

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND
SUPPORTING DOCUMENTATION FOR

*** 1,1-DICHLORO-1-NITROETHANE ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for 1,1-DICHLORO-1-NITROETHANE

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 1,1-DICHLORO-1-NITROETHANE.

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

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

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(a) Definitions. (1) "Permissible exposure" means exposure of employees to airborne concentrations of 1,1-dichloro-1-nitroethane not in excess of 10 parts per million (ppm) (60 milligrams per cubic meter (mg/M3)) averaged over any fifteen-minute period during an eight-hour work shift, as stated in § 1910.1000, Table Z-1.

(2) "Action level" means one half of the permissible exposure for 1,1-dichloro-1-nitroethane.

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

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

(i) Any information, observations, or calculations which may indicate employee exposure to 1,1-dichloro-1-nitroethane;

(ii) Any measurements of 1,1-dichloro-1-nitroethane taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to 1,1-dichloro-1-nitroethane; 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 1,1-dichloro-1-nitroethane 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 exposure of the employee during an eight-hour work shift.

(4) If the exposure measurement taken pursuant to paragraph (b)(3) of this section reveals employee exposure to 1,1-dichloro-1-nitroethane 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 1,1-dichloro-1-nitroethane 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 1,1-dichloro-1-nitroethane above the permissible exposure, the employer shall:

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

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

(iii) Individually notify, in writing, within five days, every employee who is found to be exposed to 1,1-dichloro-1-nitroethane above the permissible exposure. The employee shall also be notified of the corrective action being taken to reduce the exposure to at or below the permissible exposure.

(7) If two consecutive employee exposure measurements taken at least one week apart reveal that the employee is exposed to 1,1-dichloro-1-

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nitroethane 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 short term samples which represents the employee's actual exposure averaged over the time periods appropriate to the permissible exposure (See Appendix B (IV) of this section).

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

Table 1

Concentration	Required Accuracy
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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 1,1-dichloro-1-nitroethane above the permissible exposure as defined in paragraph (a)(1) of this section.

(2) Employee exposures to airborne concentrations of 1,1-dichloro-1-nitroethane 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 1,1-dichloro-1-nitroethane.

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

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

(ii) In work situations in which engineering and work practice controls are technically not feasible; or

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(iii) To supplement engineering and work practice controls when such controls fail to reduce airborne concentrations of 1,1-dichloro-1-nitroethane to at or below the permissible exposure; or

(iv) For operations which require entry into tanks or closed vessels; or
(v) In emergencies.

(5) Where respirators are needed and permitted under this paragraph to reduce employee exposure, the employer shall select and provide the appropriate respirator from Table 2 and shall ensure that the employee uses the respirator provided.

TABLE 2 RESPIRATORY PROTECTION FOR 1,1-DICHLORO-1-NITROETHANE

CONDITION	PERMISSIBLE RESPIRATORY PROTECTION
Vapor Concentration	
150 ppm or less	Any supplied-air respirator with a full facepiece, helmet or hood. ----- Any self-contained breathing apparatus with a full facepiece. -----
Greater than 150 ppm or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. ----- A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode. -----
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. -----
Escape	Any gas mask providing protection 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 1,1-dichloro-1-nitroethane.

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(2) For the purpose of compliance with § 1910.309, locations classified as hazardous locations due to the presence of 1,1-dichloro-1-nitroethane shall be Class I, Group C.

(3) For the purpose of compliance with § 1910.157, 1,1-dichloro-1-nitroethane is classified as a Class B fire hazard.

(4) For the purpose of compliance with § 1910.178, locations classified as hazardous locations due to the presence of 1,1-dichloro-1-nitroethane shall be Class I, Group C.

(5) For the purpose of compliance with § 1910.106, liquid 1,1-dichloro-1-nitroethane is classified as a Class II combustible liquid.

(6) Sources of ignition such as smoking or open flames are prohibited where 1,1-dichloro-1-nitroethane presents a fire or explosion hazard.

(7) 1,1-Dichloro-1-nitroethane shall be stored so as not to come in contact with strong oxidizers.

