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SITE HEALTH AND SAFETY PLAN FOR FIELD WORK AND OPERATIONS AND
MAINTENANCE AT AIR FORCE PLANT 4 NAS FORT WORTH TX
9/1/1995
INTERNATIONAL TECHNOLOGIES

File: 17G
A.F.

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**NAVAL AIR STATION
FORT WORTH JRB
CARSWELL FIELD
TEXAS**

**ADMINISTRATIVE RECORD
COVER SHEET**

AR File Number 263

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Project No. 762057
September 1995
263001



Final Plan

Site Health and Safety Plan Field Work, Operations and Maintenance Air Force Plant 4 Fort Worth, Texas

Contract No. DACA56-92-D-0008
Delivery Order No. 0027

Prepared for:

Department of the Army
Tulsa District, Corps of Engineers
Tulsa, Oklahoma



Prepared by:

IT Corporation
Monroeville, Pennsylvania

263002



September 29, 1995

762057-ITCHO-0068

Mr. Clif B. Warren, Resident Engineer
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CONTRACT: DACA56-92-D-0008, Delivery Order No. 0027
Air Force Plant No. 4
Fort Worth, Texas

SUBJECT: Transmittal
Final Health and Safety Plan
Air Force Plant No. 4

Dear Mr. Warren:

Enclosed are two copies of the Final Health and Safety Plan for Air Force Plant No. 4 in Fort Worth, Texas. The Final Health and Safety Plan is also being distributed to the Fort Worth District, Lockheed, US Air Force Aeronautical Systems Center (ASC), and the onsite IT field office by copy of this letter. Should you have any questions regarding this submittal, please do not hesitate to contact me at (412) 858-3960 or Rick Wice at (412) 858-3309.

Respectfully submitted,

IT CORPORATION

A handwritten signature in cursive script, appearing to read 'Victor D. Dozzi'.

Victor D. Dozzi, PE
Project Manager

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SITE HEALTH AND SAFETY PLAN

**Field Work, Operations and Maintenance
Air Force Plant 4
Fort Worth, Texas**

**Contract No. DACA56-92-D-0008
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2790 Mossie Boulevard
Monroeville, Pennsylvania 15146**

September 1995

IT Project No. 762057

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Review and Approvals _____

Project Manager
IT Corporation

Steve Al Duggi

21 Sept 1995
Date

H&S Manager
IT Corporation

Warren P. Houseman

9/21/95
Date

1.0 Introduction

1.1 Objective

This Health and Safety (H&S) Plan establishes the work practices necessary to help ensure protection of IT Corporation (IT) personnel, subcontractors, and authorized visitors during the Field Work, Operations, and Maintenance Action at Air Force Plant No. 4 (AFP 4) in Fort Worth, Texas. Some of the activities may be conducted at facilities managed by Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), formerly Carswell Air Force Base. Activities at NAS Fort Worth JRB will be coordinated with the Carswell Air Force Base Conversion Agency. This H&S Plan was prepared under Tulsa District, United States Army Corps of Engineers (USACE) contract DACA56-92-D-0008, Delivery Order No. 0027. This Plan incorporates portions of the H&S Plans prepared under Delivery Orders No. 0001 and No. 0013, and supersedes these documents.

The objective of this plan is to provide a mechanism for the establishment of safe working conditions at the site. The safety organization and procedures have been established following an analysis of potential hazards at the site. Specific hazard control methodologies have been evaluated and selected in an effort to minimize the potential of accident or injury.

All site operations will be performed in accordance with applicable state, local and IT corporate regulations and procedures, Occupational Safety and Health Administration (OSHA) requirements, and USACE regulations and procedures contained within EM385-1-1. Lockheed and NAS Fort Worth JRB H&S, regulations, procedures, and special training with emphasis on flight operations line area will be followed. All IT Corporation (IT) employees and subcontractors must comply with the requirements of this plan.

1.2 Site/Facility Description

AFP 4 is a government-owned contract-operated (GOCO) facility located on 663 acres of land in Tarrant County, Texas, seven miles northwest of the center of Fort Worth. This Lockheed operated installation is bordered on the south and west by the City of White Settlement, on the east by NAS Fort Worth JRB, and on the north by Lake Worth (Attachment A-2). The plant was built in 1942 of permanent-type construction, and originally contained buildings totaling 1,961,000 square feet. Progressive building additions have resulted in the present

total covered area of 6,971,058 square feet, including a mile-long assembly line.
(Attachments (A-3)).

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AFP 4's main mission since 1942 has been the production of military aircraft along with spare parts, radar units, and missile components. These operations resulted in the generation of various hazardous wastes which included waste oils, fuels, spent solvents, paint residues, and spent process chemicals. These waste products were either disposed of at on-site landfills or were burned in fire training exercises up until the 1970's. Since then all waste streams have been disposed of using environmentally sound practices.

Some of the operations for AFP 4 will be conducted on NAS Fort Worth JRB. The base, formerly known as Carswell Air Force Base, is an active Navy, Marine Corps, and Air Force Reserve Facility. From 1942 to 1994 the base was used primarily by the Air Force for Strategic Bomber Units. Since October 1, 1994, the base has been run by the Navy in support of various reserve squadrons. Landfill 4 and 5 area is shown on Attachment A-4.

The following is a brief description of the AFP 4 area where field operations and maintenance activities are currently being conducted or planned:

- **Window Area.** The Window Area is located in the East Parking Lot/Flightline area of AFP 4 (Attachment A-3). Groundwater samples collected from monitoring wells indicate both the Terrace Deposits flow system and the Paluxy Aquifer contain TCE and TCE degradation products. Currently IT is operating a groundwater recovery and treatment system in the East Parking Lot. The system has seven groundwater recovery wells and a treatment Plant that air strips the water. A system expansion including three additional recovery wells is now under construction and should be completed in late Spring 1995. System expansions for additional Terrace Deposit wells and a new Paluxy aquifer recovery treatment system may be done in the future.
- **Landfill No. 3.** Landfill No. 3 (Attachment A-3) was used from 1942 to 1945 for disposal of various wastes, including hazardous liquid wastes consisting of mixed oils and solvents. Some of these wastes were burned in a small pit in the landfill. From 1945 to 1966 Landfill No. 3 was inactive; fill dirt and rubble

were used to fill and grade the site in 1966-67. Sample results from soil borings and groundwater monitoring wells show that the soil contains concentrations of VOCs and petroleum hydrocarbons, and that the groundwater is contaminated with VOCs, semi-VOCs, fuels. Groundwater samples from the Terrace Deposits contained VOCs (primarily TCE and degradation products), semi-VOCs, and low level chromium. A vacuum enhanced pumping (VEP) system is under construction at Landfill No. 3. The VEP wells and trench were installed and the extraction piping has been hooked up. Extraction and Treatment Equipment will be installed in May 1995 with system startup planned for June 1995.

- **Landfills No. 4 and No. 5 (at NAS Fort Worth JRB).** Landfill No. 4 (LF04) is located east of Taxiway 197 and south of White Settlement Road on NAS Fort Worth JRB (Attachments A-4). There were six large pits in LF04 which contained refuse that was burned and buried. Drums of liquid wastes, partially full paint cans, and cadmium batteries were reported being buried in LF04. Landfill No. 5 (LF05) is located northwest of LF04 on the flightline side of the fence. LF05 was utilized to handle flightline wastes and refuse (oils, thinners, strippers, and paints). These wastes and refuse were burned and buried. The eastern edge of the AFP4 TCE plume flows through the Landfill 4 and 5 area in a buried paleochannel. IT's task is to recover and treat an AFP4 plume in this area. The current groundwater recovery and treatment system in the Landfill 4 and 5 area that include eleven recovery wells, six skid-mounted tray aerator/carbon units, acid injection equipment and the associated piping and control panels. Treated groundwater will be discharged into a drainage ditch that flows into the golf course irrigation ponds.
- **Fuel Saturation Area No. 1 and No. 3.** Fuel Saturation Area No. 1 (FSA1) is located southeast of Building No. 14. FSA1 (Attachment A-3) consisted of an underground fuel distribution system, a fuel pumping station, and underground storage tanks. Ground water in the vicinity became contaminated by fuels leaking from the underground JP-4 jet fuel distribution system. Soil samples taken east and west of the former product line contained significant concentrations of total petroleum hydrocarbons (TPH), VOCs, Semi-VOCs, and

metals. French Drains No. 1 and No. 2 in the West Parking Lot are connected to the FSA1 treatment system.

Fuel Saturation Area No. 3 (FSA3) is located east of Bomber Road between Buildings No. 157 and No. 142 (Attachment A-3). FSA3 was contaminated by leaking underground JP-4 fuel pipelines. Fuel-related floating product has been observed in seven of the nine groundwater monitoring wells installed at this site. Groundwater samples indicate the presence of VOCs, semi-VOCs, and TPH exceeding the federal standards. Significant concentrations of JP-4 jet fuel-related compounds also were detected in the area soils.

Existing site conditions and the recovery and treatment system including the West Parking Lot French Drains No. 1 and No. 2 are being evaluated. The systems are not active and need to be modified to bring them back to operations. IT will restore, operate, and maintain these systems in the future.

- **Building 181.** Building 181 is a major source of the TCE contamination at AFP 4 (Attachment A-3). Airplane parts and assemblies were cleaned using various solutions including TCE in dip tanks in this building. A VEP and soil vapor extractor (SVE) system is under design and construction by another contractor in Building 181. The system will recover vapors and fluids from under the floor of the Buildings 181 and 182. IT will operate and maintain this system in the future.

1.3 Policy Statement

It is the policy of IT to provide a safe and healthful work environment for all its employees. IT considers no phase of operations or administration to be of greater importance than prevention of injury and illness. Safety takes precedence over expediency or shortcuts. Every accident and every injury is avoidable and IT will take every reasonable step to reduce the possibility of injury, illness, or accident.

This H&S Plan prescribes the procedures that must be followed by all site personnel. Operational changes which could affect the health or safety of personnel, the community, or the environment will not be made without prior approval of the IT Project Manager and the IT H&S Manager.

The provisions of this plan are mandatory to all IT personnel and subcontractors assigned to the project and all visitors to any work site are required to abide by these procedures. Work conditions can change as operations progress; therefore, the H&S Manager will provide written addenda to this H&S Plan when changes warrant. No changes to the plan will be implemented without prior approval of the H&S Manager or his authorized representative.

1.4 References

This H&S Plan complies with applicable OSHA and U.S. Environmental Protection Agency (EPA) regulations. This plan follows the guidelines established in the following documents:

- Standard Operating Safety Guides (EPA November 1984)
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (National Institute of Occupational Safety and Health [NIOSH] 85-115)
- Title 29 of the Code of Federal Regulations, Part 1910.120 (29 Code of Federal Regulations [CFR] 1910.120) (U.S. Department of Labor/OSHA)
- Safety and Health Requirements Manual EM385-1-1 (U.S. Army Corp. of Engineers [USACE] Revised October 1992).

Contents of this plan are consistent with the following IT H&S Policies and Procedures:

- HS001 Safety Policy
- HS020 Accident Prevention Program: Investigation and Review
- HS021 Accident Prevention Program: Safety Inspections
- HS022 Accident Prevention Program: Review of New Proposals, Projects, Operations, and Construction
- HS023 Accident Prevention Program: Performance Recognition Program

- HS051 Employee and Contractor Training Requirements
- HS092 Reporting/Recording Occupational Injuries/Illnesses
- HS102 Access to Employee Exposure and Medical Records
- HS103 Maintenance of Employee Monitoring and Medical Records
- HS300 Confined Spaces, Industrial
- HS307 Excavation and Trenching
- HS311 Emergency Response Operations
- HS310 Hazardous Waste Operations at Uncontrolled Waste Sites
- HS400 Working in Hot Environments
- HS401 Cold Stress
- HS051 Tailgate Safety Meetings
- HS104 Employee Notification of Industrial Hygiene Monitoring Results
- HS060 Hazard Communication Program
- HS600 Personal Protective Equipment
- HS601 Respiratory Protective Program
- HS604 Electrical Safety
- HS011 Health and Safety Rules For Contractors
- HS402 Hearing Conservation Program
- HS100 Medical Policies and Procedures
- HS341 Hot Work in Hazardous Locations
- HS305 Pressurized Systems
- HS105 Occupational Injuries/Illness Procedures.

These policies and their implementation are central to IT's accident prevention program.

2.0 Responsibilities

2.1 All Personnel

All personnel are responsible for continuous adherence to these H&S procedures during the performance of their work. No person may work in a manner that conflicts with the intent or the inherent safety and environmental precautions expressed in these procedures. After due warnings, any person who violates safety procedures will be dismissed from the site. IT employees and subcontractors are subject to progressive discipline and may be terminated for continued violations. All on-site personnel will be trained in accordance with 29 CFR 1910.120 and this document.

The following are the IT personnel that will be conducting on-site work at Air Force Plant No. 4.

Victor Dozzi	Project Manager
David Corden	Site Manager
Rick Wice	Senior Project Hydrogeologist, Health and Safety Coordinator
John Pitts	Project Engineer
Randal McDaniel	Operations and Maintenance
Charles King	Operations and Maintenance
Robert Schoenewe	Hydrogeologist
Jim Gaslevic	Engineer
Roy Marak	Engineer
David Corden	Construction Superintendent
Craig Elliot	Operations and Maintenance
Sam Burks	Operations and Maintenance

2.2 Health & Safety Manager

The H&S Manager is responsible for developing and coordinating the site-specific H&S Plan and addenda as required. This plan complies with 29 CFR 1910.120 in all respects and includes medical surveillance and training requirements, hazard assessment, personnel protective equipment (PPE) specifications, field implementation procedures, and audits. The H&S Manager will issue addenda to the H&S Plan if changed conditions warrant. The H&S

Manager is the contact for regulatory agencies on matters of safety and health. Other H&S

Manager responsibilities include:

- General H&S program administration
- Determining the level of personnel protection required
- Updating equipment or procedures based on information obtained during site operations
- Establishing air monitoring parameters based on expected contaminants
- Establishing employee exposure monitoring notification programs
- Investigating significant accidents and illnesses and implementing corrective action plans
- Performing regular site inspections
- Developing site-specific employee/community emergency response plans as required based on expected hazards.

2.3 On-site H&S Coordinator

The on-site H&S Coordinator has the ultimate responsibility to stop any operation that threatens the health or safety of the team or surrounding populace or that causes significant adverse impact to the environment. Other responsibilities include but are not limited to:

- Implementing all safety procedures and operations on site
- Observing work party members for symptoms of on-site exposure or stress
- Upgrading or downgrading the levels of personal protection based upon site observations and monitoring results
- Informing the project H&S Manager of significant changes in the site environment that require equipment or procedure changes
- Arranging for the availability of on-site emergency medical care and first aid, as necessary.

2.4 Project Manager

The Project Manager is ultimately responsible for ensuring that all project activities are completed in accordance with requirements set forth in this plan.

2.5 Site Manager

The IT Site Manager supervises all IT activities at the site and is responsible for field implementation of the H&S Plan. This includes communicating site requirements to all personnel, ensuring field supervisors and subcontractors enforce all provisions of the plan, and consulting with the H&S Manager regarding changes to the H&S Plan. Other responsibilities include:

- Reading and becoming familiar with this H&S Plan and IT Policies and Procedures
- Enforcing the H&S Plan and other safety regulations
- Stopping work as required to ensure personal and environmental safety and health
- Determining evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation
- Ensuring that all site personnel and visitors have received the proper training and medical clearance prior to entering the site (See Section 6 of this plan.)
- Establishing exclusion, decontamination, and clean zones (See Section 7 of this plan.)
- Presenting tailgate safety meetings and maintaining attendance logs and records
- Assuring that the respiratory protection program is implemented (See Section 5 of this plan.)
- Assuring that decontamination procedures meet established criteria
- Assuring that there is a qualified first aid person on site
- Discussing potential H&S hazards with the H&S Manager and the Project Manager
- Implementing changes as directed by the H&S Manager and Project Manager.

