

Occupational Health Guideline for Dipropylene Glycol Methyl Ether

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: $\text{CH}_2\text{CH}(\text{OCH}_3)\text{CH}_2\text{OCH}_2\text{CH}(\text{OH})\text{CH}_3$
- Synonyms: Dipropylene glycol monomethyl ether; Dowanol 50B
- Appearance and odor: Colorless liquid with a weak odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for dipropylene glycol methyl ether is 100 parts of dipropylene glycol methyl ether per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 600 milligrams of dipropylene glycol methyl ether per cubic meter of air (mg/m^3).

HEALTH HAZARD INFORMATION

- **Routes of exposure**
Dipropylene glycol methyl ether can affect the body if it is inhaled, is swallowed, or comes in contact with the eyes or skin.
- **Effects of overexposure**
Overexposure to high airborne levels or liquid splashes of dipropylene glycol methyl ether may cause irritation of the eyes and nose. Swallowing, breathing, or absorbing this chemical through the skin may cause nausea and sleepiness.
- **Reporting signs and symptoms**
A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to dipropylene glycol methyl ether.

- **Recommended medical surveillance**

The following medical procedures should be made available to each employee who is exposed to dipropylene glycol methyl ether at potentially hazardous levels:

1. Initial Medical Screening: Employees should be screened for history of certain medical conditions (listed below) which might place the employee at increased risk from dipropylene glycol methyl ether exposure.

—Liver disease: Although dipropylene glycol methyl ether is not known as a liver toxin in humans, the importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.

—Kidney disease: Although dipropylene glycol methyl ether is not known as a kidney toxin in humans, the importance of this organ in the elimination of toxic substances justifies special consideration in those with impaired renal function.

—Chronic respiratory disease: In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of dipropylene glycol methyl ether might cause exacerbation of symptoms due to its irritant properties.

2. Periodic Medical Examination: Any employee developing the above-listed conditions should be referred for further medical examination.

- **Summary of toxicology**

Dipropylene glycol methyl ether is primarily a narcotic with mild irritating properties. Single 7-hour exposures of rats to 500-ppm vapor resulted in only mild narcosis with rapid recovery. Repeated daily inhalation exposures to four animal species at 300 to 400 ppm also produced mild narcosis but no other significant effects. These levels are disagreeable to humans, causing some eye and nasal irritation. High vapor concentrations or liquid splashes cause transient irritation of the eyes. There is no skin irritation from even prolonged or

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

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repeated contact. Chronic systemic effects have not been observed in humans.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 148
2. Boiling point (760 mm Hg): 190 C (374 F)
3. Specific gravity (water = 1): 0.95
4. Vapor density (air = 1 at boiling point of dipropylene glycol methyl ether): 5.11
5. Melting point: -83 C (-117 F)
6. Vapor pressure at 20 C (68 F): 0.3 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F):

Miscible in all proportions

8. Evaporation rate (butyl acetate = 1): 0.02

• Reactivity

1. Conditions contributing to instability: Heat
2. Incompatibilities: Contact with strong oxidizing agents may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving dipropylene glycol methyl ether.
4. Special precautions: Dipropylene glycol methyl ether will attack some forms of plastics, rubber, and coatings.

• Flammability

1. Flash point: 85 C (185 F) (closed cup)
2. Autoignition temperature: Data not available
3. Flammable limits in air, % by volume: Data not available
4. Extinguishant: Dry chemical, alcohol foam, carbon dioxide

• Warning properties

1. Odor Threshold: Browning states that dipropylene glycol monomethyl ether has "a mild ether odor in moderate concentrations but a strong objectionable odor at 1000 ppm."

2. Eye Irritation Level: Dipropylene glycol methyl ether vapor is not known to be an eye irritant, but, according to Patty, the undiluted liquid when placed in a rabbit's eye "on each of five consecutive days (causes) a mild transitory irritation of the conjunctival membranes."

3. Other Information: According to Browning, "high concentrations of the vapor cause marked irritation of the nasal mucuous membrane, which is difficult for humans to tolerate."

4. Evaluation of Warning Properties: Browning reports that nasal irritation is a warning property which "is a valuable protection against concentrations which might have toxic effects, and an inhalation hazard is not likely since, as Rowe remarks, 'levels that may be toxic on repeated exposure probably will not be tolerated voluntarily.'" The *Documentation of TLV's* notes that concentrations of 300 to 400 ppm "were very disagreeable to man; levels of 100 ppm, which might be voluntarily tolerated without complaints, were considered to be safe with respect to organic injury."

