

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND
SUPPORTING DOCUMENTATION FOR

*** MONOMETHYL ANILINE ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for MONOMETHYL ANILINE

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 MONOMETHYL ANILINE.

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 monomethyl aniline not in excess of 2 parts per million (ppm) (9 milligrams per cubic meter, (mg/m³)) averaged over an eight-hour work shift (time weighted average) as stated in § 1910.1000, Table Z-1.

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

(b) Exposure determination and measurement. (1) Each employer who has a place of employment in which monomethyl aniline is released into the workplace air shall determine if any employee may be exposed to airborne concentrations of monomethyl aniline 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 monomethyl aniline.

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

(i) Any information, observations, or calculation which may indicate employee exposure to monomethyl aniline;

(ii) Any measurements of monomethyl aniline taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to monomethyl aniline; 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 monomethyl aniline 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 monomethyl aniline 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 monomethyl aniline 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 monomethyl aniline 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 monomethyl aniline 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 monomethyl aniline 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 percent, of not less than that given in Table 1.

Table 1

Concentration

Required Accuracy

Above permissible exposure

± 25%

At or below permissible exposure

and above the action level

± 35%

At or below the action level

± 50%

(d) Compliance. (1) No employee shall be exposed to monomethyl aniline above the permissible exposure as defined in paragraph (a)(1) of this section.

(2) Employee exposures to airborne concentrations of monomethyl aniline 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 monomethyl aniline.

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

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

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

(iii) To supplement engineering and work practice controls when such controls fail to reduce airborne concentrations of monomethyl aniline 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 MONOMETHYL ANILINE

CONDITION	PERMISSIBLE RESPIRATORY PROTECTION
Vapor Concentration	
20 ppm or less	Any supplied-air respirator. Any self-contained breathing apparatus.
100 ppm or less	Any supplied-air respirator with a full facepiece, helmet or hood. A Type C supplied-air respirator with half-facepiece operated in pressure-demand or other positive pressure or continuous-flow mode. Any self-contained breathing apparatus with a full facepiece.
Greater than 100 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. (Supplied-air suits may be necessary.)

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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 monomethyl aniline.

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 monomethyl aniline.

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

(3) For the purpose of compliance with § 1910.157, monomethyl aniline 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 monomethyl aniline shall be Class I, Group C.

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

(6) Sources of ignition such as smoking or open flames are prohibited where monomethyl aniline presents a fire or explosion hazard.

(7) Monomethyl aniline shall be stored so as not to come in contact with strong oxidizers and strong acids.

(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 skin contact with liquid monomethyl aniline, where skin contact may occur. Face shields shall comply with § 1910.133(a)(2), (a)(4), (a)(5), and (a)(6).

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

(3) Employers shall ensure that non-impervious clothing which becomes contaminated with monomethyl aniline be removed immediately and not reworn until the monomethyl aniline 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

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with § 1910.133 (a)(2)-(a)(6) where liquid monomethyl aniline may contact the eyes.

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

(h) Sanitation. (1) Employers shall ensure that employees whose skin becomes contaminated with monomethyl aniline immediately wash or shower with soap or mild detergent and water to remove any monomethyl aniline from the skin.

(2) Employers shall ensure that employees do not eat or smoke in areas where liquid monomethyl aniline is handled, processed or stored.

(3) Employers shall ensure that employees who handle liquid monomethyl aniline 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 monomethyl aniline 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 monomethyl aniline above the action level or employees who may have skin or eye contact with liquid monomethyl aniline, or employees who work where monomethyl aniline presents a fire or explosion hazard, shall annually:

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

(ii) Advise affected employees as to the signs and symptoms of exposure to monomethyl aniline.

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

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

(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 make available to each employee who is to be exposed to liquid monomethyl aniline or airborne concentrations of monomethyl aniline at or above the action level, a medical examination which shall include the following:

(i) A medical history and physical examination with emphasis on lungs, liver, kidneys and blood.

(ii) a complete blood count to include at least red and white cell count, differential smear, hemoglobin and hematocrit.

(3) The employer shall obtain from the physician, as a record of the examination, the following information:

(i) A written opinion which conforms with paragraph (j)(7) of this section.

(ii) A record of the results of the complete blood count.

(4) The employer shall make available to each employee, exposed to monomethyl aniline in excess of the action level at 12 months from the date

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of the employee's first exposure, and at every 12 months of exposure in excess of the action level thereafter, a medical examination which must include the following:

(i) A medical history and physical examination with emphasis on lungs, liver, kidneys and blood.

