

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND
SUPPORTING DOCUMENTATION FOR

*** 5-METHYL - 3-HEPTANONE ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for 5-METHYL - 3-HEPTANONE

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 5-METHYL - 3-HEPTANONE.

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 - "Permissible Exposure" means inhalation of 5-methyl-3-heptanone in concentrations not in excess of 25 parts per million (ppm) (130 milligrams per cubic meter, mg/cu.m.) averaged over an 8-hour work shift, as stated in section 1910.93, Table G-1.
- (2) ACTION LEVEL - "Action Level" means one half (1/2) of the permissible exposure for 5-methyl-3-heptanone.

(b) EMPLOYEE INFORMATION - Each employer who has a workplace in which 5-methyl-3-heptanone is present shall:

- (1) STANDARD AVAILABILITY - Keep a copy of this section with its appendices at the workplace. This material shall be made readily available to affected employees; and
- (2) PRESENCE OF 5-METHYL 3 HEPTANONE - Inform affected employees of the quantity, location, and manner of use or storage of 5-methyl-3-heptanone.

(c) EXPOSURE MEASUREMENT

- (1) INITIAL DETERMINATION - Each employer who has a place of employment in which 5-methyl-3-heptanone is released into the workplace air shall determine if any employee may be exposed to airborne concentrations of 5-methyl-3-heptanone 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 5-methyl-3-heptanone. A written determination shall be made and it shall contain at least the following information:
 - (i) Any information, observations, or calculations which would indicate employee exposure to 5-methyl-3-heptanone;
 - (ii) Any measurements of airborne concentrations of 5-methyl-3-heptanone taken;
 - (iii) Any employee complaints of symptoms which may be attributable to exposure to 5-methyl-3-heptanone; and
 - (iv) Date of determination, work being performed at the time, location within work site, name, and social security number of each employee considered.
- (2) INITIAL EXPOSURE MEASUREMENT - If the employer determines that any employee may be exposed to airborne concentrations of 5-methyl-3-heptanone at or above the action level, the exposure of the employee believed to have the greatest exposure shall be measured. The exposure measurement shall be representative of the maximum exposure of the employee.
- (3) IDENTIFICATION OF EXPOSED EMPLOYEES - If the exposure measurement taken under paragraph (c)(2) of this section reveals employee exposure to airborne concentrations of 5-methyl-3-heptanone 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.
- (4) TERMINATION OF EXPOSURE MEASUREMENT - If two consecutive employee exposure measurements taken at least one week apart reveal that the employee is exposed to airborne concentrations of 5-methyl-3-heptanone below the action level, the employer may terminate measurement for the employee. For purposes of this subparagraph,

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use of respirators shall not constitute reduction of employee exposure below the action level.

- (5) EXPOSURE ABOVE THE ACTION LEVEL - If an employee exposure measurement reveals that an employee is exposed to airborne concentrations of 5-methyl-3-heptanone 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) EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE - If an employee exposure measurement reveals that an employee is exposed to airborne concentrations of 5-methyl-3-heptanone above the permissible exposure, the employer shall:
- (i) Inform the employee of the exposure as required by paragraph (N)(1) of this section; and
 - (ii) Measure the exposure of the employee at least monthly; and
 - (iii) Institute control measures as required by paragraph (E) of this section.
- (d) METHODS OF MEASUREMENT - 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 (Appendix B (iv)). The method of measurement shall have an accuracy, to a confidence level of 95%, of not less than that given in Table 1 below.

