

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND
SUPPORTING DOCUMENTATION FOR

*** o-DICHLOROBENZENE ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for o-DICHLOROBENZENE

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 o-DICHLOROBENZENE.

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.

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(a) Definitions. (1) "Permissible exposure" means exposure of employees to airborne concentrations of o-dichlorobenzene not in excess of 50 parts per million (ppm) (300 milligrams per cubic meter, mg/m³) averaged over any 15-minute period during an eight-hour work shift, as stated in § 1910.1000, Table Z-1.

(2) "Action level" means one half of the permissible exposure for o-dichlorobenzene.

(b) Exposure determination and measurement. (1) Each employer who has a place of employment in which o-dichlorobenzene is released into the workplace air shall determine if any employee may be exposed to airborne concentrations of o-dichlorobenzene at or above the action level. The determination shall be made each time there is a change in increase in airborne concentrations of o-dichlorobenzene.

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

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

(ii) Any measurements of o-dichlorobenzene taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to o-dichlorobenzene; 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 o-dichlorobenzene 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 o-dichlorobenzene 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 o-dichlorobenzene 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 o-dichlorobenzene above the permissible exposure, the employer shall:

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

(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 o-dichlorobenzene 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 o-dichlorobenzene below the action level, the employer may terminate measurement for the employee.

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(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 the time periods appropriate to the permissible exposure (SEE APPENDIX B (iv) of this section).

(2) The method of measurement shall have an accuracy, to a confidence level of 95 percent, 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) Compliance. (1) No employee shall be exposed to o-dichlorobenzene above the permissible exposure as defined in paragraph (a)(1) of this section.

(2) Employee exposures to airborne concentrations of o-dichlorobenzene 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 concentrations of o-dichlorobenzene.

(ii) In the design of open surface tank ventilation for the purposes of § 1910.94(d), operations involving o-dichlorobenzene shall be classified as -B-4 at 70 degrees F.

(4) Compliance with the permissible exposure shall not be achieved by the use of respirators except:

(i) During the time period necessary to install or implement engineering or work practice controls; or

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- (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 o-dichlorobenzene to at or below the permissible exposure; or
 - (iv) For operations which require entry into tanks or closed vessel; 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 o-DICHLOROBENZENE

CONDITION	PERMISSIBLE RESPIRATORY PROTECTION
Vapor Concentration	
1000 ppm or less	A chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
1700 ppm or less	A gas mask with a chin-style or a front- or back-mounted organic vapor canister.
	Any supplied-air respirator with a full facepiece, helmet or hood.
	Any self-contained breathing apparatus with a full facepiece.
Greater than 1700 ppm or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
	A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection

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against organic vapors.

Any escape self-contained breathing
apparatus.

(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 o-dichlorobenzene.

(2) For the purpose of compliance with § 1910.309, locations classified as hazardous locations due to the presence of o-dichlorobenzene shall be Class I, Group D.

(3) For the purpose of compliance with § 1910.157, o-dichlorobenzene is classified as a Class B fire hazard.

(4) For the purpose of compliance with § 1910.178, locations classified as hazardous locations due to the presence of o-dichlorobenzene shall be Class I, Group D.

(5) For the purpose of compliance with § 1910.106, liquid o-dichlorobenzene is classified as a Class IIIA combustible liquid.

(6) Spray finishing operations shall be performed in accordance with §§ 1910.107 and 1910.94(c).

(7) Dip tank operations shall be performed in accordance with §§ 1910.108 and 1910.94(d).

(8) Where a fan is located in ductwork and where o-dichlorobenzene is present in the ductwork in concentrations greater than 5500 ppm (approximately 25 percent of the lower flammable limit), the fan rotating element shall be of nonsparking material or the casing shall consist of, or be lined with, nonsparking material. There shall be sufficient clearance between the fan rotating element and the fan casing so as to prevent contact.

(9) Sources of ignition such as smoking or open flames are prohibited where o-dichlorobenzene presents a fire or explosion hazard.

(10) o-Dichlorobenzene shall be stored so as not to come in contact with strong oxidizers or heated aluminum.

