

# OCCUPATIONAL SAFETY AND HEALTH GUIDELINE FOR n-AMYL ACETATE

## INTRODUCTION

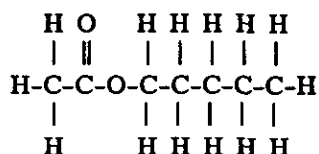
This guideline summarizes pertinent information about n-amyl acetate for workers and employers as well as for physicians, industrial hygienists, and other occupational safety and health professionals who may need such information to conduct effective occupational safety and health programs. Recommendations may be superseded by new developments; readers are therefore advised to regard these recommendations as general guidelines and to determine periodically whether new information is available.

## SUBSTANCE IDENTIFICATION

### • Formula



### • Structure



### • Synonyms

Pentyl acetate, amyl acetic ester, pear oil, acetic acid, amyl ester, acetic acid, pentyl ester, amyl acetate, amyl acetic ether, pent-acetate, 1-pentanol acetate, primary amyl acetate

### • Identifiers

1. CAS No.: 628-63-7
2. RTECS No.: AJ1925000
3. DOT UN: 1104 26
4. DOT label: Flammable Liquid

### • Appearance and odor

n-Amyl acetate is a flammable, colorless liquid with a bananalike odor. The odor threshold is reported to be 0.15 part per million (ppm) parts of air.

## CHEMICAL AND PHYSICAL PROPERTIES

### • Physical data

1. Molecular weight: 130.2
2. Boiling point (at 760 mm Hg): 149°C (300°F)
3. Specific gravity (water = 1): 0.88 at 20°C (68°F)
4. Vapor density (air = 1 at boiling point of n-amyl acetate): 4.5
5. Melting point: -70.5°C (-94.9°F)
6. Vapor pressure at 20°C (68°F): 4 mm Hg
7. Solubility: Slightly soluble in water, miscible with alcohol and ether
8. Evaporation rate (butyl acetate = 1): 0.42

### • Reactivity

1. Conditions contributing to instability: Heat, sparks, or flames
2. Incompatibilities: Fire and explosion may result from contact with nitrates, strong oxidizers, strong alkalies, or strong acids.
3. Hazardous decomposition products: Toxic gases (such as carbon monoxide), acrid smoke, and irritating fumes may be released when n-amyl acetate decomposes.
4. Special precautions: n-Amyl acetate can damage some plastics, rubbers, and coatings.

### • Flammability

The National Fire Protection Association has assigned a flammability rating of 3 (severe fire hazard) to n-amyl acetate.

1. Flash point: 25°C (77°F) (closed cup)
2. Autoignition temperature: 360°C (680°F)
3. Flammable limits in air (% by volume): Lower, 1.1; upper, 7.5

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Public Health Service Centers for Disease Control  
National Institute for Occupational Safety and Health  
Division of Standards Development and Technology Transfer

U.S. DEPARTMENT OF LABOR  
Occupational Safety and Health Administration

4. Extinguishant: Use dry chemical, carbon dioxide, or alcohol foam to fight fires involving n-amyl acetate. Water should not be used as an extinguishant because it will spread the flames.

Fires involving n-amyl acetate should be fought upwind and from the maximum distance possible. Isolate the hazard area and deny access to unnecessary personnel. Emergency personnel should stay out of low areas and ventilate closed spaces before entering. Vapor explosion and poison hazards may occur indoors, outdoors, or in sewers. Vapors may travel to a source of ignition and flash back. Containers of n-amyl acetate may explode in the heat of the fire and should be moved from the fire area if it is possible to do so safely. If this is not possible, cool containers from the sides with water until well after the fire is out. Stay away from the ends of containers. Personnel should withdraw immediately if they hear a rising sound from a venting safety device or if a container becomes discolored as a result of fire. Dikes should be used to contain fire-control water for later disposal. If a tank car or truck is involved in a fire, personnel should isolate an area of a half mile in all directions. Firefighters should wear a full set of protective clothing (including a self-contained breathing apparatus) when fighting fires involving n-amyl acetate. Firefighters' protective clothing may not provide protection against permeation by n-amyl acetate.

## EXPOSURE LIMITS

### • OSHA PEL

The current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for n-amyl acetate is 100 ppm (525 mg/m<sup>3</sup>) as an 8-hr time-weighted average (TWA) concentration [29 CFR 1910.1000, Table Z-1-A].

### • NIOSH REL

The National Institute for Occupational Safety and Health (NIOSH) has established a recommended exposure limit (REL) of 100 ppm (525 mg/m<sup>3</sup>) as an 8-hr TWA [NIOSH 1992].

