

# Occupational Health Guideline for Chlorinated Diphenyl Oxide

## INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

## SUBSTANCE IDENTIFICATION

- Formula:  $C_{12}H_4Cl_6O$
- Synonyms: Hexachlorodiphenyl oxide
- Appearance: Waxy solid or liquid.

## PERMISSIBLE EXPOSURE LIMIT (PEL)

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

## HEALTH HAZARD INFORMATION

### • Routes of exposure

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

### • Effects of overexposure

Exposure to chlorinated diphenyl oxide may cause an acne-like skin eruption or irritation. It may also injure the liver, resulting in such effects as fatigue, dark urine, and yellow jaundice.

### • Reporting signs and symptoms

A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to chlorinated diphenyl oxide.

### • Recommended medical surveillance

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

#### 1. Initial Medical Examination:

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

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

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

### • Summary of toxicology

Chlorinated diphenyl oxide vapor causes an acne-form dermatitis (chloracne). In laboratory animals, cumulative liver damage has resulted from repeated bodily intake and, in general, the toxicity increases with the degree of chlorination; in guinea pigs, a single oral dose of .05 to 0.1 g/kg of material containing 4 or more equivalents of chlorine resulted in death 30 days after administration. Limited experience with humans has shown that exposure to even small amounts of the higher chlorinated derivatives may result in appreciable acne-form dermatitis.

## CHEMICAL AND PHYSICAL PROPERTIES

### • Physical data

1. Molecular weight: 377
2. Boiling point (760 mm Hg): 230 to 260 C (446 to 500 F)
3. Specific gravity (water = 1): 1.60
4. Vapor density (air = 1 at boiling point of chlorinated diphenyl oxide): 13
5. Melting point: Data not available

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These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

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6. Vapor pressure at 20 C (68 F): Less than 0.00006 mm Hg

7. Solubility in water, g/100 g water at 20 C (68 F): 0.1

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

• **Reactivity**

1. Conditions contributing to instability: Heat.

2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.

3. Hazardous decomposition products: Toxic gases and vapors (such as hydrogen chloride and carbon monoxide) may be released in a fire involving chlorinated diphenyl oxide.

4. Special precautions: None.

• **Flammability**

1. Flash point: None

2. Autoignition temperature: 627 C (1163 F)

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

4. Extinguishant: Carbon dioxide, dry chemical

• **Warning properties**

Since there are no quantitative data relating warning properties to air concentrations of chlorinated diphenyl oxide, this material is treated as a substance with poor warning properties. The concentration of chlorinated diphenyl oxide in saturated air at 20 C could result in a significant exposure relative to the permissible exposure. There is no available information which indicates that chlorinated diphenyl oxides produce eye irritation.

## MONITORING AND MEASUREMENT PROCEDURES

• **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Method**

Sampling and analyses may be performed by collection of chlorinated diphenyl oxide on a filter with subsequent extraction with iso-octane and gas chromatographic analysis. An analytical method for chlorinated diphenyl oxide is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 2, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00260-6).

## RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. How-

ever, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

• In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

## PERSONAL PROTECTIVE EQUIPMENT

• Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with chlorinated diphenyl oxide.

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

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

• Non-impervious clothing which becomes contaminated with chlorinated diphenyl oxide should be removed promptly and not reworn until the chlorinated diphenyl oxide is removed from the clothing.

• Employees should be provided with and required to use dust- and splash-proof safety goggles where chlorinated diphenyl oxide may contact the eyes.

## SANITATION

• Workers subject to skin contact with chlorinated diphenyl oxide should wash with soap or mild detergent and water any areas of the body which may have contacted chlorinated diphenyl oxide at the end of each work day.

• Skin that becomes contaminated with chlorinated diphenyl oxide should be promptly washed or showered with soap or mild detergent and water to remove any chlorinated diphenyl oxide.

• Eating and smoking should not be permitted in areas where chlorinated diphenyl oxide is handled, processed, or stored.

- Employees who handle chlorinated diphenyl oxide should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

## COMMON OPERATIONS AND CONTROLS

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

Operation	Controls
Use as intermediate in organic synthesis in manufacture of flame-inhibiting polymers; corrosion inhibitors, dry cleaning detergents, thermal lubricants, additives for soaps and lotions, manufacture of hydraulic fluids, pesticides, wood preservatives, and electric insulators (Literature review suggests that this compound is of little or no industrial significance).	Local exhaust ventilation; general dilution ventilation; personal protective equipment

## EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

### • Eye Exposure

If chlorinated diphenyl oxide gets into the eyes, wash 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.

### • Skin Exposure

If chlorinated diphenyl oxide gets on the skin, promptly wash the contaminated skin using soap or mild detergent and water. If liquid chlorinated diphenyl oxide or liquids containing chlorinated diphenyl oxide soaks through the clothing, remove the clothing promptly and wash the skin using soap or mild detergent and water. If irritation persists after washing, get medical attention.

### • Breathing

If a person breathes in large amounts of chlorinated diphenyl oxide, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

### • Swallowing

When chlorinated diphenyl oxide has been swallowed, get medical attention immediately. If medical attention is not immediately available, get the afflicted person to vomit by having him touch the back of his throat with his finger or by giving him syrup of ipecac as directed on the package. This non-prescription drug is available at most drug stores and drug counters and should be kept with emergency medical supplies in the workplace. Do not make an unconscious person vomit.

### • Rescue

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

## SPILL, LEAK, AND DISPOSAL PROCEDURES

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

- If chlorinated diphenyl oxide is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of spill or leak.
3. If in solid form, small quantities may be swept onto paper or other suitable material, placed in an appropriate container and burned in a safe place (such as a fume hood). Larger quantities may be reclaimed; however, if this is not practical, dissolve in a flammable solvent (such as alcohol) and atomize in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.
4. If in the liquid form, for small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for evaporating vapors to completely clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Large quantities can be collected and atomized in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.

### • Waste disposal methods:

Chlorinated diphenyl oxide may be disposed of:

1. If in the solid form, by making packages of chlorinated diphenyl oxide in paper or other flammable material and burning in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device, or by dissolving in a flammable solvent (such as alcohol) and atomizing in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.
2. If in the liquid form, by absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a secured sanitary landfill, or by atomizing in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.

## ADDITIONAL INFORMATION

To find additional information on chlorinated diphenyl oxide, look up chlorinated diphenyl oxide in the following documents:

- Medical Surveillance for Chemical Hazards
- Respiratory Protection for Chemical Hazards
- Personal Protection and Sanitation for Chemical Hazards

These documents are available through the NIOSH Division of Technical Services, 4676 Columbia Parkway, Cincinnati, Ohio 45226.

- International Labour Office: *Encyclopedia of Occupational Health and Safety*, McGraw-Hill, New York, 1971.
- Patty, F. A. (ed.): *Toxicology*, Vol. II of *Industrial Hygiene and Toxicology* (2nd ed. rev.), Interscience, New York, 1963.
- Sax, N. I.: *Dangerous Properties of Industrial Materials* (3rd ed.), Van Nostrand Reinhold, New York, 1968.

## RESPIRATORY PROTECTION FOR CHLORINATED DIPHENYL OXIDE

Condition	Minimum Respiratory Protection* Required Above 0.5 mg/m <sup>3</sup>
Particulate or Vapor Concentration	
5 mg/m <sup>3</sup> or less	Any supplied-air respirator. Any self-contained breathing apparatus.
Greater than 5 mg/m <sup>3</sup> or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.  A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors, acid gases, and particulates. Any escape self-contained breathing apparatus.

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