

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND
SUPPORTING DOCUMENTATION FOR

*** DICHLOROMONOFUOROMETHANE ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for DICHLOROMONOFUOROMETHANE

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 DICHLOROMONOFUOROMETHANE.

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 inhalation of dichloromonofluoromethane in concentrations not in excess of 1,000 parts per million (ppm) (4,200 milligrams per cubic meter, mg/cu.m.) averaged over an eight-hour work shift, as stated in §§ 1910.93, Table G-1.

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

(b) Exposure determination and measurement.

(1) Each employer who has a place of employment in which dichloromonofluoromethane is released into the workplace air shall determine if any employee may be exposed to airborne concentrations of dichloromonofluoromethane 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 dichloromonofluoromethane.

(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 dichloromonofluoromethane;

(ii) Any measurements of dichloromonofluoromethane taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to dichloromonofluoromethane; 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 dichloromonofluoromethane 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 dichloromonofluoromethane 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 dichloromonofluoromethane 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 dichloromonofluoromethane 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 dichloromonofluoromethane 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.

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(7) If two consecutive employee exposure measurements taken at least one week apart reveal that the employee is exposed to dichloromonofluoromethane 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) Compliance. (1) No employee shall be exposed to dichloromonofluoromethane above the permissible exposure as defined in paragraph (a)(1) of this section.

(2) Employee exposures to airborne concentrations of dichloromonofluoromethane 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: 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 dichloromonofluoromethane.

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

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- (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 dichloromonofluoromethane to at or below the permissible exposure; or
 - (iv) 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 DICHLOROMONOFUOROMETHANE

CONDITION	PERMISSIBLE RESPIRATORY PROTECTION
Gas Concentration	
10,000 ppm or less	Any supplied-air respirator. ----- Any self-contained breathing apparatus.
50,000 ppm or less	Any supplied-air respirator with a full facepiece, helmet, or hood. ----- Any self-contained breathing apparatus with a full facepiece. ----- A Type C supplied-air respirator with a operated in pressure-demand or other positive pressure or continuous flow mode.
Greater than 50,000 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.

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Escape Any gas mask providing protection
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 dichloromonofluoromethane.

(2) Dichloromonofluoromethane shall be stored so as not to come in contact with chemically active metals.

(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 the skin from becoming wet with liquid dichloromonofluoromethane. Face shields shall comply with § 1910.133(a)(2), (a)(4), (a)(5), (a)(6).

(2) Employers shall ensure that clothing which becomes wet with liquid dichloromonofluoromethane be removed immediately and not reworn until the dichloromonofluoromethane has evaporated.

(3) 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 dichloromonofluoromethane may contact the eyes.

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

(h) Sanitation. Reserved

(i) Training and information. (1) Each employer who has a workplace in which dichloromonofluoromethane 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 dichloromonofluoromethane above the action level or employees who may have skin or eye contact with liquid dichloromonofluoromethane, or employees who work where accidental release of dichloromonofluoromethane may occur, shall annually:

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

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

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

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

(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 airborne concentrations of dichloromonofluoromethane 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) Chronic lung disease
- (ii) Heart disease

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

- (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 dichloromonofluoromethane which are listed in Appendix A which the employee suspects are caused by exposure to dichloromonofluoromethane.

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

- (i) A copy of this regulation with Appendices A, B and C for dichloromonofluoromethane;
- (ii) A description of the affected employee's duties as they relate to his exposure to dichloromonofluoromethane;
- (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 level; 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 dichloromonofluoromethane or would directly or indirectly aggravate any detected medical condition;

(B) Any recommended limitations upon the employee's exposure to dichloromonofluoromethane including limitations upon the use of 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.

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

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

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

(8) The employer shall provide emergency medical treatment for any employee injured through exposure to dichloromonofluoromethane.

(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.

(10) No medical procedures 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 dichloromonofluoromethane.

(ii) This record shall include:

(A) The date of measurement;

(B) Operations involving exposure to dichloromonofluoromethane 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)(i) 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;

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(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) 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 dichloromonofluoromethane which is conducted pursuant to this section.

