

**SITE SAFETY PLAN
CHEVRON SERVICE STATION 9-6991
2920 CASTRO VALLEY BOULEVARD
CASTRO VALLEY, CALIFORNIA**

SEPTEMBER 19, 1990

**GROUNDWATER TECHNOLOGY, INC.
20000/200 MARINER AVENUE
TORRANCE, CALIFORNIA 90503
PROJECT NUMBER: 203-175-3322**

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1.0 SITE EMERGENCY PLAN

Survey the situation. Do not endanger your own life.

Your site address: 2920 Castro Valley Boulevard
Castro Valley, California

1.1 Emergency Telephone Numbers:

Telephone located at: Service Station

Ambulance: (911)

Fire: (911)

Police: (911)

Poison Control: (415)-476-6600 or 1-800-523-2222

Nearest Hospital: Eden Hospital

Street Address: 20103 Lake Chabot Road, Castro Valley, CA

Telephone: (415)-537-1234

Directions to: From the site, proceed west on Castro Valley Boulevard to Lake Chabot Road. Drive north on Lake Chabot Road approximately two blocks.

A map showing this route is located at the beginning of Appendix D - Site Maps.

1.2 First Aid

Ingestion: Give water if patient is conscious. Call Poison Control - follow instructions. Administer CPR, if necessary. Seek medical attention.

Inhalation: Remove person from contaminated environment. Administer CPR, if necessary. Seek medical attention.

Skin Contact: Brush off dry material, remove contaminated clothing. Wash skin with soap and water. Seek medical attention if irritation develops.

Eye Contact: Flush eyes and surrounding tissue with water for 15 minutes. Seek medical attention.

* Exposure Symptoms: Headache, dizziness, nausea, drowsiness, irritation of eyes, nose, throat, breathing difficulties.

Report incident to Project Manager and Regional Health and Safety Manager after emergency procedures have been implemented.

1.3 Emergency Environmental Contacts

	<u>TELEPHONE:</u>
Groundwater Technology, Inc., Concord, CA:	(415)-685-9250
Contact Person: Joe Ramage	(415)-671-2387
Home: (415)-370-1494	
Alternates: Dave Fisch	(415)-671-2387
Home:	
Maureen Grant	(213)-371-1394
Home: 1-213-374-3551	
National Response Center:	1-800-424-8802
U.S. EPA (24-hour Hotline):	1-800-424-9346
State Regulatory Agency:	
Client: Chevron U.S.A., Inc.	
Contact Person: Cynthia Wong	(415)-842-9103

1.4 Encountering Hazardous Situations (requiring evacuation)

In the event of an emergency, i.e. fires, explosions or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil or surface water at the facility, the team member that observes this condition shall give an emergency alarm. The emergency alarm signal will be 3 horn blasts on the horn located in the site vehicle.

Actions to be taken will be dictated by the emergency. All appropriate local emergency response agencies shall be notified immediately. The police, fire department, emergency response teams and ambulance may be reached via telephone by dialing 911.

The nearest hospital and additional emergency contacts are listed on the previous page (Section 1.0).

Personnel encountering a hazardous situation shall instruct others on site to evacuate the vicinity immediately and call the (1) Site Safety Officer, (2) the Project Manager, and (3) the Health & Safety Manager for instructions.

The attached site plan indicates the primary evacuation route and the alternate evacuation routes to be used in an emergency situation.

The site must not be re-entered until back-up help, monitoring equipment, and personal protective equipment is on hand.

2.0 INFORMATIONAL SUMMARY

2.1 Health and Safety Summary

Chemicals of Concern: Gasoline, Benzene, Toluene, Ethylbenzene, & Xylene

Hazard Determination: Serious ___ Moderate ___ Low X

Minimum Level of Protection:

Modified Level D is the minimum acceptable level for this site.

Action Level for Upgrading Personal Protection: Upgrade from Level D to Level C at 50 ppm measured within the breathing zone. This should be determined by a photoionization detector (PID) with a 10.2 lamp or a flame ionization detector (FID).

Air Monitoring Requirements:

PID	<u>X</u>
OVA	___
FID	___
O ₂ /LEL	___
DETECTOR TUBES	___
OTHER	___

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TABLE I

ACTION LEVELS

NOTE: The information in this chart applies to gasoline and its chemical constituents.

GASOLINE PEL* = 300 PPM

GTI ACTION LEVEL (HALF FACE) = 50 PPM
 (FULL FACE) = 100 PPM

A C T I O N L E V E L S F O R P P E

Air Monitoring Instrument	LEVEL D	LEVEL C	LEVEL B
LEL	< 0.5%	0.5% - 5%	>5%
PID/FID	< 50 ppm	50 - 100 ppm (Half face) 100 - 750 ppm (Full face)	N/A 750 ppm
O ₂	19.5 - 23%	19.5 - 23%	<19.5%

Explanatory Information:

LEL Gasoline = 1.4 % or 14,000 ppm

0.5% LEL = 70 ppm (Wear Level C)

5% LEL = 700 ppm (Wear Level C)

>5% LEL = Level B (>700 ppm)

NOTE: Withdraw from site and contact the project manager if:

LEL > 20%, and/or O₂ > 23%

* PEL = Permissible Exposure Limit (OSHA 1989)

3.0 INTRODUCTION

3.1 Background

Chevron U.S.A. has retained Groundwater Technology, Inc. (GTI) to perform a site assessment/investigation at their facility located at 2920 Castro Valley Boulevard, Castro Valley, California.

3.2 Purpose

The purpose of the site safety plan is to provide Groundwater Technology field personnel and subcontractors with an understanding of the potential chemical and physical hazards that exist or may arise while the tasks of this project are being performed.

This SSP describes the procedures to be followed in order to reduce employee exposure to potential health hazards which may be present at the project site. The emergency response procedures necessary to respond to such hazards are also described within this SSP.

3.3 Objective

The primary objective is to ensure the well-being of all field personnel and the community surrounding this site. In order to accomplish this, project staff and approved subcontractors shall acknowledge and adhere to the policies and procedures established herein. Accordingly, all personnel assigned to this project shall read this site safety plan and sign the Agreement and Acknowledgement Statement (Appendix A) to certify that they have read, understood and agreed to abide by its provisions.

GTI personnel have the authority to stop work performed by our subcontractors at this site if any work is not performed in accordance with the requirements of this Site Safety Plan.

3.4 Amendments

Any changes in the scope of work of this project and/or site conditions must be amended in writing on the Site Safety Plan Amendment Sheet (Appendix B) and approved by Health & Safety Manager.

4.0 HAZARD EVALUATION

4.1 Site Conditions

General Site conditions at the Castro Valley site include noise, heat, and excavation activity following the removal of several waste oil underground storage tanks (USTs).

4.2 Site Tasks

The field tasks at this site will include:

- ◆ Collection of soil samples during and following excavation of soil in the immediate vicinity of the former USTs.

4.3 Job Task Hazards

4.3.1 All Field Tasks: The following hazards may be encountered.

◆ **Slippery Surfaces:**

All employees must wear ANSI approved work boots with steel toe protection. Skid proof soles are highly recommended.

◆ **Organic Vapors:**

The inhalation of volatile organic vapors during all operations can pose a potential health hazard. Hazard reduction procedures include monitoring the ambient air with a PID and/or FID and use of Personal Protective Equipment indicated on Table II. Workers should stand upwind of the source of contamination whenever possible. If ambient air levels in the breathing zone exceed 50 ppm, half face respirators equipped with organic vapor cartridges must be worn. If ambient air levels in the breathing zone exceed 100 ppm, full face respirators equipped with organic vapor cartridges must be worn.

◆ **Flammable Vapors:**

Presence of flammable vapors can pose a potential fire hazard and health hazard. Hazard reduction procedures include monitoring the ambient air with an O₂/LEL meter. If the LEL reading exceeds 20%, leave the site immediately and contact the fire department.

◆ **Oxygen:**

Atmospheres that contain a level of oxygen greater than 23% pose an extreme fire hazard (the usual ambient oxygen level is approximately 20.5%). All personnel encountering atmospheres that contain a level of Oxygen greater than 23% must evacuate the site immediately and must notify the Fire Department.

If Oxygen Level is less than 19.5%, do not enter the space.

◆ **Noise:**

GTI and ANSI approved hearing protection must be worn during noisy operations such as drilling.

◆ **Surface and Equipment Contamination:**

Contact with contaminated surfaces, or surfaces suspected of being contaminated should be avoided. This includes walking through, kneeling or placing equipment in puddles, mud, discolored surfaces, or on drums and other containers. Eating, smoking, drinking and/or the application of cosmetics is prohibited on this site in the immediate work area. This reduces the likelihood of contamination by ingestion.

◆ **Exposure - Heat Stress:**

Since climatic changes cannot be avoided work schedules will be adjusted to provide time intervals for intake of juices, juice products and water in an area free from contamination and in quantity appropriate for fluid replacement.

Heat stress may occur even in moderate temperature areas and may present any or all of the following:

- A. **Heat Rash:** result of continuous exposure to heat, humid air, and chafing clothes. Heat rash is uncomfortable and decreases the ability to tolerate heat.
- B. **Heat Cramps:** result of the inadequate replacement of body electrolytes lost through perspiration. Signs include severe spasms and pain in the extremities and abdomen.
- C. **Heat Exhaustion:** result of increase stress on the vital organs of the body in the effort to meet the body's cooling demands. Signs include shallow breathing; pale, cool, moist skin; profuse sweating; dizziness.
- D. **Heat Stroke:** result of overworked cooling system. Heat stroke is the most serious form of heat stress. Body surfaces must be cooled and medical help must be obtained immediately to prevent severe injury and/or death. Signs include red, hot, dry skin; absence of perspiration; nausea; dizziness and confusion; strong, rapid pulse. Can lead to coma and death.

