

**MULTI-SITE HEALTH AND SAFETY PLAN**  
**FORMER MANUFACTURED GAS PLANT SITES**

**Prepared for:**

**Integrys**  
**130 East Randolph Drive**  
**Chicago, Illinois 60601**

**Prepared For Use By:**

**The Consultant/Contractor**

**Revision 2**  
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**MULTI-SITE HEALTH AND SAFETY PLAN SUMMARY**

**Prior to initiating site-specific field activities, the following information will be provided to USEPA and to each field staff member within the Site-Specific Work Plan.** A copy of this Health and Safety Plan (HASP) will be maintained on site during field activities and updated as determined necessary by the Project Manger. Furthermore, any modifications to this HASP will be included within the Site-Specific Work Plan.

**Site Address:**

**Major Cross Roads:**

**Hospital Address:**

**Direction to Hospital from Site (see map below):**

**Activity(s) and Dates of Work:**

**Description of Site (See map below):**

**Health/Safety Hazards on Site:**

<b>Chemical</b>	<b>Media</b>	<b>Maximum Concentration</b>	<b>Routes of Exposure</b>
Volatile Organic Compounds	Water & Soil		Inhalation, ingestion, skin or eye contact
Semi-Volatile Organic Compounds	Water & Soil		Inhalation, ingestion, skin or eye contact
Metals	Water & Soil		Inhalation, ingestion, skin or eye contact
Cyanide	Water & Soil		Inhalation, ingestion, skin or eye contact
Others based on Site-Specific conditions			

The safety coordinator/emergency coordinator will be the consultant's/contractor's staff personnel supervising the field investigation/work.

**Protective Equipment/Instruments:**

In general, personal protective equipment (PPE) will be used as specified on Table 1 for the anticipated project tasks. The project manager may require additional PPE based on field conditions or additional data collection. A list of the PPE required for the various site activities is listed on Table 1.

**Air Monitoring:**

In general, a PID (and possibly a CGM) will be used to monitor air quality in the work zone and breathing zone during site investigation activities. Tasks requiring use of either the PID or CGM are listed in Table 1. Use of the PID will be continuous during test pit excavation and sampling, and sporadically during soil boring sampling.

Actions levels for the PID are listed below and discussed in more detail in Section 7.3. The VOC action levels, unless modified in the Work Plan, include the following:

- Occurs when a reading of 50 parts per million (ppm) is sustained on PID it is held at a constant height either in the excavation or the breathing zone. (Sustained readings last more than 30 seconds and the meter either continues to climb or remains relatively stable. Wildly fluctuating readings require a calibration check).
- Sustained readings of 50 ppm require use of either full-face or half-face respirators utilizing Organic Vapor cartridge filters.
- Air quality monitoring continues to ensure that PID readings do not exceed sustained readings of 500 ppm.
- If the 500-ppm action level is achieved, all activities on the site will immediately stop. The consultant/contractor PM will be contacted prior to taking any further action on the site.

**Safety Equipment:**

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Fire extinguisher and first aid kit in consultant's/contractor's field vehicles

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**EMERGENCY CONTACT LIST**

**Emergency contact phone numbers will be provided in the Site-Specific Work Plan.** The emergency numbers will be confirmed prior to initiating field activities.

Client Contact:                      See Work Plan(s)    See Work Plan(s)

\_\_\_\_\_  
Fire Dept:

\_\_\_\_\_  
Police:

\_\_\_\_\_  
Sheriff:

\_\_\_\_\_  
Local Utility

\_\_\_\_\_  
Local Water Co.

\_\_\_\_\_  
Consultant/Contractor:

\_\_\_\_\_  
Ambulance or  
Emergency. Medical  
Services

\_\_\_\_\_  
Subcontractor(s):

\_\_\_\_\_  
Hospital:

\_\_\_\_\_  
Field Staff Emergency Contact

**Route to Hospital: A copy of the map with the route to the hospital will be provided in the Site-Specific Work Plan.** The route will be confirmed prior to initiating field activities.

**Table 1. Summary of PPE by Sampling Activities**

PPE Required	Site Reconnaissance/Field Mobilization	Drilling (monitoring wells/bore holes)	Monitoring Well Development and Conductivity Testing	Groundwater Levels and Sampling	Soil Sampling (heavy equipment or drill rig)	Soil Sampling (hand augers or shovels)	Test Pit Excavation/Trenching	Surface Water Sampling (from land or shallow wading)	Surface Water Sampling (water craft)	Sediment Sampling (shallow wading)	Sediment Sampling (water craft)	Subsurface structure inspection (from surface)
Steel-Toed Boots (Rubber)		Av	Av	Av	Av	Av	Av	Av	Av	Av	Av	Av
Steel-Toed Boots (Leather)	X	X	X	X	X	X	X	X	X	Av	X	X
Hard Hat		X			X		X				X	X
Safety Glasses/Goggles	X	X	X	X	X	X	X	X	X	X	X	X
Gloves-Inner (Nitrile)	Av	X	X	X	X	X	X	X	X	X	X	Av
Gloves-Outer (Nitrile)		X	X	X	X	X	X	X	X	X	X	
Orange Vest	X	X	X	X	X	X	X	X	X	X	X	X
Life Vest								X	X	X	X	
Tyvek Coverall		Av			Av	Av	Av			Av	Av	
Half-Face Respirator					Av	Av	Av					
Respirator Cartridge (Hepa or Org. Vapor)					X	X	X					
Photoionization Detector (PID)		Av			Av	Av	Av					X
Combustible Gas Meter (CGM)												X
Other												

Key: X = PPE Required  
 Av = Have available at work site  
 Glove types may be altered based on field conditions to include Vinyl, Neoprene, and/or Latex  
 "Other" required or to be available PPE will be identified for each task in the Site-Specific Work Plan.

**FIELD HEALTH & SAFETY BRIEFING**

Project # \_\_\_\_\_ Task # \_\_\_\_\_

**I HEREBY CERTIFY THAT I HAVE READ AND UNDERSTOOD ALL  
HEALTH AND SAFETY PROCEDURES AS STATED HEREIN:**

<b>Name and Affiliation (printed)</b>	<b>Signature</b>	<b>Date</b>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

**HASP was received from subcontracting company.**  
 YES    NO    Not Applicable

**HASP training documentation was received from subcontracting company**  
 YES    NO    Not Applicable

**This page should be copied after it has been signed and put into the project file.**

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**FIGURES**

- Figure 1            Site Location Map – to be provided with Site-Specific Work Plan  
 Figure 2            Site Layout – to be provided with Site-Specific Work Plan

**APPENDICES**

- Appendix A:        MSDSs



# 1 INTRODUCTION

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## 1.1 Purpose and Scope

This document describes the health and safety procedures and requirements for the installation of borings/wells, test pit excavations, sampling of soil (surface and subsurface), groundwater, surface water and sediment and subsurface structure inspection (from ground surface). This document is intended to serve as a Multi-Site Health and Safety Plan (HASP) to ensure that the field work performed by the consultant/contractor is done in compliance with applicable federal occupational safety and health regulations. Any modifications will be included in the Work Plan. All subcontractors shall be made aware of the requirements of this plan; however, subcontractors are required to have their own plan for the health and safety of their own employees and for following all applicable federal, state, and local regulations.

In compliance with HAZWOPER, a comprehensive work plan will be developed for each site to evaluate the logistics and resources needed to reach work objectives for site operations. The work plan will identify cleanup activities, methods for accomplishing the objectives (sampling plans), and normal operating procedures. Comprehensive site specific work plans will be available on location at each site along with a Multi-Site Field Sampling Quality Assurance Project Plan (QAPP) and Site-Specific Work Plan.

## 1.2 Health and Safety Plan Modification Procedures

Due to varying site conditions or the finding of unanticipated hazards, it may be necessary to revise the HASP. Necessary plan changes that call for more stringent procedures or a higher level of personal protective equipment (PPE) may be made at any time by the Project Manager (PM) or Task Leader in cooperation with the Project Health and Safety Officer (PHSO). The PM should be notified at the soonest available opportunity. HASP revisions will be included as part of each site specific Work Plan.

Plan changes that would make safety procedures or PPE requirements less stringent may be made only upon approval of the PM after consultation with the Corporate Health and Safety (CHS). Plan changes must always be put in writing and communicated to all field personnel.

## **2 KEY PERSONNEL/IDENTIFICATION OF H&S PERSONNEL**

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### **2.1 Key Personnel**

Responsibilities for health and safety compliance issues associated with hazardous waste operations are primarily vested in the project organization, with support from appropriate health and safety professionals on consultant's/contractor's technical and administrative staffs.

### **2.2 Site-Specific Health and Safety Personnel and Organizational Responsibility**

#### **2.2.1 Corporate Health and Safety**

The CHS acts as a technical resource to all consultant/contractor offices on health and safety matters. This person is responsible for ensuring that all consultant/contractor health and safety programs comply with applicable federal, state, and local statutes for safety and health protection; executive orders; operating orders; permits and regulations; and company policies and procedures. The CHS is also responsible for review and approval of all site-specific HASPs, serves in a consultation capacity to the technical staff on health and safety-related issues, and has the authority to conduct health and safety audits.

#### **2.2.2 Project Manager**

The PM is accountable for health and safety compliance on his or her projects. The PM is responsible for the technical and financial execution of the project, and has the authority to commit resources, adopt program policies and procedures, and approve expenditures and subcontracts. The PM will ensure that adequate resources are budgeted and available to implement a sound health and safety program and that appropriate technical resources are brought in to support the health and safety needs of the project. The PM will ensure that health and safety is a high priority in planning fieldwork and or lab studies, and that

adequate resources are available to develop and implement an appropriate project-specific health and safety plan.

### **2.2.3 Project Health and Safety Officer**

The Project Health and Safety Officer (PHSO) is responsible for developing and implementing the project- or site-specific Health and Safety Plan. In the event a PHSO has not been identified for a specific project, the PM will assume those responsibilities. The PM is ultimately responsible for health and safety for the project. It is the responsibility of the PM to report any unsafe conditions reported by the project staff to the CHS and to work cooperatively to mitigate unsafe conditions. The PHSO will also ensure compliance with health and safety requirements presented in this Plan. The PM will serve as the PHSO unless site-specific hazards are identified warranting assignment of a PHSO to the project. To meet these responsibilities, the PM/PHSO may:

- Act as a health and safety consultant to the project field staff;
- Provide site-specific training to all staff assigned to work at the site;
- Review and confirm any changes in personal protective clothing or respiratory protection requirements;
- Require the specific health and safety precautions be taken before personnel enter a site;
- Restrict access to the site or a portion thereof;
- Perform necessary personnel monitoring;
- Stop work when the health or safety of project personnel are jeopardized and order the immediate evacuation of personnel from any area of the site;
- Require personnel to obtain immediate medical attention if warranted;
- Provide health and safety briefings to all site visitors; and
- Enforce the requirements stated in the Corporate Health and Safety Manual and the project- or site-specific Health and Safety Plan.

## 2.2.4 Field Team Members

All consultant/contractor personnel must know, understand and comply with the requirements of this Plan developed for their projects. Field personnel will:

- Read and understand all applicable health and safety plans;
- Perform their work safely;
- Be aware of and alert for signs and symptoms of work-related injuries and illnesses; and
- Promptly report any unsafe conditions that may occur on site to the PHSO, PM, and/or CHS.

## 2.2.5 Subcontractors

Subcontractors have primary responsibility for the health and safety of their own employees. However, consultant/contractor is required by OSHA standards (e.g., 29 CFR 1910.120) to provide information to its subcontractors on known or potential workplace hazards, as well as the methods proposed to manage the identified hazards.

It is currently OSHA policy to issue citations to prime contractors in the event that their subcontractor is found to be out of compliance with regulatory requirements. The consultant/contractor may incur civil penalties as a result of non-compliance with regulatory requirements by its subcontractors and/or injuries or illnesses incurred by the subcontractor's staff. Personal injury suits have been successfully brought against prime contractors in instances where a subcontractor's employee has demonstrated that the lack of health and safety oversight on the part of a prime contractor played a role in his or her sustaining an injury or illness.

The consultant/contractor intends to manage its subcontractors to protect the health and well being of consultant's/contractor's staff. The consultant's/contractor's objective is to manage subcontractors in a way that limits the consultant's/contractors and the client's liabilities related to subcontractor performance, including management of health and safety issues. To achieve this objective, a minimum level of subcontractor surveillance, with respect to health and safety issues is required.

