NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND

SUPPORTING DOCUMENTATION FOR

*** ETHYL ACRYLATE ***

NIOSH/OSHA Draft Technical Standard and Supporting Documentation for ETHYL ACRYLATE

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 ETHYL ACRYLATE.

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.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL ACRYLATE

(a) DEFINITIONS

(1) PERMISSIBLE EXPOSURE - "Permissible Exposure" means inhalation of ethyl acrylate in concentrations not in excess of 25 parts per million (ppm) (100 milligrams per cubic meter, mg/cu.m.) averaged over an eight 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 ethyl acrylate.

(b) EMPLOYEE INFORMATION - Each employer who has a workplace in which ethyl acrylate is present shall:

(1) STANDARD AVAILABILITY - Keep a copy of this section with its appendices A, B and C, at the workplace. This material shall be made readily available to affected employees; and

(2) PRESENCE OF ETHYL ACRYLATE - Inform affected employees of the quantity, location, and manner of use or storage of ethyl acrylate.

(c) EXPOSURE MEASUREMENT

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

(ii) Any measurements of airborne concentrations of ethyl acrylate taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to ethyl acrylate; 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 ethyl acrylate 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) INDENTIFICATION OF EXPOSED EMPLOYEES - If the exposure measurement taken under paragraph (c)(2) of this section reveals employee exposure to airborne concentrations of ethyl acrylate 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) EXPOSURE ABOVE THE ACTION LEVEL - If an employee exposure measurement reveals that an employee is exposed to airborne concentrations of ethyl acrylate 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.

(5) EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE - If an employee exposure measurement reveals that an employee is exposed to airborne concentrations of ethyl acrylate 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.

(6) 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 acrylate below the action level, the employer may terminate measurement for the employee. For purposes of this subparagraph, use of respirators shall not constitute reduction of employee exposure below the action level.

(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 ethyl acrylate 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 acrylate 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 acrylate is present in concentrations greater than 4500 ppm, one fourth of the lower flammable limit, the fan rotating element 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

(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 employees 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 ACRYLATE

Condition	
Vapor Concentration	
Equal to or less than 1000 ppm	organic vapor cartridge(s). 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 2000 ppm	operated in pressure-demand (positive pressure) mode or with a full facepiece, hood or helmet operated in continuous flow mode.
Greater than 2000 ppm or Entry and Escape from Unknown Concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand (positive pressure) mode. plied-air respirator with a full facepiece operated in pressure-demand (positive pressure) or continuous flow mode and an auxiliary self-contained air supply operated

	in pressure-demand mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand (positive pressure) mode.
Escape	Any gas mask with a full facepiece 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 ethyl acrylate which is contained in Appendix B in order to ensure the safe handling and use of ethyl acrylate.

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

(2) Portable fire extinguishers - For the purposes of compliance with section 1910.157, ethyl acrylate 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 ethyl acrylate shall be Class I Group D.

(4) Flammable liquids - For the purposes of compliance with section 1910.106, liquid ethyl acrylate is classified as a IB flammable liquid.

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

(6) Storage - Ethyl acrylate shall be stored so as not to come in contact with nitrates or other oxidizing materials including peroxides and other initiators of polymerization, strong alkalies, and strong acids. The monomer shall be checked at least weekly to determine inhibitor and polymer content if the material is being stored in excess of 30 days at 90 F.

(g) Personal Protective Equipment

(1) Skin Contact

(i) Employers shall provide, and require employees to use, impervious clothing, gloves, face shields (8 inch minimum) and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact to liquid ethyl acrylate. Face shields shall comply with section 1910.133(a)(6).

(ii) Employers shall ensure that clothing which becomes wet with liquid ethyl acrylate be removed immediately and not reworn until the ethyl acrylate is removed from the clothing.

(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 eye contact to liquid ethyl acrylate may occur.

(h) Spills

(1) Spills of ethyl acrylate shall be cleaned up immediately after eliminating potential sources of ignition and utilizing available ventilation.