2.6 Subcontractors

On-site subcontractors and their personnel are responsible for understanding and complying with all site requirements. Subcontractors are required to follow the guidelines established in IT's General Safety Rules for Contractors and this H&S Plan.

2.7 On-site Personnel and Visitors

All on-site personnel and visitors are required to comply with the provisions of this H&S Plan and all applicable federal, state, and local regulations. Each person is responsible for their own safety and health for completing tasks in a safe manner and for reporting any unsafe acts or conditions to his supervisor or the IT representative. Personnel will monitor themselves and their fellow employees for signs and symptoms of heat/cold stress and chemical exposure.

3.0 Job Hazard Analysis

3.1 Scope of Work

IT will conduct field investigations in support of remedial actions at various sites located on AFP 4 and NAS Fort Worth JRB. This will include the following tasks:

- Drilling and installation of groundwater monitoring and recovery wells, and soil borings
- Groundwater sampling
- Collection of groundwater level data
- Construction of groundwater treatment plants
- Aquifer pumping tests
- Digging trenches, installing pipelines and electrical lines
- Operation/maintenance of groundwater treatment plants
- Handling, storage, and introduction of materials for acid washing of treatment plants
- Surveying
- Other tasks as required by the client.

3.2 Job Hazard Assessment by Task

The Hazard Assessment identifies potential safety, health, and environmental hazards and provides for the protection of personnel, the community, and the environment. Because of the complexity and constant change of remediation projects, supervisors must continually inspect the work site to identify hazards which may harm site personnel, the community, or the environment. The Project Manager, Site Manager, Contractor Supervisor, and On-site Safety Coordinator must be aware of these changing conditions and discuss them with the H&S Manager. The H&S Manager will write addenda to change Job Safety Analyses and associated hazard controls as necessary.

This site contains volatile organic compounds (VOC), semi-volatile organic compounds (semi-VOC), chlorinated solvents, fuel related organic compounds, and chromium contaminated soil/groundwater which presents potential hazards to project personnel (see Table 4-1 and 4-2). All IT personnel and subcontractors will be familiar with these hazards and strictly adhere to the appropriate safety procedures. The potential hazards and the appropriate controls will be presented to project personnel during daily tailgate safety meetings. A detailed activity hazard analysis for each task is included in Attachment C.

As the scope of work for the project expands or changes, the H&S plan will be amended to cover the new activities.

3.2.1 Drilling and Installation of Groundwater Monitoring and Recovery Wells, and Soil Borings

IT will be drilling and installing groundwater monitoring and recovery wells, and soil borings at various locations on AFP 4 and NAS Fort Worth JRB.

Physical Hazards. Physical hazards include those associated with the use of the drill rig and supporting vehicles. Physical hazards specific to drilling are listed below:

- **Slips.** Slips are toothed wedges positioned between the drill pipe and the master bushing/rotary table to suspend the drill string in the bore when it is not supported by the hoist. Most accidents associated with slip operations are related to manual materials handling. Strained backs and shoulders are common.
- **Tongs.** Tongs are large counterweighted wrenches used to break out the torqued couplings on drill pipe. Both sets of tongs have safety lines. When break out force is put on the tongs, the tongs or the safety lines could break and injure an employee standing close to them. Another likely accident can occur when the driller actuates the wrong tong lever and an unsecured tong swings across the rig floor at uncontrolled velocity. A common accident attributable to tongs can occur when an employee has his hand or finger in the wrong place as he attempts to swing and latch the tong onto the drill pipe, resulting in crushing injuries or amputation of the fingers.

- **Elevators.** Elevators are a set of clamps affixed to the bails on the swivel below the traveling block. They are used to clamp each side of a drill pipe and hold the pipe as it is pulled from the bore. Accidents and injuries can occur during the latching and unlatching tasks. Fingers and hands can get caught and crushed in the elevator latch mechanism. If the pipe is overhead when the latching mechanism fails, then the pipe may fall on employees working on the drill floor.
- **Cat Lines.** Cat lines are used on drilling rigs to hoist material and for driving sampling equipment. Accidents that occur during cat line operations may injure the employee doing the rigging as well as injure the operator. Minimal hoisting control causes sudden and erratic load movements which may result in hand and foot injuries.
- **Working Surfaces.** The rig floor is the working surface for most tasks performed in drilling operations. The surface is frequently wet from circulating fluid and/or the water used to wash it down. Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, and slips and falls. Some work on the rig is performed on the on the tower. Slips are external and dangerous on the tower. All tower work must be done in accordance with regulations governing the use of body harnesses and safety lines.
- **Materials Handling.** The most common type of accident that occurs in materials handling is the "caught between" situation when a load is being handled and a finger or toe gets caught between two objects. Rolling stock can shift and/or fall from a pipe rack or truck bed.
- **Underground Utility Hazards.** Before drilling, the existence and location of underground pipe, electrical equipment, and gas lines will be determined. This will be done, if possible, by contacting the appropriate client representative to mark the location of the lines. If the client's knowledge is incomplete, an appropriate device, such as the cable avoiding tool, will be used to locate service lines.
- **Overhead Utility Hazards.** If drilling is conducted in the vicinity of overhead power lines, a distance of 15 feet must be maintained between the lines and any point on the drill rig. If the lines have appreciable sag, or if windy conditions exists, this distance will be 20 feet.

In addition to the specific hazards listed above, rigs produce hazardous noise levels and accidents can occur as a result of improperly placing the rig on uneven or unstable surfaces or

failing to adequately secure the rig before starting operations. See Section 4.4 for a discussion on general drilling practices.

Chemical Hazards. Chemical hazards associated with the drilling and well installation operations include fuels, lubricants, well construction materials, VOC, and contaminated soil cuttings. Sections 3.5 and 3.6 discuss the possible chemical hazards and their exposure standards.

3.2.2 Groundwater Sampling

IT will collect and analyze groundwater samples from the french drains and wells installed at various locations on at the site. The samples will be analyzed off site for various organic, inorganic, and general chemical parameters.

Physical Hazards. The physical hazards involved in this task are related to the handling of groundwater.

Slip, trip, and fall hazards will be of concern during this task. Should the walking or working surfaces become wet extra caution must be taken to avoid slipping.

Noise may be a hazard in active taxiway, runway, and hanger areas. Otherwise, noise is not expected to be a hazard during this operation, but if noise levels exceeding 85 decibels (dB), the use of hearing protection will be required.

Splash hazards will be present during the sampling of wells. Employees will be made aware of this hazard and handle all groundwater with appropriate care. Proper protective equipment will be used by all employees engaged in this activity.

Employees will follow proper lifting techniques when sampling wells. No one will be permitted to lift over 60 pounds without getting assistance.

Chemical Hazards. Inhalation of VOCs from groundwater wells may pose a potential hazard for exposure during this task. Skin absorption of VOCs from contact with

contaminated water also poses a risk. Sections 3.5 and 3.6 discuss possible chemical hazards and their exposure standards.

3.2.3 Collection of Groundwater Level Data

IT will collect groundwater level data from the wells installed at various locations on at the site as this information is needed.

Physical Hazards. The physical hazards involved in this task are related to the handling of groundwater.

Slip, trip, and fall hazards will be of concern during this task. Should the walking or working surfaces become wet extra caution must be taken to avoid slipping.

Noise may be a hazard in active taxiway, runway, and hanger areas. Otherwise, noise is not expected to be a hazard during this operation, but if noise levels exceeding 85 dB, the use of hearing protection will be required.

Splash hazards will be present during the sampling of wells. Employees will be made aware of this hazard and handle all groundwater with appropriate care. Proper protective equipment will be used by all employees engaged in this activity.

Employees will follow proper lifting techniques when sampling wells. No one will be permitted to lift over 60 pounds without getting assistance.

Chemical Hazards. Inhalation of VOCs from groundwater wells may pose a potential hazard for exposure during this task. Skin absorption of VOCs from contact with contaminated water also poses a risk. Sections 3.5 and 3.6 discuss possible chemical hazards and their exposure standards.

3.2.4 Construction of Groundwater Treatment Plant

The subcontractor chosen to complete this task will be required to submit a hazard assessment of the work to be proposed. IT will review and approve this assessment and include it as an addendum to this plan.

The addendum to this plan will be forwarded to the Contracting Officer for review and acceptance prior to the start of work. The subcontractor chosen to construct the groundwater treatment plant must also comply with the requirements of the Corps of Engineers regulations and procedures contained within EM385-1-1, Table 1, for Accident Prevention Programs. As stated in Section 1.1 of this plan, all subcontractors must comply with the requirements of this plan.

3.2.5 Aquifer Pumping Tests

IT will conduct aquifer pumping tests in wells at various locations at AFP 4.

Physical Hazards. The physical hazards involved in this task are related to the drilling activities and the handling of groundwater.

Slip, trip, and fall hazards will be of concern during this task. Should the walking or working surfaces become wet extra caution must be taken to avoid slipping.

Noise may be a hazard in active taxiway, runway, and hanger areas. Otherwise, noise is not expected to be a hazard during this operation, but if noise levels exceeding 85 dB, the use of hearing protection will be required.

Splash hazards will be present during the sampling of wells. Employees will be made aware of this hazard and handle all groundwater with appropriate care. Proper protective equipment will be used by all employees engaged in this activity.

Employees will follow proper lifting techniques when sampling wells. No one will be permitted to lift over 60 pounds without getting assistance.

Chemical Hazards. Inhalation of VOCs from groundwater wells may pose a potential hazard for exposure during this task. Skin absorption of VOCs from contact with contaminated water also poses a risk. Sections 3.5 and 3.6 discuss possible chemical hazards and their exposure standards.

3.2.6 Digging Trenches and Installing Buried Pipelines and Electrical Lines

Trenching will take place during the expansion and construction of the various treatment plants at the facility. The work areas will be barricaded off to restrict non-IT personnel access and ensure a safe working environment for IT personnel. Barricade types used will include wooden horses, equipped with flashing lights if necessary, and barricade tape. Lockheed and NAS Fort Worth JRB regulations, procedures, and special training with emphasis on flight operations line area will be followed. In addition to the required PPE selection stated in Appendix C, Table 2, Task 6, Inactive Traffic Areas, Including Flight Line, personnel will wear high visibility vests.

All trenching will take place on secured Lockheed plant facilities (Window Area Treatment Plant). Landfill 3 operations are conducted inside a fence secured area. Landfill 4 and 5 operations are outside of secured NAS Fort Worth JRB area and trenching is conducted in accordance with the previous paragraph.

Physical Hazards. This phase of the work requires a combination of physical hands-on activities combined with some equipment operations. Employees must be alert for slip, trip, fall and cut hazards and beware of pinch points around moving parts of equipment.

All operators of equipment used on site will be familiar with the requirements for inspection and operation of the equipment. Unfamiliar operations will be discussed with the affected employees before beginning work. The site supervisor will be responsible for checking the proficiency of the operators.

All underground utilities will be located prior to starting trenching activities.

Electrical lines will be connected by a qualified individual.

Employees will follow proper lifting techniques and no one will be permitted to lift over 60 pounds without obtaining assistance.

Noise presents a hazard. Mechanical equipment operations frequently result in noise levels exceeding 85 dB, requiring the implementation of noise monitoring. At 90 dB hearing protection is required. Noise may be a hazards in active taxiway, runway, and hanger areas.

Fuel handling is another hazard present during this task. Refueling of mechanical equipment poses serious burn hazards.

Heat stress/cold stress is a potential concern and employees are cautioned to be aware of possible warnings of this condition.

Chemical Hazards. Inhalation of VOCs from trenching spoils may pose a potential hazard for exposure during this task. Skin absorption of VOCs from contact with contaminated trenching spoils also poses a risk. Sections 3.5 and 3.6 discuss possible chemical hazards and their exposure standards.

3.2.7 Operation and Maintenance (O&M) of Groundwater Treatment Plant

The routine operation of the groundwater treatment plants will require these specific activities:

3.2.7.1 Routine Inspection of the Groundwater Treatment Plant

The treatment plant will be routinely inspected for signs of leakage and mechanical deterioration. In accordance with the O&M Plan, plant operational data and performance samples will be collected. Scheduled maintenance tasks will also be performed.

Physical Hazards. Inspection of the treatment plant will require a minimal amount of physical activity. Individuals conducting this inspection must be alert to slip, trip and fall hazards. During inspection or entry into any aboveground tank or other confined space greater than 5 feet vertically will require a retractable device mounted on a tripod or davit arm (miniature crane-like boom). The device will have to be secured safely to the top or sides of the tank since no other overhead anchorage point exists.

Chemical Hazards. The treatment plant will consist of a closed system providing a very small potential for any type of chemical exposure during routine inspections.

3.2.7.2 Sampling Treatment System

Water samples will be collected from various treatment system sample ports to monitor influent and effluent water quality and treatment system performance. Physical and chemical hazards associated with groundwater sampling are discussed in Section 3.2.2.

3.2.7.3 Handling of Process Chemicals

Drums of process chemicals will have to be brought to the site. The filter media will require periodic flushing and replacement.

Physical Hazards. The handling and changing out of process chemicals subjects the individual to several physical hazards. These include the potential for uneven walking/working surfaces and trip hazards, heavy material handling, sharp objects and edges (burrs) on drums, and pinch points. Individuals must be alert to the potential for liquids being released under pressure.

Chemical Hazards. Inhalation of vapors/mists from process chemicals and VOCs from groundwater may pose a potential for exposure during this task. Eye and skin contact with corrosive materials also poses a risk.

Section 3.5 and Table 1 discuss possible chemical hazards and their exposure standards.

3.2.8 Surveying

IT anticipates surveying will take place during the expansion of the various Treatment Plants at the facility. IT will also conduct site wide surveys of existing monitoring wells.

Physical Hazards. This phase of the work requires a combination of physical hands-on activities. Employees must be alert for slip, trip, fall and cut hazards and beware of pinch points around moving parts of equipment.

Employees will follow proper lifting techniques and no one will be permitted to lift over 60 pounds without obtaining assistance.

Noise presents a hazard. Active aircraft areas results in noise levels exceeding 90 dB, requiring the use of hearing protection.

3.2.9 Handling, Storage, and Introduction of Materials for Acid Washing Treatment Plants

Presence of calcium in the groundwater would precipitate calcium carbonate and deposit on the stripper packing, and would also foul process equipment downstream of the tower. Acid will be introduced to the system when the tower shows signs of fouling.

Physical Hazards. The handling and changing out of process chemicals subjects the individual to several physical hazards. These include the potential for uneven walking/working surfaces and trip hazards, heavy material handling, sharp objects and edges (burrs) on drums, and pinch points. Individuals must be alert to the potential for liquids being released under pressure.

Chemical Hazards. Inhalation of vapors/mists from acid may pose a potential for exposure during this task. Eye and skin contact with corrosive materials (such as an acid) also poses a risk.

3.3 Heat Stress Signs and Symptoms

Wearing PPE places a hazardous waste site worker at considerable risk of heat stress. Heat stress effects range from transient heat fatigue to serious illness and death. Heat stress is caused by several interacting factors including environmental conditions, clothing, work load, and the individual characteristics of the worker. Because heat stress is the most common and potentially serious illness at hazardous waste sites, preventive measures and alertness to the signs and symptoms are vital.

