NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND

SUPPORTING DOCUMENTATION FOR

*** ISOPROPYL ACETATE ***

NIOSH/OSHA Draft Technical Standard and Supporting Documentation for ISOPROPYL ACETATE

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 ISOPROPYL ACETATE.

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

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

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and Supporting Documentation for ISOPROPYL ACETATE

(a) DEFINITIONS

(1) PERMISSIBLE EXPOSURE - "Permissible Exposure" means inhalation of isopropyl acetate in concentrations not in excess of 250 parts per million (ppm) (950 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 isopropyl acetate.

(b) EMPLOYEE INFORMATION - Each employer who has a workplace in which isopropyl acetate 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 ISOPROPYL ACETATE - Inform affected employees of the quantity, location, and manner of use or storage of isopropyl acetate.

(c) EXPOSURE MEASUREMENT

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

(ii) Any measurements of airborne concentrations of isopropyl acetate taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to isopropyl acetate; 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 isopropyl acetate 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 isopropyl acetate 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 isopropyl acetate 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 isopropyl acetate 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 isopropyl acetate 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 isopropyl acetate 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 isopropyl acetate 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) In the design of open surface tank ventilation for the purposes of section 1910.94 (d), operations involving isopropyl acetate shall be classified as B-1 at 70 F.

(iii) Where a fan is located in duct work and where isopropyl acetate is present in concentrations greater than 4500 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, non-sparking 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) and (f).

TABLE 2. RESPIRATOR PROTECTION FOR ISOPROPYL ACETATE

Condition	Permissible Respiratory Protection
Vapor Concentration	
Equal to or Less than 1000 ppm	A chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
Equal to or Less than 5000 ppm	A gas mask with a chin-style organic vapor canister.
Equal to or Less than 12 000 ppm	A gas mask with a 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.
Greater than	Self-contained breathing apparatus with a full facepiece

12 000 ppm or entry & escape from unknown concentrations	air respirator with a full facepiece operated in pressure-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 escape self-contained breathing apparatus. Any gas mask providing protection against organic vapors.

(f) Fire and Safety

Employers shall familiarize themselves with the information contained in the Substance Technical Guidelines for isopropyl acetate which is contained in Appendix B in order to ensure the safe handling and use of isopropyl acetate.

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

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

(4) Flammable liquids - For the purposes of compliance with section 1910.106, liquid isobutyl acetate is classified as a Class IB flammable liquid. Spray finishing operations shall be performed in accordance with sections 1910.107 and 1910.94(c). Dip tank operations shall be performed in accordance with sections 1910.108 and 1910.94(d).

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

(6) Storage - Isopropyl acetate shall be stored so as not to come in contact with nitrates, strong oxidizers, strong acids or strong alkalies.

(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 isopropyl acetate. Face shields shall comply with section 1910.133(a)(6).

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

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

(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 isopropyl acetate may occur.

(h) Spills

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

(2) Liquid isopropyl acetate 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 isopropyl acetate promptly wash or shower as necessary to remove any isopropyl acetate from the skin.

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

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

(2) Medical -

(I) Advise employees as to the signs and symptoms of exposure to isopropyl acetate.

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

(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 isopropyl acetate, or airborne concentrations of isopropyl acetate 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 isopropyl acetate.

(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 isopropyl acetate 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 isopropyl acetate.

(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 isopropyl acetate;
(II) A description of the employee's duties as they

relate to his exposure to isopropyl acetate;

(III) A description of any personal protective equipment, including respirators, 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 isopropyl acetate 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 isopropyl acetate.

(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 isopropyl acetate.

(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.

(12) No medical procedure which would be performed pursuant to this section need be performed if records of a previous such procedure performed within the past six months are acceptable to the examining physician.

(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 until replaced by a more recent record.

(2) Exposure measurements.

(i) The employer shall keep an accurate record of all measurements taken to determine employee exposure to isopropyl acetate.

(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 isopropyl acetate 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 until replaced by a more recent record but in no event for less than one year.

(3) Mechanical ventilation.

(i) When mechanical ventilation is used as an engineering control, the employer shall maintain 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 at least 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 until replaced by a more recent record.

(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 iso
- (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 isopropyl acetate which is conducted pursuant to this section.