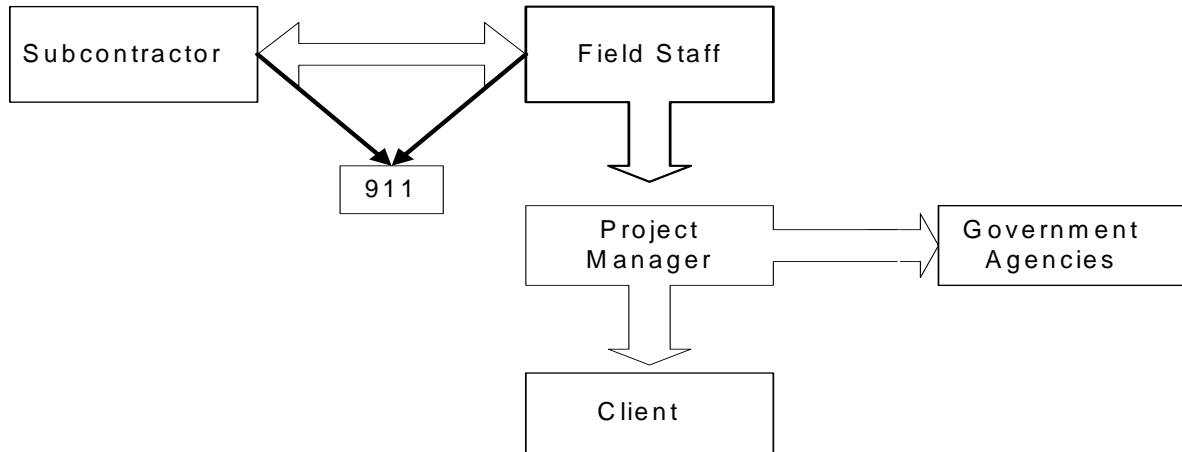
When required by the consultant/contractor, the subcontractor must review project-specific health and safety information and hazards, and develop and implement a health and safety plan. This plan must

comply with all applicable health and safety regulations and any project-specific requirements that the consultant/contractor has specified. The subcontractor must provide the consultant/contractor with a copy of this plan before the start of work. The consultant's/contractor's acceptance of the subcontractor's plan does not mean that the consultant/contractor concurs with the adequacy of the plan for protection of the health and safety of the subcontractor's employees. That responsibility rests solely with the subcontractor. The consultant's/contractor's review of subcontractor health and safety plans will be for the purposes of: 1) assessing potential health and safety impacts to the consultant's/contractor's personnel and 2) meeting the consultant's/contractors legal responsibilities as a prime contractor. Any deficiencies in the subcontractor's plan or inconsistencies in proposed work practices between the consultant/contractor and its subcontractor should be identified. If appropriate, these deficiencies or differences should be resolved before the work begins.

## **2.3 Communication**

Field staff and subcontractors are both permitted to call 911 in an emergency situation. Emergency numbers will be provided in the Site-Specific HASP Summary to be included as an appendix to the Site-Specific Work Plan. As part of preparing the Site-Specific HASP Summary, 911 services will be verified for each site location. Assuming the PM is not on-site, the field staff should contact the PM as soon as possible regarding the on-site situation. It is then up to the discretion of the PM to contact the Client or Government Agencies if the on-site situation requires. The following flow chart is a depiction of a typical on-site communication procedure (assuming the PM is not on-site).

**Communication  
Procedure**



## 3 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS

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### 3.1 Historical Overview of Site

A historical overview of the site along with details of the project description is provided in the project Work Plan. Further, the QAPP presents the organization, objectives, planned activities, and specific Quality Assurance/Quality Control (QA/QC) procedures.

Specific protocols for sampling, sample handling and storage, chain-of-custody, and laboratory and field analyses to be performed are described in the consultant's/contractor's Standard Operating Procedures (SOPs) included in the Multi-Site QAPP. All QA/QC procedures are structured in accordance with applicable technical standards, U.S. EPA's requirements, regulations, guidance, and technical standards.

### 3.2 Risk Analysis-General

All personnel in the vicinity of the drilling, excavation, and sampling operations are not only subject to the hazards of direct exposure, but also to dangers posed by machinery operation. In addition, stresses due to working in protective clothing will be encountered. Physical, chemical, and biological hazards are present at most job sites.

#### 3.2.1 Heat/Cold Stress

Temperature extremes, wet working conditions, and PPE can all combine to cause injury and illness to field workers. In general, high temperatures and/or impermeable PPE can induce heat stress. Cold stress can be induced by low temperatures and/or wet skin or clothing.

#### PRECAUTIONS

**Heat Stress:** Wear thin cotton clothing under Tyvek™ suits; have thirst liquids available; and, stop work if heat exhaustion occurs (i.e. light headedness, profuse sweating).



**Cold Stress:** Dress in layers and regulate clothing to activity levels; wear plenty of layer clothing (so layers can be added or removed); cover exposed skin when windy; glove liners can keep hands warm but reduce dexterity; use face masks and helmet liners to keep head warm and, stop work if conditions get too cold.

### **SYMPTOMS**

**Heat Stress:** Profuse sweating, weakness, rapid pulse, dizziness, nausea, and headache. If heat stroke occurs, the skin will be hot, dry and flushed.

**Cold Stress:** Involuntary shivering, speech difficulty, loss of manual dexterity, and memory lapse. The most severe localized form of cold stress, frostbite, causes the skin to become numb, pale, hard, and cold.

### **FIRST AID MEASURES**

**Heat Stress:** Move the person to a shaded, cool area. Have them drink large quantities of fluids. In the case of heat stroke, seek medical attention immediately.

**Cold Stress:** Move the person to a heated, sheltered area. Immerse exposed body parts in warm (104-130 °F) water. If exposed skin is numb, do not rub it. If frostbite is suspected, seek medical attention as soon as possible.

## **3.2.2 Slips, Trips, and Falls**

The most common hazards that will be encountered will be slips, trips, and falls. Common sense will be used to avoid these hazards. When working on slippery surfaces, tasks will be planned to decrease the risk of slipping. Slippery surfaces will be avoided, work and travel will not be hurried, and good housekeeping will be maintained. All personnel must vigilantly observe where they are working and walking to avoid slips, trips, and falls.

## **3.2.3 Vehicular Traffic**

Another common hazard that will be encountered at many sites will be vehicle traffic, including cars, trucks, drilling rigs and heavy machinery. When it is necessary to move a vehicle, all site drivers must be

mindful that pedestrians are present on site. If appropriate, site personnel on foot may guide site drivers while moving vehicles to alert and protect non-site personnel. Site personnel on foot must avoid standing in blind spots or in high traffic areas, be aware of vehicle locations, and make eye contact with site drivers if crossing the path of vehicles is necessary. All site personnel on foot must vigilantly observe where they are working and walking to avoid being struck by vehicles which, for one reason or another, are moving. Finally, when working in high traffic areas (i.e., on the edge or in the middle of city streets or heavily used parking areas) site personnel are required to set up traffic cones and wear orange traffic safety vests to alert drivers to their presence.

Work performed in rail yards or along railroad tracks poses an additional hazard. Numerous incidents have occurred when working between or alongside rail lines and have resulted in serious injury or death. Therefore, the following rules must be followed when working near rail lines:

- Never walk or step on a railroad track. The tracks can be slick and injury due to slipping off a track is possible.
- Never run over tracks - Always Walk. Tripping injuries can occur when running over the tracks which can result in serious head injuries.
- Never stand between the tracks. When necessary, walk across the railroad tracks and stand to one side or the other of a rail line.
- Always wear a hard hat, eye protection, steel-toed boots and an orange reflective vest for personal protection.

In addition to these rules, whenever work is done near railroad tracks or in a railroad right-of-way, the railroad company must be contacted and a flagman requested to monitor work activities. No work will be done without a railroad flagman being present unless the railroad company expressly permits it.

### **3.2.4 Hunting Season**

It is possible field activities will be conducted during hunting seasons and may pose a risk to site workers. The hunting season dates for the location of the project (if they exist) will be reviewed prior to conducting field activities in non-urban areas.

Site workers will wear a minimum of at least 50% of the outer clothing above the waist in 100% blaze orange (faded blaze orange is not acceptable) to alert potential hunters to their presence. If site work is

performed in densely vegetated locations, site personnel may post signs along access locations to indicate their presence.

### **3.2.5 Exposure to Excessive Noise**

Overexposure to noise can result in hearing loss. If it is difficult to hear normal speech when the speaker is 3 to 4 feet from the listener, and that condition is present for more than four hours a day, it will be assumed that the noise level exceeds 85 dBA and appropriate hearing protection will be used. The disposable "ear plug" type hearing protectors are recommended.

### **3.2.6 Chemical Hazards**

PPE requirements are stated in Personnel Protection Section 5 of this Plan. Material Safety Data Sheets (MSDSs) for suspected contaminants are contained in Appendix A.

### **3.2.7 Biological Hazards**

During warm weather months, potential biological hazards include venomous insects, snakebites, and poisonous plants. Appropriate safety measures, such as the use of insect repellent and probing of possible nesting areas, will be taken to prevent exposure to biological hazards. Long sleeves and pants will provide protection from contact with poisonous plants.

### **3.2.8 Thunderstorms and Rain**

Drilling/excavation and sampling activities during electrical storms poses a hazard of electrocution by lightning strike, and adverse working conditions, as well as high winds tipping the drill rig. All drilling/excavation and sampling activities will stop and the drilling rig mast will be lowered at the approach of a thunderstorm. Drilling activities during rainstorms can cause not only slippery conditions but also excess friction on cathead pulleys. This can cause dangerous conditions during drive sampling operations. Therefore all drive sampling operations will cease and, depending on the PHSO's assessment, drilling may be halted.

### 3.3 Risk Analysis-Task-by-Task

Table 1. Anticipated Task Hazards

	Hazards													
	Chemical	Biological	Explosive	General Safety	Physical									
					Heat	Cold	Traffic	Noise	Slip, Trips, Falls	Heavy Equipment	Underground utilities	Overhead Power	Lines	Trench/Excavation
Site reconnaissance/field mobilization		X	X	X	X	X	X	X	X	X	X		X	
Well and bore hole drilling	X	X	X	X	X	X	X	X	X	X	X		X	
Monitoring well development	X	X		X	X	X	X		X					
Groundwater level measurements	X	X		X	X	X	X		X					
Groundwater and soil sampling	X	X		X	X	X	X		X					X
Test pits and excavation	X	X	X	X	X	X	X	X	X	X	X		X	X
Surface water sampling	X	X		X	X	X	X	X	X	X			X	
Sampling through ice	X	X		X		X	X	X	X	X			X	

#### 3.3.1 Well and Bore Hole Drilling

In addition to the possibility of contact with the above listed chemicals, physical hazards associated with well and bore hole drilling include:

- Snapping cables;
- Brush and equipment fires;
- Being hit by equipment;
- Being caught in rotating tools;
- Falling objects;
- Exposure to excessive noise; and

- Contact with energized electrical lines.

### **3.3.2 Air Rotary Drilling**

This type of drilling, in addition to the above listed hazards, may also expose field personnel to blowing dust and high-pressure airlines.

### **3.3.3 Groundwater, Seep, Soil, and Pipe Sampling**

Collection of these samples presents the hazard of inhalation exposure to and skin contact with the substances listed in Appendix A.

### **3.3.4 Drilling/Excavation near Overhead Electrical Lines**

Drilling or excavation activities near overhead electrical lines present a serious electrocution hazard. Safe work distance must be maintained. This distance is a function of the humidity and the voltage present. Should work in the proximity of overhead lines be required, the minimum clearance will be determined based on OSHA standards.

### **3.3.5 Drilling/Excavation near Underground Electrical/Utility Lines**

Buried electrical/utility lines present a hidden danger while drilling/excavating. The subcontractor will be responsible for contacting the local underground utility locator service (i.e. Diggers Hotline in Chicago and Wisconsin and JULIE in Illinois outside of Chicago); however, it is the responsibility of the consultant's/contractor's PM or PHSO to ensure that the subcontractor has contacted the appropriate locator service to ensure that site activities can be completed in accordance with the schedule. The locator service will mark all underground lines to ensure safe working conditions. Drilling/excavation will not occur within three feet of any marked underground line.

### **3.3.6 Test Pits and Excavation**

Test pits and excavations pose a serious threat of injury resulting from falls or excavation wall collapses. During excavation or digging activities an exclusion work zone will be established around excavating

machinery. All bystanders and on-lookers will be prohibited from entering this work zone while the excavating machinery is in operation. The work zone will be large enough so that the excavating machinery (i.e. trackhoe, etc.) can rotate 360° without extending out of the work zone. After the excavation is completed it should either be backfilled immediately or the entire excavation will be encircled with a physical barrier (i.e. barricades, orange excavation fencing, etc.) which will limit access to the excavation and decrease the likelihood of injury resulting from falls. Any excavation greater than four feet deep will NOT be entered unless the walls of the excavation have been reinforced to prevent wall collapse. Entry into any excavation greater than four feet deep will constitute a confined space entry procedure. Therefore, no excavation entrance is allowed.

A PID will be used to monitor air quality in the breathing zone of the work area for VOC vapor levels and in an excavation (See Section 7 of this plan). Prior to Contractor Personnel entering any excavations to install piping or any other equipment, the PID will be lowered into the excavation to determine air quality in the excavation. Confined spaces will not be entered.

### **3.3.7 Operations on Surface Waters**

The procedures specified in this subsection are designed to protect the consultant's/contractor's staff when conducting work activities involving water craft vessels on surface waters. Governmental laws and regulations regarding onshore waters are under the jurisdiction of the United States Coast Guard (USCG-Great Lakes) and the State and City the work is being conducted in. Always Work In Pairs – Never Conduct Work Activities Alone.

Due to the location and manner in which work activities are conducted, the threat of falling into the water is very high. Carry retrieval equipment including:

- 50 foot of line at least 3/8 inch diameter, and
- Two - six (6) foot long wooden 2" x 4"s, if necessary.

#### **3.3.7.1 Scope and Applicability**

The procedures specified in this subsection apply to all work activities involving surface waters (including sediment sampling). The highest ranking consultant/contractor staff member (i.e. PM, Field

Task Leader) at the work site is responsible for implementing this plan. The work activities will not be initiated prior to receiving approval from the PM.