(2) Ethyl acrylate liquid may not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

(i) Sanitation

(1) Employers shall ensure that employees whose skin becomes wet with liquid ethyl acrylate promptly wash or shower as necessary to remove any ethyl acrylate from the skin.

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

(1) Substance Safety Data Sheet - Inform each employee of the information contained in the Substance Safety Data Sheet for ethyl acrylate, which is contained in Appendix A; and

(2) Medical -

(I) Advise employees as to the signs and symptoms of exposure to ethyl acrylate.

(II) Instruct the employees to advise the employer of the development of signs and symptoms of exposure to ethyl acrylate 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 ethyl acrylate.

(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 ethyl acrylate, or airborne concentrations of ethyl acrylate at or above the action level, a written statement as to whether such employee has a history of any of the following:

(I) Chronic lung disease
(II) Skin disease
(III) Liver disease

(IV) Kidney 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), (ii) signs and symptoms listed in Appendix A which the employee suspects may be caused by exposure to ethyl acrylate.

(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 continue to be exposed to ethyl acrylate 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 ethyl acrylate.

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

(I) A copy of this section with its Appendices A,B and C for ethyl ac
(II) A description of the employee's duties as they relate to his exposure to ethyl acrylate;
(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.

(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 ethyl acrylate 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 ethyl acrylate.

(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 ethyl acrylate.

(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.

(l) 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 ethyl acrylate.

(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 acrylate 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;

(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 ethy

(d) A signed statement of any refusal to be examined;

(e) A copy of information provided to the physician pursuant to paragraph (k)(9)(ii) through (vi) 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 ethyl acrylate which is conducted pursuant to this section.

(2) Exercise of opportunity to observe monitoring.

(i) When observation of the monitoring of employee exposure to ethyl acrylate 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 acrylate 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 ethyl acrylate 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.

Acrylate

APPENDIX A

SUBSTANCE SAFETY DATA SHEET

I. SUBSTANCE IDENTIFICATION

SUBSTANCE: Ethyl acrylate

PERMISSIBLE EXPOSURE: 25 parts of ethyl acrylate vapor per million parts of air (ppm) or 100 milligrams of ethyl acrylate vapor per cubic meter of air (mg/cu m)

APPEARANCE AND ODOR: Colorless liquid with a sharp acrid odor.

II. HEALTH HAZARD DATA

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

B. Effects of Overexposure:

1. Short-Term Overexposure: Overexposure to ethyl acrylate may cause irritation of the eyes, nose, throat, and lungs. Death may be caused by lung damage from breathing high air levels or from swallowing it.

2. Long-Term Overexposure: Prolonged contact with the skin or eyes may result in severe damage.

3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms associated with ethyl acrylate exposure.

III. EMERGENCY FIRST AID PROCEDURES

A. Eye Exposure: If ethyl acrylate 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 clothing becomes wet with ethyl acrylate, immediately remove and clean the clothing before wearing again. If ethyl acrylate gets on your skin, flush the contaminated skin with water immediately. If there is skin irritation, get medical attention.

C. Breathing: If you or any other person breathes in large amounts of ethyl acrylate remove the exposed person to fresh air at once. When

breathing is difficult, properly trained personnel may assist the affected person by administering 100% oxygen. 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 ethyl acrylate has been swallowed get medical attention immediately. If medical attention is not immediately available get the affected person to vomit by having him touch the back of his throat with his finger or by giving him large amounts (one pint or more) of warm salt water (two tablespoons of salt per pint of water). Do not make an unconscious person vomit.

E. Rescue: Move affected person from the hazardous exposure. If the exposed person has been overcome notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty yourself. Understand your emergency rescue procedures and know the locations of the equipment before the need arises.

IV. RESPIRATORS AND PROTECTIVE CLOTHING

A. RESPIRATORS: Respirators are not the best way to control exposure to ethyl acrylate. 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 acrylate while wearing a respirator, the respirator is not working correctly; go immediately to fresh air. If you experience difficulty breathing while wearing a respirator, tell your employer.