(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 repeated or prolonged skin contact with liquid o-dichlorobenzene. Face shields shall comply with § 1910.133(a)(2), (a)(4), (a)(5), and (a)(6).

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

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(3) Employers shall ensure that non-impervious clothing which becomes contaminated with liquid o-dichlorobenzene be removed promptly and not reworn until the o-dichlorobenzene is removed from the clothing.

(4) 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 liquid o-dichlorobenzene may contact the eyes.

(g) Spills and disposal. In the event that liquid o-dichlorobenzene is spilled the employer shall immediately eliminate potential sources of ignition, provide available ventilation and then clean up the spill.

(h) Sanitation. (1) Employers shall ensure that employees whose skin becomes contaminated with liquid o-dichlorobenzene promptly wash or shower with soap or mild detergent and water to remove any o-dichlorobenzene from the skin.

(2) Employers shall ensure that employees who handle liquid o-dichlorobenzene 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 o-dichlorobenzene is present shall keep a copy of this regulation with Appendixes 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 o-dichlorobenzene above the action level or employees who may have skin or eye contact with liquid o-dichlorobenzene, or employees who work where o-dichlorobenzene may occur, shall annually:

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

(ii) Advise affected employees as to the signs and symptoms of exposure to o-dichlorobenzene.

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

(iv) Instruct affected employees to inform the employer if they develop any of the medical conditions listed in paragraph (j)(2) of this section; and

(v) Provide training to ensure that employees understand the precautions of safe use, emergency procedures, and the correct use of protective equipment relative to o-dichlorobenzene.

(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 obtain from each employee who is exposed, or will be exposed, to liquid o-dichlorobenzene or airborne concentrations of o-dichlorobenzene at or above the action level, without regard to the use of respirators, information as to whether such employee has a history of any of the following medical conditions:

(i) Kidney disease

(ii) Liver disease

(iii) Skin disease

(3) The employer shall provide a medical examination for the employee if:

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(i) The employee provides a history of any of the medical conditions listed in paragraph (j)(2) of this section; or

(ii) The employee informs the employer of the development of any of the medical conditions listed in paragraph (j)(2) of this section or any of the signs or symptoms of exposure to o-dichlorobenzene which are listed in Appendix A which the employee suspects are caused by exposure to o-dichlorobenzene.

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

(i) A copy of this regulation with Appendixes A, B and C for o-dichlorobenzene;

(ii) A description of the affected employee's duties as they relate to his exposure to o-dichlorobenzene;

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

(iv) The results of any measurements which may indicate the affected employee's exposure;

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

(vi) Upon request of the physician, any available information from previous medical examinations of the affected employee.

(5) Where a medical examination is required by paragraph (j)(3) of this section, following such examination the employer shall obtain a written opinion from the examining physician which conforms with paragraph (j)(6) of this section.

(6)(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 condition which would place the employee at increased risk of material impairment of the employee's health from exposure to o-dichlorobenzene or would directly or indirectly aggravate any detected medical condition;

(B) Any recommended limitations upon the employee's exposure to o-dichlorobenzene including limitations upon the use of personal protective equipment and respirators;

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

(ii) The physician's written opinion shall not reveal specific medical findings or diagnoses unrelated to exposure to o-dichlorobenzene.

(iii) The employer shall provide the employee with a copy of the physician's written opinion.

(7) No employee shall be exposed to liquid o-dichlorobenzene or airborne concentrations of o-dichlorobenzene in such a way as would put the employee at increased risk of material impairment of his health from such exposure. This determination may be based on the physician's written opinion.

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

(9) 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 risk involved by refusal to be examined.

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(10) 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 o-dichlorobenzene.

(ii) This record shall include:

(A) The date of measurement;

(B) Operations involving exposure to o-dichlorobenzene 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.

(5) Medical surveillance. (i) The employer shall keep an accurate record of employee medical surveillance required by paragraph (j) of this section.

