol: Insoluble
VP: <1 mmHg	IP: ?		Sp.Gr: 1.59-1.65
Fl.P(oc): 410°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH S130 (II-2)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 20 mg/m³ : (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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Acne-form dermatitis; headache, lassitude (weakness, exhaustion), anorexia, dizziness; jaundice, liver injury
Target Organs Liver, skin, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tetraethyl lead (as Pb)			CAS 78-00-2
Pb(C ₂ H ₅) ₄			RTECS TP4550000
Synonyms & Trade Names Lead tetraethyl, TEL, Tetraethylplumbane			DOT ID & Guide 1649 131
Exposure Limits	NIOSH REL: TWA 0.075 mg/m ³ [skin]		
	OSHA PEL: TWA 0.075 mg/m ³ [skin]		
IDLH 40 mg/m ³ (as Pb)		Conversion	
Physical Description Colorless liquid (unless dyed red, orange, or blue) with a pleasant, sweet odor. [Note: Main usage is in anti-knock additives for gasoline.]			
MW: 323.5	BP: 228°F (Decomposes)	FRZ: -202°F	Sol: 0.00002%
VP: 0.2 mmHg	IP: 11.10 eV		Sp.Gr: 1.65
Fl.P: 200°F	UEL: ?	LEL: 1.8%	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers, sulfuryl chloride, rust, potassium permanganate [Note: Decomposes slowly at room temperature and more rapidly at higher temperatures.]			
Measurement Methods NIOSH 2533			
Personal Protection & Sanitation Skin: Prevent skin contact (>0.1%) Eyes: Prevent eye contact Wash skin: When contaminated (>0.1%) Remove: When wet or contaminated (>0.1%) Change: Daily Provide: Quick drench (>0.1%)		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.75 mg/m³ : (APF = 10) Any supplied-air respirator Up to 1.875 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 3.75 mg/m³ : (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 40 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 organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Insomnia, lassitude (weakness, exhaustion), anxiety; tremor, hyper-reflexia, spasticity; bradycardia, hypotension, hypothermia, pallor, nausea, anorexia, weight loss; confusion, hallucinations, psychosis, mania, convulsions, coma; eye irritation
Target Organs central nervous system, cardiovascular system, kidneys, eyes
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tetrahydrofuran			CAS 109-99-9
C4H8O			RTECS LU5950000
Synonyms & Trade Names Diethylene oxide; 1,4-Epoxybutane; Tetramethylene oxide; THF			DOT ID & Guide 2056 127
Exposure Limits	NIOSH REL: TWA 200 ppm (590 mg/m³) ST 250 ppm (735 mg/m³)		
	OSHA PEL†: TWA 200 ppm (590 mg/m³)		
IDLH 2000 ppm [10%LEL]		Conversion 1 ppm = 2.95 mg/m³	
Physical Description Colorless liquid with an ether-like odor.			
MW: 72.1	BP: 151°F	FRZ: -163°F	Sol: Miscible
VP: 132 mmHg	IP: 9.45 eV		Sp.Gr: 0.89
Fl.P: 6°F	UEL: 11.8%	LEL: 2%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, lithium-aluminum alloys [Note: Peroxides may accumulate upon prolonged storage in presence of air.]			
Measurement Methods NIOSH 1609, 3800; OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2000 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

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

Symptoms Irritation eyes, upper respiratory system; nausea, dizziness, headache, central nervous system depression

Target Organs Eyes, respiratory system, central nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tetramethyl lead (as Pb)			CAS 75-74-1
Pb(CH₃)₄			RTECS TP4725000
Synonyms & Trade Names Lead tetramethyl, Tetramethylplumbane, TML			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.075 mg/m ³ [skin]		
	OSHA PEL: TWA 0.075 mg/m ³ [skin]		
IDLH 40 mg/m ³ (as Pb)		Conversion	
Physical Description Colorless liquid (unless dyed red, orange, or blue) with a fruity odor. [Note: Main usage is in anti-knock additives for gasoline.]			
MW: 267.3	BP: 212°F (Decomposes)	FRZ: -15°F	Sol: 0.002%
VP: 23 mmHg	IP: 8.50 eV		Sp.Gr: 2.00
Fl.P: 100°F	UEL: ?	LEL: ?	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Strong oxidizers such as sulfuryl chloride or potassium permanganate			
Measurement Methods NIOSH 2534			
Personal Protection & Sanitation Skin: Prevent skin contact (>0.1%) Eyes: Prevent eye contact Wash skin: When contaminated (>0.1%) Remove: When wet or contaminated (>0.1%) Change: Daily Provide: Quick drench (>0.1%)		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.75 mg/m³: (APF = 10) Any supplied-air respirator Up to 1.875 mg/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 3.75 mg/m³: (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 40 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 organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Insomnia, bad dreams, restlessness, anxious; hypotension; nausea, anorexia; delirium, mania, convulsions; coma

Target Organs central nervous system, cardiovascular system, kidneys

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tetramethyl succinonitrile			CAS 3333-52-6
(CH3)2C(CN)C(CN)(CH3)2			RTECS WN4025000
Synonyms & Trade Names Tetramethyl succinodinitrile, TMSN			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 3 mg/m ³ (0.5 ppm) [skin]		
	OSHA PEL: TWA 3 mg/m ³ (0.5 ppm) [skin]		
IDLH 5 ppm		Conversion 1 ppm = 5.57 mg/m ³	
Physical Description Colorless, odorless solid. [Note: Forms cyanide in the body.]			
MW: 136.2	BP: Sublimes	MLT: 338°F (Sublimes)	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: 1.07
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH S155 (II-3); OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 28 mg/m³ : (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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Headache, nausea; convulsions, coma; liver, kidney, gastrointestinal effects
Target Organs central nervous system, liver, kidneys, gastrointestinal tract
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tetranitromethane			CAS 509-14-8
C(NO₂)₄			RTECS PB4025000
Synonyms & Trade Names Tetan, TNM			DOT ID & Guide 1510 143
Exposure Limits	NIOSH REL: TWA 1 ppm (8 mg/m ³)		
	OSHA PEL: TWA 1 ppm (8 mg/m ³)		
IDLH 4 ppm		Conversion 1 ppm = 8.02 mg/m ³	
Physical Description Colorless to pale-yellow liquid or solid (below 57°F) with a pungent odor.			
MW: 196.0	BP: 259°F	FRZ: 57°F	Sol: Insoluble
VP: 8 mmHg	IP: ?		Sp.Gr: 1.62
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid, but difficult to ignite.			
Incompatibilities & Reactivities Hydrocarbons, alkalis, metals, oxidizers, aluminum, toluene, cotton [Note: Combustible material wet with tetranitromethane may be highly explosive.]			
Measurement Methods NIOSH 3513			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: Daily Provide: Eyewash		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 4 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode [£] /(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 = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern [£] /(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 canister providing protection against the compound of concern⁶/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, nose, throat; dizziness, headache; chest pain, dyspnea (breathing difficulty); methemoglobinemia, cyanosis; skin burns

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tetrasodium pyrophosphate			CAS 7722-88-5
Na4P2O7			RTECS UX7350000
Synonyms & Trade Names Pyrophosphate, Sodium pyrophosphate, Tetrasodium diphosphate, Tetrasodium pyrophosphate (anhydrous), TSPP			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Odorless, white powder or granules. [Note: The decahydrate (Na4P2O7 • 10H2O) is in the form of colorless, transparent crystals.]			
MW: 265.9	BP: Decomposes	MLT: 1810°F	Sol(77°F): 7%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 2.45
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Strong acids			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash (solution)		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; dermatitis			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tetryl			CAS 479-45-8
<chem>(NO2)3C6H2N(NO2)CH3</chem>			RTECS BY6300000
Synonyms & Trade Names N-Methyl-N,2,4,6-tetranitroaniline; Nitramine; 2,4,6-Tetryl; 2,4,6-Trinitrophenyl-N-methylnitramine			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1.5 mg/m ³ [skin]		
	OSHA PEL: TWA 1.5 mg/m ³ [skin]		
IDLH 750 mg/m ³		Conversion	
Physical Description Colorless to yellow, odorless, crystalline solid.			
MW: 287.2	BP: 356-374°F (Explodes)	MLT: 268°F	Sol: 0.02%
VP: <1 mmHg	IP: ?		Sp.Gr: 1.57
Fl.P: Explodes	UEL: ?	LEL: ?	
Combustible Solid (Class A Explosive)			
Incompatibilities & Reactivities Oxidizable materials, hydrazine			
Measurement Methods NIOSH S225 (II-3)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 7.5 mg/m³ : (APF = 5) Any dust and mist respirator Up to 15 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators*/(APF = 10) Any supplied-air respirator* Up to 37.5 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter*			

Up to 75 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator 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

Up to 750 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Sensitization dermatitis, itch, erythema (skin redness); edema on nasal folds, cheeks, neck; keratitis (inflammation of the cornea); sneezing; anemia; cough, coryza; irritability; malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion), insomnia; nausea, vomiting; liver, kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Thallium (soluble compounds, as Tl)		CAS	
		RTECS	
Synonyms & Trade Names Synonyms vary depending upon the specific soluble thallium compound.		DOT ID & Guide 1707 151 (compounds, n.o.s.)	
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ [skin]		
	OSHA PEL: TWA 0.1 mg/m ³ [skin]		
IDLH 15 mg/m ³ (as Tl)		Conversion	
Physical Description Appearance and odor vary depending upon the specific soluble thallium compound.			
Properties vary depending upon the specific soluble thallium compound.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 7300; OSHA ID121			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.5 mg/m³ : (APF = 5) Any dust and mist respirator^ Up to 1 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators^/(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 a dust and mist filter^			

Up to 5 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 15 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs

Target Organs Eyes, respiratory system, central nervous system, liver, kidneys, gastrointestinal tract, body hair

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

4,4'-Thiobis(6-tert-butyl-m-cresol)			CAS 96-69-5
[CH ₃ (OH)C ₆ H ₂ C(CH ₃) ₃] ₂ S			RTECS GP3150000
Synonyms & Trade Names 4,4'-Thiobis(3-methyl-6-tert-butylphenol); 1,1'-Thiobis(2-methyl-4-hydroxy-5-tert-butylbenzene)			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Light-gray to tan powder with a slightly aromatic odor.			
MW: 358.6	BP: ?	MLT: 302°F	Sol: 0.08%
VP: 0.0000006 mmHg	IP: ?		Sp.Gr: 1.10
Fl.P: 420°F	UEL: NA	LEL: NA	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0500; 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Thioglycolic acid			CAS 68-11-1
HSCH ₂ COOH			RTECS AI5950000
Synonyms & Trade Names Acetyl mercaptan, Mercaptoacetate, Mercaptoacetic acid, 2-Mercaptoacetic acid, 2-Thioglycolic acid, Thiovanic acid			DOT ID & Guide 1940 153
Exposure Limits	NIOSH REL: TWA 1 ppm (4 mg/m ³) [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 3.77 mg/m ³	
Physical Description Colorless liquid with a strong, disagreeable odor characteristic of mercaptans. [Note: Olfactory fatigue may occur after short exposures.]			
MW: 92.1	BP: ?	FRZ: 2°F	Sol: Miscible
VP(64°F): 10 mmHg	IP: ?		Sp.Gr: 1.32
Fl.P: >230°F	UEL: ?	LEL: 5.9%	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Air, strong oxidizers, bases, active metals (e.g., sodium potassium, magnesium, calcium) [Note: Readily oxidized by air.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat; lacrimation (discharge of tears), corneal damage; skin burns, blisters; in animals: lassitude (weakness, exhaustion); gasping respirations; convulsions			

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Thionyl chloride		CAS 7719-09-7	
SOCl ₂		RTECS XM5150000	
Synonyms & Trade Names Sulfinyl chloride, Sulfur chloride oxide, Sulfurous dichloride, Sulfurous oxychloride, Thionyl dichloride		DOT ID & Guide 1836 137	
Exposure Limits	NIOSH REL: C 1 ppm (5 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.87 mg/m ³	
Physical Description Colorless to yellow to reddish liquid with a pungent odor like sulfur dioxide. [Note: Fumes form when exposed to moist air.]			
MW: 119.0	BP: 169°F	FRZ: -156°F	Sol: Reacts
VP(70°F): 100 mmHg	IP: ?		Sp.Gr: 1.64
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Liquid			
Incompatibilities & Reactivities Water, acids, alkalis, ammonia, chloryl perchlorate [Note: Reacts violently with water to form sulfur dioxide & hydrogen chloride.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane; eye, skin burns			
Target Organs Eyes, skin, respiratory system			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Thiram			CAS 137-26-8
C ₆ H ₁₂ N ₂ S ₄			RTECS JO1400000
Synonyms & Trade Names bis(Dimethylthiocarbamoyl) disulfide, Tetramethylthiuram disulfide			DOT ID & Guide 2771 151
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL: TWA 5 mg/m ³		
IDLH 100 mg/m ³		Conversion	
Physical Description Colorless to yellow, crystalline solid with a characteristic odor. [Note: Commercial pesticide products may be dyed blue.]			
MW: 240.4	BP: Decomposes	MLT: 312°F	Sol: 0.003%
VP: 0.000008 mmHg	IP: ?		Sp.Gr: 1.29
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers, strong acids, oxidizable materials			
Measurement Methods NIOSH 5005			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m ³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter*/(APF = 10) Any supplied-air respirator* Up to 100 mg/m ³ : (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) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 25) Any powered,			

air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, mucous membrane; dermatitis; Antabuse-like effects

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tin		CAS 7440-31-5	
Sn		RTECS XP7320000	
Synonyms & Trade Names Metallic tin, Tin flake, Tin metal, Tin powder		DOT ID & Guide	
Exposure Limits	NIOSH REL*: TWA 2 mg/m ³ [*Note: The REL also applies to other inorganic tin compounds (as Sn) except tin oxides.]		
	OSHA PEL*: TWA 2 mg/m ³ [*Note: The PEL also applies to other inorganic tin compounds (as Sn) except tin oxides.]		
IDLH 100 mg/m ³ (as Sn)		Conversion	
Physical Description Gray to almost silver-white, ductile, malleable, lustrous solid.			
MW: 118.7	BP: 4545°F	MLT: 449°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 7.28
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but powdered form may ignite.			
Incompatibilities & Reactivities Chlorine, turpentine, acids, alkalis			
Measurement Methods NIOSH 7300; OSHA ID121, ID206			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 10 mg/m³ : (APF = 5) Any dust and mist respirator* Up to 20 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators^*/(APF = 10) Any supplied-air respirator* Up to 50 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter^*			

Up to 100 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, skin, respiratory system; in animals: vomiting, diarrhea, paralysis with muscle twitching

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tin (organic compounds, as Sn)			CAS
			RTECS
Synonyms & Trade Names Synonyms vary depending upon the specific organic tin compound. [Note: Also see specific listing for Cyhexatin.]			DOT ID & Guide
Exposure Limits	NIOSH REL*: TWA 0.1 mg/m ³ [skin] [*Note: The REL applies to all organic tin compounds except Cyhexatin.]		
	OSHA PEL*: TWA 0.1 mg/m ³ [*Note: The PEL applies to all organic tin compounds.]		
IDLH 25 mg/m ³ (as Sn)		Conversion	
Physical Description Appearance and odor vary depending upon the specific organic tin compound.			
Properties vary depending upon the specific organic tin compound.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 5504			
Personal Protection & Sanitation Recommendations regarding personal protective clothing vary depending upon the specific compound. Recommendations regarding eye protection vary depending upon the specific compound. Recommendations regarding washing the skin vary depending upon the specific compound. Recommendations regarding the removal of personal protective clothing that becomes wet or contaminated vary depending upon the specific compound. Recommendations regarding the daily changing of personal protective clothing vary depending upon the		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	

specific compound.
Recommendations regarding the need for eyewash or quick drench facilities vary depending upon the specific compound.

