NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND

SUPPORTING DOCUMENTATION FOR

*** XYLENE ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for XYLENE

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 XYLENE.

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.

(a) Definitions. (1) "Permissible exposure" means exposure of employees to airborne concentrations of xylene (XYLOL) not in excess of 100 parts per million (ppm) (435 milligrams per cubic meter (mg/m3)) averaged over an eight-hour work shift (time weighted average), as stated in § 1910.1000, Table Z-1.

(2) "Action level" means one-half of the permissible exposure for xylene averaged over an eight-hour work shift.

(3) Xylene includes all isomers of xylene.

(b) Initial determination and exposure measurement. (1) Each employer who has a place of employment in which xylene is released into the workplace air shall determine if there is any possibility that any employee may be exposed to airborne concentrations of xylene above the permissible level. The initial determination shall be made each time there is a change in production, process, or control measures which may result in an increase in airborne concentrations of xylene.

(2) A written record of the initial determination shall be made and shall contain at least the following information:

(i) Any information, observations, or calculations which may indicate employee exposure to xylene;

(ii) Any measurements of xylene taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to xylene; and

(iv) Date of initial determination, work being performed at the time, location within work site, and employees considered.

(3) If the employer determines that any employee may be exposed to xylene above the permissible exposure, the exposure of the employee in each work operation who is believed to have the greatest exposure shall be measured. The exposure measurement shall be representative of the maximum eight-hour time weighted average exposure of the employee.

(4) If the exposure measurement taken pursuant to paragraph (b) (3) of this section reveals employee exposure to xylene above the action level, the employer shall:

(i) Identify all employees who may be exposed above the permissible level; and

(ii) Measure the exposure of the employees so identified.

(5) If an employee exposure measurement reveals that an employee is exposed to xylene above the action level, but not above the permissible exposure, the exposure of that employee shall be measured at least every three months.

(6) If an employee exposure measurement reveals that an employee is exposed to xylene above the permissible exposure, the employer shall:

(i) Measure the exposure monthly of the employee so exposed; and

(ii) Institute control measures as required by paragraph (d) of this section; and

(iii) Individually notify, in writing, within five days, every employee who is found to be exposed to xylene above the permissible exposure. The employee shall also be notified of the results of the exposure measurements and of the corrective action being taken to reduce the exposure to below the permissible exposure.

(7) If two consecutive employee exposure measurements taken at least one week apart reveal that the employee is exposed to xylene below the action level, the employer may terminate measurement for the employee.

(8) For purposes of this paragraph, employee exposure is that which would occur if the employee were not using a respirator.

(c) Methods of measurement. (1) An employee's exposure shall be obtained by any combination of long term or short term samples which represents the employee's actual exposure averaged over an eight-hour work shift (See Appendix B (IV) of this section).

(2) The method of measurement shall have an accuracy, to a confidence level of 95 percent, of not less than that given in Table 1.

Table 1

Concentration	Required Accuracy
Above permissible exposure	± 25%
At or below permissible exposure and above the action level	± 35%
At or below the action level	± 50%

(d) Compliance. (1) No employee shall be exposed to xylene above the permissible exposure as defined in paragraph (a)(1) of this section.

(2) Employee exposures to airborne concentrations of xylene shall be controlled to at or below the permissible exposure by engineering and work practice controls.

(i) Engineering and work practice controls shall be instituted to reduce exposures to at or below the permissible exposure, except to the extent that such controls are not feasible.

(ii) Wherever engineering and work practice controls are not sufficient to reduce exposures to at or below the permissible exposure, they shall nonetheless be used to reduce exposure to the lowest level feasible and shall be supplemented by respirators in accordance with paragraph (d)(4) of this section.

(3) Engineering controls. (i) When local exhaust is used to control exposure, measurements which demonstrate system effectiveness, for example, air velocity or static pressure, shall be made at least every three months. Measurements of system effectiveness shall also be made within five days of any change in production, process, or control which might result in an increase in airborne concentrations of xylene.

(ii) In the design of open surface tank ventilation for the purposes of § 1910.94(d), operations involving xylene shall be classified as B-3 at (21 degrees C) 70 degrees F.

(4) Compliance with the permissible exposure shall not be achieved by the use of respirators except:

(i) During the time period necessary to install or implement engineering or work practice controls; or

(ii) In work situations in which engineering and work practice controls are not feasible; or

(iii) To supplement engineering and work practice controls when such controls fail to reduce airborne concentrations of xylene to at or below the permissible exposure; or

(iv) For operations which require entry into tanks or closed vessels; or

(v) In emergencies.

(5) Where respirators are needed and permitted under this paragraph to reduce employee exposure, the employer shall select and provide the appropriate respirator from Table 2 and shall ensure that the employee uses the respirator provided.

TABLE 2 RESPIRATORY PROTECTION FOR XYLENE (XYLOL)

CONDITION	PERMISSIBLE RESPIRATORY PROTECTION
Vapor Concentration	
1000 ppm or less	Any chemical cartridge respirator with a full facepiece and 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
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.

(6) Respirators shall be approved by the Mining Enforcement and Safety Administration (formerly Bureau of Mines) or by the National Institute for Occupational Safety and Health under the provisions of 30 CFR Part 11.

(7) The employer shall institute a respiratory protection program in accordance with § 1910.134(b), (d), (e), and (f).

(e) Fire and safety. (1) The employer shall familiarize himself with the information contained in the Substance Technical Guidelines (Appendix B of this section) for xylene.

(2) For the purpose of compliance with § 1910.309, locations classified as hazardous locations due to the presence of xylene shall be Class I, Group D.

(3) For the purpose of compliance with § 1910.157, xylene is classified as a Class B fire hazard.

(4) For the purpose of compliance with § 1910.178, locations classified as hazardous locations due to the presence of xylene shall be Class I, Group D.

(5) For the purpose of compliance with § 1910.106, liquid xylene is classified as a Class IC flammable liquid.

(6) Spray finishing operations shall be performed in accordance with §§ 1910.107 and 1910.94(c).

(7) Dip tank operations shall be performed in accordance with §§ 1910.108 and 1910.94(d).

(8) Where a fan is located in ductwork and where xylene is present in the ductwork in concentrations greater than 2500 ppm (approximately 25% of the lower flammable limit), the fan rotating element shall be of nonsparking material or the casing shall consist of, or be lined with, nonsparking material. There shall be sufficient clearance between the fan rotating element and the fan casing so as to prevent contact.