(ii) A complete blood count to include at least red and white cell count, differential smear, hemoglobin and hematocrit.

(5) The employer shall obtain from the physician, as a record of the periodic examination, the following information:

(i) A written opinion which conforms with paragraph (j)(7) of this section.

(ii) A record of the results of the complete blood count.

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

(i) A copy of this regulation with its Appendixes A, B, and C for monomethyl aniline;

(ii) A description of the employee's duties as they relate to his exposure to monomethyl aniline;

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

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

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

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

(7)(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 monomethyl aniline or would directly or indirectly aggravate any detected medical condition;

(B) Any recommended limitations upon the employee's exposure to monomethyl aniline, 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 monomethyl aniline.

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

(8) No employee shall be exposed to liquid monomethyl aniline or airborne concentrations of monomethyl aniline 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.

(9) The employer shall provide emergency and follow-up medical examinations and treatment for any employee injured through exposure to monomethyl aniline.

(10) If the examining physician chooses to use alternative medical examinations to those specified in paragraphs (j)(2) and (4) of this section, the employer may accept such alternative medical surveillance

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examinations as meeting the requirements of this part provided that the employer:

(i) Obtains a statement from the examining physician setting forth the alternative medical examinations and the rationale for substitution and evidence that they will be equally effective.

(ii) Informs each exposed employee of the fact that alternative medical examinations to those required in paragraphs (j)(2) or (4) of this section are to be made available.

(11) 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 risks involved by refusing to be examined.

(12) 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 monomethyl aniline.

(ii) This record shall include:

(A) The date of measurement;

(B) Operations involving exposure to monomethyl aniline 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;

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(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) Results of tests required by paragraph (j)(2) and (j)(5) of this section;

(B) Any employee medical complaints relative to exposure to monomethyl aniline;

(C) A copy of information provided to the physician pursuant to paragraph (j)(6)(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 monomethyl aniline which is conducted pursuant to this section.

(2) When observation of measurement of employee exposure to monomethyl aniline 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 monomethyl aniline 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 MONOMETHYL ANILINE

I. SUBSTANCE IDENTIFICATION

- A. Substance: Monomethyl aniline
- B. Permissible Exposure: 2 parts of monomethyl aniline per million parts of air (ppm) (9 milligrams of monomethyl aniline per cubic meter of air, (mg/m³)) averaged over an eight-hour work shift.
- C. Appearance and odor: Yellow to light brown liquid with a weak ammonia-like odor.

II. HEALTH HAZARD DATA

- A. Ways in Which the Chemical Affects Your Body: Monomethyl aniline can affect your body if you inhale it, if it comes in contact with your eyes or skin, or if you swallow it. It may enter your body through your skin.
- C. Effects of Overexposure:
 - 1. Short-Term Exposure: Monomethyl aniline may cause a bluish discoloration of the skin. Headache, dizziness, weakness, drowsiness, unconsciousness may also occur.
 - 2. Long-Term Exposure: None known.
 - 3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms and suspect they are caused by exposure to monomethyl aniline.

III. EMERGENCY FIRST AID PROCEDURES

- A. Eye Exposure: If monomethyl aniline gets into your eyes, wash the eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention. Contact lenses should not be worn when working with this chemical.
- B. Skin Exposure: If monomethyl aniline gets on your skin, immediately wash the contaminated skin using soap or mild detergent and water. If monomethyl aniline soaks through your clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Get medical attention.
- C. Breathing: If you or any other person breathes in large amounts of monomethyl aniline 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 monomethyl aniline has been swallowed, give the person 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

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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 monomethyl aniline. You can only be required to wear them for routine use if your employer is in the process of installing controls or control measures prove inadequate. You may be required to wear respirators for non-routine activities or in emergencies. If respirators are worn, they must have a Mining Enforcement and Safety Administration (MESA) or National Institute for Occupational Safety and Health (NIOSH) approval label. (Older respirators may have a Bureau of Mines approval label.) For effective protection, respirators must fit your face and head snugly. Respirators should not be loosened or removed in work situations where there use is required. If you can smell monomethyl aniline 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. Supplied-air suits: in some work situations the wearing of supplied-air suits may be necessary. Your employer should instruct you in their proper use and operation.
- C. Protective Clothing: You must wear impervious clothing, gloves, face shield or other appropriate protective clothing to prevent skin contact with liquid monomethyl aniline where skin contact may occur. Replace or repair impervious clothing that has developed leaks.
- D. Eye Protection: You must wear splash-proof safety goggles where liquid monomethyl aniline may contact your eyes.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

