

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND
SUPPORTING DOCUMENTATION FOR

*** HEXACHLORONAPHTHALENE ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

The basic text of this document contains the draft technical standard approved by the Joint Review Committee of the NIOSH/OSHA Standards Completion Program and the supporting documentation for the substance HEXACHLORONAPHTHALENE.

The SCP draft technical standards are recommendations to the Department of Labor for its consideration in rulemaking and have no legal status until final rules have been promulgated by that agency. This draft standard is provided for your information only.

The References and Sources, Respirator Table Documentation and Use/Exposure and Control Documentation are the working documents used by the various SCP working groups during the development of the draft technical standard and serve as the technical foundation for the standard. The classification for each substance and the regulatory statements were derived following a decision logic established for the various sections of the standard.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

(a) Definitions.

(1) "Permissible exposure" means inhalation of hexachloronaphthalene in concentrations not in excess of 0.2 milligrams per cubic meter (mg/cu.m.) averaged over an eight-hour work shift, as stated in 29 CFR 1910.93, Table G-1.

(2) "Action level" means one half of the permissible exposure for hexachloronaphthalene.

(b) Exposure determination and measurement.

(1) Each employer who has a place of employment in which hexachloronaphthalene is released into the workplace air shall determine if any employee may be exposed to airborne concentrations of hexachloronaphthalene at or above the action level. The determination shall be made each time there is a change in production, process, or control measures which could result in an increase in airborne concentrations of hexachloronaphthalene.

(2) A written record of the determination shall be made and shall contain at least the following information:

(i) Any information, observations, or calculations which may indicate employee exposure to hexachloronaphthalene;

(ii) Any measurements of hexachloronaphthalene taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to hexachloronaphthalene; and

(iv) Date of determination, work being performed at the time, location within work site, name, and social security number of each employee considered.

(3) If the employer determines that any employee may be exposed to hexachloronaphthalene at or above the action level, the exposure of the employee in each work operation who is believed to have the greatest exposure shall be measured. The exposure measurement shall be representative of the maximum eight-hour time weighted average exposure of the employee.

(4) If the exposure measurement taken pursuant to paragraph (b) (3) of this section reveals employee exposure to hexachloronaphthalene at or above the action level, the employer shall:

(i) Identify all employees who may be exposed at or above the action level; and

(ii) Measure the exposure of the employees so identified.

(5) If an employee exposure measurement reveals that an employee is exposed to hexachloronaphthalene at or above the action level, but not above the permissible exposure, the exposure of that employee shall be measured at least every two months.

(6) If an employee exposure measurement reveals that an employee is exposed to hexachloronaphthalene above the permissible exposure, the employer shall:

(i) Measure the exposure monthly of the employee so exposed; and

(ii) Institute control measures as required by paragraph (D) of this section; and

(iii) Individually notify, in writing, within five days, every employee who is found to be exposed to hexachloronaphthalene above the permissible exposure. The employee shall also be notified of the corrective action being taken to reduce the exposure to at or below the permissible exposure.

(7) If two consecutive employee exposure measurements taken at least one week apart reveal that the employee is exposed to hexachloronaphthalene

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

below the action level, the employer may terminate measurement for the employee.

(8) For purposes of this paragraph, employee exposure is that which would occur if the employee were not using a respirator.

(c) Methods of measurement.

(1) An employee's exposure shall be obtained by any combination of long term or short term samples which represents the employee's actual exposure averaged over an eight-hour work shift (See Appendix B (iv) of this section).

(2) The method of measurement shall have an accuracy, to a confidence level of 95%, of not less than that given in Table 1.

Table 1

Concentration	Required Accuracy
Above permissible exposure	$\pm 25\%$
At or below permissible exposure and above the action level	$\pm 35\%$
At or below the action level	$\pm 50\%$
(d) <u>Compliance.</u> (1) No employee shall be exposed to hexachloronaphthalene above the permissible exposure as defined in paragraph (a)(1) of this section. (2) Employee exposures to airborne concentrations of hexachloronaphthalene shall be controlled to at or below the permissible exposure by engineering and work practice controls: (i) Engineering and work practice controls shall be instituted to reduce exposures to at or below the permissible exposure, except to the extent that such controls are not technically feasible. (ii) Wherever engineering and work practice controls are not sufficient to reduce exposures to at or below the permissible exposure, they shall nonetheless be used to reduce exposure to the lowest level feasible and shall be supplemented by respirators in accordance with paragraph (d)(4) of this section. (3) Engineering controls: (i) When mechanical ventilation is used to control exposure, measurements which demonstrate system effectiveness, for example, air velocity, static pressure, or air volume, shall be made at least every three months. Measurements of system effectiveness shall also be made within five days of any change in production, process, or control which might result in an increase in airborne concentration of hexachloronaphthalene. (ii) In the design of open surface tank ventilation for the purposes of § 1910.94(d), operations involving hexachloronaphthalene shall be classified as B-1 at 279 degrees F. (4) Compliance with the permissible exposure shall not be achieved by the use of respirators except:	

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

- (i) During the time period necessary to install or implement engineering or work practice controls; or
 - (ii) In work situations in which engineering and work practice controls are technically not feasible; or
 - (iii) To supplement engineering and work practice controls when such controls fail to reduce airborne concentrations of hexachloronaphthalene to at or below the permissible exposure; or
 - (iv) For operations which require entry into tanks or closed vessels; or
 - (v) In emergencies.
- (5) Where respirators are needed and permitted under this paragraph to reduce employee exposure, the employer shall select and provide the appropriate respirator from Table 2 and shall ensure that the employee uses the respirator provided.