For the purposes of this guideline, dipropylene glycol methyl ether is treated as a material with good warning properties.

• General

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• Method

Sampling and analyses may be performed by collection of dipropylene glycol methyl ether vapors using an adsorption tube with subsequent desorption with carbon disulfide and gas chromatographic analysis. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure dipropylene glycol methyl ether may be used. An analytical method for dipropylene glycol methyl ether is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 2, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00260-6).

RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

• In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

• Clothing wet with liquid dipropylene glycol methyl ether should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of dipropylene glycol methyl ether from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the dipropylene glycol

methyl ether, the person performing the operation should be informed of dipropylene glycol methyl ether's hazardous properties.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to dipropylene glycol methyl ether may occur and control methods which may be effective in each case:

Operation	Controls
Use as a general solvent for oils and greases; use in application of coating materials	General dilution ventilation
Use as a coupling and dispersing agent in manufacture and application of printing pastes, dyes, and inks	General dilution ventilation
Use in manufacture of cosmetics	General dilution ventilation
Use in manufacture of latex paints, lacquers, and leather protective coatings	General dilution ventilation
Use as a slimicide in food packaging and adhesives in food industry	General dilution ventilation
Use as a heat-transfer agent in hydraulic brake fluid	General dilution ventilation
Use in glass cleaning, metal cleaning, and antifogging compositions	General dilution ventilation

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• Eye Exposure

If dipropylene glycol methyl ether gets into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with this chemical.

• Skin Exposure

If dipropylene glycol methyl ether saturates the clothing, promptly remove the clothing and wash or shower. Wash any dipropylene glycol methyl ether from the skin regularly. If irritation persists after washing, get

medical attention.

• Breathing

If a person breathes in large amounts of dipropylene glycol methyl ether, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• Swallowing

When dipropylene glycol methyl ether has been swallowed, get medical attention immediately. If medical attention is not immediately available, get the afflicted person to vomit by having him touch the back of his throat with his finger or by giving him syrup of ipecac as directed on the package. This non-prescription drug is available at most drug stores and drug counters and should be kept with emergency medical supplies in the workplace. Do not make an unconscious person vomit.

• Rescue

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL, LEAK, AND DISPOSAL PROCEDURES

• Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.

• If dipropylene glycol methyl ether is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of spill or leak.
3. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for evaporating vapors to completely clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Large quantities can be collected and atomized in a suitable combustion chamber or absorbed in vermiculite, dry sand, earth, or a similar material and disposed of in a sanitary landfill.

• Waste disposal methods:

Dipropylene glycol methyl ether may be disposed of:

1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a sanitary landfill.
2. By atomizing in a suitable combustion chamber.

• American Conference of Governmental Industrial Hygienists: "Dipropylene Glycol Methyl Ether," *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.

• Browning, E.: *Toxicity and Metabolism of Industrial Solvents*, Elsevier, New York, 1965.

• Dow Chemical Company: *Material Safety Data Sheet - Dipropylene Glycol Methyl Ether*.

- Patty, F. A. (ed.): *Toxicology*, Vol. II of *Industrial Hygiene and Toxicology* (2nd ed. rev.), Interscience, New York, 1963.
- Rowe, V. K., et al.: "Toxicology of Mono-, Di-, and Tri- Propylene Glycol Methyl Ethers," *A.M.A. Archives of Industrial Hygiene and Occupational Medicine*, 9:509-525, 1954.

RESPIRATORY PROTECTION FOR DIPROPYLENE GLYCOL METHYL ETHER

Condition	Minimum Respiratory Protection* Required Above 100 ppm
Vapor Concentration	
1000 ppm or less	<p>Any supplied-air respirator.</p> <p>Any self-contained breathing apparatus.</p>
5000 ppm or less	<p>A gas mask with a chin-style or a front- or back-mounted organic vapor canister.</p> <p>Any supplied-air respirator with a full facepiece, helmet, or hood.</p> <p>Any self-contained breathing apparatus with a full facepiece.</p>
Greater than 5000 ppm or entry and escape from unknown concentrations	<p>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</p> <p>A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.</p>
Fire Fighting	<p>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</p>
Escape	<p>Any gas mask providing protection against organic vapors and particulates.</p> <p>Any escape self-contained breathing apparatus.</p>

*Only NIOSH-approved or MSHA-approved equipment should be used.