- A. Monomethyl aniline is a combustible liquid and its vapors can form explosive mixtures with air at elevated temperatures.
- B. Monomethyl aniline must be stored in tightly closed containers in a well ventilated area away from heat, sparks, flames, strong oxidizers, and strong acids.
- C. Sources of ignition such as smoking and open flames are prohibited wherever monomethyl aniline is handled, used or stored in a manner that could create a potential fire or explosion hazard.
- D. You must immediately remove any non-impervious clothing that becomes contaminated with monomethyl aniline and this clothing must not be reworn until the monomethyl aniline is removed from the clothing.
- E. If your skin becomes contaminated with monomethyl aniline, you must immediately wash or shower with soap or mild

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- detergent and water to remove the monomethyl aniline from your skin.
- F. You must not eat or smoke in areas where liquid monomethyl aniline is handled, processed or stored.
 - G. If you handle liquid monomethyl aniline, 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 monomethyl aniline is used in your work area and for any additional plant safety and health rules.

VI. ACCESS TO INFORMATION

- A. Each year your employer is required to inform you of the information contained in this Substance Safety Data Sheet for monomethyl aniline. In addition, your employer must instruct you in the safe use of monomethyl aniline, emergency procedures, and the correct use of protective equipment.
- B. Your employer is required to determine whether you are being exposed to monomethyl aniline. You or your representative have the right to observe employee exposure measurements and to record the results obtained. If your employer determines that you are being overexposed, he is required to inform you of the exposure and of the actions which are being taken to reduce your exposure.
- C. Your employer is required to keep records of exposure determinations, exposure measurements, and medical surveillance. Your employer is required to make records of exposure determinations and your exposure measurements available to you or your representative upon your request. Your employer is required to release your medical records to your physician upon your written request.

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
FOR MONOMETHYL ANILINE

I. PHYSICAL AND CHEMICAL DATA

- A. Substance Identification
 - 1. Synonyms: n-Methyl aniline; MA; methyl aniline
 - 2. Formula: $C_6H_5NH(CH_3)$
 - 3. Molecular weight: 107.2
- B. Physical Data
 - 1. Boiling point (760 mm Hg): 195.6 C (384 F)
 - 2. Specific gravity (water = 1): 0.99
 - 3. Vapor density (air = 1 at boiling point of

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- monomethyl aniline): 3.70
4. Melting point: -80 C (-112 F) (approx)
 5. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
 6. Solubility in water, % by weight at 20 C (68 F):
moderate
 7. Evaporation rate (butyl acetate = 1): Less than 1
 8. Appearance and odor: Yellow to light brown liquid with
a weak ammonia-like odor

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: 79.4 C (175 F) (closed cup)
2. Autoignition temperature: Data not available
3. Flammable limits in air, % by volume: Data not available
4. Extinguishing media: Dry chemical, carbon dioxide, alcohol
foam
5. Special fire-fighting procedures: Do not use a solid
stream of water since a stream will scatter and spread
the fire. Use water spray to cool containers exposed to
a fire.
6. Unusual fire and explosion hazards: Monomethyl aniline
is a combustible liquid. At elevated temperatures its
vapors can form explosive mixtures with air. All
ignition sources must be controlled where monomethyl
aniline is used, handled or stored in a manner that
could create a potential fire or explosion hazard.
7. For purposes of complying with the requirements of 29
CFR 1910.106, monomethyl aniline is classified as a
Class IIIA combustible liquid.
8. For purposes of complying with 29 CFR 1910.309, the
classification of hazardous locations as described in
Article 500 of the National Electrical Code for
monomethyl aniline shall be Class I Group C.

B. Reactivity

1. Conditions contributing to instability: Heat.
2. Incompatibilities: Contact of liquid with strong acids
will cause violent spattering. Contact with strong
oxidizers may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and
vapors (such as oxides of nitrogen and carbon monoxide)
may be released in a fire involving monomethyl aniline.
4. Special precautions: Liquid monomethyl aniline will
attack some forms of plastics, rubber and coatings.

III. SPILL, LEAK, AND DISPOSAL PROCEDURES

A. If monomethyl aniline is spilled or leaked, the following
steps should be taken:

1. Ventilate area of spill or leak.
2. For small quantities, absorb on paper towels. Remove to
a safe place (such as a fume hood) and burn the paper.
Large quantities can be collected and atomized in a
suitable combustion chamber equipped with an appropriate
effluent gas cleaning device.