(8) Where a fan is located in ductwork and where 1,1-dichloro-1-nitroethane is present in the ductwork in concentrations greater than 5000 ppm, the fan rotating element shall be of non-sparking material or the casing shall consist of, or be lined with, non-sparking material. There shall be sufficient clearance between the fan rotating element and the fan casing so as to prevent contact.

(f) Personal protective equipment. (1) Employers shall provide and ensure that employees use impervious clothing, gloves, face shields (eight-inch minimum) and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with liquid 1,1-dichloro-1-nitroethane. Face shields shall comply with § 1910.133(a)(2), (a)(4), (a)(5), and (a)(6).

(2) Employers shall ensure that clothing wet with liquid 1,1-dichloro-1-nitroethane is placed in closed containers for storage until it can be discarded or until the employer provides for the removal of 1,1-dichloro-1-nitroethane from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the 1,1-dichloro-1-nitroethane, the employer shall inform the person performing the operation of the hazardous properties of 1,1-dichloro-1-nitroethane.

(3) Employers shall ensure that non-impervious clothing which becomes contaminated with 1,1-dichloro-1-nitroethane be removed promptly and not worn until the 1,1-dichloro-1-nitroethane is removed from the clothing.

(4) Employers shall provide and ensure that employees use splash-proof safety goggles (cup-cover type dust and splash safety goggles) which comply with § 1910.133(a)(2)-(a)(6) where liquid 1,1-dichloro-1-nitroethane may contact the eyes.

(g) Spills and disposal. (1) In the event that liquid 1,1-dichloro-1-nitroethane is spilled the employer shall immediately eliminate potential sources of ignition, provide available ventilation and then clean up the spill.

(2) Liquid 1,1-dichloro-1-nitroethane shall not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

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

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(2) Employers shall ensure that employees who handle liquid 1,1-dichloro-1-nitroethane wash their hands thoroughly with soap or mild detergent and water before eating, smoking or using toilet facilities.

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

(2) Each employer who has employees exposed to 1,1-dichloro-1-nitroethane above the action level or employees who may have skin or eye contact with liquid 1,1-dichloro-1-nitroethane, or employees who work where 1,1-dichloro-1-nitroethane presents a potential fire or explosion hazard, shall annually:

(i) Inform affected employees of the information contained in the Substance Safety Data Sheet for 1,1-dichloro-1-nitroethane (Appendix A of this section);

(ii) Advise affected employees as to the signs and symptoms of exposure to 1,1-dichloro-1-nitroethane.

(iii) Instruct affected employees to advise the employer of the development of signs and symptoms of exposure to 1,1-dichloro-1-nitroethane which are listed in Appendix A of the section;

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

(v) Provide training to ensure that employees understand the precautions of safe use, emergency procedures, and the correct use of protective equipment relative to 1,1-dichloro-1-nitroethane.

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

(2) The employer shall obtain from each employee who is exposed, or will be exposed, to liquid 1,1-dichloro-1-nitroethane or airborne concentrations of 1,1-dichloro-1-nitroethane at or above the action level information as to whether such employee has a history of any of the following conditions:

- (i) Kidney disease
- (ii) Liver disease
- (iii) Chronic lung disease
- (iv) Skin disease
- (v) 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 1,1-dichloro-1-nitroethane which are listed in Appendix A which the employee suspects are caused by exposure to 1,1-dichloro-1-nitroethane.

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

(i) A copy of this regulation with Appendixes A, B and C for 1,1-dichloro-1-nitroethane;

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(ii) A description of the affected employee's duties as they relate to his exposure to 1,1-dichloro-1-nitroethane;

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

(iv) 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 1,1-dichloro-1-nitroethane or would directly or indirectly aggravate any detected medical condition;

(B) Any recommended limitations upon the employee's exposure to 1,1-dichloro-1-nitroethane including limitations upon the use of personal protective equipment and respirators;

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

(ii) The physician's written opinion shall not reveal specific medical findings or diagnoses unrelated to exposure to 1,1-dichloro-1-nitroethane.

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

(7) No employee shall be exposed to liquid 1,1-dichloro-1-nitroethane or airborne concentrations of 1,1-dichloro-1-nitroethane in such a way as would put the employee at increased risk of material impairment of his health from such exposure. This determination may be based on the physician's written opinion.

