

# OCCUPATIONAL SAFETY AND HEALTH GUIDELINE

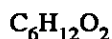
## FOR tert-BUTYL ACETATE

### INTRODUCTION

This guideline summarizes pertinent information about tert-butyl 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 Recommendations may be superseded by new developments; readers are therefore advised to regard these recommendations as general guidelines and to determine periodically whether new information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**

t-Butyl acetate; acetic acid, tert-butyl ester; acetic acid, 1,1-dimethyl ethyl ester; Texaco Lead Appreciator; TLA

- **Identifiers**

1. CAS No.: 540-88-5
2. RTECS No.: AF7400000
3. DOT UN: 1123 26
4. DOT label: Flammable Liquid

- **Appearance and odor**

tert-Butyl acetate is a flammable, colorless liquid with a fruity odor.

### CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data**

1. Molecular weight: 116.2

2. Boiling point (at 760 mm Hg): 97° to 98°C (206.6° to 208.4°F)

3. Specific gravity (water = 1): 0.87 at 20°C (68°F)

4. Vapor density (air = 1 at boiling point of tert-butyl acetate): 4.0

5. Melting point: Data not available

6. Vapor pressure at 20°C (68°F): Data not available

7. Solubility: Insoluble in water; soluble in alcohol and ether

8. Evaporation rate: Data not available

- **Reactivity**

1. Conditions contributing to instability: Heat, sparks, and open flame

2. Incompatibilities: Fire and explosions may result from contact of tert-butyl acetate with nitrates, strong oxidizers, strong alkalis, and strong acids.

3. Hazardous decomposition products: Toxic gases (such as carbon monoxide) may be released in a fire involving tert-butyl acetate.

4. Special precautions: tert-Butyl acetate may soften or dissolve plastics.

- **Flammability**

The National Fire Protection Association has not assigned a flammability rating to tert-butyl acetate; however, other sources rate this substance's fire hazard potential as severe.

1. Flash point: Between 16.6° and 22°C (62° and 72°F) (closed cup)

2. Autoignition temperature: Data not available

3. Flammable limits in air (% by volume): Lower, 1.5; upper, data not available

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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 alcohol foam, carbon dioxide, dry chemical, water spray, or Halon<sup>®</sup> to fight fires involving tert-butyl acetate.

Fires involving tert-butyl 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. Containers of tert-butyl 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. 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 tert-butyl acetate. Firefighters' protective clothing may not provide protection against permeation by tert-butyl acetate.

## EXPOSURE LIMITS

### • OSHA PEL

The current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for tert-butyl acetate is 200 ppm (950 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 200 ppm (950 mg/m<sup>3</sup>) as an 8-hr TWA [NIOSH 1992].

### • ACGIH TLV<sup>®</sup>

The American Conference of Governmental Industrial Hygienists (ACGIH) has assigned tert-butyl acetate a threshold limit value (TLV) of 200 ppm (950 mg/m<sup>3</sup>) as a TWA for a normal 8-hr workday and a 40-hr workweek [ACGIH 1991a].

### • Rationale for limits

The limits are based on the risk of eye and respiratory tract irritation associated with exposure to tert-butyl acetate.

## HEALTH HAZARD INFORMATION

### • Routes of exposure

Exposure to tert-butyl acetate can occur through inhalation, ingestion, and eye or skin contact.

### • Summary of toxicology

1. *Effects on Animals:* tert-Butyl acetate has not been tested for toxicity in animals. However, by analogy with the effects of other acetate esters, tert-butyl acetate is likely to cause eye, nose, and skin irritation and, at high concentrations, narcosis [Proctor et al. 1988].

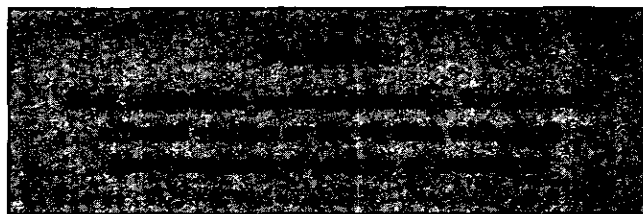
2. *Effects on Humans:* Exposure to tert-butyl acetate causes eye, skin, and respiratory irritation in workers. By analogy with the effects of similar esters, tert-butyl acetate is likely to cause narcosis at high concentrations [ACGIH 1991a].