B. PROTECTIVE CLOTHING: You must wear impervious clothing, gloves, face shield and other protective clothing to prevent repeated or prolonged skin contact with ethyl acrylate liquid and vapor.

C. EYE PROTECTION: You must wear splash-proof safety goggles (cup-cover type dust and splash safety goggles) where eye contact with liquid ethyl acrylate may occur.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

Ethyl acrylate is a flammable liquid and its vapors easily form explosive mixtures with air. It must be stored in tightly closed containers in a cool, well-ventilated area away from heat, sparks and flames. Store ethyl acrylate away from strong acids, strong alkalies, peroxides, and initiators of polymerization. Sources of ignition such as smoking and open flames are prohibited wherever ethyl acrylate is handled, used or stored in a manner that could create a potential fire or explosion hazard. You must use non-sparking tools when opening or closing metal containers of ethyl acrylate, and containers must be bonded and grounded when pouring or transferring liquid ethyl acrylate. You must immediately remove any clothing that becomes wet with liquid ethyl acrylate and this clothing must not be reworn until the ethyl acrylate is removed from the clothing. If your skin becomes wet with liquid ethyl acrylate, you must immediately wash or shower as necessary to remove the ethyl acrylate from your skin. Fire extinguishers, where provided, must be readily available and you should know where they are and how to operate them. Ask your

supervisor where ethyl acrylate is used in your work areas and for any additional plant safety rules.

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
ETHYL ACRYLATE

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Ethyl propenoate
2. Formula: $CH_2=CHCOOC_2H_5$
3. Molecular weight: 100

B. Physical Data

1. Boiling point (760 mm Hg): 99 C (211 F)
2. Specific gravity (water=1): 0.92
3. Vapor density (air=1 at boiling point of ethyl acrylate): 3.45
4. Melting point: -75 C (-103 F)
5. Vapor pressure at 20 C (68 F): 29.5 mm Hg
6. Solubility in water, % by weight at 20 C (68 F): 1.5
7. Evaporation rate (butyl acetate=1): 3.3
8. Appearance and odor: Colorless liquid with a sharp, acrid odor

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: 9 C (48 F) (closed cup)
2. Autoignition temperature: 383 C (721 F)
3. Flammable limits in air, % by volume: Lower: 1.8
4. Extinguishing media: Dry chemical, foam, carbon dioxide
5. Special fire-fighting procedures: Do not use solid stream of water since stream will scatter and spread fire. Use water spray to cool containers exposed to a fire. Fire fighting should be done from a safe distance or protected location.
6. Unusual fire and explosion hazards: ethyl acrylate is a flammable liquid. Its vapors can easily form explosive mixtures with air. All ignition sources must be controlled where ethyl acrylate is used, handled, or stored. Ethyl acrylate vapors are heavier than air and may travel along the ground and be ignited by open flames or sparks at locations remote from the site at which ethyl acrylate is handled. Ethyl acrylate vapors are uninhibited and may form polymers in vents or flame arresters of storage containers.
7. For purposes of conforming to the requirements of 29 CFR 1910.106 ethyl acrylate is classified as a Class IB flammable liquid. At 4500 ppm, one-fourth of the lower flammable limit, ethyl acrylate is considered to be a potential fire and explosion hazard.

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 ethyl acrylate shall be Class I, Group D.

B. Reactivity

1. Conditions contributing to instability: Heat and/or lack of appropriate inhibitor concentration can cause ethyl acrylate to polymerize violently and burst container.
2. Incompatibilities: Contact with oxidizing materials, including peroxides and other initiators of polymerization, strong alkalies, and atmospheric moisture may cause fire and explosion.
3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving ethyl acrylate.
4. Special precautions: Inhibitors do not function in absence of air so inert gas blankets should not be used.