(8) The employer shall provide emergency and follow-up medical examinations and treatment for any employee injured through exposure to 1,1-dichloro-1-nitroethane.

(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) This 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 1,1-dichloro-1-nitroethane.

(ii) This record shall include:

(A) The date of measurement;

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(B) Operations involving exposure to 1,1-dichloro-1-nitroethane which are being monitored;

(C) Sampling and analytical method used and evidence of their accuracy;

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

(E) Name 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 of employee trained;

(C) Content or scope of training provided.

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

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

(ii) This record shall include:

(A) The name of the employee;

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

(C) Any employee medical complaints relative to exposure to 1,1-dichloro-1-nitroethane;

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

(E) Physician's written opinion; and

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

(iii) This record shall be maintained for the duration of and for one year after termination 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) Each employee or former employee shall have access to the exposure-determination and exposure measurement records required to be maintained by this section which indicate his own exposure to 1,1-dichloro-1-nitroethane.

(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.

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(1) Employee observation of measurement. (1) The employer shall give each employee or his representative an opportunity to observe any measurement of his exposure to 1,1-dichloro-1-nitroethane which is conducted pursuant to this section.

(2) When observation of measurement of employee exposure to 1,1-dichloro-1-nitroethane 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 1,1-dichloro-1-nitroethane 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 1,1-DICHLORO-1-NITROETHANE

I. SUBSTANCE IDENTIFICATION

A. Substance: 1,1-Dichloro-1-nitroethane

B. Permissible Exposure: 10 parts of 1,1-dichloro-1-nitroethane per million parts of air (ppm) (60 milligrams of 1,1-dichloro-1-nitroethane per cubic meter of air (mg/M3)) shall not be exceeded during any fifteen-minute period during an eight-hour work shift.

C. Appearance and Odor: Colorless liquid with an unpleasant odor that causes tears

II. HEALTH HAZARD DATA

A. Ways in which the chemical affects your body: 1,1-Dichloro-1-nitroethane 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. Short-term Exposure: Exposure of animals has produced severe irritation of the lungs with severe breathing difficulties. These breathing difficulties may be

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delayed in onset. Liver, heart, kidney and blood vessel damage was also reported in animals. In addition, eye and skin irritation has been reported in animals.

2. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms and suspect that they are caused by exposure to 1,1-dichloro-1-nitroethane.

III. EMERGENCY FIRST AID PROCEDURES

- A. Eye Exposure: If liquid 1,1-dichloro-1-nitroethane gets into your eyes, wash your eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation persists after washing, get medical attention. Contact lenses should not be worn when working with this chemical.
- B. Skin Exposure: If liquid 1,1-dichloro-1-nitroethane gets on your skin, immediately wash the contaminated skin using soap or mild detergent and water. If liquid 1,1-dichloro-1-nitroethane soaks through your clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. If irritation persists after washing, get medical attention.
- C. Breathing: If you or any other person breathes in large amounts of 1,1-dichloro-1-nitroethane 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 liquid 1,1-dichloro-1-nitroethane has been swallowed, give the person large quantities of water immediately. After the water has been swallowed try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.
- 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 1,1-dichloro-1-nitroethane. 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

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1,1-dichloro-1-nitroethane 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 1,1-dichloro-1-nitroethane. Replace or repair impervious clothing that has developed leaks.
- C. Eye Protection: You must wear splash-proof safety goggles where liquid 1,1-dichloro-1-nitroethane may contact your eyes.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