- Work activities can be conducted in “open water” or “ice” conditions; and
- Each staff person at the site is responsible for following these procedures.

### **3.3.7.2 Water Craft**

The following procedures will be observed when consultant/contractor staff conducts work activities in “open water” conditions in a water craft vessels (including drill rigs mounted on barges):

- Work will not be initiated prior to meeting approval from the PM;
- All work activities conducted on surface waters will be conducted in accordance with the requirements of the USCG and other appropriate state agency;
- Personal Flotation Devices (PFD) that are USCG approved must be worn at all times when on surface waters. One adult size PFD (wearable style) for every person on the water craft is required;
- A minimum of two (2) PFDs must be on board on the water craft at all times on waters;
- Have on board a “throwable” flotation device w/attached line;
- Distribute weight evenly across the beam of the watercraft;
- Only allow one person to stand at a time in a small watercraft vessel;
- Do not exceed manufacture’s capacity plate load limits;
- Attach a lanyard or safety line which can be tied to the sampling personnel when water surface conditions are rough. This will enable easier retrieval of the person should he/she fall over the side of the water craft;
- Check running condition of the outboard motor prior to launching (i.e. ample supply of fuel/oil mix, fuel line in good condition, integrity of the propeller, EXTRA SHEER PINS);
- Equipment to have on board include oars, anchor w/line (100 foot minimum line on inland waters) and mooring lines of adequate length;
- Wear work gloves when using equipment that could injure hands;

- Wear hard hat if overhead hazards exist (e.g. A-Frame, use of long coring devices);
- Secure overboard equipment to vessel; and
- Use proper lifting techniques when retrieving heavy equipment.

### **3.3.7.3 *Shallow Water***

The Site-Specific Work Plan and the site reconnaissance will evaluate the best approach to sampling in shallow water. If wading is necessary, work activities in shallow water along the shore line shall consider the following hazards:

- Use waders to minimize exposure to water, sediment contaminant exposure and heat loss;
- Proceed carefully – water currents and falling can cause the waders to fill creating a very serious condition. In addition to wearing a PFD, a safety line should be tethered to the person walking in water currents; and
- Fatigue can occur more rapidly from walking through the water.

### **3.3.7.4 *Sampling Through Ice***

Collection of samples through frozen rivers/lakes presents the difficulties of working on ice. All precautions for slips, trips and falls will be observed. Ice thickness will be at a minimum of 9 inches thick before work activities will commence.

The following procedures will be observed when consultant/contractor staff conducts work activities on “ice” conditions:

- Work activities will not be initiated prior to meeting approval from the PHSO;
- Know the ice (i.e. thickness) and proceed with extreme caution. Ice thickness at a minimum should be 18 to 24 inches (when conducting drilling operations) and inspected for integrity. Check ice thickness regularly when traversing across ice to assure adequate support exists. Be especially cautious when approaching pressure cracks, areas of open water or areas of rivers where water velocity may be higher;
- Wear PFDs at all times;
- Warm weather causes ice thinning and potential for slipping (drilling holes on thinning ice can cause flooding of ice surface and can accelerate ice thinning and breakage);



- Equipment may be required to be hauled between work stations (use sleds); and
- Fatigue can occur from walking and drilling holes.

Based on water currents, water temperature and the amount of clothing worn by consultant/contractor staff, the threat of being swept downstream or drowning is possible. Extreme caution must be used when conducting these type of work activities. If a consultant/contractor staff employee should fall into the water, the employee will be retrieved and all warranted precautions shall be taken to ensure the safety and well being of that individual. All work activities will be immediately suspended and the person brought to shore. All wet clothing shall be removed and the person shall be dried and dressed in a set of dry clothes. If the possibility of hypothermia exists, seek medical attention immediately.

Persons sampling contaminated or potentially contaminated materials should wear the same PPE as listed for monitoring well sampling. The required PPE will be carried along on the sediment sampling water craft. PPE can add to heat stress during warm conditions and can cause decreased mobility dexterity.

#### **3.3.7.5 Subcontractors**

It is the responsibility of the PM to require any and all subcontractors assisting in the work activities, to adhere to state and federal governmental laws and regulations related to onshore and inland waters. Any refusal on behalf of the subcontractor will mandate shutdown of the project.

## **4 PERSONNEL TRAINING REQUIREMENTS**

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### **4.1 General**

All consultant/contractor and subcontractor employees performing field work on this project are required to have appropriate safety training as specified in the OSHA Standards, particularly the HAZWOPER Standard 29CFR1910.120. Consultant/contractor personnel performing fieldwork on this project meet the necessary general training requirements. Subcontractors are responsible for supplying consultant's/contractor's PM with written statements certifying that all of their project personnel meet the necessary general training requirements.

### **4.2 Site-Specific**

Site-specific hazard and hazard control information is contained in this HASP. All consultant/contractor personnel will be provided with a copy of this plan prior to the beginning of fieldwork. Each person will be required to "sign off" that they have read, understood, and will follow the procedures set forth in the plan.

### **4.3 Informational Briefings**

It is the responsibility of each consultant/contractor staff member directing field operations to keep their crew members apprised of site conditions relative to health and safety, and of any approved modifications to the plan. This will be accomplished through ongoing "tailgate" meetings. All personnel are required to report injuries, illnesses and unsafe conditions to their immediate supervisor. The supervisor is required to report in writing any such accidents to the PM and PHSO within 24 hours of occurrence.

## 5 PERSONAL PROTECTIVE EQUIPMENT

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Listed in the health and safety plan summary at the very beginning of this plan are hazardous substances that have been found or are suspected to be present at the site. Hazardous substances are most likely found in soil and groundwater. Routes of exposure include: inhalation, ingestion, and absorption. Proper PPE should be worn when applicable.

### 5.1 Drilling/Excavation/Installation of Wells

Persons handling contaminated or potentially contaminated equipment, soils, sediment or water must wear the following PPE:

- Long sleeve coveralls (light or heavy weights subject to ambient temperature);
- Bib style rain pants where wet operations exist;
- Nitrile gloves;
- Vinyl gloves for sample handling;
- Safety glasses with side-shields; (REQUIRED AT ALL TIMES)
- Hard hat; (REQUIRED AT ALL TIMES)
- Steel-toed boots; (REQUIRED AT ALL TIMES)
- Reflective orange vest; (worn as the situation warrants ) and
- Hearing protection (as required – see note below).

**NOTE:** Guidance on the requirements of ear protection is as follows: if you must raise your voice to converse with persons three feet away from you, you are probably being overexposed to noise. In these instances, the wearing of hearing protection is required. The muff or "EAR" type disposable earplugs will suffice.

## 5.2 Ground/Surface Water and Soil/Sediment Sampling

Persons sampling contaminated or potentially contaminated materials, soil, sediment, or water must wear the following PPE:

- Long sleeve coveralls (light or heavy weights subject to ambient temperature);
- Bib style rain pants where wet operations exist;
- Nitrile gloves;
- Vinyl gloves for sample handling;
- Safety glasses with side-shields;
- Steel-toed boots; and
- Hearing protection (as required).

Persons whose skin or inner clothing comes in contact with contaminated soils or liquids should remove such clothing, shower or clean as appropriate, then re-suit for continued work activities.

**NOTE:** Outer gloves should be changed between samples if contact to the sample occurs. This will preserve sample integrity.

## **6 MEDICAL SURVEILLANCE REQUIREMENTS**

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### **6.1 Medical Surveillance**

The hazardous substances known or suspected to be present at the site are not known to produce injury or illness that would not be detected by the medical examination specified in the consultant's/contractor's medical monitoring program. The medical monitoring program established complies with all OSHA guidelines regarding and necessitating medical monitoring in the work place.

## **7 FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING**

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### **7.1 Site Air Monitoring**

A photoionization detector (PID) and possibly a combustible gas indicator (CGI) will be used to measure air contaminant concentrations in the breathing and work zones. Readings are to be recorded on the logs and in the project logbook. The PID will be calibrated per the air monitoring action plan below. If a CGI is also used to detect combustible conditions at the work site, the monitoring will also follow the plan below.

### **7.2 Sampling Air Monitoring**

A PID may be used to measure air contaminant concentrations at the well head or soil sample location during sampling. If measurements are collected, they should be recorded in the project logbook. The PID will be calibrated at the start of each day of use. Air monitoring should follow the action plan below.

### **7.3 Air Monitoring Action Plan**

A PhotoVac MicroTip 3000 PID (or equivalent) will be calibrated and checked on a minimum basis at least three times per day: 1) before work activities begin; 2) during lunch break or approximately half way through the working day; and 3) following work activities at the end of the day. These calibration checks will be used to ensure accuracy of VOC readings. Calibration procedures will follow those outlined in the PID manual and consultant's/contractor's SOPs.

The PID will be used to monitor air quality in the breathing zone of the work area for the presence of VOC vapor levels. Prior to personnel entering any excavations to install piping or any other equipment, the PID will be lowered into the excavation to determine air quality in the excavation. Confined spaces will not be entered. Besides using the PID to monitor VOC vapors in the breathing zone, an oxygen meter may also be used. The oxygen meter may be used to measure percent oxygen in any excavation. Calibration of the combustible gas meter is required based on use to insure accuracy.

The VOCs "action level" is considered when a reading of 50 ppm is sustained on the PID when the PID is held at a constant height, whether in the excavation or the breathing zone. Reaching the VOC action level will require use of either full-face or half-face respirators utilizing Organic Vapor cartridge filters. Additionally, further air quality monitoring will be required to ensure that the PID readings do not exceed a sustained reading of 500 ppm. This will be done under the direction of the consultant/contractor PHSO who will determine specific modifications to work practices and PPE requirements.

If the 500-ppm action level is achieved, all activities on the site will immediately stop. The consultant/contractor PM will be contacted prior to taking any further action on the site, unless a situation exists which requires immediate action. Options such as nitrogen purging will be considered based on the most current information available.

## **8 SITE CONTROL MEASURES**

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### **8.1 Buddy System**

Each worker will maintain visual contact with another worker at all times. The buddy system will ensure against an employee becoming stressed with a co-worker being aware of his or her condition. Workers should watch out for each other while working close to potential chemical and physical hazards. For example, all work in the exclusion zone should be scheduled so that no employee works alone in this zone at any time.

### **8.2 Safe Work Practices**

To prevent accidental ingestion of chemical contaminants, the following rules must be compiled with when working within the exclusion/contamination reduction zones, and when taking or handling samples. Further, the consultant's/contractor's SOPs for groundwater and soil sampling, and drilling/excavation/well installation will be included in the Multi-Site QAPP and Field Sampling Plan (FSP).

- No eating, drinking, or smoking is allowed at work locations.
- No fires are allowed at work locations unless approved by the Project Health and Safety Officer on a site-specific, task-specific basis. If fires or propane torches are used, fires will be maintained away from potential ignition sources and site personnel will not leave the fire unattended and a fire extinguisher will be immediately available.
- All personnel must wash their hands, arms, face, and neck immediately after leaving the exclusion/contamination reduction zones. This must also be done after taking samples and prior to eating, drinking, smoking, or using the restroom.

### **8.3 Work Zone Definition**

All work crews, whether drilling, excavating or performing other activities, must prevent the uncontrolled movement of contaminated or potentially contaminated soil and water. All soil and water removed from its natural setting should be considered contaminated unless proven otherwise by chemical analysis or



specifically known to be clean material in which verification sampling is occurring. Work crews will prevent migration of removed materials by establishing work zones and decontamination procedures. Work zones will be delineated. Only persons certified as having the necessary training and medical qualifications will be allowed in the Exclusion Zone (EZ) or Contamination Reduction Zone (CRZ). The following describes the zones to be established during drilling or excavation:

- Exclusion Zone – An EZ will be established surrounding the drilling or excavation site, if necessary. The EZ will comprise an area of at least as large as a circle having a diameter equaling one half the mast height of the drilling equipment or arm of excavating equipment. The size and shape of the EZ will be determined by the PHSO. No personnel will be permitted in the EZ unless they are in full compliance with the site health and safety plan.
- Contamination Reduction Zone - A CRZ is to provide a controlled area for performing decontamination. If a CRZ is necessary for the job, the size and the shape of the CRZ will be determined by the PHSO.

## **8.4 Daily Start-up and Shutdown Procedures**

The following protocols will be followed daily prior to the start of work activities:

- The PHSO will review site conditions to determine if modifications of the work and safety plans are needed;
- Personnel will be briefed and updated on any new safety procedures based on the previous day's findings and the planned work activity for that day;
- All safety equipment will be checked for proper function;
- The PHSO will ensure that the first aid equipment is readily available; and
- The PHSO will initiate appropriate monitoring.

The following protocol will be followed at the end of daily operations and before breaks:

- All personnel will proceed through appropriate decontamination procedures and facilities;
- The work site will be left clean. Drums will be properly labeled and staged; and
- All PPE must be removed prior to eating, drinking, smoking, or using the restroom.

## **8.5 Equipment**

Drilling rigs and heavy equipment should be inspected at the start of each day to detect equipment problems. Particular attention should be paid to cables and hydraulic lines. Examine them for evidence of stretching, fraying and cracking. The fuel system should be in good repair (free from leaks) to avoid the potential for fire or explosion. The drill rig and heavy equipment should be equipped with or have stationed in the area two 20-lb. type BC fire extinguishers.