TABLE 2 RESPIRATORY PROTECTION FOR HEXACHLORONAPHTHALENE

CONDITION	PERMISSIBLE RESPIRATORY PROTECTION
Particulate or Vapor Concentration	
2 mg/M3 or less	Any supplied-air respirator with a full facepiece, helmet or hood. ----- Any self-contained breathing apparatus with a full facepiece. -----
Greater than 2 mg/M3 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 pesticides. ----- Any escape self-contained breathing apparatus. -----

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

(6) Respirators shall be approved by the Mining Enforcement and Safety Administration (formerly Bureau of Mines) or by the National Institute for Occupational Safety and Health under the provisions of 30 CFR Part 11.

(7) The employer shall institute a respiratory protection program in accordance with § 1910.134(b), (d), (e), and (f).

(e) Fire and safety. (1) The employer shall familiarize himself with the information contained in the Substance Technical Guidelines (Appendix B of this section) for hexachloronaphthalene.

(2) Hexachloronaphthalene shall be stored so as not to come in contact with strong oxidizers.

(f) Personal protective equipment. (1) Employers shall provide and ensure that employees use impervious clothing, gloves, face shields (eight-inch minimum) and other appropriate protective clothing necessary to prevent any possibility of skin contact with molten hexachloronaphthalene. Face shields shall comply with § 1910.133(a)(2), (a)(4), (a)(5), and (a)(6).

(2) Employers shall provide and ensure that employees use impervious clothing, gloves, face shields (eight-inch minimum) and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with solid hexachloronaphthalene or with liquids containing hexachloronaphthalene. Face shields shall comply with § 1910.133(a)(2), (a)(4), (a)(5), and (a)(6).

(3) Employers shall provide and ensure that employees use impervious clothing, gloves, and other appropriate protective clothing necessary to prevent skin contact to hexachloronaphthalene fumes from the heated material.

(4) Employers shall ensure that non-impervious clothing which becomes contaminated with molten hexachloronaphthalene be removed immediately and not reworn until the hexachloronaphthalene is removed from the clothing.

(5) Employers shall ensure that non-impervious clothing which becomes contaminated with solid hexachloronaphthalene or liquids containing hexachloronaphthalene be removed promptly and not reworn until the hexachloronaphthalene is removed from the clothing.

(6) Employers shall ensure that employees whose clothing may have become contaminated with solid hexachloronaphthalene change into uncontaminated clothing before leaving the work premises.

(7) Employers shall ensure that clothing contaminated with hexachloronaphthalene is placed in closed containers for storage until it can be discarded or until the employer provides for the removal of hexachloronaphthalene from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the hexachloronaphthalene, the employer shall inform the person performing the operation of the hazardous properties of hexachloronaphthalene.

(8) Employers shall provide and ensure that employees use splash-proof safety goggles (cup-cover type dust and splash safety goggles) which comply with § 1910.133(a)(2)-(a)(6) where there is any possibility of molten hexachloronaphthalene contacting the eyes.

(9) Employers shall provide and ensure that employees use safety goggles (cup-cover type dust and splash safety goggles) which comply with § 1910.133(a)(2)-(a)(6) where solid hexachloronaphthalene or liquids containing hexachloronaphthalene may contact

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

(g) Spills and disposal. In the event that hexachloronaphthalene is spilled, the employer shall immediately provide available ventilation and then clean up the spill.

(h) Sanitation. (1) Employers shall ensure that employees do not eat or smoke in areas where hexachloronaphthalene is handled, processed or stored.

(2) Employers shall ensure that all employees subject to skin contact with hexachloronaphthalene wash any areas of the body which may have contacted hexachloronaphthalene at the end of each work day.

(3) Employers shall ensure that employees whose skin becomes contaminated with solid hexachloronaphthalene or liquids containing hexachloronaphthalene promptly wash or shower using soap or mild detergent and water to remove any hexachloronaphthalene from the skin.

(4) Employers shall ensure that employees who handle hexachloronaphthalene wash their hands thoroughly with soap or mild detergent and water before eating, smoking or using toilet facilities.

(i) Training and information. (1) Each employer who has a workplace in which hexachloronaphthalene is present shall keep a copy of this regulation with Appendices A, B and C at the workplace. This material shall be made readily available to affected employees.