(ii) The record shall include:

— (A) Information concerning medical conditions obtained from the employee pursuant to paragraph (j)(2) of this section;

(B) Any employee medical complaints relative to exposure to o-dichlorobenzene;

(C) A copy of information provided to the physician pursuant to paragraph (j)(4)(ii), (iii), (iv), (v), and (vi) of this section.

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(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 o-dichlorobenzene which is conducted pursuant to this section.

(2) When observation of measurement of employee exposure to o-dichlorobenzene 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 o-dichlorobenzene 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.

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APPENDIX A

SUBSTANCE SAFETY DATA SHEET
FOR o-DICHLOROBENZENE

I. SUBSTANCE IDENTIFICATION

- A. Substance: o-Dichlorobenzene
- B. Permissible Exposure: 50 parts of o-dichlorobenzene per million parts of air (ppm) (300 milligrams of o-dichlorobenzene per cubic meter of air, mg/cu m) shall not be exceeded during any eight-hour work shift.
- C. Appearance and Odor: Colorless to pale yellow liquid with a pleasant aromatic odor.

II. HEALTH HAZARD DATA

- A. Ways in Which the Chemical Affects Your Body: o-Dichlorobenzene can affect your body if you inhale it or if it comes in contact with your eyes or skin or if you swallow it. It may also be absorbed through the skin.
- B. Effects of Overexposure:
 - 1. Short-Term Exposure: o-Dichlorobenzene vapor may cause irritation of the upper respiratory tract and eyes. Higher concentrations may cause drowsiness, unconsciousness and death. The liquid may cause burning of the skin. The liquid may also cause burning of the eyes with tissue damage.
 - 2. Long-Term Exposure: Prolonged or repeated contact with o-dichlorobenzene may cause skin irritation. Prolonged or repeated inhalation of high concentrations of vapor might cause liver or kidney injury.
 - 3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms and suspect that they are caused by exposure to o-dichlorobenzene.

III. EMERGENCY FIRST AID PROCEDURES

- A. Eye Exposure: If o-dichlorobenzene gets into your eyes, wash the eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.
- B. Skin Exposure: If o-dichlorobenzene gets on your skin, promptly wash the contaminated skin using soap or mild detergent. If o-dichlorobenzene soaks through your clothing, remove the clothing promptly and wash the skin using soap or mild detergent. If irritation persists after washing, get medical attention.
- C. Breathing: If you or any other person breathes in large amounts of o-dichlorobenzene move the exposed person to fresh air at once. If breathing has stopped, perform artificial

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respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

D. Swallowing: When o-dichlorobenzene has been swallowed, get medical attention immediately. If medical attention is not immediately available, get the 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 o-dichlorobenzene. 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 there use is required. If you can smell o-dichlorobenzene 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 repeated or prolonged skin contact with liquid o-dichlorobenzene. 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) where eye contact to liquid o-dichlorobenzene may occur.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

A. o-Dichlorobenzene is a combustible liquid and its vapors can form explosive mixtures with air at elevated temperatures.

B. o-Dichlorobenzene must be stored in tightly closed containers in a cool, well ventilated area away from heat, sparks, flames, strong oxidizers, hot aluminum, or aluminum alloys.

C. Sources of ignition such as smoking and open flames are prohibited wherever o-dichlorobenzene is handled, used or stored in a manner that could create a potential fire or explosion hazard.

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- D. You must promptly remove any non-impervious clothing that becomes contaminated with liquid o-dichlorobenzene and this clothing must not be reworn until the o-dichlorobenzene is removed from the clothing.
- E. If your skin becomes contaminated with liquid o-dichlorobenzene, you must promptly wash or shower with soap or mild detergent and water to remove the o-dichlorobenzene from your skin.
- F. If you handle liquid o-dichlorobenzene, you must wash your hands thoroughly with soap or mild detergent and water before eating, smoking or using toilet facilities.
- G. Fire extinguishers, where provided, must be readily available and you should know where they are and how to operate them.
- H. Ask your supervisor where o-dichlorobenzene 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 o-dichlorobenzene. In addition, your employer must instruct you in the safe use of o-dichlorobenzene, emergency procedures, and the correct use of protective equipment.
- B. Your employer is required to determine whether you are being exposed to o-dichlorobenzene. You or your representative have the right to observe employee exposure measurements and to record the results obtained. If your employer determines that you are being overexposed, he is required to inform you of the exposure and of the actions which are being taken to reduce your exposure.
- C. Your employer is required to keep records of exposure determinations, exposure measurements, and medical surveillance. Your employer is required to make records of exposure determinations and your exposure measurements available to you or your representative upon your request. Your employer is required to release your medical records to your physician upon your written request.

