

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND
SUPPORTING DOCUMENTATION FOR

*** DIFLUORODIBROMOMETHANE ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for DIFLUORODIBROMOMETHANE

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 DIFLUORODIBROMOMETHANE.

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 difluorodibromomethane in concentrations not in excess of 100 parts per million (ppm) (860 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 difluorodibromomethane.

(b) Exposure determination and measurement.

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

(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 difluorodibromomethane;

(ii) Any measurements of difluorodibromomethane taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to difluorodibromomethane; 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 difluorodibromomethane 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 difluorodibromomethane 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 difluorodibromomethane 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 difluorodibromomethane 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 difluorodibromomethane 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 difluorodibromomethane 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
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Above permissible exposure	$\pm 25\%$
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At or below permissible exposure	
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and above the action level	$\pm 35\%$
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At or below the action level	$\pm 50\%$
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(d) Compliance. (1) No employee shall be exposed to difluorodibromomethane above the permissible exposure as defined in paragraph (a)(1) of this section.

(2) Employee exposures to airborne concentrations of difluorodibromomethane 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 difluorodibromomethane.

(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 difluorodibromomethane 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 DIFLUORODIBROMOMETHANE

CONDITION	PERMISSIBLE RESPIRATORY PROTECTION
Vapor Concentration	
1000 ppm or less	Any supplied-air respirator.
	Any self-contained breathing apparatus.
2500 ppm or less	Any supplied-air respirator with full facepiece, helmet or hood.
	Any self-contained breathing apparatus with a full facepiece.
Greater than 2500 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 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.
	Any escape self-contained breathing

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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 difluorodibromomethane.

(2) Difluorodibromomethane 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 protective clothing necessary to prevent repeated or prolonged skin contact with liquid difluorodibromomethane. Face shields shall comply with § 1910.133(a)(2), (a)(4), (a)(5), and (a)(6).

(2) Employers shall ensure that non-impervious clothing which becomes wet with liquid difluorodibromomethane be removed promptly and not reworn until the difluorodibromomethane 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 difluorodibromomethane may contact the eyes.

(g) Spills and disposal. In the event that liquid difluorodibromomethane 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 difluorodibromomethane 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 difluorodibromomethane above the action level or employees who may have skin or eye contact with liquid difluorodibromomethane, or employees who work where accidental release of difluorodibromomethane may occur, shall annually:

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

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

(iii) Instruct affected employees to advise the employer of the development of signs and symptoms of exposure to difluorodibromomethane 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

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

(j) Medical surveillance. (1) The employer shall provide medical procedures as required by this paragraph. All medical procedures shall be

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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 difluorodibromomethane or airborne concentrations of difluorodibromomethane 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) Liver disease
- (ii) Chronic lung 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 difluorodibromomethane which are listed in Appendix A which the employee suspects are caused by exposure to difluorodibromomethane.

(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 difluorodibromomethane;
- (ii) A description of the affected employee's duties as they relate to his exposure to difluorodibromomethane;
- (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 difluorodibromomethane or would directly or indirectly aggravate any detected medical condition;

(B) Any recommended limitations upon the employee's exposure to difluorodibromomethane 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.

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

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

(7) No employee shall be exposed to liquid difluorodibromomethane or airborne concentrations of difluorodibromomethane in such a way as would put the employee at increased risk of material impairment of his health

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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 difluorodibromomethane.

(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 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 difluorodibromomethane.

(ii) This record shall include:

(A) The date of measurement;

(B) Operations involving exposure to difluorodibromomethane 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.

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

(ii) This record shall include:

(A) 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 difluorodibromomethane;

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

(D) Physician's written opinion; and

(E) A signed statement of any refusal to be examined.

(iii) This record shall be maintained for the duration of the employment of the affected employee.

(6) Access to records. (i) All records required to be maintained by this section shall be made available upon request to authorized representatives of the Assistant Secretary of Labor for Occupational Safety and Health and the Director of the National Institute for Occupational Safety and Health.

(ii) Employee exposure determination and exposure measurement records required to be maintained by this section shall be made available to employees and former employees and their designated representatives.

(iii) Employee medical records required to be maintained by this section shall be made available upon written request to a physician designated by the employee or former employee.

(1) Employee observation of measurement. (1) The employer shall give affected employees or their representatives an opportunity to observe any measurement of employee exposure to difluorodibromomethane which is conducted pursuant to this section.

(2) When observation of measurement of employee exposure to difluorodibromomethane 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 difluorodibromomethane 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 DIFLUORODIBROMOMETHANE

I. SUBSTANCE IDENTIFICATION

- A. Substance: Difluorodibromomethane
- B. Permissible Exposure: 100 parts of difluorodibromomethane per million parts of air (ppm) or 860 milligrams of difluorodibromomethane 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 characteristic odor.