Table 1

Concentration	Required Accuracy
Above permissible exposure	Plus or Minus 25%
At or below permissible exposure and above the action level	Plus or Minus 35%
At or below the action level	Plus or Minus 50%

(e) Methods of compliance

- (1) Engineering controls - No employee shall be exposed to 5-methyl-3-heptanone above the permissible limit as defined in paragraph (a)(1) of this section. Engineering and work practice controls shall be used to reduce exposure to 5-methyl-3-heptanone to at or below the permissible exposure.
- (i) When mechanical ventilation is used to control exposure, measurements which demonstrate system efficiency (For example: air velocity, static pressure, or air volume) shall be made at least every three months. Measurements of system efficiency shall also be made within five work days of any change in production, process, or control which might result in a reduction in control.
 - (ii) Where a fan is located in duct work and where 5-methyl-3-heptanone is present in concentrations greater than 3500 ppm, the fan rotating element shall be of nonsparking material or the casing shall consist of, or be lined with, nonsparking material. There shall be sufficient clearance between the fan rotating element and the fan casing so as to prevent contact.
- (2) Respirators
- (i) Compliance with the permissible exposure may not be achieved by the use of respirators except:
 - (a) During the time period necessary to install engineering controls; or

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- (b) In work situations in which engineering controls are technically not feasible; or
- (c) In work situations in which feasible engineering and work practice controls are insufficient to reduce employee exposure to at or below the permissible exposure. Where technically feasible engineering and work practice controls are not sufficient to reduce exposure to at or below permissible exposure, they shall be used to reduce exposure to the lowest level feasible; or
- (d) For operations not exceeding 40 hours per year; or
- (e) In emergencies.
- (ii) Respirators shall be jointly approved by the Mining Enforcement and Safety Administration (formerly Bureau of Mines) and by the National Institute for Occupational Safety and Health under the provisions of 30 CFR Part 11.
- (iii) Employers shall select and provide the appropriate respirator from Table 2 and shall ensure that the employee uses the respirator provided.
- (iv) Employers shall institute a respiratory protection program in accordance with sections 1910.134(b),(d),(e),(f) and (g).

TABLE 2. RESPIRATORY PROTECTION FOR 5-METHYL-3-HEPTANONE

Condition	Permissible Respiratory Protection
Vapor Concentration	
Equal to or Less than 1000 ppm	Chemical-cartridge respirator with organic vapor cartridge(s) with full facepiece. A gas mask with a chin style or front- or back-mounted organic vapor canister. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
Equal to or Less than 3000 ppm	A Type C supplied-air respirator with full facepiece operated in pressure-demand (positive pressure) mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 3000 ppm, or Entry and Escape from Unknown Concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand (positive pressure) mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand (positive pressure) mode or continuous-flow mode and an auxiliary

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self-contained air supply operated in pressure-demand (positive pressure) mode.

Fire Fighting

Self-contained breathing apparatus with a full facepiece operated in pressure-demand (positive pressure) mode.

Escape

Any gas mask providing protection against organic vapors.
Any escape self-contained breathing apparatus.

(f) Fire and Safety

Employers shall familiarize themselves with the information contained in the substance technical guidelines for 5-methyl-3-heptanone which is contained in Appendix B in order to ensure the safe handling of 5-methyl-3-heptanone.

- (1) Electrical - For the purposes of compliance with section 1910.309, locations classified as hazardous locations due to the presence of 5-methyl-3-heptanone shall be Class I Group D.
- (2) Portable fire extinguishers - For the purposes of compliance with section 1910.157, 5-methyl-3-heptanone is classified as a Class B fire hazard.
- (3) Powered industrial trucks - For the purposes of compliance with section 1910.178, locations classified as hazardous locations due to the presence of 5-methyl-3-heptanone shall be Class I Group D.
- (4) Combustible Liquids - For the purposes of compliance with section 1910.106, 5-methyl-3-heptanone is classified as a Class II combustible liquid.
- (5) Sources of ignition - Sources of ignition such as smoking or open flames are prohibited where 5-methyl-3-heptanone is used, handled, or stored in a manner so as to create a potential fire or explosion hazard.