Heat Stress Prevention

- A. Replace body fluids (water and electrolytes) lost through perspiration. Solutions may include a 0.1% salt and water solution or commercial mixes such as Gatorade and Squench.
- B. Cooling devices to aid the natural body ventilation. Cooling occurs through evaporation of perspiration and limited body contact with heat-absorbing protective clothing. Utilize fans and air conditioners to assist in evaporation. Long, cotton underwear is suggested to absorb perspiration and limit any contact with heat-absorbing protective clothing (i.e., coated Tyvek suits).
- C. Provide hose-down mobile shower facilities to cool protective clothing and reduce body temperature.
- D. Conduct non-emergency response activities in the early morning or evening during very hot weather.
- E. Provide shelter against heat and direct sunlight to protect personnel.
- F. Rotate workers wearing protective clothing during hot weather.

♦ Exposure - Cold Stress:

Work schedules will be adjusted to provide sufficient rest periods in a heated area for warming up during operations conducted in cold weather. Also thermal protective clothing such as wind and/or moisture resistant outerwear is recommended to be worn.

If work is performed continuously in the cold at or below -7°C (20°F), including wind chill temperature, heated warming shelters (tents, cabins, company vehicles, rest rooms, etc.) shall be made available nearby and the worker should be encouraged to use these shelters at regular intervals the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria, are indications for immediate return to the shelter. When entering the heated shelter the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation. A change of dry work clothing shall be provided as necessary to prevent worker from returning to their work with wet clothing. Dehydration, or the loss of body fluids, occurs in the cold environment and may increase the

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susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited. (Adapted from TLV's and Biological Exposure Indices 1988-1989; ACGIH).

◆ Falling Objects:

Hard hats must be worn by all personnel whenever construction-type activity is taking place. (ie., drilling, excavation, trenching).

◆ Vehicular traffic:

All employees will be required to wear a fluorescent safety vest at all times while on site. In addition, the following safety equipment procedures must be adhered to.

<u>TASK</u>	<u>TRAFFIC SAFETY EQUIPMENT</u>
Drilling	A
Subsurface Entry	A
Well Installation	A
Well Maintenance	B
Well Gauging	B
Sampling	B
Pump Test	B

SAFETY EQUIPMENT KEY:

A = Cones and barricades required - tapes and flags are recommended but optional.

B = Cones are required - flags are recommended but are optional.

4.3.2 Well Installation; Well Development; Well Gauging; Well Bailing; Soil & Groundwater Sampling:

Skin and eye contact with contaminated groundwater and/or soil may occur during these tasks. Nitrile butyl rubber or neoprene gloves and approved safety goggles should be worn when contact with contaminated substance and/or splash is possible.

4.3.3 Sample Preservation:

When hydrochloric acid is used, skin and eye contact can occur. This hazard can be reduced with the use of Nitrile butyl rubber or neoprene gloves and the use of safety goggles.

4.3.4 Cleaning Equipment:

Skin and eye contact with methanol, Alconox, or other cleaning substances can occur while cleaning equipment. This hazard can be reduced with the use of Nitrile butyl rubber or neoprene gloves and the use of safety goggles.

4.3.5 Confined Space:

Manholes, subsurface vaults and sheds are examples of confined spaces that may lack adequate ventilation. Organic and/or combustible vapors may be trapped resulting in a lack of oxygen (anoxia) and/or overexposure to vapors. When site work takes place in a confined space the air must be monitored for (a) oxygen level, (b) flammable vapors, and (c) toxic vapors. The following air monitoring procedures must be followed before entering a confined space.

- a. Oxygen Level: Monitor for % Oxygen with an O₂/LEL meter to ensure a minimum oxygen level of 19.5%. Oxygen level monitoring will be done at the top, middle and bottom of the enclosed space to determine if there is a minimum acceptable oxygen level of 19.5% PRIOR to entry.

If oxygen is less than 19.5%, do not enter the space.

- b. Explosive Vapors: Monitor for % of Lower Explosive Limit (LEL) with a O₂/LEL meter to determine whether vapor concentrations within the confined space are within the flammable range.

If LEL readings exceed 20%, personnel MUST leave the site immediately, and contact the project manager.

- c. Toxic Vapors: Monitor for toxic vapors with a PID and/or an FID (e.g., HNU or OVA) to determine whether toxic vapors within the confined space exceed the action levels.

If the PID and/or the FID readings exceed 50 ppm, a half face respirator with organic vapor cartridges must be worn. If the PID and/or the FID readings exceed 100 ppm, a full face respirator with organic vapor cartridges must be worn.

All monitoring equipment must be calibrated and maintained in accordance with manufacturer's recommendations. If an HNU is used, the 10.2 eV lamp is required for accurate readings. Calibrations should be recorded on the form in Appendix G, and returned to the District H&S Coordinator at the completion of the project.

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- d. Summary: Do not enter the confined space unless:
- the oxygen concentration is between 19.5 and 23%;
 - the LEL is less than 20%;
 - PID and/or FID readings are less than 750 ppm (a half face respirator must be worn above 50 ppm; a full face respirator must be worn if the readings exceed 100 ppm)
- e. Buddy System: The buddy system must be used when the work in the confined space: (1) requires the person's head to be below ground level; or (2) the person must work in a manhole or other space in which an exit may not be easily accessible.

TABLE II
HAZARD SUMMARY

Job Task	PPE Level	AIR MONITORING - BREATHING ZONE	
		Instrument	Frequency*
Soil boring samples	D	PID or FID	At start of work and 15 min to continuously
Monitoring Well Installation	D	PID or FID	At start of work and 15 min to continuously
Monitoring Well Survey	D	PID or FID	Start-up of work at each well location
Monitoring Well Development	D	PID or FID	Start-up of work at each well location
Groundwater and soil sampling	D	PID or FID	Start-up of work at each well location.

* All air monitoring data must be recorded on the Vapor Monitoring Sheet, Appendix H. Instrument calibration checks prior to monitoring must be recorded on the form in Appendix G, and the completed forms returned to the District Health & Safety Manager following project completion.

5.0 PERSONAL PROTECTIVE EQUIPMENT

Modified Level D is the minimum acceptable level for this site.

Modified Level D includes:

- ◆ coveralls/work uniform
- ◆ steel toe and shank boots
- ◆ Nitrile butyl rubber or neoprene gloves (optional)
- ◆ splash goggles/safety glasses if potential for splash
- ◆ hard hat
- ◆ fluorescent vest
- ◆ Tyvek suit (optional)
- ◆ hearing protection (as appropriate)

Level C includes:

- ◆ half or full face NIOSH approved respirator (as appropriate for analyzer readings) equipped with organic vapor cartridges
- ◆ Tyvek suits (optional unless a splash hazard is possible, in which case a coated suit must be worn as directed by the Site Safety Officer)
- ◆ Nitrile butyl rubber or neoprene gloves
- ◆ steel toe and shank boots
- ◆ outer boots - chemical resistant
- ◆ inner disposable gloves (2 pairs recommended)
- ◆ hard hat
- ◆ fluorescent vest
- ◆ hearing protection (as appropriate)

Level B includes:

- ◆ air supplied respirator
- ◆ coated Tyvek suit, such as Saranex
- ◆ Nitrile butyl rubber or neoprene gloves
- ◆ inner latex or vinyl gloves
- ◆ steel toe and shank boots
- ◆ outer boots - chemical resistant
- ◆ hard hat
- ◆ fluorescent vest
- ◆ hearing protection (as appropriate)

6.0 Decontamination Procedures

All operations conducted at this site have the potential to contaminate monitoring equipment and personal protective equipment (PPE). To prevent the transfer of contamination to vehicles, administrative areas and personnel, the following procedures must be followed:

Equipment Decontamination

1. Whenever possible, monitoring equipment should be decontaminated with a solution of Alconox and thoroughly rinsed with water prior to leaving the site. This must be done outside a 5-foot radius of any work area.

Personal Decontamination

- LEVEL D
- ◆ segregated equipment drop
 - ◆ wash/rinse outer boot (as appropriate)
 - ◆ wash/rinse chemical resistant outer glove, then remove (as appropriate)
 - ◆ remove hard hat, goggles/safety glasses/faceshield
 - ◆ remove and throw out inner disposable gloves in designated lined receptacles (as appropriate)
- LEVEL C
- ◆ segregated equipment drop
 - ◆ wash/rinse outer boots
 - ◆ wash/rinse chemical resistant outer gloves, then remove
 - ◆ remove outer boots and place to dry (if reusable)
 - ◆ remove chemical resistant suit (remove by rolling down the suit)
 - ◆ remove first pair(s) of disposable gloves
 - ◆ remove respirator/hard hat/faceshield dispose of cartridges and wash respirator
 - ◆ remove last pair of disposable gloves
- LEVEL B
- ◆ segregated equipment drop
 - ◆ wash/rinse outer boots
 - ◆ wash/rinse chemical resistant outer gloves, then remove
 - ◆ cross hotline (into clean area) and change air tanks, then redress or
 - ◆ cross hotline (into clean area)
 - ◆ remove boots and gloves
 - ◆ remove SCBA, if worn over chemical resistant suit
 - ◆ if SCBA is worn under the suit, remove the chemical resistant suit, then the SCBA
 - ◆ remove hard hat

7.0 CHEMICALS OF CONCERN

7.1 Health Effects

Potential health effects from a chemical exposure are dependant on several exposure factors such as: toxicity of substances, duration of exposure, concentration during exposure and the overall health of the person exposed.

The chemicals commonly at this site are: Gasoline, Benzene, Toluene, Ethylbenzene, and Xylene. The following is a health analysis of these chemicals.