(2) Each employer who has employees exposed to hexachloronaphthalene above the action level or employees who may have skin or eye contact with solid or molten hexachloronaphthalene or with liquids containing hexachloronaphthalene, or employees who work where accidental release or spill of hexachloronaphthalene may occur, shall annually:

(i) Inform affected employees of the information contained in the Substance Safety Data Sheet for hexachloronaphthalene, (Appendix A of this section);

(ii) Advise affected employees as to the signs and symptoms of exposure to hexachloronaphthalene;

(iii) Instruct affected employees to advise the employer of the development of signs and symptoms of exposure to hexachloronaphthalene which are listed in Appendix A of this section;

(iv) Provide training to ensure that employees understand the precautions of safe use, emergency procedures, and the correct use of protective equipment relative to hexachloronaphthalene.

(j) Medical Surveillance. (1) The employer shall provide medical procedures as required by this paragraph. All medical procedures shall be performed by or under the supervision of a physician at no cost to the employee.

(2) The employer shall make available to each employee who is to be exposed to hexachloronaphthalene at or above the action level, without regard to the use of respirators, a medical examination which shall include as a minimum the following:

(i) A medical history and physical examination with emphasis on the liver and skin.

(ii) A profile of liver function.

(3) The employer shall obtain from the physician, as a record of the examination, the following information:

(i) A written opinion which conforms with paragraph (j)(7) of this section.

(ii) A record of the results of the liver function tests.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

(4) The employer shall make available to each employee, exposed to hexachloronaphthalene in excess of the action level at 12 months from the date of the employee's first exposure, and at every 12 months of exposure in excess of the action level thereafter, a medical examination which must include the following:

(i) A medical history and physical examination (see paragraph (j)(2)(i) of this section).

(ii) Tests of liver function (see paragraph (j)(2)(ii) of this section).

(5) The employer shall obtain from the physician, as a record of the periodic examination, the following information:

(i) A written opinion which conforms with paragraph (j)(7) of this section.

(ii) A record of the results of the liver function tests.

(6) The employer shall provide to the examining physician the following information:

(i) A copy of this regulation with its Appendices A, B, and C;

(ii) A description of the employee's duties as they relate to his exposure to hexachloronaphthalene;

(iii) A description of any personal protective equipment, including respirators, required to be used;

(iv) The results of any employee's exposure measurement, if available;

(v) The employee's anticipated exposure level; and

(vi) Upon request of the physician, information from previous medical examination of the employee.

(7)(i) The physician's written opinion shall be a signed statement by the examining physician specifically stating: (A) Whether the employee has any detected medical conditions which could be directly or indirectly aggravated by exposure to hexachloronaphthalene or which could significantly interfere with the ability of the employee to follow recommended or required procedures for protecting himself from unusual or emergency exposure.

(B) Any recommended limitations on the employee's exposure to hexachloronaphthalene.

(C) That the employee has been informed by the physician of any detected medical conditions which require further medical examination or treatment.

(ii) The written opinion shall not reveal medical information unrelated to exposure to hexachloronaphthalene.

(8) No employee shall be exposed to hexachloronaphthalene if such exposure could place the employee at increased risk of material impairment of his health. This determination may be based on the physician's written opinion.

(9) The employer shall provide emergency and follow-up medical examinations and treatment for any employee injured through exposure to hexachloronaphthalene.

(10) If the examining physician chooses to use alternative medical examinations to those specified in paragraphs (j)(2) and (4) of this section, the employer may accept such alternative medical surveillance examinations as meeting the requirements of this part provided that the employer:

(i) Obtains a statement from the examining physician setting forth the alternative medical examinations and the rationale for substitution and evidence that they will be equally effective.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

(ii) Informs each exposed employee of the fact that alternative medical examinations to those required in paragraphs (j)(2) or (4) of this section are to be made available.

(11) If an employee refuses any required medical examination, the employer shall inform the employee of the possible health consequences of such refusal and obtain a signed statement from the employee indicating that the employee understands the risks involved by refusing to be examined.

(12) No medical procedure which would be performed pursuant to this section need be performed if records of a previous such procedure performed within the past six months are acceptable to the examining physician.

(k) Recordkeeping. (1) Exposure determination.

(i) The employer shall keep an accurate record of all determinations required to be made pursuant to paragraph (b)(1) of this section.

(ii) The record shall include the written determination required in paragraph (b)(2) of this section.

(iii) This record shall be maintained until replaced by a more recent record.

(2) Exposure measurements. (i) The employer shall keep an accurate record of all measurements taken to determine employee exposure to hexachloronaphthalene.

(ii) This record shall include:

(A) The date of measurement;

(B) Operations involving exposure to hexachloronaphthalene which are being monitored;

(C) Sampling and analytical methods used and evidence of their accuracy, including the method, results and date of calibration of sampling equipment;

(D) Number, duration, and results of samples taken; and

(E) Name, social security number and exposure of the employee monitored.

(iii) This record shall be maintained until replaced by a more recent record but in no event for less than one year.

(3) Mechanical ventilation. (i) When mechanical ventilation is used as an engineering control, the employer shall maintain an accurate record of the measurements demonstrating the effectiveness of such ventilation required by paragraph (d)(3) of this section.