(g) Personal Protective Equipment

(1) Skin Contact

- (i) Where repeated or prolonged skin contact to liquid 5-methyl-3-heptanone occurs, employers shall provide, and require employees to use, impervious clothing, gloves, face shields (8 inch minimum) and other appropriate protective clothing necessary to protect any area of the body which may come in contact with liquid 5-methyl-3-heptanone. Face shields shall comply with section 1910.133(a)(6).
- (ii) Employers shall ensure that clothing contaminated with liquid 5-methyl-3-heptanone not be allowed to remain in contact with the body. Contaminated clothing may not be reused until the 5-methyl-3-heptanone has been removed.
- (iii) Employers shall ensure that clothing contaminated with liquid 5-methyl-3-heptanone is placed in closed containers. Employers shall provide for the cleaning or disposal of such clothing and if the clothing is to be laundered or otherwise

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cleaned, shall inform the person performing this operation of the hazardous properties of 5-methyl-3-heptanone.

- (2) Eye Contact
 - (i) Employers shall provide, and require employees to use, splash-proof safety goggles (cup-cover type dust and splash safety goggles), which comply with section 1910.133(a)(6), where liquid 5-methyl-3-heptanone may contact the eyes.
- (h) Spills
 - (1) Spills of 5-methyl-3-heptanone shall be cleaned up immediately after eliminating potential sources of ignition and utilizing available ventilation.
 - (2) Liquid 5-methyl-3-heptanone may not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.
- (i) Sanitation
 - (1) When an employee's skin has been contaminated with liquid 5-methyl-3-heptanone, employers shall ensure that the employee wash or shower to remove any 5-methyl-3-heptanone from the skin.
 - (2) Where skin contamination may occur and showers are required for adequate cleaning of the body, employers shall provide showers as described in section 1910.141(d)(3).
- (j) Training and Information - Each employer who has employees exposed to 5-methyl-3-heptanone in excess of the action level, or employees who may have skin or eye contact with liquid 5-methyl-3-heptanone, or employees who work where accidental release, spill, fire, or explosion of 5-methyl-3-heptanone may occur, shall annually:
 - (1) Substance Safety Data Sheet - Inform each employee of the information contained in the Substance Safety Data Sheet for 5-methyl-3-heptanone, which is contained in Appendix A; and
 - (2) Medical -
 - (I) Advise employees as to the signs and symptoms of exposure to 5-methyl-3-heptanone.
 - (II) Instruct the employees to advise the employer of the development of signs and symptoms of exposure to 5-methyl-3-heptanone which are listed in Appendix A.
 - (III) Instruct the employees to inform the employer if they develop any of the medical conditions listed in (k)(2) of this section; and
- (3) Procedures -
 - (I) Provide training to ensure that employees understand the precautions of safe use, emergency procedures, and the correct use of protective equipment relative to 5-methyl-3-heptanone.
 - (II) The procedures required by (j)(1), (2), and (3)(I) shall be provided to employees at the expense of the employer during the employee's normal working hours. (k) Medical Surveillance
 - (1) The employer shall provide medical procedures as required by paragraph (k). These procedures shall be provided at no cost to the employee.
 - (2) Preplacement Questionnaire - The employer shall obtain from each employee who will be exposed to liquid 5-methyl-3-heptanone, or airborne concentrations of 5-methyl-3-heptanone at or above the action level, a

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written statement as to whether such employee has a history of any of the following:

- (i) Kidney disease
- (ii) Liver disease
- (iii) Chronic lung disease
- (iv) Skin disease
- (v) Eye disease

(3) **Preplacement Medical Examination** - The employer shall provide a medical examination for an employee if the employee provides a history of any of the conditions named in paragraph (k)(2).

(4) **Results of Preplacement Examination** - The employer shall obtain a physician's written opinion based on the medical examination pursuant to paragraph (k)(3).

(5) **Periodic Medical Examinations** - The employer shall provide a medical examination for an employee if the employee advises the employer of the development of:

- (i) Any of the medical conditions listed in (k)(2), and
- (ii) A description of the employee's duties as they relate to his exposures to 5-methyl-3-heptanone;
- (iii) A description of any personal protective equipment required to be
- (iv) The results of any employee's exposure measurement, if available;
- (v) The employee's anticipated exposure level; and
- (vi) Upon request of the physician, information from previous medical examination of the employee.

