

Occupational Health Guideline for Diisopropylamine

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: $(\text{CH}_3)_2\text{CH-NH-CH}(\text{CH}_3)_2$
- Synonyms: None
- Appearance and odor: Colorless liquid with an odor like ammonia.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for diisopropylamine is 5 parts of diisopropylamine per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 20 milligrams of diisopropylamine per cubic meter of air (mg/m^3).

HEALTH HAZARD INFORMATION

- Routes of exposure
Diisopropylamine can affect the body if it is inhaled, if it comes in contact with the eyes or skin, or if it is swallowed. It may be absorbed through the skin.
- Effects of overexposure
 1. *Short-term Exposure:* Diisopropylamine may cause headache, visual problems and nausea. It may also cause irritation of the respiratory tract.
 2. *Long-term Exposure:* None known.
 3. *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 diisopropylamine.

• Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to diisopropylamine 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 diisopropylamine exposure.

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

—Skin disease: Diisopropylamine is a primary skin irritant. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.

—Eye disease: Diisopropylamine is a severe eye irritant and may cause tissue damage. Those with pre-existing eye problems may be at increased risk from exposure.

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

• Summary of toxicology

Diisopropylamine vapor is a respiratory irritant and a severe eye irritant. Exposure of experimental animals to 260 to 2200 ppm for several hours resulted in fatalities at the higher concentrations as a result of severe pulmonary damage; exposure at these concentrations for several hours caused clouding of the cornea which was reversible. Workers exposed to concentrations between 25 and 50 ppm complained of nausea, headache, and disturbances in vision. Diisopropylamine has been reported to cause skin irritation in animals.

CHEMICAL AND PHYSICAL PROPERTIES

- Physical data
 1. Molecular weight: 101.2
 2. Boiling point (760 mm Hg): 84 C (183 F)
 3. Specific gravity (water = 1): 0.72

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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Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

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Occupational Safety and Health Administration

4. Vapor density (air = 1 at boiling point of diisopropylamine): 3.5

5. Melting point: -96 C (-141 F)

6. Vapor pressure at 20 C (68 F): 60 mm Hg

7. Solubility in water, g/100 g water at 20 C (68 F): Miscible in all proportions below 27 C (81 F). Above this temperature, the maximum solubility is 30%.

8. Evaporation rate (butyl acetate = 1): 5.8

• Reactivity

1. Conditions contributing to instability: Heat.

2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions. Contact with strong acids will cause spattering.

3. Hazardous decomposition products: Toxic gases and vapors (such as oxides of nitrogen and carbon monoxide) may be released in a fire involving diisopropylamine.

4. Special precautions: Liquid diisopropylamine will attack some forms of plastics, rubber, and coatings.

• Flammability

1. Flash point: -6.7 C (20 F) (closed cup)

2. Autoignition temperature: 316 C (600 F)

3. Flammable limits in air, % by volume: Lower: 0.8; Upper: 7.1

4. Extinguishant: Dry chemical, alcohol foam, carbon dioxide

• Warning properties

1. Odor Threshold: Diisopropylamine has an odor like ammonia, but no quantitative information is available concerning its odor threshold.

2. Eye Irritation Level: Grant reports that visual disturbances have been observed in men who have been exposed to concentrations of 25 to 50 ppm diisopropylamine. "Experimental exposures of rabbits, guinea pigs, rats, and cats have established that the vapor is injurious to the corneal epithelium." According to Grant, "this is presumably the cause of the visual disturbances observed in men." A several-hour exposure to concentrations of 260 to 2200 ppm has caused corneal injury to experimental animals.

3. Other Information: The *Documentation of TLVs* reports that Treon et al. observed irritation of the respiratory mucous membranes in animals exposed repeatedly to 260 ppm.

4. Evaluation of Warning Properties: Since there is no quantitative information relating warning properties to air concentrations of diisopropylamine, this substance is treated as a material with poor warning properties.

MONITORING AND MEASUREMENT PROCEDURES

• 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

An analytical method for diisopropylamine is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 4, 1978, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00317-3).

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

• Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with liquid diisopropylamine.

• Clothing wet with liquid diisopropylamine should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of diisopropylamine from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the diisopropylamine, the person performing the operation should be informed of diisopropylamine's hazardous properties.

• Any clothing which becomes wet with liquid diisopropylamine should be removed immediately and not reworn until the diisopropylamine is removed from the clothing.

• Employees should be provided with and required to use splash-proof safety goggles where there is any possibility of solutions containing 5 percent or more of diisopropylamine by weight contacting the eyes and where solutions containing less than 5 percent of diisopropylamine by weight may contact the eyes.

• Where there is any possibility that employees' eyes may be exposed to solutions containing 5 percent or more of diisopropylamine by weight, an eye-wash foun-

tain should be provided within the immediate work area for emergency use.

SANITATION

- Skin that becomes wet with liquid diisopropylamine should be promptly washed or showered to remove any diisopropylamine.

COMMON OPERATIONS AND CONTROLS

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

Operation	Controls
Use in synthesis of corrosion inhibitors in iron and steel	Process enclosure; general dilution ventilation; local exhaust ventilation; personal protective equipment
Use in synthesis of herbicides, delayed action vulcanization accelerator for sulfur-cured rubbers; as a catalyst for chemical synthesis of alkylene cyanohydrin	General dilution ventilation; local exhaust ventilation; personal protective equipment
Use as component in gels for cosmetic and medical applications as deodorants and aftershave solutions	General dilution ventilation; local exhaust ventilation; personal protective equipment

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 diisopropylamine gets into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

• Skin Exposure

If diisopropylamine gets on the skin, immediately wash the contaminated skin with water. If diisopropylamine soaks through the clothing, remove the clothing immediately and wash the skin with water. If irritation persists after washing, get medical attention.

• Breathing

If a person breathes in large amounts of diisopropylamine, 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 diisopropylamine has been swallowed and the person is conscious, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.

• 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 diisopropylamine 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 reclaimed or collected and atomized in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device. Diisopropylamine should not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion. Sewers designed to preclude the formation of explosive concentrations of diisopropylamine vapors are permitted.

- Waste disposal method:

Diisopropylamine may be disposed of by atomizing in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.

REFERENCES

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RESPIRATORY PROTECTION FOR DIISOPROPYLAMINE

Condition	Minimum Respiratory Protection* Required Above 5 ppm
Vapor Concentration	
250 ppm or less	Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
1000 ppm or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 1000 ppm or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. 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.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors. Any escape self-contained breathing apparatus.

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