- A. 1,1-Dichloro-1-nitroethane is a combustible liquid and its vapors can form explosive mixtures with air at elevated temperatures.
- B. 1,1-Dichloro-1-nitroethane must be stored in tightly closed containers in a cool, well-ventilated area away from heat and strong oxidizers.
- C. Sources of ignition such as smoking and open flames are prohibited wherever 1,1-dichloro-1-nitroethane is handled, used or stored in a manner that could create a potential fire or explosion hazard.
- D. You must use non-sparking tools when opening or closing metal containers of 1,1-dichloro-1-nitroethane, and containers must be bonded and grounded when pouring or transferring liquid 1,1-dichloro-1-nitroethane.
- E. You must promptly remove any non-impervious clothing that becomes contaminated with 1,1-dichloro-1-nitroethane and this clothing must not be re worn until the 1,1-dichloro-1-nitroethane is removed from the clothing.
- F. If your skin becomes contaminated with 1,1-dichloro-1-nitroethane, you must promptly wash or shower with soap or mild detergent and water to remove the 1,1-dichloro-1-nitroethane from your skin.
- G. If you handle liquid 1,1-dichloro-1-nitroethane, you must wash your hands thoroughly with soap or mild detergent and water before eating, smoking or using toilet facilities.
- H. Fire extinguishers, where provided, must be readily available and you should know where they are and how to operate them.
- I. Ask your supervisor where 1,1-dichloro-1-nitroethane is used in your work area and for any additional 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 1,1-dichloro-1-nitroethane. In addition, your employer must instruct you in the safe use of 1,1-dichloro-1-nitroethane, emergency procedures, and the correct use of protective equipment.
- B. Your employer is required to determine whether you are being exposed to 1,1-dichloro-1-nitroethane. You or your

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representative have the right to observe employee exposure measurements and to record the results obtained. If your employer determines that you are being overexposed, he is required to inform you of the exposure and the actions which are being taken to reduce your exposure.

- C. Your employer is required to keep records of your exposure and medical examinations. Your employer is required to keep exposure data for at least one year and to keep medical data during your employment, and for a period of one year following your termination of employment. Your employer is required to make the exposure data available to you upon your request. Your employer is also required to release your medical records to your physician upon your written request.
- D. Your employer must give you a copy of the physicians written opinion for any physical examination required by this standard.

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
FOR 1,1-DICHLORO-1-NITROETHANE

I. PHYSICAL AND CHEMICAL DATA

- A. Substance Identification
 - 1. Synonyms: None
 - 2. Formula: CH3CCl2NO2
 - 3. Molecular weight: 144
- B. Physical Data
 - 1. Boiling point(760 mm Hg): 125 C (257 F)
 - 2. Specific gravity (water = 1): 1.42
 - 3. Vapor density (air = 1 at boiling point of 1,1-dichloro-1-nitroethane): 5.0
 - 4. Melting point: Data not available
 - 5. Vapor pressure at 20 C (68 F): 15 mm Hg
 - 6. Solubility in water, % by weight at 20 C (68 F): 0.25
 - 7. Evaporation rate (butyl acetate = 1): Data not available
 - 8. Appearance and odor: Colorless liquid with an unpleasant odor that causes tears

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

- A. Fire
 - 1. Flash point: 58 C (136 F) (closed cup)
 - 2. Autoignition temperature: Data not available
 - 3. Flammable limits in air, % by volume: Data not available
 - 4. Extinguishing media: Dry chemical, foam, carbon dioxide
 - 5. Special fire-fighting procedures: Do not use a solid stream of water since a stream will scatter and spread

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the fire. Use water spray to cool containers exposed to a fire.

6. Unusual fire and explosion hazards: 1,1-Dichloro-1-nitroethane is a combustible liquid. At elevated temperatures its vapors can form explosive mixtures with air. All ignition sources must be controlled where 1,1-dichloro-1-nitroethane is used, handled or stored in a manner that could create a potential fire or explosion hazard. 1,1-Dichloro-1-nitroethane vapors are heavier than air and may travel along the ground and be ignited by sparks or open flames at location remote from the site at which 1,1-dichloro-1-nitroethane is handled.
7. For purposes of complying with the requirements of 29 CFR 1910.106, 1,1-dichloro-1-nitroethane is classified as a Class II combustible liquid.
8. For the purpose of complying with 29 CFR 1910.309, the classification of hazardous locations as described in Article 500 of the National Electric Code for 1,1-dichloro-1-nitroethane shall be Class I, Group C.

B. Reactivity

1. Conditions contributing to instability: Overheating in closed containers may cause explosions.
2. Incompatibilities: Contact with strong oxidizers may cause fire and explosion.
3. Hazardous decomposition products: Toxic gases and vapors (such as oxides of nitrogen, hydrogen chloride, and carbon monoxide) may be released in a fire involving 1,1-dichloro-1-nitroethane.
4. Special precautions: Liquid 1,1-dichloro-1-nitroethane will attack some forms of plastics, rubber and coatings.