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APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
FOR o-DICHLOROBENZENE

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: 1,2-dichlorobenzene; o-dichlorobenzol
2. Formula: 1,2-C₆H₄Cl₂
3. Molecular weight: 147

B. Physical Data

1. Boiling point (760 mm Hg): 180 C (356 F)
2. Specific gravity (water=1): 1.3
3. Vapor density (air = 1 at boiling point of o-dichlorobenzene): 5.1
4. Melting point: -17.6 C (0.5 F)
5. Vapor pressure at 20 C (68 F): 1.2 mm Hg
6. Solubility in water, % by weight at 20 C (68 F): 0.015
7. Evaporation rate (butyl acetate = 1): less than 1
8. Appearance and odor: Colorless to pale yellow liquid with a pleasant aromatic odor

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: 66 C (151 F) (closed cup)
2. Autoignition temperature: 648 C (1198 F)
3. Flammable limits in air, % by volume: Lower: 2.2; Upper: 9.2
4. Extinguishing media: Dry chemical, foam, carbon dioxide
5. Special fire-fighting procedures: Do not use a solid stream of water since a stream will scatter and spread the fire. Use water spray to cool containers exposed to a fire.
6. Unusual fire and explosion hazards: o-Dichlorobenzene is a combustible liquid. At elevated temperatures its vapors can form explosive mixtures with air. All ignition sources must be controlled where o-dichlorobenzene is used, handled or stored in a manner that could create a potential fire or explosion hazard.
7. For purposes of complying with the requirements of 29 CFR 1910.106, o-dichlorobenzene is classified as a Class IIIA combustible liquid. For example, above 5500 ppm, one-fourth of the lower flammable limit, is one situation in which o-dichlorobenzene is considered to be a potential fire and explosion hazard.
8. For purposes of complying with 29 CFR 1910.309, the classification of hazardous locations as described in Article 500 of the National Electrical Code for o-dichlorobenzene shall be Class I Group D.

B. Reactivity

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1. Conditions contributing to instability: Heat.
2. Incompatibilities: Contact with strong oxidizers or with hot aluminum or aluminum alloys may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as hydrogen chloride, chlorine and carbon monoxide) may be released in a fire involving o-dichlorobenzene.
4. Special precautions: Liquid o-dichlorobenzene will attack some forms of plastics, rubber and coatings.

III. SPILL, LEAK, AND DISPOSAL PROCEDURES

- A. If o-dichlorobenzene is spilled or leaked, the following steps should be taken:
 1. Remove all ignition sources.
 2. Ventilate area of spill or leak.
 3. For small quantities, absorb on paper towels. Remove to a safe place (such as a fume hood) and burn the paper. Large quantities can be collected and atomized in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.
- B. Persons not wearing protective equipment should be restricted from areas of spills or leaks until cleanup has been completed.
- C. Waste disposal methods: o-Dichlorobenzene 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.

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 during periods of maximum expected airborne concentrations of o-dichlorobenzene. Each measurement should consist of a 15-minute sample or series of consecutive samples totaling fifteen (15) minutes in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). A minimum of three measurements should be taken on one work shift and the highest of all measurements taken is a good estimate of the employee's highest exposure for that shift. Sampling and analyses may be performed by calibrated instruments such as detector tubes certified by NIOSH under CFR 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 o-dichlorobenzene to plus or minus 35%.
- B. Exposure Above the Permissible Exposure: The monitoring and measurements under this section should be essentially the same as described above. More than three (3) measurements should be taken during the work shift so that increased

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confidence may be placed in the judgement that the employee has or has not, in fact, been exposed in excess of the permissible limit. Samples should be collected as described in paragraph (IV)(A). Laboratories performing chemical analyses should be accredited in Industrial Hygiene Chemistry by the American Industrial Hygiene Association. The method of measurement must determine the concentration of o-dichlorobenzene to plus or minus 25%.