II. HEALTH HAZARD DATA

- A. Ways in Which the Chemical Affects Your Body: Difluorodibromomethane can affect your body if you inhale it or if it comes in contact with your skin or eyes. It may also affect your body if you swallow it.
- B. Effects of Overexposure:
 - 1. Exposure to difluorodibromomethane may cause irritation of the nose and throat, drowsiness, unconsciousness and death. Exposure may also cause liver damage. If the liquid gets on your skin or in your eyes, it may cause frostbite.
 - 2. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms and suspect they are caused by exposure to difluorodibromomethane.

III. EMERGENCY FIRST AID PROCEDURES

- A. Eye Exposure: If liquid difluorodibromomethane gets in your eyes wash the eyes immediately with large amounts of water lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with this chemical.
- B. Skin Exposure: If liquid difluorodibromomethane gets on your skin, immediately flush the contaminated skin with water if the liquid difluorodibromomethane has not already evaporated. If liquid difluorodibromomethane soaks through your clothing, remove the clothing immediately and flush the skin with water. Do not use hot water for skin flushing. If irritation persists after washing, get medical attention.
- C. Breathing: If you or any other person breathes in large amounts of difluorodibromomethane, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration.

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

- D. Swallowing: When difluorodibromomethane has been swallowed get medical attention immediately. If medical attention is not immediately available get the affected person to vomit by having him touch the back of the throat with his finger or by giving him large amounts (one pint or more) of warm salt water (two tablespoons of salt per pint of water). Do not make an unconscious person vomit.
- E. Rescue: Move affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty yourself. Understand your emergency rescue procedures and know the locations of the equipment before the need arises.

IV. RESPIRATORS AND PROTECTIVE CLOTHING

- A. Respirators: Respirators are not the best way to control exposure to difluorodibromomethane. 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 difluorodibromomethane 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 difluorodibromomethane. 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 contacts to liquid difluorodibromomethane may occur.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

- A. difluorodibromomethane must be stored in a cool, well-ventilated area away from chemically active metals.
- B. Difluorodibromomethane vapors may accumulate in low places and result in suffocating atmospheres.
- C. You must promptly remove any non-impervious clothing that becomes wet with liquid difluorodibromomethane and this clothing must not be reworn until the difluorodibromomethane has evaporated from the clothing.
- D. Ask your supervisor where difluorodibromomethane is used in your work area and for any additional plant safety and health rules.

VI. ACCESS TO INFORMATION

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- A. Each year your employer is required to inform you of the information contained in this Substance Safety Data Sheet for difluorodibromomethane 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 difluorodibromomethane. You or your representative has the right to observe employee exposure measurements and to be informed of the results.
- C. Your employer is required to release your exposure determination and medical records to your physician upon written request from your physician.

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APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
FOR DIFLUORODIBROMOMETHANE

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Dibromodifluoromethane; Freon 12B2
2. Formula: CBr_2F_2
3. Molecular weight: 209.8

B. Physical Data

1. Boiling point (760 mm Hg): 24.5 C (76.1 F)
2. Specific gravity (Water = 1): 2.46
3. Vapor density (air = 1 at boiling point of difluorodibromomethane): 7.2
4. Melting point: -141.6 C (-223 F)
5. Vapor pressure at 20 C (68 F): 620 mm Hg
6. Solubility in water, % by weight at 20 C (68 F): Insoluble
7. Evaporation rate (butyl acetate = 1): higher than 1
8. Appearance and odor: Colorless liquid or gas with a characteristic 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 bromide and hydrogen fluoride) may be released when difluorodibromomethane decomposes.
4. Special precautions: Liquid difluorodibromomethane will attack some forms of plastics, rubber and coatings.

III. SPILL AND LEAK PROCEDURES

- A. If difluorodibromomethane 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.

- 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

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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 difluorodibromomethane 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 difluorodibromomethane 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 difluorodibromomethane in a cool, well-ventilated area.
- B. Difluorodibromomethane vapors may accumulate in low places and result in suffocating atmospheres.
- C. Employers should advise employees of all areas and operations where exposure to difluorodibromomethane could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to difluorodibromomethane is likely to occur are: during its production and its use in small portable fire extinguishers; in organic synthesis of other freons; in processing cutting tools; and as a solvent for preparing explosives.

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APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation.