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- B. Persons not wearing protective equipment should be restricted from areas of spills or leaks until cleanup has been completed.
- C. Waste disposal methods: Monomethyl aniline may be disposed of:
 - 1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a secured sanitary landfill.
 - 2. By atomizing in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.

IV. MONITORING AND MEASUREMENT PROCEDURES

- A. EXPOSURE ABOVE THE ACTION LEVEL: Measurements taken for the purpose of determining employee exposure under this section are best taken such that the average 8-hour exposure may be determined from a single eight-hour sample or two (2) 4-hour samples. Several short time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). 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 monomethyl aniline 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 under 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 monomethyl aniline 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 K" (Order number XXXXXXXXXXXX).
- D. QUALIFIED PERSONS: Since many of the duties relating to employee protection are dependent on the results of monitoring and measuring procedures, employers should assure that the evaluation of employee exposures is performed by a competent industrial hygienist or other technically qualified person.

V. MISCELLANEOUS PRECAUTIONS

- A. Store monomethyl aniline in tightly closed containers in a well ventilated area away from heat.
- B. Use of supplied-air suits or other impervious coverings may be necessary to prevent skin contact with monomethyl aniline where the concentration of monomethyl aniline is unknown or is greater than 100 ppm. Supplied-air suits should be

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selected, used, and maintained under the immediate supervision of persons knowledgeable in the limitations and potential life endangering characteristics of supplied-air suits.

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

VI. COMMON OPERATIONS

Common operations in which exposure to monomethyl aniline is likely to occur are: during its production and its use as an intermediate in organic synthesis.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation; skin absorption.

II. TOXICOLOGY

Monomethyl aniline vapor causes anoxia due to the formation of methemoglobin. Animal fatalities occurred from daily exposures to 7.6 ppm; signs of intoxication included prostration, labored breathing, and cyanosis; methemoglobinemia developed promptly in rabbits and cats; the rabbits also exhibited mild anemia and bone marrow hyperplasia. Autopsy of animals that died revealed pulmonary involvement ranging from edema to interstitial pneumonia, as well as occasional centrilobular hepatic necrosis, and moderate kidney damage. The liquid readily caused poisoning in animals by absorption through the skin. There have been no reported effects from industrial exposure.

III. SIGNS AND SYMPTOMS

Weakness, dizziness, headache, dyspnea, cyanosis; methemoglobinemia; may cause pulmonary edema, liver and kidney damage.

IV. SPECIAL TESTS

Methemoglobin concentration in the blood should be determined when monomethyl aniline intoxication is suspected, and at regular intervals until it has been fully reduced to normal hemoglobin.

V. TREATMENT

Remove from exposure. If swallowed and the person is conscious, induce vomiting. Give artificial resuscitation or oxygen if indicated. Any monomethyl aniline on the body must be removed. Immediately remove all contaminated clothing, including shoes, and wash entire body with plenty of soap or mild detergent and water. Scrub hands. Shampoo hair and scalp. Clean finger and toe nails. Clean nostrils and ear canals. Give oxygen and confine to bed. In case of eye splashes, flush with water. Determine methemoglobin in blood and repeat every 3 to 6 hours for 18 to

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24 hours. Repeat showers and skin cleansing if methemoglobin appears to rise after 3 to 4 hours. Consideration may be given to the intravenous administration of methylene blue at high levels of methemoglobinemia in an attempt to accelerate the conversion of methemoglobin to hemoglobin; however, the use of this agent is controversial due to its toxic effects.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

In animals, monomethyl aniline is highly toxic. It is a methemoglobin former and causes pathologic changes in many organs. Skin absorption is known to occur. It is important that the physician become familiar with plant operating conditions in which exposure to monomethyl aniline 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

The following medical procedures must be made available to each employee who is exposed to monomethyl aniline:

1. A complete history and physical examination -- The purpose is to detect preexisting conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the respiratory system, liver, kidneys and blood should be stressed.
2. Complete blood count -- Monomethyl aniline has been shown to cause methemoglobinemia and anemia in animals. A complete blood count must be performed to include red and white cell count, a differential count of a stained blood smear, as well as hemoglobin and hematocrit.

C. PERIODIC EXAMINATIONS

The above medical examinations are to be repeated on an annual basis.