Heat stress monitoring should begin when personnel are wearing PPE, including Tyvek coveralls, and the ambient temperature exceeds 78 degrees Fahrenheit (°F). If impermeable garments are not worn, heat stress monitoring should begin at 85°F. When ambient temperatures exceed 90°F and impermeable garments are worn, physiological monitoring will be implemented (see Section 4.2.1, Working in Hot Environments).

Heat Rash. Heat rash is caused by continual exposure to heat and humid air and is aggravated by chaffing clothes. Heat rash decreases a person's ability to tolerate heat as well as becoming an irritating nuisance.

Heat Cramps. Heat cramps are caused by heavy sweating and inadequate electrolyte replacement. Signs and symptoms include muscle spasms and pain in the hands, feet, and abdomen.

Heat Exhaustion. Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

- Pale, cool, moist skin
- Heavy sweating
- Dizziness
- Nausea
- Fainting.

Heat Stroke. Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occurs. Competent medical help must be obtained immediately. This is a true medical emergency. Signs and symptoms are:

- Red, hot, usually dry skin
- Lack of or reduced perspiration
- Nausea
- Dizziness and confusion
- Strong, rapid pulse (initially)
- Coma.

3.4 Signs and Symptoms of Cold Stress

Most cold-related worker fatalities have resulted from failure to escape low environmental air temperatures, or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is a drop in the deep-core body temperature.

Employees should be protected from exposure to cold so that their deep-core body temperature does not fall below 36 degrees Celsius (°C) (equivalent to 98.6°F). A lower body temperature will very likely result in reduced mental alertness, reduction in rational decision-making, or loss of consciousness with the threat of fatal consequences.

Frostbite. Frostbite occurs when the extremities do not get sufficient heat from the central body stores. The fluids around the cells of the body tissues freeze from exposure to low temperatures. This condition can result in damage to, and loss of, tissue. The most vulnerable areas are the nose, cheeks, ears, fingers, and toes.

Damage from frostbite can occur in either the outer layers of skin, or in the tissue beneath these layers, and can be serious - resulting in scarring, tissue death, permanent loss of movement, or amputation.

There are degrees of frostbite:

- First degree: freezing without blistering or peeling
- Second degree: freezing with blistering or peeling
- Third degree: freezing with skin tissue death and possible deeper tissue damage.

Symptoms of frostbite include:

- Skin color changes to white or grayish-yellow, to reddish-violet and finally black as the tissue dies
- Pain may be felt at first, but subsides
- Coldness or numbness of the affected part.

Hypothermia. This is the most severe form of cold stress and results from a drop in the body's core temperature. The symptoms of hypothermia are:

- First, uncontrollable shivering and the sensation of cold
- Heartbeat slows and may become irregular
- Pulse weakens and the blood pressure changes
- As the body's core temperature drops, other signs may include cool skin, slow irregular breathing and apparent exhaustion

- When core temperatures are in the mid-range, the victim may become listless, confused, exhibit severe shivering, or develop severe pain in the extremities
- Final signs are a significant drop in blood pressure, fatigue, and shallow respiration.

3.5 Hazardous and Toxic Materials

This section discusses the hazards associated with materials that are used on the site or are likely to be found on the site. The H&S Manager will update this section as information developed during this project warrants. The potential chemical hazards associated with this site are trichloroethylene, 2-hexanone, benzene, toluene, 1,2-dichloroethane, chloroform, xylene, chromium, jet fuel, polyaromatic hydrocarbons (PAH's), and methylene chloride. Analytical data from previous site investigations can be found in Table 4-1 and 4-2. Potential health effects including routes of entry, symptoms of exposure, and relative toxicity can be found in Table 5.

The routine operation of the groundwater treatment plant requires the use of one or more of the following process chemicals: Phosphoric acid, MSW-110 polymer, Sulfuric acid, Nitric acid and Hydrochloric acid. Information regarding the health effects while working with these chemicals can be found in Table 5.

3.6 Exposure Standards

Threshold Limit Values (TLV) refer to airborne concentrations of substances which represent conditions that nearly all employees may be repeatedly exposed to day after day without adverse effect. These TLVs are prescribed by the American Conference of Governmental Industrial Hygienists (ACGIH) and are based upon the best available information obtained through industrial experience and animal or human studies. Because of the wide variation in individual susceptibility, a small percentage of workers may experience discomfort from some substances at concentrations below the recommended values. It has been policy to use these guidelines for good hygienic practices; however, whenever applicable, stricter guidelines may be utilized.

Currently, exposure guidelines to pesticides and other chemical substances are regulated by OSHA. These exposures are based upon the time-weighted average (TWA) concentration for a normal 8-hour workday and a 40-hour work week. Several chemical substances have

short-term exposure limits or ceiling values which allow a maximum concentration to which workers can be exposed continuously for a short period of time without suffering from (1) irritation, (2) chronic or irreversible tissue damage, (3) narcosis of a sufficient degree to result in accidental injury, impaired self-rescue abilities, or substantially reduced work efficiency.

The short-term exposure limit (STEL) is defined by the ACGIH and OSHA as a 15-minute TWA exposure which should not be exceeded within a 2-hour time period during a workday even if the 8-hour TWA is within applicable limits. OSHA requires that a 15-minute "Ceiling" concentration never be exceeded for that chemical constituent. This notation appears as the letter "C" after the chemical name.

Under certain chemical substance listings, a "skin" notation may appear. This refers to the potential contribution to the overall exposure by the cutaneous route including mucous membranes, and eye, either airborne or by direct contact. Little quantitative data is available describing absorption as a function of the concentration to which the skin is exposed. Biological monitoring may be considered to determine the relative contribution of dermal exposure to the total dose.

The ACGIH and OSHA have recognized through epidemiological studies, toxicology studies and, to a lesser extent, case histories that certain chemical substances may have the potential to be carcinogenic in humans. Because of the long latency period for many carcinogens, it is often impossible to base timely risk management decisions on the results of such information. Two categories of carcinogens are designated based upon the most current literature and information. These include confirmed human carcinogens and suspected human carcinogens. These chemical categories are based on either:

- Limited epidemiologic evidence
- Demonstration of carcinogens in one or more animal species by appropriate methods.

The worker potentially exposed to a known human carcinogen must be properly equipped to ensure virtually no contact with the chemical constituents. In the case of a suspected human carcinogen, worker exposure by all routes must be carefully controlled by the use of personal and respiratory protection and through administrative or engineering controls.

Table 1 represents the strictest set of guidelines currently established by either the ACGIH or OSHA.

4.0 Hazard Control Program

The following procedures are mandatory for all IT and subcontractor personnel entering the exclusion zone (EZ). All site visitors entering EZ must follow these procedures. Personnel not following procedures will be warned and, if they refuse to follow these procedures, they will be escorted from the site.

4.1 General Practices

All information regarding work to be performed, emergency procedures, and H&S hazards will be reviewed before the work begins during a daily tailgate safety meeting. No work will be performed before this meeting has taken place. At least one copy of this plan will be available at the job work site.

Only authorized personnel will be permitted in the work area. These authorized individuals must have successfully completed a medical exam and have been properly trained in the use of respiratory protective equipment and specific H&S hazards. All visitors will check in with the IT representative.

All personnel entering the site will be thoroughly briefed on the hazards, equipment requirements, safety practices, emergency procedures, and communication methods.

Protective clothing and respiratory protective equipment will be used for various stages of the operation as needed. The level of protection will be specified in Section 5.2, and will depend upon the degree of hazard.

At least one person trained in a minimum of both American Red Cross first-aid techniques and cardiopulmonary resuscitation (CPR) will be on site whenever activities occur. As an alternative, this requirement is satisfied when a 911 emergency responder can respond within five minutes to the site.

No food, beverages, or tobacco products will be present, consumed, or used in contaminated areas or potentially contaminated areas. Taking medication, smoking, or applying cosmetics are also prohibited. These activities apply at all times to the following areas; inside any treatment plant containment, inside the fence at Landfills 4 & 5 and inside the fence at Landfill 3. Lockheed and NAS Fort Worth JRB worksite procedures must be followed.

At the end of each work shift, before leaving the site, personnel who worked in contaminated zones will wash their hands and remove outer protective garments.

Before eating, drinking, or smoking employees will wash their hands and remove outer protective garments.

Containers will be moved only with the proper equipment and will be secured to prevent dropping or loss of control during transport.

Emergency equipment will be located in readily accessible uncontaminated locations. A complete first-aid kit and a fire extinguisher will be readily available on site for the team's use in the event of an emergency. The fire extinguisher will be located not more than 25 feet from the work activity. In addition, an eyewash will be readily available and must be capable of washing both eyes at once and delivering at least 0.4 gallons per minute for at least 15 minutes. At least one eyewash will be maintained in the contamination reduction zone (CRZ).

Employee entrance and exit routes will be planned and emergency escape routes designated.

All operators of equipment used on site will be familiar with the requirements for inspection and operation of such equipment. Unfamiliar operations will be discussed with affected employees before beginning work. The Site Manager or Construction Supervisor will be responsible for checking the proficiency of the operator. Audio and/or visual backup alarms will be utilized on all heavy equipment on site.

Personnel will be prohibited from being transported by any means other than those prescribed for movement of personnel. When trucks or other heavy equipment enter or leave the site, an individual will direct the driver.

Only intrinsically safe electrical equipment will be permitted in areas where a flammable atmosphere may exist. All static ignition sources will be identified and eliminated by the use of bonding and grounding techniques.

Material Safety Data Sheets (MSDS) will be obtained for every chemical product used on site. This information will be made readily available to all employees upon request and stored in a central location. All containers of any chemical products will be properly labeled to comply with OSHA Hazard Communication Standard (29 CFR 1910.1200).

Work areas will be illuminated to a minimum of 20-foot candles. Supplementary lighting may be necessary inside buildings, tanks, at night, or in other poorly lit areas.

When working around heavy equipment or materials, employees and visitors will adhere to the following precautions:

- Hard hats must be worn at all times on the site.
- Pay attention at all times.
- Maintain visual contact at all times.
- Establish hand signal communication when verbal communication is difficult. Determine one person per work group to give hand signals to equipment operators.
- Be aware of footing at all times.
- All heavy equipment will have backup alarms of some type.
- Use chain hoists, straps, and any other equipment to safely aid in moving heavy materials.
- Use proper personal lifting techniques. Use your legs, not your back.
- Get help whenever you are in doubt about a material's weight.
- Never walk directly in back or to the side of heavy equipment without the operator's knowledge.
- Never walk underneath any suspended load and always look overhead when a crane is in use.
- Only qualified people are to operate heavy equipment.

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4.1.1 Buddy System

All on-site personnel will use the buddy system. Buddies will maintain visual contact with each other. Personnel must observe each other for signs of heat stress or toxic exposure, such as:

- Changes in complexion and skin discoloration
- Changes in coordination or demeanor
- Excessive salivation and pupillary response
- Changes in speech pattern.

Personnel will inform their supervisor of nonvisual effects of toxic exposure such as:

- Headaches, dizziness, blurred vision
- Nausea
- Cramps
- Irritation of eyes, skin or respiratory tract.

4.1.2 Fall Protection

The walking and working surfaces may become wet and slippery during these tasks. Use extra caution when working on these surfaces. In addition, visible barriers will be erected around any open excavations to prevent personnel from falling into these areas.

Employees working at heights of 6 feet or greater will be protected from falls using appropriate fall protection measures (i.e. safety nets, safety belts, etc.).

4.2 Project Specific Practices

To prevent personnel exposure to heat/cold stress during all tasks, the practices outlined in Sections 4.2.1 and 4.2.2 will be followed.

The work area must be marked in such a way as to prevent traffic from passing within 10 feet of the work area. Cones, caution tape, barricades, or other means must be used to define the work area.

All on-site personnel must wear steel toed safety shoes, hard hats, and safety glasses. Long pants or trousers and shirts covering the upper body and upper arms must also be worn.

4.2.1 Working in Hot Environments

Heat Stress. Heat stress due to protective clothing decreasing body ventilation is an important factor. Heat stress of employees on site will be monitored by the American Red Cross method of monitoring heart rates and oral temperatures as personnel come out for rest and cooling off.

Ambient temperature and other environmental factors provide basic guidelines to implement work/rest periods. However, since individuals vary in their susceptibility to heat stress, IT will also utilize physiological monitoring to regulate each individual's response to heat stress when ambient temperatures exceed 78°F. The two physiological parameters that each individual will monitor are:

- **Heart Rate** - Each individual will count his/her radial (wrist) pulse for 30 seconds as early as possible in the first rest period. If the heart rate of any individual in the sampling team exceeds 100 beats per minute at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same.
- **Oral Temperature** - Each individual will measure his/her oral temperature with a single-use clinical thermometer for one minute as early as possible in the first rest period. If the oral temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same.

One or more of the following control measures can be used to help control heat stress and are mandatory if heat stress is detected by elevated heart rate or oral temperature:

- Employees should drink plenty of water throughout the day and should increase their salt intake slightly by salting their food a little heavier.
- On-site drinking water will be kept cool (50 to 60°F) to encourage personnel to drink often.
- A work regimen that will provide adequate rest periods for cooling down will be established as required.
- All personnel will be advised of the dangers and symptoms of heat stroke and exhaustion.

- Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments.
- Employees will be cautioned to monitor themselves and their co-workers for the effects of heat disorders and to take additional breaks as needed.
- All breaks are to be taken in a shaded rest area.
- Employees will not do other tasks during rest periods.
- Employees will remove impermeable garments during rest periods.
- All employees will be informed of the importance of adequate rest, acclimatization, and proper diet in the prevention of heat stress.

4.2.2 Working in Cold Environments

Cold Stress. One or more of the following control measures can be used to help control cold stress:

- Workers will be provided with warm clothing, such as mittens and heavy socks, when the air temperature is below 4 to 7 degrees Celsius ($^{\circ}\text{C}$) (equivalent to 40 to 45 $^{\circ}\text{F}$)
- Protective clothing may be used to protect the employee when the air temperature is below 0 to 7 $^{\circ}\text{C}$ (equivalent to 32 to 40 $^{\circ}\text{F}$). Depending on employee comfort, clothing for warmth in addition to protective clothing will be provided. This will include:
 - Insulated suits, such as whole-body thermal underwear
 - Wool or polypropylene socks to keep moisture off the feet if there is a potential of work activity which would cause sweating
 - Insulated gloves
 - Boots
- At air temperatures below 2 $^{\circ}\text{C}$ (equivalent to 35 $^{\circ}\text{F}$), the following work practices must be observed:

- If the clothing of the employee might become wet on the job site, the outer layer of the clothing must be impermeable to water.
- If an employee's underclothing (socks, mittens, etc.) becomes wet in any way, the employee must change into dry clothing immediately. If the clothing becomes wet from sweating, the employee may finish the task which caused the sweating before changing into dry clothing.
- Employees must be provided with a warm area, 18°C (equivalent to 65°F) or above, in which to change from work clothing into street clothing.

4.3 Hearing Conservation

All on-site personnel will wear hearing protection (E.A.R. foam inserts or equivalent) when operating heavy equipment, near active aircraft operations, or whenever noise levels exceed 85 dB, according to IT Procedure HS402. All personnel required to wear hearing protection will receive baseline and an annual audiogram, and training on the causes and prevention of hearing loss.

4.4 Drilling Safety

Drill Crews. All drillers performing work must possess required state or local licenses to perform such work. All members of the drill crew must receive site-specific training prior to beginning work. The driller must be responsible for the safe operation of the drill rig as well as the crew's adherence to the requirements of this HASP. The driller must ensure that all safety equipment is in proper condition and is properly used. The members of the crew must follow all instructions of the driller, wear all PPE, and be aware of all hazards and control procedures. The drill crews must participate in the daily tailgate safety meeting and be aware of all emergency procedures.