- C. Methods: Methods meeting the above accuracy requirements are available from NIOSH.
- D. Qualified Persons: 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 o-dichlorobenzene in tightly closed containers in a cool, well-ventilated area.
- B. Employers should advise employees of all areas and operations where exposure to o-dichlorobenzene could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to o-dichlorobenzene is likely to occur are: during its use as a heavy duty solvent for resins, gums, greases, tar, paint, varnish, lacquer, and neoprene rubber; as a reaction solvent in isocyanate manufacture; as a deodorant in aerosol formulations; during fumigation operations; and during its use in the production of surface coatings, insecticides, herbicides, dye stuffs and pharmaceuticals.

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APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation.

II. TOXICOLOGY

o-Dichlorobenzene vapor at high concentrations is toxic to the liver and kidneys in animals. Rats died from exposure to 977 ppm for 7 hours but survived when exposed for only 2 hours; animals survived from exposure to 539 ppm for 3 hours and at necropsy showed marked centrilobular necrosis of the liver, as well as cloudy swelling of the tubular epithelium of the kidneys. Several species of animals exposed repeatedly to 93 ppm for 7 hours daily showed no adverse effects. The liquid instilled in the rabbit eye produced apparent distress and slight conjunctival irritation. Eye irritation is not usually evident below 20 ppm, but becomes noticeable at 25-30 ppm and painful to some at 60-100 ppm if exposures are for more than a few minutes duration. Some acclimatization may occur but its extent is not great. Workers exposed daily to an average of 15 ppm showed no indication of injury. The liquid left on the skin may produce blistering. Sensitization dermatitis has been reported.

III. SIGNS AND SYMPTOMS

Irritation of nose and eyes; may produce liver and kidney damage; blistering of the skin from liquid contact.

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. Give artificial resuscitation if indicated. Recovery may be delayed and heavily exposed persons should be observed for evidence of liver and kidney damage.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

At high concentrations, o-dichlorobenzene causes liver and kidney damage in animals. It is important that the physician become familiar with plant operating conditions in which exposure to o-dichlorobenzene 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.

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B. PREPLACEMENT

Routine medical histories and physical examination are not required. However, the employer must screen employees for history of certain medical conditions (listed below) which might place the employee at increased risk from odichlorobenzene exposure. Only those giving a positive history of these conditions must be referred for further medical examinations.

1. Liver disease -- o-Dichlorobenzene is known as a liver toxin 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.
2. Kidney disease -- o-Dichlorobenzene is known as a kidney toxin in animals. The importance of this organ in the elimination of toxic substances justifies special consideration in those with impaired renal function.
3. Skin disease -- o-Dichlorobenzene may cause sensitization dermatitis and blistering of the skin. Persons with preexisting skin disorders may be more susceptible to the effects of this agent.

C. PERIODIC EXAMINATIONS

Routine periodic examinations are not required. However, if the employer becomes aware of an employee with the above listed conditions, he must refer such employee for further medical examination.

References

1. American Conference of Governmental Industrial Hygienists: "o-Dichlorobenzene," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, p. 76.
2. Hygienic Guide Series: "o-Dichlorobenzene," American Industrial Hygiene Association Journal, 25:320-323, 1964.
3. Patty, Frank A.: Industrial Hygiene and Toxicology, Vol. II - Toxicology (2d ed. revised), Interscience Publishing Company, New York, 1963, pp. 1335-1337.
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. 290-294.

