

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND
SUPPORTING DOCUMENTATION FOR

*** ETHYL BUTYL KETONE ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

basic text of this document contains the draft technical standard
ved by the Joint Review Committee of the NIOSH/OSHA Standards
etion Program and the supporting documentation for the substance ETHYL
KETONE.

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

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

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

DEFINITIONS

PERMISSIBLE EXPOSURE - "Permissible Exposure" means inhalation of ethyl butyl ketone in concentrations not in excess of 50 parts per million (ppm) (230 milligrams per cubic meter, mg/cu.m.) averaged over an 8-hour work shift, as stated in section 1910.93, Table G-1.

ACTION LEVEL - "Action Level" means one half (1/2) of the permissible exposure for ethyl butyl ketone.

EMPLOYEE INFORMATION - Each employer who has a workplace in which ethyl butyl ketone is present shall:

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

PRESENCE OF ETHYL BUTYL KETONE - Inform affected employees of the location, location, and manner of use or storage of ethyl butyl ketone.

EXPOSURE MEASUREMENT

INITIAL DETERMINATION - Each employer who has a place of employment in which ethyl butyl ketone is released into the workplace air shall determine if any employee may be exposed to airborne concentrations of ethyl butyl ketone 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 ethyl butyl ketone. 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 ethyl butyl ketone;
- (ii) Any measurements of airborne concentrations of ethyl butyl ketone taken;
- (iii) Any employee complaints of symptoms which may be attributable to exposure to ethyl butyl ketone; and
- (iv) Date of determination, work being performed at the time, location within work site, name, and social security number of each employee considered.

INITIAL EXPOSURE MEASUREMENT - If the employer determines that any employee may be exposed to airborne concentrations of ethyl butyl ketone 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.

IDENTIFICATION OF EXPOSED EMPLOYEES - If the exposure measurement taken under paragraph (c)(2) of this section reveals employee exposure to airborne concentrations of ethyl butyl ketone 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.

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 ethyl butyl ketone below the action level, the employer may terminate measurement for the employee. For purposes of this subparagraph, use of respirators

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

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

EXPOSURE ABOVE THE ACTION LEVEL - If an employee exposure measurement reveals that an employee is exposed to airborne concentrations of ethyl butyl ketone 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.

EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE - If an employee exposure measurement reveals that an employee is exposed to airborne concentrations of ethyl butyl ketone 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.

METHODS OF MEASUREMENT - An employee's exposure shall be obtained by 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 confidence level of 95%, of not less than that given in Table 1 below.

Table 1

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

Methods of Compliance

Engineering controls - No employee shall be exposed to ethyl butyl ketone 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 ethyl butyl ketone 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 ethyl butyl ketone is present in concentrations greater than 3500 ppm, one fourth of the lower flammable limit, 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.

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

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

- (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 ETHYL BUTYL KETONE

Condition	Permissible Respiratory Protection
Vapor Concentration	
Equal to or Less than 1000 ppm	Chemical-cartridge respirator with organic vapor cartridge(s) with full facepiece.
-----	-----
Equal to or Less than 2500 ppm	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-

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

demand (positive pressure) mode or continuous-flow mode and an auxiliary 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.

Fire and Safety

Employers shall familiarize themselves with the information contained in substance technical guidelines for ethyl butyl ketone which is contained in Appendix B in order to ensure the safe handling and use of ethyl butyl ketone.

Electrical - For the purposes of compliance with section 1910.309, locations classified as hazardous locations due to the presence of ethyl butyl ketone shall be Class I Group D.

Portable fire extinguishers - For the purposes of compliance with section 1910.157, ethyl butyl ketone is classified as a Class B fire hazard.

Powered industrial trucks - For the purposes of compliance with section 1910.178, locations classified as hazardous locations due to the presence of ethyl butyl ketone shall be Class I Group D.

Combustible Liquids - For the purposes of compliance with section 1910.106, ethyl butyl ketone is classified as a Class II combustible liquid.

Sources of ignition - Sources of ignition such as smoking or open flames are prohibited where ethyl butyl ketone is used, handled, or stored in a manner so as to create a potential fire or explosion hazard.

Personal Protective Equipment

Skin Contact

(i) Where repeated or prolonged skin contact to liquid ethyl butyl ketone 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 ethyl butyl ketone. Face shields shall comply with section 1910.133(a)(6).