(ii) This record shall include:

(A) Date of measurement;

(B) Type of measurement taken;

(C) Result of measurement.

(iii) These records shall be maintained for at least one year.

(4) Employee training and information. (i) The employer shall keep an accurate record of all employee training and information required by paragraph (i) of this section.

(ii) This record shall include:

(A) Date of training;

(B) Name and social security number of employee trained;

(C) Content or scope of training provided.

(iii) This record shall be maintained until replaced by a more recent record.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

- (5) Medical surveillance. (i) The employer shall keep an accurate record of employee medical surveillance required by paragraph (j) of this section.
- (ii) This record shall include:
- (A) Results of tests required by paragraph (j)(2) and (j)(5) of this section;
- (B) Any employee medical complaints relative to exposure to hexachloronaphthalene;
- (C) A copy of information provided to the physician pursuant to paragraph (j)(6)(ii), (iii), (iv), (v), and (vi) of this section.
- (D) Physician's written opinion; and
- (E) A signed statement of any refusal to be examined.
- (iii) This record shall be maintained for the duration of the employment of the affected employee.
- (6) Access to records. (i) All records required to be maintained by this section shall be made available upon request to authorized representatives of the Assistant Secretary of Labor for Occupational Safety and Health and the Director of the National Institute for Occupational Safety and Health.
- (ii) Employee exposure determination and exposure measurement records required to be maintained by this section shall be made available to employees and former employees and their designated representatives.
- (iii) Employee medical records required to be maintained by this section shall be made available upon written request to a physician designated by the employee or former employee.
- (1) Employee observation of measurement. (1) The employer shall give affected employees or their representatives an opportunity to observe any measurement of employee exposure to hexachloronaphthalene which is conducted pursuant to this section.
- (2) When observation of measurement of employee exposure to hexachloronaphthalene requires entry into an area where the use of personal protective devices, including respirators, is required, the observer shall be provided with and required to use such equipment and comply with all other applicable safety procedures.
- (3) Without interfering with the measurement, observers shall be entitled to:
- (i) Receive an explanation of the measurement procedure.
- (ii) Visually observe all steps related to the measurement of the airborne concentration of hexachloronaphthalene that are being performed at the place of exposure; and
- (iii) Record the results obtained.

NOTE: The information contained in the following appendixes is advisory in nature and is not intended, by itself, to create any additional obligations not otherwise imposed or detract from any existing obligation.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

APPENDIX A

SUBSTANCE SAFETY DATA SHEET
FOR HEXACHLORONAPHTHALENE

I. SUBSTANCE IDENTIFICATION

- A. Substance: Hexachloronaphthalene
- B. Permissible Exposure: 0.2 milligrams of hexachloronaphthalene per cubic meter of air (mg/cu m) averaged over an eight-hour work shift.
- C. Appearance and Odor: Light yellow solid with an aromatic odor.

II. HEALTH HAZARD DATA

- A. Ways in Which the Chemical Affects Your Body:
Hexachloronaphthalene can affect your body if you inhale it or if it comes in contact with your eyes or skin or if you swallow it. Every effort should be made to prevent skin, eye, oral, or inhalation contact with this material.
- B. Effects of Overexposure:
 - 1. Overexposure: Overexposure to hexachloronaphthalene may cause an acne-like skin rash. It may also injure your liver resulting in such affects as fatigue, dark urine, yellow jaundice and possibly death.
 - 2. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms and suspect they are caused by exposure to hexachloronaphthalene.

III. EMERGENCY FIRST AID PROCEDURES

- A. Eye Exposure: If solid hexachloronaphthalene or liquids containing hexachloronaphthalene get into your eyes, wash your eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation persists after washing, get medical attention. If molten hexachloronaphthalene gets into your 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.
- B. Skin Exposure: If nonimpervious clothing becomes soiled with hexachloronaphthalene, remove and clean the clothing before wearing again. If nonimpervious clothing becomes heavily contaminated, it should be destroyed. If solid hexachloronaphthalene or liquids containing hexachloronaphthalene gets on your skin, wash the contaminated skin with soap and water promptly. If skin irritation persists after washing, get medical attention. If molten hexachloronaphthalene gets on your skin or nonimpervious clothing,

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

immediately flush the affected area with large amounts of water to remove heat. Get medical attention immediately.

- C. Breathing: If you or any other person breathes in large amounts of hexachloronaphthalene, 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 immediately.
- D. Swallowing: When hexachloronaphthalene has been swallowed get medical attention immediately. If medical attention is not immediately available get the affected person to vomit by having him touch the back of the throat with his finger or by giving him large amounts (one pint or more) of warm salt water (two tablespoons of salt per pint of water). Do not make an unconscious person vomit.
- E. Rescue: Move 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 yourself. Understand your emergency rescue procedures and know the locations of the equipment before the need arises.