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REFERENCES AND SOURCES
o-DICHLOROBENZENE
1910.93

- (d) Compliance - Open surface tank classification based on relative evaporation rate of 52 hours (from Doolittle)
- (e) Fire and Safety
- (1) Electrical - Classification based on "Fire Hazard Classification of Chemical Vapors Relative to Explosion-proof Electrical Equipment," H. Carhart et al, National Academy of Sciences, 1973, report to U. S. Coast Guard, report no. CG-D-92-74, p. 11.
- (f) Personal Protective Equipment, and, (h) Sanitation
- Eye: Manufacturing Chemists Association MSDS, SD-54; Patty, "Industrial Hygiene and Toxicology" and Deichmann and Gerarde, "Toxicology of Drugs and Chemicals"
- Skin: Manufacturing Chemists Association MSDS, SD-54; Deichmann and Gerarde, "Toxicology of Drugs and Chemicals;" AIHA Hygienic Guide Series
- Ingestion: Patty, "Industrial Hygiene and Toxicology"

COMMENTS

Eye - Classification: 2

Output statement numbers: 10

Exceptions: None

MCA reports that this substance in liquid form can produce "severe irritation with prompt tissue damage. Permanent eye injury will probably not occur." Patty cites work which demonstrates that the undiluted chemical in the eye of a rabbit produces moderate pain and slight conjunctival irritation which clears in a few days. There was no serious injury. Deichmann and Gerarde agree with Patty. A classification of 2 is concluded to be appropriate. MCA seems to be overstating demonstrated effects.

Skin - Classification: 2

Output statement numbers: 2, 7b, 17g, 17i, 20a

Exceptions: None

MCA states "the liquid is capable of producing burning and smarting of the skin. Irritation usually does not occur unless prolonged or repeated contact occurs. Blisters have been reported in susceptible individuals." Also noted is that prolonged or repeated contact "can cause cracking and dermatitis due to the solvent action." Deichmann and Gerarde note that the substance "is irritating when applied to the skin of human subjects for 15 - 60 minutes." The AIHA Hygienic Guide essentially agrees with all of the above but adds that the substance is slowly absorbed through intact skin. A classification of 2 is concluded to be appropriate. The flashpoint of the substance is 151 F. Its vapor pressure at 20 C is 1.2 mm Hg.

Ingestion - Classification: 2

Output statement numbers: 20a

Exceptions: None

Patty cites work which shows that a dose of 188 mg/kg given 5 days/week for a total of 138 doses in 192 days

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to rats only resulted in a slight increase in liver and kidney weight but no apparent histopathology. A dose of 376 mg/kg given in the same dosing schedule had no effect on growth or mortality but resulted in a moderate increase in average liver weight and a slight increase in average kidney weight. There were slight histopathological changes in the liver. A single dose of 0.8 g/kg was survived by all guinea pigs tested but all succumbed to 2.0 g/kg.

SUBSTANCE TECHNICAL GUIDELINES

The references cited for this document include:

National Fire Protection Association, "Fire Protection Guide on Hazardous Materials," 5th edition, 1973 (NFPA)

Manufacturing Chemists Association, Material Safety Data Sheet SD-54 (MCA)

Dow Chemical USA, Material Safety Data Sheet (Dow)

Monsanto Co., Material Safety Data Sheet (Mons)

Allied Chemical Co., "Solvay Orthodichlorobenzene" (Allied)

Sources of data items used:

- I. A. 1. Synonyms: NFPA-325M; NFPA-49; MCA
2. Formula: NFPA-49
3. Molecular weight: ADL
- B. 1. Boiling point: NFPA-325M; MCA; Dow
2. Specific gravity: NFPA-49; MCA; Dow
3. Vapor density: NFPA-325M; Dow
4. Melting point: MCA
5. Vapor pressure: Dow
6. Solubility in water: Mons
7. Evaporation rate: Mons
8. Appearance and odor: NFPA-49; MCA; Dow
- II. A. 1. Flash point: NFPA-49
2. Autoignition temperature: NFPA-49
3. Flammable limits: NFPA-49; MCA; Dow
4. Extinguishing media: NFPA-49; Dow
5. Special fire fighting procedures: NFPA-325M; NFPA-49; MCA
6. Unusual fire and explosion hazards: ADL
- B. 1. Conditions contributing to instability: ADL
2. Incompatibilities: NFPA-49; Dow
3. Hazardous decomposition products: MCA; Dow
4. Special precautions: Allied
- III. A. Steps if released or spilled: NFPA-49; Mons; Dow
C. Waste disposal method: MCA; Dow; Mons
- V. Miscellaneous precautions: NFPA-49; ADL

