Occupational Health Guideline for p-tert-Butyltoluene

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: p-$CH_3C_6H_4C_4H_9$
- Synonyms: 1-Methyl-4-tert-butylbenzene
- Appearance and odor: Colorless liquid with an aromatic odor somewhat like gasoline.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for p-tert-butyltoluene is 10 parts of p-tert-butyltoluene per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 60 milligrams of p-tert-butyltoluene per cubic meter of air (mg/m^3).

HEALTH HAZARD INFORMATION

- **Routes of exposure**

p-tert-Butyltoluene can affect the body if it is inhaled, is swallowed, or comes in contact with the eyes or skin.

- **Effects of overexposure**

1. Short-term Exposure: p-tert-Butyltoluene may cause irritation of the eyes, nose, throat, and skin; it may also cause nausea, headache, and weakness.

2. Long-term Exposure: p-tert-Butyltoluene may cause heart changes, blood changes, and skin rash.

3. Reporting Signs and Symptoms: A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to p-tert-butyltoluene.

- **Recommended medical surveillance**

The following medical procedures should be made available to each employee who is exposed to p-tert-butyltoluene at potentially hazardous levels:

1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed person at increased risk, and to establish a baseline for future health monitoring. Examination of the cardiovascular and the central nervous systems should be stressed. The skin should be examined for evidence of chronic disorders.

—An electrocardiogram: This compound has been observed to cause an unusual cardiovascular syndrome in some workmen after occupational exposure. This consisted of decreased blood pressure, increased pulse rate, and failure to respond to the Master's test of cardiac fitness in a satisfactory manner.

—A complete blood count: This compound has been shown to cause depression of the bone marrow in rats exposed repeatedely to vapor in concentrations of up to 30 ppm. A complete blood count should be performed prior to exposure, including a differential count of a stained smear, as well as hemoglobin, hematocrit, and clotting time determinations.

2. Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis.

- **Summary of toxicology**

The main toxic effects of p-tert-butyltoluene are irritation of the skin and respiratory tract. If absorbed, it may depress the central nervous system and the bone marrow. In some exposed employees a cardiovascular syndrome characterized by decreased blood pressure, increased pulse rate, and abnormal response to the Master's exercise test has been observed.

CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data**

1. Molecular weight: 148

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

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

2. Boiling point (760 mm Hg): 193 C (380 F)
3. Specific gravity (water = 1): 0.86
4. Vapor density (air = 1 at boiling point of p-tert-butyltoluene): 5.1
5. Melting point: −52.5 C (-62 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Very low

• **Reactivity**

1. Conditions contributing to instability: Heat
2. Incompatibilities: Contact with oxidizing agents may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving p-tert-butyltoluene.
4. Special precautions: None

• **Flammability**

1. Flash point: 68 C (155 F) (closed cup)
2. Autoignition temperature: Data not available
3. Flammable limits in air, % by volume: Data not available
4. Extinguishant: Foam, carbon dioxide, dry chemical

• **Warning properties**

1. Odor Threshold: Patty reports that olfactory recognition is immediate at concentrations of 5 ppm.
2. Eye Irritation Level: The ILO states that slight conjunctival irritation occurs after exposure to 5 to 8 ppm.
3. Other Information: Sax states that inhalation of the vapors causes irritation of the lungs.
4. Evaluation of Warning Properties: Through its odor and irritant effects, p-tert-butyltoluene can be detected at concentrations below the permissible exposure limit. p-tert-Butyltoluene has good warning properties.

MONITORING AND MEASUREMENT PROCEDURES

• **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Method**

Sampling and analyses may be performed by collection of p-tert-butyltoluene vapors using an adsorption tube with subsequent desorption with carbon disulfide and gas chromatographic analysis. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure p-tert-butyltoluene may be used. An analytical method for p-tert-butyltoluene is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 2, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00260-6).

RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

• In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

• Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with liquid p-tert-butyltoluene.

• Clothing wet with liquid p-tert-butyltoluene should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of p-tert-butyltoluene from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the p-tert-butyltoluene, the person performing the operation should be informed of p-tert-butyltoluene's hazardous properties.

• Non-impervious clothing which becomes contaminated with liquid p-tert-butyltoluene should be removed promptly and not reworn until the p-tert-butyltoluene is removed from the clothing.

• Employees should be provided with and required to use splash-proof safety goggles where liquid p-tert-butyltoluene may contact the eyes.

SANITATION

• Skin that becomes contaminated with liquid p-tert-butyltoluene should be promptly washed or showered with soap or mild detergent and water to remove any p-tert-butyltoluene.

• Employees who handle liquid p-tert-butyltoluene should wash their hands thoroughly with soap or mild

detergent and water before eating, smoking, or using toilet facilities.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to p-tert-butyltoluene may occur and control methods which may be effective in each case:

Operation	Controls
Use and preparation of resins dissolved in p-tert-butyltoluene	Local exhaust ventilation; personal protective equipment
Use as a primary intermediate in chemical and pharmaceutical industries	Local exhaust ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• **Eye Exposure**

If p-tert-butyltoluene gets into the eyes, wash 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.

• **Skin Exposure**

If p-tert-butyltoluene gets on the skin, promptly flush the contaminated skin with water. If p-tert-butyltoluene soaks through the clothing, remove the clothing immediately and flush the skin with water. When there is skin irritation, get medical attention.

• **Breathing**

If a person breathes in large amounts of p-tert-butyltoluene, move 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.

• **Swallowing**

If p-tert-butyltoluene has been swallowed, do not induce vomiting. Get medical attention immediately.

• **Rescue**

Move the 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. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL, LEAK, AND DISPOSAL PROCEDURES

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

• If p-tert-butyltoluene 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 evaporating vapors to completely clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Large quantities can be collected and atomized in a suitable combustion chamber. Combustion may be improved by mixing with a more flammable liquid. Liquid p-tert-butyltoluene should not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

• Waste disposal methods:

p-tert-Butyltoluene may be disposed of:

1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a secured sanitary landfill.
2. By atomizing in a suitable combustion chamber. Combustion may be improved by mixing with a flammable liquid.

REFERENCES

• American Conference of Governmental Industrial Hygienists: "p-tert-Butyltoluene," *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.

• Browning, E.: *Toxicity and Metabolism of Industrial Solvents*, Elsevier, New York, 1965.

• Fairhall, L. T.: *Industrial Toxicology* (2nd ed.), Williams and Wilkins, Baltimore, 1957.

• Hine, C. H., et al.: "Toxicological Studies on p-tert-Butyltoluene." *Archives of Industrial Hygiene and Occupational Health*, 9:227-243, 1954.

• International Labour Office: *Encyclopedia of Occupational Health and Safety*, McGraw-Hill, New York, 1971.

• Patty, F. A. (ed.): *Toxicology*, Vol. II of *Industrial Hygiene and Toxicology* (2nd ed. rev.), Interscience, New York, 1963.

• Sax, N. I.: *Dangerous Properties of Industrial Materials* (3rd ed.), Van Nostrand Reinhold, New York, 1968.

RESPIRATORY PROTECTION FOR P-TERT-BUTYLTOLUENE

Condition	Minimum Respiratory Protection* Required Above 10 ppm
Vapor Concentration	
500 ppm or less	A chemical cartridge respirator with a full facepiece and an organic vapor cartridge(s). A gas mask with a chin-style or a front- or back-mounted organic vapor canister. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
1000 ppm or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 1000 ppm or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors. Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.