Additional information on these chemicals can be found in the Material Safety Data Sheet located in Appendix I.

Gasoline constituents can be divided into five major groups: alkanes, alkenes, cycloalkanes, aromatics and additives. The aromatics are the constituents generally regarded to be of greatest toxic concern. The major aromatics in gasoline are benzene, toluene, ethyl benzene and xylene. Of these, benzene is considered to be the most toxic. One characteristic effect of gasoline and its aromatic constituents is their ability to irritate the skin when repeated or prolonged exposure occurs.

Benzene

Benzene can enter the body through inhalation, ingestion and skin contact. Studies have noted that chronic exposure to benzene vapor can produce neurotoxic and hematopoietic (blood system) effects. Other effects can include headache, dizziness, nausea, convulsions, coma and possible death if exposure is not reversed. One significant effect from chronic benzene exposure is bone marrow toxicity. There is also an association between chronic exposures to benzene and the development of certain types of leukemia.

Toluene

Inhalation exposure to toluene vapor can produce effects such as central nervous system depression. Depending on exposure factors signs and symptoms can include headache, dizziness, fatigue, muscular weakness, incoordination, drowsiness, collapse and possible coma. Toluene can be a skin and mucous membrane irritant and studies have shown that high levels of toluene exposure can cause liver and kidney damage.

7.1 Health Effects (Continued)

Ethylbenzene

Exposure to ethyl benzene at high vapor concentrations may produce irritation to the skin, eyes and upper respiratory tract. Overexposure to ethyl benzene vapors can produce central nervous system depression with symptoms of headache, nausea, dizziness, shortness of breath and unsteadiness. Prolonged skin exposure to ethyl benzene may result in drying and cracking of the skin (dermatitis). Solvent resistant gloves should be worn during sampling to prevent exposure to the skin.

Xylenes

Depending on exposure factors, inhalation exposure to xylene vapor may produce central nervous system excitation followed by depression. Exposure to xylene vapor can produce dizziness, staggering, drowsiness and unconsciousness. At very high concentrations, xylene vapor may produce lung irritation, nausea, vomiting and abdominal pain. Xylene is not known to possess the chronic bone marrow toxicity of benzene, but liver enlargement and nerve-cell damage have been noted from chronic overexposure.

8.0 GAS/VAPOR MONITORING PROCEDURES

The greatest potential hazards to safety and health at this site are:

1. Exposure to chemical vapors - through inhalation
2. Exposure to chemical contamination - through skin contact and ingestion.

Ongoing air monitoring during project tasks will provide data to ensure that vapor concentrations are within acceptable ranges and will provide adequate selection criteria for respiratory and dermal protection.

- 8.0.1 A half face NIOSH approved air-purifying respirator with organic vapor cartridges must be worn by all site workers within any area where monitoring results exceed 50 ppm, and a full face respirator equipped with organic vapor cartridges must be worn by all site workers within any area where monitoring results exceed 100 ppm.
- 8.0.2 If PID readings exceed 750 ppm, level B protection will be required. Personnel must leave site immediately and contact site safety officer or Health & Safety Manager for further instructions.
- 8.0.3 Respirator cartridges will be changed once per day as a minimum. This can be accomplished at the end of the work day during respirator decontamination. If breakthrough (as evidenced by odor, taste, or irritation) is detected while wearing the respirator or breathing becomes difficult, change cartridges immediately.

8.1 Tasks Performed Within a Confined Space

When site work takes place in a confined space the air must be monitored for (a) oxygen level; (b) explosive vapors; and (c) toxic vapors. The following air monitoring procedures must be followed before entering a confined space.

- a. Oxygen Level: Monitor for % Oxygen with a O₂/LEL Meter to ensure a minimum oxygen level of 19.5%. Oxygen level monitoring will be done at the top, middle and bottom of the enclosed space to determine if there is a minimum acceptable oxygen level of 19.5% prior to entry. If oxygen is less than 19.5%, do not enter the space.

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- b. Explosive Vapors: Monitor for % of Lower Explosive Limit (LEL) with a O₂/LEL Meter to determine whether vapor concentrations within the confined space exceed 20% of the LEL. If readings exceed 20% LEL, personnel shall shut off accessible equipment, leave the site immediately, and contact the fire department.
- c. Toxic Vapors: Monitor the air within the confined space for organic vapors with a PID or FID following guidelines stated in Section 8.0 (above) to decide on the respiratory protection needed. Enter the space only if the oxygen level is at or above 19.5%, the %LEL is below 20%, the toxic vapor concentration is determined, and the proper respiratory protection is worn.

PID or FID readings will be taken at the top, middle and bottom of a vault, shed, or other confined space to ensure that vapors do not exceed acceptable levels.

All monitoring equipment must be calibrated and maintained in accordance with manufacturer's recommendations.

9.0 HEALTH AND SAFETY REQUIREMENTS

9.1 Medical Monitoring Program

All Groundwater Technology, Inc. field personnel are required to have annual medical evaluations in accordance with the company's Health and Safety Program policy. Additional re-evaluation will be considered in the event of chemical over-exposure while working on this site.

The petrochemicals typical of these facilities can affect specific organ systems producing characteristic health effects. The medical evaluation will, therefore, focus on the liver, kidney, nervous system, blood systems, and skin and lung function. Laboratory testing will include complete blood count, and applicable kidney and liver-function tests. Other tests include skin examination.

9.2 Training

All personnel working at this site should have received a minimum of 40 hours of initial hazardous waste activity instruction, and a minimum of three days of field experience under the direct supervision of a trained, experienced person. Personnel assigned to the site will also receive eight hours refresher training per year. On-site managers and supervisors directly responsible for employees engaged in hazardous waste operations have received an additional eight hours of supervisory training. These training requirements comply with the OSHA Hazardous Waste Operations and Emergency Response regulation, 29 CFR 1910.120.

The initial 40-hour training and the 8-hour annual refresher training includes specific details on the following:

- ◆ Regulatory Requirements
- ◆ First Aid/CPR
- ◆ Confined Space Entry
- ◆ Respiratory Protection
- ◆ Air Monitoring
- ◆ Decontamination Procedures
- ◆ Hazard Communication
- ◆ Toxicology

These specifications are then complimented with actual hands-on experience with the use of personal protective equipment and air monitoring equipment.

9.3 Work Zones Access

Access within a 5-foot radius of any on-site operation is prohibited to all but Groundwater Technology, Inc. field personnel and subcontractors.

9.4 Emergency Equipment

Vehicles used for site work will be equipped with a first aid kit and safety equipment including:

- ◆ fluorescent vests,
- ◆ cones,
- ◆ flags (as needed)
- ◆ barricades (as needed)
- ◆ fire extinguisher-dry chemical ABC-type extinguisher,
- ◆ flashlight,
- ◆ water, suitable for drinking,
- ◆ portable eye wash,
- ◆ appropriate emergency bandage material.

9.5 Carbon Treatment

If this site involves the use of a Carbon Treatment System, then the following information will apply.

The Carbon Treatment System is equipped with an emergency shut-off. The system will shut off automatically when the non-methane TPH vapor concentrations in the intermediate line reach 5% of the Lower Explosive Limit (LEL) for gasoline as recorded by the system monitors.

The suggested equipment for decontamination and spill response procedures includes:

- ◆ wash tubs (3)
- ◆ plastic sheets
- ◆ trash bags
- ◆ scrub brushes
- ◆ detergent
- ◆ sorbent booms (as applicable)

The carbon system is a closed system where no chemicals are used. The potential for a spill is minimal and thus spill containment is not addressed in this Site Safety Plan.

9.6 Drilling Procedures

A Dig-Alert authorization number must be obtained prior to drilling.

During the drilling operation, two persons (one designated as "driller" and the other as "helper") must be present at all times. The helper (whether Groundwater Technology, Inc. personnel or subcontractors) must be instructed as to the location of the emergency shut-off switch. Every attempt must be made to keep unauthorized personnel from entering the work area. If this is not possible, the operation should be shut down until the area is cleared. The area where the operation is taking place shall be cordoned off with a barricade. The Site Safety Officer or the Field Team Leader has the authority and the responsibility to

shut down the drilling operations whenever a hazardous situation is deemed present.

The mast of the drilling rig must maintain a minimum clearance of 20 feet from any overhead electrical cables. All drilling operations will cease immediately during hazardous weather conditions such as high winds, heavy rain, lightening and snow.

Hart hats shall be worn at all times. Hearing protection shall be worn during noisy operations.

If product is encountered during the drilling operation, all work must stop in order for employees to upgrade personal protective equipment to Level C. A full-face respirator should be worn in order to prevent the inhalation of vapors and to provide face and eye protection from splashes. Coated tyvek suits, gloves, and overboots should be worn to prevent skin contact with the soil.

Air monitoring must be performed in the work area to document breathing-zone concentrations. If air monitoring results indicate concentrations greater than 750 ppm, then Level B respiratory protection will be implemented.

Respirator cartridges must be changed at the end of a work period or if "breakthrough" occurs. If employees experience continuous cartridge "breakthrough", then the employees' work procedures and the level of respiratory protection must be re-evaluated by the Site Safety Officer and the Health and Safety Manager in order to determine the necessity of upgrading to Level B respiratory protection.

9.7 Electrical Equipment and Ground-Fault Circuit Interrupters

All electrical equipment and power cables in and around wells or structures suspected of containing chemical contamination must be intrinsically safe and equipped with a three-wire ground lead, rated explosion-proof for hazardous atmospheres. In accordance with OSHA 29 CFR 1926.404, approved ground fault circuit interrupters (GFCI) must be used for all 120 volt, single phase, 15 and 20 ampere receptacle outlets on the site which are in use by employees. Receptacles on the ends of extension cords are not part of the permanent wiring and therefore, must be protected by GFCI's whether or not the extension cord is plugged into permanent wiring.