III. SPILL, LEAK, AND DISPOSAL PROCEDURES

- A. If liquid 1,1-dichloro-1-nitroethane is spilled or leaked, the following steps should be taken:
 1. Remove all ignition sources.
 2. Ventilate area of spill or leak.
 3. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood.) Allow sufficient time for vapors to completely clear the hood ductwork, then burn the paper. Large quantities can be collected and atomized in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device. 1,1-Dichloro-1-nitroethane may not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.
- B. Persons not wearing protective equipment should be restricted from areas of spills or leaks until cleanup has been completed.
- C. Waste disposal methods: 1,1-Dichloro-1-nitroethane may be disposed of: By atomizing in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.

IV. MONITORING AND MEASUREMENT PROCEDURES

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- A. **EXPOSURE ABOVE THE ACTION LEVEL:** Measurements taken for the purpose of determining employee exposure under this section are best taken during periods of maximum expected airborne concentrations of 1,1-dichloro-1-nitroethane. Each measurement should consist of a 15-minute sample or series of consecutive samples totaling fifteen (15) minutes in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). A minimum of three measurements should be taken on one work shift and the highest of all measurements taken is a good estimate of the employee's highest exposure for that shift. Sampling and analyses may be performed by 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 analysis. The method of measurement must determine the concentration of 1,1-dichloro-1-nitroethane to plus or minus 35%.
- B. **EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE:** The monitoring and measurements under this section should be essentially the same as described above. More than three (3) measurements should be taken during the work shift so that increased confidence may be placed in the judgement that the employee has or has not, in fact, been exposed in excess of the permissible limit. Samples should be collected as described in paragraph IV. A. Laboratories performing chemical analyses should be accredited in Industrial Hygiene Chemistry by the American Industrial Hygiene Association. The method of measurement must determine the concentration of 1,1-dichloro-1-nitroethane to plus or minus 25%.
- C. **METHODS:** Methods meeting these accuracy requirements are available from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161 under the title "NIOSH Analytical Methods for Set P" (Order number XXXXXXXXXX).
- D. **QUALIFIED PERSONS:** Since many of the duties relating to employee protection are dependant 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 1,1-dichloro-1-nitroethane in tightly closed containers in a cool, well ventilated area.
- B. High exposures to 1,1-dichloro-1-nitroethane can occur when transferring the liquid from container to another.
- C. Non-sparking tools must be used to open and close metal containers of 1,1-dichloro-1-nitroethane. These containers must be effectively grounded and bonded prior to pouring.
- D. Use older stocks first. Old material has been known to decompose explosively.
- E. Employers should advise employees of all areas and operations where exposure to 1,1-dichloro-1-nitroethane could occur.

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VI. COMMON OPERATIONS

Common operations in which exposure to 1,1-dichloro-1-nitroethane is likely to occur are: During its production; and during its use in the manufacture of rubber cements and insecticides and as a soil sterilizer and fumigant.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation.

II. TOXICOLOGY

1,1-Dichloro-1-nitroethane vapor is a pulmonary, skin and eye irritant in animals. It also causes liver, kidney, and heart damage in animals. At high concentrations animals showed lacrimation, increased nasal secretion, sneezing, coughing, pulmonary rales, and weakness. Exposure of rabbits to levels as low as 52 ppm for 18 1/2 hours was fatal. Autopsies on animals exposed to over 170 ppm for over 30 minutes revealed pulmonary edema and hemorrhage, with damage to the heart, liver, and kidneys. Application of the liquid to the skin of rabbits caused irritation and edema. No human experience has been reported.

III. SIGNS AND SYMPTOMS

By analogy to effects caused in animals, it may cause eye irritation; pulmonary edema and hemorrhage; heart, liver, and kidney damage; skin irritation.

IV. SPECIAL TESTS

None in common usage.

V. TREATMENT

Remove from exposure. Immediately flush eyes with water and wash skin with soap or mild detergent and water. If swallowed and the person is conscious, immediately administer water orally and induce vomiting. Give artificial resuscitation and administer oxygen if indicated. Consideration should be given to hospitalization and observation for the possible delayed onset of pulmonary edema.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

1,1-Dichloro-1-nitroethane causes pulmonary edema, eye and skin irritation, damage to the heart, liver, and kidneys in animals. It is important that the physician become familiar with plant operating conditions in which exposure to 1,1-dichloro-1-nitroethane occurs.