IV. RESPIRATORS AND PROTECTIVE CLOTHING

- A. Respirators: Respirators are not the best way to control exposure to hexachloronaphthalene. You can only be required to wear them for routine use if your employer is in the process of installing controls or control measures prove inadequate. You may be required to wear respirators for non-routine activities or in emergencies. If respirators are worn, they must have a Mining Enforcement and Safety Administration (MESA) or National Institute for Occupational Safety and Health (NIOSH) approval label. (Older respirators may have a Bureau of Mines approval label.) For effective protection, respirators must fit your face and head snugly. Respirators should not be loosened or removed in work situations where their use is required. If you can smell hexachloronaphthalene while wearing a respirator, the respirator is not working correctly; go immediately to fresh air. If you experience difficulty breathing while wearing a respirator, tell your employer.
- B. Protective Clothing: You must wear impervious clothing, gloves, face shield or other appropriate protective clothing to prevent any possibility of skin contact with molten hexachloronaphthalene and to prevent repeated or prolonged skin contact with solid or liquids containing hexachloronaphthalene. You must wear impervious clothing, gloves, face shield or other appropriate protective clothing to prevent skin contact to hexachloronaphthalene fumes from the heated material. Replace or repair impervious clothing that has developed leaks.
- C. Eye Protection: You must wear splash-proof safety goggles (cup-cover type dust and splash safety goggles) if there is any possibility of molten hexachloronaphthalene contacting your eyes. You must wear safety goggles (cup-cover type dust and splash safety goggles) where eye contact with solid hexachloronaphthalene or liquids containing may occur.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

- V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE
- A. Store hexachloronaphthalene in tightly closed containers away from strong oxidizers.
 - B. If your skin becomes contaminated with molten hexachloronaphthalene, you must immediately wash or shower to remove any hexachloronaphthalene from the skin.
 - C. If your skin becomes contaminated with solid hexachloronaphthalene, you must promptly wash or shower using soap or mild detergent as necessary to remove the hexachloronaphthalene from your skin.
 - D. You must immediately remove any non-impervious clothing that becomes contaminated with hexachloronaphthalene and this clothing must not be reworn until the hexachloronaphthalene is removed from the clothing.
 - E. You must promptly remove any non-impervious clothing that becomes contaminated with solid hexachloronaphthalene and this clothing must not be reworn until the hexachloronaphthalene is removed from the clothing.
 - F. If your work clothing may have become contaminated with solid hexachloronaphthalene, you must change into uncontaminated clothing before leaving the work premises.
 - G. If you are subject to skin contact with hexachloronaphthalene, you must wash any areas of your body using soap or mild detergent that may have contacted hexachloronaphthalene at the end of each work day.
 - H. You must not eat or smoke in areas where hexachloronaphthalene is handled, processed or stored.
 - I. If you handle hexachloronaphthalene, you must wash your hands thoroughly with soap or mild detergent and water before eating, smoking or using toilet facilities.
 - J. Ask your supervisor where hexachloronaphthalene is used in your work area and for any additional plant safety and health rules.
- VI. ACCESS TO INFORMATION
- A. Each year your employer is required to inform you of the information contained in this Substance Safety Data Sheet for hexachloronaphthalene and to instruct you in the safe and correct use of protective equipment.
 - B. Your employer is required to determine whether you are being overexposed to hexachloronaphthalene. You or your representative has the right to observe employee exposure measurements and to be informed of the results.
 - C. Your employer is required to release your exposure determination and medical records to your physician upon written request from your physician.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
FOR HEXACHLORONAPHTHALENE

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Halowax 1014
2. Formula: $C_{10}H_2Cl_6$
3. Molecular weight: 335

B. Physical Data

1. Boiling point (760 mm Hg): 343 - 388 C (650 - 730 F) (approximately)
2. Specific gravity (Water=1): 1.78
3. Vapor density (air=1 at boiling point of hexachloronaphthalene): 11.6
4. Melting point: 137 C (279 F)
5. Vapor pressure at 20 C (68 F): less than 1 mm Hg
6. Solubility in water, % by weight at 20 C (68 F): insoluble
7. Evaporation rate (butyl acetate=1): much less than 1
8. Appearance and odor: light yellow solid with an aromatic odor

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Not combustible

B. Reactivity

1. Conditions contributing to instability: Heat
2. Incompatibilities: Reacts with strong oxidizing agents.
3. Hazardous decomposition products: Toxic gases and vapors (such as hydrogen chloride and carbon monoxide) may be released when hexachloronaphthalene decomposes.
4. Special precautions: None

III. SPILL, LEAK AND DISPOSAL PROCEDURES

A. If hexachloronaphthalene 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 hexachloronaphthalene should be absorbed in vermiculite, dry sand, earth or similar material.

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

C. Waste disposal methods: Hexachloronaphthalene may be disposed of in a secured sanitary landfill.

IV. MONITORING AND MEASUREMENT PROCEDURES

A. Exposure Above the Action Level: Measurements taken for the purpose of determining employee exposure under this section are best taken such that the average 8-hour exposure may be determined from a

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

single 8-hour sample or two (2) 4-hour samples. Several short term interval samples (up to 30 minutes) may also be used to determine 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). Sampling and analyses may be performed by instruments such as detector tubes certified by NIOSH under 42 CFR Part 84, portable direct-reading instruments, dosimeters, or gas and vapor adsorption tubes with subsequent chemical analyses. The method of measurement must determine the concentration of hexachloronaphthalene to plus or minus 35%.

