

NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND  
SUPPORTING DOCUMENTATION FOR

\*\*\* TERPHENYLS \*\*\*

NIOSH/OSHA Draft Technical Standard  
and Supporting Documentation for TERPHENYLS

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 TERPHENYLS.

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

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

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(a) Definitions

- (1) Permissible Exposure - "Permissible Exposure" means inhalation of terphenyls in concentrations not in excess of 1 part per million (ppm) (9 milligrams per cubic meter, mg/cu.m.) averaged over any 15 minute period during an 8-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 terphenyls.

(b) EMPLOYEE INFORMATION - Each employer who has a workplace in which terphenyls is present shall:

- (1) STANDARD AVAILABILITY - Keep a copy of this section with its appendices at the workplace. This material shall be made readily available to affected employees; and
- (2) PRESENCE OF TERPHENYLS - Inform affected employees of the quantity, location, and manner of use or storage of terphenyls.

(c) EXPOSURE MEASUREMENT

- (1) INITIAL DETERMINATION - Each employer who has a place of employment in which terphenyls is released into the workplace air shall determine if any employee may be exposed to airborne concentrations of terphenyls 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 terphenyls. 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 terphenyls;
- (ii) Any measurements of airborne concentrations of terphenyls taken;
- (iii) Any employee complaints of symptoms which may be attributable to exposure to terphenyls; 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 terphenyls 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) IDENTIFICATION OF EXPOSED EMPLOYEES - If the exposure measurement taken under paragraph (c)(2) of this section reveals employee exposure to airborne concentrations of terphenyls 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 terphenyls 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.

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- (5) EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE - If an employee exposure measurement reveals that an employee is exposed to airborne concentrations of terphenyls 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 terphenyls 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 samples which represent the employee's actual maximum exposure during an 8-hour work shift (Appendix B (IV.)). The method of measurement shall have an accuracy to a confidence level of 95%, of not less than 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 terphenyls 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 terphenyls 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.

(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 employee exposure to at or below the permissible exposure. Where technically feasible engineering and

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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 TERPHENYLS

Condition	Permissible Respiratory Protection
<hr/>	
Dust or Vapor Concentration	
Equal to or Less than 450 mg/m <sup>3</sup> or 50 ppm	<p>A chemical cartridge respirator with a full facepiece organic vapor cartridge(s), and high efficiency particulate filter(s).</p> <p>A gas mask with a chin-style or front or back-mounted organic vapor canister and high efficiency particulate filter.</p> <p>Any supplied-air respirator with a full facepiece.</p> <p>Any self-contained breathing apparatus with a full facepiece.</p>
<hr/>	
Equal to or Less than 900 mg/m <sup>3</sup> or 100 ppm	<p>A Type C supplied-air respirator with a full facepiece operated in pressure-demand (positive pressure) mode or with a full facepiece, hood, or helmet operated in continuous flow mode.</p>
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Greater than 900 mg/m <sup>3</sup> or 100 ppm or Entry and Escape from Unknown Concentrations	<p>Self-contained breathing apparatus with a full facepiece operated in pressure-demand (positive pressure) mode.</p> <p>A combination respirator which includes a type C in pressure-demand (positive pressure) or continuous flow mode and an auxiliary self-contained air supply operated in pressure-demand mode.</p>
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Fire Fighting	Self-contained breathing apparatus with a full face-

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piece operated in pressure-demand (positive pressure) mode.

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Escape Any escape self-contained breathing apparatus.  
Any gas mask providing protection against organic vapors and particulates.

(f) Fire and Safety

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

- (1) Electrical - For the purposes of compliance with section 1910.309, locations classified as hazardous locations due to the presence of terphenyls shall be Class II Group G.
- (2) Portable fire extinguishers - For the purposes of compliance with section 1910.157, terphenyls 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 terphenyls shall be Class II Group G.
- (4) Sources of ignition - Sources of ignition such as smoking or open flames are prohibited where terphenyls is used, handled or stored in a manner so as to create a potential fire or explosion hazard.

(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 any possibility of skin contact to molten terphenyls. Face shields shall comply with section 1910.133(a)(6).
- (ii) 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 terphenyls dust or solutions containing terphenyls. Face shields shall comply with section 1910.133(a)(6).
- (iii) Employers shall ensure that clothing contaminated with terphenyls is placed in closed containers. Employers shall provide for the cleaning or disposal of such clothing and if the clothing is to be laundered or otherwise cleaned, shall inform the person performing this operation of the hazardous properties of terphenyls.
- (iv) Where there is any possibility of exposure of an employee's body to molten terphenyls, employers shall provide facilities for quick drenching of the body within the immediate work area for emergency use.
- (v) Employers shall ensure that non-impervious clothing contaminated with terphenyls be promptly removed and not re worn until the terphenyls is removed from the clothing.

