



Right to Know Hazardous Substance Fact Sheet

Common Name: **1,3-BUTADIENE**

Synonyms: Biethylene; Divinyl; Vinylethylene

Chemical Name: 1,3-Butadiene

Date: July 1998

Revision: July 2007

CAS Number: 106-99-0

RTK Substance Number: 0272

DOT Number: UN 1010

Description and Use

1,3-Butadiene is a colorless gas, or a liquid below 31°F (-1°C), with a gasoline-like odor. It is used in making a variety of synthetic rubber products such as tires, resins, plastics, and other chemicals.

▶ ODOR THRESHOLD = 1 to 1.6 ppm

▶ Odor thresholds vary greatly. Do not rely on odor alone to determine potentially hazardous exposures.

Reason for Citation

- ▶ **1,3-Butadiene** is on the Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, NFPA and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

▶ Immediately flush with large amounts of cool water for at least 15 minutes, occasionally lifting upper and lower lids. Remove contact lenses, if worn, while rinsing. Medical attention is necessary.

Skin Contact

▶ Immerse affected part in warm water. Seek medical attention.

Inhalation

- ▶ Remove the person from exposure.
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	-	2
FLAMMABILITY	-	4
REACTIVITY	-	2

CARCINOGEN
FLAMMABLE AND REACTIVE
POISONOUS GASES ARE PRODUCED IN FIRE
GAS/AIR MIXTURES ARE EXPLOSIVE
CYLINDERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **1,3-Butadiene** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
- ▶ **1,3-Butadiene** can affect you when inhaled.
- ▶ Contact with the liquid can irritate the skin and cause frostbite.
- ▶ Inhaling **1,3-Butadiene** can irritate the eyes, nose, mouth and throat.
- ▶ Exposure can cause headache, dizziness and passing out.
- ▶ **1,3-Butadiene** is FLAMMABLE and REACTIVE and a DANGEROUS FIRE and EXPLOSION HAZARD.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **1 ppm** averaged over an 8-hour workshift and **5 ppm**, not to be exceeded during any 15-minute work period.

NIOSH: Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.

ACGIH: The threshold limit value (TLV) is **2 ppm** averaged over an 8-hour workshift.

- ▶ **1,3-Butadiene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) requires private employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **1,3-Butadiene**:

- ▶ Contact with the liquid can irritate the skin and cause frostbite.
- ▶ Inhaling **1,3-Butadiene** can irritate the eyes, nose, mouth and throat causing coughing and wheezing.
- ▶ Exposure can cause headache, dizziness, lightheadedness and passing out. Higher levels can cause coma and death.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **1,3-Butadiene** and can last for months or years:

Cancer Hazard

- ▶ **1,3-Butadiene** is a PROBABLE CARCINOGEN in humans. There is some evidence that it causes lymph and blood cancer in humans and it has been shown to cause lymph, breast, uterine, lung, heart, and skin cancer in animals.
- ▶ Many scientists believe there is no safe level of exposure to a carcinogen.
- ▶ **1,3-Butadiene** causes MUTATIONS (genetic changes). Such chemicals may have a cancer risk.

Reproductive Hazard

- ▶ **1,3-Butadiene** may damage the male (testes) and female (ovaries) reproductive systems in animals.
- ▶ There is limited evidence that **1,3-Butadiene** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

Other Effects

- ▶ No other chronic (long-term) health effects are known at this time.

Medical

Medical Testing

There is no special test for this chemical. However, if illness occurs or overexposure is suspected, medical attention is recommended.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA **1,3-Butadiene** Standard (29 CFR 1910.1051) and the Compressed Gasses Standard (29 CFR 1910.101).
- ▶ Before entering a confined space where **1,3-Butadiene** is present, check to make sure sufficient *Oxygen* (19.5%) exists.
- ▶ Before entering a confined space where **1,3-Butadiene** may be present, check to make sure that an explosive concentration does not exist.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- ▶ Avoid skin contact with **1,3-Butadiene**. Wear personal protective equipment made from material which can not be permeated and/or degraded by this substance. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- ▶ Safety equipment manufacturers recommend *Butyl* or *Viton*® for gloves and DuPont *Tychem*® *CPF2*, *SL*, *CPF3*, *CPF4*, *TK*, and *Responder*®, and Kappler *Zytron*® 300 and 500 as protective materials for clothing.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- ▶ Wear non-vented, impact resistant goggles when working with fumes, gases, or vapors.
- ▶ If additional protection is needed for the entire face, use in combination with a face shield. Never use a face shield without another type of eye protection.
- ▶ Contact lenses should not be worn when working with this substance.

Respiratory Protection

Improper use of respirators is dangerous. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure less than or equal to **5 ppm**, use a NIOSH approved respirator with an organic vapor cartridge. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **1,3-Butadiene**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential exists for exposure greater than **50 ppm** and less than or equal to **1,000 ppm**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- ▶ Exposure to **2,000 ppm** is immediately dangerous to life and health. If the possibility of exposure above **2,000 ppm** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.
- ▶ Exposure to **1,3-Butadiene** is dangerous because it can replace *Oxygen* and lead to suffocation. Only NIOSH approved self-contained breathing apparatus with a full facepiece operated in the positive pressure mode should be used in *Oxygen* deficient environments.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ **1,3-Butadiene** is FLAMMABLE and REACTIVE.
- ▶ Stop flow of gas to extinguish flames.
- ▶ POISONOUS GASES ARE PRODUCED IN FIRE.
- ▶ CYLINDERS MAY EXPLODE IN FIRE.
- ▶ Use water spray to keep fire-exposed containers cool.
- ▶ Vapors may travel to a source of ignition and flash back.
- ▶ Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **1,3-Butadiene** is leaked, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Ventilate area of leak to disperse the gas.
- ▶ Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.
- ▶ Keep **1,3-Butadiene** out of a confined space, such as a sewer, because of the possibility of an explosion.
- ▶ It may be necessary to contain and dispose of **1,3-Butadiene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **1,3-Butadiene** you should be trained on its proper handling and storage.