### • ACGIH TLV®

The American Conference of Governmental Industrial Hygienists (ACGIH) has assigned n-amyl acetate a threshold limit value (TLV) of 100 ppm (525 mg/m<sup>3</sup>) as a TWA for a normal 8-hr workday and a 40-hr workweek [ACGIH 1991b].

### • Rationale for limits

The limits are based on the risk of irritation of the eyes and respiratory passages associated with exposure to n-amyl acetate.

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## HEALTH HAZARD INFORMATION

### • Routes of exposure

Exposure to n-amyl acetate can occur through inhalation, ingestion, or contact with the skin, eyes, and mucous membranes. n-Amyl acetate can also be absorbed slowly through the skin.

### • Summary of toxicology

1. *Effects on Animals:* n-Amyl acetate is an irritant of the eyes, skin, and respiratory tract in animals. When instilled into the eyes of rabbits, n-amyl acetate liquid causes mild and reversible corneal epithelial injury [Grant 1986]. When it contacts the skin, n-amyl acetate causes defatting [AIHA 1978]. The oral LD<sub>50</sub> in rats is 6,500 mg/kg [NIOSH 1991]. In rabbits, the LD<sub>50</sub> in a 24-hr covered skin penetration test is greater than 20 ml/kg [AIHA 1978]. All rats exposed to approximately 5,200 ppm died within 8 hr [ACGIH 1991a]. Autopsies of animals chronically exposed at 2,000 to 5,000 ppm for extended (not further specified) periods showed injury to the lungs, brain, liver, and kidneys [AIHA 1978].

2. *Effects on Humans:* n-Amyl acetate is an irritant of the eyes, skin, and mucous membranes in humans; at high concentrations, it causes narcosis. At concentrations above 300 ppm, exposure causes burning of the eyes and conjunctival hyperemia [Grant 1986]. The lowest toxic concentration reported in humans is 200 ppm for 30 min; exposure to this concentration causes eye irritation and headaches [NIOSH 1991; Proctor et al. 1988]. Prolonged or repeated skin contact with n-amyl acetate liquid causes defatting and irritation and may lead to dermatitis [AIHA 1978].

### • Signs and symptoms of exposure

1. *Acute exposure:* Acute exposure to n-amyl acetate can cause headache, dizziness, cardiac arrhythmia, narcosis, nausea, pulmonary edema, and irritation of the eyes, nose, and throat. Skin contact with liquid n-amyl acetate results in irritation, and eye contact causes irritation, redness, and a burning sensation.

2. *Chronic exposure:* Chronic exposure to n-amyl acetate can cause defatting of the skin and contact dermatitis.

### • Emergency procedures



Keep unconscious victims warm and on their sides to avoid

choking if vomiting occurs. Initiate the following emergency procedures:

1. *Eye exposure:* Tissue irritation may result from exposure to concentrated solutions, vapors, mists, or aerosols of n-amyl acetate. **Immediately and thoroughly** flush eyes with large amounts of water, occasionally lifting the upper and lower eyelids.

2. *Skin exposure:* Skin irritation may result. **Immediately** remove contaminated clothing and **thoroughly** wash contaminated skin with soap and water.

3. *Inhalation exposure:* If vapors, mists, or aerosols of n-amyl acetate are inhaled, move the victim to fresh air **immediately**.

If the victim is not breathing, clean any chemical contamination from the victim's lips and perform cardiopulmonary resuscitation (CPR); if breathing is difficult, give oxygen.

4. *Ingestion exposure:* Take the following steps if n-amyl acetate or a solution containing it is ingested:

—Have the victim rinse the contaminated mouth cavity several times with a fluid such as water.

—Have the victim drink a glass (8 oz) of fluid such as water.

—Induce vomiting by giving syrup of ipecac as directed on the package. If ipecac is unavailable, have the victim touch the back of the throat with a finger until productive vomiting ceases.

—Do **not** force an unconscious or convulsing person to drink fluid or to vomit.

5. *Rescue:* Remove an incapacitated worker from further exposure and implement appropriate emergency procedures (e.g., those listed on the material safety data sheet required by OSHA's hazard communication standard [29 CFR 1910.1200]). All workers should be familiar with emergency procedures and the location and proper use of emergency equipment.