## **8.6 Drilling/Excavation Area**

The drilling/excavation area should be located away from overhead electrical lines. The location of buried water, electrical, telephone, and gas utility lines must be determined and staked. Slope of terrain, stability of embankments, soil load bearing ability, etc. should be evaluated in selection of the drilling/excavation locations.

## 9 DECONTAMINATION PLAN

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### 9.1 Decontamination Procedures

Personal decontamination will be accomplished by using good personal hygiene. Personal contamination should not occur if the protection methods specified in this plan are used. However, the following procedures must be complied with to ensure that contamination does not remain on equipment, sample containers, or in contact with personnel.

- While in the EZ clean gross contamination off equipment by scraping or brushing. Collect all contaminated soil with the drill cuttings and transport the cuttings in an appropriate manner to the staging area on site (i.e. placed in DOT approved 55-gallon drums).
- If steam cleaning of equipment is required it will occur at the designated area on site. If capture of decontamination water is required, it will be placed in DOT approved 55-gallon drums.

After equipment and sample container decontamination is accomplished, drilling crewmembers must remove PPE before leaving the CRZ. PPE must be removed in a step-wise fashion to prevent contamination of work clothing, as follows:

- Remove all contaminated soil from work boots and remove protective clothing for decontamination or disposal. If disposable PPE is required, it should be placed in an open top drum designated for that purpose. A lid should be placed on the drum after usage. All drummed material will be labeled identifying contents and the date filled.
- Remove and wash outer gloves and hard hat. Place disposable gloves in a collection bag.
- The use of respiratory protection is not anticipated. If a respirator must be used or otherwise removed from its containers, wash it down and take it with you as you exit the CRZ.
- Final daily decontamination will be reviewed by the PHSO to ensure that no contaminated articles are left which may be accessible to the public. Therefore, all disposable PPE and other miscellaneous garbage will be stored in a drum with a secured lid.

After leaving the CRZ, and before eating, drinking, smoking, or using the restroom, all personnel must wash their hands, arms, face, and neck. In addition, all personnel should take a full-body shower at the end of the workday. A full-body shower includes the use of a wash cloth to scrub the skin.

## **9.2 Waste Storage and Disposal**

Since all soil and water removed from its natural setting is considered potentially contaminated, these materials will be stored and disposed of according to the guidelines established in the Work Plan for the site. If no guidelines have been established in the Work Plan for storage and disposal of these investigative wastes, the applicable federal, state and/or local regulations and guidance pertaining to investigation derived waste will be followed. in storing and disposing of the wastes.

Waste container contents and identification will be made in the field log for future reference. All containers will be distinctly labeled using a paint pen or marker.

## **10 EMERGENCY ACTION PLAN**

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### **10.1 Medical Emergencies**

In the event of a medical emergency, the following procedures should be used.

1. If serious injury or life-threatening condition exists, call 911. Clearly describe the location, injury and conditions to the dispatcher. Designate a person to direct emergency responders to the injured person(s).
2. Call the PM.
3. Implement steps to prevent the reoccurrence of the accident.

### **10.2 Chemical Emergencies**

1. If serious injury or life-threatening condition exists, call 911. Clearly describe the location, injury and conditions to the dispatcher.
2. Evacuate other on-site personnel to a safe place in an upwind direction until it is safe for work to resume.
3. Call the PM.
4. If necessary contact clean-up contractor.
5. If release requires contacting government agencies the PM makes the appropriate calls (PM also contacts Client).

### **10.3 General Emergencies**

In the case of fire (other than a managed pre-approved fire, discussed in Section 8.2), flood, explosion, spills, severe weather, tank or pipe punctures, or other hazard, work shall be halted and if applicable, 911 called. All on-site personnel will immediately be evacuated to a safe place.

### **10.4 Accident Reports and Follow up**

All accidents, including those that do not result in injury or illness, are to be reported to the PHSO or the PM within 24 hours of their occurrence. The report form to be used can be seen on the following page. Other reporting procedures and forms, if necessary, will be included in the Work Plan for the specific site. Notifications regarding work related accidents and near misses will follow requirements set forth in OSHA.

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**Accident/Injury Report Form**

**Project No.**

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Location of Incident: \_\_\_\_\_

Was Anyone Injured \_\_\_\_\_ Name of Injured: \_\_\_\_\_

Describe Company First Aid (If Applicable): \_\_\_\_\_

Physician's Treatment (If Applicable): \_\_\_\_\_

Description of Incident: \_\_\_\_\_

Corrective Action: \_\_\_\_\_

Additional Comments: \_\_\_\_\_

Reported By: \_\_\_\_\_

Distribution:  
Corporate Health and  
Safety \_\_\_\_\_  
Project Manager: \_\_\_\_\_ Other: \_\_\_\_\_

## **11 CONFINED SPACE ENTRY PROCEDURES**

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Confined space entry procedures will be addressed in the site specific Work Plan, if necessary.



## **12 SPILL CONTAINMENT PROGRAM**

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If there is an accidental release of potentially hazardous materials or waste (i.e. spilled purge water or soil cuttings or ruptured hydraulic line), site personnel will:

- Contact the Project Health and Safety Officer and PM;
- Contain the spill, if it is possible and it can be done safely; and
- Initiate cleanup.

## **FIGURES**

**TO BE PROVIDED IN SITE SPECIFIC WORK PLANS**

## **APPENDIX**

# Appendix A

## Material Safety Data Sheets

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- Benzene
- Ethylbenzene
- Toluene
- Xylenes (M, O, & P)
- PAHs (Technical Sheet)
- Naphtha (Coal Tar)
- Cyanide
- PCBs

(To be modified by adding and/or deleting chemicals as appropriate in the Work Plan).

# BENZENE

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## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>		Watery liquid	Colorless	Gasoline-like odor
Benzol Benzole		Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F.		
<p>Restrict access.            Avoid contact with liquid and vapor.            Wear goggles and self-contained breathing apparatus.            Shut off ignition sources and call fire department.            Stay upwind and use water spray to "knock down" vapor.            Notify local health and pollution control agencies.            Protect water intakes.</p>				
<b>Fire</b>	<p><b>FLAMMABLE.</b>            Flashback along vapor trail may occur.            Vapor may explode if ignited in an enclosed area.            Wear goggles and self-contained breathing apparatus.            Extinguish with dry chemical, foam, or carbon dioxide.            Water may be ineffective on fire.            Cool exposed containers with water.</p>			
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p><b>VAPOR</b>            Irritating to eyes, nose and throat.            If inhaled, will cause headache, difficult breathing, or loss of consciousness.            Move to fresh air.            If breathing has stopped, give artificial respiration.            If breathing is difficult, give oxygen.</p> <p><b>LIQUID</b>            Irritating to skin and eyes.            Harmful if swallowed.            Remove contaminated clothing and shoes.            Flush affected areas with plenty of water.            IF IN EYES, hold eyelids open and flush with plenty of water.            IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>			
<b>Water Pollution</b>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.            May be dangerous if it enters water intakes.            Notify local health and wildlife officials.            Notify operators of nearby water intakes.</p>			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 32; Aromatic Hydrocarbon  
 2.2 **Formula:** C<sub>6</sub>H<sub>6</sub>  
 2.3 **IMO/UN Designation:** 3.2/1114  
 2.4 **DOT ID No.:** 1114  
 2.5 **CAS Registry No.:** 71-43-2  
 2.6 **NAERG Guide No.:** 130  
 2.7 **Standard Industrial Trade Classification:** 51122

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self contained positive pressure breathing apparatus; protective gloves and clothing.
- 3.2 **Symptoms Following Exposure:** Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction, nausea, and vomiting. Coma and possible death.
- 3.3 **Treatment of Exposure:** SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subsides. INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.
- 3.4 **TLV-TWA:** 0.5 ppm  
 3.5 **TLV-STEL:** 2.5 ppm  
 3.6 **TLV-Ceiling:** Not listed  
 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Leukemia.  
 3.10 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** 4.68 ppm  
 3.13 **IDLH Value:** 500 ppm  
 3.14 **OSHA PEL-TWA:** 1 ppm  
 3.15 **OSHA PEL-STEL:** 5 ppm  
 3.16 **OSHA PEL-Ceiling:** Not listed  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 12°F C.C.  
 4.2 **Flammable Limits in Air:** 1.3%-7.9%  
 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
 4.5 **Special Hazards of Combustion Products:** Not pertinent.  
 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
 4.7 **Auto Ignition Temperature:** 1097°F  
 4.8 **Electrical Hazards:** Class I, Group D  
 4.9 **Burning Rate:** 6.0 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
 5.2 **Reactivity with Common Materials:** No reaction.  
 5.3 **Stability During Transport:** Stable.  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
 5.5 **Polymerization:** Not pertinent.  
 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 5 ppm/6 hr/minnow/lethal/distilled water  
 20 ppm/24 hr/sunfish/TL<sub>50</sub>/tap water  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 1.2 lb/lb, 10 days  
 6.4 **Food Chain Concentration Potential:** None.  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 1  
 Human Contact hazard: II  
 Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Industrial pure – 99+%; Thiophene-free – 99+%; Nitration – 99+%; Industrial – 90% - 85+%; Reagent – 99+%  
 7.2 **Storage Temperature:** Ambient.  
 7.3 **Inert Atmosphere:** No requirement.  
 7.4 **Venting:** Pressure-vacuum.  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 10 pounds  
 8.7 **EPA Pollution Category:** A  
 8.8 **RCRA Waste Number:** U019  
 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 78.11  
 9.3 **Boiling Point at 1 atm:** 176°F = 80.1°C = 353.3°K  
 9.4 **Freezing Point:** 42.0°F = 5.5°C = 278.7°K  
 9.5 **Critical Temperature:** 552.0°F = 288.9°C = 562.1°K  
 9.6 **Critical Pressure:** 710 psia = 48.3 atm = 4.89 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.879 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 28.9 dynes/cm = 0.0289 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** 35.0 dynes/cm = 0.035 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** 2.8  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.061  
 9.12 **Latent Heat of Vaporization:** 169 Btu/lb = 94.1 cal/g = 3.94 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -17,460 Btu/lb = -9698 cal/g = -406.0 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent.  
 9.15 **Heat of Solution:** Not pertinent.  
 9.16 **Heat of Polymerization:** Not pertinent.  
 9.17 **Heat of Fusion:** 30.45 cal/g  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 3.22 psia

### NOTES

# BENZENE

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	55.330	45	0.394	75	0.988	55	0.724
60	55.140	50	0.396	80	0.991	60	0.693
65	54.960	55	0.398	85	0.975	65	0.665
70	54.770	60	0.400	90	0.969	70	0.638
75	54.580	65	0.403	95	0.962	75	0.612
80	54.400	70	0.405	100	0.956	80	0.588
85	54.210	75	0.407	105	0.950	85	0.566
90	54.030	80	0.409	110	0.944	90	0.544
95	53.840	85	0.411	115	0.937	95	0.524
100	53.660	90	0.414	120	0.931	100	0.505
105	53.470	95	0.416	125	0.925	105	0.487
110	53.290	100	0.418	130	0.919	110	0.470
115	53.100			135	0.912	115	0.453
120	52.920			140	0.906	120	0.438
125	52.730			145	0.900		
130	52.540			150	0.893		
135	52.360			155	0.887		
140	52.170			160	0.881		
145	51.990			165	0.875		
150	51.800			170	0.868		
155	51.620						
160	51.430						
165	51.250						
170	51.060						
175	50.870						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.180	50	0.881	50	0.01258	0	0.204
		60	1.171	60	0.01639	25	0.219
		70	1.535	70	0.02109	50	0.234
		80	1.989	80	0.02681	75	0.248
		90	2.547	90	0.03371	100	0.261
		100	3.227	100	0.04196	125	0.275
		110	4.049	110	0.05172	150	0.288
		120	5.033	120	0.06317	175	0.301
		130	6.201	130	0.07652	200	0.313
		140	7.577	140	0.09194	225	0.325
		150	9.187	150	0.10960	250	0.337
		160	11.060	160	0.12980	275	0.349
		170	13.220	170	0.15270	300	0.360
		180	15.700	180	0.17850	325	0.371
		190	18.520	190	0.20750	350	0.381
		200	21.740	200	0.23970	375	0.392
		210	25.360	210	0.27560	400	0.402
						425	0.412
						450	0.421
						475	0.431
						500	0.440
						525	0.449
						550	0.457
						575	0.465
						600	0.474

# BENZENE

Also known as: Benzol, Mineral Naphtha, Phenyl Hydride, Annulene  
Chemical reference number (CAS): 71-43-2

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## WHAT IS BENZENE?

Benzene is a widely used industrial chemical. Benzene is found in crude oil and is a major part of gasoline. It's used to make plastics, resins, synthetic fibers, rubber lubricants, dyes, detergents, drugs and pesticides. Benzene is produced naturally by volcanoes and forest fires.

In homes, benzene may be found in glues, adhesives, cleaning products, paint strippers, tobacco smoke and gasoline. Most benzene in the environment comes from our use of petroleum products.

Benzene quickly evaporates from water or soil. If benzene leaks from buried storage tanks or landfills, it can contaminate nearby drinking water wells. Benzene can move long distances in groundwater.

## HOW ARE PEOPLE EXPOSED TO BENZENE?

**Breathing:** The most common way people are exposed to benzene is when they fill their car with gasoline. People are also exposed to benzene when they use household products that contain benzene.