Rig Inspection. Each day, prior to the start of work, the drill rig and associated equipment must be inspected by the driller and/or drill crew. The following items must be inspected:

- Vehicle condition
- Proper storage of equipment
- Condition of all wire rope
- Fire extinguisher
- First aid kit.

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Rig Set Up. The drill rig must be properly blocked and levelled prior to raising the derrick. The wheels which remain on the ground must be chocked. The rig must be moved only after the derrick has been lowered. The levelling jacks must not be raised until the derrick is lowered.

Site drilling will comply with the following rules:

- Before drilling, the existence and location of underground pipe, electrical equipment, and gas lines will be determined. This will be done, if possible, by contacting the appropriate client representative to mark the location of the lines. If the client's knowledge is incomplete, an appropriate device, such as the cable avoiding tool, will be used to locate service lines.
- If drilling is conducted in the vicinity of overhead power lines, a distance of 15 feet must be maintained between the lines and any point on the drill rig. If the lines have appreciable sag, or if windy conditions exist, this distance will be 20 feet.
- If lubrication fittings are not accessible with guards in place, machinery must be stopped before oiling and greasing. Fuel, hydraulic fluid, or oil will not be placed in the drill rig unless the engine has been turned off.
- Rigging material equipment for material handling must be checked prior to use on each shift and as often as necessary to ensure it is safe. Defective rigging must be removed from service immediately.
- Drillers will not add or remove pipe from the drill stem without the assistance of the driller's helper.
- If drill cuttings are to be drummed and moved to a central storage location, lifting and transporting of these drums should be completed using the appropriate equipment and following safe loading and unloading procedures.

4.4.1 Hoisting Operations

- Drillers must never engage the rotary clutch without watching the rotary table and ensuring it is clear of personnel and equipment.
- Unless the drawworks is equipped with an automatic feed control, the brake must not be left unattended without first being tied down.
- Casing or pipe must not be picked up suddenly.

- Drill pipe must not be hoisted until the driller is sure that the pipe is latched and the drilling assistant has signalled that he/she may safely hoist the load.
- During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller will be on the rig floor and no one will be on the rig or derrick.
- The brakes on the drawworks of every drilling rig must be tested by each driller at the beginning of each shift to determine whether they are in good order. The brakes must be thoroughly inspected by a competent individual each week.
- A hoisting line with a load imposed will not be permitted to be in direct contact with any derrick member or stationary equipment unless it has been specifically designed for line contact.
- Hoisting control stations must be kept clean and controls labelled as to their functions.

4.4.2 Riding Hoisting Equipment

Under no circumstances will personnel be permitted to ride the traveling block or elevators, nor will the cat line be used as a personnel carrier.

4.4.3 Cat Line Operations

- Only experienced workers will be allowed to operate the cat line controls. The kill switch must be clearly labelled and operational prior to operation of the cat line.
- The cat line area must be kept free of obstruction and entanglements.
- The operator will not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.
- Personnel must not stand near, step over, or go under a cable or cat line which is under tension.
- Employees rigging loads on cat lines must:
 - Keep out from under the load
 - Keep fingers and feet where they will not be crushed

- Be sure to signal clearly when the load is being picked
- Use standard visual signals only, and not depend on shouting to coworkers
- Make sure that the load is properly rigged, since a sudden jerk in the cat line will shift or drop the load.

4.4.4 Pipe Handling

- Pipe must be loaded and unloaded, layer by layer, with the bottom layer pinned or blocked securely on all four corners. Each successive layer must be effectively blocked or chocked.
- Workers will not be permitted to top off the load during loading, unloading, or transferring or pipe or rolling stock.
- Employees must be instructed never to try to stop rolling pipe or casing; they must be instructed to stand clear of rolling pipe.
- When pipe is being hoisted, personnel will not stand where the bottom end of the pipe could whip and strike them.

4.5 Sanitation

IT employees will keep the work and support areas neat and orderly and free of trash and debris.

4.5.1 Break Area

An area will be established that is upwind from the work area and outside the contamination zone where personnel can take a break. The area must be clearly marked and no contaminated personnel or equipment is permitted there.

4.5.2 Potable Water

If the facility does not have a water supply available, potable water will be carried to the site for use in decon and employee cleanup. Potable water is available in the office trailer located in the East Parking Lot area.

4.5.3 Trash Collection

All refuse will be deposited into designated containers while on site. It is the responsibility of the Project Manager and the Site Manager to insure that the area is kept clean. All solid waste will be placed in the appropriate container located by the site office trailer, in the East Parking Lot.

4.6 Confined Space

IT's procedure for confined space entry will be followed if such an activity is needed during the execution of this project. A confined space is defined as a space large enough and so configured that an employee can bodily enter and perform assigned work, has limited means for entry or exit, and is not designed for continuous employee occupancy. Contaminated soil excavations, storage vessel entries, and other confined space work may pose additional hazards such as air contamination, flammable or explosive atmosphere, and oxygen deficiency. Excavation entry may pose the possibility of engulfment. IT has detailed training for confined space entry, and only personnel properly trained shall supervise and participate in confined space entry procedures or serve as standby attendants.

All confined spaces are initially considered permit required. Under certain conditions, a space may be reclassified as a non-permit confined space provided the HSO approved the reclassification and the space meets the criteria outlined in IT's Confined Space Entry Procedure HS300.

5.0 Personnel Protective Equipment

The PPE outlined below has been selected according to the site characterization and analysis, job tasks, site hazards, intended use, and duration of potential employee exposures.

Maintenance and storage of PPE, decontamination, donning and doffing procedures, inspection and monitoring of effectiveness, and limitation are outlined in this section.

5.1 Respiratory Program

A comprehensive respiratory protection program has been established by IT and is required in all locations where use of such equipment is intended to lessen the potential for adverse health affects to any employee.

As part of the respiratory training program, each employee is instructed in the following elements:

- Nature of the respiratory hazard on the work site and the appraisal of potential consequences if the respiratory protection is not utilized
- Use and proper fitting of the respirator
- Cleaning, disinfecting, inspection, maintenance, and storage of the respirator
- Proper selection, capabilities, and their limitations.

Respiratory equipment will be inspected, cleaned, and disinfected daily or between each use to help assure proper hygienic practices. An inspection of these breathing devices will include the following:

- Examination of the head straps for breaks, loss of elasticity, broken or malfunctioning buckles and other attachments
- Examination of the face-piece for excessive dirt, cracks, tears, distortion, holes, or inflexibility
- Examination of the exhalation and inhalation valves for any foreign material, cracks, tears, or distortion in the valve. Additional checks will be made to inspect for proper insertion, defective valve covers or improper installation
- Examination of air purifying elements for incorrect cartridge, expired shelf-life of the cartridge, cracks or dents in the cartridge or cartridge-holder

- Examination for proper insertion of the cartridges into the face-piece and a check of the gaskets inside the cartridge-holder
- Examination of air cylinders for adequate air volume. Only Grade D air will be utilized for breathing air.

When Level C protection is required, respiratory cartridges will be changed daily. All respirators will be inspected prior to each day's use. If broken or malfunctioning parts are found during the cleaning process, these parts will be replaced or new respiratory equipment will be issued to the user.

The respiratory protective equipment will be stored in an area protected from any mechanical damage. These devices will also be stored in a location that provides protection against dust, heat, excessive moisture, or damage by chemical contact. The storage area for the respirators should be in a readily accessible location.

- Only employees who have been trained to wear and maintain respirators properly will be allowed to use respiratory protection.
- Selection of respirators, as well as any decisions regarding upgrading or downgrading of respiratory protection, will be made by the H&S Manager or his designee.
- Positive and negative pressure tests will be performed each time the respirator is donned.
- Only employees who have been fit tested within the last 12 months will be allowed to work in atmospheres where respirators are required. Subcontractors will provide certificates of respirator fit test completed within the last 12 months for each employee on site.
- Respirator users will be instructed in the proper use and limitations of respirators.
- If an employee has difficulty in breathing during the fit test or during use, he will be evaluated medically to determine if he can wear a respirator safely while performing assigned tasks.
- No employee will be assigned to tasks requiring the use of respirators if, based upon the most recent examination, a physician determines that the health or safety of the employee will be impaired by respirator use.

- Contact lenses will not be worn while using any type of respiratory protection.
- Air-supplied respirators will be assembled according to manufacturer's specifications. Hose length, couplings, valves, regulators, manifolds, and all accessories will meet ANSI and the manufacturer's requirements.
- Respirators will be cleaned and sanitized daily after use.
- Respirators will be stored in a convenient, clean, and sanitary location on site.
- Respirators will be inspected during cleaning. Worn or deteriorated parts will be replaced.
- Facial hair that might interfere with a good face-piece seal or proper operation of the respirator is prohibited.
- The IT Site Manager will review the respiratory protection program daily to ensure employees are properly wearing and maintaining their respirators and that the respiratory protection is adequately protecting the employees.
- The H&S Manager and the Project Manager will evaluate the respiratory protection program monthly to ensure its continuing effectiveness.
- Respirators used for emergency response will be inspected weekly by the H&S Coordinator.

5.2 Levels of Protection

The level of protection used in the EZ is based on site specific information. Specific levels of protection will be changed whenever site conditions change. They can either be increased to the next higher level or decreased to the next lower level. If the Site Manager requests a change in levels of protection, he must contact the IT H&S Manager and Project Manager. If the need arises to protect safety and health, the Site Manager or Task Leader can upgrade protection levels without input from the H&S Manager or Project Manager. He will then discuss the decision with the H&S Manager, H&S Coordinator, and the Project Manager when they are available. Levels of protection will not be downgraded without prior approval from the H&S Manager.

5.2.1 Level A Protection

Level A Protection is not required.

5.2.2 Level B Protection

Level B Protection is not expected to be required. Level B Protection will be required if airborne concentrations of toxic contaminants exceed the action levels established in Table 3 for Level C protection. The H&S Manager will be notified when the decision is made to upgrade to Level B.

5.2.3 Level C Protection

Level C protection will be required if airborne concentration of suspected contaminants exceed the action levels established in Table 3 for Level D protection.

The following equipment will be used for Level C protection:

- Full face, air purifying respirators with organic vapor cartridge in combination with high efficiency particulate air (HEPA) filter which are National Institute of Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA) approved
- Hooded one piece suit, polyethylene coated Tyvek or equal, taped at gloves and boot covers
- Gloves (Outer) - chemical resistant polyvinyl chloride (PVC), neoprene, nitrile, or other impermeable material (If leather or canvas outer gloves are used, they will be disposed at the end of each shift)
- Gloves (Inner) - chemical resistant (latex)
- Boots (Outer) - chemical resistant steel-toed boots, Neoprene, PVC, with or without booties (Disposable boot covers when working in or near contaminated soil, debris or dust make decontamination easier)
- Hard hat
- Hearing protection (if necessary)
- Back support belt (if necessary).

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5.2.4 Level D Protection

The minimal level of protection that will be required of IT personnel and subcontractors at the site will be Level D. Level D protection will be worn while digging trenches for the installation of buried pipelines and electrical lines, during plant construction, within treatment plant containments, and during the installation of monitoring/groundwater recovery wells so long as airborne concentrations of toxic contaminants do not exceed the action levels established in Table 3. The following equipment will be used for Level D protection:

- Coveralls or work clothing
- Boots/shoes - with steel toes, latex overboots if area is heavily contaminated
- Safety glasses or goggles
- Work Gloves
- Hard hat
- Hearing protection (if necessary)
- Back support belt (if necessary).

5.2.5 Modified Level D Protection

Modified Level D protection is similar to Level C except for no respirator. This level of protection offers skin and slash protection above the protection offered by Level D. The Site H&S Officer will determine when to institute Modified Level D protection. Modified Level D protection will be worn during site operations that include fuel handling, acid washing, acid storage tank filling, and other work involving hazardous chemicals, so long as airborne concentrations of toxic contaminants do not exceed the action levels established in Table 3. The following equipment will be used for Modified Level D protection:

- Coveralls or work clothing
- Hooded one piece suit, polyethylene coated Tyvek or equal, taped at gloves and boot covers.
- Boots/shoes - with steel toes, latex overboots if area is heavily contaminated
- Safety glasses or goggles

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- Chemical resistant nitrile or PVC protective gloves with surgical latex undergloves as necessary
- Hard hat
- Hearing protection (if necessary)
- Back support belt (if necessary).

5.2.6 Selection of PPE

The selection of the PPE will be done after a thorough evaluation of the hazards involved at the site during each phase of the operation. Table 2 describes the PPE required for each task and Table 3 describes the action levels for upgrading.

5.3 Using PPE

All persons entering the EZ will don the required PPE according to established procedures in this plan to minimize exposure potential. When leaving the EZ, PPE will be removed according to these established procedures to minimize the spread of contamination.

5.3.1 Donning Procedures

- Put on coveralls
- Put on boots and boot covers and tape the coveralls, tape in containment area
- Put on gloves
- Tape the coveralls over the gloves at the wrist
- Don respirator and check for secure fit, if using level C
- Put hood or head covering over the respirator, if using level C
- Put on remaining protective equipment, i.e. hard hat, safety glasses, etc.

One person will remain outside the work area to check that each person entering has the proper protective equipment. No persons will be allowed to enter an EZ improperly attired.

5.3.2 Doffing Procedures

Whenever a person leaves the work site, the following proper decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated mud and debris from boots or remove boot covers.

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- Clean reusable protective equipment.
- Remove protective garments and equipment. All disposable clothing should be placed in plastic bags and labeled as contaminated waste.
- Remove outer gloves.
- Remove respirator.
- Remove inner gloves.
- Proceed to the clean area and dress.
- Clean respirator and prepare for next use.
- Proceed to the sign out point.

All disposable equipment, garments, and PPE will be bagged in two 6 mil plastic bags and properly labeled for disposal.

5.4 Selection Matrix

The PPE required for each task is outlined in Table 2.

6.0 Site Control

Site control requires establishing specific measures to prevent unauthorized entry onto the site and to protect all personnel entering the site from recognized safety and health hazards. The following measures are mandatory:

- Authorization to Enter
- Hazard Briefing
- Documentation of Certificates
- Entry Log
- Entry Requirements
- Emergency Entry and Exit.

6.1 Authorization to Enter

No IT employee or subcontractor will be admitted onto AFP4 without satisfactory proof of United States citizenship or without specific authorization from the appropriate Air Force or USACE representative.

The Project Manager, Senior Project Engineer, Senior Project Hydrogeologist, or Site Manager may grant authorization to enter the site. Access to contaminated work areas is regulated and limited to authorized personnel. Only those who have completed the required training and medical requirements will be allowed to enter. Representatives from regulatory agencies will be permitted to enter the site at any time during business hours or at other reasonable times, by appointment, to conduct official business provided they have completed the required training and medical requirements. Representatives of the news media and other visitors must receive authorization from the client and the IT Project Management Team before entry.

6.2 Hazard Briefing

The H&S Coordinator will brief this H&S Plan to all personnel entering the site to inform them of potential site H&S hazards and procedures specific to this site. All personnel will acknowledge this briefing by signing the H&S Plan. This briefing will be further documented in the site daily log.

6.3 Documentation of Certificates

Personnel entering the site to work will have satisfied the medical and training requirements of 29 CFR 1910.120. The project file will contain copies of certificates documenting status for all on-site personnel. Personnel not entering the EZs need not meet the above requirements. The Site Manager will accommodate requests from representatives of regulatory agencies to review documentation. All visitors must present documentation of current training and medical status before being granted authorization to enter the EZ.

6.4 Entry Log

The Site Manager keeps a daily roster of all on-site personnel and records the time of entry into and exit from the EZ for each person.