II. TOXICOLOGY

Difluorodibromomethane vapor is a respiratory irritant and a narcotic. Rats exposed to 4,000 ppm for 15 minutes showed pulmonary edema, while 2,300 ppm daily for 6 weeks resulted in the death of more than half the animals. At 2,300 ppm dogs showed rapid and progressive signs of intoxication with weakness and loss of balance after a few days exposure, followed by convulsions. These dogs at autopsy had pulmonary congestion, centrilobular necrosis of the liver, and some evidence of central nervous system damage. However, other dogs tolerated daily exposures of 350 ppm for 7 months without signs of intoxication. No systemic effects have been reported from industrial exposures. In liquid form this substance may cause frostbite.

III. SIGNS AND SYMPTOMS

Based on animal experiments, high levels may produce respiratory irritation, CNS symptoms and liver damage.

IV. SPECIAL TESTS

None in common usage.

V. TREATMENT

Remove from exposure. Flush eyes and skin with water if splashed with the liquid. Give artificial resuscitation if indicated. Recovery is usually rapid and complete.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

Most reported effects of difluorodibromomethane are caused by its narcotic and irritant properties. It is important that the physician becomes familiar with plant operating conditions in which exposure to difluorodibromomethane 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

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medical conditions (listed below) which might place the employee at increased risk from difluorodibromomethane exposure. Only those giving a positive history of these conditions must be referred for further medical examinations.

1. Liver disease -- Although difluorodibromomethane is not known as a liver toxin in humans, the importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.
2. Chronic respiratory disease -- In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of difluorodibromomethane might cause exacerbation of symptoms due to its irritant properties.

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: "Difluorodibromomethane," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, p. 86.
2. Patty, Frank A.: Industrial Hygiene and Toxicology, Vol. II - Toxicology (2d ed. revised), Interscience Publishing Company, New York, 1963, pp. 1327-1328.
3. 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, p. 117.

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REFERENCES AND SOURCES
DIFLUORODIBROMOMETHANE

1910.93

- (f) Personal Protective Equipment, and, (h) Sanitation
Eye: Kirk-Othmer, "Encyclopedia of Chemical Technology;" Grant,
"Toxicology of the Eye."
Skin: Sax, "Dangerous Properties of Industrial Materials;"
duPont, "Freon Compounds and Safety," Freon Product
Information
Ingestion: American Industrial Hygiene Association, Hygienic
Guides Series - "Dichlorodifluoromethane;" Kirk-Othmer, "Encyclopedia
of Chemical Technology"

COMMENTS

Eye - Classification: 2

Output statement numbers: 10

Exceptions: None

According to Kirk-Othmer the bromine compounds are more toxic than the corresponding chlorine compounds; therefore, by analogy with difluorodichloromethane, it can be expected that effects of exposure to difluorodibromomethane will be at least (and probably more serious) than to difluorodichloromethane.

Grant reports work showing residual effects six weeks after exposure of rabbit eyes to pure liquefied Freon 12 (difluorodichloromethane) for 5 to 10 seconds. He concludes, however, that "the speed of reflex closure of the eyes is such that it seems extremely unlikely that any serious injury would result from an accidental spray of this substance in the eyes of human beings." The boiling point is close to room temperature (24.5 C). This does not preclude the possibility of frostbite-type burns but does reduce the probability that such burns will be as serious or rapidly occurring as would be expected from lower boiling substances of this type.

Skin - Classification: 2

Output statement numbers: 2, 16g

Exceptions: 7 and 16i deleted and 16g modified due to high vapor pressure. Sax lists it as a moderate irritant both locally and systemically for acute exposure. By analogy with difluorodichloromethane and the fact that the boiling point is 24.5 C, the possibility of frostbite-type burns exists but cannot be considered to be a serious hazard. Although the duPont literature states that there is little evidence of skin absorption, it states that "most of the Freon liquids will dissolve and extract the natural oils present in the skin. If contact is prolonged, the skin may become dry and perhaps cracked."

The substance is not combustible. Its vapor pressure at 20 C is 620 mm Hg, indicating that it is highly volatile.

Ingestion - Classification: 0

Output statement numbers: None

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Exceptions: None

The Hygienic Guide on dichlorodifluoromethane states that "rats on a dosage of 430 mg/kg body weight in peanut oil for 10 days showed no clinical signs of toxicity or histological change." Although difluorodibromomethane is more toxic according to Kirk-Othmer, it seems unlikely that sufficient quantities would be consumed in an occupational setting to cause damage, especially when the extremely high volatility of the material is taken into account.