(ii) Employers shall ensure that clothing contaminated with liquid ethyl butyl ketone not be allowed to remain in contact with the body. Contaminated clothing may not be reused until the ethyl butyl ketone has been removed.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

- (iii) Employers shall ensure that clothing contaminated with liquid ethyl butyl ketone 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 cleaned, shall inform the person performing this operation of the hazardous properties of ethyl butyl ketone.

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 ethyl butyl ketone may contact the eyes.

Spills

Spills of ethyl butyl ketone shall be cleaned up immediately after eliminating potential sources of ignition and utilizing available ventilation.

Liquid ethyl butyl ketone may not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

Sanitation

When an employee's skin has been contaminated with liquid ethyl butyl ketone, employers shall ensure that the employee wash or shower to remove any ethyl butyl ketone from the skin.

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).

Training and Information - Each employer who has employees exposed to ethyl butyl ketone in excess of the action level, or employees who may have skin or eye contact with liquid ethyl butyl ketone, or employees who work where accidental release, spill, fire, or explosion of ethyl butyl ketone may occur, shall annually:

Substance Safety Data Sheet - Inform each employee of the information contained in the Substance Safety Data Sheet for ethyl butyl ketone, which is contained in Appendix A; and

Medical -

- (I) Advise employees as to the signs and symptoms of exposure to ethyl butyl ketone.
- (II) Instruct the employees to advise the employer of the development of signs and symptoms of exposure to ethyl butyl ketone 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

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 ethyl butyl ketone.
- (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. *gc/a (k) Medical Surveillance

The employer shall provide medical procedures as required by paragraph (k).

- (k) These procedures shall be provided at no cost to the employee.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

Preplacement Questionnaire - The employer shall obtain from each employee who will be exposed to liquid ethyl butyl ketone, or airborne concentrations of ethyl butyl ketone at or above the action level, a 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

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).

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

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 exposure to ethyl butyl ketone;
- (iii) A description of any personal protective equipment required to be used;
- (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.

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

Exclusion or removal from Exposure - No employee shall be exposed to ethyl butyl ketone if such exposure could place the employee at increased risk of material impairment of his health.

Emergency Procedures - The employer shall provide emergency and follow-up medical examinations and treatment for any employee injured by exposure to ethyl butyl ketone.

Informing the Physician - The employer shall provide to the attending physician the following information:

- (i) a copy of this regulation for ethyl butyl ketone;
- (ii) a description of the employee's duties as they relate to his exposure to ethyl butyl ketone;
- (iii) a description of any personal protective equipment required to be used;
- (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.

Physician's Written Opinion

(i) The physician's written opinion shall be a signed statement of the examining physician specifically stating:

- (a) Whether the employee has any detected medical conditions which could be directly or indirectly aggravated by exposure to ethyl butyl ketone, or which could significantly interfere with the ability of the

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

employee to follow recommended or required procedures for protecting him-
self from unusual or emergency exposure.

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

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

(ii) The written opinion shall not reveal medical information
related to exposure to ethyl butyl ketone.

(j) 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.

Recordkeeping.

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.

Exposure measurements.

(i) The employer shall keep an accurate record of all measure-
ments taken to determine employee exposure to ethyl butyl
ketone.

(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 ethyl butyl ketone
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.

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.

Training and information.

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

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

- (ii) The record shall include:
 - (a) Date of training;
 - (b) Name and Social Security number of employees trained;
 - (c) Substance of training provided.
- (iii) This record shall be maintained for at least one year.

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 ethyl butyl ketone;
 - (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.

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.

Observation of monitoring.

Duty.

The employer shall give affected employees or their representatives an opportunity to observe any monitoring of employee exposure to ethyl butyl ketone which is conducted pursuant to this section.

Exercise of opportunity to observe monitoring.

- (i) When observation of the monitoring of employee exposure to ethyl butyl ketone 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 ethyl butyl ketone that are being performed at the place of exposure.
 - (c) Record the results obtained.

Employee notification.

The employer shall notify in writing, within five work days, every employee who is found to be exposed to ethyl butyl ketone above the permissible exposure. The employee shall also be notified of the level of his exposure and the corrective and the corrective action

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

being taken to reduce the exposure to at or below the permissible exposure.