(6) **Results of Periodic Examinations** - The employer shall obtain a physician's written opinion based on the medical examination pursuant to paragraph (k)(5).

(7) **Exclusion or removal from Exposure** - No employee shall be exposed to 5-methyl-3-heptanone if such exposure could place the employee at increased risk of material impairment of his health.

(8) **Emergency Procedures** - The employer shall provide emergency and follow-up medical examinations and treatment for any employee injured through exposure to 5-methyl-3-heptanone.

(9) **Informing the Physician** - The employer shall provide to the examining physician the following information:

- (i) a copy of this regulation for 5-methyl-3-heptanone;
- (ii) a description of the employee's duties as they relate to his exposure to 5-methyl-3-heptanone;
- (iii) a description of any personal protective equipment required to be
- (iv) the results of any employee's exposure measurement, if available;
- (v) the employee's anticipated exposure level; and
- (vi) upon request of the physician, information from previous medical examination of the employee.

(10) **Physician's Written Opinion**

(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 conditions which could be directly or indirectly aggravated by exposure to 5-methyl-3-heptanone or which could significantly interfere with the ability of the employee to follow recommended or required procedures for protecting himself from unusual or emergency exposure.

(b) Any recommended limitations upon the employee's exposure to

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

(ii) The written opinion shall not reveal medical information unrelated to exposure to 5-methyl-3-heptanone.

(11) Refusal to be Medically Examined - 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.

(1) Recordkeeping.

(1) Initial determination.

(i) The employer shall keep an accurate record of all initial determinations required to be made pursuant to paragraph (c)(1) of this section.

(ii) The record shall include the written determination and any supporting documentation as required in paragraph (c)(1) of this section.

(iii) This record shall be maintained for at least one year.

(2) Exposure measurements.

(i) The employer shall keep an accurate record of all measurements taken to determine employee exposure to 5-methyl-3-heptanone.

(ii) This record shall include:

(a) The date of measurement;

(b) A reference to the subparagraph of this regulation which required the measurement, if any;

(c) Operations involving exposure to 5-methyl-3-heptanone which are being monitored;

(d) Sampling and analytical methods used and evidence of their accuracy;

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

(f) Name, Social Security number, and exposure of the employee monitored.

(iii) This record shall be maintained for one year.

(3) Mechanical ventilation.

(i) When mechanical ventilation is used as an engineering control, the employer shall maintain a record of measurements demonstrating the effectiveness of such ventilation as required by paragraph (e)(1)(i) of this section.

(ii) This record shall include:

(a) Date of measurement;

(b) Type of measurement taken;

(c) Result of measurement.

(iii) This record shall be maintained for one year.

(4) Training and information.

(i) The employer shall keep an accurate record of all employee training and advice required by paragraph (j) of this section.

(ii) The record shall include:

(a) Date of training;

(b) Name and Social Security number of employees trained;

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- (c) Substance of training provided.
- (iii) This record shall be maintained for at least one year.
- (5) Medical records.
 - (i) The employer shall keep an accurate medical record for each employee.
 - (ii) The record shall include:
 - (a) Physician's written opinion;
 - (b) Preplacement questionnaire;
 - (c) Any employee medical complaints relative to exposure to 5-me
 - (d) A signed statement of any refusal to be examined;
 - (e) A copy of information provided to the physician pursuant to paragraph (k)(9) of this section.
 - (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 and the Director.
 - (ii) Employee 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.
- (m) Observation of monitoring.
 - (1) Duty.

The employer shall give affected employees or their representatives an opportunity to observe any monitoring of employee exposure to 5-methyl-3-heptanone which is conducted pursuant to this section.
 - (2) Exercise of opportunity to observe monitoring.
 - (i) When observation of the monitoring of employee exposure to 5-methyl-3-heptanone requires entry into an area where the use of personal protective devices is required, the observer shall use such equipment and comply with all other applicable safety procedures.
 - (ii) Without interfering with the measurement, observers shall be entitled to:
 - (a) Receive an explanation of the measurement procedures;
 - (b) Visually observe all steps related to the measurement of exposure to 5-methyl-3-heptanone that are being performed at the place of exposure.
 - (c) Record the results obtained.
- (n) Employee notification.
 - (1) The employer shall notify in writing, within five work days, every employee who is found to be exposed to 5-methyl-3-heptanone above the permissible exposure. The employee shall also be notified of the level of his exposure and the corrective action being taken to reduce the exposure to at or below the permissible exposure.
 - (2) Pursuant to paragraph (k) of this Section, when an employee is medically examined the employer shall provide the employee with a copy of the physician's written opinion.