(9) Sources of ignition such as smoking or open flames are prohibited where xylene presents a fire or explosion hazard.

(10) Xylene shall be stored so as not to come in contact with strong oxidizers.

(f) Personal protective equipment. (1) Employers shall provide and ensure that employees use appropriate protective clothing and equipment necessary to prevent repeated or prolonged skin contact with liquid or solid xylene. Face shields shall comply with § 1910.133(a)(2),(a)(4), (a)(5), and (a)(6).

(2) Employers shall ensure that clothing contaminated with xylene is placed in closed containers for storage until it can be discarded or until the employer provides for the removal of xylene from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the xylene, the employer shall inform the person performing the operation of the hazardous properties of xylene.

(3) Employers shall ensure that any clothing which becomes wet with liquid xylene be removed immediately and that non-impervious clothing which becomes contaminated with xylene be removed promptly. Such clothing shall not be reworn until the xylene is removed from the clothing.

(4) Employers shall provide and ensure that employees use safety goggles which comply with § 1910.133(a)(2)-(a)(6) where liquid or solid xylene may contact the eyes.

(g) Spills and disposal. (1) In the event that liquid xylene is spilled the employer shall immediately eliminate potential sources of ignition, provide available ventilation and then clean up the spill.

(2) Liquid xylene shall not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion. Sewers designed to preclude the formation of explosive concentrations of xylene are permitted.

(h) Sanitation. (1) Employers shall ensure that employees whose skin becomes contaminated with xylene promptly wash or shower with soap or mild detergent and water to remove any xylene from the skin.

(2) Employers shall ensure that employees who handle liquid or solid xylene wash their hands thoroughly with soap or mild detergent and water before eating, smoking or using toilet facilities.

(i) Training and information. (1) Each employer who has a workplace in which xylene is present shall keep a copy of this regulation with Appendixes A, B and C at the workplace. This material shall be made readily available to affected employees.

(2) Each employer who has employees exposed to xylene above the action level without regard to the use of respirators, or employees who may have repeated or prolonged skin contact or who may have eye contact with liquid or solid xylene, or employees who work where xylene presents a fire or explosion hazard, shall annually:

(i) Inform affected employees of the information contained in the Substance Safety Data Sheet for xylene (Appendix A of this section);

(ii) Advise affected employees as to the signs and symptoms of exposure to xylene.

(iii) Instruct affected employees to advise the employer of the development of signs and symptoms of overexposure to xylene which are listed in Appendix A of the section; and

(iv) Provide training to ensure that employees understand the precautions of safe use, emergency procedures, and the correct use of protective equipment relative to xylene.

(j) Medical surveillance. (1) The employer shall provide medical procedures as required by this paragraph. All medical procedures shall be performed by or under the supervision of a physician at no cost to the employee.

(2) Preplacement medical examination. The employer shall make available to each employee who is exposed, or will be exposed, to airborne concentrations of xylene above the action level, without regard to the use of respirators, or employees who may have repeated or prolonged skin contact or who may have eye contact with liquid or solid xylene, a preplacement medical examination which must include the following:

(i) A medical history and physical examination with emphasis on the central nervous system, eyes, gastrointestinal tract, blood, liver, kidneys and skin;

(ii) A complete blood count to include at least red and white cell count, a differential smear, hemoglobin and hematocrit;

(iii) Urinalysis to include specific gravity, albumin, glucose and a microscopic on centrifuged sediment;

(iv) A profile of liver function.

(3) Periodic medical examination. The employer shall make available to each employee exposed to airborne concentrations of xylene above the action level, without regard to the use of respirators, or employees who may have repeated or prolonged skin contact or who may have eye contact with liquid or solid xylene, twenty-four months from the date of the employee's first exposure, and every twenty-four months thereafter, a periodic medical examination which must include the following:

(i) A medical history and physical examination with emphasis on the central nervous system, eyes, gastrointestinal tract, blood, liver, kidneys and skin;

(ii) A complete blood count to include at least red and white cell count, a differential smear, hemoglobin and hematocrit;

(iii) Urinalysis to include specific gravity, albumin, glucose and a microscopic on centrifuged sediment;

(iv) A profile of liver function.

(4) Alternative medical procedures. If the examining physician chooses to use alternative medical procedures to those specified in paragraphs (j)(2) and (j)(3) of this section, the employer may accept such alternative medical procedures as meeting the requirements of this section provided that the employer:

(i) Obtains a statement from the examining physician setting forth the alternative medical procedures, the rationale for substitution, and evidence that they will be equally effective;

(ii) Informs each exposed worker of the fact that alternative medical procedures to those required in paragraphs (j)(2) and (j)(3) of this section are to be made available.

(5) Interim medical examination. The employer shall provide an interim medical examination for the employee if the employee informs the employer of any of the signs or symptoms of exposure to xylene which are listed in Appendix A which the employee suspects are caused by exposure to xylene.

(6) Informing the physician. The employer shall provide to the physician performing any medical examination required by this section the following information:

(i) A copy of this regulation with Appendixes A, B, and C for xylene;

(ii) A description of the affected employee's duties as they relate to his exposure to xylene;

(iii) A description of any personal protective equipment and respirators required to be used;

(iv) The results of any measurements which may indicate the affected employee's exposure;

(v) The affected employee's anticipated exposure level; and

(vi) Upon request of the physician, any available information from previous medical examinations of the affected employee.

(7) Where a medical examination is required by paragraphs (j)(2), (j)(3), or (j)(5) of this section, following such examination the employer shall obtain from the examining physician a written opinion which conforms with paragraph (j)(8) of this section.

(8) Physician's written opinion. (i) The physician's written opinion by the examining physician shall specifically state:

(A) Whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to xylene;

(B) Any recommended limitations upon the employee's exposure to xylene, including limitations upon the use of personal protective equipment and respirators;

(C) That the employee has been informed by the physician of any detected medical conditions which require further medical examination or treatment.

(ii) The physician's written opinion shall not reveal specific medical findings or diagnoses unrelated to the employee's employment.

(iii) The employer shall provide the employee with a copy of the physician's written opinion.