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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 examinations 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 1,1-dichloro-1-nitroethane exposure. Only those giving a positive history of these conditions must be referred for further medical examinations.

1. Chronic respiratory disease -- 1,1-Dichloro-1-nitroethane causes respiratory irritation in animals. In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of 1,1-dichloro-1-nitroethane might cause exacerbation of symptoms due to its irritant properties.
2. Liver disease -- 1,1-Dichloro-1-nitroethane causes liver damage in animals. The importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.
3. Kidney disease -- 1,1-Dichloro-1-nitroethane causes kidney damage in animals. The importance of this organ in the elimination of toxic substances justifies special consideration in those with impaired renal function.
4. Cardiovascular disease -- 1,1-Dichloro-1-nitroethane causes heart damage in animals. In persons with impaired cardiovascular function, the inhalation of 1,1-dichloro-1-nitroethane might cause exacerbation of preexisting disorders.
5. Skin disease -- 1,1-Dichloro-1-nitroethane can cause dermatitis on prolonged exposure. Persons with preexisting skin disorders may be more susceptible to the effects of this agent.

C. PERIODIC EXAMINATIONS

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

VII. REFERENCES

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for 1,1-DICHLORO-1-NITROETHANE

1. American Conference of Governmental Industrial Hygienists: "1,1-Dichloro-1-Nitroethane," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, p. 82.
2. Patty, Frank A.: Industrial Hygiene and Toxicology, Vol. II - Toxicology (2d ed. revised), Interscience Publishing Company, New York, 1963, pp. 2080-2081.
3. Machle, W., et al: "The Physiological Response of Animals to Certain Chlorinated Mononitroparaffins," Journal of Industrial Hygiene and Toxicology, 27:95-102, 1945.
4. Negherbon, William O., Ed.: Handbook of Toxicology. Vol. III - Insecticides. W.B. Saunders Company, Philadelphia, 1959, pp. 212-213.

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REFERENCES AND SOURCES
1,1-DICHLORO-1-NITROETHANE
1910.1000

- (f) Personal Protective Equipment, and, (h) Sanitation
- Eye: Grant, "Toxicology of the Eye;" Browning, "Toxicity and Metabolism of Industrial Solvents;" International Labour Office, "Encyclopedia of Occupational Health and Safety"
- Skin: Fairhall, "Industrial Toxicology;" Browning, "Toxicity and Metabolism of Industrial Solvents;" International Labour Office, "Encyclopedia of Occupational Health and Safety;" Sax, "Dangerous Properties of Industrial Materials;" Patty, "Industrial Hygiene and Toxicology"
- Ingestion: Browning, "Toxicity and Metabolism of Industrial Solvents;" Elkins, "The Chemistry of Industrial Toxicology;" Fairhall, "Industrial Toxicology;" American Conference of Governmental Industrial Hygienists, "Documentation of the Threshold Limit Values for Substances in Workroom Air;" Spencer, "Guide to Chemicals Used in Crop Protections;" ILO, "Encyclopedia of Occupational Health and Safety"

COMMENTS

Eye - Classification: 2
Output statement numbers: 10
Exceptions: None

A literature search did not reveal the specific effects of 1,1-dichloro-1-nitroethane liquid on the eyes. Grant and Browning have elucidated upon the irritating and lacrimatory effects of the vapor upon heating this compound, but not of the effects of direct liquid contact.

Reporting on chlorinated nitroparaffins in general, the ILO notes "in case of eye or skin contact, washing with large amounts of water is necessary."

Grant reports in general that "a splash of a chemically inert solvent usually causes immediate stinging and smarting pain, and it may cause loss of some or all of the corneal epithelium, particularly if it is a good fat solvent, but as a general rule it does not damage the corneal stroma underlying the epithelium. Even if all the epithelium is lost from the cornea as a result of splash of ordinary organic solvents, it generally regenerates in a few days without residual permanent damage. While the epithelium is missing, the corneal stroma may be slightly swollen and the posterior surface of the cornea may appear wrinkled."