Benzene evaporates quickly from contaminated water. People can be exposed to benzene if they use contaminated water to bathe, shower, wash dishes or do laundry.

Benzene vapors are present in exhaust from many industries and automobiles. People who live near highways or industries can be exposed to benzene.

**Drinking/Eating:** People whose drinking water wells are located within half a mile of leaking underground storage tank, may be exposed by drinking contaminated water.

**Touching:** Benzene can pass through the skin. Benzene exposure through skin contact with gasoline or other solvents is possible. People can also absorb benzene as they bathe or shower in contaminated water.

## DO STANDARDS EXIST FOR REGULATING BENZENE?

**Water:** The state and federal drinking water standards for benzene are both set at 5 parts per billion (ppb). We suggest you stop drinking water that contains more than 5 ppb of benzene. If the level of benzene in your water is higher than 100 ppb, you may also need to avoid washing, bathing or using the water for other purposes. Contact your local public health agency for more information specific to your situation.

**Air:** No standards exist for the amount of benzene allowed in the air of homes. We recommend that people with any detectable levels of benzene in the air of their homes eliminate the source of the contamination (gasoline in cans, contaminated drinking water, etc.) Most people can smell benzene at levels above 5 parts per million (ppm) in air.



## WILL EXPOSURE TO BENZENE RESULT IN HARMFUL HEALTH EFFECTS?

Drowsiness, headaches, and dizziness have been reported when people breathed air with benzene levels of more than 10 ppm for a short time.

The following health effects can occur after several years of exposure to benzene:

**Cancer:** Long-term exposure to benzene can increase the risk of developing leukemia.

**Reproductive Effects:** Animal studies show that inhaling benzene vapors can damage reproductive organs and cause infertility. Exposure to benzene in workplaces has caused menstrual variations.

**Organ Systems:** Exposure to benzene can cause anemia and weaken the immune system.

In general, chemicals affect the same organ systems in all people who are exposed. However, the seriousness of the effects may vary from person to person.

A person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals including medicines, and personal habits such as smoking or drinking.

It is also important to consider the length of exposure to the chemical; the amount of chemical exposure; and whether the chemical was inhaled, touched, or eaten.

## CAN A MEDICAL TEST DETERMINE EXPOSURE TO BENZENE?

Benzene breaks down in the body to several other compounds. Those compounds can be found in the blood or urine of people who have been exposed to high levels of benzene within the past two days. Tests will prove an exposure to benzene occurred but will not predict the kind of illness that could result. We do not know what level of benzene break-down products are common in most people, since most people are regularly exposed to some amount of benzene.

People who think they have been exposed to benzene over a long period of time should contact their doctor. Physicians can use blood chemistry, liver function and kidney function tests.

*Seek medical advice if you have any symptoms that you think may be related to chemical exposure.*

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to work exposure or emergency situations.

## FOR MORE INFORMATION

- Poison Control Center, 800-815-8855
- Your local public health agency
- Division of Public Health, BEH, 1 West Wilson Street, Rm. 150, Madison, WI 53701-2659, (608) 266-1120 or Internet: [www.dhfs.state.wi.us/eh/index.htm](http://www.dhfs.state.wi.us/eh/index.htm)

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(POH 4341 Revised 12/2000)

# ETHYLBENZENE

ETB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>		Liquid	Colorless	Sweet, gasoline-like odor
EB Phenylethane		Floats on water. Flammable, irritating vapor is produced.		
<p>Keep people away. Avoid contact with liquid and vapor.                  Avoid inhalation.                  Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).                  Shut off ignition sources and call fire department.                  Stay upwind and use water spray to "knock down" vapor.                  Notify local health and pollution control agencies.                  Protect water intakes.</p>				
<b>Fire</b>	<p>FLAMMABLE.                  Flashback along vapor trail may occur.                  Vapor may explode if ignited in an enclosed area.                  Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).                  Extinguish with dry chemical, foam, or carbon dioxide.                  Water may be ineffective on fire.                  Cool exposed containers with water.</p>			
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.                  VAPOR                  Irritating to eyes, nose and throat.                  If inhaled, will cause dizziness or difficult breathing.                  Move to fresh air.                  If breathing has stopped, give artificial respiration.                  If breathing is difficult, give oxygen.</p> <p>LIQUID                  Will burn skin and eyes.                  Harmful if swallowed.                  Remove contaminated clothing and shoes.                  Flush affected areas with plenty of water.                  IF IN EYES, hold eyelids open and flush with plenty of water.                  IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.                  DO NOT INDUCE VOMITING.</p>			
<b>Water Pollution</b>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.                  Fouling to shoreline.                  May be dangerous if it enters water intakes.                  Notify local health and wildlife officials.                  Notify operators of nearby water intakes.</p>			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skin  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 32; Aromatic Hydrocarbon  
 2.2 **Formula:** C<sub>8</sub>H<sub>10</sub>  
 2.3 **IMO/UN Designation:** 3.3/1175  
 2.4 **DOT ID No.:** 1175  
 2.5 **CAS Registry No.:** 100-41-4  
 2.6 **NAERG Guide No.:** 129  
 2.7 **Standard Industrial Trade Classification:** 51126

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; safety goggles.  
 3.2 **Symptoms Following Exposure:** Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters.  
 3.3 **Treatment of Exposure:** INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration. INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis. SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.  
 3.4 **TLV-TWA:** 100 ppm  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** 125 ppm  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
 3.12 **Odor Threshold:** 140 ppm  
 3.13 **IDLH Value:** 800 ppm  
 3.14 **OSHA PEL-TWA:** 100 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 80°F O.C. 59°F C.C.  
 4.2 **Flammable Limits in Air:** 1.0%-6.7%  
 4.3 **Fire Extinguishing Agents:** Foam (most effective), water fog, carbon dioxide or dry chemical.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.  
 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back.  
 4.7 **Auto Ignition Temperature:** 860°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 5.8 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 9.0%

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** 29 ppm/96 hr/bluegill/TL<sub>m</sub>/fresh water  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 2.8% (theor.), 5 days  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 3  
 Human Oral hazard: 1  
 Human Contact hazard: I  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Research grade: 99.98%; pure grade: 99.5%; technical grade: 99.0%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
 7.5 **IMO Pollution Category:** B  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Instability (Yellow)	0

8.6 **EPA Reportable Quantity:** 1000 pounds  
 8.7 **EPA Pollution Category:** C  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 106.17  
 9.3 **Boiling Point at 1 atm:** 277.2°F = 136.2°C = 409.4°K  
 9.4 **Freezing Point:** -139°F = -95°C = 178°K  
 9.5 **Critical Temperature:** 651.0°F = 343.9°C = 617.1°K  
 9.6 **Critical Pressure:** 523 psia = 35.6 atm = 3.61 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.867 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 29.2 dynes/cm = 0.0292 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** 35.48 dynes/cm = 0.03548 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071  
 9.12 **Latent Heat of Vaporization:** 144 Btu/lb = 80.1 cal/g = 3.35 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -17,780 Btu/lb = -9877 cal/g = -413.5 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 0.4 psia

NOTES

# ETHYLBENZENE

ETB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	54.990	40	0.402	-90	1.065	40	0.835
50	54.680	50	0.404	-80	1.056	50	0.774
60	54.370	60	0.407	-70	1.047	60	0.719
70	54.060	70	0.409	-60	1.037	70	0.670
80	53.750	80	0.412	-50	1.028	80	0.626
90	53.430	90	0.414	-40	1.018	90	0.586
100	53.120	100	0.417	-30	1.009	100	0.550
110	52.810	110	0.419	-20	1.000	110	0.518
120	52.500	120	0.421	-10	0.990	120	0.488
130	52.190	130	0.424	0	0.981	130	0.461
140	51.870	140	0.426	10	0.971	140	0.436
150	51.560	150	0.429	20	0.962	150	0.414
160	51.250	160	0.431	30	0.953	160	0.393
170	50.940	170	0.434	40	0.943	170	0.374
180	50.620	180	0.436	50	0.934	180	0.356
190	50.310	190	0.439	60	0.924	190	0.340
200	50.000	200	0.441	70	0.915	200	0.325
210	49.690	210	0.443	80	0.906	210	0.311
				90	0.896		
				100	0.887		
				110	0.877		
				120	0.868		
				130	0.859		
				140	0.849		
				150	0.840		
				160	0.830		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.020	80	0.202	80	0.00370	-400	-0.007
		100	0.370	100	0.00654	-350	0.026
		120	0.644	120	0.01099	-300	0.060
		140	1.071	140	0.01767	-250	0.093
		160	1.713	160	0.02734	-200	0.125
		180	2.643	180	0.04087	-150	0.157
		200	3.953	200	0.05926	-100	0.187
		220	5.747	220	0.08363	-50	0.217
		240	8.147	240	0.11520	0	0.246
		260	11.290	260	0.15510	50	0.274
		280	15.320	280	0.20490	100	0.301
		300	20.410	300	0.26570	150	0.327
		320	26.730	320	0.33910	200	0.353
		340	34.460	340	0.42620	250	0.377
		360	43.800	360	0.52850	300	0.401
		380	54.950	380	0.64720	350	0.424
						400	0.446
						450	0.467
						500	0.487
						550	0.507
						600	0.525

# TOLUENE

TOL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methylbenzene Methylbenzol Toluol	Watery liquid Colorless Pleasant odor
Floats on water. Flammable, irritating vapor is produced.	
<p>Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.</p>	
<b>Fire</b>	<p><b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p><b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen.</p> <p><b>LIQUID</b> Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>
<b>Water Pollution</b>	<p>Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>

### 1. CORRECTIVE RESPONSE ACTIONS

- Stop discharge
- Contain
- Collection Systems: Skim
- Chemical and Physical Treatment: Burn
- Clean shore line
- Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 32; Aromatic Hydrocarbon
- 2.2 **Formula:** C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub>
- 2.3 **IMO/UN Designation:** 3.2/1294
- 2.4 **DOT ID No.:** 1294
- 2.5 **CAS Registry No.:** 108-88-3
- 2.6 **NAERG Guide No.:** 130
- 2.7 **Standard Industrial Trade Classification:** 51123

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask; goggles or face shield; plastic gloves.
- 3.2 **Symptoms Following Exposure:** Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
- 3.4 **TLV-TWA:** 50 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Kidney and liver damage may follow ingestion.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 0.17 ppm
- 3.13 **IDLH Value:** 500 ppm
- 3.14 **OSHA PEL-TWA:** 200 ppm
- 3.15 **OSHA PEL-STEL:** 500 ppm, 10 minute peak once in 8 hour shift
- 3.16 **OSHA PEL-Ceiling:** 300 ppm
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 55°F O.C. 40°F C.C.
- 4.2 **Flammable Limits in Air:** 1.27%-7%
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, ordinary foam for large fires.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 896°F
- 4.8 **Electrical Hazards:** Class I, Group D
- 4.9 **Burning Rate:** 5.7 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 9.5%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 1180 mg/l/96 hr/sunfish/TL<sub>m</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 0%; 5 days; 38% (theor), 8 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research, reagent, nitration-all 99.8 + %; industrial: contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120: less pure than industrial.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester) or pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** U220
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 92.14
- 9.3 **Boiling Point at 1 atm:** 231.1°F = 110.6°C = 383.8°K
- 9.4 **Freezing Point:** -139°F = -95.0°C = 178.2°K
- 9.5 **Critical Temperature:** 605.5°F = 318.6°C = 591.8°K
- 9.6 **Critical Pressure:** 596.1 psia = 40.55 atm = 4.108 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.867 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 29.0 dynes/cm = 0.0290 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** 36.1 dynes/cm = 0.0361 N/m at 25°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.089
- 9.12 **Latent Heat of Vaporization:** 155 Btu/lb = 86.1 cal/g = 3.61 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -17,430 Btu/lb = -9686 cal/g = -405.5 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 17.17 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 1.1 psia

### NOTES

# TOLUENE

TOL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-30	57.180	0	0.396	0	1.026	0	1.024
-20	56.870	5	0.397	10	1.015	5	0.978
-10	56.550	10	0.399	20	1.005	10	0.935
0	56.240	15	0.400	30	0.994	15	0.894
10	55.930	20	0.402	40	0.983	20	0.857
20	55.620	25	0.403	50	0.972	25	0.821
30	55.310	30	0.404	60	0.962	30	0.788
40	54.990	35	0.406	70	0.951	35	0.757
50	54.680	40	0.407	80	0.940	40	0.727
60	54.370	45	0.409	90	0.929	45	0.700
70	54.060	50	0.410	100	0.919	50	0.673
80	53.750	55	0.411	110	0.908	55	0.649
90	53.430	60	0.413	120	0.897	60	0.625
100	53.120	65	0.414	130	0.886	65	0.603
110	52.810	70	0.415	140	0.876	70	0.582
120	52.500	75	0.417	150	0.865	75	0.562
		80	0.418	160	0.854	80	0.544
		85	0.420	170	0.843	85	0.526
		90	0.421	180	0.833	90	0.509
		95	0.422	190	0.822	95	0.493
		100	0.424	200	0.811	100	0.477
		105	0.425				
		110	0.427	210	0.800		
		115	0.428				
		120	0.429				
		125	0.431				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.050	0	0.038	0	0.00070	0	0.228
		10	0.057	10	0.00103	25	0.241
		20	0.084	20	0.00150	50	0.255
		30	0.121	30	0.00212	75	0.268
		40	0.172	40	0.00296	100	0.281
		50	0.241	50	0.00405	125	0.294
		60	0.331	60	0.00547	150	0.306
		70	0.449	70	0.00727	175	0.319
		80	0.600	80	0.00954	200	0.331
		90	0.792	90	0.01237	225	0.343
		100	1.033	100	0.01584	250	0.355
		110	1.332	110	0.02007	275	0.367
		120	1.700	120	0.02518	300	0.378
		130	2.148	130	0.03127	325	0.389
		140	2.690	140	0.03850	350	0.400
		150	3.338	150	0.04700	375	0.411
		160	4.109	160	0.05691	400	0.422
		170	5.018	170	0.06840	425	0.432
		180	6.083	180	0.08162	450	0.443
		190	7.323	190	0.09675	475	0.453
		200	8.758	200	0.11400	500	0.462
		210	10.410	210	0.13340	525	0.472
						550	0.482
						575	0.491
						600	0.500

## TOLUENE

Also known as: Toluol, Methylbenzene, Phenylmethane  
Chemical reference number (CAS): 108-88-3

### WHAT IS TOLUENE?

Toluene is a common ingredient in degreasers. It's a colorless liquid with a sweet smell and taste. It evaporates quickly. Toluene is found naturally in crude oil. It's used in oil refining and the manufacturing of paints, lacquers, explosives (TNT) and glues. In homes, toluene may be found in paint thinners, paint brush cleaners, nail polish, glues, inks and stain removers. Toluene is also found in car exhaust and the smoke from cigarettes.