The GFCI is a fast-acting circuit breaker which senses small imbalances in the circuit caused by current leakage to ground, and in a fraction of a second shuts off the electricity. However, the GFCI will not protect the employee from line-to-line contact hazards (such as a person holding two "hot" wires or a hot and neutral wire in each hand). The GFCI does provide protection against the most common form of electrical shock hazard - the ground fault. It also provides protection against fires, overheating, and destruction of insulation on wiring.

GFCIs can be used successfully to reduce electrical hazards on construction sites. Tripping of GFCIs - interruption of current flow - is sometimes caused by wet connectors and tools. It is good practice to limit exposure of connectors and tools to excessive moisture by using watertight or sealable connectors. Providing more GFCIs or shorter circuits can prevent tripping caused by the cumulative leakage from several tools or by leakages from extremely long circuits. (Adapted from OSHA 3007; Ground-Fault Protection on Construction sites, 1987.)

9.8 Fire Prevention

During equipment operation, periodic vapor concentration measurements should be taken with an explosimeter or combustimeter. If at any time the vapor concentrations exceed 20% of LEL, then the Site Safety Officer or designated field worker should immediately shut down all operations.

Only Factory Mutual (FM) approved fire safety cans will be used to transport and store flammable liquids. All gasoline and diesel-driven engines requiring refueling must be shut down and allowed to cool before filling. Smoking is not allowed during any operations within the work area in which petroleum products or solvents in free-floating, dissolved or vapor forms, or other flammable liquids may be present.

No open flame or spark is allowed in any area containing petroleum products, or other flammable liquids.

9.9 General Health

Medicine and alcohol can increase the effects of exposure to toxic chemicals. Unless specifically approved by a qualified physician, prescription drugs should not be taken by personnel assigned to operations where the potential for absorption, inhalation, or ingestion of toxic substances exists.

Drinking alcoholic beverages is prohibited. Drinking alcoholic beverages and driving is prohibited at any time. Driving at excessive speeds is always prohibited.

Skin abrasions must be thoroughly protected to prevent chemicals from penetrating the abrasion. It is recommended that Contact Lenses not be worn by persons working on the site.

9.10 MSDS Information

Material Safety Data Sheets (MSDS) on chemical substances encountered at the site shall be made available to all persons (including subcontractors) working at the site. These MSDSs shall be enclosed within this site safety plan in Appendix I. For emergency situations not specifically addressed by this site safety plan, refer to MSDS recommendations for action information.

10.0 PROJECT PERSONNEL

Groundwater Technology, Inc. will oversee and act accordingly during all phases of the project. The following management structure will be instituted for the purpose of successfully and safely completing this project.

10.1 Project Manager:

Joe Ramage

The Project Manager will be responsible for implementing the project and obtaining any necessary personnel or resources for the completion of the project. Specific duties will include:

- ◆ coordinating the activities of all subcontractors, to include informing them of the required personal protective equipment and ensuring their signature acknowledging this Site Safety Plan (see Appendix A),
- ◆ selecting a Site Safety Officer and field personnel for the work to be undertaken on site,
- ◆ ensuring that the tasks assigned are being completed as planned and on schedule,
- ◆ providing authority and resources to ensure that the Site Safety Officer is able to implement and manage safety procedures,
- ◆ preparing reports and recommendations about the project to clients and affected Groundwater Technology, Inc. personnel,
- ◆ ensuring that persons allowed to enter the site (i.e., EPA, contractors, state officials, visitors) are made aware of the potential hazards associated with the substances known or suspected to be on site, and are knowledgeable as to the on-site copy of the specific site safety plan.
- ◆ ensuring that the Site Safety Officer is aware of all of the provisions of this site safety plan and is instructing all personnel on site about the safety practices and emergency procedures defined in the plan, and
- ◆ ensuring that the Site Safety Officer is making an effort to monitor site safety, and has designated a Field Team Leader to assist with the responsibility when necessary.

10.2 Health & Safety Manager

Maureen Grant

The Health & Safety Manager shall be responsible for the overall coordination and oversight of the site safety plan. Specific duties will include:

- ◆ approving the selection of the types of personal protective equipment (PPE) to be used on site for specific tasks,
- ◆ monitoring the compliance activities and the documentation processes undertaken by the Site Safety Officer,
- ◆ evaluating weather and chemical hazard information and making recommendations to the Project Manager about any modifications to work plans or personal protection levels in order to maintain personnel safety,
- ◆ coordinate upgrading or downgrading PPE with Site Safety Officer, as necessary, due to changes in exposure levels, monitoring results, weather, other site conditions,
- ◆ approving all field personnel working on site, taking into consideration their level of safety training, their physical capacity, and their eligibility to wear the protective equipment necessary for their assigned tasks (i.e.: Respirator Fit Testing Results), and,
- ◆ overseeing the air monitoring procedures as they are carried out by site personnel for compliance with all company health and safety policies.

10.3 Site Safety Officer

Dave Fisch

The Site Safety Officer shall be responsible for the implementation of the site safety plan on site. Specific duties will include:

- ◆ conducting daily tailgate safety meetings, completing a Tailgate Safety Meeting (TSM) form (see Appendix F) for each meeting, and returning the completed TSM forms to the District Health & Safety Coordinator at the end of the project,
- ◆ monitoring the compliance of field personnel for the routine and proper use of the PPE that has been designated for each task,
- ◆ routinely inspecting PPE and clothing to ensure that it is in good condition and is being stored and maintained properly,

Chevron U.S.A., Castro Valley Site
Site Safety Plan
September 19, 1990

- ◆ stopping work on the site or changing work assignments or procedures if any operation threatens the health and safety of workers or the public,
- ◆ monitoring personnel who enter and exit the site and all controlled access points,
- ◆ reporting any signs of fatigue, work-related stress, or chemical exposures to the Project Manager and/or Health & Safety Manager,
- ◆ dismissing field personnel from the site if their actions or negligence endangers themselves, co-workers, or the public, and reporting the same to the Project Manager and/or Health & Safety Manager,
- ◆ reporting any accidents or violations of the site safety plan to the Project Manager and/or Health & Safety Manager, and documenting the same for the project in the project records,
- ◆ knowing emergency procedures, evacuation routes and the telephone numbers of the ambulance, local hospital, poison control center, fire and police departments,
- ◆ ensuring that all project-related personnel have signed the personnel agreement and acknowledgments form contained in this site safety plan,
- ◆ coordinate upgrading and downgrading PPE with the Health & Safety Manager, as necessary, due to changes in exposure levels, monitoring results, weather, and other site conditions, and
- ◆ perform air monitoring with approved instruments in accordance with requirements stated in this Site Safety Plan (see monitoring procedures on page 20 for specific information), recording the monitoring results using the Vapor Monitoring Sheet (VMS) template in Appendix H, and returning all completed VMS forms to the District Health & Safety Coordinator at the end of the project.

10.4 Field Team Leader

Dave Fisch

In the event that the Project Manager and the Site Safety Officer are not on site, the Field Team Leader will assume all responsibility of the Site Safety Officer.

10.5 Other Field Personnel

Technician staff is responsible for system maintenance, calibration and system operation. Records of site visits documenting system conditions are maintained by the technicians. All field personnel shall be responsible for acting in compliance with all safety procedures outlined in the site safety plan. Any hazardous work situations or procedures should be reported to the Site Safety Officer so that corrective steps can be taken.

10.6 Medical/Technical Advisors

Frank H. Lawrence, M.D.
ENVIROLOGIC DATA, Portland, Maine.....(207) 773-3020

Marilyn E. Grant, R.N., B.S., C.O.H.N
ENVIROLOGIC DATA, Portland, Maine.....(207) 773-3020

Lori St.Pierre, I.H.I.T.
ENVIROLOGIC DATA, Portland, Maine.....(207) 773-3020

The specific duties of the Medical/Technical Advisors include:

- ◆ providing technical input into the design of the site safety plan,
- ◆ advising worker exposure potential along with appropriate hazard reduction methods, and
- ◆ recommending a suitable medical monitoring program for the site workers.

APPENDIX A

(Agreement and Acknowledgment Statement)

APPENDIX B

(Site Safety Plan Amendment Sheet)

APPENDIX C

(Definition of Hazard Evaluation Guidelines)

APPENDIX C

Definition of Hazard Evaluation Guidelines

Hazard: Airborne Contaminants

Guideline

Threshold Limit Value
Time-Weighted Average
(TLV-TWA)

Explanation

The time-weighted average concentration for a normal 8-hour work day and a 40-hour work week, to which nearly all workers may be repeatedly exposed without adverse effect.

Permissible Exposure Limit
(PEL)

Time-weighted average concentrations similar to (and in many cases derived from) the Threshold Limit Values.

Immediately Dangerous to
Life and Health
(IDLH)

"IDLH" or "Immediately dangerous to life or health" means any atmospheric condition that poses an immediate threat to life, or which is likely to result in acute or immediate severe health effects. This includes oxygen deficiency conditions.

Hazard: Explosion

Guideline

Lower Explosive Limit
(LEL)

Explanation

The minimum concentration of vapor in air below which propagation of a flame will not occur in the presence of an ignition source.

Upper Explosive Limit
(UEL)

The maximum concentration of vapor in air above which propagation of a flame will not occur in the presence of an ignition source.

Hazard: Fire

Guideline

Flash Point
(flash p)

Explanation

The lowest temperature at which the vapor of a combustible liquid can be made to ignite momentarily in air.

APPENDIX E

(Accident Investigation Form)

GROUNDWATER TECHNOLOGY, INC.