(2) Exercise of opportunity to observe monitoring.

(i) When observation of the monitoring of employee exposure to isopropyl acetate 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 isopropyl acetate 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 isopropyl acetate 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.

APPENDIX A

SUBSTANCE SAFETY DATA SHEET

I. SUBSTANCE IDENTIFICATION

SUBSTANCE: Isopropyl acetate

PERMISSIBLE EXPOSURE: 250 parts of isopropyl acetate vapor per million parts of air (ppm) or 950 milligrams of isopropyl acetate vapor per cubic meter of air (mg/cu m)

APPEARANCE AND ODOR: Colorless liquid with a fruity odor.

II. HEALTH HAZARD DATA

A. Ways in Which the Chemical Affects Your Body: Isopropyl acetate may 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 isopropyl acetate may cause irritation of the eyes, nose, and throat. Severe overexposure may cause weakness, drowsiness, and unconsciousness.
2. Long-Term Overexposure: Prolonged overexposure may produce irritation of the skin.
3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms associated with isopropyl acetate.

III. EMERGENCY FIRST AID PROCEDURES

A. Eye Exposure: If isopropyl acetate 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.

B. Skin Exposure: If isopropyl acetate gets on your skin, flush the contaminated skin with water promptly. If isopropyl acetate soaks through your clothing, remove the clothing immediately and flush the skin with water. Do not rewear the clothing until the isopropyl acetate has been removed. Replace or repair impervious clothing that has developed leaks. If there is skin irritation get medical attention.

C. Breathing: If you or any other person breathes in large amounts of isopropyl acetate remove the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

D. Swallowing: When isopropyl acetate 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 the 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 isopropyl acetate. 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 isopropyl acetate 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 shields and other appropriate protective clothing to prevent repeated or prolonged skin contact with liquid isopropyl acetate.

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

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

Isopropyl acetate 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, flames, nitrates, strong oxidizers, strong acids and strong alkalies. Sources of ignition such as smoking and open flames are prohibited wherever isopropyl acetate 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 isopropyl acetate, and containers must be bonded and grounded when pouring or transferring liquid isopropyl acetate. If your skin becomes wet with liquid isopropyl acetate, you must promptly wash or shower as necessary to remove the isopropyl acetate from your skin. You must immediately remove any clothing that becomes wet with liquid isopropyl acetate and

this clothing must not be reworn until the isopropyl acetate is removed from the clothing. Fire extinguishers,, where provided, must be readily available and you should know where they are and how to operate them. Ask your supervisor where isopropyl acetate is used in your work area and for any additional plant safety and health rules.

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APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
ISOPROPYL ACETATE

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Isopropyl ester of acetic acid; sec-propyl acetate

2. Formula: $CH_3COOCH(CH_3)_2$

3. Molecular weight: 102

B. Physical Data

1. Boiling point (760 mm Hg): 90 C (194 F)

2. Specific gravity (water=1): 0.87

3. Vapor density (air=1 at boiling point of isopropyl acetate): 3.5

4. Melting point: -69 C (-92 F)

5. Vapor pressure at 20 C (68 F): 43 mm Hg

6. Solubility in water, % by weight at 20 C (68 F): 2.9

7. Evaporation rate (butyl acetate=1): 5

8. Appearance and odor: Colorless liquid with a fruity odor.

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: 4.4 C (40 F) (closed cup)

2. Autoignition temperature: 460 C (860 F)

3. Flammable limits in air, % by volume: Lower: 1.8; Upper: 8.0

4. Extinguishing media: Alcohol foam, dry chemical, 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.

6. Unusual fire and explosion hazards: Isopropyl acetate is a flammable liquid. Its vapors can easily form exposive mixtures with air. All ignition sources must be controlled where isopropyl acetate is used, handled or stored. Isopropyl acetate vapors are heavier than air and may travel along the ground and be ignited by sparks or open flames at locations remote from the site at which isopropyl acetate is handled.

7. For purposes of conforming to the requirements of 29 CFR 1910.106, isopropyl acetate is classified as a Class IB flammable liquid. At 4500 ppm, one-fourth of the lower flammable limit, isopropyl acetate is considered to be a potential fire and explosion hazard.

