NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND

SUPPORTING DOCUMENTATION FOR

*** N-PROPYL ACETATE ***

NIOSH/OSHA Draft Technical Standard and Supporting Documentation for N-PROPYL 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 N-PROPYL 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.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for N-PROPYL ACETATE

(a) DEFINITIONS

(1) PERMISSIBLE EXPOSURE - "Permissible Exposure" means inhalation of n-propyl acetate in concentrations not in excess of 200 parts per million (ppm) (840 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 n-propyl acetate.

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

(c) EXPOSURE MEASUREMENT

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

(ii) Any measurements of airborne concentrations of n-propyl acetate taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to n-propyl 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 n-propyl 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 n-propyl 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 n-propyl 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 n-propyl 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 n-propyl 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 n-propyl 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 n-propyl 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 compliance with section 1910.94(d), operations involving n-propyl acetate shall be classified as B-2 at 70 F.

(iii) Where a fan is located in duct work and where n-propyl acetate is present in concentrations greater than 5000 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 n-PROPYL ACETATE

Condition	Permissible Respiratory Protection
Vapor Concentration	
Equal to or Less than 1000 ppm	organic vapor cartridge(s).
Equal to or Less than 5000 ppm	canister. Any supplied-air respirator with a full facepiece, helmet or hood. Any self-contained breathing apparatus with a full facepiece.
Greater than 8000 ppm or,	Self-contained breathing apparatus with a full facepiece operated in pressure-demand (positive pressure)

Entry & Escape from Unknown Concentrations	A combination respirator which includes a Type C supplied-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 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 n-propyl acetate which is contained in Appendix B in order to ensure the safe handling and use of n-propyl acetate.

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

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

(4) Flammable liquids - For the purposes of compliance with section 1910.106, liquid n-propyl 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 n-propyl acetate is handled, used or stored in a manner so as to create a potential fire or explosion hazard.

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

(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 n-propyl acetate. Face shields shall comply with section 1910.133(a)(6).

(ii) Employers shall ensure that clothing which becomes wet with liquid n-propyl acetate be removed immediately and not reworn until the n-propyl acetate 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 n-propyl acetate may occur.

(h) Spills

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

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

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

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

(2) Medical -

(I) Advise employees as to the signs and symptoms of exposure to n-propyl acetate.

(II) Instruct the employees to advise the employer of the development of signs and symptoms of exposure to n-propyl 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 n-propyl 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 n-propyl acetate, or airborne concentrations of n-propyl 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) Kidney disease
(IV) Liver 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 n-propyl acetate.

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

(7) Exclusion or Removal from Exposure - No employee shall continue to be exposed to n-propyl 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 n-propyl 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 n-propyl
(II) A description of the employee's duties as they relate to his exposure to n-propyl acetate;
(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 n-propyl 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 n-propyl 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 n-propyl 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.

(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 n-propyl 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 n-propyl 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 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 n-pr

(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 n-propyl 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 n-propyl 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 n-propyl 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 n-propyl 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: n-propyl acetate

PERMISSIBLE EXPOSURE: 200 parts of n-propyl acetate vapor per million parts of air (ppm) or 840 milligrams of n-propyl acetate vapor per cubic meter of air (mg/cu m)

APPEARANCE AND ODOR: Colorless liquid with a mild fruity odor.

II. HEALTH HAZARD DATA

A. Ways in Which the Chemical Affects your Body: n-Propyl acetate 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 n-propyl acetate may cause irritation of 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 n-propyl acetate exposure.

III. EMERGENCY FIRST AID PROCEDURES

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

C. Breathing: If you or any other person breathes in large amounts of n-propyl 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 n-propyl 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 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 n-propyl 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 n-propyl 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 shield, and other appropriate protective clothing to prevent repeated or prolonged skin contact with liquid n-propyl acetate .

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

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

Propyl 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 and flames. Store n-propyl acetate away from nitrates, strong oxidizers, strong alkalies, and strong acids. Sources of ignition such as smoking and open flames are prohibited wherever n-propyl 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 n-propyl acetate, and containers must be bonded and grounded when pouring or transferring liquid n-propyl acetate. If your skin becomes wet with liquid n-propyl acetate, you must promptly wash or shower as necessary to remove the n-propyl acetate from your skin. You must immediately remove any clothing that becomes wet with liquid n-propyl acetate and this clothing must not be reworn until the n-propyl 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 n-propyl acetate is used in your work area and for any additional plant safety rules.