When toluene is spilled on the ground or improperly disposed, it can seep into soil and contaminate nearby wells and streams. Toluene can remain unchanged for a long time in soil or water that is not in contact with air.

### HOW ARE PEOPLE EXPOSED TO TOLUENE?

**Breathing:** People are often exposed to high levels of toluene when they breathe vapors from paints, paint thinners, or glues. Breathing gasoline or car exhaust will also result in some exposure to toluene. People who live near industries using toluene may be exposed to the chemical in the air. If home water supplies are contaminated, people may inhale the chemical while washing, bathing or using water for other household purposes.

Some people intentionally inhale toluene to get "high." These people can be exposed to hazardous levels of the chemical.

**Drinking/Eating:** People may be exposed by drinking contaminated water, handling contaminated soils or touching their mouths or eating with dirty hands.

**Touching:** Although the chemical may irritate the skin, it passes through the skin slowly. People can be exposed to toluene when they touch the chemical, touch contaminated soil, or bathe in contaminated water.

### DO STANDARDS EXIST FOR REGULATING TOLUENE?

**Water:** The Wisconsin drinking water standard is 343 parts per billion (ppb) of toluene. We suggest you stop drinking water that contains higher levels. If levels of toluene are very high in your water, you should avoid washing, bathing, or using the water for other purposes. Contact your local public health agency for more information specific to your situation.

**Air:** No standards exist for the amount of toluene allowed in the air of homes. We use a formula to convert work place limits to suggested home limits. Based on the formula, we recommend levels be no higher than 4 parts per million (ppm) of toluene in air. Most people can't smell toluene until levels reach 0.16 - 37 ppm. If you can smell the chemical, the level may be too high to be safe.

The Wisconsin Department of Natural Resources regulates the amount of toluene that can be released by industries.

## WILL EXPOSURE TO TOLUENE RESULT IN HARMFUL HEALTH EFFECTS?

The following symptoms may occur immediately or shortly after exposure to levels over 100 ppm of toluene in air;

- Tiredness, dizziness, headache, loss of coordination or hearing, euphoria, insomnia
- Nausea
- Eye and nose irritation
- Rapid delay of reaction time, unconsciousness, and death at levels of 4,000 ppm

The worst effects of exposure to toluene have occurred in deliberate abusers of toluene. Most studies of workers exposed to moderate levels of toluene show no harmful health effects.

The following health effects can occur after several years of exposure to toluene:

**Cancer:** Research shows that toluene is unlikely to cause cancer.

**Reproductive Effects:** There are no indications toluene causes damage to reproductive organs. Toluene may affect the development of unborn babies.

**Organ Systems:** Damage to the brain, liver, bone marrow and kidneys can occur.

In general, chemicals affect the same organ systems in all people who are exposed. However, the seriousness of the effects may vary from person to person. A person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals including medicines, and personal habits such as smoking or drinking.

It's also important to consider the length of exposure to the chemical; the amount of chemical exposure; and whether the chemical was inhaled, touched, or eaten.

## CAN A MEDICAL TEST DETERMINE EXPOSURE TO TOLUENE?

The breakdown products of toluene, hippuric acid and cresol, can be measured in urine within 12 hours of a high level exposure. These measurements may not predict possible future health effects. Other medical tests may be helpful in determining damage to the nervous system, kidneys or liver.

*Seek medical advice if you have any symptoms that you think may be related to chemical exposure.*

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to work exposure or emergency situations.

## FOR MORE INFORMATION

- Poison Control Center, 800-815-8855
- Your local public health agency
- Division of Public Health, BEH, 1 West Wilson Street, Rm. 150, Madison, WI 53701-2659, (608) 266-1120 or Internet: [www.dhfs.state.wi.us/eh/index.htm](http://www.dhfs.state.wi.us/eh/index.htm)



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(POH 4351 Revised 12/2000)

# M-XYLENE

XLM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,3-Dimethylbenzene Xylol	Watery liquid Colorless Sweet odor
Floats on water. Flammable, irritating vapor is produced.	
<p>Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.</p>	
<b>Fire</b>	<p><b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p><b>VAPOR</b> Irritating to eyes, nose, and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p><b>LIQUID</b> Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>
<b>Water Pollution</b>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 32; Aromatic Hydrocarbon  
2.2 **Formula:** m-C<sub>8</sub>H<sub>10</sub>(CH<sub>3</sub>)<sub>2</sub>  
2.3 **IMO/UN Designation:** 3.2/1307  
2.4 **DOT ID No.:** 1307  
2.5 **CAS Registry No.:** 108-38-3  
2.6 **NAERG Guide No.:** 130  
2.7 **Standard Industrial Trade Classification:** 51124

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.
- 3.2 **Symptoms Following Exposure:** Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
- 3.4 **TLV-TWA:** 100 ppm  
3.5 **TLV-STEL:** 150 ppm  
3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Kidney and liver damage.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.05 ppm  
3.13 **IDLH Value:** 900 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 81°F C.C.  
4.2 **Flammable Limits in Air:** 1.1%-7.0%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 982°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 5.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 22 ppm/96 hr/bluegill/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0 lb/lb, 5 days; 0% (theor.), 8 days  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research: 99.99%; Pure: 99.9%; Technical: 99.2%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- |                           |                |
|---------------------------|----------------|
| Category                  | Classification |
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** U239  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 106.16  
9.3 **Boiling Point at 1 atm:** 282°F = 138.9°C = 412.1°K  
9.4 **Freezing Point:** -54.2°F = -47.9°C = 225.3°K  
9.5 **Critical Temperature:** 650.8°F = 343.8°C = 617°K  
9.6 **Critical Pressure:** 513.8 atm = 34.95 psia = 3.540 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.864 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 28.6 dynes/cm = 0.0286 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 36.4 dynes/cm = 0.0364 N/m at 30°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071  
9.12 **Latent Heat of Vaporization:** 147 Btu/lb = 81.9 cal/g = 3.43 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -17,554 Btu/lb = -9752.4 cal/g = -408.31 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 26.01 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.34 psia

### NOTES



# M-XYLENE

XLM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	55.400	40	0.387	35	0.962	15	0.938
20	55.260	50	0.393	40	0.953	20	0.896
25	55.130	60	0.398	45	0.944	25	0.862
30	54.990	70	0.404	50	0.935	30	0.827
35	54.850	80	0.410	55	0.926	35	0.794
40	54.710	90	0.415	60	0.917	40	0.764
45	54.570	100	0.421	65	0.908	45	0.735
50	54.430	110	0.426	70	0.899	50	0.708
55	54.290	120	0.432	75	0.890	55	0.682
60	54.160	130	0.437	80	0.881	60	0.658
65	54.020	140	0.443	85	0.873	65	0.635
70	53.880	150	0.448	90	0.864	70	0.613
75	53.740	160	0.454	95	0.855	75	0.592
80	53.600	170	0.460	100	0.846	80	0.572
85	53.460	180	0.465			85	0.554
90	53.320	190	0.471				
95	53.180	200	0.476				
100	53.050	210	0.482				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.090	60	0.00172	0	0.247
	N	70	0.127	70	0.00238	25	0.260
	S	80	0.177	80	0.00324	50	0.273
	O	90	0.242	90	0.00435	75	0.286
	L	100	0.326	100	0.00577	100	0.299
	U	110	0.434	110	0.00754	125	0.311
	B	120	0.571	120	0.00975	150	0.324
	L	130	0.743	130	0.01247	175	0.336
	E	140	0.956	140	0.01577	200	0.348
		150	1.219	150	0.01977	225	0.360
		160	1.538	160	0.02455	250	0.371
		170	1.924	170	0.03023	275	0.383
		180	2.388	180	0.03691	300	0.394
		190	2.939	190	0.04473	325	0.406
		200	3.590	200	0.05382	350	0.417
		210	4.355	210	0.06431	375	0.427
		220	5.247	220	0.07635	400	0.438
		230	6.282	230	0.09009	425	0.449
		240	7.476	240	0.10570	450	0.459
		250	8.846	250	0.12330	475	0.469
		260	10.410	260	0.14310	500	0.479
						525	0.489
						550	0.499
						575	0.508
						600	0.517

# O-XYLENE

XLO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Dimethylbenzene Xylol	Watery liquid Colorless Sweet odor
Floats on water. Flammable, irritating vapor is produced.	
<p>Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.</p>	
<b>Fire</b>	<p><b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p><b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p><b>LIQUID</b> Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>
<b>Water Pollution</b>	<p>Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

**2.1 CG Compatibility Group:** 32; Aromatic Hydrocarbon  
**2.2 Formula:** o-C<sub>8</sub>H<sub>10</sub>(CH<sub>3</sub>)<sub>2</sub>  
**2.3 IMO/UN Designation:** 3.2/1307  
**2.4 DOT ID No.:** 1307  
**2.5 CAS Registry No.:** 95-47-6  
**2.6 NAERG Guide No.:** 130  
**2.7 Standard Industrial Trade Classification:** 51124

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.
- 3.2 Symptoms Following Exposure:** Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.
- 3.3 Treatment of Exposure:** INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
- 3.4 TLV-TWA:** 100 ppm  
**3.5 TLV-STEL:** 150 ppm  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Kidney and liver damage.  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
**3.12 Odor Threshold:** 0.05 ppm  
**3.13 IDLH Value:** 900 ppm  
**3.14 OSHA PEL-TWA:** 100 ppm  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 90°F C.C.  
**4.2 Flammable Limits in Air:** 0.9 - 6.7%  
**4.3 Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
**4.7 Auto Ignition Temperature:** 869°F  
**4.8 Electrical Hazards:** Class I, Group D  
**4.9 Burning Rate:** 5.8 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** >100 mg/l/96 hr/D. magna/TL<sub>m</sub>/fresh water  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** 0 lb/lb. 5 days; 2.5% (theor.), 8 days  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Research: 99.99%; Pure: 99.7%; Commercial: 95+%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No reaction  
**7.4 Venting:** Open (flame arrester) or pressure-vacuum  
**7.5 IMO Pollution Category:** C  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** II  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**
- |                           |                |
|---------------------------|----------------|
| Category                  | Classification |
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity:** 1000 pounds  
**8.7 EPA Pollution Category:** C  
**8.8 RCRA Waste Number:** U239  
**8.9 EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 106.16  
**9.3 Boiling Point at 1 atm:** 291.9°F = 144.4°C = 417.6°K  
**9.4 Freezing Point:** -13.3°F = -25.2°C = 248.0°K  
**9.5 Critical Temperature:** 674.8°F = 357.1°C = 630.3°K  
**9.6 Critical Pressure:** 541.5 atm = 36.84 psia = 3.732 MN/m<sup>2</sup>  
**9.7 Specific Gravity:** 0.880 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 30.53 dynes/cm = 0.03053 N/m at 15.5°C  
**9.9 Liquid Water Interfacial Tension:** 36.06 dynes/cm = 0.03606 N/m at 20°C  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.068  
**9.12 Latent Heat of Vaporization:** 149 Btu/lb = 82.9 cal/g = 3.47 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -17,558 Btu/lb = -9754.7 cal/g = -408.41 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** 30.64 cal/g  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 0.28 psia