(2) When observation of monitoring of employee exposure to dichloromonofluoromethane 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 dichloromonofluoromethane 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.

APPENDIX A

SUBSTANCE SAFETY DATA SHEET
FOR DICHLOROMONOFUOROMETHANE

I. SUBSTANCE IDENTIFICATION

A. Substance: Dichloromonofluoromethane

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- B. Permissible Exposure: 1000 parts of dichloromonofluoromethane per million parts of air (ppm) or 4200 milligrams of dichloromonofluoromethane per cubic meter of air (mg/cu m) averaged over an eight-hour work shift.
- C. Appearance and Odor: Colorless liquid or gas with a slight, ether-like odor.

II. HEALTH HAZARD DATA

- A. Ways in Which the Chemical Affects Your Body:
Dichloromonofluoromethane can affect your body if you inhale it or if it comes in contact with your eyes or skin. It may also affect your body if you swallow it.
- B. Effects of Overexposure:
 - 1. Exposure to dichloromonofluoromethane may cause drowsiness, unconsciousness, and death. Exposure to dichloromonofluoromethane may cause your heart to beat irregularly. If the liquid is spilled on the skin it may cause frostbite.
 - 2. Long-Term Exposure: None known
 - 3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms and suspect they are caused by exposure to dichloromonofluoromethane.

III. EMERGENCY FIRST AID PROCEDURES

- A. Eye Exposure: If liquid dichloromonofluoromethane gets into your eyes, wash your 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 liquid dichloromonofluoromethane gets on your skin, immediately flush the contaminated skin with water if the dichloromonofluoromethane has not already evaporated. If liquid dichloromonofluoromethane soaks through your clothing, remove the clothing immediately and flush the skin with water. Do not use hot water for skin flushing. If irritation is present after washing, get medical attention.
- C. Breathing: If you or any other person breathes in large amounts of dichloromonofluoromethane, 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.
- D. Swallowing: When dichloromonofluoromethane 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

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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 dichloromonofluoromethane. 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 dichloromonofluoromethane 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 your skin from becoming wet with liquid dichloromonofluoromethane. 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 dichloromonofluoromethane may occur.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

- A. Dichloromonofluoromethane must be stored in a cool, well-ventilated area away from chemically active metals.
- B. Dichloromonofluoromethane vapors may accumulate in low places and result in a suffocating atmosphere.
- C. You must immediately remove any clothing that becomes wet with liquid dichloromonofluoromethane and this clothing must not be reworn until the dichloromonofluoromethane has evaporated from the clothing.
- D. Ask your supervisor where dichloromonofluoromethane 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 dichloromonofluoromethane 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 dichloromonofluoromethane. You or your representative has the right to observe employee exposure measurements and to be informed of the results.

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- C. Your employer is required to release your exposure determination and medical records to your physician upon written request from your physician.

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
FOR DICHLOROMONOFUOROMETHANE

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Refrigerant 21; Freon 21; Halon 112;
dichlorofluoromethane
2. Formula: CHCl_2F
3. Molecular weight: 102.9

B. Physical Data

1. Boiling point (760 mm Hg): 8.9 C (48.1 F)
2. Specific gravity (Water = 1): 1.37
3. Vapor density (air = 1 at boiling point of dichloromonofluoromethane): 3.82
4. Melting point: -135 C (-211 F)
5. Vapor pressure at 20 C (68 F): Data not available
6. Solubility in water, % by weight at 20 C (68 F): 1
7. Evaporation rate (butyl acetate = 1): much higher than 1
8. Appearance and odor: Colorless liquid or gas with a slight ether-like 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 chemically active metals such as sodium, potassium, calcium, powdered aluminum, zinc and magnesium.
3. Hazardous decomposition products: Toxic gases and vapors (such as hydrogen chloride, phosgene, and hydrogen fluoride) may be released when dichloromonofluoromethane decomposes.
4. Special precautions: Liquid dichloromonofluoromethane will attack some forms of plastics, rubber and coatings.