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.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

APPENDIX A

SUBSTANCE SAFETY DATA SHEET

SUBSTANCE IDENTIFICATION

STANCE: Ethyl butyl ketone

MISSIBLE EXPOSURE: 50 parts of ethyl butyl ketone vapor per million parts of air (ppm) or 230 milligrams of ethyl butyl ketone vapor per cubic meter of air (mg/cu m)

EARANCE AND ODOR: Ethyl butyl ketone is a colorless liquid with a mild fruity odor.

HEALTH HAZARD DATA

Ways in Which the Chemical Affects Your Body: Ethyl butyl ketone can affect your body if you inhale it, swallow it, or if it comes in contact with your skin or eyes.

Effects of Overexposure:

1. Short-Term Effects: Ethyl butyl ketone may cause irritation of the eyes, nose, throat, and lungs. Exposure to high concentrations may cause headaches, dizziness or unconsciousness.
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 ethyl butyl ketone exposure.

EMERGENCY FIRST AID PROCEDURES

Eye Exposure: If liquid ethyl butyl ketone gets into your eyes, wash the 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.

Skin Exposure: If liquid ethyl butyl ketone 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.

Breathing: If you or any other person breathes in large amounts of ethyl butyl ketone remove the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

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

Swallowing: If the person is not unconscious and liquid ethyl butyl ketone 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 have the person stick his finger down his throat. Get medical attention as soon as possible.

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.

RESPIRATORS AND PROTECTIVE CLOTHING

RESPIRATORS: Respirators are not the best way to control exposure to ethyl butyl ketone. 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 ethyl butyl ketone 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.

PROTECTIVE CLOTHING: You must wear impervious clothing, gloves, face shields and other appropriate protective clothing over any parts of your body which could repeatedly be exposed to ethyl butyl ketone liquid, vapor or mist.

EYE PROTECTION: You must wear splash-proof safety goggles if it is possible that liquid ethyl butyl ketone may get into your eyes.

PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

ethyl butyl 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 ethyl butyl ketone is used or stored. All ethyl butyl ketone 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 ethyl butyl ketone you must remove the wet clothing and not wear it again until the ethyl butyl ketone has been removed. If your skin becomes wet with ethyl butyl ketone, you must wash or shower. If you handle ethyl butyl ketone, you should 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 ethyl butyl ketone is used in your work area and for any additional plant safety rules.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
ETHYL BUTYL KETONE

PHYSICAL AND CHEMICAL DATA

Substance Identification

1. Synonyms: butyl ethyl ketone, 3-heptanone
2. Formula: C2H5COC4H9

Physical Data

1. Boiling point (760 mm Hg): 147 C (297 F)
2. Specific gravity (H₂O=1): 0.82
3. Vapor density (air=1): 3.93
4. Melting point: -39 C (-36.4 F)
5. Vapor pressure at 20 C (68 F): 4 mm Hg
6. Solubility in water, % by weight at 20 C (68 F): 0.43
7. Evaporation rate (butyl acetate=1): 0.45
8. Appearance and odor: Colorless liquid with a mild fruity odor.

FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

Fire

1. Flash point: 46 C (115 F) (open cup)
2. Autoignition temperature: Data not available
3. Flammable limits in air, % by volume: Lower: 1.4, Upper: 8.8
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: ethyl butyl ketone is a combustible liquid. Its vapors can form explosive mixtures at elevated temperatures. All ignition sources must be controlled when ethyl butyl ketone is used, handled, and stored. ethyl butyl ketone 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 ethyl butyl ketone is handled.
7. For purposes of conforming to the requirements of 29 CFR 1910.106, ethyl butyl ketone is classified as a Class II combustible liquid. At 3500 ppm, one fourth the lower flammable limit, ethyl butyl ketone is considered to be a potential fire and explosion hazard.
8. For the purposes of complying with 29 CFR 1910.309, the classification of hazardous locations as described in Article

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

500 of the National Electrical Code for ethyl butyl ketone shall be Class I, Group D.

Reactivity

1. Conditions contributing to instability: heat
2. Incompatibilities: Contact with oxidizing agents may cause fire and explosions.
3. Hazardous Decomposition Products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving ethyl butyl ketone.
4. Special Precautions: ethyl butyl ketone will attack some forms of plastics, rubber, and coatings.

SPILL OR LEAK PROCEDURES

If ethyl butyl ketone is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources
2. Ventilate enclosed spaces
3. Flush ethyl butyl ketone with large amounts of water spray. Ethyl butyl ketone should not be flushed into a confined space as there may be danger of explosion.

