

MASS.
MA13.2:
R245/2
toluene



Commonwealth of Massachusetts

RECOMMENDED SAFE PRACTICES BULLETIN

TOLUENE

Synonyms: Methyl benzene, toluol,
phenyl methane, methacide
CAS Number: 108-88-3

Chemical Formula: C₇H₈
Date Completed: 1/89

HAZARD SUMMARY

- Toluene can affect you when inhaled, or by contact with the skin or eyes.
- Toluene can cause impaired coordination and confusion. At very high levels, it may even cause death.
- Long term exposure to toluene may damage the liver and kidneys. It may cause disturbances in thinking ability and emotions which may be irreversible.
- Skin contact with toluene can cause dermatitis (dryness and scaling).
- Toluene may harm the developing fetus if a pregnant woman is exposed.

GENERAL DESCRIPTION

Toluene is a colorless liquid with an aromatic odor. It is obtained mainly from petroleum, and is used as an industrial solvent and as a raw material for the manufacture of benzene, toluene diisocyanate, TNT, dyestuffs, and many other organic compounds.

HEALTH HAZARD INFORMATION

Exposure to toluene may occur by inhalation, ingestion, skin contact, and eye contact.

ACUTE (short-term) HEALTH EFFECTS

Inhalation: At low concentrations, toluene has been shown to cause irritation of the upper respiratory tract. At levels greater than 200 ppm toluene can cause symptoms of central nervous system

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depression, including headache, impaired coordination, confusion and nausea. Significantly higher levels of exposure may cause loss of consciousness and death.

Severe, life-threatening respiratory depression and metabolic abnormalities have occurred in individual "glue and toluene sniffers".

Skin Contact: Toluene may be absorbed through unbroken skin; however, this is not usually a significant route of exposure. Skin contact with toluene can result in dryness, scaling and redness.

Eye Contact: Toluene can cause eye irritation and tearing.

CHRONIC (long-term) HEALTH EFFECTS

Long-term exposure to toluene may cause liver and kidney damage. Toluene may also cause disturbances in memory, emotions, thinking ability and coordination. These changes may be irreversible.

Prolonged and repeated skin contact may result in dermatitis.

Cancer Hazard: Toluene is not known to cause cancer.

Reproductive Hazard: When given to pregnant rodents, toluene has caused damage to the fetus, including death. In some studies, toluene has caused mutations in cells. There are a few case reports of developmental problems in the children of women exposed to toluene during pregnancy. Organic solvents as a group have been associated with birth defects (e.g., of the nervous system) in children of mothers exposed during their pregnancies.

CONDITIONS THAT MAY BE AGGRAVATED BY EXPOSURE

Liver disease may be aggravated by exposure.

OCCUPATIONAL EXPOSURE LIMITS

Most OSHA exposure limits are based on recommendations made by the ACGIH. Other recommendations made by NIOSH may be more protective of human health. Many chemicals have not been studied for long-term effects. Because of individual susceptibility, a small percentage of workers exposed to this substance at or below any of the recommended limits may experience some ill effects.

OSHA: The permissible airborne exposure limit is 100 ppm, averaged over an 8-hour workshift. The short-term exposure limit, not to be exceeded in any 15-minute period, is 150 ppm.

ACGIH: The recommended airborne exposure limit is 100 ppm, averaged over an 8-hour workshift. The short-term exposure limit, not to be exceeded in any 15-minute period, is 150 ppm.

NIOSH: The recommended airborne exposure limit is 100 ppm, averaged over an 8-hour workshift. The short-term exposure limit, not to be exceeded in any 10-minute period, is 200 ppm.

MEDICAL MONITORING

Yearly medical evaluations, including physical examination, blood count, urinalysis and liver function tests, should be performed.

EMERGENCY INFORMATION

FIRST AID

Inhalation: Remove from exposure area to fresh air immediately. If breathing has stopped, perform artificial respiration. Keep person warm and at rest. Get medical attention immediately.

Ingestion: Extreme care must be used to prevent aspiration. Use gastric lavage with activated charcoal and a cuffed endotracheal tube within 15 minutes. In the absence of depression or convulsions or impaired gag reflex, ipecac emesis can be done. When vomiting begins, keep head below the hips to prevent aspiration. After vomiting stops, give 30-60 milliliters of fleet's phospho-soda diluted 1:4 in water. Maintain airway, blood pressure and respiration. Get medical attention. Treatment must be administered by qualified medical personnel.

Skin Contact: Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

Eye Contact: Wash eyes immediately with large amounts of water, occasionally lifting upper and lower lids, until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

FIRE AND EXPLOSION

NFPA Rating

Flammability: 3	Flash Point: 40°F (4°C)
Reactivity: 0	Extinguishing Media: Dry chemical, carbon dioxide, water spray, or foam
Health: 2	Flammable Limits: lower - 1.3%, upper - 7.1%

Respiratory Protection: Self-contained breathing apparatus with full facepiece, operated in pressure-demand or other positive-pressure mode. Supplied-air respirator with full facepiece, operated in 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.

Protective Equipment: Impervious clothing and gloves must be worn to prevent skin contact, and splash-proof safety goggles to prevent eye contact.

Special Precautions: Toxic oxides of carbon may be formed when toluene burns.