Accident/Incident/Near Miss Report

Employee's Name: _____ D.O.B. _____

Address: _____ D.O.H. _____

_____ SS# _____

Job Title: _____ Supervisors's Name: _____

Office Location: _____

Location at Time of Incident: _____

Date/Time of Incident: _____

Description: Describe clearly how the accident occurred:

Was Incident: Physical _____ Chemical _____

Part(s) of body affected: _____ Exposure: Dermal _____

right left Inhalation _____

Ingestion _____

Witnesses: 1) _____ 2) _____

Conditions/acts contributing to this incident: _____

Explain specifically the corrective action you have taken to prevent a recurrence:

Did the injured go to a doctor? _____ Where? _____

When? _____

Did injured go to a hospital? _____ Where? _____

When? _____

Signatures:

Employee

Reporting Manager

Regional H&S Manager

Date

Date

Date

This form must be completed and returned within 5 working days to Regional Health & Safety Manager, who will forward a copy to Corporate Health & Safety Manager at ELD.

APPENDIX F

(Tailgate Safety Meeting Form)

SITE SAFETY BRIEFINGS

Job Name _____ Number _____

Date _____ Start Time _____ Completed _____

Site Location _____

Type of Work (General) _____

SAFETY ISSUES

Tasks (this shift) _____

Protective Clothing/Equipment _____

Chemical Hazards _____

Physical Hazards _____

Control Methods _____

Special Equipment/Techniques _____

Nearest Phone _____

Hospital Name/Address _____

Special Topics (incidents, actions taken, etc.) _____

ATTENDEES

Print Name

Sign Name

Meeting conducted by: _____

End-of-Shift Summary

Personal Protective Equipment Used (Level A,B,C, or D) _____

Respiratory Protection Worn On-Site:

Half-Face _____ Full-Face _____ Airline _____ SCBA _____

Cartridges: _____

Completed By: _____

APPENDIX G

(Daily Instrument Calibration Check Sheet)



**GROUNDWATER
TECHNOLOGY, INC.**

**HEALTH & SAFETY PROGRAM
DAILY INSTRUMENT CALIBRATION CHECK SHEET**

Project Name _____ Instrument _____

Job Number _____ ID # _____

DATE	INSTRUMENT	BATTERY CHECK OK?	ZERO ADJUST OK?	CALIBRATION GAS (PPM)	READING (PPM)	CALIBRATED BY	COMMENTS

APPENDIX H

(Vapor Monitoring Sheet Form)

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855



No. 316

BENZENE
(Revision D)
Issued: November 1978
Revised: April 1988

SECTION 1. MATERIAL IDENTIFICATION

25

Material Name: **BENZENE**

Description (Origin/Uses): Used in the manufacture of medicinal chemicals, dyes, linoleum, airplane dopes, varnishes, and lacquers; and as a solvent for waxes, resins, and oils.



Other Designations: Benzol; Phene; Phenylhydride; C₆H₆; NIOSH RTECS No. CY1400000;
CAS No. 0071-43-2

HMS
H 2
F 3 R 1
R 0 I 4
PPG* S 2
*See sect. 8 K 4

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

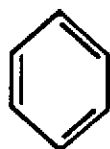
SECTION 2. INGREDIENTS AND HAZARDS

%

EXPOSURE LIMITS

Benzene, CAS No. 0071-43-2

Ca 100



OSHA PEL
8-Hr TWA: 1 ppm
15-Min Ceiling: 5 ppm
Action Level: 0.5 ppm

ACGIH TLV, 1987-88
TLV-TWA: 10 ppm, 30 mg/m³

Toxicity Data*
Human, Inhalation, LC₅₀: 2000 ppm/5 Min
Human, Oral, TD₅₀: 130 mg/kg
Human, Inhalation, TC₅₀: 210 ppm

*See NIOSH, RTECS, for additional data with references to irritative, mutagenic, tumorigenic, and reproductive effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 176°F (80°C)
Melting Point: 42°F (5.5°C)
Vapor Pressure: 75 Torr at 68°F (20°C)
Vapor Density (Air = 1): >1

Water Solubility (%): Slight
% Volatile by Volume: 100
Molecular Weight: 78 Grams/Mole
Specific Gravity (H₂O = 1): 0.87865 at 68°F (20°C)

Appearance and Odor: A colorless liquid; characteristic aromatic odor.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

12°F (-11.1°C) CC

928°F (498°C)

% by Volume

1.3%

7.1%

Extinguishing Media: Use dry chemical, foam, or carbon dioxide to put out benzene fires. Water may be ineffective as an extinguishing agent because it can scatter and spread the fire. Use water to cool fire-exposed containers, flush spills away from exposures, disperse benzene vapor, and protect personnel attempting to stop an unignited benzene leak.

Unusual Fire or Explosion Hazards: Benzene vapor is heavier than air and can collect in low-lying areas such as sumps or wells. Eliminate all sources of ignition there to prevent a dangerous flashback to the original liquid benzene. Danger: Explosive and flammable benzene vapor-air mixtures can easily form at room temperature; always use this material in a way that minimizes dispersion of its vapor into general work areas.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Benzene is stable in closed containers during routine operations. It does not undergo hazardous polymerization.

Chemical Incompatibilities: Hazardous chemical reactions involving benzene and the following materials are reported in Genium reference 84: bromine pentafluoride, chlorine, chlorine trifluoride, chromic anhydride, nitryl perchlorate, oxygen, ozone, perchlorates, perchloryl fluoride and aluminum chloride, permanganates and sulfuric acid, potassium peroxide, silver perchlorate, and sodium peroxide.

Conditions to Avoid: Avoid all exposure to sources of ignition and to incompatible chemicals.

Hazardous Products of Decomposition: Toxic gases like carbon monoxide (CO) may be produced during benzene fires.



SECTION 1. MATERIAL IDENTIFICATION

20

MATERIAL NAME Toluene

OTHER DESIGNATIONS: Methyl Benzene, Methyl Benzol, Phenylmethane, Toluol, ...
 C₇H₈, CAS #0108-88-3

MANUFACTURER/SUPPLIER: Available from many suppliers, including:
 Allied Corp., PO Box 2064R, Morristown, NJ 07960; Telephone: (201) 455-4400
 Ashland Chemical Co., Industrial Chemicals & Solvents Div., PO Box 2219,
 Columbus, OH; Telephone: (614) 889-3844

HIMIS

H: 2

F: 3

R: 0

PPE*

*See sect. 8



R 1

I 3

S 2

K 4

SECTION 2. INGREDIENTS AND HAZARDS

%

HAZARD DATA

Toluene



ca 100

8-hr TLV: 100 ppm, or
 375 mg/m³ (Skin)**

Man. Inhalation, TClO:
 100 ppm: Psychotropic***

Rat, Oral, LD₅₀: 5000 mg/kg

Rat, Inhalation, LCLo:
 4000 ppm/4 hr.

Rabbit, Skin, LD₅₀: 14 g/kg

Human, Eye: 300 ppm

- * Current (1985-86) ACGIH TLV. The OSHA PEL is 200 ppm with an acceptable ceiling concentration of 300 ppm and an acceptable maximum peak of 500 ppm/10 minutes.
- ** Skin designation indicates that toluene can be absorbed through intact skin and contribute to overall exposure.
- *** Affects the mind.

SECTION 3. PHYSICAL DATA

Boiling Point ... 231°F (111°C)
 Vapor Pressure @ 20°C, mm Hg ... 22
 Water Solubility @ 20°C, wt. % ... 0.05
 Vapor Density (Air = 1) ... 3.14

Evaporation Rate (BuAc = 1) ... 2.24
 Specific Gravity (H₂O = 1) ... 0.866
 Melting Point ... -139°F (-95°C)
 Percent Volatile by Volume ... ca 100
 Molecular Weight ... 92.15

Appearance and odor: Clear, colorless liquid with a characteristic aromatic odor. The odor is detectable to most individuals in the range of 10 to 15 ppm. Because olfactory fatigue occurs rapidly upon exposure to toluene, odor is not a good warning property.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER UPPER

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air		
40°F (4°C) CC	896°F (480°C)	% by Volume	1.27	7.1

EXTINGUISHING MEDIA: Carbon dioxide, dry chemical, alcohol foam. Do not use a solid stream of water because the stream will scatter and spread the fire. Use water spray to cool tanks/containers that are exposed to fire and to disperse vapors.

UNUSUAL FIRE/EXPLOSION HAZARDS: This OSHA class IB flammable liquid is a dangerous fire hazard. It is a moderate fire hazard when exposed to oxidizers, heat, sparks, or open flame. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.

SPECIAL FIRE-FIGHTING PROCEDURES: Fire fighters should wear self-contained breathing apparatus with full facepiece operated in a positive-pressure mode when fighting fires involving toluene.

SECTION 5. REACTIVITY DATA

CHEMICAL INCOMPATIBILITIES: Toluene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. This material is incompatible with strong oxidizing agents, dinitrogen tetroxide, silver perchlorate, tetranitromethane, and uranium hexafluoride. Contact with these materials may cause fire or explosion. Nitric acid and toluene, especially in the presence of sulfuric acid, will produce nitrated compounds that are dangerously explosive.

CONDITIONS TO AVOID: Avoid exposure to sparks, open flame, hot surfaces, and all sources of heat and ignition. Toluene will attack some forms of plastics, rubber, and coatings. Thermal decomposition or burning produces carbon dioxide and/or carbon monoxide.

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
1145 CATALYN STREET
SCHENECTADY, NY 12303-1836 USA
(518) 377-8855



No. 385

ETHYL BENZENE

Date August 1978

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: ETHYL BENZENE
OTHER DESIGNATIONS: Phenylethane, Ethylbenzol, $C_2H_5C_6H_5$, CAS# 000 100 414
MANUFACTURER: Available from several suppliers.