(9) Results of tests. Where a preplacement or periodic medical examination is required by paragraphs (j)(2) or (j)(3) of this section, following such examination the employer shall obtain from the examining physician for inclusion in the employee's medical record:

(i) A recording of the results of the blood tests, liver function tests and urinalysis;

(ii) Where alternative medical procedures have been performed in accordance with paragraph (j)(4) of this section, a recording of such alternative procedures.

(10) No employee shall be exposed to xylene in such a way as would put the employee at increased risk of material impairment of his health from such exposure. The employer shall base this decision on any information available including the physician's written opinion.

(11) No medical procedure which would be performed pursuant to paragraphs (j)(2) or (j)(3) of this section need be performed if records of a previous such procedure performed within the past six months are acceptable to the examining physician.

(12) 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 risk involved by refusal to be examined.

(13) The employer shall provide emergency medical treatment for any employee injured through exposure to xylene.

(k) Recordkeeping. (1) Exposure determination. (i) The employer shall keep an accurate record of all determinations required to be made pursuant to paragraph (b)(1) of this section.

(ii) This record shall include the written determination required in paragraph (b)(2) of this section.

(iii) This record shall be maintained until replaced by a more recent record.

(2) Exposure measurements. (i) The employer shall keep an accurate record of all measurements taken to determine employee exposure to xylene.

(ii) This record shall include:

(A) The date of measurement;

(B) Operations involving exposure to xylene which are being monitored;

(C) Sampling and analytical method used and evidence of their accuracy;

(D) Number, duration, and results of samples taken; and

(E) Name, social security number and exposure of the employee monitored.

(iii) This record shall be maintained until replaced by a more recent record but in no event for less than one year.

(3) Mechanical ventilation. (i) When mechanical ventilation is used as an engineering control, the employer shall maintain an accurate record of the measurements demonstrating the effectiveness of such ventilation required by paragraph (d)(3) of this section.

(ii) This record shall include:

(A) Date of measurement;

(B) Type of measurement taken;

(C) Result of measurement.

(iii) These records shall be maintained for at least one year.

(4) Employee training and information. (i) The employer shall keep an accurate record of all employee training and information required by paragraph (i) of this section.

(ii) This record shall include:

(A) Date of training;

(B) Name and social security number of employee trained;

(C) Content or scope of training provided.

(iii) This record shall be maintained until replaced by a more recent record.

(5) Medical surveillance. (i) The employer shall keep an accurate record of employee medical surveillance required by paragraph (j) of this section.

(ii) This record shall include:

(A) The name and social security number of the employee;

(B) Results of tests required by paragraph (j)(2) and (j)(3) of this section and results of any tests conducted pursuant to paragraphs (j)(4) of this section;

(C) Any employee medical complaints relative to exposure to xylene;

(D) A copy of information provided to the physician pursuant to paragraph (j)(6)(ii), (iii), (iv), (v), and (vi) of this section.

(E) Physician's written opinion; and

(F) A signed statement of any refusal to be examined.

(iii) This record shall be maintained for the duration of and for five years after termination 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 of Labor for Occupational Safety and Health and the Director of the National Institute for Occupational Safety and Health.

(ii) Each employee or former employee shall have access to the exposure determination and exposure measurement records required to be maintained by this section which indicate his own exposure to xylene.

(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.

(l) Employee observation of measurement. (1) The employer shall give each employee or his representative an opportunity to observe any measurement of his exposure to xylene which is conducted pursuant to this section.

(2) When observation of measurement of employee exposure to xylene requires entry into an area where the use of personal protective devices, including respirators, is required, the observer shall be provided with and required to use such equipment and comply with all other applicable safety procedures.

(3) Without interfering with the measurement, observers shall be entitled to:

(i) Receive an explanation of the measurement procedure.

(ii) Visually observe all steps related to the measurement of the airborne concentration of xylene that are being performed at the place of exposure; and

(iii) Record the results obtained.

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NOTE: The information contained in the following appendix for xylene is neither intended, by itself, to create any additional obligations not otherwise imposed, nor detract from any existing obligations. To the extent the information supplements this regulation for xylene, it is advisory in nature.

APPENDIX A

SUBSTANCE SAFETY DATA SHEET
FOR XYLENE (XYLOL)

I. SUBSTANCE IDENTIFICATION

A. Substance: Xylene (XYLOL)

B. Permissible Exposure: 100 parts of xylene per million parts of air (ppm) (435 milligrams of xylene per cubic meter of air (mg/m3)) averaged over an eight-hour workshift.

C. Appearance and Odor: Colorless liquids with aromatic odors (pure p-xylene is a solid below 55 F.)

II. HEALTH HAZARD DATA

A. Ways in which the chemical affects your body: Xylene can affect your body if you inhale it or if it comes in contact with your eyes or skin or if you swallow it. It may enter your body through your skin.

B. Effects of Overexposure:

1. Short-term Exposure: Xylene vapor may cause irritation of the eyes, nose and throat. At high concentrations, xylene vapor may cause severe breathing difficulties which may be delayed in onset. At high concentrations it may also cause dizziness, staggering, drowsiness and unconsciousness. In addition, breathing high concentrations may cause loss of appetite, nausea, vomiting and abdominal pain. Liquid xylene may be irritating to the eyes and skin. Exposure to high concentrations of xylene vapor may cause reversible damage to the kidney and liver.

2. Long-term Exposure: Repreated or prolonged exposure to xylene may cause a skin rash. Repreated exposure of the eyes to high concentrations of xylene vapor may cause reversible eye damage.

3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms and suspect that they are caused by exposure to xylene.

III. EMERGENCY FIRST AID PROCEDURES

A. Eye Exposure: If liquid or solid xylene gets into your eyes, wash your eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical

attention immediately. Contact lenses should not be worn when working with this chemical.

B. Skin Exposure: If liquid or solid xylene gets on your skin, promptly wash the contaminated skin using soap or mild detergent and water. If liquid or solid xylene penetrates through your clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. If irritation is present after washing, get medical attention.

C. Breathing: If you or any other person breathes in large amounts of xylene 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.

D. Swallowing: When xylene has been swallowed, get medical attention immediately. Do not attempt to make the exposed person vomit.

E. Rescue: Move affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty yourself. Understand your emergency rescue procedures and know the locations of the emergency rescue equipment before the need arises.