Because of the properties of this compound, a classification of 2 is, therefore, concluded to be appropriate.

Skin - Classification: 2
Output statement numbers: 2, 7b, 17g, 17i, 20a
Exceptions: None

According to Fairhall, skin application of this compound results in "irritation," but "no systemic effects" or "weight loss" has resulted. The ILO further adds that "skin irritation resulted from large amounts" when applied.

Browning notes that "skin application has caused

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swelling and irritation" but it is "not appreciably absorbed by the skin."

Sax considers the substance to be an acute local irritant of high toxic hazard. Patty notes it is considerably more irritating to skin than 1-chloro-1-nitropropane. The ILO also adds that chlorinated nitroparaffins are used as solvents. It recommends that "in case of eye or skin contact, washing with large amounts of water is necessary" and implies that chronic effects include dermatoses.

1-1-Dichloro-1-nitroethane has a vapor pressure of 15 mm Hg at 20 degrees C. It is 0.25% soluble in water and has a flash point of 136 degrees F.

Though the literature does not clearly describe the duration and extent of contact necessary to produce local effects, it can be inferred from the above comments and the properties of the substance that prolonged or repeated contact is necessary, i.e. the substance is not instantly corrosive. A classification of 2 is, therefore, concluded to be most appropriate.

Ingestion - Classification: 2

Output statement numbers: 20a

Exceptions: None

Browning reports that oral administration of this compound resulted in "erosion of the gastric mucosa, with congestion, haemorrhage and inflammatory exudate; generalized vascular damage, pulmonary edema, and myocardial degeneration. The liver showed severe degeneration and necrosis; the kidneys degeneration of the glomeruli and tubules." Elkins adds that the toxic dose, "whether given orally or by inhalation caused edema of the lungs of experimental animals."

Fairhall notes that the symptoms produced in animals by the administration of 1,1-dichloro-1-nitroethane by stomach tube were found by "Machle and his associates to be similar to those produced by the simple nitroparaffins, i.e., progressive weakness and collapse, unsteadiness, incoordination. Weakness and depression were the outstanding signs."

The ACGIH give the oral LD50 for rabbits between 0.15 and 0.20 gm/kg, and Spencer gives the acute oral LD50 for rats at 410 mg/kg.

According to the ILO, "no significant reports about chronic local or systemic cases of poisoning in industrial workers have been recorded."

Browning states further that "the introduction of a chlorine atom into the molecule of the mononitroparaffins greatly increases their irritant properties, especially to the lungs, but since they have no appreciable vapor pressure at ordinary temperatures danger from their industrial use would appear to be chiefly that of accidental ingestion."

The compound has a vapor pressure somewhat less than that of water. A classification of 2 is concluded to be sufficient to prevent ingestion of harmful amounts.

SUBSTANCE TECHNICAL GUIDELINES

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The references cited for this document include:

- National Fire Protection Association, "Fire Protection Guide on Hazardous Materials," 5th edition, 1975 (NFPA)
- Commercial Solvents Corp., letter from P. J. Baker dated 8/20/74 and NP Technical Data Sheet No. 1 (CSC)
- Manufacturing Chemists' Association, "Laboratory Waste Disposal Manual" (MCA)
- Kirk-Othmer, "Encyclopedia of Chemical Technology," 2nd edition, Vol. 13, p. 864 (K-O)
- "Lange's Handbook of Chemistry," 11th edition (Lange)
- "Beilstein's Handbuch der Organischen Chemie," Vol. 1, p. 101 and supplements (Beil)
- Factory Mutual Engineering Corp., "Handbook of Industrial Loss Prevention," 2nd edition, 1967 (FM)

Sources of data items used:

- I. A. 1. Synonyms: None
2. Formula: MCA
3. Molecular weight: Lange
B. 1. Boiling point: Beil
2. Specific gravity: NFPA-325M, MCA
3. Vapor density: NFPA-325M, MCA
4. Melting point: Data not available
5. Vapor pressure: Beil
6. Solubility in water: Beil
7. Evaporation rate: Data not available
8. Appearance and odor: CSC
- II. A. 1. Flash point: FM
2. Autoignition temperature: Data not available
3. Flammable limits: Data not available
4. Extinguishing media: NFPA-325M, ADL
5. Special fire fighting procedures: CSC, ADL
6. Unusual fire and explosion hazards: CSC, ADL
B. 1. Conditions contributing to instability: Analogy with other nitroparaffins
2. Incompatibilities: ADL
3. Hazardous decomposition products: ADL
4. Special precautions: CSC
- III. A. Steps if released or spilled: MCA
C. Waste disposal method: MCA
- V. Miscellaneous precautions: CSC, ADL