Respirator Recommendations NIOSH/OSHA

Up to 1 mg/m³: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust and mist filter/(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 organic vapor cartridge(s) in combination with a dust and mist filter

Up to 5 mg/m³: (APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter/(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 25 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system; headache, dizziness; psycho-neurologic disturbance; sore throat, cough; abdominal pain, vomiting; urine retention; paresis, focal anesthesia; skin burns, pruritus; in animals: hemolysis; hepatic necrosis; kidney damage

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tin(II) oxide (as Sn)			CAS 21651-19-4
SnO			RTECS
Synonyms & Trade Names Stannous oxide, Tin protoxide [Note: Also see specific listing for Tin(IV) oxide (as Sn).]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 2 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Brownish-black powder.			
MW: 134.7	BP: Decomposes	MLT(600 mmHg): 1976°F (Decomposes)	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 6.3
FLP: NA	UEL: NA	LEL: NA	
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 7300			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Stannosis (benign pneumoconiosis): dyspnea (breathing difficulty), decreased pulmonary function			
Target Organs respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tin(IV) oxide (as Sn)			CAS 18282-10-5
SnO ₂			RTECS XQ4000000
Synonyms & Trade Names Stannic dioxide, Stannic oxide, White tin oxide [Note: Also see specific listing for Tin(II) oxide (as Sn).]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 2 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description White or slightly gray powder.			
MW: 150.7	BP: Decomposes	MLT: 2966°F (Decomposes)	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 6.95
FLP: NA	UEL: NA	LEL: NA	
Incompatibilities & Reactivities Chlorine trifluoride			
Measurement Methods NIOSH 7300			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Stannosis (benign pneumoconiosis): dyspnea (breathing difficulty), decreased pulmonary function			
Target Organs respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Titanium dioxide			CAS 13463-67-7
TiO ₂			RTECS XR2275000
Synonyms & Trade Names Rutile, Titanium oxide, Titanium peroxide			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: TWA 15 mg/m ³		
IDLH Ca [5000 mg/m ³]		Conversion	
Physical Description White, odorless powder.			
MW: 79.9	BP: 4532-5432°F	MLT: 3326-3362°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 4.26
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH S385 (II-3)			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: Daily		First Aid (See procedures) 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation
Symptoms Lung fibrosis; [potential occupational carcinogen]
Target Organs respiratory system
Cancer Site [in animals: lung tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Tolidine		CAS 119-93-7	
C ₁₄ H ₁₆ N ₂		RTECS DD1225000	
Synonyms & Trade Names 4,4'-Diamino-3,3'-dimethylbiphenyl; Diaminoditoly; 3,3'-Dimethylbenzidine; 3,3'-Dimethyl-4,4'-diphenyldiamine; 3,3'-Tolidine		DOT ID & Guide	
Exposure Limits	NIOSH REL: Ca C 0.02 mg/m ³ [60-minute] [skin] See Appendix A See Appendix C		
	OSHA PEL: See Appendix C		
IDLH Ca [N.D.]		Conversion	
Physical Description White to reddish crystals or powder. [Note: Darkens on exposure to air. Often used in paste or wet cake form. Used as a basis for many dyes.]			
MW: 212.3	BP: 572°F	MLT: 264°F	Sol: 0.1%
VP: ?	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 5013; OSHA 71			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose; in animals: liver, kidney damage; [potential occupational carcinogen]
Target Organs Eyes, respiratory system, liver, kidneys
Cancer Site [in animals: liver, bladder & mammary gland tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Toluene			CAS 108-88-3
C ₆ H ₅ CH ₃			RTECS XS5250000
Synonyms & Trade Names Methyl benzene, Methyl benzol, Phenyl methane, Toluol			DOT ID & Guide 1294 130
Exposure Limits	NIOSH REL: TWA 100 ppm (375 mg/m ³) ST 150 ppm (560 mg/m ³)		
	OSHA PEL†: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)		
IDLH 500 ppm		Conversion 1 ppm = 3.77 mg/m ³	
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			
Measurement Methods NIOSH 1500, 1501, 3800, 4000; OSHA 111			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly 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
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
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Toluenediamine			CAS 25376-45-8 95-80-7 (2,4-TDA)
CH ₃ C ₆ H ₃ (NH ₂) ₂			RTECS XS9445000 XS9625000 (2,4-TDA)
Synonyms & Trade Names Diaminotoluene, Methylphenylene diamine, TDA, Toluenediamine isomers, Tolylenediamine [Note: Various isomers of TDA exist.]			DOT ID & Guide 1709 151
Exposure Limits	NIOSH REL: Ca (all isomers) See Appendix A		
	OSHA PEL: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Colorless to brown, needle-shaped crystals or powder. [Note: Tends to darken on storage & exposure to air. Properties given are for 2,4-TDA.]			
MW: 122.2	BP: 558°F	MLT: 210°F	Sol: Soluble
VP(224°F): 1 mmHg	IP: ?		Sp.Gr: 1.05 (Liquid at 212°F)
Fl.P: 300°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 5516; OSHA 65			
Personal Protection & Sanitation 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) Eye: Irrigate immediately 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 (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; dermatitis; ataxia, tachycardia, nausea, vomiting, convulsions, respiratory depression; methemoglobinemia, cyanosis, headache, lassitude (weakness, exhaustion), dizziness, bluish skin; liver injury; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, blood, cardiovascular system, liver
Cancer Site [in animals: liver, skin & mammary gland tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Toluene-2,4-diisocyanate			CAS 584-84-9
CH ₃ C ₆ H ₃ (NCO) ₂			RTECS CZ6300000
Synonyms & Trade Names TDI; 2,4-TDI; 2,4-Toluene diisocyanate			DOT ID & Guide 2078 156
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: C 0.02 ppm (0.14 mg/m ³)		
IDLH Ca [2.5 ppm]		Conversion 1 ppm = 7.13 mg/m ³	
Physical Description Colorless to pale-yellow solid or liquid (above 71°F) with a sharp, pungent odor.			
MW: 174.2	BP: 484°F	MLT: 71°F	Sol: Insoluble
VP(77°F): 0.01 mmHg	IP: ?		Sp.Gr: 1.22
Fl.P: 260°F	UEL: 9.5%	LEL: 0.9%	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Strong oxidizers, water, acids, bases & amines (may cause foam & spatter); alcohols [Note: Reacts slowly with water to form carbon dioxide and polyureas.]			
Measurement Methods NIOSH 2535, 5521, 5522; OSHA 18, 33, 42			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, nose, throat; choke, paroxysmal cough; chest pain, retrosternal (occurring behind the sternum) soreness; nausea, vomiting, abdominal pain; bronchitis, bronchospasm, pulmonary edema; dyspnea (breathing difficulty), asthma; conjunctivitis, lacrimation (discharge of tears); dermatitis, skin sensitization; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system
Cancer Site [in animals: pancreas, liver, mammary gland, circulatory system & skin tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Toluidine			CAS 95-53-4
CH3C6H4NH2			RTECS XU2975000
Synonyms & Trade Names o-Aminotoluene, 2-Aminotoluene, 1-Methyl-2-aminobenzene, o-Methylaniline, 2-Methylaniline, ortho-Toluidine			DOT ID & Guide 1708 153
Exposure Limits	NIOSH REL: Ca [skin] See Appendix A		
	OSHA PEL: TWA 5 ppm (22 mg/m³) [skin]		
IDLH Ca [50 ppm]		Conversion 1 ppm = 4.38 mg/m³	
Physical Description Colorless to pale-yellow liquid with an aromatic, aniline-like odor.			
MW: 107.2	BP: 392°F	FRZ: 6°F	Sol: 2%
VP: 0.3 mmHg	IP: 7.44 eV		Sp.Gr: 1.01
Fl.P: 185°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Strong oxidizers, nitric acid, bases			
Measurement Methods NIOSH 2002, 2017; OSHA 73			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes; anoxia, headache, cyanosis; lassitude (weakness, exhaustion), dizziness, drowsiness; micro hematuria (blood in the urine); eye burns; dermatitis; [potential occupational carcinogen]
Target Organs Eyes, skin, blood, kidneys, liver, cardiovascular system
Cancer Site [bladder cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

m-Toluidine			CAS 108-44-1
CH₃C₆H₄NH₂			RTECS XU2800000
Synonyms & Trade Names 3-Amino-1-methylbenzene, 1-Aminophenylmethane, m-Aminotoluene, 3-Methylaniline, 3-Methylbenzenamine, 3-Toluidine, m-Tolylamine			DOT ID & Guide 1708 153
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless to light-yellow liquid with an aromatic, amine-like odor. [Note: Used as a basis for many dyes.]			
MW: 107.2	BP: 397°F	FRZ: -23°F	Sol: 2%
VP(106°F): 1 mmHg	IP: 7.50 eV		Sp.Gr: 0.999
Fl.P: 187°F	UEL: ?	LEL: ?	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Oxidizers, acids			
Measurement Methods NIOSH 2002; OSHA 73			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin; dermatitis; hematuria (blood in the urine), methemoglobinemia; cyanosis, nausea, vomiting, low blood pressure, convulsions; anemia, lassitude (weakness, exhaustion)			
Target Organs Eyes, skin, blood, cardiovascular system			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

p-Toluidine			CAS 106-49-0
CH₃C₆H₄NH₂			RTECS XU3150000
Synonyms & Trade Names 4-Aminotoluene, 4-Methylaniline, 4-Methylbenzenamine, 4-Toluidine, Tolylamine			DOT ID & Guide 1708 153
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion	
Physical Description White solid with an aromatic odor. [Note: Used as a basis for many dyes.]			
MW: 107.2	BP: 393°F	MLT: 111°F	Sol: 0.7%
VP(108°F): 1 mmHg	IP: 7.50 eV		Sp.Gr: 1.05
Fl.P: 188°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Oxidizers, acids			
Measurement Methods NIOSH 2002; OSHA 73			
Personal Protection & Sanitation 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) 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-			

contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; dermatitis; hematuria (blood in the urine), methemoglobinemia; cyanosis, nausea, vomiting, low blood pressure, convulsions; anemia, lassitude (weakness, exhaustion); [potential occupational carcinogen]
Target Organs Eyes, skin, blood, cardiovascular system
Cancer Site [in animals: liver tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tributyl phosphate			CAS 126-73-8
(CH ₃ [CH ₂] ₃ O) ₃ PO			RTECS TC7700000
Synonyms & Trade Names Butyl phosphate, TBP, Tributyl ester of phosphoric acid, Tri-n-butyl phosphate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.2 ppm (2.5 mg/m ³)		
	OSHA PEL†: TWA 5 mg/m ³		
IDLH 30 ppm		Conversion 1 ppm = 10.89 mg/m ³	
Physical Description Colorless to pale-yellow, odorless liquid.			
MW: 266.3	BP: 552°F (Decomposes)	FRZ: -112°F	Sol: 0.6%
VP(77°F): 0.004 mmHg	IP: ?		Sp.Gr: 0.98
Fl.P(oc): 295°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Alkalis, oxidizers, water, moist air			
Measurement Methods NIOSH 5034			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 2 ppm : (APF = 10) Any supplied-air respirator Up to 5 ppm : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 10 ppm : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece Up to 30 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, respiratory system, headache; nausea

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Trichloroacetic acid			CAS 76-03-9
CCl ₃ COOH			RTECS AJ7875000
Synonyms & Trade Names TCA, Trichloroethanoic acid			DOT ID & Guide 1839 153 (solid) 2564 153 (solution)
Exposure Limits	NIOSH REL: TWA 1 ppm (7 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 6.68 mg/m ³	
Physical Description Colorless to white, crystalline solid with a sharp, pungent odor.			
MW: 163.4	BP: 388°F	MLT: 136°F	Sol: Miscible
VP(124°F): 1 mmHg	IP: ?		Sp.Gr: 1.62
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Moisture, iron, zinc, aluminum, strong oxidizers [Note: Decomposes on heating to form phosgene & hydrogen chloride. Corrosive to metals.]			
Measurement Methods OSHA PV2017			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat, respiratory system; cough, dyspnea (breathing difficulty), delayed pulmonary edema; eye, skin burns; dermatitis; salivation, vomiting, diarrhea			
Target Organs Eyes, skin, respiratory system, gastrointestinal tract			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,2,4-Trichlorobenzene			CAS 120-82-1
C ₆ H ₃ Cl ₃			RTECS DC2100000
Synonyms & Trade Names unsym-Trichlorobenzene; 1,2,4-Trichlorobenzol			DOT ID & Guide 2321 153 (liquid)
Exposure Limits	NIOSH REL: C 5 ppm (40 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 7.42 mg/m ³	
Physical Description Colorless liquid or crystalline solid (below 63°F) with an aromatic odor.			
MW: 181.4	BP: 416°F	FRZ: 63°F	Sol: 0.003%
VP: 1 mmHg	IP: ?		Sp.Gr: 1.45
Fl.P: 222°F	UEL(302°F): 6.6%	LEL(302°F): 2.5%	
Class IIIB Combustible Liquid Combustible Solid			
Incompatibilities & Reactivities Acids, acid fumes, oxidizers, steam			
Measurement Methods NIOSH 5517			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, mucous membrane; in animals: liver, kidney damage; possible teratogenic effects			
Target Organs Eyes, skin, respiratory system, liver, reproductive system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,1,2-Trichloroethane			CAS 79-00-5
CHCl ₂ CH ₂ Cl			RTECS KJ3150000
Synonyms & Trade Names Ethane trichloride, beta-Trichloroethane, Vinyl trichloride			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca TWA 10 ppm (45 mg/m ³) [skin] See Appendix A See Appendix C (Chloroethanes)		
	OSHA PEL: TWA 10 ppm (45 mg/m ³) [skin]		
IDLH Ca [100 ppm]		Conversion 1 ppm = 5.46 mg/m ³	
Physical Description Colorless liquid with a sweet, chloroform-like odor.			
MW: 133.4	BP: 237°F	FRZ: -34°F	Sol: 0.4%
VP: 19 mmHg	IP: 11.00 eV		Sp.Gr: 1.44
Fl.P: ?	UEL: 15.5%	LEL: 6%	
Combustible Liquid, forms dense soot.			
Incompatibilities & Reactivities Strong oxidizers & caustics; chemically-active metals (such as aluminum, magnesium powders, sodium & potassium)			
Measurement Methods NIOSH 1003; OSHA 11			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose; central nervous system depression; liver, kidney damage; dermatitis; [potential occupational carcinogen]
Target Organs Eyes, respiratory system, central nervous system, liver, kidneys
Cancer Site [in animals: liver cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Trichloroethylene			CAS 79-01-6
ClCH=CCl ₂			RTECS KX4550000
Synonyms & Trade Names Ethylene trichloride, TCE, Trichloroethene, Trilene			DOT ID & Guide 1710 160
Exposure Limits	NIOSH REL: Ca See Appendix A See Appendix C		
	OSHA PEL†: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)		
IDLH Ca [1000 ppm]		Conversion 1 ppm = 5.37 mg/m ³	
Physical Description Colorless liquid (unless dyed blue) with a chloroform-like odor.			
MW: 131.4	BP: 189°F	FRZ: -99°F	Sol(77°F): 0.1%
VP: 58 mmHg	IP: 9.45 eV		Sp.Gr: 1.46
Fl.P: ?	UEL(77°F): 10.5%	LEL(77°F): 8%	
Combustible Liquid, but burns with difficulty.			
Incompatibilities & Reactivities Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)			
Measurement Methods NIOSH 1022, 3800; OSHA 1001			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system
Cancer Site [in animals: liver & kidney cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Trichloronaphthalene			CAS 1321-65-9
C ₁₀ H ₅ Cl ₃			RTECS QK4025000
Synonyms & Trade Names Halowax®, Nibren wax, Seekay wax			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³ [skin]		
	OSHA PEL: TWA 5 mg/m ³ [skin]		
IDLH Unknown		Conversion	
Physical Description Colorless to pale-yellow solid with an aromatic odor.			
MW: 231.5	BP: 579-669°F	MLT: 199°F	Sol: Insoluble
VP: <1 mmHg	IP: ?		Sp.Gr: 1.58
Fl.P(oc): 392°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH S128 (II-2)			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m³ : (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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Anorexia, nausea; dizziness; jaundice, liver injury
Target Organs Liver
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,2,3-Trichloropropane			CAS 96-18-4
CH ₂ ClCHClCH ₂ Cl			RTECS TZ9275000
Synonyms & Trade Names Allyl trichloride, Glycerol trichlorohydrin, Glyceryl trichlorohydrin, Trichlorohydrin			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca TWA 10 ppm (60 mg/m ³) [skin] See Appendix A		
	OSHA PEL†: TWA 50 ppm (300 mg/m ³)		
IDLH Ca [100 ppm]		Conversion 1 ppm = 6.03 mg/m ³	
Physical Description Colorless liquid with a chloroform-like odor.			
MW: 147.4	BP: 314°F	FRZ: 6°F	Sol: 0.1%
VP: 3 mmHg	IP: ?		Sp.Gr: 1.39
Fl.P: 160°F	UEL(302°F): 12.6%	LEL(248°F): 3.2%	
Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.			
Incompatibilities & Reactivities Chemically-active metals, strong caustics & oxidizers			
Measurement Methods NIOSH 1003; OSHA 7			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash 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			

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, nose, throat; central nervous system depression; in animals: liver, kidney injury; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys
Cancer Site [in animals: forestomach, liver & mammary gland cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,1,2-Trichloro-1,2,2-trifluoroethane			CAS 76-13-1
CCl ₂ FCClF ₂			RTECS KJ4000000
Synonyms & Trade Names Chlorofluorocarbon-113, CFC-113, Freon® 113, Genetron® 113, Halocarbon 113, Refrigerant 113, TTE			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1000 ppm (7600 mg/m ³) ST 1250 ppm (9500 mg/m ³)		
	OSHA PEL†: TWA 1000 ppm (7600 mg/m ³)		
IDLH 2000 ppm		Conversion 1 ppm = 7.67 mg/m ³	
Physical Description Colorless to water-white liquid with an odor like carbon tetrachloride at high concentrations. [Note: A gas above 118°F.]			
MW: 187.4	BP: 118°F	FRZ: -31°F	Sol(77°F): 0.02%
VP: 285 mmHg	IP: 11.99 eV		Sp.Gr(77°F): 1.56
Fl.P: ?	UEL: ?	LEL: ?	
Noncombustible Liquid at ordinary temperatures, but the gas will ignite and burn weakly at 1256°F.			
Incompatibilities & Reactivities Chemically-active metals such as calcium, powdered aluminum, zinc, magnesium & beryllium [Note: Decomposes if in contact with alloys containing >2% magnesium.]			
Measurement Methods NIOSH 1020; OSHA 113			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 2000 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation skin, throat, drowsiness, dermatitis; central nervous system depression; in animals: cardiac arrhythmias, narcosis
Target Organs Skin, heart, central nervous system, cardiovascular system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Triethylamine			CAS 121-44-8
(C ₂ H ₅) ₃ N			RTECS YEO175000
Synonyms & Trade Names TEA			DOT ID & Guide 1296 132
Exposure Limits	NIOSH REL: See Appendix D		
	OSHA PEL†: TWA 25 ppm (100 mg/m ³)		
IDLH 200 ppm		Conversion 1 ppm = 4.14 mg/m ³	
Physical Description Colorless liquid with a strong, ammonia-like odor.			
MW: 101.2	BP: 193°F	FRZ: -175°F	Sol: 2%
VP: 54 mmHg	IP: 7.50 eV		Sp.Gr: 0.73
Fl.P: 20°F	UEL: 8.0%	LEL: 1.2%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids, chlorine, hypochlorite, halogenated compounds			
Measurement Methods NIOSH S152 (II-3); OSHA PV2060			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Eyewash (>1%), Quick drench (>1%)		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations OSHA Up to 200 ppm : (APF = 25) Any supplied-air respirator 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 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; in animals: myocardial, kidney, liver damage
Target Organs Eyes, skin, respiratory system, cardiovascular system, liver, kidneys
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Trifluorobromomethane			CAS 75-63-8
CBrF ₃			RTECS PA5425000
Synonyms & Trade Names Bromotrifluoromethane, Fluorocarbon 1301, Freon® 13B1, Halocarbon 13B1, Halon® 1301, Monobromotrifluoromethane, Refrigerant 13B1, Trifluoromonobromomethane			DOT ID & Guide 1009 126
Exposure Limits	NIOSH REL: TWA 1000 ppm (6100 mg/m ³)		
	OSHA PEL: TWA 1000 ppm (6100 mg/m ³)		
IDLH 40,000 ppm		Conversion 1 ppm = 6.09 mg/m ³	
Physical Description Colorless, odorless gas. [Note: Shipped as a liquefied compressed gas.]			
MW: 148.9	BP: -72°F	FRZ: -267°F	Sol: 0.03%
VP: >1 atm	IP: 11.78 eV	RGasD: 5.14	
Fl.P: NA	UEL: NA	LEL: NA	
Nonflammable Gas			
Incompatibilities & Reactivities Chemically-active metals (such as calcium, powdered aluminum, zinc & magnesium)			
Measurement Methods NIOSH 1017			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: No recommendation Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 10,000 ppm: (APF = 10) Any supplied-air respirator Up to 25,000 ppm: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 40,000 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 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