- B. Exposure Above the Permissible Exposure: The monitoring under this section should be essentially the same as described under paragraph (IV)(A). Laboratories performing chemical analyses should be accredited in Industrial Hygiene Chemistry by the American Industrial Hygiene Association (AIHA). The method of measurement must determine the concentration of hexachloronaphthalene to plus or minus 25%.
- C. Methods meeting these accuracy requirements are available from NIOSH.
- D. Since many of the duties relating to employee protection are dependent on the results of monitoring and measuring procedures, employers should assure that the evaluation of employee exposures is performed by a competent industrial hygienist or other technically qualified person.

V. MISCELLANEOUS PRECAUTIONS

- A. Store hexachloronaphthalene in tightly closed containers in a well-ventilated area.
- B. Laundering or other cleaning of clothing contaminated with hexachloronaphthalene should be performed in a manner that will not result in contamination of cleaning equipment and fluids which could subsequently contaminate other clothing, etc. cleaned by the same process.
- C. Employers should advise employees of all areas and operations where exposure to hexachloronaphthalene could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to hexachloronaphthalene is likely to occur are: during the formulation of electrical insulating compounds, oil and cutting oil additives, electroplating stop-off compounds; during the production of polymers and resins; and during the production of hexachloronaphthalene.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation; skin absorption.

II. TOXICOLOGY

Hexachloronaphthalene vapor and dust are toxic to the liver and the skin. Repeated exposure to an average concentration of 8.9 mg/m³ of a mixture of penta- and hexachloronaphthalene produced jaundice and was fatal to rats; the liver showed marked fatty degeneration and centrilobular necrosis. At concentrations of mixed penta- and hexachloronaphthalene averaging 1 to 2 mg/m³, there were human fatalities due to acute yellow atrophy of the liver. Such exposures produced jaundice associated with nausea, indigestion, and weight loss. The acute late stage progresses from restlessness to confusion, fever and coma. Exposure of workers by inhalation of vapor or dust, or by skin absorption, has caused a severe acne-form dermatitis termed chloracne, as well as serious liver injury.

III. SIGNS AND SYMPTOMS

Acne-form dermatitis; nausea, confusion, jaundice and coma.

IV. SPECIAL TESTS

None in common usage.

V. TREATMENT

Remove from exposure. Flush eyes with water and wash skin with soap and water. If swallowed and the person is conscious, induce vomiting.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

The anticipated effects of hexachloronaphthalene are caused by its capacity to cause an acne-form dermatitis, and to affect the liver. It is important that the physician becomes familiar with plant operating conditions in which exposure to hexachloronaphthalene occurs. Those with skin disease may not tolerate the wearing of protective clothing and those with chronic respiratory disease may not tolerate the wearing of negative pressure respirators.

B. PREPLACEMENT

The following medical procedures must be made available to each employee who is exposed to hexachloronaphthalene.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

1. A complete history and physical examination -- The purpose is to detect preexisting 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.
2. Liver function tests -- Since this substance is a known liver toxin, a profile of liver function shall be obtained by utilizing a medically acceptable array of biochemical tests.

C. PERIODIC EXAMINATIONS

The above medical examinations are to be repeated on an annual basis.

References

1. American Conference of Governmental Industrial Hygienists: "Hexachloronaphthalene," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, p. 125.
2. Patty, Frank A.: Industrial Hygiene and Toxicology, Vol. II - Toxicology (2d ed. revised), Interscience Publishing Company, New York, 1963, pp. 1343-1345.
3. Hygienic Guide Series: "Hexachloronaphthalene," American Industrial Hygiene Association Journal, 27:89-92, 1966.
4. von Oettingen, W. F.: The Halogenated Aliphatic, Olefinic, Cyclic, Aromatic, and Aliphatic-Aromatic Hydrocarbons Including the Halogenated Insecticides, Their Toxicity and Potential Dangers, U.S. Public Health Service Publication No. 414, U.S. Government Printing Office, Washington, D.C., 1955, pp. 310-314.
5. Kleinfeld, Morris, et al: "Clinical Effects of Chlorinated Naphthalene Exposure," Journal of Occupational Medicine, 14:377-379, 1972.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

REFERENCES AND SOURCES
HEXACHLORONAPHTHALENE
1910.93

(g) Personal Protective Equipment, and, (i) Sanitation

Eye: Kopper Corp. MSDS

Skin : Documentation of TLV's;

Hunter, "The Diseases of Occupation"; Patty, "Ind. Hyg. and Tox."; International Labour Office, "Encyclopedia of Occ. Health and Safety"; Koppers Corp. MSDS

Ingestion: Sax, "Dangerous Properties of Ind. Materials"; Hunter, "The Diseases of Occupation"; Patty, "Ind. Hyg. and Tox."

