

# Occupational Health Guideline for 1-Chloro-1-Nitropropane

## 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:  $C_2H_5CHClNO_2$
- Synonyms: None
- Appearance and odor: Colorless liquid with an unpleasant odor that causes tears.

## PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for 1-chloro-1-nitropropane is 20 parts of 1-chloro-1-nitropropane per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 100 milligrams of 1-chloro-1-nitropropane per cubic meter of air ( $mg/m^3$ ). The American Conference of Governmental Industrial Hygienists has issued a Notice of Intended Changes of their recommended Threshold Limit Value for 1-chloro-1-nitropropane from 20 ppm to 2 ppm.

## HEALTH HAZARD INFORMATION

### • Routes of exposure

1-Chloro-1-nitropropane can affect the body if it is inhaled or if it comes in contact with the eyes. It can also affect the body if it is swallowed.

### • Effects of overexposure

Exposure of animals has produced severe irritation of the lungs with severe breathing difficulties which may be delayed in onset. Liver, heart, kidney, and blood vessel damage were also reported in animals. In addition, eye irritation has been reported in animals.

### • 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 1-chloro-1-nitropropane.

### • Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to 1-chloro-1-nitropropane 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 1-chloro-1-nitropropane exposure.

—Chronic respiratory disease: 1-Chloro-1-nitropropane causes respiratory irritation in animals. In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of 1-chloro-1-nitropropane might cause exacerbation of symptoms due to its irritant properties.

—Liver disease: 1-Chloro-1-nitropropane causes liver damage in animals. 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: 1-Chloro-1-nitropropane causes kidney damage in animals. The importance of this organ in the elimination of toxic substances justifies special consideration in those with impaired renal function.

—Cardiovascular disease: 1-Chloro-1-nitropropane causes heart damage in animals. In persons with impaired cardiovascular function, the inhalation of 1-chloro-1-nitropropane might cause exacerbation of pre-existing disorders.

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

### • Summary of toxicology

1-Chloro-1-nitropropane is a pulmonary irritant and causes liver, kidney, and heart damage in animals. Exposure of rabbits to concentrations near 2600 ppm for

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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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2 hours was fatal, but 2200 ppm for 1 hour was nonlethal; autopsy revealed pulmonary edema, cellular necrosis of the heart, liver, and kidneys, and cellular damage in the brain. At high concentrations there was lacrimation, nasal discharge, and pulmonary rales. No human experience has been reported.

## CHEMICAL AND PHYSICAL PROPERTIES

### • Physical data

1. Molecular weight: 123.5
2. Boiling point (760 mm Hg): 140 C (285 F)
3. Specific gravity (water = 1): 1.2
4. Vapor density (air = 1 at boiling point of 1-chloro-1-nitropropane): 4.3
5. Melting point: Data not available
6. Vapor pressure at 20 C (68 F): 5.8 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Less than 0.8
8. Evaporation rate (butyl acetate = 1): Data not available

### • Reactivity

1. Conditions contributing to instability: Overheating in closed containers may cause explosions.
2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.

3. Hazardous decomposition products: Toxic gases and vapors (such as oxides of nitrogen, hydrogen chloride, and carbon monoxide) may be released in a fire involving 1-chloro-1-nitropropane.

4. Special precautions: Liquid 1-chloro-1-nitropropane will attack some forms of plastics, rubber, and coatings.

### • Flammability

1. Flash point: 62 C (144 F) (closed cup)
2. Autoignition temperature: Data not available
3. Flammable limits in air, % by volume: Data not available
4. Extinguishant: Dry chemical, foam, carbon dioxide

### • Warning properties

1. Odor Threshold: No quantitative information is available concerning the odor threshold of this substance.

2. Eye Irritation Level: According to the *Handbook of Organic Industrial Solvents*, 1-chloro-1-nitropropane may irritate the eyes.

3. Evaluation of Warning Properties: Since the TLV has been recommended only to "minimize" irritation, for the purposes of this guideline, 1-chloro-1-nitropropane 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

An analytical method for 1-chloro-1-nitropropane is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 5, 1979, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00349-1).

## 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 1-chloro-1-nitropropane.

• Clothing wet with liquid 1-chloro-1-nitropropane should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of 1-chloro-1-nitropropane from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the 1-chloro-1-nitropropane, the person performing the operation should be informed of 1-chloro-1-nitropropane's hazardous properties.

• Non-impervious clothing which becomes wet with liquid 1-chloro-1-nitropropane should be removed promptly and not reworn until the 1-chloro-1-nitropropane is removed from the clothing.

• Employees should be provided with and required to use splash-proof safety goggles where liquid 1-chloro-1-nitropropane may contact the eyes.

## SANITATION

- Skin that becomes wet with liquid 1-chloro-1-nitropropane should be promptly washed or showered with soap or mild detergent and water to remove any 1-chloro-1-nitropropane.
- Eating and smoking should not be permitted in areas where 1-chloro-1-nitropropane is handled, processed, or stored.
- Employees who handle liquid 1-chloro-1-nitropropane should wash their hands thoroughly with soap or mild detergent and water before eating or smoking.

## COMMON OPERATIONS AND CONTROLS

The following partial list includes some common operations in which exposure to 1-chloro-1-nitropropane may occur and control methods which may be effective in each case:

Operation	Controls
Use as a solvent and anti-gelling agent for rubber cements	General dilution ventilation; process enclosure; 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 liquid 1-chloro-1-nitropropane 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 liquid 1-chloro-1-nitropropane gets on the skin, wash the contaminated skin using soap or mild detergent and water. If liquid 1-chloro-1-nitropropane soaks through the clothing, remove the clothing promptly and wash the skin using soap or mild detergent and water. If irritation persists after washing, get medical attention.

### • Breathing

If a person breathes in large amounts of 1-chloro-1-nitropropane, 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 liquid 1-chloro-1-nitropropane 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 1-chloro-1-nitropropane is spilled or leaked, the following steps should be taken:

1. Ventilate area of spill or leak.
2. 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.
3. Mix spill of up to one gallon with soda ash, spray with water, let stand in bucket with water for two hours, neutralize with dilute hydrochloric acid, flush to sewer, and wash area of spill with detergent and solution.

• Waste disposal methods:

1-Chloro-1-nitropropane may be disposed of:

1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a secured sanitary landfill.
2. By atomizing in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.
3. If quantities of up to one gallon, by the treatment described above.

## REFERENCES

- American Conference of Governmental Industrial Hygienists: "1-Chloro-1-Nitropropane," *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.
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## RESPIRATORY PROTECTION FOR 1-CHLORO-1-NITROPROPANE

Condition	Minimum Respiratory Protection* Required Above 20 ppm
Vapor Concentration  1000 ppm or less	<p>A chemical cartridge respirator with a full facepiece and an organic vapor cartridge(s).</p> <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>
2000 ppm or less	<p>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.</p>
Greater than 2000 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.</p> <p>Any escape self-contained breathing apparatus.</p>

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