8. For purposes of comply with 29 CFR 1910.309 the classification of hazardous locations as described in Article 500 of the National Electrical Code for isopropyl acetate shall be Class I Group D.

B. Reactivity

1. Conditions contributing to instability: heat
2. Incompatibilities: Contact with nitrates, strong oxidizers, strong alkalies, or strong acids may cause fire and explosion.
3. Hazardous decomposition products: Toxic gases and vapors (such as Carbon monoxide) may be released in a fire involving isopropyl acetate.
4. Special precautions: Isopropyl acetate will attack some forms of plastics, rubber and coatings .

III. SPILL, LEAK, AND DISPOSAL PROCEDURES

A. If isopropyl acetate 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. Isopropyl acetate 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:

Isopropyl acetate may be disposed of:

1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a sanitary landfill.
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 isopropyl acetate 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 isopropyl acetate to plus or minus 25%. Methods meeting these accuracy requirements are available in the "NIOSH Monitoring Methods Manual".

V. MISCELLANEOUS PRECAUTIONS

A. Store isopropyl acetate in tightly closed containers in a cool, well-ventilated area.

B. High exposures to isopropyl acetate can occur when transferring the liquid from one container to another.

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

D. Employers must advise employees of all plant areas and operations where exposure to isopropyl acetate could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to isopropyl acetate is likely to occur are: in the application of fabric coatings containing isopropyl acetate; in the manufacture and use of lacquers, thinners, and printing and litho inks; its use as a solvent in the plastics industry and use as a general

solvent for waxes, gums, and oils; during its manufacture; in the manufacture of perfumes and flavoring extracts; in its use in organic synthesis.

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APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation; minor skin absorption.

II. TOXICOLOGY

Isopropyl acetate is an irritant of the eyes and upper respiratory tract. It may produce narcosis at high concentrations approaching the lethal level in animals. No chronic systemic effects have been reported in humans.

III. SIGNS AND SYMPTOMS

Irritation of the eyes and nose; narcosis may occur at sustained high levels of exposure. Dermatitis may occur from prolonged skin contact.

IV. SPECIAL TESTS

None in common usage.

V. TREATMENT

Remove from exposure. Give artificial resuscitation if indicated. Wash eyes and contaminated skin with water. If swallowed and the person is conscious, induce vomiting. Recovery is usually complete.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

Most reported effects of isopropyl acetate are caused by its irritant properties. It is important that the physician becomes familiar with plant operating conditions in which exposure to isopropyl acetate 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 examination 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. Chronic respiratory disease -- In persons with impaired pulmonary function, especially those with obstructive airway

diseases, the inhalation of isopropyl acetate might cause exacerbation of symptoms due to its irritant properties.

2. Skin disease -- Isopropyl acetate is a defatting agent and can cause dematitis on prolonged exposure. Persons with preexisting skin disorders may be more susceptible to the effects of this agent.

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

4. Kidney disease -- Although isopropyl acetate is not known as a kidney toxin in humans, the importance of this organ in the elimination of toxic substances justifies special consideration in those with impaired renal 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 examination.

References

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2. Browning, Ethel; Toxicity and Metabolism of Industrial Solvents, Elsevier Publishing Company, Amsterdam, 1965, pp. 535-536.

3. von Oettingen, W. F.: "The Aliphatic Acids and Their Esters: Toxicity and Potential Dangers," A.M.A. Archives of Industrial Health, 21: 28-65, 1960.

4. American Conference of Governmental Industrial Hygienists: "Isopropyl Acetate," (3d ed. 2d printing), Documentation of the Threshold Limit Values for Substances in Workroom Air, Cincinnati, 1974, p. 141.

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REFERENCES AND SOURCES
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1910.93

(f) Personal Protective Equipment, (h) Sanitation

Eye: Grant, "Toxicology of the Eye;" "Isopropyl Acetate," Union Carbide Corp. Toxicology Study; Enjay Corp. Product Bulletin; "Encyclopedia of Occupational Safety and Health," International Labour Office

Skin: "Isopropyl Acetate," Union Carbide Corp. Toxicology Study; Sax, "Dangerous Properties of Industrial Materials"

Ingestion: "Isopropyl Acetate," Union Carbide Corp. Toxicology Study; Patty, "Industrial Hygiene and Toxicology;" Spector, "Handbook of Toxicology;" NIOSH Toxic Substances List (1973); Stecher, "The Merck Index," Sax, "Dangerous Properties of Industrial Materials"

COMMENTS

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

Grant reports only that "splashes in human eyes have been noted to result in 'slow healing' in two cases, but no details have bee published." Union Carbide notes "minor burns are caused by flooding the eye with an excess of the chemical." An Enjay product bulletin notes that contact causes "irritation but no eye injury." ILO reports that "occupational exposures" have not resulted in "permanent lesions."