III. SPILL, LEAK, AND DISPOSAL PROCEDURES

A. If ethyl acrylate is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources
2. Ventilate area of spill or leak
3. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood) and burn the paper. Large quantities can be collected and atomized in a suitable combustion chamber. Ethyl acrylate may not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

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

C. Waste Disposal Methods:

Ethyl acrylate may be disposed of:

1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a sanitary land fill in an area where the odor will not be objectionable.
2. By atomizing in a suitable combustion chamber.

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 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 the 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 acrylate 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 ethyl acrylate to plus or minus 25%. Methods meeting these accuracy requirements are available in the "NIOSH Monitoring Methods Manual".

V. MISCELLANEOUS PRECAUTIONS

A. Store ethyl acrylate in tightly closed containers in a cool, well-ventilated area.

B. High exposures to ethyl acrylate can occur when transferring the liquid from one container to another.

C. Non-sparking tools must be used to open and close metal ethyl acrylate containers. These containers must be effectively grounded and bonded prior to pouring.

D. Inhibitor concentration specified by the manufacturer should be maintained during prolonged storage.

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

VI. COMMON OPERATIONS

Common operations in which exposure to ethyl acrylate is likely to occur are: its manufacture and the manufacture of polymers.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation; skin absorption.

II. TOXICOLOGY

The vapor of ethyl acrylate is irritating to the conjunctiva and upper respiratory tract. In moderate concentrations there are characteristic lachrymatory effects in man. Animals exposed to high concentrations show marked irritation of the eyes and of the respiratory tract, leading to pulmonary edema. The lowest concentration of vapor producing no significant effect in rodents is 75 ppm. A concentration of 2000 ppm vapor killed rats in four hours with death attributable to severe pulmonary irritation, although 1000 ppm for four hours allowed survival. Prolonged contact with the skin in animals causes moderate damage and skin sensitization may occur. Fatal doses are absorbed through the skin of animals exposed for 24 hours. While there are no reports of injury to man from long-term exposure to concentrations ordinarily encountered in the work situation, common practice suggests that most workmen do not tolerate exposure to 25 ppm for more than a few minutes.

III. SIGNS AND SYMPTOMS

Irritation of the eyes and respiratory tract from overexposure to vapor; marked irritation of the eyes and the skin from direct contact with the liquid.

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. Observe for possible delayed pulmonary edema.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

Most reported effects of ethyl acrylate are caused by its irritant properties. Skin absorption has been reported to occur. Those suspected of high exposure should be observed for pulmonary edema. It is important that the physician become familiar with plant operating conditions in which exposure to ethyl acrylate occurs. Those with skin disease may not tolerate the wearing of protective clothing and those with chronic respiratory disease may not tolerate the wearing of negative pressure respirators.

B. PREPLACEMENT

Routine medical histories and physical 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 ethyl acrylate exposure. Only those giving a positive history of these conditions must be referred for further medical examinations.

1. Chronic lung disease -- In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of ethyl acrylate might cause exacerbation of symptoms due to its irritant properties.

2. Skin disease - Ethyl acrylate is absorbed through the skin. It also is a defatting agent and may cause dryness and cracking. Persons with preexisting skin disorders may be more susceptible to the effects of this agent.

3. Liver disease -- Although ethyl acrylate is not known as a liver toxin in humans, the importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.

4. Kidney disease -- Although ethyl acrylate is not known as a kidney toxin in humans, the importance of this organ in the excretion of certain chemicals and their metabolites should be considered before exposing persons with impaired kidney function.

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, Vol. II - Toxicology (2d ed. revised), Interscience Publishers, New York, 1963, pp. 1874-1883.

2. Hygienic Guide Series: "Ethyl Acrylate," Industrial Hygiene Journal, 27:571-574, 1966.

3. American Conference of Governmental Industrial Hygienists: "Ethyl Acrylate," (3d ed., 2d printing), Documentation of the Threshold Limit Values for Substances in Workroom Air, Cincinnati, 1974, pp. 102-103.