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES
N-PROPYL ACETATE

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Propyl acetate; acetic acid n-propyl ester
2. Formula: $CH_3COOCH_2CH_2CH_3$
3. Molecular weight: 102

B. Physical Data

1. Boiling point (760 mm Hg): 101.6 C (215 F)
2. Specific gravity (water=1): 0.89
3. Vapor density (air=1 at boiling point of n-propyl acetate): 3.5
4. Melting point: -95 C (-140 F)
5. Vapor pressure at 20 C (68 F): 25 mm Hg
6. Solubility in water % by weight at 20 C (68 F): 2
7. Evaporation rate (butyl acetate=1): 2.75
8. Appearance and odor: Colorless liquid with a mild fruity odor

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: 14 C (58 F) (closed cup)
2. Autoignition temperature: 450 C (842 F)
3. Flammable limits in air, % by volume: Lower: 2; Upper: 8
4. Extinguishing media: Dry chemical, carbon dioxide, alcohol foam
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: n-Propyl acetate is a flammable liquid. Its vapors can easily form exposive mixtures with air. All ignition sources must be controlled where n-propyl acetate is used, handled or stored. n-Propyl 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 n-propyl acetate is handled.
7. For purposes of conforming to the requirements of 29 CFR 1910.106, n-propyl acetate is classified as a Class IB flammable liquid. At 5000 ppm, one-fourth of the lower flammable limit, n-propyl acetate 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 n-propyl acetate shall be Class I Group D.

B. Reactivity

1. Conditions contributing to instability: Heat
2. Incompatibilities: Contact with nitrates, strong oxidizers, strong alkalies, and 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 n-propyl acetate.
4. Special precautions: n-Propyl acetate will dissolve many plastics and resins. .

III. SPILL, LEAK, AND DISPOSAL PROCEDURES

A. If n-propyl 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. n-Propyl 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:
n-Propyl acetate may be disposed of:

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

V. MISCELLANEOUS PRECAUTIONS

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

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

C. Non-sparking tools must be used to open and close metal n-propyl 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 n-propyl acetate could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to n-propyl acetate is likely to occur are: operations involved in its manufacture and in its use as a solvent for many resins, plastics and lacquers.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for N-PROPYL ACETATE

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation

II. TOXICOLOGY

The toxicologic effects of n-propyl acetate are chiefly irritation of the conjunctiva and upper respiratory tract, followed by narcosis. Cats exposed to 5,300 ppm for six hours daily showed eye irritation and salivation; at 24,500 ppm there was narcosis and death. No chronic systemic effects have been reported in humans.

III. SIGNS AND SYMPTOMS

Irritation of the eyes, nose and throat; narcosis at much higher concentrations; skin exposure predisposes to dermatitis due to defatting effect.

IV. SPECIAL TESTS

None in common usage.

V. TREATMENT

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

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

Most reported effects of n-propyl acetate are caused by its irritant properties. It is important that the physician become familiar with plant operating conditions in which exposure to n-propyl 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 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 n-propyl acetate 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, expecially those with obstructive airway diseases, the breathing of n-propyl acetate might cause exacerbation of symptoms due to its irritant properties.

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

3. Kidney disease -- Although n-propyl acetate is not known as a kidney toxin in humans, the importance of the organ in the elimination of toxic substances justifies special consideration in those with possible impairment of renal function.

4. Liver disease -- Although n-propyl acetate 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.

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. 1847-1866.

2. Browning, Ethel: Toxicity and Metabolism of Industrial Solvents, Elsevier Publishing Company, Amsterdam, 1965, pp. 533-535.

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.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for N-PROPYL ACETATE

REFERENCES AND SOURCES
N-PROPYL ACETATE
1910.93

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

Eye: Grant, "Toxicology of the Eye"
"n-Propyl Acetate," Union Carbide Toxicology Study

Skin: Patty, "Industrial Hygiene and Toxicology"
"n-Propyl Acetate," Union Carbide Toxicology Study
Sax, "Dangerous Properties of Industrial Materials"

Ingestion: "n-Propyl Acetate," Union Carbide Toxicology Study
Sax, "Dangerous Properties of Industrial Materials"

COMMENTS

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

Grant only reports that "human beings exposed for a week to vapor concentration of 29 to 60 mg/liter of air are reported to have shown conjunctival irritation, but this subsided as soon as exposure was discontinued." Union Carbide notes "flooding the rabbit eye with an excess of the chemical caus a reaction no more severe than moderate inflammation." A classification of 2 is concluded to be appropriate.