(2) Eye Contact

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- (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 there is any possibility of liquid molten terphenyls contacting the eye.
  - (ii) 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 solutions containing terphenyls may occur.
  - (iii) Employers shall provide, and require employees to use, dust-proof safety goggles (cup-cover type dust and splash safety goggles), which comply with section 1910.133(a)(6), where eye contact to terphenyl dust may occur.
  - (iv) Where there is any possibility that an employee's eyes may be exposed to molten terphenyls, employers shall provide an eye wash fountain within the immediate work area for emergency use.
- (h) Spills
- (1) Spills of terphenyls shall be cleaned up immediately after eliminating potential sources of ignition and utilizing available
- (i) Sanitation
- (1) Employers shall ensure that employees whose skin becomes contaminated with molten terphenyls immediately wash or shower to remove any terphenyls from the skin.
  - (2) Employers shall ensure that employees whose skin becomes contaminated with terphenyl dust or solutions containing terphenyls promptly wash or shower to remove any terphenyls from the skin.
  - (3) Where skin contamination may occur and showers are required for adequate cleaning of the body, employers shall provide showers as described in section 1910.141(d)(3).
  - (4) Employers shall ensure that employees who handle terphenyls wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.
- (j) Training and Information - Each employer who has employees exposed to terphenyls in excess of the action level, or employees who may have skin or eye contact with molten terphenyls, terphenyl dust, or solutions containing terphenyls, or employees who work where accidental release, spill, fire, or explosion of terphenyls may occur, shall annually:
- (1) Substance Safety Data Sheet - Inform each employee of the information contained in the Substance Safety Data Sheet for terphenyls, which is contained in Appendix A; and
  - (2) Medical -
    - (I) Advise employees as to the signs and symptoms of exposure to terphenyls.
    - (II) Instruct the employees to advise the employer of the development of signs and symptoms of exposure to terphenyls 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 -

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- (I) Provide training to insure that employees understand the precautions of safe use, emergency procedures, and the correct use of protective equipment relative to terphenyls.
- (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 terphenyls, or airborne concentrations of terphenyls at or above the action level, a written statement as to whether such employee has a history of any of the following:

- (i) Kidney disease
- (ii) Liver disease
- (iii) Chronic lung disease
- (iv) Skin 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 terphenyls.

(6) Results of Periodic Examinations - The employer shall obtain a physician's written opinion based on the medical examination pursuant to paragraph (k)(5).

(7) Exclusion or Removal from Exposure - No employee shall be exposed to terphenyls 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 terphenyls.

(9) Informing the Physician - The employer shall provide to the examining physician the following information:

- (i) A copy of this regulation for terphenyls;
- (ii) A description of the employee's duties as they relate to his exposure to terphenyls;
- (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

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(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 terphenyls 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 terphenyls.

(c) The employee has been informed by the physician of any detected medical conditions which required further medical examination or treatment.

(ii) The written opinion shall not reveal medical information unrelated to exposure to terphenyls.

(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.

(1) 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 terphenyls.

(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 terphenyls 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.

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- (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 terphenyls;
    - (d) A signed statement of any refusal to be examined;
    - (e) A copy of information provided to the physician pursuant to paragraph (k)(9) 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 terphenyls which is conducted pursuant to this section.
  - (2) Exercise of opportunity to observe monitoring.
    - (i) When observation of the monitoring of employee exposure to terphenyls 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 terphenyls that are being performed at the place of exposure.
      - (c) Record the results obtained.
- (n) Employee notification.

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- (1) The employer shall notify in writing, within five work days, every employee who is found to be exposed to terphenyls 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.

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APPENDIX A

SUBSTANCE SAFETY DATA SHEET

I. SUBSTANCE IDENTIFICATION

SUBSTANCE: Terphenyls

PERMISSIBLE EXPOSURE: 1 part of terphenyls vapor per million parts of air (ppm) or 9 milligrams terphenyls vapor per cubic meter of air (mg/cu m) must never be exceeded.

APPEARANCE AND ODOR: Colorless or light yellow solid.

II. HEALTH HAZARD DATA

A. Ways in Which the Chemical Affects Your Body: Terphenyls can affect your body if you inhale them, or if they come in contact with your skin or eyes, or if you swallow them.

B. Effects of Overexposure:

1. Short Term Effects: Exposure to terphenyls may cause eye, skin, and respiratory irritation.
2. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms associated with terphenyls exposure.