REFERENCES AND SOURCES
ETHYL ACRYLATE
1910.93

(f) Personal Protective Equipment, and (h) Sanitation

Eye: Grant, "Toxicology of the Eye;" "Ethyl Acrylate," Union Carbide Corp Toxicology Study; Patty, "Industrial Hygiene and Toxicology;" "Methyl Acrylate and Ethyl Acrylate," Manufacturing Chemists' Association; "Ethyl Acrylate," AIHA Hygienic Guide

Skin: "Ethyl Acrylate," Union Carbide Corp. Toxicology Study; Patty, "Industrial Hygiene and Toxicology;" "Ethyl Acrylate," AIHA Hygienic Guide; "Methyl Acrylate and Ethyl Acrylate," Manufacturing Chemists' Association

Ingestion: Patty, "Industrial Hygiene and Toxicology;" Documentation of Threshold Limit Values; "Ethyl Acrylate," Union Carbide Corp. Toxicology Study; Spector, "Handbook of Toxicology;" Sax, "Dangerous Properties of Industrial Materials"

COMMENTS

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

Grant reports that "the liquid monomer applied in quantities of 0.1 to 0.5 ml to rabbit corneas causes injury similar to that by ethyl alcohol, limited to damage of the corneal epithelium. T degree of recovery has not been reported, but if similar to ethyl alcohol, presumably recovery would be complete." Union Carbide s states that "one average sized drop caused minor injury in the ra eye." Patty notes that "prolonged contact with the skin or eye m cause severe damage" in the text, but notes in a table that its e effect is "moderate." The MCA reports that severe vapor exposure can cause the eyes to water considerably and chemical burns to develop on the cornea. However, its recommended label for the substance states only that it "may irritate skin and eyes." The Hygienic Guide, citing the same reference as Grant does, reports that 0.1 ml "instilled in the eyes of rabbits produced corneal ne within 24 hours," and suggests that chemical "goggles should be w when splashes are likely."

There is no clear indication in the literature that this sub can cause severe and/or irreversible injury. It is therefore con that a classification of 2 is appropriate.

Skin - Classification: 2
Output statement numbers: 2, 7b, 14g, 21, 14i
(14g and 21 combined)
Exceptions: None

Union Carbide reports that locally the "undiluted chemical c no reaction on the tender skin of the rabbit belly greater than a faint redness of short duration." Patty notes in the text that p longed contact can cause severe damage, but qualifies this statem in a table by reporting the local effects of uncovered contact ar "slight" though "severe if confined." The Hygienic Guide notes t the substance can cause dermatitis and reports that "application 0.01 ml of the undiluted liquid to the uncovered clipped abdomen five rabbits caused no effect in three animals and minor infectio

the skin capillaries in the remainder." It also states that cove applications resulted in necrosis of the skin.

Absorption through the skin is indicated as being a hazard o contact. The Hygienic Guide gives a 24-hour rabbit skin penetrat LD50 of 1.95 ml/kg and notes that "hemmorhage of the lungs, liver kidneys occurred." The MCA agrees that "systemic absorption may to degenerative changes in the liver and kidneys."

Ethyl acrylate has a vapor pressure of 29.5 mm Hg at 20 degr It is 1.5% soluble in water and has a flash point of 48 degrees F

The primary hazard from contact is considered to be acute or systemic effects from skin absorption. To prevent the occurence effects, and any local effects, it is concluded that a classifica is appropriate if statements 14g and 14i are used instead of stat numbered 16. Statement 20a is not specified because the amounts substance towards which it is directed would not have any noticea

Ingestion - Classification: 0

Output statement numbers: None

Exceptions: None

Patty lists an acute oral LD50 in rabbits of 0.4 g/kg. The Documentation of TLV's reports that "repeated oral intake . . . resulted in no apparent cumulative effects in animals." Union Carbide lists the single oral dose LD50 in rats as being 2.08 g/k but Patty lists a rat LD50 of 1 g/kg. Spector agrees with Patty rats and Sax agrees for rabbits. Sax adds that fatal poisoning " characterized in its terminal stages by dyspnea, cyanosis, and co movements. It caused severe local irritation of the gastro-enter tract; and toxic degenerative changes of cardiac, hepatic, renal, splenic tissues."