### NOTES

# O-XYLENE

XLO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	56.460	35	0.389	35	1.043	15	1.328
20	56.330	40	0.391	40	1.035	20	1.263
25	56.190	45	0.394	45	1.027	25	1.202
30	56.050	50	0.396	50	1.018	30	1.145
35	55.910	55	0.398	55	1.010	35	1.092
40	55.770	60	0.400	60	1.002	40	1.042
45	55.630	65	0.402	65	0.993	45	0.995
50	55.490	70	0.404	70	0.985	50	0.952
55	55.360	75	0.406	75	0.977	55	0.911
60	55.220	80	0.408	80	0.969	60	0.873
65	55.080	85	0.411	85	0.960	65	0.836
70	54.940	90	0.413	90	0.952	70	0.802
75	54.800	95	0.415	95	0.944	75	0.770
80	54.660	100	0.417	100	0.935	80	0.740
85	54.520					85	0.712
90	54.380						
95	54.250						
100	54.110						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.071	60	0.00135	0	0.261
	N	70	0.101	70	0.00188	25	0.274
	S	80	0.141	80	0.00258	50	0.287
	O	90	0.194	90	0.00349	75	0.299
	L	100	0.263	100	0.00464	100	0.311
	U	110	0.352	110	0.00511	125	0.323
	B	120	0.465	120	0.00794	150	0.335
	L	130	0.609	130	0.01021	175	0.347
	E	140	0.787	140	0.01298	200	0.358
		150	1.007	150	0.01634	225	0.370
		160	1.277	160	0.02038	250	0.381
		170	1.605	170	0.02520	275	0.392
		180	1.999	180	0.03090	300	0.403
		190	2.469	190	0.03759	325	0.414
		200	3.028	200	0.04539	350	0.424
		210	3.686	210	0.05443	375	0.435
		220	4.456	220	0.06484	400	0.445
		230	5.352	230	0.07674	425	0.455
		240	6.389	240	0.09030	450	0.465
		250	7.581	250	0.10560	475	0.475
		260	8.947	260	0.12290	500	0.485
						525	0.494
						550	0.504
						575	0.513
						600	0.522

# P-XYLENE

XLP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,4-Dimethylbenzene Xylol		Watery liquid	Colorless	Sweet odor
Floats on water. Flammable, irritating vapor is produced. Freezing point is 56°F.				
<p>Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.</p>				
<b>Fire</b>	<p><b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>			
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p><b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p><b>LIQUID</b> Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>			
<b>Water Pollution</b>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

**2.1 CG Compatibility Group:** 32; Aromatic Hydrocarbon  
**2.2 Formula:** p-C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>  
**2.3 IMO/UN Designation:** 3.2/1307  
**2.4 DOT ID No.:** 1307  
**2.5 CAS Registry No.:** 106-42-3  
**2.6 NAERG Guide No.:** 130  
**2.7 Standard Industrial Trade Classification:** 51124

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.
- 3.2 Symptoms Following Exposure:** Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.
- 3.3 Treatment of Exposure:** INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
- 3.4 TLV-TWA:** 100 ppm  
**3.5 TLV-STEL:** 150 ppm  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Kidney and liver damage.  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
**3.12 Odor Threshold:** 0.05 ppm  
**3.13 IDLH Value:** 900 ppm  
**3.14 OSHA PEL-TWA:** 100 ppm  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 81°F C.C.  
**4.2 Flammable Limits in Air:** 1.1%-7.0%  
**4.3 Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
**4.7 Auto Ignition Temperature:** 984°F  
**4.8 Electrical Hazards:** Class I, Group D  
**4.9 Burning Rate:** 5.8 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** 22 ppm/96 hr/bluegill/TL<sub>m</sub>/fresh water  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** 0 lb/lb in 5 days  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Research: 99.99%; Pure: 99.8%; Technical: 99.0%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester) or pressure-vacuum  
**7.5 IMO Pollution Category:** C  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** III  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**
- | Category             | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2              |
| Flammability (Red)   | 3              |
| Instability (Yellow) | 0              |
- 8.6 EPA Reportable Quantity:** 100 pounds  
**8.7 EPA Pollution Category:** B  
**8.8 RCRA Waste Number:** U239  
**8.9 EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 106.16  
**9.3 Boiling Point at 1 atm:** 280.9°F = 138.3°C = 411.5°K  
**9.4 Freezing Point:** 55.9°F = 13.3°C = 286.5°K  
**9.5 Critical Temperature:** 649.4°F = 343.0°C = 616.2°K  
**9.6 Critical Pressure:** 509.4 atm = 34.65 psia = 3.510 MN/m<sup>2</sup>  
**9.7 Specific Gravity:** 0.861 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 28.3 dynes/cm = 0.0283 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** 37.8 dynes/cm = 0.0378 N/m at 20°C  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.071  
**9.12 Latent Heat of Vaporization:** 150 Btu/lb = 81 cal/g = 3.4 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -17,559 Btu/lb = -9754.7 cal/g = -408.41 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** 37.83 cal/g  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 0.34 psia

### NOTES

# P-XYLENE

XLP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	53.970	60	0.412	60	0.935	60	0.678
65	53.850	70	0.418	65	0.928	65	0.654
70	53.690	80	0.424	70	0.921	70	0.631
75	53.550	90	0.429	75	0.914	75	0.610
80	53.410	100	0.435	80	0.907	80	0.590
85	53.270	110	0.440	85	0.900	85	0.571
90	53.140	120	0.446	90	0.892	90	0.552
95	53.000	130	0.451	95	0.885	95	0.535
100	52.860	140	0.457	100	0.878	100	0.519
105	52.720	150	0.462			105	0.503
110	52.580	160	0.468			110	0.488
115	52.440	170	0.474			115	0.474
120	52.300	180	0.479			120	0.460
		190	0.485				
		200	0.490				
		210	0.496				
		220	0.501				
		230	0.507				
		240	0.512				
		250	0.518				
		260	0.524				
		270	0.529				
		280	0.535				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.096	60	0.00183	0	0.246
	N	70	0.135	70	0.00252	25	0.259
	S	80	0.187	80	0.00343	50	0.272
	O	90	0.255	90	0.00459	75	0.285
	L	100	0.343	100	0.00607	100	0.297
	U	110	0.456	110	0.00792	125	0.309
	B	120	0.599	120	0.01022	150	0.321
	L	130	0.777	130	0.01303	175	0.333
	E	140	0.998	140	0.01646	200	0.345
		150	1.270	150	0.02059	225	0.357
		160	1.600	160	0.02553	250	0.368
		170	1.998	170	0.03138	275	0.380
		180	2.475	180	0.03826	300	0.391
		190	3.041	190	0.04629	325	0.402
		200	3.710	200	0.05561	350	0.413
		210	4.493	210	0.06636	375	0.424
		220	5.407	220	0.07867	400	0.435
		230	6.465	230	0.09270	425	0.445
		240	7.683	240	0.10860	450	0.456
		250	9.080	250	0.12650	475	0.466
		260	10.670	260	0.14670	500	0.476
						525	0.486
						550	0.496
						575	0.505
						600	0.515

## POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Also known as: Polynuclear Aromatic Hydrocarbons, PNA, Polyaromatic Hydrocarbons

Examples: Benzo(a)pyrene, Benzanthracene, Benzo(b)fluoranthene, Fluoranthene, Naphthalene

### WHAT ARE PAHs?

PAHs are a group of approximately 10,000 compounds, a few of which are listed above. Most PAHs in the environment are from incomplete burning of carbon-containing materials like oil, wood, garbage or coal. Many useful products such as mothballs, blacktop, and creosote wood preservatives contain PAHs. They are also found at low concentrations in some special-purpose skin creams and anti-dandruff shampoos that contain coal tars.

Automobile exhaust, industrial emissions and smoke from burning wood, charcoal and tobacco contain high levels of PAHs. In general, more PAHs form when materials burn at low temperatures, such as in wood fires or cigarettes. High-temperature furnaces produce fewer PAHs.

Fires can form fine PAH particles. They bind to ash particles and can move long distances through the air. Some PAHs can dissolve in water. PAHs can enter groundwater from ash, tar, or creosote that is improperly disposed in landfills.

### HOW ARE PEOPLE EXPOSED TO PAHs?

**Breathing:** Most people are exposed to PAHs when they breathe smoke, auto emissions or industrial exhausts. Most exhausts contain many different PAH compounds. People with the highest exposures are smokers, people who live or work with smokers, roofers, road builders and people who live near major highways or industrial sources.

**Drinking/Eating:** Charcoal-broiled foods, especially meats, are a source of some PAH exposure. Shellfish living in contaminated water may be another major source of exposure. PAHs may be in groundwater near disposal sites where construction wastes or ash are buried; people may be exposed by drinking this water. Vegetables do not take up significant amounts of PAHs that are in soil.

**Touching:** PAH can be absorbed through skin. Exposure can come from handling contaminated soil or bathing in contaminated water. Low levels of these chemicals may be absorbed when a person uses medicated skin cream or shampoo containing PAHs.

### DO STANDARDS EXIST FOR REGULATING PAHs?

**Water:** Wisconsin has established drinking water standards for five PAHs: Anthracene - 3,000 parts per billion (ppb), Benzo(a)pyrene - 0.2 ppb, Benzo(b)fluoranthene - 0.2 ppb, Fluoranthene - 400 ppb and Fluorene - 400 ppb. We suggest you stop drinking water containing more than these amounts. If other PAHs are found in your drinking water, contact your local public health agency for advice.

**Air:** No standards exist for the amount of PAHs allowed in the air of homes. We use a formula to convert workplace limits to suggested home limits. Based on the formula, we recommend levels of PAHs in air be no higher than 0.004 parts per million (ppm).

The Wisconsin Department of Natural Resources regulates the amount of several PAHs that can be released by industries.

## WILL EXPOSURE TO PAHs RESULT IN HARMFUL HEALTH EFFECTS?

The effects of breathing high concentrations of PAHs have not been studied. However, PAHs may be attached to dust or ash causing lung irritation. Skin contact with PAHs may cause redness, blistering, and peeling.

The following health effects can occur after several years of exposure to PAHs:

**Cancer:** Benzo(a)pyrene, a common PAH, is shown to cause lung and skin cancer in laboratory animals. Other PAHs are not known to have this effect. Extracts of various types of smoke containing PAHs caused lung tumors in laboratory animals. Cigarette smoke will cause lung cancer.

**Reproductive Effects:** Reproductive problems and problems in unborn babies' development have occurred in laboratory animals that were exposed to benzo(a)pyrene. Other PAHs have not been studied enough to determine whether they cause reproductive problems.

**Organ Systems:** A person's lungs, liver, skin, and kidneys can be damaged by exposure.

In general, chemicals affect the same organ systems in all people who are exposed. However, the seriousness of the effects may vary from person to person.

A person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals including medicines, and personal habits such as smoking or drinking.

It's also important to consider the length of exposure to the chemical; the amount of chemical exposure; and whether the chemical was inhaled, touched, or eaten.

## CAN A MEDICAL TEST DETERMINE EXPOSURE TO PAHs?

Many PAHs can be detected in blood or urine soon after exposure. Tests for these compounds are not routine and can only be performed using special equipment not usually found in doctor's offices. People who think they may have been exposed to PAHs for a long time should contact their physician. Blood tests of liver and kidney function are available. People exposed to PAHs in air may want to ask their doctor to consider having lung function tests done.

*Seek medical advice if you have any symptoms that you think may be related to chemical exposure.*

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to work exposure or emergency situations.

## FOR MORE INFORMATION

- Poison Control Center, 800-815-8855
- Your local public health agency
- Division of Public Health, BEH, 1 West Wilson Street, Rm. 150, Madison, WI 53701-2659, (608) 266-1120 or Internet: [www.dhfs.state.wi.us/eh/index.htm](http://www.dhfs.state.wi.us/eh/index.htm)



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(POH 4606 Revised 12/2000)

# NAPHTHA: COAL TAR

NCT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mixture of benzene, toluene, xylenes		Watery liquid	Colorless to pale yellow	Gasoline-like odor
Floats on water. Irritating vapor is produced.				
<p>Keep people away. Avoid inhalation. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.</p>				
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical or carbon dioxide. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 33; Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Currently not available  
2.3 **IMO/UN Designation:** 3.2/2553  
2.4 **DOT ID No.:** 1268  
2.5 **CAS Registry No.:** MX8030-31-7  
2.6 **NAERG Guide No.:** 128  
2.7 **Standard Industrial Trade Classification:** 33429

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Hydrocarbon vapor canister or air pack; plastic gloves; goggles or face shield.
- 3.2 **Symptoms Following Exposure:** Primarily a narcotic, causing unconsciousness in high concentrations. The symptoms of acute benzene poisoning are not likely, since the compound has components other than benzene.
- 3.3 **Treatment of Exposure:** Remove from exposure. Support respiration. Call physician.
- 3.4 **TLV-TWA:** 400 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Leukemia
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause a smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 4.68 ppm
- 3.13 **IDLH Value:** 1,000 ppm
- 3.14 **OSHA PEL-TWA:** 100 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 107°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 900–950°F
- 4.8 **Electrical Hazards:** Class I, Group D
- 4.9 **Burning Rate:** 4 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Purity varies with coal used and distillation range taken.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** 200–500°F = 93–260°C = 366–533°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.86–0.88 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030
- 9.12 **Latent Heat of Vaporization:** (est.) 101 Btu/lb = 56.2 cal/g = 2.35 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** (est.) –18,200 Btu/lb = –10,100 cal/g = –424 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.13 psia

### NOTES



# NAPHTHA: COAL TAR

NCT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	53.680	50	0.478	50	1.040	50	9.343
52	53.680	52	0.478	52	1.040	52	8.841
54	53.680	54	0.478	54	1.040	54	8.370
56	53.680	56	0.478	56	1.040	56	7.927
58	53.680	58	0.478	58	1.040	58	7.511
60	53.680	60	0.478	60	1.040	60	7.119
62	53.680	62	0.478	62	1.040	62	6.751
64	53.680	64	0.478	64	1.040	64	6.404
66	53.680	66	0.478	66	1.040	66	6.078
68	53.680	68	0.478	68	1.040	68	5.770
70	53.680	70	0.478	70	1.040	70	5.481
72	53.680	72	0.478	72	1.040	72	5.207
74	53.680	74	0.478	74	1.040	74	4.950
76	53.680	76	0.478	76	1.040	76	4.707
78	53.680	78	0.478	78	1.040	78	4.477
80	53.680	80	0.478	80	1.040	80	4.260
82	53.680	82	0.478	82	1.040	82	4.056
84	53.680	84	0.478	84	1.040	84	3.862
86	53.680	86	0.478	86	1.040	86	3.679
88	53.680	88	0.478	88	1.040	88	3.506
90	53.680	90	0.478	90	1.040	90	3.342
92	53.680	92	0.478	92	1.040	92	3.187
94	53.680	94	0.478	94	1.040	94	3.040
96	53.680	96	0.478	96	1.040	96	2.901
98	53.680	98	0.478	98	1.040	98	2.770
100	53.680	100	0.478	100	1.040	100	2.645

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	90	0.094		N		C
	N	100	0.124		O		U
	S	110	0.163		T		R
	O	120	0.211		P		R
	L	130	0.272		E		E
	U	140	0.347		R		N
	B	150	0.440		T		T
	L	160	0.553		I		L
	E	170	0.691		N		Y
		180	0.856		E		N
		190	1.054		N		O
		200	1.290		T		T
		210	1.569				A
		220	1.897				V
		230	2.281				A
		240	2.728				I
		250	3.247				L
		260	3.846				A
		270	4.535				B
		280	5.323				L
		290	6.221				E
		300	7.241				
		310	8.394				
		320	9.695				
		330	11.160				
		340	12.790				

## CYANIDE

Chemical reference numbers (CAS) of common forms: Cyanide 57-12-5, Zinc Cyanide 557-21-1, Sodium Cyanide 143-33-9, Potassium Cyanide 151-50-8, Hydrogen Cyanide 74-90-8

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### WHAT IS CYANIDE?