There are no data in the literature to suggest that any injury caused is irreversible or otherwise severe. The substance is, therefore, assigned a classification of 2.

Skin - Classification: 2
Output statement numbers: 2, 7b, 16i, 21
Exceptions: None

Union Carbide reports that the single skin absorption LD50 for rabbits is slightly in excess of 20 ml/kg and states "repeate exposure may result in a defatting action on the skin and may cause a dermatitis." Also noted is that an uncovered application to a rabbit belly did not demonstrate skin irritation. Sax lists the substance as being an acute local irritant of slight toxic hazard.

Isopropyl acetate has a vapor pressure of 43 mm Hg at 20 degrees C. It is 2.9% soluble in water and has a flash point of 40 degrees F.

A classification of 2 is concluded to be appropriate.

Ingestion - Classification: 0
Output statement numbers: None
Exceptions: None

Union Carbide gives a single oral dose rat LD50 of 6.75 gm/kg. Patty gives one of 3,000 mg/kg with which Spector and the NIOSH Toxic Substances List agree . Sax notes "chronic exposure can cause liver damage," but lists the toxic hazard of chronic ingestion as being slight. Stecher agrees with this latter statement.

The vapor pressure of the substance is considerable. It is therefore, concluded that, in the context of this standard, ingestion would not present a hazard in the industrial environment.

SUBSTANCE TECHNICAL GUIDELINES
ISOPROPYL ACETATE

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Isopropyl ester of acetic acid; sec-propyl acetate
2. Formula: $CH_3COOCH(CH_3)_2$
3. Molecular weight: 102

B. Physical Data

1. Boiling point (760 mm Hg): 90 C (194 F)
2. Specific gravity (water=1): 0.87
3. Vapor density (air=1 at boiling point of isopropyl acetate): 3.5
4. Melting point: -69 C (-92 F)
5. Vapor pressure at 20 C (68 F): 43 mm Hg
6. Solubility in water, % by weight at 20 C (68 F): 2.9
7. Evaporation rate (butyl acetate=1): 5
8. Appearance and odor: Colorless liquid with a fruity odor.

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: 4.4 C (40 F) (closed cup)
2. Autoignition temperature: 460 C (860 F)
3. Flammable limits in air, % by volume: Lower: 1.8; Upper: 8.0
4. Extinguishing media: Alcohol foam, dry chemical, 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.
6. Unusual fire and explosion hazards: Isopropyl acetate is a flammable liquid. Its vapors can easily form exposive mixtures with air. All ignition sources must be controlled where isopropyl acetate is used, handled or stored in a manner that could create a potential fire or explosion hazard. Isopropyl acetate vapors are heavier than air and may travel along the ground and be ignited by sparks or open flames at locations remote from the site at which isopropyl acetate is handled.
7. For purposes of conforming to the requirements of 29 CFR 1910.106, isopropyl acetate 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 isopropyl acetate is considered to be a potential fire and explosion hazard.
8. For purposes of comply with 29 CFR 1910.309 the classification of hazardous locations as described in Article 500 of the National Electrical Code for isopropyl acetate shall be Class I Group D.

B. Reactivity

1. Conditions contributing to instability: Heat.
2. Incompatibilities: Contact with nitrates, strong oxidizers, strong alkalies, or strong acids may cause fire and explosion.
3. Hazardous decomposition products: Toxic gases and vapors (such as Carbon monoxide) may be released in a fire involving isopropyl acetate.
4. Special precautions: Isopropyl acetate will attack some forms of plastics, rubber and coatings .

III. SPILL, LEAK, AND DISPOSAL PROCEDURES

A. If isopropyl acetate 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. Isopropyl acetate 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: Isopropyl acetate 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 isopropyl acetate 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 isopropyl acetate to plus or

minus 25%. Methods meeting these accuracy requirements are available in the "NIOSH Monitoring Methods Manual".