SECTION II. INGREDIENTS AND HAZARDS

	X	HAZARD DATA
Ethyl Benzene	ca 100	8-hr TWA 100 ppm*
*Current OSHA permissible exposure level. A Standard was proposed by OSHA in October 1975 which includes an <u>action level</u> of 50 ppm, and detailed requirements of monitoring, medical surveillance, employee training, etc.; when exposure exceeds 50 ppm. It has not yet issued as a legal requirement.		Human, inhalation TCLo 100 ppm for 8 hr (irritation) Rat, Oral LD50 3500 mg/kg

SECTION III. PHYSICAL DATA

Boiling point at 1 atm, deg C -- 136	Specific gravity 20/4C ----- 0.867
Vapor pressure at 25.9 C, mm Hg - 10	Volatiles. % ----- ca 100
Vapor density (Air=1) ----- 3.66	Evaporation rate (BuAc=1) ----- <1
Water solubility at 20 C Wt. % - 0.015	Melting point, deg C ----- -95
	Molecular weight ----- 106.16

Appearance & Odor: Clear, colorless liquid with an aromatic hydrocarbon odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
59 F (15 C) (closed cup)	810 F (432 C)	Volume %	1.0	6.7

Extinguishing media: Carbon dioxide, dry chemical or "alcohol" foam. A water spray may be ineffective to put out fire, but may be used to cool fire-exposed containers. A stream of water can spread fire of burning liquid.
This is a flammable liquid (OSHA Class IB) which can readily form explosive mixtures with air, especially when heated. Heavier-than-air vapors can flow along surfaces to reach distant ignition sources, and then flash back. Firefighters should use self-contained breathing equipment and eye protection to fight fires in enclosed places.

SECTION V. REACTIVITY DATA

This material is stable in storage in closed containers at room temperature. It does not polymerize.
This flammable material should be kept separated from oxidizing agents, strong acids and bases and ammonia. Thermal-oxidative degradation can produce toxic products, including carbon monoxide.

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855



GENIUM PUBLISHING CORP.

No. 318

XYLENE (Mixed Isomers)
(Revision D)
Issued: November 1980
Revised: August 1988

SECTION 1. MATERIAL IDENTIFICATION

26

Material Name: XYLENE (Mixed Isomers)

Description (Origin/Uses): Used as a raw material for the production of benzoic acid, phthalic anhydride, isophthalic and terephthalic acids and their dimethyl esters in the manufacture of polyester fibers; in sterilizing catgut; with Canadian balsam as oil-immersion in microscopy; and as a cleaning agent in microscopic techniques.

Other Designations: Dimethylbenzene; Xylol; C_8H_{10} ; CAS No. 1330-20-7

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek*

Buyers' Guide (Genium ref. 73) for a list of suppliers.

Comments: Although there are three different isomers of xylene (*ortho*, *meta*, and *para*), the health and physical hazards of all three isomers are very similar. This MSDS is written for a xylene mixture of all three isomers, which is usually commercial xylene.



NFPA

HMIS

H 2

F 3

R 0

PPG*

*See sect. 8

R 1

I 3

S 2

K 3

SECTION 2. INGREDIENTS AND HAZARDS

%

EXPOSURE LIMITS

Xylene (Mixed Isomers), CAS No. 1330-20-7*

**

IDLH*** Level: 1000 ppm

*o-Xylene, CAS No. 0095-47-6

m-Xylene, CAS No. 0108-38-3

p-Xylene, CAS No. 0106-42-3

**Check with your supplier to determine if there are additions, contaminants, or impurities (such as benzene) that are present in reportable quantities per 29 CFR 1910.

***Immediately dangerous to life and health.

**** See NIOSH, RTECS (No. ZE2100000), for additional data with references to reproductive, irritative, and mutagenic effects.

OSHA PEL
8-Hr TWA: 100 ppm, 435 mg/m³
ACGIH TLVs, 1987-88
TLV-TWA: 100 ppm, 435 mg/m³
TLV-STEL: 150 ppm, 655 mg/m³

Toxicity Data****

Human, Inhalation, TC_{L_0} : 200 ppm
Man, Inhalation, LC_{50} : 10000 ppm/6 Hrs
Rat, Oral, LD_{50} : 4300 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 275°F to 293°F (135°C to 145°C)*

Melting Point: -13°F (-25°C)

Evaporation Rate: 0.6 Relative to BuAc = 1

Specific Gravity ($H_2O = 1$): 0.86

Water Solubility (%): Insoluble

Molecular Weight: 106 Grams/Mole

% Volatile by Volume: Ca 100

Vapor Pressure: 7 to 9 Torr at 68°F (20°C)

Vapor Density (Air = 1): 3.7

Appearance and Odor: A clear liquid; aromatic hydrocarbon odor.

*Materials with wider and narrower boiling ranges are commercially available.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

81°F to 90°F (27°C to 32°C)

867°F (464°C)

% by Volume

1%

7%

Extinguishing Media: Use foam, dry chemical, or carbon dioxide. Use water sprays to reduce the rate of burning and to cool containers.

Unusual Fire or Explosion Hazards: Xylene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Xylene is stable in closed containers during routine operations. It does not undergo hazardous polymerization.

Chemical Incompatibilities: This material may react dangerously with strong oxidizers.

Conditions to Avoid: Avoid any exposure to sources of ignition and to strong oxidizers.

Hazardous Products of Decomposition: Carbon monoxide (CO) may be evolved during xylene fires.

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
1145 CATALYN STREET
SCHENECTADY, NY 12303-1836 USA
(518) 377-8855



No. 467

AUTOMOTIVE
GASOLINE, LEAD-FREE

Date October 1981

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: AUTOMOTIVE GASOLINE, LEAD-FREE
DESCRIPTION: A volatile blend of hydrocarbons for automotive fuel
OTHER DESIGNATIONS: Petrol, CAS #008 006 619, ASTM D439
MANUFACTURER: Available from several suppliers.

SECTION II. INGREDIENTS AND HAZARDS

	x	HAZARD DATA
Gasoline A hydrocarbon blend that can include normal and branched chain alkanes, cycloalkanes, alkenes, aromatics and other additives.** (Lead max 0.013 g/L, phosphorus max 0.0013 g/L, sulfur max 0.10 wt%. May contain benzene, <5%; see ASTM D3606). *ACGIH 1981 TLV (Intended Changes List). See also Am. Ind. Hyg. A. 39 110-117 (1978) **The composition of fuel is varied with altitude and seasonal requirements for a locality. The blend must meet antiknock requirements. (Antiknock Index min 85, ASTM D439.)	100	8-hr TWA 300 ppm or 900 mg/m ³ * <u>Man</u> Eye: 500 ppm/1H Moderate irritation Inhalation: TCLo 900 ppm/1H TFX:CNS

SECTION III. PHYSICAL DATA

Distillation at 1 atm, Initial, deg C >39 Specific gravity, 60/60 F - 0.72-0.76
50% distilled - 77-121 Melting point, deg C ----- -90.5-95.4
End point ----- <240 Evaporation rate ----- N/A

Vapor density (Air=1) ----- 3.0-4.0
Solubility in water ----- Insoluble

Appearance and Odor: A clear, mobile liquid with a characteristic odor which can be recognized at about 10 ppm in air. (Gasoline may be colored with dye.)

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air % by volume	LOWER	UPPER
			1.4	7.6
-45 F	536-853 F			

Extinguishing Media: Dry chemical, carbon dioxide, alcohol foam. Use of water may be ineffective to extinguish fire, but use water spray for cooling fire-exposed drums and tanks to prevent pressure rupture. It is a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow along surfaces, reach distant ignition sources and flash back. Can react violently with oxidizing agents.
Firefighters should wear self-contained breathing apparatus and full protective clothing.

SECTION V. REACTIVITY DATA

This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.
This is an OSHA Class IA flammable liquid. A mixture of gasoline vapors and air can be explosive. It is incompatible with oxidizing agents.
Thermal-oxidative degradation can yield carbon monoxide and partially oxidized hydrocarbons.

APPENDIX J

(OSHA Inspection Steps)

APPENDIX J

Immediate OSHA Inspection Steps

1. Identify the Inspector.
 - (a) Ask to see credentials.
 - (b) Write down the relevant information, including the inspector's name, agency affiliation, address, telephone number and the statutory authority under which the inspection is being conducted.
 - (c) If any doubts, call OSHA office to verify the visit.
 - (d) If inspection occurs at a project site, ask for written certification of medical monitoring (including respiratory evaluation) and for 40 hour hazardous waste training certification. NO ONE may venture out of the clean zone without it. DOUBLE CHECK it with his/her office if in doubt.
 2. Notify the Health & Safety Manager and Project Manager immediately.
 - (a) The Project Manager should notify the District Manager.
 - (b) The Health & Safety Manager should notify Corporate Health and Safety (ELD).
 3. Take notes on:
 - (a) What is said
 - (b) What is seen
 - (c) Who spoke to whom
 - (d) Any sample or copies taken
 - (e) Any corrective actions done in the inspector's presence
 - (f) Any activity, including where, when, who, and what
 - (g) Any other occurrence, even if seemingly minor
- ◆ When in doubt on any question, DO NOT BLUFF AN ANSWER. Ask the inspector to put the question in writing, addressed to company counsel. Never lie, even by omission; jail can be the penalty.
 - ◆ If inspection occurs on site, carefully review the Site Safety Plans with the Inspector if asked to do so.
 - ◆ If inspection occurs at an office, have accident reports, OSHA 200 logs ready at all times for inspection. Always make sure OSHA poster is visible.
 - ◆ Determine the scope of the inspection: Ask the OSHA inspector what areas of the company activity are of interest and the reason for the inspection. Discover what has triggered the inspection. If complaints initiated the inspection, find out specifically what they were.