6.5 Entry Requirements

All personnel entering work or EZs will use the proper PPE. All personnel entering EZs will enter and exit through the decontamination units and observe the mandatory decontamination procedures.

6.6 Emergency Entry and Exit

During emergencies, decontamination will be conducted to the extent that is possible without endangering personnel. All persons responding, both on site and off site, will be informed of site safety and health hazards and health hazards associated with contaminated personnel.

7.0 Decontamination

7.1 Contamination Control Zones

The H&S Coordinator will establish contamination control zones for the project based on the location of contamination, drilling activities, accessibility, and site control. These zones must be clearly marked and defended against unauthorized entry.

7.1.1 Exclusion Zone

An EZ is the area where contamination does or could occur during site activities. This zone has the highest potential for exposure to the contaminants by contact or inhalation. All employees will use proper PPE when working in these areas. The EZ will be a defined area where there is a possible respiratory and/or contact health hazard. In most instances this area will be a 20-foot radius around the drill rig or other site activity within the containments of the treatment plants. The location of the EZ will be identified by printed hazard tape or other appropriate means. At treatment plants, the EZ will be the area within the containment. For Landfills 4 and 5, the plant fence will act as the EZ boundary.

7.1.2 Contamination Reduction Zone

A CRZ will be established and decontamination will be performed in the CRZ. All personnel entering or leaving the EZ will pass through this area in order to prevent any cross-contamination and for the purpose of accountability. Tools and any equipment or machinery will be decontaminated on site (CRZ) prior to personnel decontamination. Decontamination of all large equipment will be performed on site (CRZ) prior to personnel decontamination. The decontamination of all personnel will be performed on site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and properly labeled. Routine treatment plant operations will not have a CRZ. Tools and equipment will be cleaned within the containment. The area within the plant containment by the sump will act as a CRZ. At other plants without containment, the CRZ will be within the plant area by the exit.

7.1.3 Support Zone

Support zones (SZ) are established in uncontaminated areas and are used for the storage of supplies and general administrative functions. The SZ will be located to prevent employees

from being exposed to any organic vapors or dust levels above regulatory limits. Eating, drinking, or smoking will be permitted in the SZ only after washing face and hands.

During field operations, warnings signs or barrier tape will be affixed in readily visible locations to delineate the EZ, CRZ, and SZ.

7.2 Decontamination General Rules

- An area outside of the EZ will be designated as the break area. Employees will proceed through personal decontamination before eating, drinking, or smoking. No eating, drinking, or smoking will take place in the EZ.
- The H&S Coordinator will monitor the effectiveness of the decontamination procedures and, if ineffective, will take appropriate steps to correct any deficiencies or modify the plan as needed.
- Used coveralls, gloves, and overboots will be dropped into a bag-lined garbage can for disposal at an approved facility.
- Spent disposable respirator cartridges will be dropped into a bag-lined garbage can.
- Clean respirators, hard hats, goggles, and face shields will be placed on the work table at the clean end of the zone.
- Soiled boots, hard hats, respirators, and other equipment will be inspected daily, washed and scrubbed in a detergent/water solution. After cleaning, equipment will be rinsed thoroughly in water and allowed to dry on a clean surface.
- If there is a rip or tear in the employee's protective clothing, that individual will remove the torn garment in the decontamination area and new protective clothing will be issued in order for the employee to return back to work. The same procedure will apply to defective respiratory equipment.

7.3 Equipment Decontamination

The purpose of the CRZ is to limit the spread of contamination by contaminated personnel, tools, equipment, and materials from the EZ. Any person, tool, equipment, or material from inside the EZ will be considered contaminated and must be cleaned before leaving the work site. Decontamination of all large equipment will be performed on site (prior to personnel decontamination). Verification that all equipment has been properly decontaminated will be

the responsibility of the site Project Superintendent and the H&S Coordinator. All contaminated solvents and waters generated from the cleaning operation will be collected and containerized for disposal.

Decontamination can be accomplished by any one, or combination, of the following methods:

- Contaminant removal: Water rinse, steam jet, leaching, or scrubbing
- Detoxification: Halogen stripping, neutralization, or thermal degradation
- Disinfection: Chemical, dry heat, gas/vapor or irradiation.

7.4 PPE Decontamination

At least one person will remain outside the work area to assist decontaminating personnel in the CRZ.

Whenever a person leaves the work site, the following proper decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated mud, etc. from boots or remove boot covers.
- Remove protective garments and equipment. All disposable clothing should be placed in plastic bags and labeled as contaminated waste.
- Reusable protective equipment must be cleaned at the job site.
- Remove respirator after contaminated outer wear has been removed and after showering.
- Proceed to the clean area and dress.
- Clean respirator and prepare for next use.
- Proceed to the sign out point.

All disposable equipment, garments, and PPE will be bagged in two 6 mil plastic bags and properly labeled for disposal at the job site.

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7.5 Decontamination During Medical Emergencies

The IT On-site H&S Coordinator or emergency-care provider will quickly assess the extent of the injury or illnesses to determine if life-saving medical treatment is crucial or if the decontamination procedures will create additional injuries and aggravate the existing condition. Under such circumstances, decontamination procedures will be greatly modified, simplified, or eliminated completely.

Life threatening injuries will be attended to immediately. Respiratory equipment must be removed and outside garments can be removed or cut away if it does not cause delays in treatment or cause further injury to the individual. Care will be taken to minimize the spread of contamination to emergency response personnel and transport vehicle by placing towels, blankets, or plastic beneath the victim.

8.0 Site Monitoring

8.1 Air Monitoring

Measurements of airborne VOC will be conducted in the work area by using an HNu photoionization analyzer or equivalent to indicate exposure levels. VOCs will be monitored in the breathing zones of employees. During drilling operations and new plant testing activities colormetric tubes will be used to assess the presence of benzene and vinyl chloride.

Measurements of oxygen and combustible gases will be made using a combination oxygen/combustible gas monitor during intrusive activities and in accordance with confined space entry procedures.

All air monitoring equipment will be maintained and calibrated according to the manufacturer's recommendations. Calibration will be done before and after use each day. All work activity is prohibited in atmospheres where tests indicate the concentration of flammable vapors exceeds 10 percent of the LEL. Such an area will be ventilated to reduce the concentration to an acceptable level.

Air monitoring will be completed each time a well is opened for water level monitoring. During drilling operations, air monitoring will be completed continuously. Air monitoring will be done prior to each confined space entry. The Site H&S Coordinator will determine any change or addition of the air monitoring events.

On-site personnel must wear monitoring equipment as instructed by the H&S Coordinator and refusal to wear monitoring equipment, or intentional tampering with sampling apparatus, will lead to immediate dismissal from the job site.

8.2 Other Hazardous Conditions

The H&S Coordinator will take affirmative action to limit exposures. If unknown chemicals or contamination are encountered, operations will cease until the situation is evaluated. The H&S Coordinator will contact the H&S Manager to evaluate any potentially hazardous situations, or any situation with elevated contamination levels. Operations will only be resumed if they can be accomplished in a safe manner.

8.3 Noise Monitoring

Noise monitoring will be conducted as required using a Quest 2400 noise meter or equivalent. Hearing protection is mandatory for all employees in noise hazardous areas or when operating heavy equipment or near active aircraft operations.

8.4 Record Keeping

The on-site H&S Coordinator or his designee will be responsible for establishing and maintaining records of all required monitoring as described below:

- Date, time, pertinent task information, exposure information
- Description of the analytical methods, equipment used, calibration data
- Type of PPE worn
- Engineering controls used to reduce exposure.

8.5 Notification

Employees who are exposed to hazardous and toxic materials at job sites will be notified of the results of the industrial hygiene monitoring conducted at the site in accordance with IT procedure HS104.

9.0 Employee Training

IT trains all field personnel according to 29 CFR 1910.120 before their initial assignment to any project. All field employees receive a minimum of 40 hours of training off site and a minimum of 3 days of actual field experience under the direct supervision of a trained, experience supervisor. Subcontractor personnel must meet the above training requirements. Personnel, including subcontractors, whose activities are limited to nonhazardous activities within the work zone complete 24 hours of training off site and 8 hours of on-site training. For non-hazardous construction work and some non-intrusive actions, this training may not be required. only the H&S Manager can exempt personal and contractors from training requirements.

On-site management and supervisors receive a minimum of 8 hours of additional training on program supervision. Each hazardous waste operations employee receives 8 hours of refresher training annually.

IT provides each employee who completes the required 40 hours of classroom training and 3 days of field experience with a certificate signed by the instructor. A copy of the certificate is maintained with the project files and in the IT H&S Office. Subcontractors must provide certificates of training for the project file for all employees assigned to the project. All visitors, including any government representatives, entering the CRZ or EZ must also provide certificates of appropriate training.

9.1 Pre-entry Briefings

The following training sessions and informational materials are provided at each project site:

- Tailgate Safety Meetings
- MSDS
- H&S Plans.

9.1.1 Tailgate Safety Meetings

The Site Manager or a designee conducts a tailgate safety meeting the beginning of each shift or whenever new employees arrive at the job site once the job commences. The topics discussed at the tailgate safety meeting include H&S considerations for the day's activities, necessary protective equipment, problems encountered, and new operations. Attendance records and meeting notes are maintained with the project files.

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9.1.2 Material Safety Data Sheets

MSDSs will be obtained for every chemical product used on site. This information will be made readily available to all employees upon request and stored in a central location.

9.1.3 Health & Safety Plans

IT prepares a site specific H&S Plan for each project falling within the scope and application of 29 CFR 1910.120. The H&S Coordinator presents the H&S Plan and discusses it with everybody assigned to the project. All workers and visitors must read and sign the H&S Plan acknowledging acceptance of site rules and understanding of site hazards before entering.

9.2 Site Workers Basic Course

Following is a general list of topics covered in the 40-hour course:

- General site safety
- Physical hazards (fall protection, noise, heat stress, cold stress)
- Names and titles of key personnel responsible for site safety and health
- Safety, health and other hazards present at the site
- Use of PPE
- Work practices by which employees can minimize risks from hazards
- Safe use of engineering controls and equipment on site
- Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards
- Worker Right-to-Know (Hazard Communication)
- Routes of exposure to on site contaminants
- Engineering controls and safe work practices
- Components of the site H&S Program
- Decontamination practices for personnel and equipment

- Confined-space entry procedures
- Emergency Response Plan (ERP).

9.3 Supervisors Course

Management and supervisors receive an additional 8 hours of training which includes:

- General safety and health program
- PPE program
- Spill containment program
- Air monitoring techniques.

9.4 First Aid and CPR

Employees will receive instruction in Red Cross first aid and CPR techniques from qualified instructors.

9.5 Instructors

The IT Training Division, headquartered in Irvine, California, teaches the 40-hour classes using certified instructors. When training needs exceed the capacity of the Training Division, IT uses outside institutions. IT Training Division is recognized by the EPA and listed in the Federal Register (53 FR 3982). Only similarly recognized outside training institutions are used.

9.6 Site-Specific Training

All site personnel will be trained in excavation safety, if required. Training in confined-space entry is required only for those personnel entering a confined space. All confined-space entries will be authorized by the on-site H&S Coordinator.

10.0 Medical Surveillance

10.1 Medical Examination

As required by IT Policy and Procedure HS100, all personnel on site will have successfully completed a preplacement or periodic/updated physical examination.

10.1.1 Preplacement Exam

This examination has been designed to meet 29 CFR 1910.120 requirements for hazardous waste site operations.

The IT medical surveillance program examination consists of:

- Medical and occupational history questionnaire which includes information on past gastrointestinal, hematologic, renal cardiovascular, reproductive, immunological, and neurologic problems
- Physical examination
- Blood pressure measurements
- Complete blood count (CBC) and differential to include hemoglobin and hematocrit determinations, red cell indices, and smear of peripheral morphology
- Blood urea nitrogen and serum creatinine
- SMAC 24
- Chest x-ray
- Pulmonary function test
- Audiogram
- EKG for employees over 35 years old or when other complications indicate the necessity
- Drug and alcohol screening
- Visual acuity.

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The following information is provided to the examining physician:

- Description of employee's duties
- Anticipated chemical and asbestos exposure and levels
- Description of the PPE to be used
- Information from previous medical exams.

The medical surveillance provided to the employee includes a judgment by the medical examiner of the ability of the employee to use either positive- or negative-pressure respiratory equipment. Any employee found to have a medical condition which could directly or indirectly be aggravated by exposure to these chemical substances or by the use of respiratory equipment will not be employed for the project. A copy of the medical examination is provided at the employee's request.

The employee will be informed of any medical conditions that would result in work restriction or that would prevent them from working at hazardous waste sites.

Subcontractors will certify that all their employees have successfully completed a physical examination by a qualified physician on the Certification Form (Attachment B). The physical examinations will meet the requirements of 29 CFR 1910.120 and 29 CFR 1910.134.

Subcontractors will supply copies of the medical examination certificate for each on-site employee. All visitors, including any government representatives, entering the CRZ or EZ must also provide appropriate medical credentials.

10.1.2 Annual Exam

All IT employees receive an annual update exam meeting the requirements of 29 CFR 1910.120. The results of these exams are compared to previous results and the baseline physical to determine if any effects due to exposure have occurred. Appropriate actions are taken as recommended by the physician should the results indicate an exposure; otherwise, employees are cleared for continued work.

10.1.3 Exit Exam

IT offers exit physical exams for all employees involved in the medical surveillance program who are leaving the company for any reason to ensure they are in good health.

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10.2 First Aid and Medical Treatment

Employees are trained in Red Cross first aid treatment skills and IT retains a local medical clinic for all of its offices. Employees have access to the clinic at any time during their working hours should an occupational injury or illness occur.

10.3 Medical Restriction

Should an occupational injury or illness occur that restricts an employee's ability to function at full capacity, IT maintains a policy of providing these employees with light duty assignments whenever possible to allow them to continue to be productive.

10.4 Medical Records

Medical and personal exposure monitoring records will be maintained according to the requirements of 29 CFR 1910.20 and will kept for a minimum of 30 years. Employee confidentiality will be maintained.

11.0 Emergency Procedures

IT develops each H&S plan to allow hazardous waste operations to proceed without adverse impacts on the safety and health of the worker, the environment, and the community. In addition, supplementary ERPs have been developed to cover extraordinary conditions that might occur at various sites.

11.1 General

The Site Manager and H&S Coordinator will establish evacuation routes and assembly areas for the site. All personnel entering the site are informed of these routes and assembly areas. If the evacuation routes are not clear, a site plan will be prepared marking the evacuation routes and will be posted at conspicuous locations.

The Site Manager and H&S Coordinator will evaluate the site for the potential for fire, explosion, chemical release, or other catastrophic events. As part of the training, site workers are instructed to report unusual events, activities, chemicals, and conditions to the Project Superintendent.

11.2 Emergency Response

The objective of emergency response actions is to minimize adverse health risks to site workers, the environment, and the local community. The H&S Coordinator or the Site Manager will be the site emergency coordinator.

Responsibilities. The site emergency coordinator will have the responsibility for directing the response activity in the event of an emergency. The responsibilities are described below:

- Assess the emergency situation and notify site security personnel
- Determine the required response measures and inform the Client contact
- Notify the appropriate response teams of the specific action that will be taken upon request
- Determine and coordinate the on-site personnel actions for the particular emergency situation
- Contact and coordinate with appropriate governmental or regulatory agency

- Act as liaison between responding agencies and site personnel
- Immediately complete the Supervisor Injury Report form upon occurrence of an accident or incident
- The emergency coordinator will notify the Project Manager and the H&S Coordinator of any incident.

The emergency coordinator has the authority to commit resources as needed to contain and control released material and to prevent its spread to off-site areas.