V. MISCELLANEOUS PRECAUTIONS

A. Store isopropyl acetate in tightly closed containers in a cool, well-ventilated area.

B. High exposures to isopropyl acetate can occur when transferring the liquid from one container to another.

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

D. Employers should advise employees of all plant areas and operations where exposure to isopropyl acetate could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to isopropyl acetate is likely to occur are: in the application of fabric coatings containing isopropyl acetate; in the manufacture and use of lacquers, thinners, and printing and litho inks; its use as a solvent in the plastics industry and use as a general solvent for waxes, gums, and oils; during its manufacture; in the manufacture of perfumes and flavoring extracts; and in its use in organic synthesis.

RESPIRATOR TABLE DOCUMENTATION

SUBSTANCE: Isopropyl acetate

D.O.L. STANDARD: 250 ppm

WARNING PROPERTIES:

Odor Threshold: Staub reports two odor thresholds for isopropyl acetate: 3(

Eye Irritation Level: Patty reports that 200 ppm causes eye irritation in ma

Evaluation of Warning Properties: Because of its low odor threshold and the of eye irritation, isopropyl acetate is treated as a material with good properties. Gas sorbent respiratory equipment is permitted.

IDLH: 16,000 ppm

Basis for IDLH Value: This IDLH is based upon the report of Union Carbide C(that a 4-hour exposure to 16,000 ppm killed 1 out of 6 rats.

Other Toxicological Information: The Chemical Company Guides of Union Carbi(Corporation report that "breathing a concentration of 16,000 parts per r for four hours killed one of 6 animals (rats). Breathing a concentrati(32,000 parts per million for four hours killed five of six animals. Bre saturated vapors in air killed on of six animals after one hour and thre six animals after two hours."

The Documentation of TLV's states that "a limit of 250 ppm, sligl higher than that for n-propyl acetate, is considered adequate to preven significant irritation of the eyes and respiratory passages."

LFL: 18,000 ppm

VAPOR PRESSURE AT 20 C: 43 mm Hg

SATURATED CONCENTRATION AT 20 C: Approximately 56,600 ppm

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USE/EXPOSURE AND CONTROL DOCUMENT
ISOPROPYL ACETATE

	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Inhalation of vapor during coating application to fabrics (artificial silk, leather and especially vinyl resin fabrics)	A	Local exhaust ventilation; general dilution ventilation
2.	Inhalation of vapor and mist and skin contact with liquid during spray application of lacquers (vehicle solvent for cellulose nitrate and ethyl cellulose lacquers)	A,B	Local exhaust ventilation; spray booths; personal protective equipment (respirator, goggles, protective rubber clothing)
3.	Inhalation of vapor during manufacture of cellulose nitrate and ethyl cellulose lacquers and thinners	A	Local exhaust ventilation, general dilution ventilation
4.	Inhalation of vapor during the use as a solvent of synthetic resins (cellulose nitrate, ethyl cellulose, polymethylmethacrylate, polystyrene, polyvinyl acetate) in the plastics industry	A	Local exhaust ventilation; general dilution ventilation
5.	Inhalation of vapor and skin contact with liquid during the manufacture and use of printing and litho inks	A,B	Local exhaust ventilation; general dilution ventilation
6.	Inhalation of vapor during production of isopropyl acetate	A	Local exhaust ventilation; general dilution ventilation; process enclosure
7.	Inhalation of vapor and skin contact with liquid during manufacture of perfumes and flavoring extracts	A,B	Local exhaust ventilation; general dilution ventilation
8.	Inhalation of vapor and skin contact with liquid during use as a general solvent for waxes, gums and oils	A,B	Local exhaust ventilation; general dilution ventilation; personal protective equipment (rubber gloves)
9.	Inhalation of vapor and skin contact with liquid during cleaning operation of storage	A,B	Local exhaust ventilation; general dilution ventilation; personal protective

	tanks and equipment		equipment (goggles, respirator, rubber gloves, protective clothing)
10.	Inhalation of vapor and skin contact with liquid when used for organic synthesis	A,B	Local exhaust ventilation; general dilution ventila-

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