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

Waste Disposal Methods: ethyl butyl ketone 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.

MONITORING AND MEASUREMENT PROCEDURES

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 ethyl butyl ketone to plus or minus 35%.

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

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

accredited in Industrial Hygiene Chemistry by the American Industrial Hygiene Association (AIHA). The method of measurement must determine the concentration of ethyl butyl ketone to plus or minus 25%. Methods meeting these accuracy requirements are available in the "NIOSH Monitoring Methods Manual".

MISCELLANEOUS PRECAUTIONS

High exposures to ethyl butyl ketone can occur when transferring the liquid from one container to another.

Non-sparking tools should be used to open metal ethyl butyl ketone containers which should then be effectively grounded and bonded prior to pouring.

Store ethyl butyl ketone in closed containers in a cool, well-ventilated area.

Employers must advise employees of all plant areas and operations where exposure to ethyl butyl ketone could occur.

COMMON OPERATIONS

Exposure to ethyl butyl ketone may occur during application of lacquers, surface coatings, use of mastics and adhesives, and cleaning and maintenance of ketone process equipment.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

Route of Entry

Inhalation; insignificant skin absorption

Toxicology

There is some local irritation of the skin and respiratory tract by solvent effect of ethyl butyl ketone on lipids. Central nervous depression occurs on exposure to high concentration, producing narcosis. Effects are more pronounced in unacclimated individuals. No chronic systemic effects reported.

Signs and Symptoms

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

Special Tests

None in common usage.

Treatment

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

Surveillance and Preventive Considerations

General

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

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

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

1. Renal disease -- Although ethyl butyl ketone 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 ethyl butyl ketone might cause exacerbation of symptoms due to its irritant properties or psychic reflex bronchospasm.
3. Liver disease -- Although ethyl butyl ketone is not known as liver toxin in humans, the importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.
4. Skin disease -- Ethyl butyl 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 ethyl butyl ketone.

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

Patty, Frank A.: Industrial Hygiene and Toxicology, Volume II - Toxicology, Interscience Publishers, New York, 1962, pp. 1740-1742.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

Grant, W. Morton: Toxicology of the Eye, (Second Edition), Charles
omas, Illinois, 1974, page 1153.

Browning, Ethel: Toxicity and Metabolism of Industrial Solvents,
ier Publishing Company, Amsterdam, 1965, pp. 433-434.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

REFERENCES AND SOURCES

ETHYL BUTYL KETONE

1910.93

Personal Protective Equipment, and (h) Sanitation

Eye: "3-Heptanone," Union Carbide Corporation; Smyth et al., "Range-Finding Toxicity Data, List III," J. Ind. Hyg. 31:60-62 (1949); Patty, "Industrial Hygiene and Toxicology; "Documentation of Threshold Limit Values", ACGIH

Skin: Patty, "Industrial Hygiene and Toxicology;" "3-Heptanone," Union Carbide Corporation

Ingestion: Patty, "Industrial Hygiene and Toxicology;" "3-Heptanone," Union Carbide Corporation

COMMENTS

Eye - Classification: 2

Output statement numbers: 10

Exceptions: None

Union Carbide notes, "several average sized drops of 3-heptanone caused surface injury, but one small drop caused barely detectable abnormality. Patty and the Documentation of TLV's state that the substance produces at most irritation of mild degree. Smyth et al. note that the undilute chemical placed in rabbit eyes caused injury rated 3 on a scale of 10 after 24 hours. This indicates that 0.1 ml undiluted produces less than severe injury while 0.5 ml causes severe injury. A classification of 2 is concluded to be appropriate in view of the fact that it requires an excess of the chemical in the eye for 24 hours to produce severe injury.

Skin - Classification: 2

Output statement numbers: 2, 17g, 7b, 17i

Exceptions: 20a deleted

Patty notes, "due to its defatting action to the skin, a dermatitis may result from frequently repeated or excessively prolonged skin exposures. Union Carbide and Patty list a rabbit single skin penetration LD50 of greater than 20 ml/kg. Union Carbide notes "this result suggests that skin penetration in harmful amounts is not apt to occur." For skin irritation, they add, "the undiluted chemical caused no reaction on the tender skin of the rabbit belly greater than a faint redness of short duration." The vapor pressure of ethyl butyl ketone is 4 mm Hg at 20 degrees C. It has a flash point of 115 degrees F and is but 0.43% soluble in water.