VII. REFERENCES

1. American Conference of Governmental Industrial Hygienists: "Monomethyl Aniline," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, p. 174.
2. Treon, J.F., et al: "The Toxic Properties of Xylidine and Monomethylaniline," AMA Archives of Industrial Hygiene and Occupational Medicine, 1:506-524, 1950.

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3. Mangelsdorff, A.F.: "Treatment of Methemoglobinemia," AMA Archives of Industrial Health, 14:148-153, 1956.

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REFERENCES AND SOURCES
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- (e) Fire and Safety
(1) Electrical - Classification based on "Fire Hazard Classification of Chemical Vapors Relative to Explosion-proof Electrical Equipment," H. Carhart et al., National Academy of Sciences, 1973, report to U. S. Coast Guard, report no. CG-D-92-74, p. 31 (secondary amine).
- (f) Personal Protective Equipment, and, (h) Sanitation
Eye: Sax, "Dangerous Properties of Industrial Materials;" Grant, "Toxicology of the Eye"
Skin: Spector, "Handbook of Toxicology;" Treon et al., "The Toxic Properties of Xylidine and Monomethyl Aniline," J. of Ind. Hyg. and Toxicology, 31(1), 1 - 20, 1949
Ingestion: "Documentation of TLV," Gleason, "Clinical Toxicology of Commercial Products;" Treon et al., "The Toxic Properties of Eylidine and Monomethyl Aniline," J. of Ind. Hyg. and Toxicology, 31(1), 1 - 20, 1949

COMMENTS

Eyes - Classification: 2

Output statement numbers: 10

Exceptions: None

Sax states the toxicity of monomethyl aniline to be comparable to that of aniline. On this latter compound Grant notes, "experimental testing by bathing rabbit eyes for ten minutes with 0.02 M aqueous solutions of pure aniline adjusted with hydrochloric acid to pH 4.5 and to pH 7.25 after mechanical removal of the corneal epithelium caused no permanent damage or discoloration." He continues, "it is doubtful that aniline poisoning has a specific effect on the eye, apart from the discoloration of the blood seen in the vessels of the conjunctiva and fundus." By analogy to aniline, the substance is given a classification of 2.

Skin - Classification: 2

Output statement numbers: 2, 7a, 14g, 14i, 20a

Exceptions: See below

A rabbit cutaneous LD of 3000 mg/kg is given by Spector. Treon et al. note "monomethyl aniline penetrated the intact skin of rabbits in sufficient quantity to cause cyanosis and death, without any local effects on the skin. . . ." They continue, "contact of rabbit skin with 0.10 to 0.16 g/kg of monomethyl aniline for one hour on each of five days per week over a period of ten weeks, had no deleterious effects, but death occurred among others subjected correspondingly to applications of 0.22 to 0.72 g/kg." "Microscopic evidence of degenerative change was found in the brain, heart muscle, lungs, liver, and kidneys of some of these animals, without any apparent correlation of their presence or absence with the death or survival of the animals." The flash point of the substance is 206 F. It is moderately soluble in water and has a vapor

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pressure of 1 mm Hg at 36 C.

The observed effects of skin absorption indicate that a classification of 2 is appropriate if contact is prevented where it "may occur" and statements 14g and 14i are used instead of those numbered 16 or 17.

Ingestion - Classification: 1

Output statement numbers: 19, 20a

Exceptions: None

Gleason reports "intoxication results in weakness, headache, dizziness, convulsions and collapse." According to Treon et al., "three rabbits survived without illness during a period in which each was given orally 24 mg/kg of monomethyl aniline on 5 days of each week until each had been given 100 doses." Also noted is that "methemoglobinemia was induced in rabbits, following a single oral administration of monomethyl aniline . . . large numbers of Heinz bodies were found in the erythrocytes of rabbits following oral or intravenous administration . . . rabbits developed marked but temporary anemia following oral administration of a single dose of 0.18 gram of monomethyl aniline per kilogram . . . microscopic examination of the bone-marrow and spleen of animals given monomethyl aniline gave evidence of stimulated hemopoiesis . . . (and) extensive vascular damage was found on gross and microscopic examination of tissues of animals." A classification of 1 is concluded to be warranted.