SUBSTANCE TECHNICAL GUIDELINES

The references cited for this document include:

- "Matheson Gas Data Book," 5th edition, p. 179 (Math)
- Kirk-Othmer, "Encyclopedia of Chemical Technology," 2nd edition, Vol. 9, p. 748 (K-O)
- Union Carbide Corp., Linde Division, "Linde Specialty Gases - Safety Precautions and Emergency Procedures" (Linde)

Sources of data items used:

- I. A. 1. Synonyms: Math
- 2. Formula: Math
- 3. Molecular weight: Math
- B. 1. Boiling point: Math
- 2. Specific gravity: Math
- 3. Vapor density: ADL
- 4. Melting point: Math
- 5. Vapor pressure: Math
- 6. Solubility in water: Math
- 7. Evaporation rate: ADL
- 8. Appearance and odor: Math
- II. B. 1. Conditions contributing to instability: analogy
- 2. Incompatibilities: analogy
- 3. Hazardous decomposition products: analogy
- 4. Special precautions: analogy
- III. A. Steps if released or spilled: Math; Linde
- C. Waste disposal method: Math
- V. Miscellaneous precautions: Math; ADL

USE/EXPOSURE AND CONTROL DOCUMENT

References used in the preparation of this document include:

- "Chemical Abstracts," 66 - 75 (1967 - 71); 80:P98078q(1974) (CA)
 - E. I. duPont de Nemours and Company, Freon Product Information Bulletin B - 2, 1969 (duPont)
 - International Labour Organization, "Encyclopedia of Occupational Health and Safety," Geneva, 1972 (ILO)
 - Kirk, R. and Othmer, D., "Encyclopedia of Chemical Technology," Interscience Publishers, Division of John Wiley, 1st edition, 1954 (Chem Tech)
 - Kirk, R. and Othmer, R., "Encyclopedia of Chemical Technology," Interscience Publishers, Division of John Wiley, 2nd edition, 1972 (K-O)
 - Mellan, I., "Handbook of Solvents," Volume II, Reinhold, 1957 (Mellan)
 - Patty, F. A., "Industrial Hygiene and Toxicology," Vol. II, Interscience, 1962 (Patty)
 - Simon, J. H., "Fluorine Chemistry," Vol. 5, Academic Press, 1964 (Simon)
- References for Specific Use/Exposure
- 1. duPont, Chem Tech, K-O, ILO, Mellan, Patty, Simon

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2. CA 66 - 75 (1967 - 71), ILO
3. duPont, K-0
4. CA 68:P106152v
5. CA 80:P98078q, Mellan

References for Specific Control Methods

duPont and ILO were the references used for the Specific Control Methods in numbers 1 - 5.

RESPIRATOR TABLE JUSTIFICATION

Patty reports that Comstock determined a lethal concentration for rats of 55,000 ppm difluorodibromomethane. "Significant pulmonary damage, irritation, and edema" was produced in rats exposed to 4000 ppm for 15 minutes.

The NIOSH Toxic Substances List gives a LCLO by inhalation of 2300 ppm difluorodibromomethane for rats. The LCLO is the "lowest concentration of a substance, other than a LC50, in air which has been reported to have caused death in man or to have caused death in animals when they have been exposed for 24 hours or less."

WARNING PROPERTIES: Difluorodibromomethane does not have adequate warning properties. Gas sorbent respiratory equipment is not permitted.

EYE IRRITATION: Difluorodibromomethane is not a known eye irritant.

IDLH: Based upon the LCLO of 2300 ppm for rats given in the NIOSH Toxic Substances List and upon Patty's report that 4000 ppm for 15-minutes caused "significant pulmonary damage" in rats, an IDLH of 2500 ppm difluorodibromomethane is assumed for the purposes of this standard.

LFL: Difluorodibromomethane is not flammable.

PERMISSIBLE EXPOSURE: 100 ppm.

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USE/EXPOSURE AND CONTROL DOCUMENT
DIFLUORODIBROMOMETHANE

Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1. Inhalation of vapor and skin contact with liquid during preparation and limited use as a fire extinguishing agent (in confined spaces, in military and commercial aircraft, in fires from liquid rocket fuels)	A,B	General dilution ventilation; local exhaust ventilation; personal protective equipment (gloves, goggles, respiratory protective devices)
2. Inhalation of vapor and skin contact with liquid during use in organic synthesis (addition to olefins, preparation of other Freons, synthesis of difluorocarbene)	A,B	General dilution ventilation; local exhaust ventilation; personal protective equipment (gloves, goggles)
3. Inhalation of vapor and skin contact with liquid during manufacture and distribution of difluorodibromomethane and during maintenance of storage containers.	A,B	Process enclosure and local exhaust ventilation; personal protective equipment (gloves, goggles, respiratory protective devices)
4. Inhalation of vapor and skin contact with liquid during use in processing of cutting tools (razor blades, hypodermic needles, scalpels, culinary knives, garden tools)	A,B	General dilution ventilation; local exhaust ventilation; personal protective equipment (gloves, goggles)
5. Inhalation of vapor and skin contact with liquid during use as a special solvent (for preparation of explosive mixtures)	A,B	General dilution ventilation; local exhaust ventilation; 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