APPENDIX K

(Excavation/Trenching)

**GROUNDWATER TECHNOLOGY, INC.
EXCAVATION AND TRENCHING POLICY - CALIFORNIA
SAFE CODE OF PRACTICES**

Although many of the rules and regulations pertaining to excavation and trenching operations in the State of California closely parallel Federal Standards, this policy specifically pertains to California operations.

It shall be the policy of Groundwater Technology, Inc. to ensure that all Groundwater Technology employees and sub-contractors comply with the provisions within the California Code of Regulations, Title 8, Chapter 4, Subchapter 4 - Construction Safety Orders.

It is inevitable that remediation procedures for which Groundwater Technology is retained will involve some aspect within the jurisdiction of the Construction Safety Orders. Such operations may include: trenching, vault construction, tank removal, and excavation of contaminated soils.

DEFINITIONS - EXCAVATION, TRENCHES, EARTHWORK

Bank - a mass of soil rising above a digging level.

Bell Hole - an additional excavation made into the sides or bottom of a trench to provide additional work space.

Belled Excavation - a part of a shaft or footing excavation, usually near the bottom and bell-shaped, that makes the cross-sectional area at that point larger than that above.

Benching - a method of excavation whereby the faces of an excavation or trench are widened progressively outward with respect to the bottom of a specific series of horizontal and vertical cuts to provide protection against the hazard of moving ground.

Braces for Excavations - the horizontal members of the shoring system, the ends of which bear against the uprights or stringers.

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Earthwork - the process of excavating, moving, storing, placing, and working any type of earth materials.

Excavation - a man-made cavity or depression in the earth's surface, including its' sides, walls, or faces formed by the removal of materials, and producing unsupported earth conditions by reason of such removal. If installed forms or similar structures reduce the depth-to-width relationship, the excavation may become a trench.

Exploration Shaft - a shaft created and used for the purpose of obtaining subsurface data.

Geotechnical Specialist (GTS) - a person registered by the State as a Certified Engineering Geologist, or a Registered Civil Engineer trained in soil mechanics, or an engineering geologist or civil engineer with a minimum of 3 years applicable experience working under the direct supervision of either a Certified Engineering Geologist or Registered Civil Engineer.

Hard Compact - all earth material not classified as running soil.

Hydraulic Shoring - a shoring system using hydraulic cylinders, planks, rails, plywood or steel beams to support the excavated wall of trenches.

Lagging - boards which are joined, side-by-side, lining an excavation.

Running Soil - earth material where the angle of repose is approximately zero, as in the case of soil in a nearly liquid state, or dry, unpacked sand which flows freely under slight pressure. Running material also includes loose or disturbed earth that can be only contained with solid sheeting.

Shaft - an excavation under the earth's surface in which the depth, is much greater than its cross-sectional dimensions (such as those formed to serve as wells, cesspools, certain foundation footings, and under streets, railroads, buildings, etc.).

Shore - a supporting member that resists a compressive force imposed by a load.

Shoring System - a temporary structure for the support of earth surfaces formed as a result of excavation work.

Sides, Walls, and Faces - the vertical or inclined earth surfaces formed as a result of excavation work.

Sloping - a method of excavation whereby the faces of an excavation of trench are laid back to provide protection from moving ground.

Spoil - the earth material that is removed in the formation of an excavation.

Stringers - the horizontal members of the shoring system whose sides bear against the uprights. Stringers are sometimes called whalers.

Strut - a structural member designed to resist forces, either tensional or compressional.

Trench - an excavation made below the surface of the ground. In general, the depth is greater than the width at the bottom, but the width of a trench at the bottom is not greater than 15 feet.

Trench Shield - a protective device which shields workers from the effect of ground movement and which can be moved along as work progresses.

Uprights - the vertical members of the shoring system.

Whaler - a structural member in a horizontal or nearly horizontal position used for stiffening or securing other components of concrete forms, excavation sheeting, or similar temporary structures.

EXCAVATION PROCEDURES (also trenches, shafts and other earthwork)

1. Prior to beginning an excavation, the location of all underground utilities and other underground hazards shall be determined.
2. A hazard assessment shall be conducted by a qualified person to evaluate the potential exposure to employees who may work in or around the excavation.
3. The excavation shall also be inspected by a qualified person after each rain or other hazard-increasing event to evaluate the potential hazards from slides or cave-ins.
4. Anytime an employee enters an excavation 5 feet or greater in depth, that employee must be protected by a system of shoring, sloping, benching or alternative means addressed in #15 below.

5. The conditions in #4 above, will also require Groundwater Technology to obtain the necessary excavation permit and/or notification procedures with Cal-OSHA.
6. Excavated materials shall be prevented from falling back into the excavation. Spoils should be placed no closer than 2 feet from the edge of the excavation.
7. Work which is conducted within the excavation should be under the direct supervision of a qualified person who is capable of modifying the shoring or sloping system.
8. A convenient and safe means of egress shall be provided for employees working within an excavation 4-feet deep or greater. This may consist of a stairway, ladder, or ramp located within 25 feet of lateral travel.
9. Any employee working in the vicinity of an excavator shall not be in a position where that employee might fall into contact with the moving parts of that excavator. Employees shall also be wearing a reflective vest.
10. An adequate means of water drainage shall be implemented to reduce the likelihood of run-off entering the excavation. This shall hold true during the rainy season. If the accumulation of water could pose a hazard to employees, the situation should be controlled prior to resumption of operations.
11. All shoring systems shall incorporate the soil specifications and conditions for that particular site. The installation of shoring systems shall be conducted in such a way that the employee is properly protected from the potential of cave-ins. Additionally, the removal of the system shall follow the same requirement.
12. If the excavation exceeds 20 feet, or if an alternative shoring, sloping, or benching system is utilized, a civil engineer currently registered in California shall prepare detailed plans showing the materials and methods to be utilized (Appendix A).
13. The detailed plans in #12 above, shall be available for inspection at the site.
14. Shoring shall be installed in accordance with Table 1-6 located within Appendix B, or as detailed in plans and specifications prepared by a State of California Registered Civil Engineer in accordance with engineering criteria within Appendix A.

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15. If protective shields, (i.e., trench shields) are to be utilized for the protection of employees within an excavation, a civil engineer registered in California must prepare the necessary calculations and designs prior to the use of such equipment.
16. When sloping or benching are utilized in lieu of a shoring system, the slope shall be at least three-quarter horizontal to one vertical for excavations up to 8 feet, unless the instability of the soil requires a slope flatter than 3/4:1. For excavations greater than 8 feet but less than 12 feet, a slope of 1:1 shall be utilized (Appendix C).

On the following pages are specific requirements as set by California Code of Regulation, Title 8, Chapter 4, Subchapter 4-Construction Safety Outline. The pages are facsimiles of pages from this document.

TITLE 8 CONSTRUCTION SAFETY ORDERS
(Register 82, No. 23-4-18-87)

(p. 170.151)

PLATE C-22
BEARING VALUE OF SOIL

Shores and similar members that depend upon earth for support will probably require foot blocks or sills to distribute the load. In the absence of test data that establish the sustaining power of the soils in question, the following information should be helpful in determining the size of sill needed to assure adequate support from the soil.

Soil type	Tons allowable per square foot
Soft clay	1
Wet clay	2
Sand and clay, mixed in layers	2
Fine dry sand	3
Hard dry clay	4
Coarse compact dry sand	4

DESIGN CONSIDERATIONS
EXCAVATIONS, SLOPES AND BENCHES

The determination of the slope or bench configuration or design of the shoring system shall be based upon careful evaluation of such pertinent factors as the following:

- (1) Depth and width of cut.
- (2) Possible variation in water content of the material while the excavation is open.
- (3) Anticipated changes in materials from exposure to air, sun, water or freezing temperatures.
- (4) Loading imposed by structures, equipment, overlaying material or stored material.
- (5) Vibration from equipment, blasting, traffic, trains or other sources.
- (6) Existing underground facilities.
- (7) New or old adjacent excavations.
- (8) A minimum Kw of 35 pcf shall be used in all calculations unless a soils evaluation indicates otherwise.

K = Coefficient of active earth pressure
W = Unit weight of soil in pcf

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

ISTORY:

1. Amendment filed 8-23-82, effective thirtieth day thereafter (Register 82, No. 33).

TABLE 2
WOOD SHORING FOR RUNNING SOIL

DEPTH	Uprights		Brace (Struts) at 7' on centers (O.C.)	Stringer (Waler)
	Horizontal Spacing (Feet)	Wood Thickness (Inches)	Wood Size (Inches) and Excavation Width (Feet)	Wood Size (Inches)
8 to 8	Solid	3	6 x 6 All widths up to 15'	8 x 10
Over 8 to 10	Solid	3	6 x 6 up to 10' width, 8 x 6 over 10' width up to 15'	10 x 10
Over 10 to 12	Solid	3	6 x 6 up to 8' width, 8 x 6 over 8' up to 15'	10 x 12
Over 12 to 15	Solid	3	6 x 6 All widths up to 15'	10 x 12
Over 15 to 20	Solid	4	8 x 8 up to 12' width, 10 x 10 over 12' up to 20'	12 x 12
Over 20	See Section 1541(a)(6)		See Section 1541(a)(6)	

GENERAL NOTES for Table 2

1. Timber shall be "selected lumber" quality. (See Definitions Section 1504.)
 2. Timber members of equivalent "section modulus" may be substituted for uprights and stringers shown in these tables.
 3. These tables may be modified by a civil engineer in accordance with Section 1541(a)(6).
 4. Stringers shall be placed to develop maximum strength (with long side horizontally).
- ** See Section 1541(c) for exception