USE/EXPOSURE AND CONTROL DOCUMENT

References used in the preparation of this document include:

"Chemical Abstracts," American Chemical Society, 74:32746S, 66:P19750d, and 67:65291y (CA)

Gleason, M. N., et al., "Chemical Toxicology of Commercial Products," Williams and Wilkins Co., Baltimore, 1969 (Gleason)

Hollingsworth, R. L., Rowe, V. K., Oyen, F., Torkelson, T. R. and Adams, E. M., "Toxicity of o-Dichlorobenzene," Archives of Industrial Health, 17:180 - 187, 1958 (Hollingsworth)

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- Jacobs, M., "The Analytical Chemistry of Industrial Poisons, Hazards, and Solvents," Interscience Publishers, 1956 (Jacobs)
- Mellan, I., "Source Book of Industrial Solvents," Vol. II - Halogenated Hydrocarbons, Reinhold, New York, 1957 (Mellan)
- "o-Dichlorobenzene," American Conference of Government Industrial Hygienists, Hygienic Guide Series, May - June, 1964 (Hygienic Guides)
- "o-Dichlorobenzene," Chemical Profile, Schnell Publishing Company, April 1, 1974 (Chem Profile)
- "Ortho- and Para-dichlorobenzenes," Chemical Engineering, April 15, 1974, p. 57 (Chem Eng)
- "Ortho-dichlorobenzene," Manual Sheet SD-54, Manufacturing Chemists Association, Inc., 1953 (MCA)
- Sciarra, J. J. and Stoller, L. - editors, "The Science and Technology of Aerosol Packaging," Wiley Interscience, 1974 (Sciarra)
- Stanford Research Institute, "Chemical Economics Handbook," Menlo Park, California (SRI)
- U. S. Environmental Protection Agency, "EPA Compendium of Registered Pesticides," Vol. III - Insecticides, Acaricides, Molluscicides, and Anti-fouling Compounds, U. S. Government Printing Office, Washington D. C., 1972 (EPA)

References for Specific Use/Exposures

1. Hollingsworth, Mellan, Gleason
2. EPA, Gleason, Jacobs
3. Mellan, CA 74:32746s
4. CA 67:65291y and 66:P19750d
5. Mellan, Gleason, Sciarra
6. Mellan
7. Hygienic Guides, Chem Profile, SRI
8. Chem Profile, SRI, Chem Eng
9. Hollingsworth, Gleason
10. SRI, ADL estimate

References for Specific Control Methods

MCA and Hygienic Guides were the references used in the Specific Control Methods in numbers 1 - 10.

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RESPIRATOR TABLE DOCUMENTATION

Substance: o-Dichlorobenzene

D. O. L. Standard: 50 ppm

WARNING PROPERTIES:

Odor Threshold: 2 - 4 ppm, according to the AIHA Hygienic Guides;
50 ppm according to Staub and to Patty.

Eye Irritation Level: 20 - 30 ppm according to the AIHA Hygienic
Guides

Evaluation of Warning Properties: Since the odor threshold of
o-dichlorobenzene and the concentration causing eye irritation
are at or below the permissible exposure, o-dichlorobenzene is
treated as a material with adequate warning properties, and
gas sorbent respiratory equipment is permitted.

IDLH: 1700 ppm

Basis for IDLH Concentration: Based upon the statement in the AIHA
Hygienic Guides that 1700 ppm is "not likely to endanger life
in exposures of less than one-hour duration," an IDLH concentra-
tion of 1700 ppm o-dichlorobenzene has been assumed for the
purposes of this standard. 1700 ppm is the saturated con-
centration at 25 degrees C. Toxicological information is not
available for concentrations above 1700 ppm.

Other Toxicological Information: According to Patty, o-dichlorobenzene
is primarily a hepatotoxin and secondarily a nephrotoxin.
Depression of the CNS may result from exposures to high concen-
trations of o-dichlorobenzene.

