

Occupational Health Guideline for Pentachloronaphthalene

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: $C_{10}H_2Cl_8$
- Synonyms: Halowax 1013
- Appearance and odor: Pale, yellow solid with an aromatic odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for pentachloronaphthalene is 0.5 milligram of pentachloronaphthalene per cubic meter of air (mg/m^3) averaged over an eight-hour work shift.

HEALTH HAZARD INFORMATION

• Routes of exposure

Pentachloronaphthalene can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. Every effort should be made to prevent skin, eye, oral, or inhalation contact with this material.

• Effects of overexposure

Overexposure to pentachloronaphthalene causes headache and dizziness. Prolonged overexposure to pentachloronaphthalene may cause an acne-like skin rash. It may also injure the liver, resulting in such effects as fatigue, dark urine, yellow jaundice, and possibly death.

• 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 pentachloronaphthalene.

• Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to pentachloronaphthalene 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 should be stressed. The skin should be examined for evidence of chronic disorders.

—Liver function tests: Pentachloronaphthalene may cause liver damage. A profile of liver function should be performed by using 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

Pentachloronaphthalene is a severe hepatic toxin, with marked effects upon the skin. While a solid at room temperature, the heated liquid produces a hazardous vapor. Rats exposed to the vapor of a mixture of hexa- and pentachloronaphthalene at average concentrations of $1.16 mg/m^3$ for 16 hours daily up to 4½ months showed definite liver injury, while $8.8 mg/m^3$ produced some mortality and severe liver injury. The most striking human response to prolonged skin contact with the solid, or to shorter term inhalation of hot vapors, is chloracne. This is an acne-form skin eruption characterized by papules, large comedones and pustules, chiefly affecting the face, neck, arms, and legs. Pruritic erythematous and vasculoerythematous reactions have also been reported. Skin lesions are often accompanied by symptoms of systemic effects, including headache, vertigo, and anorexia. Liver damage characterized by toxic jaundice, which may progress to fatal hepatic necrosis, results from the inhalation of higher concentrations of the hot fumes of the molten substance. Skin absorption

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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has been demonstrated in animals and is suspected in man.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 300.5
2. Boiling point (760 mm Hg): 327 to 371 C (620 to 700 F)
3. Specific gravity (water = 1): 1.67
4. Vapor density (air = 1 at boiling point of pentachloronaphthalene): 10.4
5. Melting point: 120 C (248 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

8. Evaporation rate (butyl acetate = 1): Not applicable

• 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 and toxic chloride fumes) may be released in a fire involving pentachloronaphthalene.

4. Special precautions: None

• Flammability

1. Not combustible

• Warning properties

1. Odor Threshold: No quantitative information is available.

2. Eye Irritation Level: The AIHA *Hygienic Guide* states that "eye injury has not proved to be troublesome with the chloronaphthalenes;" nonetheless, they specifically state that "if respirators are used, they should be of the full-facepiece type approved by the U. S. Bureau of Mines for disperoids or organic vapors."

3. Evaluation of Warning Properties: There are no quantitative data relating warning properties to air concentrations of pentachloronaphthalene; therefore, 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

Sampling and analyses may be performed by collection of pentachloronaphthalene with a filter and a bubbler containing iso-octane, followed by gas chromatographic analysis. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure pentachloronaphthalene may be used. An analytical method for pentachloronaphthalene 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 pentachloronaphthalene.

• 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 pentachloronaphthalene or liquids containing pentachloronaphthalene.

• 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 pentachloronaphthalene vapors from the heated material.

• If employees' clothing may have become contaminated with solid pentachloronaphthalene, employees

should change into uncontaminated clothing before leaving the work premises.

- Clothing contaminated with pentachloronaphthalene should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of pentachloronaphthalene from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the pentachloronaphthalene, the person performing the operation should be informed of pentachloronaphthalene's hazardous properties.
- Non-impervious clothing which becomes contaminated with molten pentachloronaphthalene should be removed immediately and not reworn until the pentachloronaphthalene is removed from the clothing.
- Non-impervious clothing which becomes contaminated with solid pentachloronaphthalene or liquids containing pentachloronaphthalene should be removed promptly and not reworn until the pentachloronaphthalene is removed from the clothing.
- Employees should be provided with and required to use splash-proof safety goggles where there is any possibility of molten pentachloronaphthalene contacting the eyes.
- Employees should be provided with and required to use splash-proof safety goggles where solid pentachloronaphthalene or liquids containing pentachloronaphthalene may contact the eyes.

SANITATION

- Workers subject to skin contact with pentachloronaphthalene should wash with soap or mild detergent and water any areas of the body which may have contacted pentachloronaphthalene at the end of each work day.
- Skin that becomes contaminated with pentachloronaphthalene should be promptly washed or showered with soap or mild detergent and water to remove any pentachloronaphthalene.
- Eating and smoking should not be permitted in areas where solid pentachloronaphthalene is handled, processed, or stored.
- Employees who handle solid pentachloronaphthalene or liquids containing pentachloronaphthalene 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 pentachloronaphthalene may occur and control methods which may be effective in each case:

Operation

Use during manufacture of electric equipment as an insulating material; pouring molten solvent or finely ground solid materials; dipping; peeling and covering insulated cable with fabric

Liberation from use of electrical equipment insulated with octachloronaphthalene/pentachloronaphthalene

Use as an inert compound of resins or polymers for coating or impregnating textiles, wood, and paper to impart flame resistance, water proofness, and fungicidal and insecticidal properties

Use as an additive for cutting oil in various operations performed on metals

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

Controls

Local exhaust ventilation; general dilution with intake and exhaust fans; personal protective equipment

Local exhaust ventilation; general dilution ventilation; personal protective equipment

Process enclosure; local exhaust ventilation; general dilution with intake and exhaust fans; personal protective equipment

Local exhaust ventilation; general dilution ventilation; personal protective equipment

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 pentachloronaphthalene or liquids containing pentachloronaphthalene get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation persists after washing, get medical attention. If molten pentachloronaphthalene 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 non-impervious clothing becomes contaminated with pentachloronaphthalene, remove and clean the clothing before wearing again. If non-impervious clothing becomes heavily contaminated, it should be destroyed. If solid pentachloronaphthalene or liquids containing

pentachloronaphthalene get on the skin, promptly wash the contaminated skin using soap or mild detergent and water. If irritation persists after washing, get medical attention. If molten pentachloronaphthalene 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 pentachloronaphthalene, 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 pentachloronaphthalene 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 pentachloronaphthalene is spilled, the following steps should be taken:

1. Ventilate area of spill.
2. Collect spilled material in the most convenient and safe manner for reclamation or for disposal in a secured sanitary landfill. Liquids containing pentachloronaphthalene should be absorbed in vermiculite, dry sand, earth, or a similar material.

- **Waste disposal method:**

Pentachloronaphthalene may be disposed of in a secured sanitary landfill.

REFERENCES

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RESPIRATORY PROTECTION FOR PENTACHLORONAPHTHALENE

Condition	Minimum Respiratory Protection* Required Above 0.5 mg/m ³
Particulate Concentration	
5 mg/m ³ or less	Any supplied-air respirator.** Any self-contained breathing apparatus.**
25 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.
500 mg/m ³ or less	A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
1000 mg/m ³ 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 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.

**If eye irritation occurs, full-facepiece respiratory protective equipment should be used.