III. SPILL AND LEAK PROCEDURES

- A. If dichloromonofluoromethane is spilled or leaked, the following steps should be taken:

1. Ventilate area of spill or leak
2. If the gas is leaking, stop the flow.
3. If the liquid is spilled or leaked, allow to vaporize.

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

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 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 dichloromonofluoromethane 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 dichloromonofluoromethane 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 dichloromonofluoromethane in a cool, well-ventilated area.

B. Dichloromonofluoromethane vapors may accumulate in low places and result in suffocating atmospheres.

C. Employers should advise employees of all areas and operations where exposure to dichloromonofluoromethane could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to dichloromonofluoromethane is likely to occur are: during its use in water purification; as a refrigerant, aerosol propellant, solvent for low-temperature extraction, and blowing agent for rigid foams; in chemical synthesis of other freons; and during its production.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation.

II. TOXICOLOGY

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Dichloromonofluoromethane vapor is a respiratory irritant and causes asphyxia at extremely high concentrations. Exposure to 400,000 ppm with 18% oxygen was fatal to guinea pigs and death was preceded by dyspnea, tremors, and convulsive movements but not narcosis. Animals died at 102,000 ppm with congested lungs, kidneys and liver, but survived 52,000 ppm showing tremors, incoordination, and irregular breathing. In liquid form this substance may cause frostbite. Sniffing aerosols of fluorochlorinated hydrocarbons has caused sudden death due to cardiac arrest probably due to sensitization of the myocardium. Acute or chronic effects from human exposure have not been reported.

III. SIGNS AND SYMPTOMS

May produce asphyxia at very high concentrations, cardiac arrhythmias and cardiac arrest.

IV. SPECIAL TESTS

None in common usage.

V. TREATMENT

Remove from exposure. Flush eyes and skin with water. Give artificial resuscitation if indicated. Recovery is usually rapid and complete. Caution should be exercised in using epinephrines or similar drugs.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

Dichloromonofluoromethane is an asphyxiant and may also cause cardiac conduction defects. It is important that the physician becomes familiar with plant operating conditions in which exposure to dichloromonofluoromethane 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

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 dichloromonofluoromethane exposure. Only those giving a positive history of these conditions must be referred for further medical examinations.

1. Chronic respiratory disease -- In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of dichloromonofluoromethane might cause exacerbation of symptoms due to its irritant properties.

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2. Cardiovascular disease -- In persons with impaired cardiovascular function, especially those with a history of cardiac arrhythmias, the inhalation of dichloromonofluoromethane might cause exacerbation of disorders of the conduction mechanism due to its sensitizing effects on the myocardium.

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: "Dichloromonofluoromethane," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, p. 81.
2. 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. 73-75.
3. Smyth, Henry F., Jr.: "Improved Communication--Hygienic Standards for Daily Inhalation," American Industrial Hygiene Association Quarterly, 17:155, 1956.
4. Aviado, D.M. and Belej, M.A.: "Toxicity of Aerosol Propellants on the Respiratory and Circulatory Systems -- 1. Cardiac Arrhythmia in the Mouse," Toxicology, 2:31-42, 1974.

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REFERENCES AND SOURCES
DICHLOROMONOFUOROMETHANE
1910.93

- (f) Personal Protective Equipment, and, (h) Sanitation
Eye: DuPont,
"Freon Compounds and Safety," Freon Product Information
Skin: DuPont,
"Freon Compounds and Safety," Freon Product Information
Ingestion - Kirk-Othmer, "Encyclopedia of Chemical Technology;"

COMMENTS

Eye - Classification: 2

Output statements for low boiling liquids used.

Exceptions: None

As the boiling point is 8.9 C, the possibility of a chill burn from splashing exists. This is supported by duPont information which states "if lower boiling liquids contact the eye, serious damage from freezing may occur."

Skin - Classification: 2

Output statements for low boiling liquids used.