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

Symptoms Dizziness; cardiac arrhythmias; liquid: frostbite

Target Organs central nervous system, heart

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Trimellitic anhydride			CAS 552-30-7
C ₉ H ₄ O ₅			RTECS DC2050000
Synonyms & Trade Names 1,2,4-Benzenetricarboxylic anhydride; 4-Carboxyphthalic anhydride; TMA; TMAN; Trimellic acid anhydride [Note: TMA is also a synonym for Trimethylamine.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.005 ppm (0.04 mg/m ³) Should be handled in the workplace as an extremely toxic substance.		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 7.86 mg/m ³	
Physical Description Colorless solid.			
MW: 192.1	BP: ?	MLT: 322°F	Sol: ?
VP: 0.000004 mmHg	IP: ?		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 5036; OSHA 98			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, respiratory system; pulmonary edema, respiratory sensitization; rhinitis, asthma, cough, wheezing, dyspnea (breathing difficulty), malaise (vague feeling of discomfort), fever, muscle aches, sneezing			

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Trimethylamine			CAS 75-50-3
(CH ₃) ₃ N			RTECS PA0350000
Synonyms & Trade Names N,N-Dimethylmethanamine; TMA [Note: May be used in an aqueous solution (typically 25%, 30%, or 40% TMA.)]			DOT ID & Guide 1083 118 (anhydrous) 1297 132 (aqueous solution)
Exposure Limits	NIOSH REL: TWA 10 ppm (24 mg/m ³) ST 15 ppm (36 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 2.42 mg/m ³	
Physical Description Colorless gas with a fishy, amine odor. [Note: A liquid below 37°F. Shipped as a liquefied compressed gas.]			
MW: 59.1	BP: 37°F	FRZ: -179°F	Sol(86°F): 48%
VP(70°F): 1454 mmHg	IP: 7.82 eV	RGasD: 2.09	
Fl.P: NA (Gas) 20°F (Liquid)	UEL: 11.6%	LEL: 2.0%	
Flammable Gas Class IA Flammable Liquid			
Incompatibilities & Reactivities Strong oxidizers (including bromine), ethylene oxide, nitrosating agents (e.g., sodium nitrite), mercury, strong acids [Note: Corrosive to many metals (e.g., zinc, brass, aluminum, copper).]			
Measurement Methods OSHA PV2060			
Personal Protection & Sanitation Skin: Prevent skin contact (liquid/solution)/Frostbite Eyes: Prevent eye contact (liquid/solution)/Frostbite Wash skin: When contaminated (solution) Remove: When wet (flammable) Change: No recommendation Provide: Eyewash (liquid/solution), Quick drench (liquid/solution), Frostbite		First Aid (See procedures) Eye: Irrigate immediately (liquid/solution)/Frostbite Skin: Water flush immediately (liquid/solution)/Frostbite Breathing: Respiratory support Swallow: Medical attention immediately (solution)	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion (solution), skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat, respiratory system; cough, dyspnea (breathing difficulty), delayed			

pulmonary edema; blurred vision, corneal necrosis; skin burns; liquid: frostbite
Target Organs Eyes, skin, respiratory system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,2,3-Trimethylbenzene			CAS 526-73-8
C ₆ H ₃ (CH ₃) ₃			RTECS DC330000
Synonyms & Trade Names Hemellitol [Note: Hemimellite is a mixture of the 1,2,3-isomer with up to 10% of related aromatics such as the 1,2,4-isomer.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 25 ppm (125 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.92 mg/m ³	
Physical Description Clear, colorless liquid with a distinctive, aromatic odor.			
MW: 120.2	BP: 349°F	FRZ: -14°F	Sol: Low
VP(62°F): 1 mmHg	IP: 8.48 eV		Sp.Gr: 0.89
Fl.P: ?	UEL: 6.6%	LEL: 0.8%	
Flammable Liquid			
Incompatibilities & Reactivities Oxidizers, nitric acid			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)			
Target Organs Eyes, skin, respiratory system, central nervous system, blood			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,2,4-Trimethylbenzene			CAS 95-63-6
C ₆ H ₃ (CH ₃) ₃			RTECS DC3325000
Synonyms & Trade Names Assymetrical trimethylbenzene, psi-Cumene, Pseudocumene [Note: Hemimellite is a mixture of the 1,2,3-isomer with up to 10% of related aromatics such as the 1,2,4-isomer.]			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 25 ppm (125 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.92 mg/m ³	
Physical Description Clear, colorless liquid with a distinctive, aromatic odor.			
MW: 120.2	BP: 337°F	FRZ: -77°F	Sol: 0.006%
VP(56°F): 1 mmHg	IP: 8.27 eV		Sp.Gr: 0.88
FLP: 112°F	UEL: 6.4%	LEL: 0.9%	
Class II Flammable Liquid			
Incompatibilities & Reactivities Oxidizers, nitric acid			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, fatigue, dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)			
Target Organs Eyes, skin, respiratory system, central nervous system, blood			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1,3,5-Trimethylbenzene			CAS 108-67-8
C ₆ H ₃ (CH ₃) ₃			RTECS OX6825000
Synonyms & Trade Names Mesitylene, Symmetrical trimethylbenzene, sym-Trimethylbenzene			DOT ID & Guide 2325 129
Exposure Limits	NIOSH REL: TWA 25 ppm (125 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 4.92 mg/m ³	
Physical Description Clear, colorless liquid with a distinctive, aromatic odor.			
MW: 120.2	BP: 329°F	FRZ: -49°F	Sol: 0.002%
VP: 2 mmHg	IP: 8.39 eV		Sp.Gr: 0.86
Fl.P: 122°F	UEL: ?	LEL: ?	
Class II Flammable Liquid			
Incompatibilities & Reactivities Oxidizers, nitric acid			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)			
Target Organs Eyes, skin, respiratory system, central nervous system, blood			

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Trimethyl phosphite			CAS 121-45-9
(CH ₃ O) ₃ P			RTECS TH1400000
Synonyms & Trade Names Methyl phosphite, Trimethoxyphosphine, Trimethyl ester of phosphorous acid			DOT ID & Guide 2329 129
Exposure Limits	NIOSH REL: TWA 2 ppm (10 mg/m ³)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 5.08 mg/m ³	
Physical Description Colorless liquid with a distinctive, pungent odor.			
MW: 124.1	BP: 232°F	FRZ: -108°F	Sol: Reacts
VP(77°F): 24 mmHg	IP: ?		Sp.Gr: 1.05
Fl.P: 82°F	UEL: ?	LEL: ?	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Magnesium perchlorate, water [Note: Reacts (hydrolyzes) with water.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; dermatitis; in animals: teratogenic effects			
Target Organs Eyes, skin, respiratory system, reproductive system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

2,4,6-Trinitrotoluene			CAS 118-96-7
CH3C6H2(NO2)3			RTECS XU0175000
Synonyms & Trade Names 1-Methyl-2,4,6-trinitrobenzene; TNT; Trinitrotoluene; sym-Trinitrotoluene; Trinitrotoluol			DOT ID & Guide 1356 113 (wet)
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³ [skin]		
	OSHA PEL†: TWA 1.5 mg/m ³ [skin]		
IDLH 500 mg/m ³		Conversion	
Physical Description Colorless to pale-yellow, odorless solid or crushed flakes.			
MW: 227.1	BP: 464°F (Explodes)	MLT: 176°F	Sol(77°F): 0.01%
VP: 0.0002 mmHg	IP: 10.59 eV		Sp.Gr: 1.65
Fl.P: ? (Explodes)	UEL: ?	LEL: ?	
Combustible Solid (Class A Explosive)			
Incompatibilities & Reactivities Strong oxidizers, ammonia, strong alkalis, combustible materials, heat [Note: Rapid heating will result in detonation.]			
Measurement Methods OSHA 44			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 mg/m³ : (APF = 10) Any supplied-air respirator* Up to 12.5 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* Up to 25 mg/m³ : (APF = 50) Any self-contained breathing apparatus with a full facepiece/(APF = 50) Any supplied-air respirator with a full facepiece			

Up to 500 mg/m : (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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation skin, mucous membrane; liver damage, jaundice; cyanosis; sneezing; cough, sore throat; peripheral neuropathy, muscle pain; kidney damage; cataract; sensitization dermatitis; leukocytosis (increased blood leukocytes); anemia; cardiac irregularities

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Triorthocresyl phosphate			CAS 78-30-8
(CH ₃ C ₆ H ₄) ₃ PO			RTECS TD0350000
Synonyms & Trade Names TCP, TOCP, Tri-o-cresyl ester of phosphoric acid, Tri-o-cresyl phosphate			DOT ID & Guide 2574 151
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ [skin]		
	OSHA PEL†: TWA 0.1 mg/m ³		
IDLH 40 mg/m ³		Conversion	
Physical Description Colorless to pale-yellow, odorless liquid or solid (below 52°F).			
MW: 368.4	BP: 770°F (Decomposes)	FRZ: 52°F	Sol: Slight
VP(77°F): 0.00002	IP: ?		Sp.Gr: 1.20
Fl.P: 437°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods NIOSH 5037			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.5 mg/m³ : (APF = 5) Any dust and mist respirator Up to 1 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(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 a dust and mist filter Up to 5 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate			

filter/(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 40 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Gastrointestinal disturbance; peripheral neuropathy; cramps in calves, paresthesia in feet or hands; weak feet, wrist drop, paralysis

Target Organs peripheral nervous system, central nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Triphenylamine			CAS 603-34-9
(C ₆ H ₅) ₃ N			RTECS YK2680000
Synonyms & Trade Names N,N-Diphenylaniline; N,N-Diphenylbenzenamine			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 5 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless solid.			
MW: 245.3	BP: 689°F	MLT: 261°F	Sol: Insoluble
VP: ?	IP: 7.60 eV		Sp.Gr: 0.77
Fl.P: ?	UEL: ?	LEL: ?	
Incompatibilities & Reactivities None reported			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms In animals: irritation skin			
Target Organs Skin			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Triphenyl phosphate			CAS 115-86-6
(C ₆ H ₅ O) ₃ PO			RTECS TC8400000
Synonyms & Trade Names Phenyl phosphate, TPP, Triphenyl ester of phosphoric acid			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 3 mg/m ³		
	OSHA PEL: TWA 3 mg/m ³		
IDLH 1000 mg/m ³		Conversion	
Physical Description Colorless, crystalline powder with a phenol-like odor.			
MW: 326.3	BP: 776°F	MLT: 120°F	Sol(129°F): 0.002%
VP(380°F): 1 mmHg	IP: ?		Sp.Gr: 1.29
Fl.P: 428°F	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 5038			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 15 mg/m ³ : (APF = 5) Any dust respirator Up to 30 mg/m ³ : (APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any dust respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 75 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter Up to 150 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate			

filter/(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 1000 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, ingestion

Symptoms Minor changes in blood enzymes; in animals: muscle weakness, paralysis

Target Organs Blood, peripheral nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tungsten			CAS 7440-33-7
W			RTECS YO7175000
Synonyms & Trade Names Tungsten metal, Wolfram			DOT ID & Guide
Exposure Limits	NIOSH REL*: TWA 5 mg/m ³ ST 10 mg/m ³ [*Note: The REL also applies to other insoluble tungsten compounds (as W).]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Hard, brittle, steel-gray to tin-white solid.			
MW: 183.9	BP: 10,701°F	MLT: 6170°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 19.3
Fl.P: NA	UEL: NA	LEL: NA	
Combustible in the form of finely divided powder; may ignite spontaneously.			
Incompatibilities & Reactivities Bromine trifluoride, chlorine trifluoride, fluorine, iodine pentafluoride			
Measurement Methods NIOSH 7074, 7300; OSHA ID213			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 50 mg/m³ : (APF = 10) Any 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 = 10) Any air-purifying respirator with a high-efficiency particulate filter/Any appropriate escape-			

type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, respiratory system; diffuse pulmonary fibrosis; loss of appetite, nausea, cough; blood changes
Target Organs Eyes, skin, respiratory system, blood
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tungsten (soluble compounds, as W)			CAS
			RTECS
Synonyms & Trade Names Synonyms vary depending upon the specific soluble tungsten compound.			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 1 mg/m ³ ST 3 mg/m ³		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Appearance and odor vary depending upon the specific soluble tungsten compound.			
Properties vary depending upon the specific soluble tungsten compound.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 7074; 7300; OSHA ID213			
Personal Protection & Sanitation Recommendations regarding personal protective clothing vary depending upon the specific compound. Recommendations regarding eye protection vary depending upon the specific compound. Recommendations regarding washing the skin vary depending upon the specific compound. Recommendations regarding the removal of personal protective clothing that becomes wet or contaminated vary depending upon the specific compound. Recommendations regarding the daily changing of personal protective clothing vary depending upon the specific compound. Recommendations regarding the need for eyewash or quick drench facilities vary depending upon the specific		First Aid (See procedures) Eye: Irrigate immediately Skin: Water wash Breathing: Respiratory support Swallow: Medical attention immediately	

compound.	
Respirator Recommendations NIOSH Up to 10 mg/m³ : (APF = 10) Any air-purifying respirator with a high-efficiency particulate filter/(APF = 10) Any supplied-air respirator Up to 25 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode Up to 50 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus	
Exposure Routes inhalation, ingestion, skin and/or eye contact	
Symptoms Irritation eyes, skin, respiratory system; in animals: central nervous system disturbances; diarrhea; respiratory failure; behavioral, body weight, blood changes	
Target Organs Eyes, skin, respiratory system, central nervous system, gastrointestinal tract	
See also: INTRODUCTION	

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Tungsten carbide (cemented)		CAS 1: 11107-01-0 2: 12718-69-3 3: 37329-49-0	
WC/Co/Ni/Ti		RTECS 1: Y07350000 2: Y07525000 3: YO7700000	
Synonyms & Trade Names Cemented tungsten carbide, Cemented WC, Hard metal [Note: The tungsten carbide (WC) content is generally 85-95% & the cobalt content is generally 5-15%.] [1: 85% WC, 15% Co 2: 92% WC, 8% Co 3: 78% WC, 14% Co, 8% Ti]		DOT ID & Guide	
Exposure Limits	NIOSH REL: See Appendix C		
	OSHA PEL†: See Appendix C		
IDLH N.D.		Conversion	
Physical Description A mixture of tungsten carbide, cobalt, and sometimes other metals & metal oxides or carbides.			
Properties vary depending upon the specific mixture.			
Incompatibilities & Reactivities Tungsten carbide: Fluorine, chlorine trifluoride, oxides of nitrogen, lead dioxide			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily (Ni) Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 0.25 mg Co/m³ : (APF = 5) Any dust and mist respirator^ Up to 0.5 mg Co/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask			

respirators*/(APF = 10) Any dust, mist, and fume respirator*/(APF = 10) Any supplied-air respirator*

Up to 1.25 mg Co/m³: (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter*/(APF = 25) Any powered, air-purifying respirator with a dust, mist, and fume filter*

Up to 2.5 mg Co/m³: (APF = 50) Any air-purifying, full-facepiece respirator 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

Up to 20 mg Co/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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

[*Note: Respirator for Tungsten carbide (cemented) containing Nickel.]