IV. RESPIRATORS AND PROTECTIVE CLOTHING

A. Respirators: Respirators are not the best way to control exposure to xylene. You can only be required to wear them for routine use if your employer is in the process of installing controls or 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) or National Institute for Occupational Safety and Health (NIOSH) approval label. (Older respirators may have a Bureau of Mines approval label.) For effective protection, respirators must fit your face and head snugly. Respirators should not be loosened or removed in work situations where there use is required. If you can smell xylene while wearing a respirator, the respirator is not working correctly; go immediately to fresh air. If you experience difficulty breathing while wearing a respirator, tell your employer.

B. Protective clothing: You must wear appropriate protective clothing and equipment to prevent repeated or prolonged skin contact with liquid or solid xylene. Replace or repair impervious clothing that has developed leaks.

C. Eye Protection: You must wear splash-proof safety goggles where liquid xylene may contact your eyes. You must wear dust-resistant safety goggles where solid xylene may contact your eyes.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

A. Xylene is a flammable liquid. Its vapors can easily form explosive mixtures with air.

B. Xylene must be stored in tightly closed containers in a cool, well ventilated area away from strong oxidizers.

C. Sources of ignition such as smoking and open flames are prohibited wherever xylene is handled, used or stored in a manner that could create a potential fire or explosion hazard.

D. Metal containers in operations involving the transfer of five gallons or more of xylene should be grounded and bonded.

E. You must promptly remove any non-impervious clothing that becomes contaminated with xylene and this clothing must not be reworn until the xylene is removed from the clothing.

F. Clothing wet with liquid xylene can be easily ignited. This clothing must be removed immediately and not reworn until the xylene is removed from the clothing.

G. If your skin becomes contaminated with xylene, you must promptly wash or shower with soap or mild detergent and water to remove any xylene from your skin.

H. If you handle xylene, you must wash your hand thoroughly with soap or mild detergent and water before eating, smoking or using toilet facilities.

I. Fire extinguishers, where provided, must be readily available and you should know where they are and how to operate them.

J. Ask your supervisor where xylene is used in your work area and for any additional safety and health rules.

VI. ACCESS TO INFORMATION

A. Each year your employer is required to inform you of the information contained in this Substance Safety Data Sheet for xylene. In addition, your employer must instruct you in the safe use of xylene, emergency procedures, and the correct use of protective equipment.

B. Your employer is required to determine whether you are being exposed to xylene. You or your representative have the right to observe employee exposure measurements and to record the results obtained. If your employer determines that you are being overexposed, he is required to inform you of the exposure and the actions which are being taken to reduce your exposure.

C. Your employer is required to keep records of your exposure and medical examinations. Your employer is required to keep exposure data for at least one year and to keep medical data during your employment, and for a period of five years following your termination of employment. Your employer is required to make the exposure data available to you upon your request. Your employer is also required to release your medical records to your physician upon your written request.

D. Your employer must give you a copy of the physicians written opinion for any physical examination required by this standard.

NOTE: The information contained in the following appendix for xylene is neither intended, by itself, to create any additional obligations not otherwise imposed, nor detract from any existing obligations. To the

extent the information supplements this regulation for xylene, it is advisory in nature.

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES FOR XYLENE (XYLOL)

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Commercial xylene (xylol) is a mixture, mostly th meta-isomer. 1) O-xylene, ortho-xylene, 1,2-dimethyl-benzene; 2) m-xylene, meta-xylene, 1,3-dimethylbenzene; 3) p-xylene, para-xylene, 1,4-dimethylbenzene
2. Formula: $C_6H_4(CH_3)_2$
3. Molecular weight: 106.2

B. Physical Data

1. Boiling point (760 mm Hg): 1) 144.4 C (292 F); 2) 138.9 (282 F); 3) 138.3 (281 F)
2. Specific gravity (water = 1): 1) 0.88; 2) 0.86; 3) 0.86
3. Vapor density (air = 1 at boiling point of xylene): 3.7
4. Melting point: 1) -25 C (-12 F); 2) -48 C (-54 F); 3) 13 C (55 F)
5. Vapor pressure at 20 C (68 F): 1) 7 mm Hg; 2) 9 mm Hg; 3) 9 mm Hg
6. Solubility in water, % by weight at 20 C (68 F): 1) 0.00003; 2) 0.00003; 3) 0.00003
7. Evaporation rate (butyl acetate = 1): 1) 0.7; 2) 0.7; 3) 0.7
8. Appearance and odor: Colorless liquids with aromatic odors (pure p-xylene is a solid below 55 F.)

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: 1) 32 C (90 F) (closed cup); 2) 28.9 C (84 F); 3) 27.2 C (81 F)
2. Autoignition temperature: 1) 465 C (869 F); 2) 530 C (986 F); 3) 530 C (986 F)
3. Flammable limits in air, % by volume: Lower: 1) 1.0; 2) 1.1; 3) 1.1; Upper: 1) 6.0; 2) 7.0; 3) 7.0
4. Extinguishing media: Foam, carbon dioxide, dry chemical
5. Special fire-fighting procedures: Do not use a solid stream of water since a stream will scatter and spread the fire. Use water spray to cool containers exposed to a fire.
6. Unusual fire and explosion hazards: Xylene is a flammable liquid. Its vapors can easily form explosive

mixtures with air. All ignition sources must be controlled where xylene is used, handled or stored in a manner that could create a potential fire or explosion hazard. Xylene vapors are heavier than air and may travel along the ground and be ignited by open flames or sparks at locations remote from the site at which xylene is handled.

7. For purposes of conforming with the requirements of 29 CFR 1910.106, xylene is classified as a Class IC flammable liquid. For example, 2500 ppm, approximately one-fourth of the lower flammable limit, is one situation in which xylene is considered to be a potential fire and explosion hazard.
8. For purposes of complying with 29 CFR 1910.309, the classification of hazardous locations as described in Article 500 of the National Electrical Code for xylene shall be Class I, Group D.

B. Reactivity

1. Conditions contributing to instability: Elevated temperatures may cause containers to burst.
2. Incompatibilites: Contact with strong oxidizers may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving xylene.
4. Special precautions: Xylene will attack some forms of plastics, rubber and coatings.

III. SPILL, LEAK, AND DISPOSAL PROCEDURES

A. If xylene is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of spill or leak.
3. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for vapors to completely clear hood ductwork, then burn the paper. Large quantities can be collected and atomized in a suitable combustion chamber. Xylene must not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion. Sewers designed to preclude the formation of explosive concentrations of xylene vapors are permitted.
4. If in the solid form, allow to melt and treat as in (3) above.