Exceptions: None

The possibility of a chill burn from splashing exists, as the boiling point is 8.9 C. This is supported by duPont information which states "if the liquid phase of the lower boiling "Freon" products come in contact with the skin, the rapid evaporation may cause freezing." DuPont further notes that there is little evidence of skin absorption, but that with prolonged contact with the liquid "the skin may become dry and perhaps cracked." The substance is not combustible.

Ingestion - Classification: 0

Output statement numbers: None

Exceptions: None

According to Kirk-Othmer, it is "practically non-toxic, with little physiological effect except at high concentrations." As the boiling point is 8.9 C, the probability of ingestion in harmful amounts in an industrial exposure seems remote.

SUBSTANCE TECHNICAL GUIDELINES

The references cited for this document include:

- E. I. duPont de Nemours and Co., Material Safety Data Sheet, Freon Product Information and "Freon Compounds and Safety" (duP)
"Matheson Gas Data Book," 5th edition, p. 191 (Math)
Union Carbide Corp., Linde Division, "Linde Specialty Gases - Safety Precautions and Emergency Procedures" (Linde)

Sources of data items used:

- I. A. 1. Synonyms: duP
2. Formula: duP
3. Molecular weight: duP
B. 1. Boiling point: duP
2. Specific gravity: duP
3. Vapor density: Math
4. Melting point: Math

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- 5. Vapor pressure: not pertinent
- 6. Solubility in water: duP
- 7. Evaporation rate: duP
- 8. Appearance and odor: duP; Linde
- II. B. 1. Conditions contributing to instability: duP
- 2. Incompatibilities: duP
- 3. Hazardous decomposition products: duP
- 4. Special precautions: ADL; duP
- III. A. Steps if released or spilled: Linde; ADL
- C. Waste disposal method: Math; duP
- V. Miscellaneous precautions: Math; duP
- VI. Common operations: Math

USE/EXPOSURE AND CONTROL DOCUMENT

References used in the preparation of this document:

- "Chemical Abstracts," 66 - 75 (1967 - 71); 79 (1973); 80 (1974)
(CA)
- E. I. duPont de Nemours Company, Freon Product Information B - 2, 1969 (duPont)
- E. I. duPont de Nemours Company, "Freon Compounds and Safety," S - 16, 1969 (duPont Safety)
- "Dichloromonofluoromethane," Hazard Process Index, Hazard Entry No. 57, NIOSH-HSM-99-73-62 (HPI)
- Hawley, G. G., "The Condensed Chemical Dictionary," 8th edition, Van Nostrand Reinhold, 1971 (Hawley)
- International Labour Organization, "Encyclopedia of Occupational Health and Safety," Geneva, 1972 (ILO)
- Kirk, R. and Othmer, R., "Encyclopedia of Chemical Technology," Interscience Publishers, Division of John Wiley, 1st edition, 1954 (Chem Tech)
- Kirk, R. and Othmer, D., "Encyclopedia of Chemical Technology," Interscience Publishers, Division of John Wiley, 2nd edition, 1972 (K-O)
- Mark, H. F., Gaylord, N. G., and Bikales, N. M., "Encyclopedia of Polymer Science and Technology," Interscience, 1964 (Polymer Sci)
- Mellan, I., "Handbook of Solvents," Vol. 2, Reinhold, 1957 (Mellan)
- Simons, J. H., "Fluorine Chemistry," Vol. 5, Academic Press, 1964 (Simons)
- Stacey, M., Tatlow, J. C. and Sharpe, A. G., "Advances in Fluorine Chemistry," Vol. 3, Butterworth, 1963 (Stacey)
- Union Carbide Corp., "Linde Specialty Gases," 1971 (Carbide)

References for Specific Use/Exposure

- 1. Hawley, HPI, Simons, K-O, Stacey, CA 66 - 75 (1967 - 71)
- 2. CA 75:131113k, Chem Tech, ILO, K-O, HPI, Hawley, Simons, Stacey
- 3. CA 66 - 75 (1967 - 71); 79:P55225p; duPont B - 2; Chem Tech, Hawley, Mellan
- 4. CA 66 - 75 (1967 - 71); duPont B - 2, Stacey; Polymer Sci
- 5. CA 66 - 75 (1967 - 71); Carbide, duPont, Stacey
- 6. CA 66:20435m (1967); 79:20,864n (1973)
- 7. CA 66 - 75 (1967 - 71)
- 8. CA 66 - 75 (1967 - 71), ILO

References for Specific Control Methods

Carbide, duPont, ILO and Stacey were the references used in the Specific Control Methods for numbers 1 - 8.