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

Symptoms Irritation eyes, skin, respiratory system; possible skin sensitization to cobalt, nickel; diffuse pulmonary fibrosis; loss of appetite, nausea, cough; blood changes

Target Organs Eyes, skin, respiratory system, blood

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Turpentine			CAS 8006-64-2
C₁₀H₁₆ (approx)			RTECS YO8400000
Synonyms & Trade Names Gumspirits, Gum turpentine, Spirits of turpentine, Steam distilled turpentine, Sulfate wood turpentine, Turps, Wood turpentine			DOT ID & Guide 1299 128
Exposure Limits	NIOSH REL: TWA 100 ppm (560 mg/m ³)		
	OSHA PEL: TWA 100 ppm (560 mg/m ³)		
IDLH 800 ppm		Conversion 1 ppm = 5.56 mg/m ³ (approx)	
Physical Description Colorless liquid with a characteristic odor.			
MW: 136 (approx)	BP: 309-338°F	FRZ: -58 to -76°F	Sol: Insoluble
VP: 4 mmHg	IP: ?		Sp.Gr: 0.86
Fl.P: 95°F	UEL: ?	LEL: 0.8%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers, chlorine, chromic anhydride, stannic chloride, chromyl chloride			
Measurement Methods NIOSH 1551			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 800 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

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

Symptoms Irritation eyes, skin, nose, throat; headache, dizziness, convulsions; skin sensitization; hematuria (blood in the urine), proteinuria; kidney damage; abdominal pain, nausea, vomiting, diarrhea; chemical pneumonitis (aspiration liquid)

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

1-Undecanethiol			CAS 5332-52-5
CH ₃ (CH ₂) ₁₀ SH			RTECS
Synonyms & Trade Names Undecyl mercaptan			DOT ID & Guide 1228 131
Exposure Limits	NIOSH REL: C 0.5 ppm (3.9 mg/m ³) [15-minute]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 7.71 mg/m ³	
Physical Description Liquid.			
MW: 188.4	BP: 495°F	FRZ: 27°F	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: 0.84
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities Oxidizers, reducing agents, strong acids & bases, alkali metals			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 5 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator 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
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

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

Symptoms Irritation eyes, skin, respiratory system; confusion, dizziness, headache, drowsiness, nausea, vomiting, lassitude (weakness, exhaustion), convulsions

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Uranium (insoluble compounds, as U)			CAS 7440-61-1 (metal)
U (metal)			RTECS YR3490000 (metal)
Synonyms & Trade Names Uranium metal: Uranium I Synonyms of other insoluble uranium compounds vary depending upon the specific compound.			DOT ID & Guide 2979 162 (metal, pyrophoric)
Exposure Limits	NIOSH REL: Ca TWA 0.2 mg/m ³ ST 0.6 mg/m ³ See Appendix A		
	OSHA PEL†: TWA 0.25 mg/m ³		
IDLH Ca [10 mg/m ³ (as U)]		Conversion	
Physical Description Metal: Silver-white, malleable, ductile, lustrous solid. [Note: Weakly radioactive.]			
MW: 238.0	BP: 6895°F	MLT: 2097°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 19.05 (metal)
Fl.P: NA	UEL: NA	LEL: NA	MEC: 60 g/m ³
Metal: Combustible Solid, especially turnings and powder.			
Incompatibilities & Reactivities Carbon dioxide, carbon tetrachloride, nitric acid, fluorine [Note: Complete coverage of uranium metal scrap with oil is essential for prevention of fire.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily Provide: Eyewash		First Aid (See procedures) 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Dermatitis; kidney damage; blood changes; [potential occupational carcinogen]; in animals: lung, lymph node damage [Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).]
Target Organs Skin, kidneys, bone marrow, lymphatic system
Cancer Site [lung cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Uranium (soluble compounds, as U)		CAS	
		RTECS	
Synonyms & Trade Names Synonyms vary depending upon the specific soluble uranium compound.		DOT ID & Guide	
Exposure Limits	NIOSH REL: Ca TWA 0.05 mg/m ³ See Appendix A		
	OSHA PEL: TWA 0.05 mg/m ³		
IDLH Ca [10 mg/m ³ (as U)]		Conversion	
Physical Description Appearance and odor vary depending upon the specific soluble uranium compound.			
Properties vary depending upon the specific soluble uranium compound.			
Incompatibilities & Reactivities Uranyl nitrate: combustibles Uranium hexafluoride: water			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily Provide: Eyewash (UF6), Quick drench		First Aid (See procedures) Eye: Irrigate immediately 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(Halides): (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or			

back-mounted acid gas canister having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
[Escape\(Non-halides\)](#): (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Lacrimation (discharge of tears), conjunctivitis; shortness breath, cough, chest rales; nausea, vomiting; skin burns; red blood cell, casts in urine; proteinuria; high blood urea nitrogen; [potential occupational carcinogen] [Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).]

Target Organs respiratory system, blood, liver, kidneys, lymphatic system, skin, bone marrow

Cancer Site [lung cancer]

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

n-Valeraldehyde			CAS 110-62-3
CH ₃ (CH ₂) ₃ CHO			RTECS YV3600000
Synonyms & Trade Names Amyl aldehyde, Pentanal, Valeral, Valeraldehyde, Valeric aldehyde			DOT ID & Guide 2058 129
Exposure Limits	NIOSH REL: TWA 50 ppm (175 mg/m ³) See Appendix C (Aldehydes)		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 3.53 mg/m ³	
Physical Description Colorless liquid with a strong, acrid, pungent odor.			
MW: 86.2	BP: 217°F	FRZ: -133°F	Sol: Slight
VP: 26 mmHg	IP: 9.82 eV		Sp.Gr: 0.81
Fl.P: 54°F	UEL: ?	LEL: ?	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 2536; OSHA 85			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Vanadium dust			CAS 1314-62-1
V ₂ O ₅			RTECS YW2450000
Synonyms & Trade Names Divanadium pentoxide dust, Vanadic anhydride dust, Vanadium oxide dust, Vanadium pentaoxide dust Other synonyms vary depending upon the specific vanadium compound.			DOT ID & Guide 2862 151
Exposure Limits	NIOSH REL*: C 0.05 mg V/m ³ [15-minute] [*Note: The REL applies to all vanadium compounds except Vanadium metal and Vanadium carbide (see Ferrovandium dust).]		
	OSHA PEL†: C 0.5 mg V ₂ O ₅ /m ³ (resp)		
IDLH 35 mg/m ³ (as V)		Conversion	
Physical Description Yellow-orange powder or dark-gray, odorless flakes dispersed in air.			
MW: 181.9	BP: 3182°F (Decomposes)	MLT: 1274°F	Sol: 0.8%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 3.36
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid, but may increase intensity of fire when in contact with combustible materials.			
Incompatibilities & Reactivities Lithium, chlorine trifluoride			
Measurement Methods NIOSH 7300, 7504; OSHA ID185			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH (as V) Up to 0.5 mg/m ³ : (APF = 10) Any air-purifying respirator with a high-efficiency particulate filter*/(APF = 10) Any supplied-air respirator* Up to 1.25 mg/m ³ : (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 a high-efficiency particulate filter/(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 35 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes, skin, throat; green tongue, metallic taste, eczema; cough; fine rales, wheezing, bronchitis, dyspnea (breathing difficulty)

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Vanadium fume			CAS 1314-62-1
V ₂ O ₅			RTECS YW2460000
Synonyms & Trade Names Divanadium pentoxide fume, Vanadic anhydride fume, Vanadium oxide fume, Vanadium pentaoxide fume Other synonyms vary depending upon the specific vanadium compound.			DOT ID & Guide 2862 151
Exposure Limits	NIOSH REL: C 0.05 mg V/m ³ [15-minute]		
	OSHA PEL†: C 0.1 mg V ₂ O ₅ /m ³		
IDLH 35 mg/m ³ (as V)		Conversion	
Physical Description Finely divided particulate dispersed in air.			
MW: 181.9	BP: 3182°F (Decomposes)	MLT: 1274°F	Sol: 0.8%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 3.36
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Lithium, chlorine trifluoride			
Measurement Methods NIOSH 7300, 7504; OSHA ID185			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations NIOSH (as V) Up to 0.5 mg/m ³ : (APF = 10) Any air-purifying respirator with a high-efficiency particulate filter*/(APF = 10) Any supplied-air respirator* Up to 1.25 mg/m ³ : (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/m : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 35 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, throat; green tongue, metallic taste; cough, fine rales, wheezing, bronchitis, dyspnea (breathing difficulty); eczema

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Vegetable oil mist			CAS 68956-68-3
			RTECS YX1850000
Synonyms & Trade Names Vegetable mist			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description An oil extracted from the seeds, fruit, or nuts of vegetables or other plant matter.			
MW: varies	BP: ?	FRZ: ?	Sol: Insoluble
VP: ?	IP: ?		Sp.Gr: 0.91-0.95
Fl.P: 323-540°F	UEL: ?	LEL: ?	
Combustible Liquid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH: 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Breathing: Fresh air	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin and/or eye contact			
Symptoms Irritation eyes, skin, respiratory system; lacrimation (discharge of tears)			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Vinyl acetate			CAS 108-05-4
CH ₂ =CHOOCCH ₃			RTECS AK0875000
Synonyms & Trade Names 1-Acetoxyethylene, Ethenyl acetate, Ethenyl ethanoate, VAC, Vinyl acetate monomer, Vinyl ethanoate			DOT ID & Guide 1301 129P
Exposure Limits	NIOSH REL: C 4 ppm (15 mg/m ³) [15-minute]		
	OSHA PEL†: none		
IDLH N.D.		Conversion 1 ppm = 3.52 mg/m ³	
Physical Description Colorless liquid with a pleasant, fruity odor. [Note: Raw material for many polyvinyl resins.]			
MW: 86.1	BP: 162°F	FRZ: -136°F	Sol: 2%
VP: 83 mmHg	IP: 9.19 eV		Sp.Gr: 0.93
Fl.P: 18°F	UEL: 13.4%	LEL: 2.6%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities Acids, bases, silica gel, alumina, oxidizers, azo compounds, ozone [Note: Usually contains a stabilizer (e.g., hydroquinone or diphenylamine) to prevent polymerization.]			
Measurement Methods NIOSH 1453; OSHA 51			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 40 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)*/(APF = 10) Any supplied-air respirator* Up to 100 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 200 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 4000 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

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

Symptoms Irritation eyes, skin, nose, throat; hoarseness, cough; loss of smell; eye burns, skin blisters

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Vinyl bromide			CAS 593-60-2
CH ₂ =CHBr			RTECS KU8400000
Synonyms & Trade Names Bromoethene, Bromoethylene, Monobromoethylene			DOT ID & Guide 1085 116P (inhibited)
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion 1 ppm = 4.38 mg/m ³	
Physical Description Colorless gas or liquid (below 60°F) with a pleasant odor. [Note: Shipped as a liquefied compressed gas with 0.1% phenol added to prevent polymerization.]			
MW: 107.0	BP: 60°F	FRZ: -219°F	Sol: Insoluble
VP: 1.4 atm	IP: 9.80 eV	RGasD: 3.79	Sp.Gr: 1.49 (Liquid at 60°F)
Fl.P: NA (Gas)	UEL: 15%	LEL: 9%	
Flammable Gas Class IA Flammable Liquid			
Incompatibilities & Reactivities Strong oxidizers (e.g., perchlorates, peroxides, chlorates, permanganates & nitrates.) [Note: May polymerize in sunlight.]			
Measurement Methods NIOSH 1009; OSHA 8			
Personal Protection & Sanitation Skin: Prevent skin contact (liquid) Eyes: Prevent eye contact (liquid) Wash skin: When contaminated (liquid) Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately (liquid) Skin: Water flush immediately (liquid) Breathing: Respiratory support Swallow: Medical attention immediately (liquid)	
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
Exposure Routes inhalation, ingestion (liquid), skin and/or eye contact
Symptoms Irritation eyes, skin; dizziness, confusion, incoordination, narcosis, nausea, vomiting; liquid: frostbite; [potential occupational carcinogen]
Target Organs Eyes, skin, central nervous system, liver
Cancer Site [in animals: liver & lymph node tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Vinyl chloride			CAS 75-01-4
CH ₂ =CHCl			RTECS KU9625000
Synonyms & Trade Names Chloroethene, Chloroethylene, Ethylene monochloride, Monochloroethene, Monochloroethylene, VC, Vinyl chloride monomer (VCM)			DOT ID & Guide 1086 116P
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL: [1910.1017] TWA 1 ppm C 5 ppm [15-minute]		
IDLH Ca [N.D.]		Conversion 1 ppm = 2.56 mg/m ³	
Physical Description Colorless gas or liquid (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	RGasD: 2.21	
Fl.P: NA (Gas)	UEL: 33.0%	LEL: 3.6%	
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.]			
Measurement Methods NIOSH 1007; OSHA 4, 75			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) 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: (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
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]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Vinyl cyclohexene dioxide			CAS 106-87-6
C ₈ H ₁₂ O ₂			RTECS RN8640000
Synonyms & Trade Names 1-Epoxyethyl-3,4-epoxy-cyclohexane; 4-Vinylcyclohexene diepoxide; 4-Vinyl-1-cyclohexene dioxide			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca TWA 10 ppm (60 mg/m ³) [skin] See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion 1 ppm = 5.73 mg/m ³	
Physical Description Colorless liquid.			
MW: 140.2	BP: 441°F	FRZ: -164°F	Sol: High
VP: 0.1 mmHg	IP: ?		Sp.Gr: 1.10
Fl.P(oc): 230°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities Alcohols, amines, water [Note: Slowly hydrolyzes in water.]			
Measurement Methods None available			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms In animals: irritation eyes, skin, respiratory system; testicular atrophy; leukopenia (reduced blood leukocytes), necrosis thymus; skin sensitization; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, blood, thymus, reproductive system
Cancer Site [in animals: skin tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Vinyl fluoride			CAS 75-02-5
CH ₂ =CHF			RTECS YZ7351000
Synonyms & Trade Names Fluoroethene, Fluoroethylene, Monofluoroethylene, Vinyl fluoride monomer			DOT ID & Guide 1860 116P (inhibited)
Exposure Limits	NIOSH REL: TWA 1 ppm C 5 ppm [use 1910.1017]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 1.89 mg/m ³	
Physical Description Colorless gas with a faint, ethereal odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 46.1	BP: -98°F	FRZ: -257°F	Sol: Insoluble
VP: 25.2 atm	IP: 10.37 eV	RGasD: 1.60	
Fl.P: NA (Gas)	UEL: 21.7%	LEL: 2.6%	
Flammable Gas			
Incompatibilities & Reactivities None reported [Note: Inhibited with 0.2% terpenes to prevent polymerization.]			
Measurement Methods None available			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
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 200 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

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

Symptoms Headache, dizziness, confusion, incoordination, narcosis, nausea, vomiting; liquid: frostbite

Target Organs central nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Vinylidene chloride			CAS 75-35-4
CH ₂ =CCl ₂			RTECS KV9275000
Synonyms & Trade Names 1,1-DCE; 1,1-Dichloroethene; 1,1-Dichloroethylene; VDC; Vinylidene chloride monomer; Vinylidene dichloride			DOT ID & Guide 1303 129P (inhibited)
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor.			
MW: 96.9	BP: 89°F	FRZ: -189°F	Sol: 0.04%
VP: 500 mmHg	IP: 10.00 eV		Sp.Gr: 1.21
Fl.P: -2°F	UEL: 15.5%	LEL: 6.5%	
Class IA Flammable Liquid: Fl.P. below 73°F and BP below 100°F.			
Incompatibilities & Reactivities Aluminum, sunlight, air, copper, heat [Note: Polymerization may occur if exposed to oxidizers, chlorosulfonic acid, nitric acid, or oleum. Inhibitors such as the monomethyl ether of hydroquinone are added to prevent polymerization.]			
Measurement Methods NIOSH 1015; OSHA 19			
Personal Protection & Sanitation 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) 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
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys
Cancer Site [in animals: liver & kidney tumors]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Vinylidene fluoride			CAS 75-38-7
CH ₂ =CF ₂			RTECS KW0560000
Synonyms & Trade Names Difluoro-1,1-ethylene; 1,1-Difluoroethene; 1,1-Difluoroethylene; Halocarbon 1132A; VDF; Vinylidene difluoride			DOT ID & Guide 1959 116P
Exposure Limits	NIOSH REL: TWA 1 ppm C 5 ppm [use 1910.1017]		
	OSHA PEL: none		
IDLH N.D.		Conversion 1 ppm = 2.62 mg/m ³	
Physical Description Colorless gas with a faint, ethereal odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 64.0	BP: -122°F	FRZ: -227°F	Sol: Insoluble
VP: 35.2 atm	IP: 10.29 eV	RGasD: 2.21	
Fl.P: NA (Gas)	UEL: 21.3%	LEL: 5.5%	
Flammable Gas			
Incompatibilities & Reactivities Oxidizers, aluminum chloride [Note: Violent reaction with hydrogen chloride when heated under pressure.]			
Measurement Methods NIOSH 3800			
Personal Protection & Sanitation Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite		First Aid (See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
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 200 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

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

Symptoms Dizziness, headache, nausea; liquid: frostbite

Target Organs central nervous system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Vinyl toluene			CAS 25013-15-4 (inhibited)
CH ₂ =CHC ₆ H ₄ CH ₃			RTECS WL5075000
Synonyms & Trade Names Ethenylmethylbenzene, Methylstyrene, Tolyethylene			DOT ID & Guide 2618 130P
Exposure Limits	NIOSH REL: TWA 100 ppm (480 mg/m ³)		
	OSHA PEL: TWA 100 ppm (480 mg/m ³)		
IDLH 400 ppm		Conversion 1 ppm = 4.83 mg/m ³	
Physical Description Colorless liquid with a strong, disagreeable odor.			
MW: 118.2	BP: 339°F	FRZ: -106°F	Sol: 0.009%
VP: 1 mmHg	IP: 8.20 eV		Sp.Gr: 0.89
Fl.P: 127°F	UEL: 11.0%	LEL: 0.8%	
Class II Combustible Liquid: Fl.P. at or above 100°F and below 140°F.			
Incompatibilities & Reactivities Oxidizers, peroxides, strong acids, iron or aluminum salts [Note: Usually inhibited with tert-butyl catechol to prevent polymerization.]			
Measurement Methods NIOSH 1501, OSHA 7			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 400 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
Exposure Routes inhalation, ingestion, skin and/or eye contact
Symptoms Irritation eyes, skin, upper respiratory system; drowsiness; in animals: narcosis
Target Organs Eyes, skin, respiratory system, central nervous system
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