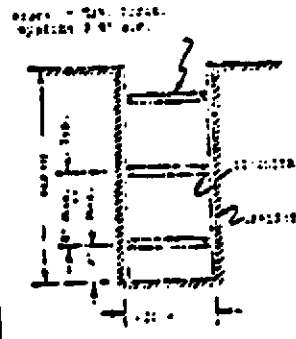
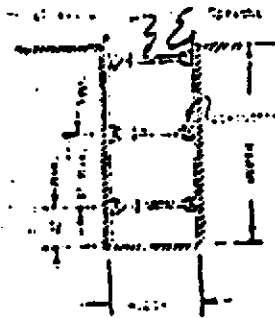


TABLE 3
METAL-WOOD SHORING FOR HARD COMPACT SOIL

DEPTH (Feet)	Uprights		Braces (Struts) at 8' on centers				Stringer* (Waler) (Wood) Size (Inches)
	Horizontal Spacing (Feet)	Wood Size (Inches)	Aluminum Pipe		Std. Steel Pipe		
			Min. I.D. (Inches)	Max. Excav. Width (FL)	Min. I.D. (Inches)	Max. Excav. Width (FL)	
8 to 7	8	3 x 8	2 1/4 (3 1/4)	8 (10)	1 1/4	3	-----
	4	3 x 10	2 1/4 (3 1/4)	8 (14)	1 1/4	3	4 x 4
	2	2 x 8	2 1/4 (3 1/4)	8 (20)	1 1/4	3	4 x 4
Over 7 to 10	8	4 x 10	2 1/4 (3 1/4)	8 (8)	2	6	-----
	4	3 x 10	2 1/4 (3 1/4)	9 (11)	2 1/4	12	6 x 8
	2	3 x 8	2 1/4 (3 1/4)	12 (16)	3	15	6 x 8
Over 10 to 12	8	6 x 8	2 1/4 (3 1/4)	6 (7)	2 (2 1/4)	8 (12)	-----
	4	4 x 8	2 1/4 (3 1/4)	8 (10)	2 (2 1/4)	10 (11)	8 x 8
	2	3 x 8	2 1/4 (3 1/4)	10 (15)	2 1/4 (3)	13 (15)	8 x 8
Over 12 to 15	8	6 x 8	2 1/4 (3 1/4)	5 (6)	2 (2 1/4)	6 (10)	-----
	4	4 x 10	2 1/4 (3 1/4)	7 (8)	2 (2 1/4)	8 (12)	8 x 10
	2	3 x 10	2 1/4 (3 1/4)	9 (13)	2 1/4 (3)	13 (15)	8 x 10
Over 15 to 30	8	6 x 10	2 1/4 (3 1/4)	4 (5)	2 1/4 (3)	8 (12)	-----
	4	4 x 12	2 1/4 (3 1/4)	6 (8)	2 1/4 (3)	10 (15)	8 x 12
	2	3 x 12	2 1/4 (3 1/4)	8 (11)	2 1/4 (3)	12 (15)	8 x 12
Over 30	See Section 1541(a)(6)						

GENERAL NOTES for Tables 3 & 4

1. Metal pipe braces permitted by these Orders shall be schedule 40, standard steel pipe, or equivalent and installation shall be as set forth by these Orders.
 2. Timber shall be "selected lumber" quality. (See Definitions—Section 1504.)
 3. Timber members of equivalent "section modulus" may be substituted for uprights and stringers shown in these Tables.
 4. See Plate C-24-a for screw jack installation requirement.
 5. The numbers in parentheses designate the maximum safe span for a specified diameter pipe. (continued—Table 4)
- * Optional ** See Section 1541(c)(8) for exception



**TABLE 5
HYDRAULIC SHORING FOR HARD COMPACT SOIL**

DEPTH (Feet)	Uprights		Stringers (Wales) (When used)		Braces (Struts)				
	Horizontal Spacing (Feet)	Size Aluminum Rail	Size Aluminum Rail	Vertical Spacing (Feet)	Hydraulic Cylinders	Horizontal Spacing (Feet)	Max. Knee Width (Feet)		
3 to 7	8 * (See Note)	8" Wide Standard ***	8" Wide Standard ***	5	2" ID—2 1/2" OD	8 or	2 1/2	30 **	
Over 7 to 12	8 * (See Note)	8" Wide Standard ***	8" Wide Standard ***	5	2" ID—2 1/2" OD	8 or	0	30 **	
Over 12 to 16	8 * (See Note)	8" Wide Std. or HD	6" Wide Std. or 8" Wide HD	5 5	2" ID—2 1/2" OD 2" ID—2 1/4" OD	6 or	0	30 **	
Over 16 to 20	8 * (See Note)	8" Wide Std or HD	6" Wide Std. or 8" Wide HD	4 4	2" or 3" ID— or 2 1/2" or 3 1/4" OD	4 or	0	30 **	
Over 20	See Section 1541(a)(6)		<p align="center">GENERAL NOTES</p> <p>1) * Plywood may be used behind uprights. (See Section 1541(c)(3).)</p> <p>2) ** A 3/4 x 3/4 x 1/4" steel overhange is required to Std. 2" I.D. No steel overhange required on 3" I.D.</p> <p>3) *** See Hydraulic Shoring Association Manual for strength of rails.</p> <p>4) If wooden members are used, they shall comply with Tables 1 or 2.</p> <p>5) This table may be modified by a civil engineer in accordance with Section 1541(a)(6).</p>						

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(p. 12)

CONSTRUCTION SAFETY ORDERS

(Engineer B. No. 31-4342)

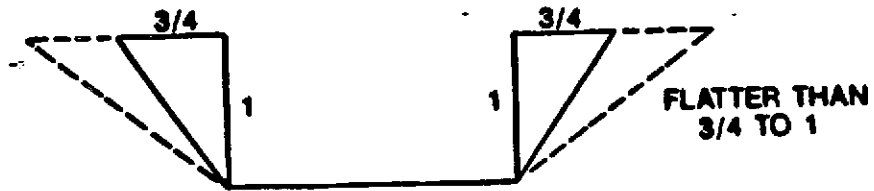
TITLE 5

**TABLE 6
HYDRAULIC SHORING FOR RUNNING SOIL**

DEPTH (Feet)	Uprights (Wood)		Stringers (Wales)		Beams (Struts)				
	Horizontal Spacing (Feet)	Wood Thickness (Inches)	Size Aluminum Rail	Vertical Spacing (Feet)	Hydraulic Cylinders	Horizontal Spacing (Feet)	Max. Excess Width (Feet)		
5 to 7	Solid*	2	6" Wide Standard	4	2" ID—2 1/2" OD	6 or	9	20**	
Over 7 to 12	Solid*	3	6" Wide Standard	4	2" ID—2 1/2" OD	6 or	9	20**	
Over 12 to 16	Solid*	3	6" Wide Standard	4	2" or 3" ID or 2 1/2" or 3 1/2" OD	4 or	8	15**	
Over 16 to 20	Solid*	4	6" Wide Standard	3	2" or 3" ID or 2 1/2" or 3 1/2" OD	3 or	6	15**	
Over 20	See Section 1541(a)(6)		<p align="center">GENERAL NOTES</p> <p>1) *Plywood may be used behind uprights. (See Section 1541(c)(5).)</p> <p>2) **A 3 1/2" x 3 1/2" x 1/2" steel overbeave is required to Std. 2" I.D. No steel overbeave required on 3" I.D.</p> <p>3) **See Hydraulic Shoring Association Manual for strength of rails.</p> <p>4) If wooden members are used, they shall comply with Tables 1 or 3.</p> <p>5) This table may be modified by a civil engineer in accordance with Section 1541(a)(6).</p>						

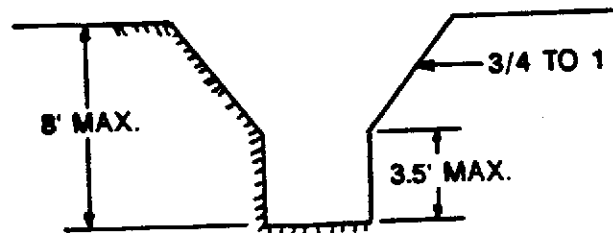
TITLE 8
Chapter 12, No. 28-0-0021
CONSTRUCTION SAFETY ORDERS

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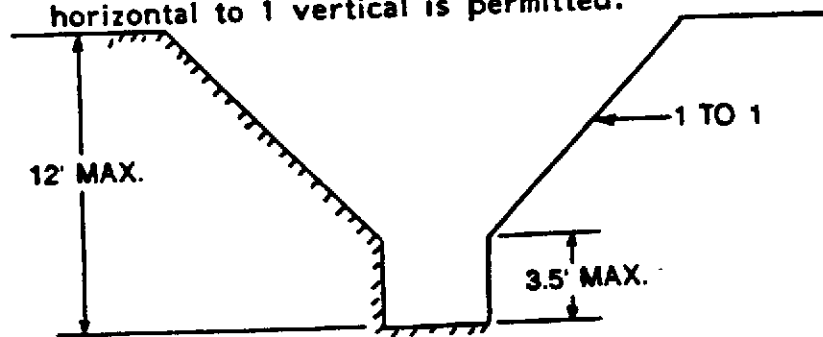


EXCEPTIONS: In hard, compact soil where the depth of the excavation or trench is 8 feet or less, a vertical cut of 3-1/8 feet with sloping of 3/4 horizontal to 1 vertical is permitted.

CONSTRUCTION SAFETY ORDERS



In hard, compact soil where the depth of the excavation or trench is 12 feet or less, a vertical cut of 3 1/2 feet with sloping of 1 horizontal to 1 vertical is permitted.



(2) Benching in hard, compact soil, is permitted provided that a slope ratio of 3/4 horizontal to 1 vertical, or flatter, is used.