11.3 Safety Signals

Vehicle, tractor, and portable gas-operated horns are used for safety signals as follows:

- 1 Long Blast: Warning alarm - prepare for Emergency Response
- 2 Short Blasts: Activation alarm - initiate Emergency Response activities as directed by Emergency Coordinator
- 3 Short Blasts: All clear - return to normal activities.

11.4 Medical Emergency

Emergency medical personnel will be summoned without delay in the event of a medical emergency. The emergency coordinator will stay on the line with the 911 Operator until the 911 Operator hangs up.

Worker Injury. If a person working in an area is physically injured, American Red Cross first-aid procedures will be followed. Depending upon the severity of the injury or illness, emergency medical response may be obtained accordingly. If the person can be moved, that person will be taken to a location where emergency first aid treatment can be administered. The local emergency medical facility should be contacted along with an ambulance.

If the injury to the worker is of chemical nature, the following first-aid procedures will be instituted as soon as possible:

- **Eye Exposure** - If contaminated material gets into the eyes, the eyes will be flushed immediately at the eyewash station using copious amounts of water while lifting up the lower and upper eyelids.

- **Skin Exposure** - If contaminated sludge or corrosive liquid material gets on the skin, the affected area will be washed with soap or mild detergent.
- **Inhalation** - If an individual inhales a volume of toxic or corrosive vapors, the employee will be removed to fresh air at once. If breathing has stopped, artificial respiration will be performed on the affected individual until medical attention can arrive on scene and transport the patient to the nearest medial facility.
- **Ingestion** - In the event a person ingests a toxic liquid or solid material, medical attention will be obtained at once.

11.5 Reporting Injuries and Illnesses

Employees will report all injuries to their supervisor immediately and report illnesses as soon as the employee knows he/she is sick. Supervisors will submit completed "Supervisor's Report of Injury" to the IT H&S Department within 24 hours of the occurrence. If there is any indication that the illness is work-related, the supervisor will submit a completed "Supervisor's Report of Injury" to H&S Department within 24 hours after notification by the employee.

11.6 Emergency Information

11.6.1 Public Agencies

- | | | |
|----------------------------------|------------------------------------|----------------|
| • FIRE* | Lockheed Fire Department | (817) 777-2174 |
| | White Settlement Fire Department | (817) 246-1761 |
| | Fort Worth Fire Department | (817) 922-3000 |
| | NAS Fort Worth JRB Fire Department | (817) 782-6330 |
| • POLICE* | Lockheed Police Department | (817) 777-4522 |
| | White Settlement Police Department | (817) 246-7070 |
| | Fort Worth Police Department | (817) 335-4222 |
| | NAS Fort Worth JRB Security | (817) 782-5200 |
| • NATIONAL SPILL RESPONSE CENTER | | (800) 424-8802 |

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- HOSPITAL Robert L. Thompson Hospital (817) 782-4000
 Osteopathic Medical Center of Texas (817) 731-4311
 Emergency (817) 735-3100
- AMBULANCE* 911

*White Settlement and Fort Worth Police and Fire will respond to a 911 call.

Hospital location map (See Attachment A-1).

11.6.2 Key IT Personnel

<u>Position</u>	<u>Name</u>	<u>Contact Phone Number</u>
IT Program Manager	Willy Heisey	(412) 372-7701
IT Project Manager	Victor Dozzi	(412) 858-3960
IT Program H&S Manager	Warren Houseman	(412) 372-7701
IT Site Manager	Dave Corden	Office (817) 732-8176 Mobile phone (817) 480-0541 Pager 1-800-978-5679
IT Senior Project	Rick Wice	(412) 858-3309
Hydrogeologist/Health & Safety Coordinator		Pager 1-800-978-5677

11.6.3 Key USACE Personnel

<u>Position</u>	<u>Name</u>	<u>Contact Phone Number</u>
Project Engineer	Scotty Fiehler	(918) 669-7505
Chief Safety Officer	Bob Vandergriff	(918) 669-7360 (918) 669-7505
Chief Quality Control	Jim McDonald	Home (918) 342-3264
Air Force Projects Engineer	Theresa Pannel	(817) 334-2992

Note: Mr. Fiehler is primary USACE Tulsa District contact. Mr. McDonald is to be contacted if injury is serious or life threatening, or property damage is over \$125,000.

11.6.4 Key U.S. Air Force Aeronautical Center Personnel

<u>Position</u>	<u>Name</u>	<u>Contact Phone Number</u>
IRP Manager	John Doepker	(513) 255-7716
Team Leader	Kamel Mardini	(513) 255-7716

TABLES

**Table 1
Exposure Guidelines**

CONTAMINANTS	OSHA PEL	ACGIH TWA	ACGIH STEL
Trichloroethylene	100 ppm	50 ppm	200 ppm
2-Hexanone	100 ppm	5 ppm	---
Benzene	1 ppm	10 ppm	---
Acetone	750 ppm	750 ppm	1000 ppm
Toluene	100 ppm	100 ppm	150 ppm
Dichlorobenzene	50 ppm	25 ppm	50 ppm
1,2-Dichloroethylene	200 ppm	200 ppm	---
1,2-Dichloroethane	100 ppm	100 ppm	---
Chloroform	50 ppm	10 ppm	---
Xylene	100 ppm	100 ppm	150 ppm
Chromium	1 mg/m ³	0.5 mg/m ³	---
Vinyl Chloride	1 ppm	5 ppm	---
Methylene Chloride	100 ppm	50 ppm	---

TREATMENT PLANT PROCESS CHEMICALS	OSHA PEL	ACGIH TWA	ACGIH STEL
Phosphoric acid	N/A	N/A	N/A
Sulfuric acid	1 mg/m ³	1 mg/m ³	3 mg/m ³
Nitric acid	2 ppm (5 mg/m ³)	2 ppm (5.2 mg/m ³)	4 ppm (10 mg/m ³)
Hydrochloric acid	5 ppm (7 mg/m ³)	Ceiling 5 ppm (7.5 mg/m ³)	N/A

Table 2 PPE Selection Matrix

Task 1: Drilling and Installation of Monitoring/Groundwater Recovery Wells (Level D and Level D Modified)

- Coveralls or work clothing
- Steel-toed boots
- Latex boot covers
- Hard hat
- Nitrile gloves (outer)
- Latex gloves (inner)
- Polycoated Tyvek in Landfills, Tyvek in other areas outside of source areas
- Duct tape openings (ankles and wrists)
- Hearing protection

Note: At times this activity may require upgrade to Level C. Site H&S Officer will determine when to upgrade PPE selection. Level D Modified will be used for splash protection, as directed by the Site H&S Officer.

Task 2: Groundwater Sampling (Level D and Level D Modified)

- Coveralls or work clothing
- Steel-toed boots
- Latex boot covers
- Safety glasses
- Hard hat
- Nitrile gloves
- Hearing protection (if necessary)
- Respiratory protection if action levels are exceeded
- Polycoated Tyvek coveralls, if using bailing or pumping equipment

Task 3: Collection of Groundwater Level Data (Level D Modified)

- Coveralls or work clothing
- Steel-toed boots
- Latex boot covers
- Safety glasses
- Hard hat
- Nitrile gloves
- Hearing protection (if necessary)
- Respiratory protection if action levels are exceeded
- Polycoated Tyvek coveralls

Table 2
PPE Selection Matrix
(continued)

Task 4: Construction of Groundwater Treatment Plan (Level D)

- Coveralls or work clothing
- Steel-toed boots/shoes
- Safety glasses
- Hard hat
- Hearing protection (if necessary)
- Leather palm gloves

Task 5: Aquifer Pumping Tests (Level D and Level D Modified)

- Coveralls or work clothing
- Steel-toed boots
- Latex boot covers, when handling water
- Safety glasses
- Hard hat
- Nitrile gloves, when handling water
- Hearing protection (if necessary)
- Respiratory protection if action levels are exceeded
- Polycoated Tyvek coveralls, when connecting piping or handling water

Task 6: Digging Trenches and Installing Buried Pipelines and Electrical Lines (Level D)

- Coveralls or work clothing
- Steel-toed boots
- Safety glasses
- Hardhat
- Hearing protection (as required)

Note: In landfill areas Level D Modified or Level C may be required. Site H&S Officer will determine when to upgrade PPE selection.

Task 7: Surveying (Level D)

- Coveralls or work clothing
- Steel-toed boots/shoes
- Safety glasses
- Hard hat
- Hearing protection (if necessary)
- Leather palm gloves

Table 2
PPE Selection Matrix
(continued)

Task 8: Operation of Groundwater Treatment Plant

5.1 Routine Inspections of Groundwater Treatment Plant (Level D)

- Coveralls or work clothing
- Steel-toed boots/shoes
- Safety glasses
- Hard hat
- Hearing protection (as required)

5.2 Sampling Influent and Effluent Water (Level D Modified)

- Coveralls or work clothing
- Steel-toed boots
- Latex boot covers
- Safety glasses
- Hard hat
- Nitrile gloves
- Hearing protection (if necessary)
- Respiratory protection if action levels are exceeded
- Polycoated Tyvek coveralls

5.3 Handling Process Chemicals (Level C)

- Coveralls or work clothing
- Steel-toed boots
- Latex boot covers
- Safety glasses
- Hard hat
- Nitrile gloves
- Hearing protection (if necessary)
- Full face respirator with suitable cartridges for possible exposure
- Acid suit

Task 9: Handling, Storage and Introduction of Materials for Acid Washing Treatment Plants

- Coveralls or work clothing
- Steel-toed boots
- Latex boot covers
- Safety glasses/splash shield
- Hard hat
- Nitrile gloves
- Hearing protection (as required)

Table 2
PPE Selection Matrix
(continued)

- Respiratory protection if action levels are exceeded
- PVC suit

**Table 3
Action Levels**

CONTAMINANT	ACTION LEVEL	LEVEL OF PPE
VOC'S	> 1 ppm above background with benzene present	C
	> 1 ppm above background with vinyl chloride present	C
	> 10 ppm above background without benzene or vinyl chloride present	C
	> 10 ppm above background with benzene or vinyl chloride present	B/Stop Work*
	> 20 ppm above background	B/Stop Work*
LEL	> 10 percent of LEL	Stop work*

*Contact with the IT H&S Manager must be made prior to continuance of work.

No one is permitted to downgrade levels of PPE without authorization of the H&S Manager.

Table 4-1
Groundwater Quality in the Windows Area
Volatile Organic Analysis Parameters

Recovery Well	Sample Date (MO/YR)	Contaminant Concentration in Groundwater (PPB)					
		Benzene	Trans-1,2-Dichloroethylene	Cis-1,2-Dichloroethylene	TCE	Methylene Chloride	
RW-1U	1/93	27	8	1,900	14,000	ND	
RW-2U	1/93	ND	ND	ND	20,000	ND	
RW-3UR	5/93	ND	ND	ND	8,100	ND	
RW-4U	5/93	ND	ND	360	3,000	ND	
RW-5U	5/93	ND	ND	480	1,600	ND	
RW-6U	5/93	ND	ND	ND	6,500	ND	
RW-7U	5/93	ND	ND	210	3,500	ND	
RW-8UR	5/93	ND	ND	ND	9,900	ND	
RW-9U	7/94	ND	6.4	290	2,300	17B	
RW-10U	7/94	ND	ND	390	3,700	ND	
RW11U	7/94	ND	6	1300	6,900	17B	
AF4-INF-2-95	2/95	ND	ND	260	12,000	ND	

Notes: Volatile organics analyzed using EPA Method 8240. (AF4-INF-2-95 is a treatment plant influent sample, EPA Method 624)

ND-not detected, B-Detected in lab blank.

**Table 4-2
Groundwater Quality in Landfill No. 3 Area
Vacuum Enhanced Pumping Test Water Samples
Volatile Organic Analysis Parameters**

Volatile Organic Parameter	Contaminant Concentration in GroundWater (ppb)	
	VEP-1 (VEP-1-1)	VEP-3&4 (VEP-3&4-1)
Vinyl Chloride	14	ND
Acetone	ND	230
1,1-Dichloroethylene	16	ND
cis-1,2-Dichloroethylene	140	71
Chloroform	7.8	ND
2-Butanone	95	21,000
Naphthalene	130	8.8

Notes: Volatile organics analyzed by EPA Method 8240.
ND-Not detected

Table 5 Toxicological Data

The following compounds are known to be present in the Windows area of AFP4. This list will be modified by the H&S Manager as site conditions warrant.

Chromium

Routes of Entry

- Highly toxic by inhalation
- Moderately toxic by ingestion and skin/eye contact

Symptoms of Exposure

- Ingestion - effects have not been well defined
- Inhalation - irritation of nose and throat, chest pain and shortness of breath
- Skin/Eye - Corrosive action on skin with moderate irritation of eyes

Trichloroethylene

Routes of Entry

- Highly toxic by inhalation and skin/eye contact
- Moderately toxic by ingestion

Symptoms of Exposure

- Ingestion - nausea, vomiting, and diarrhea
- Inhalation - headache, dizziness, vertigo, tremors, nausea, irregular heartbeat, fatigue, blurred vision, and intoxication similar to that of alcohol
- Skin/Eye - burning irritation and damage to eyes, dermatitis

Toluene

Routes of Entry

- Highly toxic by inhalation
- Moderately toxic by ingestion and skin/eye contact

Symptoms of Exposure

- Ingestion - vomiting, diarrhea, depressed respiratory capability
- Inhalation - headache, dizziness, fatigue, muscular weakness, drowsiness, incoordination
- Skin/Eye - drying, cracking, fissured dermatitis, and temporary corneal injury

Benzene

Routes of Entry

- Highly toxic by inhalation.
- Moderately toxic ingestion and skin/eye absorption.

Table 5
Toxicological Data
(continued)

Symptoms of Exposure

- Ingestion - euphoria, changes in motor activities, reduced number of blood platelets, dermatitis, and fever
- Inhalation - headache, dizziness, nausea, convulsions, and overall central nervous system depression
- Skin/Eye Contact - moderate irritability effect, erythema, burning sensation, and eye reddening and tearing

Xylene

Routes of Entry

- Moderately toxic by eye/skin contact and inhalation
- Slightly toxic by ingestion

Symptoms of Exposure

- Ingestion - mild upset stomach along with nausea, and throat irritation
- Inhalation - dizziness, drowsiness, nausea, vomiting, central nervous system depression and minor reversible effects upon liver and kidneys
- Skin/Eye Contact - severe eye irritation with reversible damage, and drying and defatting of skin which may lead to dermatitis

Cis-1,2-dichloroethylene and Trans-1,2-dichloroethylene

Routes of Entry

- Moderately toxic by eye/skin contact, inhalation, and ingestion

Symptoms of Exposure

- Ingestion - nausea, vomiting, throat irritation, CNS depression, and transient renal effects
- Inhalation - general anesthesia, narcotic effects, dizziness, nausea, frequent vomiting, CNS depression
- Skin/Eye Contact - mild irritation of skin and eyes

1,2-Dichloroethane

Routes of Entry

- Highly toxic by inhalation
- Moderately toxic by ingestion and skin/eye contact

Symptoms of Exposure

- Ingestion - drowsiness, weakness, fatigue, and headaches
- Inhalation - dizziness, drowsiness, confusion, unconsciousness, headaches and vision problems, CNS depression
- Skin/Eye - minor rash and irritation, watering of eyes, and slight burning sensation

Table 5
Toxicological Data
(continued)

Vinyl ChlorideRoutes of Entry

- Highly toxic by inhalation and skin/eye absorption
- Moderately toxic by ingestion

Symptoms of Exposure

- Ingestion - throat irritation, nausea, vomiting, and CNS depression
- Inhalation - CNS depression, lightheadedness, nausea, dulling of visual and auditory responses, mucous membrane irritation
- Skin/Eye - severe irritation of skin and eyes, skin burns by rapid evaporation and consequent freezing

Methylene ChlorideRoutes of Entry

- Highly toxic by inhalation
- Moderately toxic by ingestion and skin/eye contact

Symptoms of Exposure

- Ingestion - altered sleep time, headache, nausea, vomiting, convulsions, euphoria, changes in heart rate
- Inhalation - headache, giddiness, stupor, irritability, numbness, nausea, vomiting, hallucinations
- Skin/Eye - dry, scaly, fissured dermatitis, skin burns, and slight to moderate irritation to eyes

ChloroformRoutes of Entry

- Highly toxic by inhalation and ingestion
- Moderately toxic by skin/eye contact

Symptoms of Exposure

- Ingestion - nausea, vomiting, headache, dizziness, and other gastrointestinal effects
- Inhalation - dilation of pupils, irritation of mucous membranes, hallucinations, distorted perceptions, nausea, vomiting, dizziness, headache, fatigue, loss of reflexes
- Skin/Eye - skin burns, with moderate eye irritation

Table 5
Toxicological Data
(continued)

2-HexanoneRoutes of Entry

- Moderately toxic by inhalation and ingestion
- Slightly toxic by skin/eye contact

Symptoms of Exposure

- Ingestion - headache, nausea, vomiting, throat irritation, and dizziness
- Inhalation - unspecified eye effects, headache, nausea, or vomiting
- Skin/Eye - mild eye and skin irritation

The following process chemicals may be used for the routine operation of the groundwater treatment plant. This list of chemicals will be updated should there be a change in the process.