## EXPOSURE SOURCES AND CONTROL METHODS

The following operations may involve n-amyl acetate and may result in worker exposures to this substance:

—Use of n-amyl acetate as a vehicle solvent in the manufacture of cellulose nitrate lacquers, lacquer thinners, adhesives, paints, enamels, enamel removers, nitrate cements, and film cements

—Spray, hand, brush, or coating applications of paints, lacquers, lacquer thinners, film cements, enamels, adhesives, nitrate cements, and enamel removers

—Extraction of penicillin from fermentation broth during production of antibiotics

—Manufacture of photographic film, quick-drying inks, metallic inks, transfer inks, and artificial fruit-flavoring agents

—Use of n-amyl acetate as a vehicle solvent during molding operations in the manufacture of cellulose nitrate plastics, toys, eyeglass frames, combs, and novelties

—Manufacture of furniture polish, leather polish, and shoe polish

—Pre-spotting and spotting operations in the dry cleaning industry

The following methods are effective in controlling worker exposures to n-amyl acetate, depending on the feasibility of implementation:

—Process enclosure

—Local exhaust ventilation

—General dilution ventilation

—Personal protective equipment

Good sources of information about control methods are as follows:

1. ACGIH [1992]. Industrial ventilation—a manual of recommended practice. 21st ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.

2. Burton DJ [1986]. Industrial ventilation—a self study companion. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.

3. Alden JL, Kane JM [1982]. Design of industrial ventilation systems. New York, NY: Industrial Press, Inc.

4. Wadden RA, Scheff PA [1987]. Engineering design for control of workplace hazards. New York, NY: McGraw-Hill.

5. Plog BA [1988]. Fundamentals of industrial hygiene. Chicago, IL: National Safety Council.

## MEDICAL MONITORING

Workers who may be exposed to chemical hazards should be monitored in a systematic program of medical surveillance that is intended to prevent occupational injury and disease. The program should include education of employers and workers about work-related hazards, placement of workers in jobs that do not jeopardize their safety or health, early detection of adverse health effects, and referral of workers for diagnosis and treatment. The occurrence of disease or other work-related adverse health effects should prompt immediate evaluation of primary preventive measures (e.g., industrial hygiene monitoring, engineering controls, and personal protective equipment). A medical monitoring program is intended to supplement, not replace, such measures.

To place workers effectively and to detect and control work-related health effects, medical evaluations should be performed (1) before job placement, (2) periodically during the term of employment, and (3) at the time of job transfer or termination.

- **Preplacement medical evaluation**

Before a worker is placed in a job with potential for exposure to n-amyl acetate, a licensed health care professional should evaluate and document the worker's baseline health status with thorough medical, environmental, and occupational histories, a physical examination, and physiologic and laboratory tests appropriate for the anticipated occupational risks. These should concentrate on the function and integrity of the eyes, skin, and respiratory system. Medical monitoring for respiratory disease should be conducted using the principles and methods recommended by the American Thoracic Society [ATS 1987].

A preplacement medical evaluation is recommended to assess an individual's suitability for employment at a specific job and to detect and assess medical conditions that may be aggravated or may result in increased risk when a worker is exposed to n-amyl acetate at or below the prescribed exposure limit. The licensed health care professional should consider the probable frequency, intensity, and duration of exposure as well as the nature and degree of any applicable medical condition. Such conditions (which should not be regarded as absolute contraindications to job placement) include a history and other findings consistent with chronic eye, skin, or respiratory system diseases.

- **Periodic medical examinations and biological monitoring**

Occupational health interviews and physical examinations should be performed at regular intervals during the employment period, as mandated by any applicable Federal, State, or local standard. Where no standard exists and the hazard is minimal, evaluations should be conducted every 3 to 5 years or as frequently as recommended by an experienced occupational health physician. Additional examinations may be necessary if a worker develops symptoms attributable to n-amyl acetate exposure. The interviews, examinations, and medical screening tests should focus on identifying the adverse effects of n-amyl acetate on the eyes, skin, and respiratory system. Current health status should be compared with the baseline health status of the individual worker or with expected values for a suitable reference population.

Biological monitoring involves sampling and analyzing body tissues or fluids to provide an index of exposure to a toxic substance or metabolite. No biological monitoring test acceptable for routine use has yet been developed for n-amyl acetate.

- **Medical examinations recommended at the time of job transfer or termination**

The medical, environmental, and occupational history interviews, the physical examination, and selected physiologic or laboratory tests that were conducted at the time of job placement should be repeated at the time of job transfer or termination. Any changes in the worker's health status should be compared with those expected for a suitable reference population.

