

Occupational Health Guideline for Trichloronaphthalene

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: $C_{10}H_7Cl_3$
- Synonyms: Halowax; Seekay wax; nibren wax
- Appearance and odor: Colorless to pale yellow solid with an aromatic odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for trichloronaphthalene is 5 milligrams of trichloronaphthalene per cubic meter of air (mg/m^3) averaged over an eight-hour work shift.

HEALTH HAZARD INFORMATION

• Routes of exposure

Trichloronaphthalene 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

Exposure to trichloronaphthalene may cause an acne-like rash. It may also injure the liver, resulting in such effects as fatigue, dark urine, and yellow jaundice.

• 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 trichloronaphthalene.

• Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to trichloronaphthalene at potentially hazardous levels:

1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the liver and skin should be stressed.

—Liver function tests: Trichloronaphthalene may cause liver damage. A profile of liver function should be obtained by utilizing a medically acceptable array of biochemical tests.

2. *Periodic Medical Examination:* The aforementioned medical examinations should be repeated on an annual basis.

• Summary of toxicology

Trichloronaphthalene vapor and dust are toxic to the liver and the skin. Rats exposed to a mixture of tri- and tetrachloronaphthalene at $11 mg/m^3$, 16 hours daily for 2-½ months showed slightly swollen liver cells with granular cytoplasm. An industrial exposure to unknown concentrations caused a severe acne-form dermatitis (chloracne) in 50 workers (89% of the crew); initially there was pruritis, which progressed to an acute eczema and finally a subacute folliculitis of acne type affecting mainly the face, periorbital region, cheeks, and ears. Two workers experienced anorexia, nausea, and vertigo. No fatal cases of liver injury have been reported, but one instance of toxic hepatitis resulted from exposure to $3 mg/m^3$.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 231.4
2. Boiling point (760 mm Hg): 304– 354 C (580– 670 F)
3. Specific gravity (water = 1): 1.58
4. Vapor density (air = 1 at boiling point of trichloronaphthalene): 8.0
5. Melting point: 93 C (199 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble

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
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Occupational Safety and Health Administration

8. Evaporation rate (butyl acetate = 1): Much less than 1

• **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 hydrogen chloride, phosgene, and carbon monoxide) may be released in a fire involving trichloronaphthalene.

4. Special precautions: None known.

• **Flammability**

1. Flash point: 200 C (392 F) (open cup)

2. Autoignition temperature: None to boiling point

3. Flammable limits in air, % by volume: Data not available

4. Extinguishant: Foam, carbon dioxide, dry chemical

• **Warning properties**

Since there are no quantitative data relating warning properties to air concentrations of trichloronaphthalene, this substance is treated as a material with poor warning properties. The concentration of trichloronaphthalene in saturated air at 20 C could result in a significant exposure relative to the permissible exposure.

Even though the AIHA *Hygienic Guide* states that "eye injury has not proved to be troublesome with the chloronaphthalenes," trichloronaphthalene is treated as an eye irritant for the purposes of this guideline, as a Koppers Corporation *Material Safety Data Sheet* states that the vapors or dust may irritate the eyes.

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 trichloronaphthalene on a filter and in a bubbler containing iso-octane, followed by extraction with iso-octane, and gas chromatographic analysis. An analytical method for trichloronaphthalene 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

• 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 any possibility of skin contact with molten trichloronaphthalene.

• 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 solid trichloronaphthalene or liquids containing trichloronaphthalene.

• 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 trichloronaphthalene fumes from the heated material.

• Non-impervious clothing which becomes contaminated with molten trichloronaphthalene should be removed immediately and not reworn until the trichloronaphthalene is removed from the clothing.

• Non-impervious clothing which becomes contaminated with solid trichloronaphthalene or liquids containing trichloronaphthalene should be removed promptly and not reworn until the trichloronaphthalene is removed from the clothing.

• If employees' clothing may have become contaminated with solid trichloronaphthalene, employees should change into uncontaminated clothing before leaving the work premises.

• Clothing contaminated with trichloronaphthalene should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of trichloronaphthalene from the clothing. If the clothing is to be laundered or otherwise cleaned to

remove the trichloronaphthalene, the person performing the operation should be informed of trichloronaphthalene's hazardous properties.

- Employees should be provided with and required to use splash-proof safety goggles where there is any possibility of molten trichloronaphthalene contacting the eyes.
- Employees should be provided with and required to use dust- and splash-proof safety goggles where solid trichloronaphthalene or liquids containing trichloronaphthalene may contact the eyes.

SANITATION

- Workers subject to skin contact with trichloronaphthalene should wash with soap or mild detergent and water any areas of the body which may have contacted trichloronaphthalene at the end of each work day.
- Skin that becomes contaminated with trichloronaphthalene should be promptly washed or showered with soap or mild detergent and water to remove any trichloronaphthalene.
- Employees who handle trichloronaphthalene should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

COMMON OPERATIONS AND CONTROLS

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

Operation	Controls
Use as an insulating material in pouring, dipping, and covering of electrical equipment	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Liberation during use of electrical equipment	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use as an inert component for resins or polymers as a flame-resistant, water-proofing, and fungicidal/insecticidal agent in coatings for wood, textiles, and paper	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

Operation

Controls

Use in catalytic chlorination of naphthalene to produce tetrachloronaphthalene and trichloronaphthalene; as a filler to impart flame resistance and improve electrical resistance to polymers; manufacture of special lubricants

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

Use as an additive for cutting oil

Local exhaust ventilation; general dilution ventilation; personal protective equipment

Use as an additive to special lubricants in crankcase oil, lubricants for farm machinery, and as an extreme-pressure lubricant

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 solid trichloronaphthalene or liquids containing trichloronaphthalene get 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. If molten trichloronaphthalene gets into the eyes, immediately flush the eyes with large amounts of water to remove heat. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

• Skin Exposure

If solid trichloronaphthalene or liquids containing trichloronaphthalene get on the skin, promptly wash the contaminated skin using soap or mild detergent and water. If trichloronaphthalene 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. If molten trichloronaphthalene gets on the skin or non-impervious clothing, immediately flush the affected area with large amounts of water to remove heat. Get medical attention immediately.

• Breathing

If a person breathes in large amounts of trichloronaphthalene, 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 trichloronaphthalene 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 AND DISPOSAL PROCEDURES

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

• If trichloronaphthalene is spilled, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of spill.
3. For small quantities, sweep onto paper or other flammable material, place in an appropriate container and burn in a safe place (such as a fume hood.) Large quantities may be reclaimed; however, if this is not practical, dissolve in a flammable solvent (such as alcohol) and atomize in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.

• Waste disposal methods:

Trichloronaphthalene may be disposed of:

1. By making packages of trichloronaphthalene in paper or other flammable material and burning in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.
2. By dissolving in a flammable solvent (such as alcohol) and atomizing in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.

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RESPIRATORY PROTECTION FOR TRICHLORONAPHTHALENE

Condition	Minimum Respiratory Protection* Required Above 5 mg/m ³
Particulate Concentration	
50 mg/m ³ or less	Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
Greater than 50 mg/m ³ 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 and particulates. Any escape self-contained breathing apparatus.

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