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

C. Waste disposal methods: Xylene may be disposed of by atomizing in a suitable combustion chamber.

IV. MONITORING AND MEASUREMENT PROCEDURES

A. EXPOSURE ABOVE THE ACTION LEVEL: Measurements taken for the purpose of determining employee exposure under this section are best taken such that the eight-hour exposure may be

determined from a single eight-hour sample or 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). Sampling and analyses may be performed by instruments such as detector tubes certified by NIOSH under 42 CFR part 84, portable direct-reading instruments, dosimeters, or gas and vapor adsorption tubes with subsequent chemical analysis. The method of measurement must determine the concentration of xylene to plus or minus 35%.

B. EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE: The monitoring and measurements under this section should be essentially the same as described under paragraph IV. A. Laboratories performing chemical analyses should be accredited in Industrial Hygiene Chemistry by the American Industrial Hygiene Association. The method of measurement must determine the concentration of xylene to plus or minus 25%.

C. METHODS: Methods meeting these accuracy requirements are available from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161 under the title "NIOSH Analytical Methods for Set U" (Order number XXXXXXXXXX).

D. QUALIFIED PERSONS: Since many of the duties relating to employee protection are dependent on the results of monitoring and measuring procedures, employers should assure that the evaluation of employee exposures is performed by a competent industrial hygienist or other technically qualified person.

V. MISCELLANEOUS PRECAUTIONS

A. Store xylene in tightly closed containers in a cool, well ventilated area.

B. High exposures to xylene can occur when transferring the liquid from one container to another.

C. Metal containers in operations involving the transfer of five gallons or more of xylene should be grounded and bonded.

D. Employers should advise employees of all areas and operations where their exposure to xylene could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to xylene is likely to occur are: During its production and its use as a solvent; as an ingredient in certain high-octane gasolines; as an intermediate in the manufacture of dibasic acids for polymers; during synthesis of intermediates and mixed and pure isomers; and during application of surface coatings and in printing operations.

NOTE: The information contained in the following appendix for xylene is neither intended, by itself, to create any additional obligations not otherwise imposed, nor detract from any existing obligations. To the extent the information supplements this regulation for xylene, it is advisory in nature.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation; skin absorption.

II. TOXICOLOGY

Xylene vapor is an irritant of the eyes, mucous membranes, and skin; at high concentrations it causes narcosis. In animals, xylene causes blood changes reflecting mild toxicity to the hematopoietic system. Repeated exposure of rabbits to 1150 ppm of a mixture of isomers of xylene for 40 to 55 days caused a reversible decrease in red and white cell count and an increase in thrombocytes; exposure to 690 ppm for the same time period caused only a slight decrease in the white cell count. Three painters working in a confined space of a fuel tank were overcome by xylene vapors estimated to be 10,000 ppm; they were not found until 18.5 hours after entering the tank and 1 died from pulmonary edema shortly thereafter; the other 2 recovered completely in 2 days; they both had temporary hepatic impairment (inferred from elevated serum transaminase levels) and 1 of them had evidence of temporary renal impairment (increased blood urea and reduced creatinine clearance). In humans, exposure to undetermined but high concentrations caused dizziness, excitement, drowsiness, incoordination and a staggering gait. Workers exposed to concentrations above 200 ppm complain of anorexia, nausea, vomiting, and abdominal pain. Brief exposure of humans to 200 ppm caused irritation of the eyes, nose, and throat. There are reports of reversible corneal vacuolization in workers exposed to xylene, or to xylene plus other volatile solvents. The liquid is a skin irritant and causes erythema, dryness, and defatting; prolonged contact may cause the formation of vesicles.

III. SIGNS AND SYMPTOMS

Dizziness, excitement, drowsiness, incoordination, staggering gait; irritation of eyes, nose, and throat; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.

IV. SPECIAL TESTS

None in common usage.

V. TREATMENT

Remove from exposure. Immediately flush eyes with water and wash skin with soap or mild detergent and water. If swallowed, do not induce vomiting.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

Xylene causes narcosis at high concentrations but most complaints from workers occur from exposures to lower concentrations which cause irritation of mucous membranes and gastrointestinal disturbances. Skin absorption is known to occur. It is important that the physician become familiar with plant operating conditions in which exposure to xylene 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

The following medical procedures must be made available to each employee who is exposed to xylene:

1. A complete history and physical examination -- The purpose is to detect preexisting conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the central nervous system, eyes, gastrointestinal tract, blood, liver, and kidneys should be stressed. The skin should be examined for evidence of chronic disorders.

2. A complete blood count -- Xylene has been shown to cause reversible hematopoietic depression in animals. A complete blood count must be performed including a red cell count, a white cell count, a differential count of a stained smear, as well as hemoglobin and hematocrit.

3. Liver function tests -- Since liver damage has been observed in humans exposed to xylene, a profile of liver function shall be obtained by using a medically acceptable array of biochemical tests.

4. Urinalysis -- Since kidney damage has been observed in humans exposed to xylene, a urinalysis shall be obtained to include at a minimum specific gravity, albumin, glucose and a microscopic on centrifuged sediment.

C. PERIODIC EXAMINATIONS

The above medical examinations are to be repeated on a bi-annual basis.

VII. REFERENCES

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for XYLENE

1. American Conference of Governmental Industrial Hygienists: "Xylene," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, pp. 281-282.

2. Hygienic Guide Series: "Xylene," American Industrial Hygiene Association Journal, 32:702-705, 1971.

3. Patty, Frank A.: Industrial Hygiene and Toxicology, Vol. II - Toxicology (2d ed. revised), Interscience Publishing Company, New York, 1963, pp. 1233-1234.

4. National Institute for Occupational Safety and Health, U.S. Department of Health, Education, and Welfare: Criteria for a Recommended Standard....Occupational Exposure to Xylene, (NIOSH) 75-168, U.S. Government Printing Office, Washington, D.C., 1975.

5. Browning, Ethel: Toxicity and Metabolism of Industrial Solvents, Elsevier Publishing Company, Amsterdam, 1965, pp. 77-89.

6. Gerarde, H.W.: Toxicology and Biochemistry of Aromatic Hydrocarbons, Elsevier Publishing Company, Amsterdam, 1960, pp. 171-180.