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APPENDIX A

SUBSTANCE SAFETY DATA SHEET

I. SUBSTANCE IDENTIFICATION

SUBSTANCE: 5-methyl-3-heptanone

PERMISSIBLE EXPOSURE: 25 parts of 5-methyl-3-heptanone vapor per million parts of air (ppm) or 130 milligrams of 5-methyl-3-heptanone per cubic meter of air (mg/cu m)

APPEARANCE AND ODOR: Ethyl sec-amyl ketone is a colorless liquid with a mild, fruity odor.

II. HEALTH HAZARD DATA

A. Ways in Which The Chemical Affects Your Body: 5-methyl-3-heptanone can affect your body if you inhale it, swallow it, or if it comes in contact with your skin or eyes.

B. Effects of Overexposure:

1. Short-Term Effects: 5-methyl-3-heptanone may irritate your eyes, nose and throat, and may cause headache, and dizziness. At very high air concentrations the vapor may cause unconsciousness in a short time.
2. Long-Term Effects: Prolonged or repeated skin contact may cause dryness and irritation of your skin.
3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms associated with 5-methyl-3-heptanone exposure.

III. EMERGENCY FIRST AID PROCEDURES

A. Eye Exposure: If 5-methyl-3-heptanone gets into your eyes, wash your eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention as soon as possible. Contact lenses should not be worn when working with this chemical.

B. Skin Exposure: If 5-methyl-3-heptanone gets on your clothing or skin remove and clean the contaminated clothing and flush the contaminated skin with water. When there is evidence of skin irritation, get medical attention.

C. Breathing: If you or any other person breathes in large amounts of 5-methyl-3-heptanone remove the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the

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

- D. Swallowing: If the person is not unconscious and 5-methyl-3-heptanone has been swallowed, you should try to make the individual vomit immediately by giving him large amounts (one pint or more) of warm salt water (two tablespoons of salt per pint of water) or by having the person stick his finger down his throat. Get medical attention as soon as possible.
- 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 rescue equipment before the need arises.

IV. RESPIRATORS AND PROTECTIVE CLOTHING

- A. RESPIRATORS: Respirators are not the best way to control exposure to 5-methyl-3-heptanone. You can only be required to wear them for routine use if your employer is in the process of installing controls or other 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)/-National Institute for Occupational Safety and Health (NIOSH) approval label. (Older respirators may have a Bureau of Mines approval label.) If you can smell 5-methyl-3-heptanone 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, faceshields and other appropriate protective clothing over any parts of your body which could repeatedly be exposed to 5-methyl-3-heptanone liquid, vapor, or mist.
- C. EYE PROTECTION: You must wear splash-proof safety goggles if it is possible that 5-methyl-3-heptanone liquid vapor, or mist may get into your eyes.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

Ethyl sec-amyl ketone is combustible and must be stored in tightly closed containers, in a cool well-ventilated area, away from strong oxidizing agents. You must not smoke where 5-methyl-3-heptanone is used or stored. Metal 5-methyl-3-heptanone storage containers must be grounded and bonded when transferring liquids and must be opened and closed with non-sparking tools. If your clothing becomes wet with 5-methyl-3-heptanone you must remove the wet clothing and not wear it again until the 5-methyl-3-heptanone has been removed. If your skin becomes wet with 5-methyl-3-heptanone, you must wash or shower. If you handle 5-methyl-3-heptanone, you must wash your hands thoroughly before eating, smoking or using toilet facilities. Fire extinguishers, where provided, should be readily available and you should know where they are and how to use them. Ask your supervisor where 5-methyl-3-heptanone is used in your work area and for any additional plant safety rules.