## **WORKPLACE MONITORING AND MEASUREMENT**

A worker's exposure to airborne n-amyl acetate is determined by using a charcoal tube (100/50-mg sections, 20/40 mesh). Samples are collected at a maximum flow rate of 0.2 liter/min until a maximum air volume of 10 liters is collected. The sample is then treated with carbon disulfide to extract the n-amyl acetate. Analysis is conducted by gas chromatography using a flame ionization detector. The standard analytical error for this procedure is 0.08. This method is included in the OSHA Computerized Information System [OSHA 1989] and in Method 1450 of the *NIOSH Manual of Analytical Methods* [NIOSH 1984].

## **PERSONAL HYGIENE**

If n-amyl acetate contacts the skin, workers should immediately wash the affected areas with soap and water.

Clothing and shoes contaminated with n-amyl acetate should be removed immediately, and provisions should be made for safely removing this chemical from these articles. Persons laundering contaminated clothing should be informed about the hazardous properties of n-amyl acetate, particularly its potential for causing irritation.

A worker who handles n-amyl acetate should thoroughly wash hands, forearms, and face with soap and water before eating, using tobacco products, or using toilet facilities.

Workers should not eat, drink, or use tobacco products in areas where n-amyl acetate or a solution containing it is handled, processed, or stored.

## **STORAGE**

n-Amyl acetate should be stored in a cool, dry, well-ventilated area in tightly sealed containers that are labeled in accordance with OSHA's hazard communication standard [29 CFR 1910.1200]. Containers of n-amyl acetate should be protected from physical damage and should be stored separately from strong oxidizers, strong alkalis, nitrates, strong acids, heat, sparks, and open flame. To prevent static sparks, metal storage containers should be bonded and electrically grounded. All tools and equipment used to open or close containers of n-amyl acetate should be of the non-

sparkling type. Drums used to store n-amyl acetate must be equipped with self-closing valves, pressure-vacuum bungs, and flame arresters. Because empty containers that formerly contained n-amyl acetate may still hold product residues, they should be handled appropriately.

## SPILLS AND LEAKS

In the event of a spill or leak involving n-amyl acetate, persons not wearing protective equipment and clothing should be restricted from contaminated areas until cleanup is complete. The following steps should be undertaken following a spill or leak:

1. Do not touch the spilled material; stop the leak if it is possible to do so without risk.
2. Notify safety personnel.
3. Remove any hot metal surface and all sources of heat and ignition.
4. Provide maximum explosionproof ventilation.
5. Use nonsparking tools for cleanup.
6. Absorb liquid spills with sand or other noncombustible absorbent material and place the material in a covered container for later disposal.
7. For large liquid spills, build dikes far ahead of the spill to contain the n-amyl acetate for later reclamation or disposal.

## SPECIAL REQUIREMENTS

U.S. Environmental Protection Agency (EPA) requirements for emergency planning, reportable quantities of hazardous releases, community right-to-know, and hazardous waste management may change over time. Users are therefore advised to determine periodically whether new information is available.

### • Emergency planning requirements

n-Amyl acetate is not subject to EPA emergency planning requirements under the Superfund Amendments and Reauthorization Act (SARA) [42 USC 11022].

### • Reportable quantity requirements for hazardous releases

A hazardous substance release is defined by EPA as any spilling, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of a hazardous substance into the environment (including the abandonment or discarding of contaminated containers). In the event of a release that is equal to or greater than the reportable quantity for that chemical, employers are required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [40 CFR 355.40] to notify the proper Federal, State, and local authorities.

The reportable quantity for n-amyl acetate is 5,000 lb. If an amount equal to or greater than this quantity is released within a 24-hr period in a manner that will expose persons outside the facility, employers are required to do the following:

- Notify the National Response Center *immediately* at (800) 424-8802 or at (202) 426-2675 in Washington, D.C. [40 CFR 302.6].
- Notify the emergency response commission of the State likely to be affected by the release [40 CFR 355.40].
- Notify the community emergency coordinator of the local emergency planning committee (or relevant local emergency response personnel) of any area likely to be affected by the release [40 CFR 355.40].

### • Community right-to-know requirements

Employers are not required by SARA to submit a Toxic Chemical Release Inventory Form (Form R) to EPA reporting the amount of n-amyl acetate emitted or released from their facility annually.

### • Hazardous waste management requirements

EPA considers a waste to be hazardous if it exhibits any of the following characteristics: ignitability, corrosivity, reactivity, or toxicity as defined in 40 CFR 261.21-261.24. Although n-amyl acetate is not specifically listed as a hazardous waste under the Resource Conservation and Recovery Act of 1976 as amended (RCRA) [42 U.S.C. 690 et seq], EPA requires employers to treat waste as hazardous if it exhibits any of the characteristics discussed above.