COMMENTS

Eye - Classification: 1, 2, and 6

Output statement numbers: 9, 10 and 12 combined

Exceptions: Eye wash fountains not required (Statement 13)

There are no specifics in the literature as to the effects of eye contact with this material. The manufacturer's MSDS only indicates that goggles are recommended. The absence of data and the recommendation of goggles suggests that eye contact to hexachloronaphthalene should be prevented. The classification of 1 is given because this material might be used in the molten state in the workplace and eye contact can be expected to cause thermal burns.

Skin - Classification: 1, 2, 4, and 6

Output statement numbers: 1, 2, 4, 5b, 7a, 14g, 15
17g, 17i, and 20a

Exceptions: 6 not felt necessary for molten material; quick d. facilities not required (Statement 8); 15 added; 4 m
14i not included as 17i is sufficient.

The effects of this material are everywhere noted as similar to the effects of pentachloronaphthalene. The comments made for that material, which are as follows, directly apply.

"The Documentation of TLV's has the notation "skin" after the chemical name.

Hunter notes that "work-people must be taught not to touch the skin with the hands and not to use rags for wiping the nose and face." Patty simply says some authors have indicated that chlorinated naphthalenes may be absorbed through the skin. He reports that the most striking response to contact with these materials is chloracne which usually occurs from long-term contact or from a much shorter contact with hot vapors. It is noted that the reaction is slow to appear and may take months to disappear. Patty suggests (page 2252) that employees keep skin contact to a minimum, that workers be required to take a shower every day before leaving the factory, and that clean work clothing and protective gloves be provided. ILO agrees that fumes can cause a problem and recommends daily clothing changes. The Koppers Corp. MSDS agrees that daily showers and clothing changes are necessary. The classification of 1 is given because the material might be used in the molten state in the workplace and contact could be

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

expected to cause thermal burns. Contact to hot vapors is prevented by the assignment of classification 4."

Ingestion - Classification: 5

Output statement numbers: 19, 20a

Exceptions: None

See the comments made above and the following material which has been extracted from the documentation for pentachloronaphthalene. "Sax considers its acute and chronic systemic effects by ingestion to be severe. Hunter notes that employees "must wash before meals and take food only in special rooms set aside for the purpose." Patty cites work which indicates that rats fed a mixture of tetra- and pentachloronaphthalene at the dose of 0.5 g/day for 2 months exhibited some sickness, some mortality, and definitive liver injury."

SUBSTANCE TECHNICAL GUIDELINES

The references cited for this document include:

Koppers Co., Inc., "Halowax Chlorinated Naphthalene Oils and Waxlike Solids" and Material Safety Data Sheet (Kopp)

USE/EXPOSURE AND CONTROL DOCUMENT

References used in the preparation of this document include:

"Halowax," Koppers Chemical and Coatings (Halowax)

International Labour Organization, "Encyclopedia of Occupational Health and Safety," Geneva, 1972 (ILO)

Kirk, R. and Othmer, D. "Encyclopedia of Chemical Technology," Interscience Publishers, Division of John Wiley, 2nd edition, 1972 (K-O)

"Hexachloronaphthalene," Material Safety Data Sheet, Koppers Company, Inc. (MSDS)

Schwartz, L., Tulipan, L., Birmingham, D. J., "Occupational Diseases of the Skin," Third edition, Lea and Febiger, 1957 (Schwartz)

Worth, A. H., "The Chemistry and Technology of Waxes," Second Edition, Reinhold Publishing Corp., 1965 (Worth)

References for Specific Use/Exposure

1. Schwartz, Worth
2. Schwartz
3. K-O, Worth
4. Halowax, K-O
5. Worth
6. ILO, Worth
7. ADL estimate, MSDS
8. Halowax, Worth

References for Specific Control Methods

1. K-O, MSDS, Schwartz
2. K-O, MSDS, Schwartz
3. K-O, Schwartz
4. K-O, MSDS
5. MSDS, Schwartz
6. K-O, Schwartz
7. K-O, MSDS, Schwartz
8. K-O, MSDS, Schwartz

RESPIRATOR TABLE JUSTIFICATION

Patty treats the chlorinated naphthalenes as a group, since they do not occur in industry as individual compounds. Patty reports that

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

although any one material is a mixture, it will have a certain range of chlorine substitution. Those with four or more chlorine equivalents are much more toxic than those with three or fewer. In general, the greater the degree of chlorination, the higher is the toxicity. Inhalation of the hot vapors of the more highly chlorinated naphthalenes can result in systemic damage, consisting almost exclusively of liver injury.

Patty reports that daily exposures of rats to the vapors of a mixture of penta- and hexachloronaphthalene at an average concentration of 1.16 mg/M3 for periods up to 4 1/2 months produced definite liver injury. Some mortality, poor growth, and severe liver injury resulted from exposures to a concentration of 8.88 mg/M3.