- ▶ A regulated, marked area should be established where **1,3-Butadiene** is handled, used, or stored as required by the OSHA **1,3-Butadiene** Standard (29 CFR 1910.1051).
- ▶ **1,3-Butadiene** reacts with PHENOL; CROTONALDEHYDE; CHLORINE DIOXIDE; HALOGENS; OXYGEN; NITROGEN OXIDES; ALUMINUM TETRAHYDROBORATE; RUST; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).
- ▶ **1,3-Butadiene** forms shock-sensitive compounds with COPPER and COPPER ALLOYS.
- ▶ Store in tightly closed containers in a cool, well-ventilated area away from HEAT and SUNLIGHT. High heat can cause a violent chemical reaction that will rupture the container.
- ▶ **1,3-Butadiene** may form explosive *Peroxides* upon exposure to AIR. It should be stored with an inhibitor to prevent self-polymerization.
- ▶ Sources of ignition, such as smoking and open flames, are prohibited where **1,3-Butadiene** is used, handled, or stored.
- ▶ Metal containers involving the transfer of **1,3-Butadiene** should be grounded and bonded.
- ▶ Use only non-sparking tools and equipment, especially when opening and closing containers of **1,3-Butadiene**.

Occupational Health Services Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health
 Right to Know
 PO Box 368
 Trenton, NJ 08625-0368
 Phone: 609-984-2202
 Fax: 609-984-7407
 E-mail: rtk@doh.state.nj.us
 Web address: <http://www.nj.gov/health/eoh/rtkweb>

*The Right to Know Hazardous Substance Fact Sheets
 are not intended to be copied and sold
 for commercial purposes.*

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or **Lower Explosive Limit** is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Chemical Name: **1,3-BUTADIENE**

Synonyms: Biethylene; Divinyl; Vinylethylene

CAS No: 106-99-0

Molecular Formula: CH₂CHCHCH₂

RTK Substance No: 0272

Description: Colorless gas, liquefied or compressed gas below 31°F (-1°C), with a gasoline-like odor.

DOT/NFPA DATA

Hazard Rating	Firefighting	Reactivity
2 - Health 4 - Fire 2 - Reactivity DOT ID #: UN 1010 ERG Guide #: 116 P Hazard Class: 2.1 (Flammable gas)	Stop flow of gas. Gas/Air mixtures are explosive. Cylinders may explode in fire. May autopolymerize. Vapors may travel to a source of ignition and flash back. Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.	1,3-Butadiene reacts with PHENOL; CROTONALDEHYDE; CHLORINE DIOXIDE; HALOGENS; OXYGEN; NITROGEN OXIDES; ALUMINUM TETRAHYDROBORATE; RUST; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC). 1,3-Butadiene forms shock-sensitive compounds with COPPER and COPPER ALLOYS.

SPILL/LEAKS

Isolation Distance:
 Small Spills: 30 meters (100 feet)
 Large Spills: 60 meters (200 feet)

 Move cylinder to a safe place and allow to vent unless flow of gas can be stopped.

PHYSICAL PROPERTIES

Odor Threshold: 1 to 1.6 ppm
Flash Point: -105°F (-76°C)
LEL: 2%
UEL: 11.5%
Vapor Density: 1.9 (air = 1)
Vapor Pressure: 1,824 mm Hg at 68°F (20°C)
Water Solubility: Insoluble
Boiling Point: 24°F (-4.4°C)
Ionization Potential: 9.07 eV

EXPOSURE LIMITS

OSHA: 1 ppm 8-hr TWA, 5 ppm STEL
NIOSH: Lowest feasible concentration
ACGIH: 2 ppm, 8-hr TWA
IDLH LEVEL: 2,000 ppm

PROTECTIVE EQUIPMENT

Gloves: Butyl, Viton®
Coverall: DuPont Tychem® CPF2, SL, CPF3, CPF4, TK, and Responder®, Kappler Zytron® 300 and 500

Boot: Butyl
Respirator: ≤ 5 ppm APR with Organic Vapor cartridge
 ≤ 50 ppm full facepiece APR with Organic Vapor cartridge
 ≤ 1000 ppm Supplied Air

HEALTH EFFECTS

Eyes: Irritation
Skin: Irritation, frostbite
Acute: Coughing, wheezing, headache, dizziness, and passing out
Chronic: Cancer (lymph and blood) in humans
 May damage the male and female reproductive systems in animals

FIRST AID AND DECONTAMINATION

Remove the person from exposure.
 Flush eyes with large amounts of water for at least 15 minutes.
 Remove contact lenses if worn.
 Immerse affected part in warm water.
 Transfer to a medical facility.