Patty reports that "rats survived 2 hours at a concentration of
977 ppm in air and succumbed to an exposure of 7 hours at the same
concentration." An exposure of 539 ppm for 7 hours was survived
by the rats, but these animals exhibited "drowsiness, unsteadiness,
and eye irritation." In addition, "marked central lobular necrosis
in the liver and cloudy swelling of the tubular epithelium of the
kidneys" were definite organic injuries which were noted.
The Documentation of TLV's reports that one investigator found
that 20-hour exposure to 1000 ppm was fatal to guinea pigs,
and another investigator observed some liver damage in animals
which had been exposed for several hours to concentrations of
50 to 800 ppm.

Elkins states that "no ill effects other than irritation of
the respiratory passages and eyes were noted" among workers
intermittently exposed to concentrations up to 100 ppm
o-dichlorobenzene during "wool-fulling processes."

The AIHA Hygienic Guides state that "the highest concentra-
tions attainable at room temperature (about 1700 ppm) is not
likely to endanger life in exposures of less than one-hour
duration."

LFL: 22,000 ppm o-dichlorobenzene

-VAPOR PRESSURE: 1.20 mm Hg at 20 deg. C.

1.282 mm Hg at 25 deg. C.

SATURATED CONCENTRATION: At 20 deg. C.: Approximately 1580 ppm

At 25 deg. C.: Approximately 1690 ppm

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USE/EXPOSURE AND CONTROL DOCUMENT
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Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1. Inhalation of vapor and skin contact with liquid during cleaning and degreasing operations (including metals, metal parts, and automobile engines and parts, leather, hides, and wool; paper for recycling; and dry cleaning)	A,B	General dilution ventilation; personal protective equipment (aprons, goggles, respiratory protective devices)
2. Inhalation of vapor and skin contact with liquid during fumigation operations (including in poultry houses and stockyards and in other areas for termites, moths, and beetles)	A,B	Personal protective equipment (gloves, goggles, protective clothing, respiratory protective devices)
3. Inhalation of vapor and skin contact with liquid during application of surface coatings or surface coating removers containing solvent (including paints, lacquers, varnishes)	A,B	General dilution ventilation; personal protective equipment (aprons, goggles, respiratory protective devices)
4. Inhalation of vapor and skin contact with liquid during textile dyeing operations	A,B	Local exhaust ventilation; general dilution ventilation; personal protective equipment (gloves)
5. Inhalation of vapor and skin contact with liquid during production and handling of cleaning, degreasing, and polishing agents (including metal polishes, dry cleaning compounds, engine/motor cleaners, furnace/fireplace cleaners, upholstery cleaners)	A,B	Process enclosure; local exhaust ventilation; personal protective equipment (gloves, aprons)
6. Inhalation of vapor and	A,B	Process enclosure; local

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skin contact with liquid
during production of
surface coatings containing
solvent (including lacquers
varnishes, paints)

exhaust ventilation; per-
sonal protective equipment
(gloves)

- | | | | |
|-----|---|-----|---|
| 7. | Inhalation of vapor
during organic
synthesis (including
insecticides, selective
herbicides, dyestuffs,
and pharmaceuticals) | A,B | General dilution ventila-
tion |
| 8. | Inhalation of vapor and
skin contact during use
as a process intermediate
(including manufacture
of toluene diisocyanate)
and extractive distillation
of ethyl benzene from
xylene | A,B | General dilution ventila-
tion |
| 9. | Inhalation of vapor during
manufacture and use of
deodorizing agents
(including garbage can
deodorizers) | A,B | General dilution ventila-
tion |
| 10. | Inhalation of vapor and
skin contact with liquid
during maintenance of
equipment containing
heat-transfer agent | A,B | Personal protective equip-
ment (gloves, goggles,
protective clothing, respir-
atory protective devices) |

- A -- Inhalation
- B -- Skin contact and eye
contact resulting in
localized irritation
- C -- Ingestion
- D -- Skin contact resulting in
absorption and subsequent
systemic poisoning