SUBSTANCE TECHNICAL GUIDELINES

The references cited for this document include:

American Cyanamid Co., Product Data Sheet and Material Safety Data Sheet (Cyan)

Kirk-Othmer, "Encyclopedia of Chemical Technology," 1st edition, Vol. 1, p. 923 (K-O)

"Beilstein's Handbuch der Organischen Chemie," Vol. 12, p. 136 and supplements (Beil)

Sources of data items used:

- I. A. 1. Synonyms: Cyan; K-O
- 2. Formula: Cyan
- 3. Molecular weight: Cyan
- B. 1. Boiling point: Cyan
- 2. Specific gravity: Cyan
- 3. Vapor density: Cyan
- 4. Melting point: Beil
- 5. Vapor pressure: Cyan
- 6. Solubility in water: Cyan
- 7. Evaporation rate: Cyan
- 8. Appearance and odor: Cyan
- II. A. 1. Flash point: Cyan
- 2. Autoignition temperature: Not available
- 3. Flammable limits: Not available
- 4. Extinguishing media: Cyan
- 5. Special fire fighting procedures: ADL
- 6. Unusual fire and explosion hazards: ADL
- B. 1. Conditions contributing to instability: ADL; Cyan

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- 2. Incompatibilities: Cyan
- 3. Hazardous decomposition products: Cyan
- 4. Special precautions: ADL
- III. A. Steps if released or spilled: ADL
- C. Waste disposal method: Cyan
- V. Miscellaneous precautions: ADL

USE/EXPOSURE AND CONTROL DOCUMENT

References used in the preparation of this document include:

Hawley, G., "The Condensed Chemical Dictionary," 8th edition, Van Nostrand-Reinhold, New York, 1971 (Hawley)

"Monomethylaniline," Material Safety Data Sheet 263. Cyanamid, April 19, 1972 (Cyanamid)

References for Specific Use/Exposure

- 1. ADL estimate
- 2. ADL estimate, Hawley

References for Specific Control Methods

- 1. Cyanamid
- 2. Cyanamid

RESPIRATOR TABLE DOCUMENTATION

SUBSTANCE: Monomethyl Aniline

D. O. L. STANDARD: 2 ppm

WARNING PROPERTIES:

Odor Threshold: Cyanamid's Material Safety Data Sheet states that monomethyl aniline has a "moderate aniline-type odor," but no quantitative information is available concerning the odor threshold.

Eye Irritation Level: Monomethyl aniline vapor is not a known eye irritant.

Evaluation of Warning Properties: Since there is no available information relating warning properties of monomethyl aniline to air concentrations, monomethyl aniline is considered to have poor warning properties. Gas sorbent respiratory equipment is not permitted.

IDLH: 100 ppm

Basis for IDLH Value: The IDLH of 100 ppm is set by analogy to aniline.

Other Toxicological Information: The Documentation of TLV's reports that Treon found "death among rabbits, guinea pigs and rats after 130 or fewer seven-hour exposures at 7.6 ppm, and among cats after 58 exposures at 27 ppm. A dog, however, survived 50 exposures at 86 ppm, and animals of several species, including a monkey, survived 130 seven-hour exposures at 2.4 ppm."

The Documentation of TLV's notes that "Eckardt and Hammond, on the basis of industrial experience, suggested higher limits: 5 ppm and 25 ppm, respectively."

According to Spector, a lethal dose for rabbits from skin absorption is 3000 mg/kg. Treon et al. note that monomethyl aniline "can penetrate the intact skin of animals without causing local damage." According to the investigators, "the application of 3 grams or more of monomethyl aniline . . . per kilogram, upon the intact skin of a rabbit for an hour or more always resulted fatally."

LFL: Data not available

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VAPOR PRESSURE AT 20 DEG. C.: less than 1 mm Hg

SATURATED CONCENTRATION AT 20 DEG. C.: less than 1316 ppm

Reference: Treon, J. F., Deichmann, W. B., Sigmon, H. E., Wright, H.,
Witherup, S. O., Heyroth, F. F., Kitzmiller, K. V. and
Keenan, C., "The Toxic Properties of Xylidine and
Monomethyl Aniline," J. Ind. Hyg. and Tox., 31:1, 1949.

NOTE: Acute toxicological information needs to be obtained for this substance
accurate IDLH.

NOTE: Since all organic vapor cartridges may not be efficient in removing monomethyl
aniline only those cartridges and canisters which provide protection against
monomethyl aniline are permitted.

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Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1. Skin contact with liquid during synthesis of substance	A,D	Process enclosure; personal protective equipment (gloves, goggles, protective clothing)
2. Skin contact with liquid during organic synthesis (possibly dye intermediates)	A,D	Process enclosure; personal protective equipment (gloves, goggles, protective clothing)

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