SPILL, LEAK, AND DISPOSAL PROCEDURES

Dig a holding area such as a lagoon or pit for containment, or dike the flow with soil, sandbags, or foamed material. Use cement powder, fly ash, or a gelling agent to absorb the liquid. For a spill on water, contain with oil-spill control booms, and apply detergents or alcohols to thicken the spilled material. Shut off all ignition sources. Keep unnecessary people away. Ventilate enclosed areas. Disposal must be done in accordance with the standards given in 40 CFR 262. The EPA hazardous waste number is U220.

EMERGENCY INFORMATION SOURCES

CHEMTREC: (800) 424-9300

Poison Information Center: (800) 682-9211; 232-2120 (Boston area only)

PROTECTIVE MEASURES

ENGINEERING CONTROLS

Engineering controls are almost always the best way to control employee exposure to hazardous chemicals. Engineering controls may include local exhaust ventilation, enclosure of the process, general dilution ventilation and others. However, for some jobs (such as outside work, confined space entry, non-routine maintenance, emergencies, and jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

RESPIRATORY PROTECTION

Only respirators that have been approved by NIOSH or MSHA for exposures to toluene should be used. Such equipment should only be used if the employer has a written program that takes into account air concentrations of the contaminant, and includes respirator fit testing, regular training, maintenance, inspection, cleaning, and evaluation. Improper use of respirators can be dangerous.

The following respiratory protection may be used:

- Up to 1000 ppm: Any chemical cartridge respirator with organic vapor cartridges.
Any supplied-air respirator.
Any powered air-purifying respirator with organic vapor cartridges.
Any self-contained breathing apparatus.
- Over 1000 ppm: Any supplied-air respirator operated in a continuous-flow mode.
Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.
Any air-purifying full-facepiece respirator with a chin-style or front- or back-mounted organic vapor canister.

For escape: Any appropriate escape-type self-contained breathing apparatus.

PROTECTIVE EQUIPMENT

Eye Protection: Splash-proof safety goggles must be worn.

Clothing: Appropriate impervious clothing (such as Viton or Fluorine/Chloroprene), including protective gloves, must be worn to prevent repeated or prolonged skin contact with toluene.

STORAGE AND REACTIVITY INFORMATION

REACTIVITY

Although toluene is stable at normal temperatures and pressures, it is flammable.

INCOMPATIBILITIES

Severe fire and explosion hazard in the presence of oxidizing agents, especially nitric acid; explosive reaction with acids, nitrogen tetroxide, bromine trifluoride, and nitromethane.

HAZARDOUS DECOMPOSITION PRODUCTS

Thermal decomposition of toluene may cause formation of toxic carbon monoxide gas.

STORAGE

Containers must be protected against physical damage, stored outside or in a detached enclosure designed for flammable liquids. No oxidizing materials should be present. Containers should meet NFPA guidelines 77-1983 for electrical grounding.

PHYSICAL AND CHEMICAL DATA

Boiling Point: 232°F (111°C)
Melting Point: -139°F (-95°C)
Vapor Pressure: 28 mmHg @ 25°C
Specific Gravity: 0.866

Molecular Weight: 92.13
Solubility in Water: 0.05%
Evaporation Rate (Butyl acetate=1): 2.24
Vapor Density: 3.2

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits for exposure to workplace chemicals.

Action level is the amount of a chemical in the air above which OSHA-specified medical and air monitoring must be done.

A carcinogen is a substance that causes cancer.

The C.A.S. number is assigned by the Chemical Abstracts Service to identify a specific chemical.

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

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of how much of a chemical is in the air.

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A mutagen is a substance that causes 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.

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

ppm means parts of a substance per million parts of air. It is a measure of how much gas or vapor is in the air.

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

The vapor pressure is a measure of how easily a liquid or a solid gives off vapors. A higher vapor pressure indicates a higher concentration of the substance in the air, and therefore increases the amount of it breathed in.

WHERE TO GO FOR ADDITIONAL INFORMATION

The following information is available from the Massachusetts Department of Labor and Industries.

RIGHT TO KNOW INFORMATION

The Right to Know Program can answer questions about particular chemicals, training, labeling, and other Right to Know matters. Violations of the Right to Know Law should be reported to the nearest office of the Department of Labor and Industries.

PUBLIC PRESENTATIONS

Presentations and educational programs on occupational health or the Right to Know Law can be given for labor unions, trade associations and other groups.

OCCUPATIONAL HEALTH AND SAFETY SERVICES

Upon receipt of a complaint, an inspection may be conducted at your workplace. An inspection may include a walk-through, air monitoring, and evaluation of existing conditions and controls. Complaints about workplace health and safety conditions may be reported to any office of the Department of Labor and Industries. Such complaints are maintained strictly confidential. In addition, employers may obtain free technical assistance in complying with OSHA standards and the Massachusetts Right to Know Law.

MEDICAL EVALUATION

The Division of Occupational Hygiene has the names of various occupational health services and occupational physicians who are board-certified. This information is available upon request.

MASSACHUSETTS DEPARTMENT OF LABOR AND INDUSTRIES

Division of Occupational Hygiene

West Newton (617) 969-7177

Division of Industrial Safety

Boston (617) 727-3460
Lawrence (617) 681-7798

New Bedford (617) 997-8263
Springfield (413) 734-1421

Worcester (617) 752-6504
Pittsfield (413) 445-4214