VM & P Naphtha			CAS 8032-32-4
			RTECS OI6180000
Synonyms & Trade Names Ligroin, Painters naphtha, Petroleum ether, Petroleum spirit, Refined solvent naphtha, Varnish makers' & painters' naphtha			DOT ID & Guide 1271 128
Exposure Limits	NIOSH REL: TWA 350 mg/m ³ C 1800 mg/m ³ [15-minute]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Clear to yellowish liquid with a pleasant, aromatic odor.			
MW: 87-114 (approx)	BP: 203-320°F	FRZ: ?	Sol: Insoluble
VP: 2-20 mmHg	IP: ?		Sp.Gr(60°F): 0.73-0.76
Fl.P: 20-55°F	UEL: 6.0%	LEL: 1.2%	
Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.			
Incompatibilities & Reactivities None reported [Note: VM&P Naphtha is a refined petroleum solvent predominantly C7-C11 which is typically 55% paraffins, 30% monocycloparaffins, 2% dicycloparaffins & 12% alkylbenzenes.]			
Measurement Methods NIOSH 1550; OSHA 48			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 3500 mg/m³ : (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator Up to 8750 mg/m³ : (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 17,500 mg/m³ : (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

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

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

Symptoms Irritation eyes, upper respiratory system; dermatitis; central nervous system depression; chemical pneumonitis (aspiration liquid)

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

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Warfarin			CAS 81-81-2
C ₁₉ H ₁₆ O ₄			RTECS GN4550000
Synonyms & Trade Names 3-(alpha-Acetonyl)-benzyl-4-hydroxycoumarin, 4-Hydroxy-3-(3-oxo-1-phenyl butyl)-2H-1-benzopyran-2-one, WARF			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³		
	OSHA PEL: TWA 0.1 mg/m ³		
IDLH 100 mg/m ³		Conversion	
Physical Description Colorless, odorless, crystalline powder. [rodenticide]			
MW: 308.3	BP: Decomposes	MLT: 322°F	Sol: 0.002%
VP(71°F): 0.09 mmHg	IP: ?		Sp.Gr: ?
Fl.P: ?	UEL: ?	LEL: ?	
Combustible Solid			
Incompatibilities & Reactivities Strong oxidizers			
Measurement Methods NIOSH 5002			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 0.5 mg/m³ : (APF = 5) Any dust and mist respirator Up to 1 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(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 a dust and mist filter			

Up to 5 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 100 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Hematuria (blood in the urine), back pain; hematoma arms, legs; epistaxis (nosebleed), bleeding lips, mucous membrane hemorrhage; abdominal pain, vomiting, fecal blood; petechial rash; abnormal hematologic indices

Target Organs Blood, cardiovascular system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Welding fumes		CAS	
		RTECS ZC2550000	
Synonyms & Trade Names Synonyms vary depending upon the specific component of the welding fumes.		DOT ID & Guide	
Exposure Limits	NIOSH REL: Ca See Appendix A		
	OSHA PEL†: none		
IDLH Ca [N.D.]		Conversion	
Physical Description Fumes generated by the process of joining or cutting pieces of metal by heat, pressure, or both.			
Properties vary depending upon the specific component of the welding fumes.			
Incompatibilities & Reactivities Varies			
Measurement Methods NIOSH 7300			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash 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 having a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus
Exposure Routes inhalation, skin and/or eye contact
Symptoms Symptoms vary depending upon the specific component of the welding fumes; metal fume fever: flu-like symptoms, dyspnea (breathing difficulty), cough, muscle pain, fever, chills; interstitial pneumonitis; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system, central nervous system
Cancer Site [lung cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Wood dust			CAS
			RTECS ZC9850000
Synonyms & Trade Names Hard wood dust, Soft wood dust, Western red cedar dust			DOT ID & Guide
Exposure Limits	NIOSH REL: Ca 1 mg/m ³ See Appendix A		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH Ca [N.D.]		Conversion	
Physical Description Dust from various types of wood.			
MW: varies	BP: NA	MLT: NA	Sol: ?
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: ?
Fl.P: NA	UEL: NA	LEL: NA	
Combustible Solid			
Incompatibilities & Reactivities None reported			
Measurement Methods NIOSH 0500			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air	
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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus			

Exposure Routes inhalation, skin and/or eye contact
Symptoms Irritation eyes; epistaxis (nosebleed); dermatitis; respiratory hypersensitivity; granulomatous pneumonitis; asthma, cough, wheezing, sinusitis; prolonged colds; [potential occupational carcinogen]
Target Organs Eyes, skin, respiratory system
Cancer Site [nasal cancer]
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

o-Xylene			CAS 95-47-6
C6H4(CH3)2			RTECS ZE2450000
Synonyms & Trade Names 1,2-Dimethylbenzene; ortho-Xylene; o-Xylol			DOT ID & Guide 1307 130
Exposure Limits	NIOSH REL: TWA 100 ppm (435 mg/m ³) ST 150 ppm (655 mg/m ³)		
	OSHA PEL†: TWA 100 ppm (435 mg/m ³)		
IDLH 900 ppm		Conversion 1 ppm = 4.34 mg/m ³	
Physical Description Colorless liquid with an aromatic odor.			
MW: 106.2	BP: 292°F	FRZ: -13°F	Sol: 0.02%
VP: 7 mmHg	IP: 8.56 eV		Sp.Gr: 0.88
Fl.P: 90°F	UEL: 6.7%	LEL: 0.9%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids			
Measurement Methods NIOSH 1501, 3800; OSHA 1002			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
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
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
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

m-Xylene			CAS 108-38-3
C6H4(CH3)2			RTECS ZE2275000
Synonyms & Trade Names 1,3-Dimethylbenzene; meta-Xylene; m-Xylol			DOT ID & Guide 1307 130
Exposure Limits	NIOSH REL: TWA 100 ppm (435 mg/m³) ST 150 ppm (655 mg/m³)		
	OSHA PEL†: TWA 100 ppm (435 mg/m³)		
IDLH 900 ppm		Conversion 1 ppm = 4.34 mg/m³	
Physical Description Colorless liquid with an aromatic odor.			
MW: 106.2	BP: 282°F	FRZ: -54°F	Sol: Slight
VP: 9 mmHg	IP: 8.56 eV		Sp.Gr: 0.86
Fl.P: 82°F	UEL: 7.0%	LEL: 1.1%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids			
Measurement Methods NIOSH 1501, 3800; OSHA 1002			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
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
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
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

p-Xylene			CAS 106-42-3
C ₆ H ₄ (CH ₃) ₂			RTECS ZE2625000
Synonyms & Trade Names 1,4-Dimethylbenzene; para-Xylene; p-Xylol			DOT ID & Guide 1307 130
Exposure Limits	NIOSH REL: TWA 100 ppm (435 mg/m ³) ST 150 ppm (655 mg/m ³)		
	OSHA PEL†: TWA 100 ppm (435 mg/m ³)		
IDLH 900 ppm		Conversion 1 ppm = 4.41 mg/m ³	
Physical Description Colorless liquid with an aromatic odor. [Note: A solid below 56°F.]			
MW: 106.2	BP: 281°F	FRZ: 56°F	Sol: 0.02%
VP: 9 mmHg	IP: 8.44 eV		Sp.Gr: 0.86
Fl.P: 81°F	UEL: 7.0%	LEL: 1.1%	
Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.			
Incompatibilities & Reactivities Strong oxidizers, strong acids			
Measurement Methods NIOSH 1501, 3800; OSHA 1002			
Personal Protection & Sanitation Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet (flammable) Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
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
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
See also: INTRODUCTION

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

m-Xylene-alpha,alpha'-diamine			CAS 1477-55-0
C ₆ H ₄ (CH ₂ NH ₂) ₂			RTECS PF8970000
Synonyms & Trade Names 1,3-bis(Aminomethyl)benzene; 1,3-Benzenedimethanamine; MXDA; m-Phenylenebis(methylamine); m-Xylylenediamine			DOT ID & Guide
Exposure Limits	NIOSH REL: C 0.1 mg/m ³ [skin]		
	OSHA PEL†: none		
IDLH N.D.		Conversion	
Physical Description Colorless liquid.			
MW: 136.2	BP: 477°F	FRZ: 58°F	Sol: Miscible
VP(77°F): 0.03 mmHg	IP: ?		Sp.Gr: 1.032
Fl.P: 243°F	UEL: ?	LEL: ?	
Class IIIB Combustible Liquid: Fl.P. at or above 200°F.			
Incompatibilities & Reactivities None reported			
Measurement Methods OSHA 105			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Water flush immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms In animals: irritation eyes, skin; liver, kidney, lung damage			
Target Organs Eyes, skin, respiratory system, liver, kidneys			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)
[INDEX with CHEMICAL NAMES and SYNONYMS](#)
[INDEX with CHEMICAL NAMES](#)
[INDEX with CAS NUMBERS](#)
[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Xylidine			CAS 1300-73-8
(CH ₃) ₂ C ₆ H ₃ NH ₂			RTECS ZE8575000
Synonyms & Trade Names Aminodimethylbenzene, Aminoxylene, Dimethylaminobenzene, Dimethylaniline, Xylidine isomers (e.g., 2,4-Dimethylaniline) [Note: Dimethylaniline is also used as a synonym for N,N-Dimethylaniline.]			DOT ID & Guide 1711 153
Exposure Limits	NIOSH REL: TWA 2 ppm (10 mg/m ³) [skin]		
	OSHA PEL†: TWA 5 ppm (25 mg/m ³) [skin]		
IDLH 50 ppm		Conversion 1 ppm = 4.96 mg/m ³	
Physical Description Pale-yellow to brown liquid with a weak, aromatic, amine-like odor.			
MW: 121.2	BP: 415-439°F	FRZ: -33°F	Sol: Slight
VP: <1 mmHg	IP: 7.65 eV (2,4-) 7.30 eV (2,6-)		Sp.Gr: 0.98
Fl.P: 206°F (2,3-)	UEL: ?	LEL: 1.0% (o-isomer)	
Class IIIB Combustible Liquid (2,3-)			
Incompatibilities & Reactivities Strong oxidizers, hypochlorite salts			
Measurement Methods NIOSH 2002			
Personal Protection & Sanitation 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) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 20 ppm: (APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)/(APF = 10) Any supplied-air respirator Up to 50 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

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

Symptoms Anoxia, cyanosis, methemoglobinemia; lung, liver, kidney damage

Target Organs respiratory system, blood, liver, kidneys, cardiovascular system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Yttrium			CAS 7440-65-5
Y			RTECS ZG2980000
Synonyms & Trade Names Yttrium metal			DOT ID & Guide
Exposure Limits	NIOSH REL*: TWA 1 mg/m ³ [*Note: The REL also applies to other yttrium compounds (as Y).]		
	OSHA PEL*: TWA 1 mg/m ³ [*Note: The PEL also applies to other yttrium compounds (as Y).]		
IDLH 500 mg/m ³ (as Y)		Conversion	
Physical Description Dark-gray to black, odorless solid.			
MW: 88.9	BP: 5301°F	MLT: 2732°F	Sol: Soluble in hot H ₂ O
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 4.47
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form.			
Incompatibilities & Reactivities Oxidizers			
Measurement Methods NIOSH 7300; OSHA ID121			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 5 mg/m³ : (APF = 5) Any dust and mist respirator Up to 10 mg/m³ : (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 10) Any supplied-air respirator Up to 25 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter			

Up to 50 mg/m³: (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 500 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

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

Symptoms Irritation eyes; in animals: pulmonary irritation; eye injury; possible liver damage

Target Organs Eyes, respiratory system, liver

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Zinc chloride fume			CAS 7646-85-7
ZnCl ₂			RTECS ZH1400000
Synonyms & Trade Names Zinc dichloride fume			DOT ID & Guide 2331 154
Exposure Limits	NIOSH REL: TWA 1 mg/m ³ ST 2 mg/m ³		
	OSHA PEL†: TWA 1 mg/m ³		
IDLH 50 mg/m ³		Conversion	
Physical Description White particulate dispersed in air.			
MW: 136.3	BP: 1350°F	MLT: 554°F	Sol(70°F): 435%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr(77°F): 2.91
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Potassium			
Measurement Methods OSHA ID121			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 10 mg/m³ : (APF = 10) Any dust, mist, and fume respirator*/(APF = 10) Any supplied-air respirator* Up to 25 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode*/(APF = 25) Any powered, air-purifying respirator with a dust, mist, and fume filter* Up to 50 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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
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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Irritation eyes, skin, nose, throat; conjunctivitis; cough, copious sputum; dyspnea (breathing difficulty), chest pain, pulmonary edema, pneumonitis; pulmonary fibrosis, cor pulmonale; fever; cyanosis; tachypnea; skin burns

Target Organs Eyes, skin, respiratory system, cardiovascular system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Zinc oxide			CAS 1314-13-2
ZnO			RTECS ZH4810000
Synonyms & Trade Names Zinc peroxide			DOT ID & Guide 1516 143
Exposure Limits	NIOSH REL: Dust: TWA 5 mg/m ³ C 15 mg/m ³ Fume: TWA 5 mg/m ³ ST 10 mg/m ³		
	OSHA PEL†: TWA 5 mg/m ³ (fume) TWA 15 mg/m ³ (total dust) TWA 5 mg/m ³ (resp dust)		
IDLH 500 mg/m ³		Conversion	
Physical Description White, odorless solid.			
MW: 81.4	BP: ?	MLT: 3587°F	Sol(64°F): 0.0004%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 5.61
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities Chlorinated rubber (at 419°F), water [Note: Slowly decomposed by water.]			
Measurement Methods NIOSH 7502; OSHA ID121, ID143			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Breathing: Respiratory support	
Respirator Recommendations NIOSH/OSHA Up to 50 mg/m³ : (APF = 10) Any dust, mist, and fume respirator/(APF = 10) Any supplied-air respirator Up to 125 mg/m³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode/(APF = 25) Any powered, air-purifying respirator with a dust, mist, and fume filter Up to 250 mg/m³ : (APF = 50) Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter/(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 500 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 with a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation

Symptoms Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function

Target Organs respiratory system

See also: [INTRODUCTION](#)

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Zinc stearate			CAS 557-05-1
Zn(C ₁₈ H ₃₅ O ₂) ₂			RTECS ZH5200000
Synonyms & Trade Names Dibasic zinc stearate, Zinc salt of stearic acid, Zinc distearate			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
	OSHA PEL†: TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp)		
IDLH N.D.		Conversion	
Physical Description Soft, white powder with a slight, characteristic odor.			
MW: 632.4	BP: ?	MLT: 266°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 1.10
Fl.P(oc): 530°F	UEL: ?	LEL: ?	MEC: 20 g/m ³
Combustible Solid			
Incompatibilities & Reactivities Oxidizers, dilute acids [Note: Hydrophobic (i.e., repels water).]			
Measurement Methods NIOSH 0500, 0600			
Personal Protection & Sanitation Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Fresh air Swallow: Medical attention immediately	
Respirator Recommendations To be added later			
Exposure Routes inhalation, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, upper respiratory system; cough			
Target Organs Eyes, skin, respiratory system			
See also: INTRODUCTION			

NIOSH Pocket Guide to Chemical Hazards

- [INTRODUCTION](#)
- [INDEX with CHEMICAL NAMES and SYNONYMS](#)
- [INDEX with CHEMICAL NAMES](#)
- [INDEX with CAS NUMBERS](#)
- [APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

Zirconium compounds (as Zr)		CAS 7440-67-7 (Metal)	
Zr (Metal)		RTECS ZH7070000 (Metal)	
Synonyms & Trade Names Zirconium metal: Zirconium Synonyms of other zirconium compounds vary depending upon the specific compound.		DOT ID & Guide 1358 170 (powder, wet) 1932 135 (scrap) 2008 135 (powder, dry)	
Exposure Limits	NIOSH REL*: TWA 5 mg/m ³ ST 10 mg/m ³ [*Note: The REL applies to all zirconium compounds (as Zr) except Zirconium tetrachloride.]		
	OSHA PEL†: TWA 5 mg/m ³		
IDLH 50 mg/m ³ (as Zr)		Conversion	
Physical Description Metal: Soft, malleable, ductile, solid or gray to gold, amorphous powder.			
MW: 91.2	BP: 6471°F	MLT: 3375°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 6.51 (Metal)
Fl.P: NA	UEL: NA	LEL: NA	
Metal: Combustible, but solid form is difficult to ignite; however, powder form may ignite SPONTANEOUSLY and can continue burning under water.			
Incompatibilities & Reactivities Potassium nitrate, oxidizers [Note: Fine powder may be stored completely immersed in water.]			
Measurement Methods NIOSH 7300; OSHA ID121			
Personal Protection & Sanitation Recommendations regarding personal protective clothing vary depending upon the specific compound. Recommendations regarding eye protection vary depending upon the specific compound. Recommendations regarding washing the skin vary depending upon the specific compound. Recommendations regarding the removal of personal protective clothing that becomes wet or contaminated vary depending upon the specific compound. Recommendations regarding the daily changing of		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	

personal protective clothing vary depending upon the specific compound.
Recommendations regarding the need for eyewash or quick drench facilities vary depending upon the specific compound.