REFERENCES AND SOURCES
XYLENE
1910.1000

(d) Compliance - Open surface tank classification based on relative evaporation rate of 14 hours. Doolittle

(e) Fire and Safety

(1) Electrical - Classification based on "Fire Hazard Classification of Chemical Vapors Relative to Explosion-proof Electrical Equipment," H. Carhart et al., National Academy of Science, 1973, report to U.S. Coast Guard, report no. CG-D-92-74, p. 22.

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

Eye: Deichmann and Gerarde, "Toxicology of Drugs and Chemicals;" Dow Chemical Co., Material Safety Data Sheet; Grant, "Toxicology of the Eye"

Skin: Commonwealth of Pennsylvania, "Hygienic Information Guide," No. 31; American National Standards Institute, "American National Standards Acceptable Concentrations;" Grant, "Toxicology of the Eye;" Gleason, "Clinical Toxicology of Commercial Products;" Patty, "Industrial Hygiene and Toxicology;" Sax, "Dangerous Properties of Industrial Materials"

Ingestion: American National Standards Institute, "American National Standards Acceptable Concentrations;" Gleason, "Clinical Toxicol of Commercial Products;" Dow Chemical Co., Material Safety Data Sheet; Christensen, "NIOSH Toxic Substances List"

COMMENTS

Eye - Classifications: 2 and 6
Output statement numbers: 10 and 12 combined
Exceptions: None

Deichmann and Gerarde report "direct contact with . . . eyes has resulted in intense burning," but according to Dow, no corneal injury is likely.

Grant has "observed that when a drop is dropped on rabbits' eyes xylene causes immediate discomfort and blepharospasm, followed by hyperemia of the conjunctiva and very slight transient injury of the corneal epithelium . . . Accidental splash in human eyes similarly causes only transient superficial damage, with rapid recovery." Grant states for solvents in general that "while the epithelium is missing, the corneal stroma may be slightly swollen" with a slightly wrinkled posterior surface; however, "as a result of splash of . . . organic solvents," the epithelium ". . . generally regenerates in a few days without residual permanent damage."

Although xylene is generally thought of as being a liquid at normal working temperatures, the para-isomer has a melting point of 55 degrees F. Thus, classifications of both 2 and 6 are assigned to the substance.

Skin - Classifications: 2 and 6
Output statement numbers: 2, 7a, 17g and 21 combined, 17i and 20a
Exceptions: 5b deleted

The Hygienic Information Guide No. 31 reports "skin disorders may be caused in three ways. First, by dissolving and

removing the fatty and sebaceous content of the skin, resulting in dryness and cracking; second, by dissolving the superficial layers causing redness and blistering; and third, by an allergic reaction in which contact with small amounts may cause severe generalized dermatitis."

According to ANSI, "in addition to defatting the skin, which can lead to severe dermatitis following repeated or prolonged contact, xylene also causes vasodilation in sensitive body sites." Grant agrees, saying the effect is strikingly demonstrated when xylene is applied to rabbit ears to facilitate I.V. injections.

Sax lists xylene as being an acute and chronic local irritant of slight toxic hazard. Its chronic systemic effects by skin absorption are also listed as being of slight toxic hazard.

Patty, ANSI, Gleason and others report that xylene may be absorbed through the skin but that such absorption is not of industrial significance.

The flash points of the three isomers of xylene range from 81 to 90 degrees F. They are all 0.00003% soluble in water. The ortho- and meta-isomers are liquids at normal working temperatures. The para-isomer, however, has a melting point of 55 degrees F. The vapor pressures of the isomers range from 7 to 9 mm Hg at 20 degrees C.

Since one isomer can exist as a solid at normal working temperatures, xylene is assigned both classifications of 2 and 6. Statement 5b is not specified, however, because the effects of the small amounts involved would be innocuous.

Ingestion - Classification: 2

Output statement numbers: 20a

Exceptions: None

According to the ANSI, "the isomers differ in acute toxicity, although there is not complete agreement among investigators about their relative potency . . . . Effects of chronic exposure to xylene are headache, fatigue, lassitude, irritability and in some cases, digestive disturbance." Gleason reports that "essentially the same train of symptoms follows the ingestion of the liquid" as inhalation of vapor. He adds that the "mean lethal dose of xylene is not known and no fatal cases are recorded;" however, the material is thought to resemble benzene and toluene in that 15 ml by mouth gives acute toxicity.

Concerning ingestion, Dow states "probably low in single dose oral toxicity; LD50 greater than 2000 mg/kg." Christensen lists an oral LD50 for the rat as 4300 mg/kg.

The API reports "one case of nonfatal poisoning due to the ingestion of 200 ml of xylene has been reported. The symptoms following ingestion were relieved by gastric lavage. Oliguria, increased urine urobilinogen, and a reduction in hemoglobin were found three days after ingestion. During the next three days all symptoms of intoxication had regressed."

The chronic effects of ingestion do not appear to be well defined. The available information concerning the effects of inhalation, however, indicates that there is no severe hazard and that a classification of 2 applied to both the solid and liquid forms should be adequate.

SUBSTANCE TECHNICAL GUIDELINES

The references cited for this document include:

Doolittle, A.K., "Technology of Solvents and Plasticizers," Wiley, 1954 (Doolittle)

National Fire Protection Association, "Fire Protection Guide on Hazardous Materials," 5th edition, 1975 (NFPA)

Exxon Co., U.S.A., Material Safety Data Sheet (Exxon)

Sun Oil Co., Material Safety Data Sheet (Sun)

Kirk-Othmer, "Encyclopedia of Chemical Technology," 2nd edition, Vol. 22, p. 467 (K-O)

Sources of data items used:

I. A. 1. Synonyms: K-O
2. Formula: NFPA-325M
3. Molecular weight: ADL

B. 1. Boiling point: NFPA-325M, Sun
2. Specific gravity: K-O
3. Vapor density: NFPA-325M, Exxon
4. Melting point: K-O
5. Vapor pressure: Exxon, ADL, Sun
6. Solubility in water: K-O
7. Evaporation rate: Exxon
8. Appearance and odor: NFPA-49, Exxon