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

Patty notes in general for esters that "the local effects on skin are about the same as for other volatile solvents; defatting and cracking may occur. Sensitization dermatitis negligible." Union Carbide reports "the undiluted chemical caused no reaction on the tender skin of the rabbit belly gr than a faint redness of short duration. It also notes that skin penetration LD50 in rabbits is greater than 20 ml/kg. Sax considers it to be an acute local irritant of slight tox hazard.

N-Propyl acetate has a vapor pressure of 25 mm Hg at 20 degrees C. It is 2% soluble in water and has a flash point 58 degrees F.

A classification of 2 is concluded to be appropriate.

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

Union Carbide gives an acute oral dose LD50 in rats of 9.8 m Sax reports "it is not likely to cause chronic poisoning, si there is definite evidence of habituation to this material." It is therefore concluded that ingestion would not present a hazard in the industrial environment.

SUBSTANCE TECHNICAL GUIDELINES
N-PROPYL ACETATE

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Propyl acetate; acetic acid n-propyl ester

2. Formula: $CH_3COOCH_2CH_2CH_3$
3. Molecular weight: 102

B. Physical Data

1. Boiling point (760 mm Hg): 101.6 C (215 F)
2. Specific gravity (water=1): 0.89
3. Vapor density (air=1 at boiling point of n-propyl acetate): 3.5
4. Melting point: -95 C (-140 F)
5. Vapor pressure at 20 C (68 F): 25 mm Hg
6. Solubility in water % by weight at 20 C (68 F): 2
7. Evaporation rate (butyl acetate=1): 2.75
8. Appearance and odor: Colorless liquid with a mild fruity odor

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: 14 C (58 F) (closed cup)
2. Autoignition temperature: 450 C (842 F)
3. Flammable limits in air, % by volume: Lower: 2; Upper: 8
4. Extinguishing media: Dry chemical, carbon dioxide, alcohol foam
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: n-Propyl acetate is a flammable liquid. Its vapors can easily form exposive mixtures with air. All ignition sources must be controlled where n-propyl acetate is used, handled or stored in a manner that could create a potential fire or explosion hazard. n-Propyl 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 n-propyl acetate is handled.
7. For purposes of conforming to the requirements of 29 CFR 1910.106, n-propyl acetate is classified as a Class IB flammable liquid. For example, 5000 ppm, approximately one-fourth of the lower flammable limit, is one situation in which n-propyl acetate 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 n-propyl acetate shall be Class I Group D.

B. Reactivity

1. Conditions contributing to instability: Heat
2. Incompatibilities: Contact with nitrates, strong oxidizers, strong alkalies, and 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 n-propyl acetate.
4. Special precautions: n-Propyl acetate will dissolve many plastics and resins.

III. SPILL, LEAK, AND DISPOSAL PROCEDURES

A. If n-propyl 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. n-Propyl 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: n-Propyl 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 n-Propyl 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 n-Propyl acetate to plus or minus 25%. Methods meeting these accuracy requirements are available in the "NIOSH Monitoring Methods Manual".

V. MISCELLANEOUS PRECAUTIONS

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

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

C. Non-sparking tools must be used to open and close metal n-propyl 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 n-propyl acetate could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to n-propyl acetate is likely to occur are: operations involved in its manufacture and in its use as a solvent for many resins, plastics and lacquers.

RESPIRATOR TABLE DOCUMENTATION

SUBSTANCE: n-Propyl Acetate

D. O. L. STANDARD: 200 ppm

WARNING PROPERTIES:

Odor Threshold: According to the Handbook or Industrial Solvents, the odor of n-propyl acetate is detectable at the permissible exposure limit.

Eye Irritation Level: The Handbook of Organic Industrial Solvents states that n-propyl acetate "causes irritation of mucous membranes at the threshold limit."

Evaluation of Warning Properties: Through its odor and irritant effects, n-propyl acetate can be detected at the TLV. For the purposes of this standard, therefore, n-propyl acetate is treated as a material with good warning properties. Gas sorbent respiratory equipment is permitted

IDLH: 8000 ppm

Basis for IDLH Value: This IDLH is based upon the report in the Documentatio of TLV's that "A four-hour exposure at 8000 ppm was fatal to four of six rats."

Other Toxicological Information: The Documentation of TLV's states that "According to Flury and Wirth, the limiting narcotic concentration for a five-hour exposure was 9000 ppm for cats and 6000 ppm for mice . . . Exposures at 2,600 ppm caused salivation and eye irritation in cats. Smyth stated that a four-hour exposure at 8000 ppm was fatal to four of rats."