Phosphoric Acid (DEQUEST 2010 DEFLOCCULANT and SEQUESTRANT)Routes of Entry

- Oral - slightly toxic
- Dermal - practically non-toxic
- Eye Irritation - corrosive
- Skin Irritation - non-irritating

Symptoms of Exposure

- Ingestion - effects have not been well defined
- Eye contact - causes eye burns

MSW-110 PolymerRoutes of Entry

- Eye contact - may produce irritation upon contact with the eyes
- Skin contact - will not be absorbed through the skin in harmful amounts
- Ingestion - practically non-toxic if swallowed
- Inhalation - may be irritating to the mucous membranes of the respiratory tract

Symptoms of Exposure

- Ingestion - non-toxic
- Inhalation - breathing mist may irritate the mucous membranes of the respiratory tract
- Eye contact - may cause eye irritation
- Skin contact - not expected to cause irritation to the skin upon contact

Table 5
Toxicological Data
(continued)

Sulfuric AcidRoutes of Entry

- Inhalation - highly toxic by inhalation
- Skin and eye contact - highly toxic by skin and eye contact
- Ingestion - highly toxic - may cause injury and death

Symptoms of Exposure

- Ingestion - circulatory collapse with clammy skin, weak and rapid pulse, with shallow respirations
- Inhalation - causes coughing, sneezing, nose irritation, nose bleeds, reflex bronchospasm, shortness of breath, pulmonary edema, emphysema, and permanent changes in pulmonary function
- Skin contact - causes severe burns, tissue damage, and scarring
- Eye contact - produces deep corneal ulceration, conjunctivitis, lesions and possible blindness

Nitric AcidRoutes of Entry

- Ingestion - highly toxic upon ingestion
- Inhalation - highly toxic
- Skin contact - moderately toxic
- Eye contact - highly toxic

Symptoms of Exposure

- Ingestion - produces immediate pain and digestive tract burns followed by throat swelling, convulsions, risk of stomach perforation and possible coma
- Inhalation - symptoms may take several hours and include throat and nose irritation, cough, chest pain, difficulty breathing, salivation, giddiness, nausea, muscular weakness, ulceration of nasal mucous membranes, pulmonary edema, and chemical pneumonia
- Skin contact - is moderately irritating to severely corrosive depending on percentage of nitric acid. Burns may penetrate deeply causing ulcers. Skin may be stained yellowish brown.
- Eye contact - causes yellow discoloration of the eyes and severe burns which may result in permanent damage

Table 5
Toxicological Data
(continued)

Hydrochloric Acid

Routes of Entry

- Inhalation - highly toxic
- Ingestion - highly toxic
- Skin/Eye contact - highly toxic

Symptoms of Exposure

- Inhalation - corrosive to the respiratory tract and can cause tracheal and bronchia tissue death, cough, choking, ulceration, liquid aspiration can cause pulmonary edema, lung collapse, emphysema, and damage to the pulmonary blood vessels
- Ingestion - symptoms include gray tongue color, corrosion of mucous membranes, esophagus and stomach, nausea, vomiting, intense thirst, diarrhea, difficulty swallowing, circulatory collapse and possible death.
- Eye contact - permanent eye damage may result from splashes.
- Skin contact - causes burns and ulcerations

263037

ATTACHMENT A

263038

DRAWING NUMBER 762057-A1

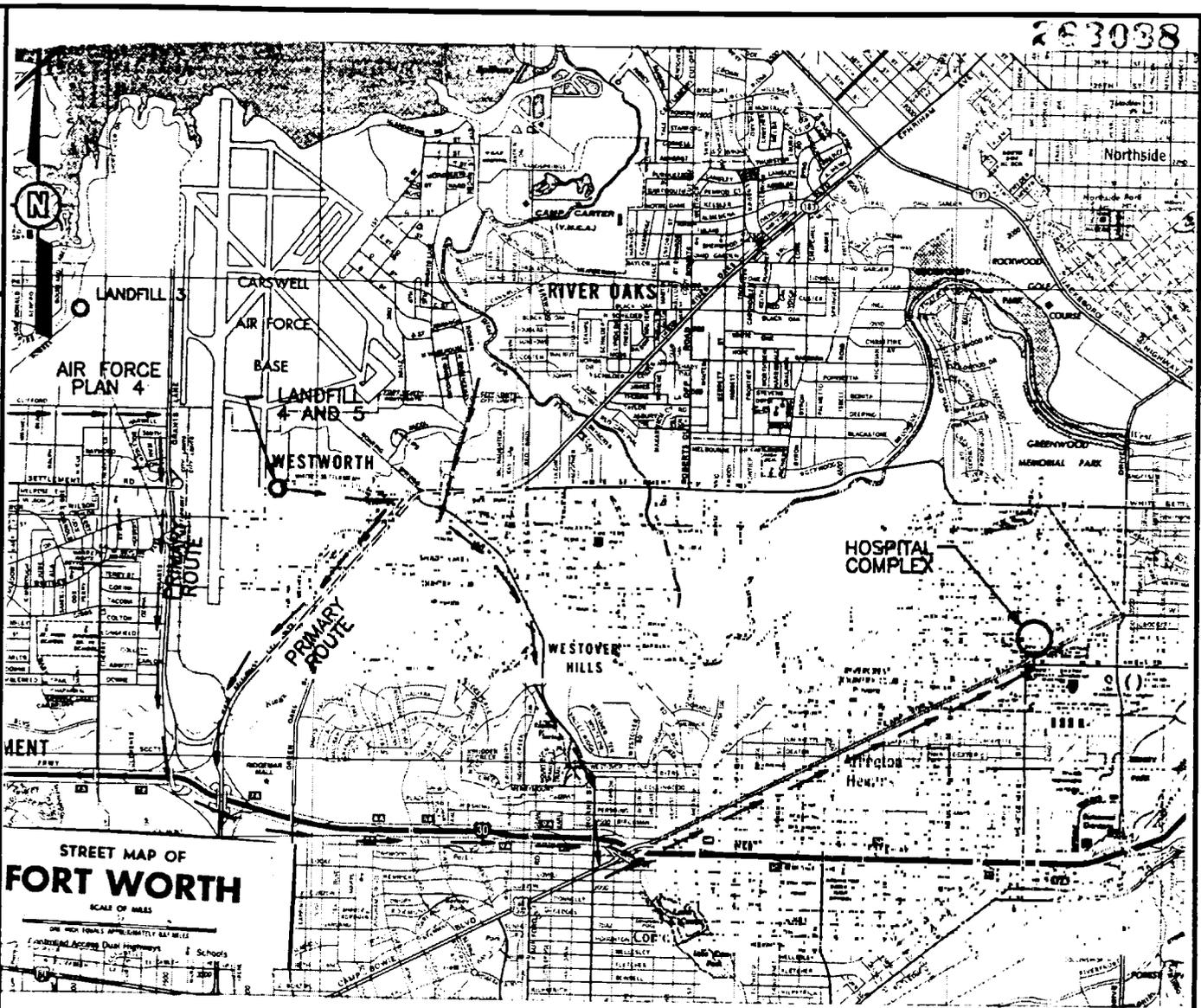
CHECKED BY

APPROVED BY

RJC

04/14/95

DRAWN BY



STREET MAP OF FORT WORTH



REFERENCE:

ATTACHMENT A-1

SITE/HOSPITAL LOCATION MAP

PREPARED FOR

AIR FORCE PLANT No. 4
U.S. ARMY CORPS OF ENGINEERS



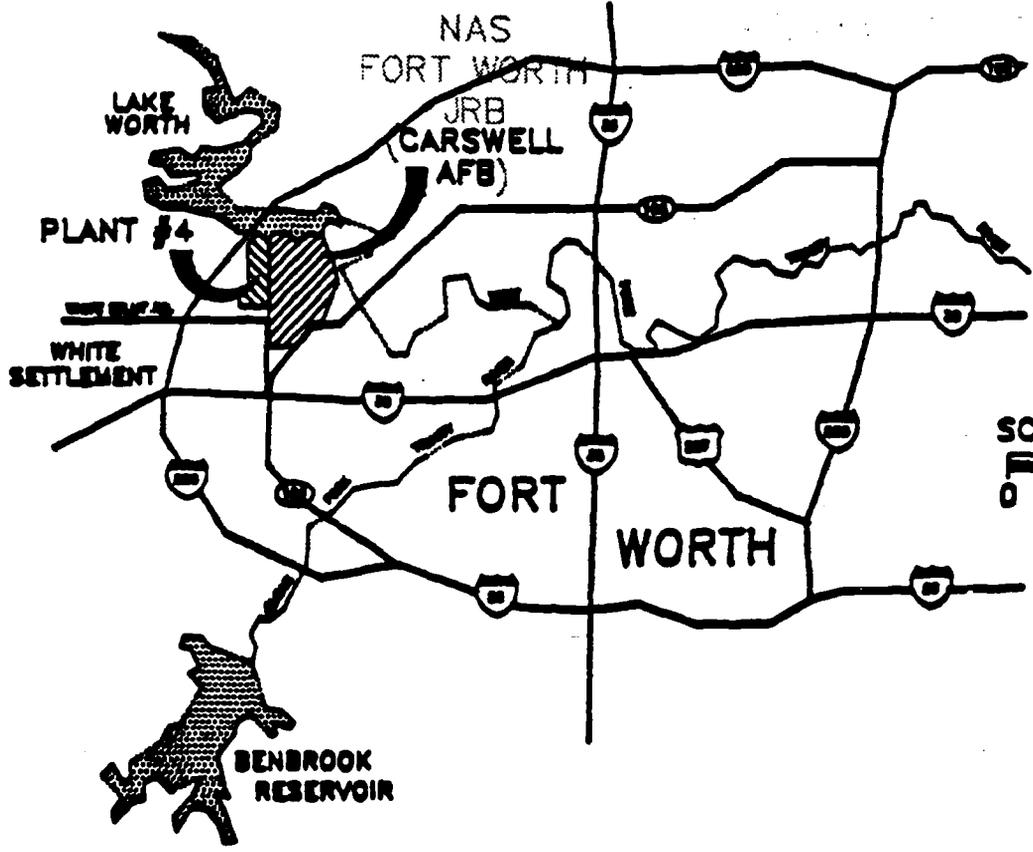
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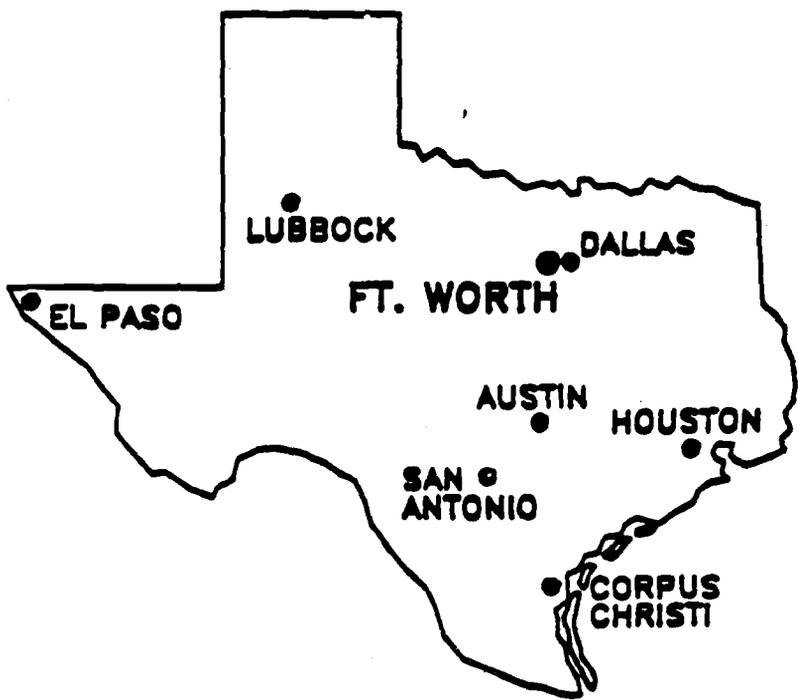
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DRAWING NUMBER 762057-A2



DRAWN BY	RJC	CHECKED BY
	04/14/95	APPROVED BY



ATTACHMENT A-2
 SITE LOCATION MAP
 PREPARED FOR

AIR FORCE PLANT No. 4
 U.S. ARMY CORPS OF ENGINEERS

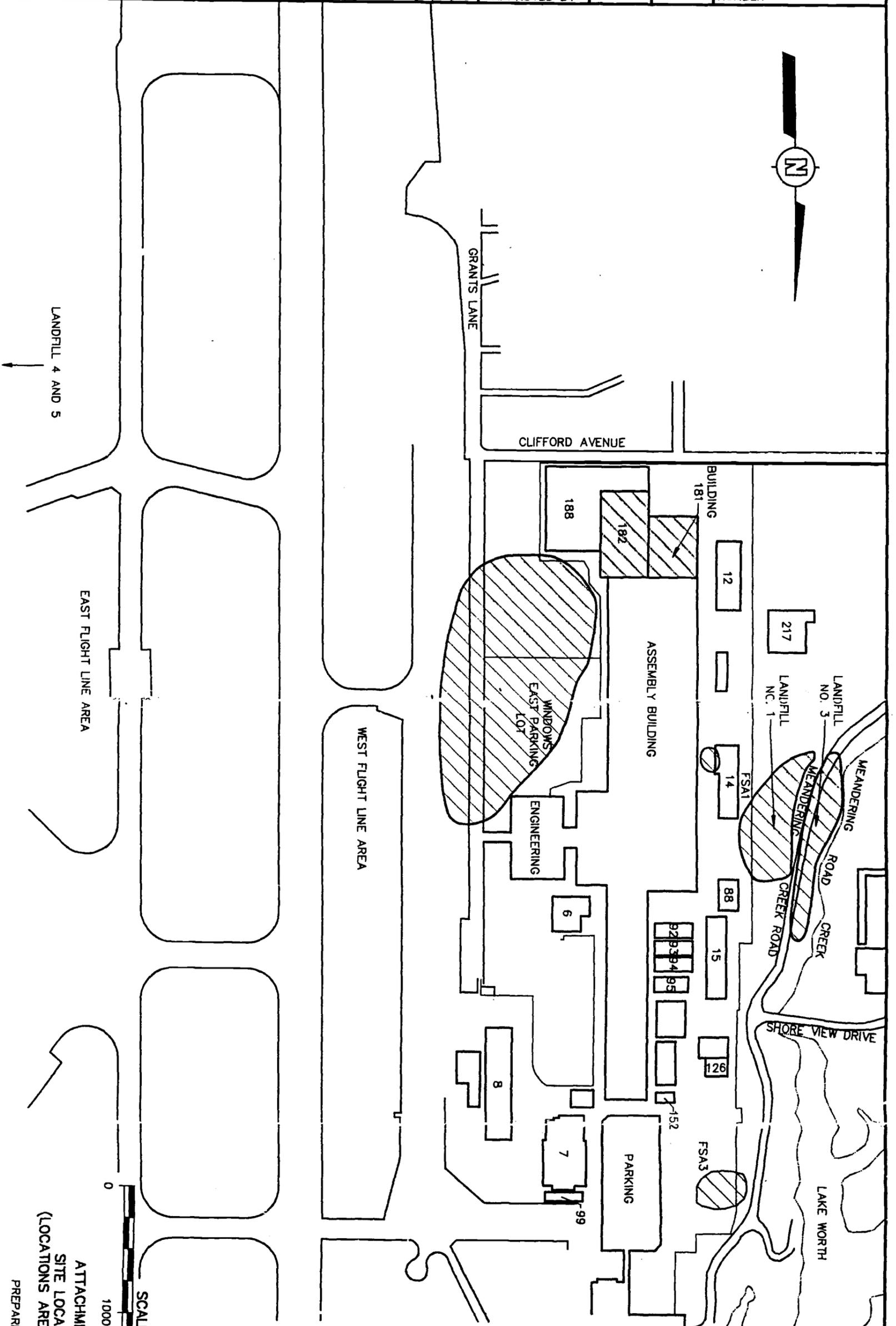


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94 AUG 95

DRAWN BY	C.J. BUREK	CHECKED BY		DRAWING NUMBER	762057-B1
	4/14/95	APPROVED BY			



NOTE:
WATER LEVEL WORK IS
A SITE WIDE ACTIVITY.