II. A. 1. Flash point: NFPA-325M, Sun
2. Autoignition temperature: NFPA-325M
3. Flammable limits: NFPA-325M
4. Extinguishing media: NFPA-49, Exxon
5. Special fire fighting procedures: NFPA-49, NFPA-325M
6. Unusual fire and explosion hazards: NFPA-49

B. 1. Conditions contributing to instability: ADL
2. Incompatibilities: NFPA-49, Sun
3. Hazardous decomposition products: None
4. Special precautions: Exxon

III. A. Steps if released or spilled: Exxon, K-O

C. Waste disposal method: Exxon

V. Miscellaneous precautions: NFPA-49, Exxon

USE/EXPOSURE AND CONTROL DOCUMENT

References used in the preparation of this document include:

Browning, E., "Toxicity and Metabolism of Industrial Solvents," Elsevier Publishing Co., 1965 (Browning)

Butler, G. J. and Taylor, J. S., "Health Hazard Evaluation Report 72-13-27," Uniroyal Inc., Mishawaka, Indiana, Hazard Evaluation Branch, NIOSH, Cincinnati, Ohio, Report 72-13-27, 1972 (Butler)

Cohen, S. R. and Apol, A., "Health Hazard Evaluation Report 72-50-117," Chevrol Flint Assembly Plant, Flint, Michigan, Hazard Evaluation Branch, NIOSH, Cincinnati, Ohio, Report No. 72-50-117, 1974 (Cohen)

D.E.R.(R) 337 X 90 Epoxy Resin, Material Safety Data Sheet, Dow Chemical, U.S.A., Midland, Michigan, January 1972 (Dow)

"Dimethylbenzene (Xylene)," Hazard Process Index, Hazard Entry No. 63, Contract No. HSM-99- 73-62, National Institute of Occupational Safety and Health (HPI)

Doolittle, A.K., "Technology of Solvents and Plasticizers," Wiley, 1954 (Doolittle)

Ellis, C., "Printing Inks - Their Chemistry and Technology," Reinhold, New York, 1940 (Ellis)

Kirk, R. and Othmer, D., "Encyclopedia of Chemical Technology," Interscience Publishers, Division of John Wiley, 2nd edition, 1972 (K-O)

Goldie, I., "Can Xylene (Xylol) Provoke Convulsive Seizures?" Industrial Medicine and Surgery, Jan:33 - 35, 1960 (Goldie)

Hawley, G. G., "The Condensed Chemical Dictionary," 8th edition, van Nostrand, 1971 (Hawley)

International Labour Organization, "Encyclopedia of Occupational Health and Safety," Geneva, 1972 (ILO)

Lee, H. and Neville, K., "Handbook of Epoxy Resins," McGraw-Hill, New York, 1967 (Lee and Neville)

McCormick, W. E., "Industrial Health Problems in the Rubber Industry," American Industrial Hygiene Association Quarterly, 13:37 - 41, 1952 (McCormick)

"Merck Index of Chemicals and Drugs," Merck and Co., Inc., Rahway, N.J., 8th edition, 1968 (Merck)

Okawa, M. T., "Health Hazard Evaluation Report 74-113-192," Del Monte Corp., Oakland, California, Hazard Evaluation Services Branch, NIOSH, Cincinnati, Ohio, Report No. 74-113-192, 1975 (Okawa)

Patty, F. A., "Industrial Hygiene and Toxicology," Vol. II, Interscience Publishers, 1962 (Patty)

Stanford Research Institute, "Chemical Economics Handbook," Menlo Park, California (SRI)

"Xylene, Dimethylbenzene," Material Safety Data Sheet, Allied Chemical Corp., Specialty Chemicals Division, Morristown, New Jersey, May 1975 (Allied Chemical)

"Xylene (Xylol, Dimethyl Benzene), American Conference of Governmental Industrial Hygienists, Hygienic Guide Series, October, 1971 (Hygienic Guides)

"Xylene (Xylol)," Hygienic Information Guide, No. 31, Commonwealth of Pennsylvania, Department of Environmental Resources, Division of Occupational Health, 5/72 (Pennsylvania)

Reference for Specific Use/Exposure

1. HPI, SRI, K-O
2. HPI, ADL estimate
3. HPI, ADL estimate
4. Goldie, ILO, Okawa, Cohen
5. Ellis, ILO
6. McCormick, Patty
7. SRI, ADL estimate
8. K-O, HPI
9. Browning, Merck
10. Dow, Browning, Lee and Neville
11. HPI
12. HPI, ILO, K-O
13. ILO, Butler

4. HPI, SRI
15. Pennsylvania, HPI
16. Hawley, ILO
17. Hawley
18. Goldie, Browning
19. Merck, Pennsylvania

References for Specific Control Methods

Allied Chemicals, Pennsylvania and Hygienic Guides were the references used in all the Specific Control Methods.

RESPIRATOR TABLE DOCUMENTATION

SUBSTANCE: Xylene (xylol)

D. O. L. STANDARD: 100 ppm

WARNING PROPERTIES:

Odor Threshold: Patty states that "the initial odor of 200 ppm has an intensity of approximately 3 and an irritation value of 1. As in most other instances, olfactory fatigue occurs rapidly and the odor is no longer detected at this concentration."

Eye Irritation Level: The AIHA Hygienic Guides state that "exposure to vapors at 200 ppm caused eye irritation in most of the persons tested. Lesions in the form of fine vacuoles in the cornea of cats exposed to commercial xylene vapors have been observed." For the purposes of this standard, only full facepiece respirators are permitted.

Other Information: The Handbook of Industrial Organic Chemicals states that xylene "may be irritating to eyes, nose and throat as exposure exceeds threshold limit." The Hygienic Guides note that 200 ppm causes irritation of the nose and throat.

Evaluation of Warning Properties: Through its irritant effects, xylene can be detected within three times of the permissible exposure limit. For the purposes of this standard, therefore, xylene is treated as a material with good warning properties. Gas sorbent respiratory equipment is permitted.

IDLH: 1000 ppm

Basis for IDLH Value: This IDLH is based upon the statement by the American National Standards Institute that "exposure at 1000 ppm for five minutes or less will probably allow self-rescue with no irreversible injury. Higher concentrations or longer exposure periods can cause eye and respiratory tract irritation, and the beginning of narcotic effects which may limit self-rescue ability. This information is based on human experience and extrapolation from animal data."