USE/EXPOSURE AND CONTROL DOCUMENT

References used in the preparation of this document include:

- Gleason, M. N., et al., "Chemical Toxicology of Commercial Products," Williams and Wilkins Co., 1969 (Gleason)
- Kirk, R. and Othmer, D., "Encyclopedia of Chemical Technology," Interscience Publishers, 1954 (Chem Tech)
- Personal Correspondence to Dr. Edward R. Atkinson from Mr. Philip J. Baker, Jr., of the Commercial Solvents Corporation, August 20, 1974 (Personal Correspondence)

References for Specific Use/Exposure

- 1. Chem Tech, Gleason
- 2. Personal Correspondence

References for Specific Control Methods

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1. Chem Tech
2. Personal Correspondence

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RESPIRATORY TABLE DOCUMENTATION

SUBSTANCE: 1,1-Dichloro-1-nitroethane

D. O. L. STANDARD: 10 ppm shall not be exceeded

WARNING PROPERTIES:

Odor Threshold: There is no quantitative information available concerning the odor threshold of 1,1-dichloro-1-nitroethane.

Eye Irritation Level: The Handbook of Organic Industrial Chemicals states that 1,1-dichloro-1-nitroethane "may cause irritation of eyes and nose at twice threshold limit and, at higher concentrations, lung injury." Grant points out that 1,1-dichloro-1-nitroethane "has an irritant, lacrimogenic effect which gives adequate warning to prevent dangerous exposure."

Evaluation of Warning Properties: Although 1,1-dichloro-1-nitroethane produces irritant effects at only 2 times the permissible exposure limit, this material is treated as a substance with poor warning properties, since the permissible exposure limit is a ceiling concentration which was set "to prevent serious injury in man." Gas sorbent respiratory equipment is not permitted.

IDLH: 150 ppm

Basis for IDLH Value: An IDLH of 150 ppm has been used based on a report by Machle which states that autopsies on animals exposed to over 170 ppm for over 30 minutes revealed pulmonary edema and hemorrhage, with damage to the heart, liver, and kidneys (see Appendix C-II).

Other Toxicological Information: Patty points out that "1,1-dichloronitroethane is considerably more irritating to skin and mucous membranes than 1-chloro-1-nitropropane." 1,1-Dichloro-1-nitroethane causes "pulmonary edema and death within 24 hours following exposure to high concentrations. The chief site of injury is the lungs but damage is also observed in the heart muscle, liver, and kidneys after lethal exposures."

The following table can be found in Patty:

RESPONSE TO INHALATION OF 1,1-DICHLORONITROETHANE

Average Concentration ppm	Duration of Exposure	Mortality*	
		Rabbit	Guinea Pig
4910	30 min.	2	2
985	3 1/2 hrs.	2	1
594	2 1/2 hrs.	1	None
254	1 hr.	None	None
169	2 hrs.	1	1
100	6 hrs.	2	2
60	2 hrs.	None	None
52	18 hrs., 40 mins.	2	None
34	4 hrs.	None	None
25	204 hrs.	None	None

* Two rabbits and 2 guinea pigs in each experiment

LFL: Data not available

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VAPOR PRESSURE AT 20 C: 15 mm Hg

SATURATED CONCENTRATION AT 20 C: Approximately 19,700 ppm

NOTE: Additional toxicological information is needed to establish a more accur

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	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Inhalation of vapor and skin contact with liquid during use as an insecticidal fumigant for grain	A,B	Material substitution
2.	Inhalation for vapor and skin contact with liquid during the synthesis and processing of 1,1-dichloro-1-nitroethane	A,B	General dilution ventila- tion; local exhaust venti- lation; personal protective equipment (respiratory protective devices)

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

Note - This product has been withdrawn from the market.