The Chemical Company Guides of Union Carbide Corporation report that "Breathing concentrated vapors formed at room temperature killed all of six animals (rats) in one hour of exposure. All survived one-hal Animals were not killed by four-hour hexpsure to a concentration of 4000

The TLV was recommended to "prevent significant irritation of the eyes and respiratory passages."

LFL: 20,000 ppm

VAPOR PRESSURE AT 20 C: 25 mm Hg

SATURATED CONCENTRATION AT 20 C: 32,900 ppm

USE/EXPOSURE AND CONTROL DOCUMENT
N-PROPYL ACETATE

	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Inhalation of vapors and skin contact with liquid during the spray, brush or dip application of lacquers	A,B A,B	Local exhaust ventilation; general dilution ventilation Local exhaust ventilation; equipment (respiratory protection)
2.	Inhalation of vapors and skin contact with liquid during the application of adhesives	A,B	Local exhaust ventilation; general dilution ventilation; avoid skin contact
3.	Inhalation of vapors and skin contact with liquid during the manufacture of lacquers	A,B	Local exhaust ventilation; general dilution ventilation; avoid skin contact
4.	Inhalation of vapors and skin contact with liquid during the manufacture of adhesives	A,B	Local exhaust ventilation; general dilution ventilation; avoid skin contact
5.	Inhalation of vapors and skin contact with liquid during use as a solvent for rubber	A,B	General dilution ventilation; avoid skin contact
6.	Inhalation of vapors and skin contact with liquid during application as solvent for plastics, nitrocellulose, cellulosic derivatives and resins	A,B	General dilution ventilation; avoid skin contact
7.	Inhalation of vapor and skin contact with liquid during brush or dip application of lacquers	A,B	General dilution ventilation; avoid skin contact
8.	Inhalation of vapors and skin contact with liquid during the preparation of flavoring agents and perfumes	A,B	General dilution ventilation; avoid skin contact

A -- Inhalation
B -- Skin contact resulting in localized irritation
C -- Ingestion
D -- Skin contact rsulting in

absorption and subsequent
systemic poisoning

------ JES2 JOB STATISTICS ------

1,190 CARDS READ

0 SYSOUT PRINT RECORDS

0 SYSOUT PUNCH RECORDS

0.00 MINUTES EXECUTION TIME

```
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*                                                 *
*** JES2 NJE *A*                                                ***
*** JES2 NJE *A*                                               ** **
*** JES2 NJE *A*                                              **   **
*** JES2 NJE *A*                                             **     **
*** JES2 NJE *A*                                            **       **
*** JES2 NJE *A*                                           **  ****   **
*** JES2 NJE *A*                                          **  **  **   **
*** JES2 NJE *A*                                         **   **   **   **
*** JES2 NJE *A*                                        **    **    **   **
*** JES2 NJE *A*                                       **     **     **   **
*** JES2 NJE *A*                                      **      **      **   **
*** JES2 NJE *A*                                     **       **       **   **
*** JES2 NJE *A*                                    **        **        **   **
*** JES2 NJE *A*                                   **         **         **   **
*** JES2 NJE *A*                                  **          **        **   . **
*** JES2 NJE *A*                                 **           **       **       **
*** JES2 NJE *A*                                **            **      **         **
*** JES2 NJE *A*                               **             **     **           **
*** JES2 NJE *A*                              **              **    **             **
*** JES2 NJE *A*                             **               **   **               **
*** JES2 NJE *A*                            **                **  **                 **
*** JES2 NJE *A*                           **   **            ** **             **    **
*** JES2 NJE *A*                          **   ****           ****             ****    **
*** JES2 NJE *A*                         **   **  **          **              **  **    **
*** JES2 NJE *A*                        **   **    **         **             **    **    **
*** JES2 NJE *A*                       **   **                **            **            **
*** JES2 NJE *A*                      **   **                 **           **              **
*** JES2 NJE *A*                     **   **                  **          **                **
*** JES2 NJE *A*                    **   **                   **         **                  **
*** JES2 NJE *A*                   **   **                    **        **                    *
*** JES2 NJE *A*                  **   **                     **       **
*** JES2 NJE *A*                 **   **                **    **      **                  **
*** JES2 NJE *A*                **   **                  **   **     **                    **
*** JES2 NJE *A*               **    ***********************  **     *************************
*** JES2 NJE *A*               **    ***********************  **     *************************
*** JES2 NJE *A*              **                              **
*** JES2 NJE *A*            **
*** JES2 NJE *A*           ********************************************************************
*** JES2 NJE *A*          *********************************************************************
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
*** JES2 NJE *A*    FWMMITS  OSH     JOB 1511     END     PRINTER8   MITS-PERIF-0205      2.13.39
```