RESPIRATOR TABLE JUSTIFICATION

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Central nervous system depression results from exposures to high concentrations of dichloromonofluoromethane, according to Gleason.

Sax assigns to dichloromonofluoromethane an acute toxic inhalation hazard rating of 1, which indicated that there is only a slight hazard, and that any changes which might occur are "readily reversible" and will disappear at the end of the exposure.

The Documentation of TLV's notes that "signs of irritation, tremors, incoordination, and irregular breathing" have been produced in guinea pigs exposed to concentrations of 52,000 ppm and greater. Death resulted among guinea pigs exposed to 102,000 ppm.

WARNING PROPERTIES: Since there is no available quantitative information relating warning properties to air concentrations of dichloromonofluoromethane, this substance is treated as a material with poor warning properties.

EYE IRRITATION: Dichloromonofluoromethane is not a known eye irritant.

IDLH: The Documentation of TLV's statement that 52,000 ppm dichloromonofluoromethane produces incoordination, irregular breathing, and tremors in guinea pigs. Dr. Lester Scheel of NIOSH's Toxicology Branch Cincinnati, Ohio, in evaluating the work of Avidado, D.M., Belej, M.A., Toxicity of Aerosol Propellants on the Respiratory and Circulatory System Cardiac Arrhythmia in the Mouse, Toxicology, 2, 31, 1974, has indicated cardiac toxicity concentration of dichloromonofluoromethane of 100,000 ppm. Based on the above information an IDLH of 50,000 ppm has been used for this substance.

LFL: Dichloromonofluoromethane is not flammable.

PERMISSIBLE EXPOSURE: 1000 ppm.

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	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Inhalation of gas and skin contact with gas or liquefied gas during manufacture and use of aerosol propellants (used principally for pharmaceuticals)	A,B	General dilution ventilation; local exhaust ventilation; personal protective equipment (gloves, goggles)
2.	Inhalation of gas and skin contact with gas or liquefied gas during use as a refrigerating agent	A,B	General dilution ventilation; local exhaust ventilation; personal protective equipment (gloves, goggles)
3.	Inhalation of gas and skin contact with gas or liquefied gas during use as an industrial solvent (separation of fatty acids, of polymers)	A,B	General dilution ventilation; local exhaust ventilation; personal protective equipment (gloves, goggles)
4.	Inhalation of gas and skin contact with gas or liquefied gas during use as a blowing agent for rigid foams (especially insulating foams)	A,B	General dilution ventilation; local exhaust ventilation; personal protective equipment (gloves, goggles)
5.	Inhalation of gas and skin contact with gas or liquefied gas during manufacture and distribution of dichloromonofluoromethane and during maintenance of storage tanks	A,B	Local exhaust ventilation; personal protective equipment (gloves, goggles, lifeline, respiratory protective devices)
6.	Inhalation of gas and skin contact with gas or liquefied gas during use as a working fluid (in Rankine cycle turbogenerators)	A,B	General dilution ventilation; local exhaust ventilation; personal protective equipment (gloves, goggles)
-7.	Inhalation of gas and skin contact with gas or liquefied gas during use in water purification	A,B	General dilution ventilation; local exhaust ventilation; personal protective equipment (gloves, goggles)
8.	Inhalation of gas and	A,B	General dilution ventila-

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skin contact with gas or
liquefied gas during use
in organic synthesis
(preparation of other
Freons, addition to olefins)

tion; local exhaust venti-
lation; personal protective
equipment (gloves, goggles)

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