The Documentation of TLV's notes an industrial exposure in which fatal cases of hepatic injury occurred. Air concentrations of mixed penta- and hexachloronaphthalene ranged between 1 and 2 mg/M3 in the plant.

The AIHA Hygienic Guides state that the IDLH concentrations for the chloronaphthalenes are "probably unattainable with the possible exception of monochloronaphthalene." The Hygienic Guides also specify that only full facepiece respirators approved by the U. S. Bureau of Mines for dispersoids or organic vapors should be used.

WARNING PROPERTIES: There are no quantitative data available on the relationship between air concentrations of the chloronaphthalenes and warning properties. Vapor pressure is 1 mm creating a concentration of 1500 ppm. Therefore, air purifying or DFM respirators are not allowed.

EYE IRRITATION: Even though the AIHA Hygienic Guides state that "eye injury has not proved to be troublesome with the chloronaphthalenes," and no special precautions for these materials are necessary, the Hygienic Guides also specify that only full facepiece respirators should be used.

IDLH: Although the AIHA Hygienic Guides state that IDLH concentrations for the chloronaphthalenes are "probably unattainable," for the purposes of this standard, an IDLH concentration of 2 mg/M3 for hexachloronaphthalene is assumed. This IDLH is based on the industrial exposure in which fatal cases of hepatic injury occurred in a plant where air concentrations ranged between 1 and 2 mg/M3 of mixed penta- and hexachloronaphthalene.

LFL: There is no lower flammable limit for hexachloronaphthalene, as there is only a minimal or nonexistent fire hazard.

PERMISSIBLE EXPOSURE: .2 mg/M3.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

USE/EXPOSURE AND CONTROL DOCUMENT
HEXACHLORONAPHTHALENE

	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Inhalation of vapor or dust and skin contact with vapor, solid or dust during the manufacture of electric equipment using hexachloronaphthalene as an insulating material: a. Pouring molten solvent dissolved or finely ground solid materials (transformers, condensers, battery separators) b. Dipping electric cable, wires, coils, condensers into molten material c. Peeling and covering of the insulated cable with fabric.	A,B,D	Local exhaust ventilation; general dilution ventilation with intake and exhaust fans; personal protective equipment (gloves and overshoes, clean coveralls, goggles, respiratory protective device for dust)
2.	Inhalation of vapor and skin contact with solid or vapor during use of electric equipment insulated with hexachloronaphthalene (Electricians stripping wires, handling wires or condensers, soldering wires or condensers)	A,B,D	Local exhaust ventilation; general dilution ventilation; personal protective equipment (gloves, clean coveralls, respiratory protective devices, goggles for soldering)
3.	Inhalation of vapor and skin contact with solid or vapor during use as an inert component of resins or polymers for coating or impregnating textiles, wood and paper (to impart flame resistance, water proofness, fungicidal and insecticidal properties)	A,B,D	Process enclosure, local exhaust ventilation; general dilution ventilation with intake and exhaust fans, personal protective equipment (rubber gloves, goggles, respirator for dust, clean coveralls)
4.	Inhalation of vapor and dust and skin contact with vapor solid and dust during the manufacture of	A,B,D	Process enclosure, local exhaust ventilation; general dilution ventilation; personal protective equip-

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

hexachloronaphthalene (catalytic chlorination of naphthalene) and preparation of material for industrial use (cutting, grinding, pulverizing and packing)

ment (rubber gloves, clean coveralls, rubber overshoes, respiratory protective devices, goggles)

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|----|--|-------|---|
| 5. | Inhalation of mist and skin contact with mist during use as an additive for cutting oil (used in various operations performed on metals - cutting, drilling, grinding) | A,B,D | Local exhaust ventilation; general dilution ventilation; personal protective equipment (goggles, respiratory protective devices, clean coveralls, rubber overshoes) |
| 6. | Inhalation of vapor and skin contact with vapor, liquid or solid during use as an additive to special lubricants (crankcase oil, lubricants for farm machinery, extreme pressure lubricants) | A,B,D | General dilution ventilation |
| 7. | Inhalation of vapor and dust and skin contact with vapor, solid or dust during cleaning and maintenance of storage vessels and during clean up of accidental spills | A,B,D | Local exhaust ventilation; general dilution ventilation; personal protective equipment (goggles, clean coveralls, rubber overshoes, rubber gloves, respiratory protective devices) |
| 8. | Inhalation of vapor, solid or dust and skin contact with vapor, solid or dust during manufacture of polymers using hexachloronaphthalene as fillers (to impart flame resistance and improve electrical properties of polymers) and during the manufacture of special lubricants (chassis lubricants, crankcase oil, extreme pressure lubricants) | A,B,D | Process enclosure, local exhaust ventilation; general dilution ventilation; personal protective equipment (rubber gloves, goggles, respiratory protective devices, clean coveralls, rubber overshoes) |
- A -- Inhalation
B -- Skin contact resulting in localized irritation
C -- Ingestion
D -- Skin contact resulting in absorption and subsequent

11

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for HEXACHLORONAPHTHALENE

systemic poisoning