Respirator Recommendations NIOSH/OSHA

Up to 25 mg/m³: (APF = 5) Any dust and mist respirator

Up to 50 mg/m³: (APF = 10) Any dust and mist respirator except single-use and quarter-mask respirators/(APF = 25) Any powered, air-purifying respirator with a dust and mist filter/(APF = 50) Any air-purifying, full-facepiece 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 a high-efficiency particulate filter/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin and/or eye contact

Symptoms Skin, lung granulomas; in animals: irritation skin, mucous membrane; X-ray evidence of retention in lungs

Target Organs Skin, respiratory system

See also: [INTRODUCTION](#)

[INTRODUCTION](#)

[INDEX with CHEMICAL NAMES and SYNONYMS](#)

[INDEX with CHEMICAL NAMES](#)

[INDEX with CAS NUMBERS](#)

[APPENDICES](#)

NIOSH Pocket Guide to Chemical Hazards

APPENDICES

APPENDIX A

NIOSH POTENTIAL OCCUPATIONAL CARCINOGENS

New Policy

For the past 20 plus years, NIOSH has subscribed to a carcinogen policy that was published in 1976 by Edward J. Fairchild, II, Associate Director for Cincinnati Operations, which called for "no detectable exposure levels for proven carcinogenic substances" (Annals of the New York Academy of Sciences, 271:200-207, 1976). This was in response to a generic OSHA rulemaking on carcinogens. Because of advances in science and in approaches to risk assessment and risk management, NIOSH has adopted a more inclusive policy. NIOSH recommended exposure limits (RELs) will be based on risk evaluations using human or animal health effects data, and on an assessment of what levels can be feasibly achieved by engineering controls and measured by analytical techniques. To the extent feasible, NIOSH will project not only a no-effect exposure, but also exposure levels at which there may be residual risks. This policy applies to all workplace hazards, including carcinogens, and is responsive to Section 20(a)(3) of the Occupational Safety and Health Act of 1970, which charges NIOSH to ". . . describe exposure levels that are safe for various periods of employment, including but not limited to the exposure levels at which no employee will suffer impaired health or functional capacities or diminished life expectancy as a result of his work experience."

The effect of this new policy will be the development, whenever possible, of quantitative RELs that are based on human and/or animal data, as well as on the consideration of technological feasibility for controlling workplace exposures to the REL. Under the old policy, RELs for most carcinogens were non-quantitative values labeled "lowest feasible concentration (LFC)." [Note: There are a few exceptions to LFC RELs for carcinogens (e.g., RELs for asbestos, formaldehyde, benzene, and ethylene oxide are quantitative values based primarily on analytical limits of detection or technological feasibility). Also, in 1989, NIOSH adopted several quantitative RELs for carcinogens from OSHA's permissible exposure limit (PEL) update.]

Under the new policy, NIOSH will also recommend the complete range of respirators (as determined by the NIOSH Respirator Decision Logic) for carcinogens with quantitative RELs. In this way, respirators will be consistently recommended regardless of whether a substance is a carcinogen or a non-carcinogen.

Old Policy

In the past, NIOSH identified numerous substances that should be treated as potential occupational carcinogens even though OSHA might not have identified them as such. In determining their carcinogenicity, NIOSH used the OSHA classification outlined in 29 CFR 1910.103, which states in part:

Potential occupational carcinogen means any substance, or combination or mixture of substances, which causes an increased incidence of benign and/or malignant neoplasms, or a substantial decrease in the latency period between exposure and onset of neoplasms in humans or in one or more experimental mammalian species as the result of any oral, respiratory or dermal exposure, or any other exposure which

results in the induction of tumors at a site other than the site of administration. This definition also includes any substance which is metabolized into one or more potential occupational carcinogens by mammals.

When thresholds for carcinogens that would protect 100% of the population had not been identified, NIOSH usually recommended that occupational exposures to carcinogens be limited to the lowest feasible concentration. To ensure maximum protection from carcinogens through the use of respiratory protection, NIOSH also recommended that only the most reliable and protective respirators be used. These respirators include (1) a self-contained breathing apparatus (SCBA) that has a full facepiece and is operated in a positive-pressure mode, or (2) a 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 SCBA operated in a pressure-demand or other positive-pressure mode.

Recommendations to be Revised

The RELs and respirator recommendations for carcinogens listed in this edition of the *Pocket Guide* still reflect the old policy. Changes in the RELs and respirator recommendations that reflect the new policy will be included in future editions.

[Return to Top of Page](#)

APPENDIX B THIRTEEN OSHA-REGULATED CARCINOGENS

Without establishing PELs, OSHA promulgated standards in 1974 to regulate the industrial use of 13 chemicals identified as potential occupational carcinogens.

- 2-acetylaminofluorene
- 4-aminodiphenyl
- benzidine
- bis-chloromethyl ether
- 3,3'-dichlorobenzidine
- 4-dimethylaminoazobenzene
- ethyleneimine
- methyl chloromethyl ether
- alpha-naphthylamine
- beta-naphthylamine
- 4-nitrobiphenyl
- N-nitrosodimethylamine
- beta-propiolactone

Exposures of workers to these 13 chemicals are to be controlled through the required use of engineering controls, work practices, and personal protective equipment, including respirators. See 29 CFR 1910.1003-1910.1016 for specific details of these requirements.

Respirator selections in the Pocket Guide are based on NIOSH policy, which considers the 13 chemicals to be potential occupational carcinogens.

[Return to Top of Page](#)

APPENDIX C SUPPLEMENTARY EXPOSURE LIMITS

Aldehydes (Low-Molecular-Weight)

Exposure to acetaldehyde has produced nasal tumors in rats and laryngeal tumors in hamsters, and exposure to malonaldehyde has produced thyroid gland and pancreatic islet cell tumors in rats. NIOSH therefore recommends that acetaldehyde and malonaldehyde be considered potential occupational carcinogens in conformance with the OSHA carcinogen policy.

Testing has not been completed to determine the carcinogenicity of acrolein, butyraldehyde (CAS#: 123-72-8), crotonaldehyde, glutaraldehyde, glyoxal (CAS#: 107-22-2), paraformaldehyde (CAS#: 30525-89-4), propionaldehyde (CAS#: 624-67-9), propionaldehyde (CAS#: 123-38-6), and n-valeraldehyde, nine related low-molecular-weight-aldehydes.

However, the limited studies to date indicate that these substances have chemical reactivity and mutagenicity similar to acetaldehyde and malonaldehyde. Therefore, NIOSH recommends that careful consideration should be given to reducing exposures to these nine related aldehydes.

Further information can be found in the "NIOSH Current Intelligence Bulletin 55: Carcinogenicity of Acetaldehyde and Malonaldehyde, and Mutagenicity of Related Low-Molecular-Weight Aldehydes" [DHHS (NIOSH) Publication No. 91-112.]

Asbestos

NIOSH considers asbestos to be a potential occupational carcinogen and recommends that exposures be reduced to the lowest feasible concentration. For asbestos fibers >5 micrometers in length, NIOSH recommends a REL of 100,000 fibers per cubic meter of air (100,000 fibers/m³), which is equal to 0.1 fiber per cubic centimeter of air (0.1 fiber/cm³), as determined by a 400-liter air sample collected over 100 minutes in accordance with NIOSH Analytical Method #7400. Airborne asbestos fibers are defined as those particles having (1) an aspect ratio of 3 to 1 or greater and (2) the mineralogic characteristics (that is, the crystal structure and elemental composition) of the asbestos minerals and their nonasbestiform analogs. The asbestos minerals are defined as chrysotile, crocidolite, amosite (cummingtonite-grunerite), anthophyllite, tremolite, and actinolite. In addition, airborne cleavage fragments from the nonasbestiform habits of the serpentine minerals antigorite and lizardite, and the amphibole minerals contained in the series cummingtonite-grunerite, tremolite-ferroactinolite, and glaucophane-riebeckite should also be counted as fibers provided they meet the criteria for a fiber when viewed microscopically.

As found in 29 CFR 1910.1001, the OSHA PEL for asbestos fibers (i.e., actinolite asbestos, amosite, anthophyllite asbestos, chrysotile, crocidolite, and tremolite asbestos) is an 8-hour TWA airborne concentration of 0.1 fiber (longer than 5 micrometers and having a length-to-diameter ratio of at least 3 to 1) per cubic centimeter of air (0.1 fiber/cm³), as determined by the membrane filter method at approximately 400X magnification with phase contrast illumination. No worker should be exposed in excess of 1 fiber/cm³ (excursion limit) as averaged over a sampling period of 30 minutes.

Benzidine-, o-Tolidine, and o-Dianisidine-based Dyes

In December 1980, OSHA and NIOSH jointly published the Health Hazard Alert: Benzidine-, o-Tolidine-, and o-Dianisidine-based Dyes.

In this Alert, OSHA and NIOSH concluded that benzidine and benzidine-based dyes were potential occupational carcinogens and recommended that worker exposure be reduced to the lowest feasible level.

OSHA and NIOSH further concluded that o-tolidine and o-dianisidine (and dyes based on them) may present a cancer risk to workers and should be handled with caution and exposure minimized.

Carbon Black

NIOSH considers "Carbon Black" to be the material consisting of more than 80% elemental carbon in the form of near-spherical colloidal particles and coalesced particle aggregates of colloidal size that is obtained by the partial

combustion or thermal decomposition of hydrocarbons.

The NIOSH REL (10-hour TWA) for carbon black is 3.5 mg/m³. Polycyclic aromatic hydrocarbons (PAHs), particulate polycyclic organic material (PPOM), and polynuclear aromatic hydrocarbons (PNAs) are terms frequently used to describe various petroleum-based substances that NIOSH considers to be potential occupational carcinogens.

Since some of these aromatic hydrocarbons may be formed during the manufacture of carbon black (and become adsorbed on the carbon black), the NIOSH REL (10-hour TWA) for carbon black in the presence of PAHs is also 0.1 mg PAHs/m³ (measured as the cyclohexane-extractable fraction).

The OSHA PEL (8-hour TWA) for carbon black is 3.5 mg/m³.

Chloroethanes

NIOSH considers ethylene dichloride; hexachloroethane; 1,1,2,2-tetrachloroethane; and 1,1,2-trichloroethane; to be potential occupational carcinogens.

Additionally, NIOSH recommends that the other five chloroethane compounds:

- 1,1-dichloroethane
- ethyl chloride
- methyl chloroform
- pentachloroethane
- 1,1,1,2-tetrachloroethane

be treated in the workplace with caution because of their structural similarity to the four chloroethanes shown to be carcinogenic in animals.

Chromic Acid and Chromates (as CrO₃), Chromium(II) and Chromium(III) Compounds (as Cr), and Chromium Metal (as Cr)

The NIOSH REL (10-hour TWA) is 0.001 mg Cr(VI)/m³ for all hexavalent chromium [Cr(VI)] compounds. NIOSH considers all Cr(VI) compounds (including chromic acid, tert-butyl chromate, zinc chromate, and chromyl chloride) to be potential occupational carcinogens.

The NIOSH REL (8-hour TWA) is 0.5 mg Cr/m³ for chromium metal and chromium(II) and chromium(III) compounds.

The OSHA PEL is 0.1 mg CrO₃/m³ (ceiling) for chromic acid and chromates (including tert-butyl chromate with a "skin" designation and zinc chromate); 0.5 mg Cr/m³ (8-hour TWA) for chromium(II) and chromium(III) compounds; and 1 mg Cr/m³ (8-hour TWA) for chromium metal and insoluble salts.

Coal Tar Pitch Volatiles

NIOSH considers coal tar products (i.e., coal tar, coal tar pitch, or creosote) to be potential occupational carcinogens; the NIOSH REL (10-hour TWA) for coal tar products is 0.1 mg/m³ (cyclohexane-extractable fraction).

The OSHA PEL (8-hour TWA) for coal tar pitch volatiles is 0.2 mg/m³ (benzene-soluble fraction). OSHA defines "coal tar pitch volatiles" in 29 CFR 1910.1002 as the fused polycyclic hydrocarbons that volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter and includes substances such as anthracene, benzo(a)pyrene (BaP), phenanthrene, acridine, chrysene, pyrene, etc.

Coke Oven Emissions

The production of coke by the carbonization of bituminous coal leads to the release of chemically-complex emissions from coke ovens that include both gases and particulate matter of varying chemical composition.

The emissions include coal tar pitch volatiles (e.g., particulate polycyclic organic matter [PPOM], polycyclic aromatic hydrocarbons [PAHs], and polynuclear aromatic hydrocarbons [PNAs]), aromatic compounds (e.g., benzene and beta-naphthylamine), trace metals (e.g., arsenic, beryllium, cadmium, chromium, lead, and nickel), and gases (e.g., nitric oxides and sulfur dioxide).

Cotton Dust (raw)

NIOSH recommends reducing exposures to cotton dust to the lowest feasible concentration to reduce the prevalence and severity of byssinosis; the REL is $<0.200 \text{ mg/m}^3$ (as lint-free cotton dust).

As found in OSHA Table Z-1 (29 CFR 1910.1000), the PEL for cotton dust (raw) is 1 mg/m^3 for the cotton waste processing operations of waste recycling (sorting, blending, cleaning, and willowing) and garnetting.

PELs for other sectors (as found in 29 CFR 1910.1043) are 0.200 mg/m^3 for yarn manufacturing and cotton washing operations, 0.500 mg/m^3 for textile mill waste house operations or for dust from "lower grade washed cotton" used during yarn manufacturing, and 0.750 mg/m^3 for textile slashing and weaving operations.

The OSHA standard in 29 CFR 1910.1043 does not apply to cotton harvesting, ginning, or the handling and processing of woven or knitted materials and washed cotton.

All PELs for cotton dust are mean concentrations of lint-free, respirable cotton dust collected by the vertical elutriator or an equivalent method and averaged over an 8-hour period.

Lead

NIOSH considers "Lead" to mean metallic lead, lead oxides, and lead salts (including organic salts such as lead soaps but excluding lead arsenate).

The NIOSH REL for lead (8-hour TWA) is 0.050 mg/m^3 ; air concentrations should be maintained so that worker blood lead remains less than $0.060 \text{ mg Pb/100 g}$ of whole blood.

OSHA considers "Lead" to mean metallic lead, all inorganic lead compounds (lead oxides and lead salts), and a class of organic compounds called soaps; all other lead compounds are excluded from this definition.

The OSHA PEL (8-hour TWA) is 0.050 mg/m^3 ; other OSHA requirements can be found in 29 CFR 1910.1025. The OSHA PEL (8-hour TWA) for lead in "non-ferrous foundries with less than 20 employees" is 0.075 mg/m^3 .

Mineral Dusts

These OSHA PELs for "mineral dusts" listed below are from Table Z-3 of 29 CFR 1910.1000.

The OSHA PEL (8-hour TWA) for crystalline silica (as respirable quartz) is either 250 mppcf divided by the value " $\% \text{SiO}_2 + 5$ " or 10 mg/m^3 divided by the value " $\% \text{SiO}_2 + 2$ ".

The OSHA PEL (8-hour TWA) for crystalline silica (as total quartz) is 30 mg/m^3 divided by the value " $\% \text{SiO}_2 + 2$ ".

The OSHA PELs (8-hour TWAs) for cristobalite and tridymite are the values calculated above using the count or mass formulae for quartz.

The OSHA PEL (8-hour TWA) for amorphous silica (including diatomaceous earth) is either 80 mg/m^3 divided by the value "%SiO₂", or 20 mppcf.

The OSHA PELs (8-hour TWAs) for mica, soapstone, and talc (not containing asbestos) are 20 mppcf.

The OSHA PEL (8-hour TWA) for Portland cement is 50 mppcf. The OSHA PEL (8-hour TWA) for graphite (natural) is 15 mppcf.

The OSHA PEL (8-hour TWA) for coal dust (as the respirable fraction) containing less than 5% SiO₂ is 2.4 mg/m^3 .

The OSHA PEL (8-hour TWA) for coal dust (as the respirable fraction) containing greater than 5% SiO₂ is 10 mg/m^3 divided by the value "%SiO₂ + 2".

NIAX® Catalyst ESN

In May 1978, OSHA and NIOSH jointly published the Current Intelligence Bulletin (CIB) 26: NIAX® Catalyst ESN.

In this CIB, OSHA and NIOSH recommended that occupational exposure to NIAX® Catalyst ESN, its components, dimethylaminopropionitrile and bis(2-(dimethylamino)ethyl)ether, as well as formulations containing either component, be minimized.

Exposures should be limited to as few workers as possible, while minimizing workplace exposure concentrations with effective work practices and engineering controls.

Exposed workers should be carefully monitored for potential disorders of the nervous and genitourinary system. Although substitution is a possible control measure, alternatives to NIAX® Catalyst ESN or its components should be carefully evaluated with regard to possible adverse health effects.

Trichloroethylene

NIOSH considers trichloroethylene (TCE) to be a potential occupational carcinogen and recommends a REL of 2 ppm (as a 60-minute ceiling) during the usage of TCE as an anesthetic agent and 25 ppm (as a 10-hour TWA) during all other exposures.

Tungsten Carbide (Cemented)

"Cemented tungsten carbide" or "hard metal" refers to a mixture of tungsten carbide, cobalt, and sometimes metal oxides or carbides and other metals (including nickel).

When the cobalt (Co) content exceeds 2%, its contribution to the potential hazard is judged to exceed that of tungsten carbide.

Therefore, the NIOSH REL (10-hour TWA) for cemented tungsten carbide containing >2% Co is 0.05 mg Co/m^3 ; the applicable OSHA PEL is 0.1 mg Co/m^3 (8-hour TWA). Nickel (Ni) may sometimes be used as a binder rather than cobalt.

NIOSH considers cemented tungsten carbide containing nickel to be a potential occupational carcinogen and recommends a REL of 0.015 mg Ni/m^3 (10-hour TWA).

The OSHA PEL for Insoluble Nickel (i.e., a 1 mg Ni/m^3 8-hour TWA) applies to mixtures of tungsten carbide and nickel.

[Return to Top of Page](#)

APPENDIX D

SUBSTANCES WITH NO ESTABLISHED RELs

After reviewing available published literature, NIOSH provided comments to OSHA on August 1, 1988, regarding the "Proposed Rule on Air Contaminants" (29 CFR 1910, Docket No. H-020).