The statement in the Documentation of TLV's indicates that i in the context of this standard, should not present a hazard in t environment.

SUBSTANCE TECHNICAL GUIDELINES
ETHYL ACRYLATE

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Ethyl propenoate
2. Formula: $CH_2=CHCOOC_2H_5$
3. Molecular weight: 100

B. Physical Data

1. Boiling point (760 mm Hg): 99 C (211 F)
2. Specific gravity (water=1): 0.92
3. Vapor density (air=1 at boiling point of ethyl acrylate): 3.45
4. Melting point: -75 C (-103 F)
5. Vapor pressure at 20 C (68 F): 29.5 mm Hg
6. Solubility in water, % by weight at 20 C (68 F): 1.5
7. Evaporation rate (butyl acetate=1): 3.3
8. Appearance and odor: Colorless liquid with a sharp, acrid odor

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: 9 C (48 F) (closed cup)
2. Autoignition temperature: 383 C (721 F)
3. Flammable limits in air, % by volume: Lower: 1.8
4. Extinguishing media: Dry chemical, foam, carbon dioxide
5. Special fire-fighting procedures: Do not use solid stream of water since stream will scatter and spread fire. Use water spray to cool containers exposed to a fire. Fire fighting should be done from a safe distance or protected location.
6. Unusual fire and explosion hazards: ethyl acrylate is a flammable liquid. Its vapors can easily form explosive mixtures with air. All ignition sources must be controlled where ethyl acrylate is used, handled, or stored in a manner that could create a potential fire or explosion hazard. Ethyl acrylate vapors are heavier than air and may travel along the ground and be ignited by open flames or sparks at locations remote from the site at which ethyl acrylate is handled. Ethyl acrylate vapors are uninhibited and may form polymers in vents or flame arresters of storage containers.
7. For purposes of conforming to the requirements of 29 CFR 1910.106 ethyl acrylate is classified as a Class IB flammable liquid. For example, 4500 ppm, approximately one-fourth of the lower flammable limit, is one situation in which ethyl acrylate is considered to be a potential fire and explosion hazard.
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 ethyl acrylate shall be Class I, Group D.

B. Reactivity

1. Conditions contributing to instability: Heat and/or lack of appropriate inhibitor concentration can cause ethyl acrylate to polymerize violently and burst container.
2. Incompatibilities: Contact with oxidizing materials, including peroxides and other initiators of polymerization, strong alkalies, and atmospheric moisture may cause fire and explosion.
3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving ethyl acrylate.
4. Special precautions: Inhibitors do not function in absence of air so inert gas blankets should not be used.

III. SPILL, LEAK, AND DISPOSAL PROCEDURES

A. If ethyl acrylate is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of spill or leak.
3. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for vapors to completely clear hood ductwork, then burn the paper. Large quantities can be collected and atomized in a suitable combustion chamber. Ethyl acrylate may not be

allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

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

C. Waste disposal methods: Ethyl acrylate may be disposed of by atomizing in a suitable combustion chamber.

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 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 the 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 acrylate 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 ethyl acrylate to plus or minus 25%. Methods meeting these accuracy requirements are available in the "NIOSH Monitoring Methods Manual".

V. MISCELLANEOUS PRECAUTIONS

A. Store ethyl acrylate in tightly closed containers in a cool, well-ventilated area.

B. High exposures to ethyl acrylate can occur when transferring the liquid from one container to another.

C. Non-sparking tools must be used to open and close metal ethyl acrylate containers. These containers must be effectively grounded and bonded prior to pouring.