III. EMERGENCY FIRST AID PROCEDURES

A. Eye Exposure: If terphenyls get into your eyes, wash your 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 these chemicals.

B. Skin Exposure: If molten terphenyls get on your non-impervious clothing or skin remove and clean the contaminated clothing and flush the contaminated skin with water immediately and wash or shower to remove terphenyls. If terphenyls dust or solutions containing terphenyls get on your skin, promptly wash or shower to remove any terphenyls. If there is skin irritation, get medical attention.

C. Breathing: If you or any other person breathes in large amounts of terphenyls remove the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the

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affected person warm and at rest. Get medical attention as soon as possible.

- D. Swallowing: If terphenyls has been swallowed, do not cause vomiting. Get medical attention immediately.
  - 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 terphenyls. 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 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 over any parts of your body that could repeatedly be exposed to terphenyls powder or dust and solutions of terphenyls. If you handle hot solutions of terphenyls, the clothing must be air tight.
  - C. EYE PROTECTION: You must wear splash-proof safety goggles if it is possible that terphenyls powder or dust or solutions containing terphenyls may get into your eyes.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

You must store powdered terphenyls away from ignition sources. If you work in an area where your clothing is known to become contaminated with terphenyls, you must change into clean work clothing before work and into street clothing before going home. You must promptly remove any clothing which has become contaminated, wash or shower to remove terphenyls. Clothing that has become contaminated with terphenyls must not be reworn until the terphenyls have been removed from the clothing. Smoking and eating are prohibited in areas where terphenyls are handled, used, or stored. If you handle terphenyls you must always wash your hands thoroughly to remove terphenyls before eating, smoking, or using toilet facilities. To remove terphenyls from areas of your body contaminated with terphenyls you must wash with powdered pumice cleansers, borax or other suitable cleansers. Fire extinguishers, where provided, must be readily available, and you should know where they are and how to operate them. Ask your supervisor where terphenyls are used in your work area and for any additional plant safety rules.

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APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES  
TERPHENYLS

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Ortho-terphenyl; meta-terphenyl; para-terphenyl; mixed terphenyls; diphenylbenzenes; triphenyls
2. Formula: C<sub>18</sub>H<sub>14</sub>

B. Physical Data

1. Boiling point (760 mm Hg): 333-381 C (630-718 F)
2. Specific gravity (H<sub>2</sub>O=1): 1.1-1.2
3. Vapor density (air=1): Not applicable
4. Melting point: 56-213 C (133-415 F)
5. Vapor pressure at 20 C (68 F): very low
6. Solubility in water, % by weight at 20 C (68 F): Insoluble
7. Evaporation rate (butyl acetate=1): Not applicable
8. Appearance and odor: Colorless or light yellow solid

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: 163-207 C (325-405 F) (open cup)
2. Autoignition temperature: Data not available
3. Flammable limits in air, % by volume: Data not available
4. Extinguishing media: Carbon dioxide or dry chemical
5. Special fire fighting procedures: Do not use a solid stream of water because stream will scatter and spread fire. Water or foam may cause frothing. Use water spray to cool containers.
6. Unusual fire and explosion hazards: Dust clouds of terphenyls in air can be ignited by sparks, hot surfaces, and flames. The minimum explosive concentration of dust is 28 mg/cu m.
7. For purposes of complying with the requirements of 29 CFR 1910.309, the classification of hazardous locations as described in Article 500 of the National Electrical Code for terphenyls shall be Class II, Group G.

B. Reactivity

1. Conditions contributing to instability: Heat
2. Incompatibilities: None
3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving terphenyl.
4. Special Precautions: None

III. SPILL AND LEAK PROCEDURES

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- A. If terphenyls 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, sweep onto paper or other suitable material, place in an appropriate container and place in a safe place (such as a fume hood) and burn. Large quantities may be reclaimed; however, if this is not practical use a procedure similar to that for small quantities.
- B. Persons not wearing protective equipment should be restricted from areas of spills or leaks until cleanup has been completed.
- C. Waste Disposal Methods:  
Terphenyls may be disposed of:
1. By making packages of terphenyls in paper or other flammable material and burning in a suitable combustion chamber.
  2. By dissolving terphenyls in a flammable solvent (such as alcohol) and 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 must be taken during periods of maximum expected airborne concentrations of terphenyls. Each measurement should consist of a 15-minute sample or series of consecutive samples totaling fifteen (15) minutes in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). A minimum of three measurements should be taken on one work shift and the highest of all measurements taken is a good estimate of employee's exposure for that shift. 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 terphenyls 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.. More than three (3) measurements should be taken during the work shift so that increased confidence may be placed in the judgement that the employee has or has not, in fact, been exposed in excess of the permissible limit. Laboratories performing samples should be collected as described under paragraph IV.A.. 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 terphenyls to plus or minus 25%. Methods meeting these accuracy requirements are available in the "NIOSH Monitoring Methods Manual".
- V. MISCELLANEOUS PRECAUTIONS
- A. Powdered material must not be stored where ignition sources are present. The dust often is formed by condensation of hot vapors that escape when the material is used as a heat-transfer fluid.
- B. Employers must advise employees of all plant areas and operations where exposure to terphenyls might occur.
- VI. COMMON OPERATIONS