**Cyanide is very poisonous.** Cyanide can exist as a gas, liquid or white crystal powder. Cyanide is used in the electroplating industry, in metal cleaning operations, and as an industrial bug killer. Breathing the gas, eating the liquid or solid forms can make people suddenly lose consciousness or cause death.

There are no common uses of cyanide in the home. Most cyanide in the environment results from industrial processes and from improper waste disposal.

### HOW ARE PEOPLE EXPOSED TO CYANIDE?

**Breathing:** Cyanide gas can be found in industrial emissions and car exhaust, cigarette smoke and certain papers and plastics as they burn. It is also possible to breathe or eat cyanide dust when working with cyanide powder. If people use a contaminated water supply, they can breathe cyanide when they cook or shower with the water.

**Drinking/Eating:** Cyanide is sometimes found in contaminated drinking water. People can be exposed when they drink contaminated water. People who handle contaminated soil may be exposed when they eat or touch their mouths with dirty hands.

**Touching:** Cyanide can enter the body through skin when people handle the chemical, contaminated soil or contaminated water. People can be exposed to cyanide if they wash or bathe with contaminated water.

### DO STANDARDS EXIST FOR REGULATING CYANIDE?

**Water:** The federal drinking water standard for cyanide is set at 200 parts per billion (ppb). We suggest you stop drinking water containing more than 200 ppb of cyanide.

**Air:** No standards exist for the amount of cyanide allowed in the air of homes. We use a formula to convert workplace limits to suggested home limits. Based on the formula, we recommend cyanide levels be no higher than 90 ppb. Most people can't smell cyanide until levels reach 600 ppb. Cyanide compounds smell like bitter almonds to some people, while others cannot smell them at all. If you can smell the chemical, the level is too high to be safe.

The Wisconsin Department of Natural Resources regulates the amount of cyanide that can be released by industries.

## WILL EXPOSURE TO CYANIDE RESULT IN HARMFUL HEALTH EFFECTS?

The following health effects are described in cases of suicide or accidental exposure to high levels of cyanide compounds. These effects are not expected following low-dose exposures:

- Irritation of skin and mucous membranes (causing redness or flushing of skin)
- Headaches, dizziness and loss of coordination
- Nausea and vomiting
- Rapid, deep breathing or gasping
- Rapid pulse rate and increased blood pressure
- Muscle spasms and convulsions
- Loss of consciousness and death.

The following health effects can occur after several years of exposure to low levels of cyanide:

**Cancer:** No studies show a relationship between exposure to cyanide and the development of cancer.

**Reproductive Effects:** Studies of laboratory animals show exposure to cyanide resulted in birth defects.

**Organ Systems:** Cyanide can cause nerve damage affecting hearing, vision, and muscle coordination. Damage to the thyroid gland is also possible, resulting in changes of metabolism in adults and slowing growth or development in children.

In general, chemicals affect the same organ systems in all people who are exposed. A person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals including medicines, and personal habits such as smoking or drinking.

It's also important to consider the length of exposure to the chemical; the amount of chemical exposure; and whether the chemical was inhaled, touched, or eaten.

## CAN A MEDICAL TEST DETERMINE EXPOSURE TO CYANIDE?

Doctors can test urine for "thiocyanate" shortly after exposure to cyanide. Blood levels of cyanide can indicate recent exposure. Cigarette smokers generally have higher levels of cyanide-related compounds in their bodies than non-smokers.

*Seek medical advice if you have any symptoms that you think may be related to chemical exposure.*

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to work exposure or emergency situations.

## FOR MORE INFORMATION

- Poison Control Center, 800-815-8855
- Your local public health agency
- Division of Public Health, BEH, 1 West Wilson Street, Rm. 150, Madison, WI 53701-2659, (608) 266-1120 or Internet: [www.dhfs.state.wi.us/eh/index.htm](http://www.dhfs.state.wi.us/eh/index.htm)



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# POLYCHLORINATED BIPHENYL

PCB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arochlor Chlorinated biphenyl Halogenated waxes PCB Polychloropolyphenyls		Oily liquid to solid powder	Light yellow liquid, or white powder	Weak odor
Sinks in water.				
<p>Notify local health and pollution control agencies. Protect water intakes. Keep people away. Avoid contact with liquid and solid. Call fire department.</p>				
<b>Fire</b>	Combustible. Extinguish with water, foam, dry chemical, or carbon dioxide.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.			
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
 2.2 **Formula:** (C<sub>12</sub>H<sub>10-x</sub>)Cl<sub>x</sub>  
 2.3 **IMO/UN Designation:** Not listed  
 2.4 **DOT ID No.:** 2315  
 2.5 **CAS Registry No.:** 1336-36-3  
 2.6 **NAERG Guide No.:** 171  
 2.7 **Standard Industrial Trade Classification:** 51139

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Gloves and protective garments.  
 3.2 **Symptoms Following Exposure:** Acne from skin contact.  
 3.3 **Treatment of Exposure:** SKIN: wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 3980 mg/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Causes chromosomal abnormalities in rats, birth defects in birds  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and cause eye and lung injury. They cannot be tolerated even at low concentrations.  
 3.11 **Liquid or Solid Characteristics:** Contact with skin may cause irritation.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** >286°F  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Irritating gases are generated in fires.  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** 0.278 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water  
 0.005 ppm/336-1080 hr/pinfish/TL<sub>50</sub>/salt water  
 6.2 **Waterfowl Toxicity:** LD<sub>50</sub> 2000 ppm (mallard duck)  
 6.3 **Biological Oxygen Demand (BOD):** Very low  
 6.4 **Food Chain Concentration Potential:** High  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: +  
 Damage to living resources: 4  
 Human Oral hazard: 1  
 Human Contact hazard: II  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 11 grades (some liquid, some solids) which differ primarily in their chlorine content (20%-68% by weight)  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Class 9  
 8.2 **49 CFR Class:** 9  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** Yes  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** 1 pound  
 8.7 **EPA Pollution Category:** X  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
 9.2 **Molecular Weight:** Not pertinent  
 9.3 **Boiling Point at 1 atm:** Very high  
 9.4 **Freezing Point:** Not pertinent  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 1.3-1.8 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** Not pertinent  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** Not pertinent  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# POLYCHLORINATED BIPHENYL

PCB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	81.150		N		N		N
69	81.150		O		O		O
70	81.150		T		T		T
71	81.150						
72	81.150		P		P		P
73	81.150		E		E		E
74	81.150		R		R		R
75	81.150		T		T		T
76	81.150		I		I		I
77	81.150		N		N		N
78	81.150		E		E		E
79	81.150		N		N		N
80	81.150		E		E		E
81	81.150		N		N		N
82	81.150		T		T		T
83	81.150						
84	81.150						
85	81.150						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T		N O T		N O T
			P E R T I N E N T		P E R T I N E N T		P E R T I N E N T

## POLYCHLORINATED BIPHENYLS (PCBs)

Also known as: Aroclor, Chlorinated Biphenyls, Kaneclor

Chemical reference number (CAS): 1336-36-3

### WHAT ARE PCBs?

PCBs are a group of 209 different compounds. PCBs are man-made and have no smell. They are yellow, oily liquids that don't easily burn. There are no natural sources of PCBs.

Companies in the United States first made PCBs in 1929. They've been used as coolants in electrical equipment, metal-cutting oils, microscope lens oils, and in inks, dyes, and carbonless copy paper.

In 1977, the U.S. Environmental Protection Agency (EPA) banned the use of PCBs. The EPA was concerned about the harmful effects of PCBs. For example, PCBs can accumulate in the environment. PCBs may be present in old fluorescent light fixtures and parts of appliances made before 1978.

PCBs break down very slowly and can be carried long distances in the air, in rivers, lakes and oceans. PCBs can build up over time in the fat of people and animals. Recent studies found that most people have traces of PCBs in their body fat. PCBs can build-up in the food chain. For example, fish can have PCB levels in their fatty tissues that are much higher than the surrounding water.

### HOW ARE PEOPLE EXPOSED TO PCBs

**Drinking/Eating:** For most people, eating fish or other seafood caught from polluted water is the main way in which they are exposed to PCBs.

*Women who are pregnant or plan to have children should be especially cautious about eating contaminated fish.* When people eat contaminated food over many years, PCBs can build up in their body fat. When people lose weight or breastfeed, their bodies use stored fat

and put stored PCBs back into their blood. Babies may be exposed to PCBs in breast milk from mothers who often eat PCB contaminated fish.

Researchers have found high levels of PCBs in several types of fish, shellfish, marine mammals and waterfowl. In general, older animals living in polluted areas have the highest levels. State advisories are available for people who eat sport-caught fish and waterfowl. For more information, contact your regional Wisconsin Department of Natural Resources (DNR) office or call (608) 266-1877.

**Touching:** People can be exposed to PCBs in places where these chemicals were used, spilled, or thrown away. PCBs can be absorbed through skin during handling of the chemicals, contaminated soil or other contaminated items.

**Breathing:** Inhalation of PCB vapors or air is a minor source of contamination.

### DO STANDARDS EXIST FOR REGULATING PCBs?

**Food:** The U.S. Food and Drug Administration (FDA) suggests not eating fish containing more than 2 parts per million of PCBs. This guidance assumes that a person eats two 8-ounce servings of fish per month, for every month of the year.

**Water:** The state and federal drinking water standard for PCBs are both set at 0.5 parts per billion (ppb). The Wisconsin groundwater standard is 0.03 ppb. Wisconsin's standard is to protect people against the possible cancer-causing effects of PCBs and the effects PCBs have on infants. We suggest you stop drinking water containing more than 0.03 ppb of PCBs.

## WILL EXPOSURE TO PCBs RESULT IN HARMFUL HEALTH EFFECTS?

Researchers have found PCBs cause a number of harmful health effects. Exposure to high levels of PCBs, as might occur as a result of a chemical spill, can cause changes in the immune system and in liver function. The following health effects can occur after several years of exposure to PCBs:

**Cancer:** PCBs cause liver cancer in laboratory animals and may cause cancer in humans.

**Reproductive Effects:** Some limited animal and human studies suggest PCBs can effect reproduction and the development of unborn babies. Researchers have noted learning and memory problems in some children who were exposed to PCBs before birth.

**Immunity:** Animal studies show the immune system can be affected by PCBs.

**Organ Systems:** PCB exposure can cause liver damage.

In general, chemicals affect the same organ systems in all people who are exposed. However, the seriousness of the effects may vary from person to person.

Each person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals including medicines, and personal habits such as smoking or drinking.

It is also important to consider the length of exposure to the chemical; the amount of chemical exposure; and whether the chemical was inhaled, touched, or eaten.

## CAN A MEDICAL TEST DETERMINE EXPOSURE TO PCBs?

Doctors can use blood tests to evaluate exposure to PCBs. This type of blood test is expensive and not always locally available. Testing can also detect PCBs in human fat or breast milk. Most testing of this type has been done for research purposes. Liver function tests may be helpful in determining damage from exposure.

*Seek medical advice if you have any symptoms that you think may be related to exposure.*

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to work exposure or emergency situations.

## FOR MORE INFORMATION

- Poison Control Center, 800-815-8855
- Your local public health agency
- Division of Public Health, BEH, 1 West Wilson Street, Rm. 150, Madison, WI 53701-2659, (608) 266-1120 or Internet: [www.dhfs.state.wi.us/eh/index.htm](http://www.dhfs.state.wi.us/eh/index.htm)



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