D. Inhibitor concentration specified by the manufacturer should be maintained during prolonged storage.

E. Employers should advise employees of all plant areas and operations where exposure to ethyl acrylate could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to ethyl acrylate is likely to occur are: its manufacture and the manufacture of polymers.

RESPIRATOR TABLE DOCUMENTATION

SUBSTANCE: Ethyl acrylate

D.O.L.STANDARD: 25 ppm

WARNING PROPERTIES:

Odor Threshold: The AIHA Hygienic Guides state that "the odor of ethyl acryl vapor is readily detectable at one ppm and was described as fairly stron and moderately irritating at four ppm." The Manufacturing Chemists' Association (MCA) reports that an odor of ethyl acrylate can be detected most persons at 8 ppm.

Eye Irritation Level: The AIHA Hygienic Guides state that "a concentration o ethyl acrylate vapor caused irritation of the conjunctiva of rabbit eyes did not elicit any observable reaction." According to the MCA, however, of the eyes occurs at about 75 ppm.

Other Information: The MCA states that irritation of the mucous membranes oc 75 ppm.

The AIHA Hygienic Guides states that the TLV (25 ppm) "is conside high to prevent irritating effects in humans."

Evaluation of Warning Properties: Through its odor ethyl acrylate can be det the permissible exposure limit, and through its irritant effects ethyl a be detected at or just several times above the TLV. Therefore, ethyl ac is considered to have good warning properties. Gas sorbent respiratory is permitted.

IDLH: 2000 ppm

Basis for IDLH Value: This IDLH is based on the report by Patty and Union Ca Corporation that 5 out of 6 rats died following a 4-hour exposure to 200 ethyl acrylate. A concentration of 1000 ppm for 4 hours killed no rats.

Other Toxicological Information: Patty states that ethyl acrylate by inhalat is a strong irritant, "causing salivation, conjunctival irritation, and marked respiratory irritation or pulmonary edema at high concentrations. Prolonged contact with skin or eye may cause severe damage . . . . Such findings as cloudy swelling of the liver and kidney have been noted at v high levels, but probably represent only nonspecific effects of the very tissue concentrations of such" an irritant.

Patty reports that a 4-hour exposure to 1000 ppm ethyl acrylate k 0 out of 6 rats; to 2000 ppm killed 5 out of 6 rats; to 4000 ppm killed 6 out of 6 rats. The Chemical Company Guides of Union Carbide Corporati give similar information.

Union Carbide also reports a single skin penetration LD50 in rabb of 1.95 grams per kilogram of body weight.

According to the Documentation of TLV's, the TLV of 25 ppm was co to be low enough to prevent irritation and systemic effects. The Hygien Guides, however, state that 25 ppm "is considered to be too high to prev irritating effects in humans."

LF: 18,000 ppm

VAPOR PRESSURE AT 20 C: 29.5 mm Hg

SATURATED CONCENTRATION AT 20 C: 38,800 ppm

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for ETHYL ACRYLATE

USE/EXPOSURE AND CONTROL DOCUMENT
ETHYL ACRYLATE

	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Inhalation of vapor and skin contact with liquid during the manufacture of acrylic resins for use in paint formulations, industrial coatings and latexes	A,B,D	Local exhaust ventilation; personal protective equipment (gloves, clothing)
2.	Inhalation of vapor and skin contact with liquid during manufacture of plastics such as ethylene ethyl acrylate	A,B,D	Local exhaust ventilation; personal protective equipment (gloves, clothing)
3.	Inhalation of vapor and skin contact with liquid during the manufacture of poly acrylate elastomers and acrylic rubber	A,B,D	Local exhaust ventilation; personal protective equipment (gloves, clothing)
4.	Inhalation of vapor and skin contact with liquid during the handling of ethyl acrylate monomer and the maintenance of powering equipment	A,B,D	Local exhaust ventilation; personal protective equipment (gloves, clothing)
5.	Skin contact during the forming of denture materials	B,D	Personal protective equipment (gloves)

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