Other Toxicological Information: The American National Standard Institute states that "inhalation is the primary exposure route for absorption of xylene. Although xylene can be absorbed through the skin, this is not a significant factor in industrial exposures. Acute exposures to high concentrations result in a narcotic effect on the central nervous system which can lead to unconsciousness. Characteristic indications of acute exposure include giddiness, fatigue, palpitation, dyspnea, anxiety, numbness of hands and feet, and intoxication.

"The isomers differ in acute toxicity, although there is not complete agreement among investigators about their relative potency in this respect. Effects of chronic exposure to xylene are headache, fatigue, lassitude, irritability and in some cases, digestive disturbances. Xylene has greater local irritant properties than

toluene. In addition to defatting of the skin, which can lead to severe dermatitis following repeated or prolonged contact, xylene also causes vasodilation in sensitive body sites."

The Documentation of TLV's states that "commercial xylene is a mixture of three isomers, with the meta form usually the principal component. According to Gerarde, 6 to 15% of ethyl benzene may also be present. Fairhall considered the effects of xylene similar to those of toluene, but Gerarde stated that the acute toxicity of the xylenes was higher . . .

"Nelson and associates found 200 ppm of xylene definitely irritating to the eyes, nose and throat of experimental human subjects. Greenburg and Moskowitz suggested a maximum allowable concentration of 200 ppm. Cook, Smyth, Elkins and Gerarde all considered this value too high, and Gerarde suggested 100 ppm as a more acceptable limit.

"A TLV of 100 ppm is recommended to prevent irritant and narcotic effects. It is believed that no significant chronic injury will result from continued occupational exposure at this level."

Patty points out that "the toxicological studies conducted on the xylenes are far fewer in number and less complete than the work reported on benzene and toluene. It appears that the acute toxicity of the xylenes is greater than the acute toxicity of toluene or benzene. The xylene isomers differ in their acute toxicity although the is not complete unanimity among animal experimentalists about the relative toxicity."

LFL: Ortho: 10,000 ppm; Meta: 11,000 ppm; Para: 11,000 ppm

VAPOR PRESSURE AT 20 C: Ortho: 5 mm Hg; Meta: 6.5 mm Hg; Para: 6.9 mm Hg

SATURATED CONCENTRATION AT 20 C: Ortho: Approximately 6580 ppm; Meta: Approximately 8550 ppm; Para: Approximately 9080 ppm

USE/EXPOSURE AND CONTROL DOCUMENT
XYLENE

	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Inhalation of vapor and skin contact with liquid during synthesis of intermediates (including terephthalic acid, phthalic anhydride, isophthalic acid, and dimethyl terephthalate) in manufacture of plastics and synthetic fibers	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
2.	Inhalation of vapor and skin contact with liquid during synthesis and handling of mixed isomers	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
3.	Inhalation of vapor and skin contact with liquid during synthesis and handling of pure isomers, benzene, and ethylbenzene	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
4.	Inhalation of vapor and skin contact with liquid during application of surface coatings containing diluent or solvent (including varnishes, cellulose nitrate lacquers, furniture finishes, enamels, and paint)	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
5.	Inhalation of vapor and skin contact with liquid during printing operations with ink containing solvent (including intaglio, color and planographic printing and type cleaning)	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
6.	Inhalation of vapor and skin contact with liquid during use as a solvent	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation;

	in manufacture of rubber and rubber products		personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
7.	Inhalation of vapor and skin contact with liquid during application of insecticide sprays	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
8.	Inhalation of vapor and skin contact with liquid during blending and handling of motor fuels containing octane-improving agent (including aviation fuels)	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
9.	Inhalation of vapor and skin contact with liquid during cleaning and degreasing operations (including paint and varnish removal and in electronics manufacture)	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
10.	Inhalation of vapor and skin contact with liquid during manufacture and processing of epoxy resin containing solvent or carrier	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
11.	Inhalation of vapor and skin contact with liquid during manufacture of xylene-formaldehyde resins	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
12.	Inhalation of vapor and skin contact with liquid during manufacture and handling of surface coatings containing solvent or diluent (including var-	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective

	nishes, cellulose nitrate lacquers, furniture finishes, enamels and paints)		devices, protective clothing)
13.	Inhalation of vapor and skin contact with liquid during preparation and handling of cements and adhesives containing solvent (including in plastics and electronics manufacture)	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
14.	Inhalation of vapor and skin contact with liquid during formulation of insecticide sprays	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
15.	Inhalation of vapor and skin contact with liquid during synthesis of intermediates and use as a reaction solvent in organic synthesis (including xylidenes and nitroxylidenes in synthesis of dyes)	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
16.	Inhalation of vapor and skin contact with liquid during manufacture of pharmaceuticals	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
17.	Inhalation of vapor and skin contact with liquid during manufacture of vitamins	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)
18.	Inhalation of vapor and skin contact with liquid during leather manufacture	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective

			devices, protective clothing)
19.	Inhalation of vapor and skin contact with liquid during use as a sterilizing agent (including in microscopy and for sterilizing cat gut)	A,B,D	Process enclosure; local exhaust ventilation; general mechanical ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, protective clothing)

A -- Inhalation
B -- Skin and eye contact resulting in localized irritation
C -- Ingestion
D -- Skin contact resulting in absorption and subsequent systemic poisoning

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

1,525 CARDS READ

0 SYSOUT PRINT RECORDS

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0.00 MINUTES EXECUTION TIME

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*** JES2 NJE *A*    FWMMITS  OSH     JOB  276    END    PRINTER8   MITS-PERIF-0205      8.34.17
*** JES2 NJE *A*    FWMMITS  OSH     JOB  276    END    PRINTER8   MITS-PERIF-0205      8.34.17
*** JES2 NJE *A*    FWMMITS  OSH     JOB  276    END    PRINTER8   MITS-PERIF-0205      8.34.17
*** JES2 NJE *A*    FWMMITS  OSH     JOB  276    END    PRINTER8   MITS-PERIF-0205      8.34.17
*** JES2 NJE *A*    FWMMITS  OSH     JOB  276    END    PRINTER8   MITS-PERIF-0205      8.34.17
*** JES2 NJE *A*    FWMMITS  OSH     JOB  276    END    PRINTER8   MITS-PERIF-0205      8.34.17
*** JES2 NJE *A*    FWMMITS  OSH     JOB  276    END    PRINTER8   MITS-PERIF-0205      8.34.17
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