In these comments, NIOSH questioned whether the PELs proposed (and listed below) for the following substances included in the Pocket Guide were adequate to protect workers from recognized health hazards:

- acetylene tetrabromide [TWA 1 ppm]
- chlorobenzene [TWA 75 ppm]
- coal dust (<5%SiO₂) [2 mg/m³ (as the respirable dust fraction)], coal dust (>= 5% SiO₂) [0.1 mg/m³ (as the respirable quartz fraction)]
- ethyl bromide [TWA 200 ppm; STEL 250 ppm]
- ethylene glycol [Ceiling 50 ppm]
- ethyl ether [TWA 400 ppm; STEL 500 ppm]
- fenthion [TWA 0.2 mg/m³ (skin)]
- furfural [TWA 2 ppm (skin)]
- 2-isopropoxyethanol [TWA 25 ppm]
- isopropyl acetate [TWA 250 ppm; STEL 310 ppm]
- isopropylamine [TWA 5 ppm; STEL 10 ppm]
- manganese tetroxide (as Mn) [TWA 1 mg/m³]
- molybdenum (soluble compounds as Mo) [TWA 5 mg/m³]
- nitromethane [TWA 100 ppm]
- m-toluidine [TWA 2 ppm (skin)]
- triethylamine [TWA 10 ppm; STEL 15 ppm]

At that time, NIOSH also conducted a limited evaluation of the literature and concluded that the documentation cited by OSHA was inadequate to support the proposed PEL (as an 8-hour TWA) of 10 mg/m³ for alpha-alumina, benomyl, emery, glycerine (mist), graphite (synthetic), magnesium oxide fume, molybdenum (insoluble compounds as Mo), particulates not otherwise regulated, picloram, and rouge.

[Return to Top of Page](#)

APPENDIX E

RESPIRATOR RECOMMENDATIONS FOR SELECTED CHEMICALS

Mercury compounds [except (organo) alkyls]

Mercury vapor:
NIOSH

- | | |
|--------------------------------|---|
| Up to 0.5 mg/m ³ : | (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/m ³ : | (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 [†] |
| Up to 2.5 | (APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing |

mg/m ³ :	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 [†] / (APF = 50) Any self-contained breathing apparatus that has a full facepiece/ (APF = 50) Any supplied-air respirator with a full facepiece
Up to 10 mg/m ³ :	(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 breathing apparatus operated in pressure-demand or other positive-pressure mode
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

[†] End of service life indicator (ESLI) required

Other non (organo) alkyl mercury compounds:
NIOSH/OSHA

Up to 1 mg/m ³ :	(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/m ³ :	(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 [†]
Up to 5 mg/m ³ :	(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 [†] / (APF = 50) Any self-contained breathing apparatus that has a full facepiece/ (APF = 50) Any supplied-air respirator with a full facepiece
Up to 10 mg/m ³ :	(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 breathing apparatus operated in pressure-demand or other positive-pressure mode
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

[†] End of service life indicator (ESLI) required

[Return to Top of Page](#)

APPENDIX F
MISCELLANEOUS NOTES

Benzene: The final OSHA Benzene standard in 1910.1028 applies to all occupational exposures to benzene except some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sales of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply (i.e., an 8-hour TWA of 10 ppm, an acceptable ceiling of 25 ppm, and 50 ppm for a maximum duration of 10 minutes as an acceptable maximum peak above the acceptable ceiling).

[Return to TOP of PAGE](#)

APPENDIX G
1989 AIR CONTAMINANTS UPDATE PROJECT:
EXPOSURE LIMITS NOT IN EFFECT

Acetaldehyde	TWA 100 ppm (180 mg/m ³) ST 150 ppm (270 mg/m ³)
Acetic anhydride	C 5 ppm (20 mg/m ³)
Acetone	TWA 750 ppm (1800 mg/m ³) ST 1000 ppm (2400 mg/m ³)
Acetonitrile	TWA 40 ppm (70 mg/m ³) ST 60 ppm (105 mg/m ³)
Acetylsalicylic acid	TWA 5 mg/m ³
Acrolein	TWA 0.1 ppm (0.25 mg/m ³) ST 0.3 ppm (0.8 mg/m ³)
Acrylamide	TWA 0.03 mg/m ³ [skin]
Acrylic acid	TWA 10 ppm (30 mg/m ³) [skin]
Allyl alcohol	TWA 2 ppm (5 mg/m ³) ST 4 ppm (10 mg/m ³) [skin]
Allyl chloride	TWA 1 ppm (3 mg/m ³) ST 2 ppm (6 mg/m ³)
Allyl glycidyl ether	TWA 5 ppm (22 mg/m ³) ST 10 ppm (44 mg/m ³)
Allyl propyl disulfide	TWA 2 ppm (12 mg/m ³) ST 3 ppm (18 mg/m ³)
alpha-Alumina	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Aluminum (pyro powders & welding fumes, as Al)	TWA 5 mg/m ³

Aluminum (soluble salts & alkyls, as Al)	TWA 2 mg/m ³
Amitrole	TWA 0.2 mg/m ³
Ammonia	ST 35 ppm (27 mg/m ³)
Ammonium chloride fume	TWA 10 mg/m ³ ST 20 mg/m ³
Ammonium sulfamate	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Aniline (and homologs)	TWA 2 ppm (8 mg/m ³) [skin]
Atrazine	TWA 5 mg/m ³
Barium sulfate	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Benomyl	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Benzenethiol	TWA 0.5 ppm (2 mg/m ³)
Bismuth telluride (doped with selenium sulfide, as Bi ₂ Te ₃)	TWA 5 mg/m ³
Borates, tetra, sodium salts (Anhydrous)	TWA 10 mg/m ³
Borates, tetra, sodium salts (Decahydrate)	TWA 10 mg/m ³
Borates, tetra, sodium salts (Pentahydrate)	TWA 10 mg/m ³
Boron oxide	TWA 10 mg/m ³
Boron tribromide	C 1 ppm (10 mg/m ³)
Bromacil	TWA 1 ppm (10 mg/m ³)
Bromine	TWA 0.1 ppm (0.7 mg/m ³) ST 0.3 ppm (2 mg/m ³)
Bromine pentafluoride	TWA 0.1 ppm (0.7 mg/m ³)
n-Butane	TWA 800 ppm (1900 mg/m ³)
2-Butanone	TWA 200 ppm (590 mg/m ³) ST 300 ppm (885 mg/m ³)
2-Butoxyethanol	TWA 25 ppm (120 mg/m ³) [skin]
n-Butyl acetate	TWA 150 ppm (710 mg/m ³) ST 200 ppm (950 mg/m ³)
Butyl acrylate	TWA 10 ppm (55 mg/m ³)
n-Butyl alcohol	C 50 ppm (150 mg/m ³) [skin]
sec-Butyl alcohol	TWA 100 ppm (305 mg/m ³)
tert-Butyl alcohol	TWA 100 ppm (300 mg/m ³) ST 150 ppm (450 mg/m ³)
n-Butyl glycidyl ether	TWA 25 ppm (135 mg/m ³)

n-Butyl lactate	TWA 5 ppm (25 mg/m ³)
n-Butyl mercaptan	TWA 0.5 ppm (1.5 mg/m ³)
o-sec-Butylphenol	TWA 5 ppm (30 mg/m ³) [skin]
p-tert-Butyltoluene	TWA 10 ppm (60 mg/m ³) ST 20 ppm (120 mg/m ³)
Calcium cyanamide	TWA 0.5 mg/m ³
Caprolactam	Dust: TWA 1 mg/m ³ ST 3 mg/m ³ Vapor: TWA 5 ppm (20 mg/m ³) ST 10 ppm (40 mg/m ³)
Captafol	TWA 0.1 mg/m ³
Captan	TWA 5 mg/m ³
Carbofuran	TWA 0.1 mg/m ³
Carbon dioxide	TWA 10,000 ppm (18,000 mg/m ³) ST 30,000 ppm (54,000 mg/m ³)
Carbon disulfide	TWA 4 ppm (12 mg/m ³) ST 12 ppm (36 mg/m ³) [skin]
Carbon monoxide	TWA 35 ppm (40 mg/m ³) C 200 ppm (229 mg/m ³)
Carbon tetrabromide	TWA 0.1 ppm (1.4 mg/m ³) ST 0.3 ppm (4 mg/m ³)
Carbon tetrachloride	TWA 2 ppm (12.6 mg/m ³)
Carbonyl fluoride	TWA 2 ppm (5 mg/m ³) ST 5 ppm (15 mg/m ³)
Catechol	TWA 5 ppm (20 mg/m ³) [skin]
Cesium hydroxide	TWA 2 mg/m ³
Chlorinated camphene	TWA 0.5 mg/m ³ ST 1 mg/m ³ [skin]
Chlorine	TWA 0.5 ppm (1.5 mg/m ³) ST 1 ppm (3 mg/m ³)
Chlorine dioxide	TWA 0.1 ppm (0.3 mg/m ³) ST 0.3 ppm (0.9 mg/m ³)
Chloroacetyl chloride	TWA 0.05 ppm (0.2 mg/m ³)
o-Chlorobenzylidene malononitrile	C 0.05 ppm (0.4 mg/m ³) [skin]
Chlorodifluoromethane	TWA 1000 ppm (3500 mg/m ³)

Chloroform	TWA 2 ppm (9.78 mg/m ³)
1-Chloro-1-nitropropane	TWA 2 ppm (10 mg/m ³)
Chloropentafluoroethane	TWA 1000 ppm (6320 mg/m ³)
beta-Chloroprene	TWA 10 ppm (35 mg/m ³) [skin]
o-Chlorostyrene	TWA 50 ppm (285 mg/m ³) ST 75 ppm (428 mg/m ³)
o-Chlorotoluene	TWA 50 ppm (250 mg/m ³)
Chlorpyrifos	TWA 0.2 mg/m ³ [skin]
Coal dust	TWA 2 mg/m ³ (<5% SiO ₂)(resp dust) TWA 0.1 mg/m ³ (>= 5% SiO ₂) (resp quartz)
Cobalt metal dust & fume, as Co)	TWA 0.05 mg/m ³
Cobalt carbonyl (as Co)	TWA 0.1 mg/m ³
Cobalt hydrocarbonyl (as Co)	TWA 0.1 mg/m ³
Crag® herbicide	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Crufomate	TWA 5 mg/m ³
Cyanamide	TWA 2 mg/m ³
Cyanogen	TWA 10 ppm (20 mg/m ³)
Cyanogen chloride	C 0.3 ppm (0.6 mg/m ³)
Cyclohexanol	TWA 50 ppm (200 mg/m ³) [skin]
Cyclohexanone	TWA 25 ppm (100 mg/m ³) [skin]
Cyclohexylamine	TWA 10 ppm (40 mg/m ³)
Cyclonite	TWA 1.5 mg/m ³ [skin]
Cyclopentane	TWA 600 ppm (1720 mg/m ³)
Cyhexatin	TWA 5 mg/m ³
Decaborane	TWA 0.3 mg/m ³ (0.05 ppm) ST 0.9 mg/m ³ (0.15 ppm) [skin]
Diazinon	TWA 0.1 mg/m ³ [skin]
2-N-Dibutylaminoethanol	TWA 2 ppm (14 mg/m ³)
Dibutyl phosphate	TWA 1 ppm (5 mg/m ³) ST 2 ppm (10 mg/m ³)
Dichloroacetylene	C 0.1 ppm (0.4 mg/m ³)
p-Dichlorobenzene	TWA 75 ppm (450 mg/m ³) ST 110 ppm (675 mg/m ³)
1,3-Dichloro-5,5-dimethylhydantoin	TWA 0.2 mg/m ³ ST 0.4 mg/m ³

Dichloroethyl ether	TWA 5 ppm (30 mg/m ³) ST 10 ppm (60 mg/m ³) [skin]
Dichloromonofluoromethane	TWA 10 ppm (40 mg/m ³)
1,1-Dichloro-1-nitroethane	TWA 2 ppm (10 mg/m ³)
1,3-Dichloropropene	TWA 1 ppm (5 mg/m ³) [skin]
2,2-Dichloropropionic acid	TWA 1 ppm (6 mg/m ³)
Dicrotophos	TWA 0.25 mg/m ³ [skin]
Dicyclopentadiene	TWA 5 ppm (30 mg/m ³)
Dicyclopentadienyl iron	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Diethanolamine	TWA 3 ppm (15 mg/m ³)
Diethylamine	TWA 10 ppm (30 mg/m ³) ST 25 ppm (75 mg/m ³)
Diethylenetriamine	TWA 1 ppm (4 mg/m ³)
Diethyl ketone	TWA 200 ppm (705 mg/m ³)
Diethyl phthalate	TWA 5 mg/m ³
Diglycidyl ether	TWA 0.1 ppm (0.5 mg/m ³)
Diisobutyl ketone	TWA 25 ppm (150 mg/m ³)
N,N-Dimethylaniline	TWA 5 ppm (25 mg/m ³) ST 10 ppm (50 mg/m ³) [skin]
Dimethyl-1,2-dibromo-2,2-dichlorethyl phosphate	TWA 3 mg/m ³ [skin]
Dimethyl sulfate	TWA 0.1 ppm (0.5 mg/m ³) [skin]
Dinitolmide	TWA 5 mg/m ³
Di-sec octyl phthalate	TWA 5 mg/m ³ ST 10 mg/m ³
Dioxane	TWA 25 ppm (90 mg/m ³) [skin]
Dioxathion	TWA 0.2 mg/m ³ [skin]
Diphenylamine	TWA 10 mg/m ³
Dipropylene glycol methyl ether	TWA 100 ppm (600 mg/m ³) ST 150 ppm (900 mg/m ³) [skin]
Dipropyl ketone	TWA 50 ppm (235 mg/m ³)
Diquat (Diquat dibromide)	TWA 0.5 mg/m ³
Disulfiram	TWA 2 mg/m ³
Disulfoton	TWA 0.1 mg/m ³ [skin]
2,6-Di-tert-butyl-p-cresol	TWA 10 mg/m ³
Diuron	TWA 10 mg/m ³

Divinyl benzene	TWA 10 ppm (50 mg/m ³)
Emery	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Endosulfan	TWA 0.1 mg/m ³ [skin]
Epichlorohydrin	TWA 2 ppm (8 mg/m ³) [skin]
Ethanolamine	TWA 3 ppm (8 mg/m ³) ST 6 ppm (15 mg/m ³)
Ethion	0.4 mg/m ³ [skin]
Ethyl acrylate	TWA 5 ppm (20 mg/m ³) ST 25 ppm (100 mg/m ³) [skin]
Ethyl benzene	TWA 100 ppm (435 mg/m ³) ST 125 ppm (545 mg/m ³)
Ethyl bromide	TWA 200 ppm (890 mg/m ³) ST 250 ppm (1110 mg/m ³)
Ethylene chlorohydrin	C 1 ppm (3 mg/m ³) [skin]
Ethylene dichloride	TWA 1 ppm (4 mg/m ³) ST 2 ppm (8 mg/m ³)
Ethylene glycol	C 50 ppm (125 mg/m ³)
Ethylene glycol dinitrate	ST 0.1 mg/m ³ [skin]
Ethyl ether	TWA 400 ppm (1200 mg/m ³) ST 500 ppm (1500 mg/m ³)
Ethylidene norbornene	C 5 ppm (25 mg/m ³)
Ethyl mercaptan	TWA 0.5 ppm (1 mg/m ³)
N-Ethylmorpholine	TWA 5 ppm (23 mg/m ³) [skin]
Ethyl silicate	TWA 10 ppm (85 mg/m ³)
Fenamiphos	TWA 0.1 mg/m ³ [skin]
Fensulfothion	TWA 0.1 mg/m ³
Fenthion	TWA 0.2 mg/m ³ [skin]
Ferbam	TWA 10 mg/m ³
Ferrovandium dust	TWA 1 mg/m ³ ST 3 mg/m ³
Fluorotrichloromethane	C 1000 ppm (5600 mg/m ³)
Fonofos	TWA 0.1 mg/m ³ [skin]
Formamide	TWA 20 ppm (30 mg/m ³) ST 30 ppm (45 mg/m ³)
Furfural	TWA 2 ppm (8 mg/m ³) [skin]
Furfuryl alcohol	3

	TWA 10 ppm (40 mg/m ³) ST 15 ppm (60 mg/m ³) [skin]
Gasoline	TWA 300 ppm (900 mg/m ³) ST 500 ppm (1500 mg/m ³)
Germanium tetrahydride	TWA 0.2 ppm (0.6 mg/m ³)
Glutaraldehyde	C 0.2 ppm (0.8 mg/m ³)
Glycerin (mist)	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Glycidol	TWA 25 ppm (75 mg/m ³)
Graphite (natural)	TWA 2.5 mg/m ³ (resp)
Graphite (synthetic)	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
n-Heptane	TWA 400 ppm (1600 mg/m ³) ST 500 ppm (2000 mg/m ³)
Hexachlorobutadiene	TWA 0.02 ppm (0.24 mg/m ³)
Hexachlorocyclopentadiene	TWA 0.01 ppm (0.1 mg/m ³)
Hexafluoroacetone	TWA 0.1 ppm (0.7 mg/m ³) [skin]
n-Hexane	TWA 50 ppm (180 mg/m ³)
Hexane isomers (except n-Hexane)	TWA 500 ppm (1800 mg/m ³) ST 1000 ppm (3600 mg/m ³)
2-Hexanone	TWA 5 ppm (20 mg/m ³)
Hexone	TWA 50 ppm (205 mg/m ³) ST 75 ppm (300 mg/m ³)
Hexylene glycol	C 25 ppm (125 mg/m ³)
Hydrazine	TWA 0.1 ppm (0.1 mg/m ³) [skin]
Hydrogenated terphenyls	TWA 0.5 ppm (5 mg/m ³)
Hydrogen bromide	C 3 ppm (10 mg/m ³)
Hydrogen cyanide	ST 4.7 ppm (5 mg/m ³) [skin]
Hydrogen fluoride (as F)	TWA 3 ppm ST 6 ppm
Hydrogen sulfide	TWA 10 ppm (14 mg/m ³) ST 15 ppm (21 mg/m ³)
2-Hydroxypropyl acrylate	TWA 0.5 ppm (3 mg/m ³) [skin]
Indene	TWA 10 ppm (45 mg/m ³)
Indium	TWA 0.1 mg/m ³
Iodoform	TWA 0.6 ppm (10 mg/m ³)
Iron pentacarbonyl (as Fe)	TWA 0.1 ppm (0.8 mg/m ³)