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Some common operations in which exposure to terphenyls is likely to occur are manufacture of plastic scintillators, use of terphenyls as heat-transfer fluids, ingredients in waxes, polishes, plasticizers and in the manufacture of chlorinated derivatives and hydrogenated derivatives.

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APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. Route of Entry

Inhalation

II. Toxicology

Experimental animals show conjunctival irritation from direct contact with terphenyls. Clinical studies of an exposed group of employees showed no ill effects from prolonged exposure to concentrations ranging from 0.1 to 0.9 mg/m<sup>3</sup>. Animals exposed to concentrations of three to five times these levels had slight cellular changes in the lungs and liver as demonstrated by electron microscopy. Absorbed terphenyls are slowly metabolized and excreted in the urine as phenolic compounds and as glucuronides.

III. Signs and Symptoms

Splashes of heated liquid on the skin produce thermal tar-like burns. Exposure to the hot liquid or vapor produces headache and sore throat of less than 24 hours duration, as well as irritation of the eyes and skin.

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 usually rapid and complete.

VI. Surveillance and Preventive Considerations

A. General

Most reported effects of terphenyls are caused by its irritant properties. It is important that the physician becomes familiar with plant operating conditions in which exposure to terphenyls 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 exposure to terphenyls. Only those giving a positive history of these conditions must be referred for further medical examinations.

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1. Skin disease -- The hot vapor of the terphenyls has a primary irritant effect on the skin. Persons with pre-existing skin disorders may be more susceptible to this effect.
2. Chronic respiratory disease -- Persons with acute or chronic respiratory diseases may be more susceptible to the effects of terphenyls, since transient changes in the mitochondria of alveolar cells have been demonstrated in the lungs of animals following such exposure.
3. Liver disease -- Persons with liver disease may be more susceptible to the effects of inhalation of terphenyls, since transient changes in hepatic cells have been demonstrated in the liver of animals following such exposure.
4. Kidney disease -- Although the terphenyls are not recognized as renal toxins, the importance of the kidney in the excretion of metabolites formed from absorbed terphenyls justifies special consideration in persons with possible impairment of renal functions.

C. Periodic Examinations

Routine periodic examinations are not required. However, if the employer becomes aware of an exposed employee with any of the above listed conditions, he must refer such an employee for further medical examination.

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References

1. Cornish, H.H., et al.: "Toxicity and Metabolism of Ortho-, Meta-, and Para-Terphenyls", Journal of Industrial Hygiene, 23:372-378, 1962.
2. Weeks, J.L., and B.C. Lentle: "Health Considerations in the Use of Organic Reactor Coolants", Journal of Occupational Medicine, 12:246-252, 1970.

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USE/EXPOSURE AND CONTROL DOCUMENT  
TERPHENYLS

Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1. Inhalation of vapors and skin contact with fumes during formulation of waxes, polishes, and resin body paints	A,B	personal protective equipment (leather gloves, goggles)
2. Skin contact with terphenyls during application of resin body paints, solvents, waxes, and polishes	B	Personal protective equipment (gloves, goggles)
3. Inhalation of vapors and skin contact with liquids during maintenance operations or following leaks in heat-transfer systems	A,B	(gloves, goggles, respiratory protection)
4. Inhalation of vapors and skin contact with high-temperature lubricants released during system leakage	A,B	(gloves, goggles, respiratory protection)
5. Inhalation of vapors and skin contact with dusts and fumes during distillation and other processing operations	A	(gloves, goggles, respiratory protection)
6. Inhalation of vapors and dusts during manufacture of plastic scintillators	A	(gloves, goggles, respiratory protection)
7. Inhalation of vapors and dusts during process of flaking or crushing to produce solid terphenyls following distillation	A	Personal protective equipment (gloves, goggles, respiratory protection)

A -- Inhalation

B -- Skin contact resulting in localized irritation

C -- Ingestion

D -- Skin contact resulting in absorption and subsequent systemic poisoning

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

933 CARDS READ

0 SYSOUT PRINT RECORDS

0 SYSOUT PUNCH RECORDS

0.00 MINUTES EXECUTION TIME