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APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
5-METHYL-3-HEPTANONE

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: ethyl sec-amyl ketone, ethyl amyl ketone, amyl ethyl ketone
2. Formula: $C_8H_{16}O$

B. PHYSICAL DATA

1. Boiling point (760 mm Hg): 159 C (318 F)
2. Specific gravity (H₂O=1): 0.82
3. Vapor density (air=1): 4.4
4. Melting point: -57 C (-70 F)
5. Vapor pressure at 20 C (68 F): 2 mm Hg
6. Solubility in water, % by weight at 20 C (68 F): 0.26
7. Evaporation rate (butyl acetate=1): 0.26
8. Appearance and odor: Colorless liquid with mild fruity odor

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: 43.3 C (110 F) (Tag closed cup)
2. Autoignition temperature: Data not available
3. Flammable limits in air, % by volume: Data not available
4. Extinguishing media: Carbon dioxide, dry chemical, or foam
5. Special fire-fighting procedures: Do not use solid stream of water, since stream will scatter and spread fire. Use water spray to keep fire-exposed containers cool.
6. Unusual fire and explosion hazards: 5-methyl-3-heptanone is a combustible liquid. Its vapors can form explosive mixtures at elevated temperatures. All ignition sources must be controlled when 5-methyl-3-heptanone is used, handled, and stored. 5-methyl-3-heptanone vapors are heavier than air; thus the vapors may travel along the ground and be ignited by open flames or sparks at locations remote from the site at which the 5-methyl-3-heptanone is handled.
7. For purposes of conforming to the requirements of 29 CFR 1910.106, 5-methyl-3-heptanone is classified as a Class II combustible liquid.
8. For the purposes of complying with 29 CFR 1910.309, the classification of hazardous locations as described in Article 500 of the National Electrical Code for 5-methyl-3-heptanone shall be Class I, Group D.

B. Reactivity

1. Conditions contributing to instability: heat

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2. Incompatibilities: Contact with oxidizing agents may cause fire and explosion.
3. Hazardous Decomposition Products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving 5-methyl-3-heptanone.
4. Special Precautions: none

III. SPILL OR LEAK PROCEDURES

- A. If 5-methyl-3-heptanone is spilled or leaked, the following steps should be taken:
 1. Remove all ignition sources
 2. Ventilate enclosed spaces
 3. Flush 5-methyl-3-heptanone with large amounts of water spray. Ethyl sec-amyl ketone should not be flushed into a confined space as there may be danger of explosion.
- B. Persons not wearing protective equipment should be restricted from areas of spills until cleanup has been completed.
- C. Waste Disposal Methods: 5-methyl-3-heptanone may be disposed of:
 1. By absorbing it in dry sand or earth and disposing in a sanitary land fill.
 2. If small quantities, by removing it to a safe location away from building or other combustibles, pouring it on dry sand or earth and cautiously igniting it.
 3. If large quantities, by atomizing into a suitable combustion chamber. It may be necessary to blend with a more flammable liquid in order to burn effectively.

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 in a fashion such that the average 8-hour exposure may be determined from a single sample or two (2) 4-hour samples. Short term interval samples (up to 30 minutes) may also be used to determine average exposure level if a minimum of five (5) measurements are taken in a random manner over the 8-hour work shift. Random sampling means that any portion of work shift has the same chance of being sampled as any other. The arithmetic average of all such random equal duration samples taken on one (1) work shift is an estimate of an employee's average level of exposure for that work shift. 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, gas and vapor adsorption tubes with subsequent chemical analyses, or dosimeters. The method of measurement must determine the concentration of 5-methyl-3-heptanone to plus or minus 35%.
- b. EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE: The monitoring under this section should be essentially the same as described under paragraph IV. a. Laboratories performing chemical analyses should be accredited in Industrial Hygiene Chemistry by the American Industrial Hygiene Association (AIHA). The method of measurement must determine the concentration of 5-methyl-3-heptanone to plus or minus 25%. Methods meeting these accuracy requirements are available in the "NIOSH Monitoring Methods Manual".