### • Signs and symptoms of exposure

1. *Acute exposure:* Acute exposure to tert-butyl acetate can cause itchy or inflamed eyes and irritation of the nose and upper respiratory tract. Exposure to high concentrations of tert-butyl acetate may cause headache, drowsiness, and other narcotic effects.

2. *Chronic exposure:* No chronic effects of exposure to tert-butyl acetate have been reported; however, prolonged exposure may increase the severity of the acute dermal effects noted above.

### • 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 tert-butyl 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 tert-butyl 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 tert-butyl 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 uses of tert-butyl acetate may result in worker exposures to this substance:

- Use as a solvent
- Use as an additive to improve the antiknock properties of motor fuels

The following methods are effective in controlling worker exposures to tert-butyl 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 a potential for exposure to tert-butyl 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 tert-butyl 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 eye, skin, or respiratory tract 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 tert-butyl acetate exposure. The interviews, examinations, and medical screening tests should focus on identifying the adverse effects of tert-butyl 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 tert-butyl 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 tert-butyl acetate is determined by using coconut shell charcoal tubes (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 desorbed with carbon disulfide. Analysis is conducted by gas chromatography using a flame ionization detector. The limit of detection for this procedure is 0.02 mg per sample. This method is described in Method 1450 of the *NIOSH Manual of Analytical Methods* [NIOSH 1984].

## **PERSONAL HYGIENE**

If tert-butyl acetate contacts the skin, workers should flush the affected areas immediately with plenty of water for 15 min and then wash with soap and water.

Clothing contaminated with tert-butyl 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 of the hazardous properties of tert-butyl acetate, particularly its potential to be irritating to the eyes and skin.

A worker who handles tert-butyl 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 tert-butyl acetate is handled, processed, or stored.

## **STORAGE**

tert-Butyl 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 tert-butyl acetate should be protected from physical damage and should be stored separately from nitrates, strong oxidizers, strong acids, strong alkalis, heat, sparks, and open flame. Because containers that formerly contained tert-butyl acetate may still hold product residues, they should be handled appropriately.

## **SPILLS AND LEAKS**

In the event of a leak involving tert-butyl 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 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 all sources of heat and ignition.
4. Ventilate potentially explosive atmospheres.
5. Use water spray to reduce vapors, but be aware that the spray may not prevent ignition in closed spaces.
6. Absorb small 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 tert-butyl 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**

tert-Butyl 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 hazardous substances 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 authorities.

The reportable quantity for tert-butyl 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 Section 313 of the SARA to submit a Toxic Chemical Release Inventory Form (Form R) to EPA reporting the amount of tert-butyl 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 tert-butyl acetate is not specifically listed as a hazardous waste under the Resource Conservation and Recovery Act (RCRA) [40 USC 6901 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 specific 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 tert-butyl 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 materials 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 tert-butyl 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 the 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 skin contact with tert-butyl 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. No reports have been published on the resistance of various protective clothing materials to permeation by tert-butyl acetate; however, the following materials have been tested against permeation by a chemically similar substance (n-butyl acetate) and have demonstrated protection for more than 4 but fewer than 8 hr: polyvinyl alcohol, polyethylene/ethylene vinyl alcohol, and Teflon<sup>®</sup>. Natural rubber, neoprene, nitrile rubber,

polyethylene, polyvinyl chloride, and Viton® have demonstrated poor resistance to permeation by n-butyl acetate. Since specific test data are not available for tert-butyl acetate, the information provided here should be considered as a guideline only. If permeability data are not readily available, protective clothing manufacturers should be requested to provide information on the best chemical protective clothing for workers to wear when they are exposed to tert-butyl acetate.

If tert-butyl acetate is dissolved in 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 tert-butyl 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 tert-butyl acetate. Contact lenses should not be worn if the potential exists for tert-butyl acetate exposure.

## REFERENCES CITED

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