	ST 0.2 ppm (1.6 mg/m ³)
Iron salts (soluble, as Fe)	TWA 1 mg/m ³
Isoamyl alcohol (primary & secondary)	TWA 100 ppm (360 mg/m ³) ST 125 ppm (450 mg/m ³)
Isobutane	TWA 800 ppm (1900 mg/m ³)
Isobutyl alcohol	TWA 50 ppm (150 mg/m ³)
Isooctyl alcohol	TWA 50 ppm (270 mg/m ³) [skin]
Isophorone	TWA 4 ppm (23 mg/m ³)
Isophorone diisocyanate	TWA 0.005 ppm ST 0.02 ppm [skin]
2-Isopropoxyethanol	TWA 25 ppm (105 mg/m ³)
Isopropyl acetate	TWA 250 ppm (950 mg/m ³) ST 310 ppm (1185 mg/m ³)
Isopropyl alcohol	TWA 400 ppm (980 mg/m ³) ST 500 ppm (1225 mg/m ³)
Isopropylamine	TWA 5 ppm (12 mg/m ³) ST 10 ppm (24 mg/m ³)
N-Isopropylaniline	TWA 2 ppm (10 mg/m ³) [skin]
Isopropyl glycidyl ether	TWA 50 ppm (240 mg/m ³) ST 75 ppm (360 mg/m ³)
Kaolin	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Ketene	TWA 0.5 ppm (0.9 mg/m ³) ST 1.5 ppm (3 mg/m ³)
Magnesium oxide fume	TWA 10 mg/m ³
Malathion	TWA 10 mg/m ³ [skin]
Manganese compounds and fume (as Mn)	Compounds: C 5 mg/m ³ Fume: TWA 1 mg/m ³ ST 3 mg/m ³
Manganese cyclopentadienyl tricarbonyl (as Mn)	TWA 0.1 mg/m ³ [skin]
Manganese tetroxide (as Mn)	TWA 1 mg/m ³
Mercury compounds, as Hg [except(organo) alkyls]	
Hg Vapor	TWA 0.05 mg/m ³ [skin]
Non-alkyl compounds	C 0.1 mg/m ³ [skin]
Mercury (organo) alkyl compounds (as Hg)	TWA 0.01 mg/m ³

	ST 0.03 mg/m [skin]
Mesityl oxide	TWA 15 ppm (60 mg/m ³) ST 25 ppm (100 mg/m ³)
Methacrylic acid	TWA 20 ppm (70 mg/m ³) [skin]
Methomyl	TWA 2.5 mg/m ³
Methoxychlor	TWA 10 mg/m ³
4-Methoxyphenol	TWA 5 mg/m ³
Methyl acetate	TWA 200 ppm (610 mg/m ³) ST 250 ppm (760 mg/m ³)
Methyl acetylene-propadiene mixture	TWA 1000 ppm (1800 mg/m ³) ST 1250 ppm (2250 mg/m ³)
Methylacrylonitrile	TWA 1 ppm (3 mg/m ³) [skin]
Methyl alcohol	TWA 200 ppm (260 mg/m ³) ST 250 ppm (325 mg/m ³) [skin]
Methyl bromide	TWA 5 ppm (20 mg/m ³) [skin]
Methyl chloride	TWA 50 ppm (105 mg/m ³) ST 100 ppm (210 mg/m ³)
Methyl chloroform	TWA 350 ppm (1900 mg/m ³) ST 450 ppm (2450 mg/m ³)
Methyl-2-cyanoacrylate	TWA 2 ppm (8 mg/m ³) ST 4 ppm (16 mg/m ³)
Methylcyclohexane	TWA 400 ppm (1600 mg/m ³)
Methylcyclohexanol	TWA 50 ppm (235 mg/m ³)
o-Methylcyclohexanone	TWA 50 ppm (230 mg/m ³) ST 75 ppm (345 mg/m ³) [skin]
Methyl cyclopentadienyl manganese tricarbonyl (as Mn)	TWA 0.2 mg/m ³ [skin]
Methyl demeton	TWA 0.5 mg/m ³ [skin]
4,4'-Methylenebis(2-chloroaniline)	TWA 0.02 ppm (0.22 mg/m ³) [skin]
Methylene bis(4-cyclo-hexylisocyanate)	C 0.01 ppm (0.11 mg/m ³) [skin]
Methyl ethyl ketone peroxide	C 0.7 ppm (5 mg/m ³)
Methyl formate	TWA 100 ppm (250 mg/m ³) ST 150 ppm (375 mg/m ³)
Methyl iodide	TWA 2 ppm (10 mg/m ³) [skin]
Methyl isoamyl ketone	TWA 50 ppm (240 mg/m ³)
Methyl isobutyl carbinol	TWA 25 ppm (100 mg/m ³) ST 40 ppm (165 mg/m ³) [skin]
Methyl isopropyl ketone	TWA 200 ppm (705 mg/m ³)

Methyl mercaptan	TWA 0.5 ppm (1 mg/m ³)
Methyl parathion	TWA 0.2 mg/m ³ [skin]
Methyl silicate	TWA 1 ppm (6 mg/m ³)
alpha-Methyl styrene	TWA 50 ppm (240 mg/m ³) ST 100 ppm (485 mg/m ³)
Metribuzin	TWA 5 mg/m ³
Mica	TWA 3 mg/m ³ (resp)
Molybdenum (insoluble compounds, as Mo)	TWA 10 mg/m ³
Monocrotophos	TWA 0.25 mg/m ³
Monomethyl aniline	TWA 0.5 ppm (2 mg/m ³) [skin]
Morpholine	TWA 20 ppm (70 mg/m ³) ST 30 ppm (105 mg/m ³) [skin]
Naphthalene	TWA 10 ppm (50 mg/m ³) ST 15 ppm (75 mg/m ³)
Nickel metal & other compounds (as Ni)	
Metal & insoluble compounds	TWA 1 mg/m ³
Soluble compounds	TWA 0.1 mg/m ³
Nitric acid	TWA 2 ppm (5 mg/m ³) ST 4 ppm (10 mg/m ³)
p-Nitroaniline	TWA 3 mg/m ³ [skin]
Nitrogen dioxide	ST 1 ppm (1.8 mg/m ³)
Nitroglycerine	ST 0.1 mg/m ³) [skin]
2-Nitropropane	TWA 10 ppm (35 mg/m ³)
Nitrotoluene (o-, m-, p-isomers)	TWA 2 ppm (11 mg/m ³) [skin]
Nonane	TWA 200 ppm (1050 mg/m ³)
Octachloronaphthalene	TWA 0.1 mg/m ³ ST 0.3 mg/m ³ [skin]
Octane	TWA 300 ppm (1450 mg/m ³) ST 375 ppm (1800 mg/m ³)
Osmium tetroxide (as Os)	TWA 0.002 mg/m ³ (0.0002 ppm) ST 0.006 mg/m ³ (0.0006 ppm)
Oxalic acid	TWA 1 mg/m ³ ST 2 mg/m ³
Oxygen difluoride	C 0.05 ppm (0.1 mg/m ³)
Ozone	TWA 0.1 ppm (0.2 mg/m ³) ST 0.3 ppm (0.6 mg/m ³)
Paraffin wax fume	TWA 2 mg/m ³

Paraquat	TWA 0.1 mg/m ³ (resp) [skin]
Pentaborane	TWA 0.005 ppm (0.01 mg/m ³) ST 0.015 ppm (0.03 mg/m ³)
Pentaerythritol	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
n-Pentane	TWA 600 ppm (1800 mg/m ³) ST 750 ppm (2250 mg/m ³)
2-Pentanone	TWA 200 ppm (700 mg/m ³) ST 250 ppm (875 mg/m ³)
Perchloryl fluoride	TWA 3 ppm (14 mg/m ³) ST 6 ppm (28 mg/m ³)
Petroleum distillates (naphtha)	TWA 400 ppm (1600 mg/m ³)
Phenothiazine	TWA 5 mg/m ³ [skin]
Phenyl glycidyl ether	TWA 1 ppm (6 mg/m ³)
Phenylhydrazine	TWA 5 ppm (20 mg/m ³) ST 10 ppm (45 mg/m ³) [skin]
Phenylphosphine	C 0.05 ppm (0.25 mg/m ³)
Phorate	TWA 0.05 mg/m ³ ST 0.2 mg/m ³ [skin]
Phosdrin	TWA 0.01 ppm (0.1 mg/m ³) ST 0.03 ppm (0.3 mg/m ³) [skin]
Phosphine	TWA 0.3 ppm (0.4 mg/m ³) ST 1 ppm (1 mg/m ³)
Phosphoric acid	TWA 1 mg/m ³ ST 3 mg/m ³
Phosphorus oxychloride	TWA 0.1 ppm (0.6 mg/m ³)
Phosphorus pentasulfide	TWA 1 mg/m ³ ST 3 mg/m ³
Phosphorus trichloride	TWA 0.2 ppm (1.5 mg/m ³) ST 0.5 ppm (3 mg/m ³)
Phthalic anhydride	TWA 6 mg/m ³ (1 ppm)
m-Phthalodinitrile	TWA 5 mg/m ³
Picloram	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Piperazine dihydrochloride	TWA 5 mg/m ³
Platinum metal (as Pt)	TWA 1 mg/m ³
Portland cement	TWA 10 mg/m ³ (total)

	TWA 5 mg/m (resp)
Potassium hydroxide	TWA 2 mg/m ³
Propargyl alcohol	TWA 1 ppm (2 mg/m ³) [skin]
Propionic acid	TWA 10 ppm (30 mg/m ³)
Propoxur	TWA 0.5 mg/m ³
n-Propyl acetate	TWA 200 ppm (840 mg/m ³) ST 250 ppm (1050 mg/m ³)
n-Propyl alcohol	TWA 200 ppm (500 mg/m ³) ST 250 ppm (625 mg/m ³)
Propylene dichloride	TWA 75 ppm (350 mg/m ³) ST 110 ppm (510 mg/m ³)
Propylene glycol dinitrate	TWA 0.05 ppm (0.3 mg/m ³)
Propylene glycol monomethyl ether	TWA 100 ppm (360 mg/m ³) ST 150 ppm (540 mg/m ³)
Propylene oxide	TWA 20 ppm (50 mg/m ³)
n-Propyl nitrate	TWA 25 ppm (105 mg/m ³) ST 40 ppm (170 mg/m ³)
Resorcinol	TWA 10 ppm (45 mg/m ³) ST 20 ppm (90 mg/m ³)
Ronnel	TWA 10 mg/m ³
Rosin core solder, pyrolysis products (as formaldehyde)	TWA 0.1 mg/m ³
Rouge	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Silica, amorphous	TWA 6 mg/m ³ TWA 0.1 mg/m ³ (fused)
Silica, crystalline (as respirable dust)	TWA 0.05 mg/m ³ (cristobalite) TWA 0.05 mg/m ³ (tridymite) TWA 0.1 mg/m ³ (quartz) TWA 0.1 mg/m ³ (tripoli)
Silicon	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Silicon carbide	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Silicon tetrahydride	TWA 5 ppm (7 mg/m ³)
Soapstone	TWA 6 mg/m ³ (total) TWA 3 mg/m ³ (resp)
Sodium azide	C 0.1 ppm (as HN ₃) [skin] C 0.3 mg/m ³ (as NaN ₃) [skin]

Sodium bisulfite	TWA 5 mg/m ³
Sodium fluoroacetate	TWA 0.05 mg/m ³ ST 0.15 mg/m ³ [skin]
Sodium hydroxide	C 2 mg/m ³
Sodium metabisulfite	TWA 5 mg/m ³
Stoddard solvent	TWA 525 mg/m ³ (100 ppm)
Styrene	TWA 50 ppm (215 mg/m ³) ST 100 ppm (425 mg/m ³)
Subtilisins	ST 0.00006 mg/m ³ [60-minute]
Sulfur dioxide	TWA 2 ppm (5 mg/m ³) ST 5 ppm (13 mg/m ³)
Sulfur monochloride	C 1 ppm (6 mg/m ³)
Sulfur pentafluoride	C 0.01 ppm (0.1 mg/m ³)
Sulfur tetrafluoride	C 0.1 ppm (0.4 mg/m ³)
Sulfuryl fluoride	TWA 5 ppm (20 mg/m ³) ST 10 ppm (40 mg/m ³)
Sulprofos	TWA 1 mg/m ³
Talc	TWA 2 mg/m ³ (resp)
Temephos	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Terphenyl (o-, m-, p-isomers)	C 5 mg/m ³ (0.5 ppm)
1,1,2,2-Tetrachloroethane	TWA 1 ppm (7 mg/m ³) [skin]
Tetrachloroethylene	TWA 25 ppm (170 mg/m ³)
Tetrahydrofuran	TWA 200 ppm (590 mg/m ³) ST 250 ppm (735 mg/m ³)
Tetrasodium pyrophosphate	TWA 5 mg/m ³
4,4'-Thiobis(6-tert-butyl-m-cresol)	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Thioglycolic acid	TWA 1 ppm (4 mg/m ³) [skin]
Thionyl chloride	C 1 ppm (5 mg/m ³)
Tin (organic compounds, as Sn)	TWA 0.1 mg/m ³ [skin]
Tin(II) oxide (as Sn)	TWA 2 mg/m ³
Tin(IV) oxide (as Sn)	TWA 2 mg/m ³
Titanium dioxide	TWA 10 mg/m ³
Toluene	TWA 100 ppm (375 mg/m ³) ST 150 ppm (560 mg/m ³)

Toluene-2,4-diisocyanate	TWA 0.005 ppm (0.04 mg/m ³) ST 0.02 ppm (0.15 mg/m ³)
m-Toluidine	TWA 2 ppm (9 mg/m ³) [skin]
p-Toluidine	TWA 2 ppm (9 mg/m ³) [skin]
Tributyl phosphate	TWA 0.2 ppm (2.5 mg/m ³)
Trichloroacetic acid	TWA 1 ppm (7 mg/m ³)
1,2,4-Trichlorobenzene	C 5 ppm (40 mg/m ³)
Trichloroethylene	TWA 50 ppm (270 mg/m ³) ST 200 ppm (1080 mg/m ³)
1,2,3-Trichloropropane	TWA 10 ppm (60 mg/m ³)
1,1,2-Trichloro-1,2,2-trifluoroethane	TWA 1000 ppm (7600 mg/m ³) ST 1250 ppm (9500 mg/m ³)
Triethylamine	TWA 10 ppm (40 mg/m ³) ST 15 ppm (60 mg/m ³)
Trimellitic anhydride	TWA 0.005 ppm (0.04 mg/m ³)
Trimethylamine	TWA 10 ppm (24 mg/m ³) ST 15 ppm (36 mg/m ³)
1,2,3-Trimethylbenzene	TWA 25 ppm (125 mg/m ³)
1,2,4-Trimethylbenzene	TWA 25 ppm (125 mg/m ³)
1,3,5-Trimethylbenzene	TWA 25 ppm (125 mg/m ³)
Trimethyl phosphite	TWA 2 ppm (10 mg/m ³)
2,4,6-Trinitrotoluene	TWA 0.5 mg/m ³ [skin]
Triorthocresyl phosphate	TWA 0.1 mg/m ³ [skin]
Triphenylamine	TWA 5 mg/m ³
Tungsten (insoluble compounds, as W)	TWA 5 mg/m ³ ST 10 mg/m ³
Tungsten (soluble compounds, as W)	TWA 1 mg/m ³ ST 3 mg/m ³
Tungsten carbide (cemented)	TWA 5 mg/m ³ (as W) ST 10 mg/m ³ (as W) TWA 0.05 mg/m ³ (as Co) TWA 1 mg/m ³ (as Ni)
Uranium (insoluble compounds, as U)	TWA 0.2 mg/m ³ ST 0.6 mg/m ³
n-Valeraldehyde	TWA 50 ppm (175 mg/m ³)
Vanadium dust	TWA 0.05 mg V ₂ O ₅ /m ³ (resp)
Vanadium fume	C 0.05 mg V ₂ O ₅ /m ³

Vinyl acetate	TWA 10 ppm (30 mg/m ³) ST 20 ppm (60 mg/m ³)
Vinyl bromide	TWA 5 ppm (20 mg/m ³)
Vinyl cyclohexene dioxide	TWA 10 ppm (60 mg/m ³) [skin]
Vinylidene chloride	TWA 1 ppm (4 mg/m ³)
VM & P Naphtha	TWA 1350 mg/m ³ (300 ppm) ST 1800 mg/m ³ (400 ppm)
Welding fumes	TWA 5 mg/m ³
Wood dust (all wood dusts except Western red cedar)	TWA 5 mg/m ³ ST 10 mg/m ³
Wood dust (Western red cedar)	TWA 2.5 mg/m ³
Xylene (o-, m-, p-isomers)	TWA 100 ppm (435 mg/m ³) ST 150 ppm (655 mg/m ³)
m-Xylene alpha, alpha'-diamine	C 0.1 mg/m ³ [skin]
Xylidine	TWA 2 ppm (10 mg/m ³) [skin]
Zinc chloride fume	TWA 1 mg/m ³ ST 2 mg/m ³
Zinc oxide	TWA 5 mg/m ³ (fume) ST 10 mg/m ³ (fume) TWA 10 mg/m ³ (total dust) TWA 5 mg/m ³ (resp dust)
Zinc stearate	TWA 10 mg/m ³ (total) TWA 5 mg/m ³ (resp)
Zirconium compounds (as Zr)	TWA 5 mg/m ³ ST 10 mg/m ³

[Return to TOP of PAGE](#)