

Occupational Health Guideline for Isopropylamine

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: $(\text{CH}_3)_2\text{CHNH}_2$
- Synonyms: Monoisopropylamine; 2-aminopropane
- Appearance and odor: Colorless liquid with a pungent, ammonia-like odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for isopropylamine is 5 parts of isopropylamine per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 12 milligrams of isopropylamine per cubic meter of air (mg/m^3).

HEALTH HAZARD INFORMATION

• Routes of exposure

Isopropylamine can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. It may enter the body through the skin.

• Effects of overexposure

1. Short-term Exposure: Isopropylamine vapor may cause irritation of the nose, throat, and lungs. Both isopropylamine liquid and vapor may cause irritation or burning of the eyes and skin. Permanent eye damage may occur if proper care is not given immediately. Breathing difficulties may occur either immediately or may be delayed.

2. Long-term Exposure: Repeated or prolonged exposure to isopropylamine causes an irritation of the skin.

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 isopropylamine.

• Recommended medical surveillance

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

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

—Eye disease: Isopropylamine is an eye irritant and has caused corneal edema in workers. Persons with pre-existing eye disorders may be more susceptible to the effects of this agent.

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

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

• Summary of toxicology

Isopropylamine vapor is a respiratory and eye irritant. Rats exposed to 8000 ppm for 4 hours died as a result of pulmonary edema. Human subjects experienced irritation of the nose and throat after brief exposures to 10 to 20 ppm. Workers complained of transient visual disturbances after exposure to the vapor for 8 hours, probably due to mild corneal edema that usually cleared within 3 or 4 hours. The liquid is capable of causing very severe eye burns, which may cause permanent visual impairment. Isopropylamine in both liquid and vapor forms is irritating to the skin and may cause skin burns; repeated lesser exposures may result in dermatitis.

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.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 59.1
2. Boiling point (760 mm Hg): 32.4 C (90 F)
3. Specific gravity (water = 1): 0.68
4. Vapor density (air = 1 at boiling point of isopropylamine): 2.03
5. Melting point: -95 C (-139 F)
6. Vapor pressure at 20 C (68 F): 478 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): Greater than 1

• Reactivity

1. Conditions contributing to instability: Heat
2. Incompatibilities: Contact of liquid isopropylamine with strong acids will cause explosive spattering. Contact with strong oxidizers may cause fires and explosions.

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

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

• Flammability

1. Flash point: -37 C (-35 F) (closed cup)
2. Autoignition temperature: 402 C (756 F)
3. Flammable limits in air, % by volume: Lower: 2.0; Upper: 10.4
4. Extinguishant: Alcohol foam, carbon dioxide, dry chemical

• Warning properties

1. Odor Threshold: Patty reports that at a concentration of 5 to 10 ppm, the ammoniacal odor is definite, and at 10 to 20 ppm, the odor is strong.

2. Eye Irritation Level: The MCA Chemical Safety Data Sheet notes that the vapors of isopropylamine are highly irritating to the eyes, but no quantitative information is available concerning the threshold of eye irritation.

3. Other Information: Patty reports that nose and throat irritation results from short exposures to 10 to 20 ppm isopropylamine. No eye irritation is cited.

4. Evaluation of Warning Properties: Since the odor of isopropylamine is definite at a concentration which is only twice the permissible exposure, and since nose and throat irritation occurs at a concentration which is only 2 to 4 times the permissible exposure, isopropylamine is treated as a material with good 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

Sampling and analyses may be performed by collection of isopropylamine in a bubbler containing sulfuric acid, followed by treatment with sodium hydroxide, and gas chromatographic analysis. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure isopropylamine may be used. An analytical method for isopropylamine is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 3, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00261-4).

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 skin contact with liquid isopropylamine, where skin contact may occur.

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

• Where exposure of an employee's body to liquid isopropylamine may occur, facilities for quick drench-

ing of the body should be provided within the immediate work area for emergency use.

- Any clothing which becomes wet with isopropylamine or non-impervious clothing which becomes contaminated with isopropylamine should be removed immediately and not reworn until the isopropylamine is removed from the clothing.
- Employees should be provided with and required to use splash-proof safety goggles where there is any possibility of liquid isopropylamine contacting the eyes.
- Where there is any possibility that employees' eyes may be exposed to liquid isopropylamine, an eye-wash fountain should be provided within the immediate work area for emergency use.

SANITATION

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

COMMON OPERATIONS AND CONTROLS

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

Operation	Controls
Use as an intermediate in synthesis of agricultural chemicals	General dilution ventilation; local exhaust ventilation; personal protective equipment
Use as a solubilizer for 2,4-D and 2,4,5-T herbicides in hard water	Local exhaust ventilation; personal protective equipment
Use as an intermediate in synthesis of insecticides and bactericides	General dilution ventilation; local exhaust ventilation; personal protective equipment
Use with surface-active sulfonate to form oil-soluble emulsifier and detergent for use in dry cleaning operations	General dilution ventilation; local exhaust ventilation; personal protective equipment
Use as an intermediate in synthesis of vulcanization accelerators for sulfur-cured rubbers	General dilution ventilation; local exhaust ventilation; personal protective equipment

Operation

Use in manufacture of ore flotation agents; use as a depilatory on skins and hides in leather manufacture; use in manufacture of emulsion-type floor polish

Use as a general solvent; use as a stabilizer against oxidation and polymerization

Use in manufacture of medicinals in purification of penicillin and streptomycin; use as an intermediate in synthesis of some dyes

Controls

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

• Breathing

If a person breathes in large amounts of isopropylamine, 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 isopropylamine has been swallowed, 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 isopropylamine 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 equipped with an appropriate effluent gas cleaning device. Isopropylamine should not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

- Waste disposal method:

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

REFERENCES

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- Grant, W. M.: *Toxicology of the Eye* (2nd ed.), C. C. Thomas, Springfield, Illinois, 1974.
- Manufacturing Chemists Association, Inc.: *Chemical Safety Data Sheet SD-72, Isopropylamine*, Washington, D.C., 1959.
- Patty, F. A. (ed.): *Toxicology*, Vol. II of *Industrial Hygiene and Toxicology* (2nd ed. rev.), Interscience, New York, 1963.
- Union Carbide Corporation, Industrial Medicine and Toxicology Department: *Toxicology Studies - Isopropylamine*, New York, 1971.

RESPIRATORY PROTECTION FOR ISOPROPYLAMINE

Condition	Minimum Respiratory Protection* Required Above 5 ppm
Vapor Concentration	
250 ppm or less	A chemical cartridge respirator with a full facepiece and a cartridge(s) providing protection against isopropylamine. A gas mask with a chin-style or a front- or back-mounted canister which provides protection against isopropylamine. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
4000 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 4000 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 isopropylamine. Any escape self-contained breathing apparatus.

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