Providing detailed information about the removal and disposal of chemicals is beyond the scope of this guideline. The U.S. Department of Transportation, EPA, and State and local regulations should be followed to ensure that removal, transport, and disposal of n-amyl acetate are conducted in accordance with existing regulations. To be certain that chemical waste disposal meets EPA regulatory requirements, employers should address any questions to the RCRA hotline at (800) 424-9346 or at (202) 382-3000 in Washington, D.C. In addition, relevant State and local authorities should be contacted for information about their requirements for waste removal and disposal.

## RESPIRATORY PROTECTION

### • Conditions for respirator use

Good industrial hygiene practice requires that engineering controls be used where feasible to reduce workplace concentrations of hazardous substances to the prescribed exposure limit. However, some situations may require the use of respirators to control exposure. Respirators must be worn if the ambient concentration of n-amyl acetate exceeds

prescribed exposure limits. Respirators may be used (1) before engineering controls have been installed, (2) during work operations such as maintenance or repair activities that involve unknown exposures, (3) during operations that require entry into tanks or closed vessels, and (4) during emergencies. Workers should use only respirators that have been approved by NIOSH and the Mine Safety and Health Administration (MSHA).

#### • Respiratory protection program

Employers should institute a complete respiratory protection program that, at a minimum, complies with the requirements of OSHA's respiratory protection standard [29 CFR 1910.134]. Such a program must include respirator selection, an evaluation of the worker's ability to perform the work while wearing a respirator, the regular training of personnel, fit testing, periodic workplace monitoring, and regular respirator maintenance, inspection, and cleaning. The implementation of an adequate respiratory protection program (including selection of the correct respirator) requires that a knowledgeable person be in charge of the program and that the program be evaluated regularly. For additional information about selection and use of respirators and the medical screening of respirator users, consult the *NIOSH Respirator Decision Logic* [NIOSH 1987b] and the *NIOSH Guide to Industrial Respiratory Protection* [NIOSH 1987a].

## PERSONAL PROTECTIVE EQUIPMENT

Protective clothing should be worn to prevent any skin contact with n-amyl acetate. Chemical protective clothing should be selected on the basis of available performance data, manufacturers' recommendations, and evaluation of the clothing under actual conditions of use. Polyvinyl alcohol has demonstrated good-to-excellent resistance to permeation by n-amyl acetate, withstanding permeation for more than 4 but fewer than 8 hr. Butyl rubber has demonstrated limited resistance to permeation. Natural rubber, neoprene, nitrile rubber, Viton<sup>®</sup>, and polyvinyl chloride have demonstrated poor resistance to permeation by n-amyl acetate.

If n-amyl acetate is dissolved in water or an organic solvent, the permeation properties of both the solvent and the mixture must be considered when selecting personal protective equipment and clothing.

Safety glasses, goggles, or face shields should be worn during operations in which n-amyl acetate might contact the eyes (e.g., through splashes of solution). Eyewash fountains and emergency showers should be available within the immediate work area whenever the potential exists for eye or skin contact with n-amyl acetate. Contact lenses should not be worn if the potential exists for n-amyl acetate exposure.

## REFERENCES CITED

ACGIH [1991a]. Documentation of the threshold limit values and biological exposure indices. 6th ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.

ACGIH [1991b]. 1991-1992 Threshold limit values for chemical substances and physical agents and biological exposure indices. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.

AIHA [1978]. Hygienic guide series. Akron, OH: American Industrial Hygiene Association.

ATS [1987]. Standardization of spirometry—1987 update. American Thoracic Society. *Am Rev Respir Dis* 136:1285-1296.

CFR. Code of Federal regulations. Washington, DC: U.S. Government Printing Office, Office of the Federal Register.

Grant WM [1986]. Toxicology of the eye. 3rd ed. Springfield, IL: Charles C. Thomas.


NIOSH [1984]. Esters I: Method 1450. In: Eller PM, ed. NIOSH manual of analytical methods. 3rd ed. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 84-100.

NIOSH [1987a]. NIOSH guide to industrial respiratory protection. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 87-116.

NIOSH [1987b]. Respirator decision logic. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 87-108.

NIOSH [1991]. Registry for toxic effects of chemical substances database: n-amyl acetate. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, Division of Standards Development and Technology Transfer, Technical Information Branch.

NIOSH [1992]. NIOSH recommendations for occupational safety and health: compendium of policy documents and statements. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 92-100.



OSHA [1989]. Computerized information system. Washington, DC: U.S. Department of Labor, Occupational Safety and Health Administration.

Proctor NH, Hughes JP, Fischman ML [1988]. Chemical hazards of the workplace. 2nd ed. Philadelphia, PA: J.B. Lippincott Company.