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V. MISCELLANEOUS PRECAUTIONS

- A. High exposures to 5-methyl-3-heptanone can occur when transferring the liquid from one container to another.
- B. Non-sparking tools should be used to open metal 5-methyl-3-heptanone containers which should then be effectively grounded and bonded prior to pouring.
- C. Store 5-methyl-3-heptanone in closed containers in a cool, well-ventilated area.
- D. Employers must advise employees of all plant areas and operations where exposure to 5-methyl-3-heptanone could occur.

VI. COMMON OPERATIONS

Ethyl sec-amyl ketone may be found in surface coating and silk screen printing operations, in the rubber industry, and as a chemical intermediate.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. Route of Entry

Inhalation; insignificant skin absorption.

II. Toxicology

There is local irritation of tissues by solvent effect of 5-methyl-3-heptanone on lipids. Central nervous system depression may occur on exposure to high concentration, producing narcosis. No chronic effects are reported.

III. Signs and Symptoms

Intense irritation of eyes and mucous membranes of upper respiratory tract; headache; narcosis leading to coma may occur at sustained high levels of exposure. Excessive skin contact may produce a dermatitis.

IV. Special Tests

None in common usage.

V. Treatment

None specific. Remove from exposure, give artificial resuscitation if indicated and wash eyes and contaminated skin. Recovery is usually rapid and complete.

VI. Surveillance and Preventive Considerations

A. General

Most reported effects of 5-methyl-3-heptanone are caused by its irritant properties. It is important that the physician becomes familiar with plant operating conditions in which exposure to 5-methyl-3-heptanone occurs. Those with skin disease may not tolerate the wearing of protective clothing and those with chronic respira-

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

1. Renal disease -- Although 5-methyl-3-heptanone is not known as a kidney toxin, the importance of the organ in the elimination of toxic substances justifies special consideration in those with possible impairment of renal function.
2. Chronic respiratory disease -- In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of 5-methyl-3-heptanone might cause exacerbation of symptoms due to its irritant properties or psychic reflex bronchospasm.
3. Liver disease -- Although 5-methyl-3-heptanone is not known as a liver toxic in humans, the importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.
4. Skin disease -- Ethyl sec-amyl ketone is a defatting agent and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of 5-methyl-3-heptanone.

C. Periodic Examinations

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

References

1. Patty, Frank A.: Industrial Hygiene and Toxicology, Volume II - Toxicology, Interscience Publishers, New York, 1962, pp. 1734-1735.
2. Thienes, Clinton H., and Thomas J. Haley: Clinical Toxicology (Fifth edition), Lea & Febiger, Philadelphia, 1972, p. 137.

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REFERENCES AND SOURCES
SEC-AMYL KETONE

1910.93

(f) Personal protective equipment, and, (h) Sanitation

Eye: Patty, "Industrial Hygiene and Toxicology"

Skin: Patty, "Industrial Hygiene and Toxicology"

"Ethyl Amyl Ketone," Shell Chemical Company

Ingestion: Patty, "Industrial Hygiene and Toxicology"

"Ethyl Amyl Ketone" Shell Chemical Company

COMMENTS

Eye - Classification: 2

Output statement numbers: 10

Exceptions: None

Patty states that 5-methyl-3 heptanone "is capable of producing mild irritation and some transient corneal injury. To a large extent the degree of severity of the reaction of this chemical with the eye depends on its concentration and on the length of contact. Patty notes that "prompt flushing of contaminated eyes reduces the injury."

Since any injury caused is transient and irritation caused is mild, the compound is assigned a classification of 2.

Skin - Classification: 2

Output statement numbers: 2, 7b, 16g, 16i

Exceptions: 20a

Patty reports "upon the skin it is only a mildly irritating compound, however continuous or frequently repeated contact with the liquid may lead to a drying or cracking of the skin." The Shell Chemical Company lists a rabbit dermal LD50 of greater than 16 ml/kg.