A classification of 2 is concluded appropriate to prevent dermatitis or other irritation. The frequent or excessively prolonged contact required to produce any effect leads to the conclusion that statement 20a is not needed.

Ingestion - Classification: 0

Output statement numbers: None

Exceptions: None

Patty states that "in industrial handling, swallowing of (3-heptanone) should not be a problem." Union Carbide lists a single oral rat LD50 of 2.76 g/kg. The moderate toxicity of the substance leads to the conclusion that ingestion would not be a problem in the industrial environment.

RESPIRATOR TABLE DOCUMENTATION

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

ANCE: Ethyl Butyl Ketone (3-Heptanone)

L. STANDARD: 50 ppm

NG PROPERTIES:

Odor Threshold: According to Patty, ethyl butyl ketone has a
"typical ketone-type odor."

Eye Irritation Level: According to the Documentation of TLV's,
"when in contact with skin and eyes, it (ethyl butyl ketone)
produces at most, irritation of mild degree." Any respirator
organic vapor cartridge(s) is therefore permitted up to 500 ppm.

Evaluation of Warning Properties: For the purposes of this standard,
ethyl butyl ketone is treated as a material with good
warning properties. Gas sorbent respiratory equipment is
permitted.

3000 ppm

Basis for IDLH: Patty and Deichmann and Gerarde report that no
rats died following a 4-hour exposure to 2000 ppm, but all
rats died following a 4-hour exposure to 4000 ppm
ethyl butyl ketone.

Other Toxicological Information: The Documentation of TLV's
states that "a threshold limit value of 50 ppm should be
low enough to prevent narcosis and also to prevent significant
eye irritation, the chief recognized effects of exposure."

Patty reports that "toxicological information concerning
the effect of inhalation of ethyl butyl ketone is limited.
Smyth et al. have reported that when rats were exposed for
4 hours to 2000 ppm of ethyl butyl ketone no deaths occurred;
at 4000 ppm all rats died." Deichmann and Gerarde report
the same information.

The Chemical Company Guides of Union Carbide Corporation
state that "breathing the vapors in a state approaching
saturation in room air killed two of six animals (rats)
after one hour and all of six after four hours."

According to Carpenter et al., a concentration of 2000 ppm
ethyl butyl ketone for 4 hours was fractionally lethal to
rats.

14,000 ppm

PRESSURE AT 20 C: 4 mm Hg

ATED CONCENTRATION AT 20 C: 5260 ppm

Carpenter, C.P., H.F. Smith, and V.C. Pozzani: J. Ind. Hyg. &
Tox., 31:343(1949).

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

USE/EXPOSURE AND CONTROL DOCUMENT

ETHYL BUTYL KETONE

Use/Exposure	Principal Route of Entry	Currently Used Control Methods
Inhalation of vapor during spray application of lacquer, varnish, epoxy, and vinyl coatings, finishes, and adhesives	A	Local exhaust ventilation; personal protective equipment (organic vapor mask)
Inhalation of vapor during applications of lacquer, varnish, epoxy, and vinyl coatings, finishes, and adhesives by dipping, roller coating, tumbling, knifing, or brushing	A	Local exhaust ventilation; general dilution ventilation
Inhalation of vapor during oven or air drying of coatings and adhesives	A	General dilution ventilation
Inhalation of vapor and skin contact with liquid during manual application of cellulosic, acetate, and rubber adhesives in shoe manufacturing, bookbinding, and packaging	A,B	Local exhaust ventilation; general dilution ventilation; personal protective equipment, including gloves and aprons
Inhalation of vapor in use of cellulosic household cements	A	General dilution ventilation
Inhalation of vapor during application of mastics or other natural gum-based adhesives for floor and wall tiles, other floor coverings, automobile silencer, and lining pads	A	General dilution ventilation; local exhaust ventilation
Inhalation of vapor and skin contact with liquid during cleaning and maintenance of ketone processing equipment, such as distillation columns, reactors, mixers, and storage vessels	A,B	Personal protective equipment, including respiratory protective devices (self-contained breathing apparatus or organic vapor mask depending upon condition), gloves, aprons, and barrier creams
Inhalation of vapor and skin contact with liquid during	A,B	Local exhaust ventilation; personal protective equipment,

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL BUTYL KETONE

blending of coating and
adhesive raw materials in
open mixers

including organic vapor mask,
gloves, and aprons

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