The vapor pressure of the substance is 2 mm Hg at 20 degrees C. It is 0.26% soluble in water, and has a flash point of 110 degrees F.

A classification of 2 is concluded to be fully appropriate if statement 20a is not used. The amounts of chemical towards which this statement is directed should not have a significant, if any, effect.

Ingestion - Classification: 0

Output statement numbers: None

Exceptions: None

Patty lists mouse and guinea pig oral LD50 values of 3.8 g/kg and 2.5 g/kg respectively and notes "the material has a low acute oral toxicity." He found excessive administrative results in "nausea, headache, incoordination . . . with local irritation of the gastric mucosa and a slight discoloration of the liver, spleen and kidney." The Shell Chemical Company gives a rat LD50 of 3.5 g/kg.

The toxicity of this substance appears to be too low for ingestion, in the context of this standard, to present a hazard in the industrial environment.

RESPIRATOR TABLE DOCUMENTATION

SUBSTANCE: Ethyl sec-amyl Ketone (5-methyl-3-heptanone)

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D. O. L. STANDARD: 25 ppm

WARNING PROPERTIES:

Odor Threshold: The Documentation of TLV's reports that Shell Chemical Corporation determined the odor threshold of ethyl sec-amyl ketone (5-methyl-3-heptanone) to be 6 ppm.

Irritation Levels: According to the Documentation of TLV's, "Shell Chemical Corporation presented the following observations in respect to sensory responses by unconditioned personnel during or following five-minute exposures to the vapor:

. . . 50% Threshold, eye irritation 50 ppm
50% Threshold, nose irritation 50 ppm"

The irritation of the nose and eyes is, according to the Documentation, transient.

Evaluation of Warning Properties: Since ethyl sec-amyl ketone has an odor threshold which is lower than the permissible exposure limit, ethyl sec-amyl ketone is treated as a material with adequate warning properties. Gas sorbent respiratory equipment is permitted.

IDLH: 3000 ppm

Basis for IDLH Value: This IDLH is based upon the report in Patty that no rats died, but 3 out of 6 mice died when exposed for 4 hours to approximately 3000 ppm ethyl sec-amyl ketone.

Other Toxicological Information: According to Patty, the principal physiological effects of inhaling high concentrations of ethyl sec-amyl ketone are irritation and narcosis.

Patty reports that "the results of single dose inhalation studies show that mice and rats, when exposed for 4 hours to saturated air at 25°C (approximately 3000 ppm), quickly developed signs of irritation of the respiratory tract and of the eyes. Three of the 6 mice exposed and none of the 6 rats exposed died. An exposure of 8 hours to approximately 6000 ppm (saturated air at 35°C) caused the same symptoms and death of all the mice, but of only 4 of the 6 rats exposed. Varying degrees of ataxia, prostration, and respiratory distress followed by hypnosis were noted. Those animals that survived did not appear to be greatly affected."

LFL: Data not available

VAPOR PRESSURE AT 20 C: 2 mm Hg

SATURATED CONCENTRATION AT 20 C: 2630 ppm

*OSHA will discuss this substance with Joint Review since data does not support

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USE/EXPOSURE AND CONTROL DOCUMENT
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Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1. Inhalation of vapor during spray application of resinous and lacquer surface coatings	A	Local exhaust ventilation personal protective equip (organic vapor mask)
2. Inhalation of vapor and skin contact with liquid during subdivision of large quantities of ethyl amyl ketone or compounds containing it	A,B	General dilution ventilat personal protective equip including barrier creams impervious gloves, aprons footwear
3. Inhalation of vapor and skin contact with liquid during preparation of perfumes	A,B,	Local exhaust ventilation personal protective cloth (rubber gloves and barrie
4. Inhalation of vapor and skin contact with liquid during specialized solvent cleaning operations	A,B	Local exhaust ventilation personal protective equip (organic vapor mask, rubb barrier creams) and gener dilution ventilation

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