LEGEND:
 CURRENT IT PROJECTS AREA

SCALE
0 1000 2000 FEET
ATTACHMENT A-3
SITE LOCATION MAP
(LOCATIONS ARE APPROXIMATE)
PREPARED FOR

AIR FORCE PLANT No. 4
U.S. ARMY CORPS OF ENGINEERS



ATTACHMENT B

Contractor Certification

I, _____ as an agent of _____, do hereby certify that the following employees have successfully completed a 40-hour training course which complies with the provisions of 29 CFR 1910.120. Each employee has successfully completed a medical examination which complies with the above regulation.

Individual copies of certification of successful completion of the required training and medical examination are attached for each employee.

Signature

Date

ATTACHMENT C

DRILLING AND MONITORING WELL INSTALLATION

Principal Steps	Potential Hazards	Recommended Controls
Drill rig inspection	Faulty or damaged equipment being utilized to perform work	All machinery or mechanized equipment will be inspected by a competent mechanic and be certified to be in safe operating condition.
		Equipment will be inspected before being put to use and at the beginning of each shift.
		Faulty/unsafe equipment will be tagged and if possible locked out.
Drill rig staging	Uneven terrain, poor ground support, inadequate clearances, contact with utilities	Inspections or determinations of road conditions and structures shall be made in advance to assure that clearances and load capacities are safe for the passage or placing of any machinery or equipment.
		Machinery and mechanized equipment shall be operated only by designated personnel.
		Above and below ground utilities will be located prior to staging equipment.
		Whenever the equipment is parked, the parking brake shall be set. Equipment parked on inclines will have the wheels chocked.
		Inspect brakes and tire pressure on drill rig before staging for work.
Drill rig operation	Unexperienced operator	Machinery and mechanized equipment shall be operated only by designated personnel.
	Jacks/outriggers	Insure proper footing and cribbing.
	Falling objects	Hardhats, remove unsecured tools and materials before raising or lowering the derrick.
		Stay alert and clear of materials suspended overhead.
	Pinch points	Keep feet and hands clear of moving/suspended materials and equipment.
		Stay alert at all times!!!

Principal Steps	Potential Hazards	Recommended Controls
	Fire	Keep areas adjacent to derricks reasonably free from accumulation of oil, fuel, or other materials (good housekeeping).
		Have fire extinguishers inspected and readily available.
	Fall hazards	Use safety belts and lifeline when working above 6 ft.
	Noise	Hearing protection is mandatory above 85 dBA.
	Contact with rotating or reciprocating machine parts	Machine guards, use long-handled shovels to remove auger cuttings.
		Safe lockout procedures for maintenance work.
	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs require assistance or mechanical equipment size-up the lift. Recommend wearing a back support if possible.
	Slip, trip and fall hazards	Good housekeeping, keep work area picked up and clean as feasible. Continually inspect the work area for slip, trip and fall hazards.
	Contact with potentially contaminated materials	Real time air monitoring will take place. If necessary, proper personal protective clothing and equipment will be utilized.

Note: Section 4.4 of the Health and Safety Plan addresses additional safety concerns for drilling.

GROUNDWATER SAMPLING

Principal Steps	Potential Hazards	Recommended Controls
Decontamination	Cross-contamination and contact with potentially contaminated materials	Proper-decontamination procedures shall be followed.
		All liquids and materials used for decontamination shall be contained and disposed of in accordance with Federal, State and Local regulations.
		Follow good hygiene practices.
	Hazard communication	Label all containers as to contents and dispose of properly.
Moving and shipping collected samples	Heavy lifting	Any lifting of 60 lbs or more requires assistance or a mechanical lifting device.
		Follow safe lifting procedures.
	Hazard communication	Label all containers as to contents and associated hazards.
Staging equipment	Contact with moving equipment/vehicles	Area around monitoring well will be barricaded/demarcated.
		Equipment will be layed out in an area free of traffic flow.
	Cut hazards	Use care when handling any glassware.
		Wear adequate hand protection
Collect samples	Chemical contamination	Sampling technicians will wear proper protective clothing and equipment to safeguard against potential contamination.
	Hazard communication	Label all containers as to contents.
	General safety concerns	See section 3.2.2 of HASP.
	Cuts	Use care when handling glassware.
		Wear adequate hand protection
	Sprain/strains	Use caution when removing well caps.

Principal Steps	Potential Hazards	Recommended Controls
		Machinery or equipment will not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
		All repairs on machinery or equipment will be made at a location which provides protection from traffic for repair persons.
		Bulldozer and scraper blades, end-loader buckets, and similar equipment will be either fully lowered or blocked when being repaired or when not in use.
Preparation of foundation/work platform	Heavy equipment operation	All self-propelled construction equipment shall be equipped with a back-up alarm.
		Each bulldozer, backhoe, or other similar equipment will be equipped with at least one dry chemical fire extinguisher having a minimum UL rating of 5 B:C.
	Contact with underground utilities	All underground utilities shall be located and marked prior to excavation operations.
	Open excavations	IT Policy and Procedure HS307 "Excavation and Trenching" will be adhered to at all times.
Painting	Contact with or exposure to toxic materials	Hazard communication - all containers of paints, thinners, etc. shall be properly labeled and a MSDS will be kept onsite for the material.
		Proper protective clothing and equipment will be used in accordance with the MSDS
		All waste materials shall be disposed of in accordance with Federal, State and Local regulations.

GROUNDWATER LEVEL CHECKING OF WELLS AND AQUIFERS

Principal Steps	Potential Hazards	Recommended Controls
Checking levels in wells	Cut hazards	Use care when handling metal tape measure
		Wear adequate hand protection
	Chemical contamination	Sampling technicians will wear proper protective clothing and equipment to safeguard against potential contamination.
	Inhalation hazards	Check head space in wells with PID.
	Contact with moving equipment/vehicles	Area around monitoring well will be barricaded/demarcated.
		Equipment will be laid out in an area free of traffic flow.
		Use "Buddy System".
	Hazard communication	Use radios or portable phone to contact others or call for help.
	General safety concerns	See section 3.2.8 of HASP.
		Maintain MSDS of known chemicals that could present exposure risks.
	Heavy lifting	Any lifting of 60 lbs. or more requires assistance or a mechanical lifting device.
Decontamination	Cross-contamination and contact with potentially contaminated materials	Proper decontamination procedures shall be followed.

Principal Steps	Potential Hazards	Recommended Controls
Decontamination	Cross-contamination and contact with potentially contaminated materials	All liquids and materials used for decontamination shall be contained and disposed of in accordance with federal, state and local regulations.
		Follow good hygiene practices.

CONSTRUCTION OF GROUNDWATER TREATMENT PLANT

Principal Steps	Potential Hazards	Recommended Controls
Welding and Cutting	U.V. light, fire	Utilize appropriate eye protection. Provide fire watch. Obtain hot work permit. Torches must have anti-flashback device.
	Pressurized cylinders	Properly store and secure compressed gas cylinders.
Handling sharp objects	Cuts	Wear appropriate hand protection.
Grinding/sawing	Flying particles	Proper eye protection.
Working on elevated heights	Falls	Lanyards, lifelines and ladder/scaffolding safety.
	Falling objects	Overhead protection/hardhats
Material storage	Flammable and combustible liquids	Store in NO SMOKING AREA and 50 ft from combustible construction materials.
		Fire extinguisher readily available.
		Properly grounded and bonded.
	Round stock	Secure from rolling, work from the top of the stack.
Material storage	Slip, trip and fall hazards	Good housekeeping
	Sprains and strains	Safe lifting procedures
	Pinch points/cuts	Adequate hand protection and observation of contact points.
	Hazard communication	Proper labeling/MSDS's
Hoisting equipment and materials	Suspended loads	Taglines, inspect ropes, slings and chains. Load testing/equipment inspection signal persons "Do not walk or work under suspended loads".
Assembly	Pinch points/cuts	Adequate hand protection and observe contact points.
	Electrical hand tools/electrocution	Ground fault circuit interrupters inspect extension cords, hand tool inspection, lockout - tagout procedure.

Principal Steps	Potential Hazards	Recommended Controls
	Contact with glues, solvents etc.	Be familiar with the materials you are working with. (MSDS's)
	Noise	If noise levels exceed 85 dbls wear hearing protection.
Assembly	Heavy lifting	Safe lifting procedures. Loads over 60 lbs require assistance or mechanical lifting device.
	Slip, trip and fall hazards	Good housekeeping
	Confined spaces	Follow IT Corporation H&S 300 Policy and Procedure.
	Excavation and trenching	Follow IT Corporation HS 307 Policy and Procedure.
	Hot work	Hot work permits
Preparation of foundation/work platform	Heavy equipment operations	Before any machinery or mechanized equipment is placed into service, it shall be inspected and tested by a competent mechanic and certified to be in a safe operating condition.
		Equipment shall be inspected before being placed into service and at the beginning of each shift.
		Preventative maintenance procedures recommended by the manufacturer shall be followed.
Preparation of foundation/work platform	Heavy equipment operations	A lockout - tagout procedure shall be used for equipment found to be faulty or undergoing maintenance.
		Machinery and mechanized equipment shall be operated only by designated personnel.
		Getting off or on any equipment while it is in motion is prohibited.
		Machinery or equipment requiring an operator shall not be permitted to run unattended.

Principal Steps	Potential Hazards	Recommended Controls
		Machinery or equipment will not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
		All repairs on machinery or equipment will be made at a location which provides protection from traffic for repair persons.
		Bulldozer and scraper blades, end-loader buckets, and similar equipment will be either fully lowered or blocked when being repaired or when not in use.
Preparation of foundation/work platform	Heavy equipment operation	All self-propelled construction equipment shall be equipped with a back-up alarm.
		Each bulldozer, backhoe or other similar equipment will be equipped with at least one dry chemical fire extinguisher having a minimum U.L. rating of 5 B:C.
	Contact with underground utilities	All underground utilities shall be located and marked prior to excavation operations.
	Open excavations	IT Policy and Procedure HS 307 "Excavation and Trenching" will be adhered to at all times.
Painting	Contact with or exposure to toxic materials	Hazard communication - all containers of paints, thinners, etc. shall be properly labeled and a MSDS will be kept onsite for the material.
		Proper protective clothing and equipment will be used in accordance with the MSDS.
		All waste materials shall be disposed of in accordance with Federal, State and Local regulations.

AQUIFER PUMPING TESTS

Principal Steps	Potential Hazards	Recommended Controls
Decontamination	Cross-contamination and contact with potentially contaminated materials	Proper-decontamination procedures shall be followed.
		All liquids and materials used for decontamination shall be contained and disposed of in accordance with Federal, State and Local regulations.
		Follow good hygiene practices.
	Hazard communication	Label all containers as to contents and dispose of properly.
Staging equipment	Contact with moving equipment/vehicles	Area around monitoring well will be barricaded/demarcated.
		Equipment will be layed out in an area free of traffic flow.
	Cut hazards	Use care when handling any glassware.
		Wear adequate hand protection
Collect groundwater	Chemical contamination	Sampling technicians will wear proper protective clothing and equipment to safeguard against potential contamination.
	Heavy lifting	Any lifting of 60 lbs or more requires assistance or a mechanical lifting device.
		Follow safe lifting procedures.
	Cuts	Use care when handling glassware.
		Wear adequate hand protection
	Sprain/strains	Use caution when removing well caps.
		Machinery or equipment will not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.

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Principal Steps	Potential Hazards	Recommended Controls
		All repairs on machinery or equipment will be made at a location which provides protection from traffic for repair persons.

DIGGING TRENCHES AND INSTALLING BURIED PIPELINES AND ELECTRICAL LINE

Principal Steps	Potential Hazards	Recommended Controls
Excavate trench	Underground utilities	All underground utilities will be located prior to excavating.
	Open trenches	IT Policy and Procedure HS307- "Excavation and Trenching" will be adhered to at all times.
	Contact with potentially contaminated materials	Real time air monitoring will take place. If necessary proper personal protective clothing and equipment will be utilized.
	Noise	Noise levels above 85 dBA mandates hearing protection.
	Equipment operations	Before any machinery or mechanized equipment is placed into service, it shall be inspected and tested by a competent mechanic and certified to be in a safe operating condition.
		Equipment shall be inspected before being placed into service and at the beginning of each shift.
		Preventative maintenance procedures recommended by the manufacturer shall be followed.
	Equipment operations	A lockout-tagout procedure shall be used for equipment found to be faulty or undergoing maintenance.
		Machinery and mechanized equipment shall be operated only by designated personnel.
		Machinery or equipment requiring an operator shall not be permitted to run unattended.

Principal Steps	Potential Hazards	Recommended Controls
Excavate trench	Equipment operations	Machinery or equipment will not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
		All machinery or equipment will be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done.
		All repairs on machinery or equipment will be made at a location which provides protection from traffic for repair persons.
	Fire	A dry chemical fire extinguisher will be readily available.
	Pinch points	Keep hands, fingers, and feet clear of moving parts.
Install pipelines and electrical line	Electrical shock	Electrical line will be installed and connected by a qualified individual.
	Heavy lifting	Any lifting over 60 lbs. requires assistance or the use of a mechanical lifting device.
	Slip, trip, fall hazards	Good housekeeping, keep work area picked up and as clean as feasible. Continually inspect the work area for slip, trip, and fall hazards. Look where you step, ensure safe footing.
	Cut hazards	Wear adequate hand protection.
	Traffic	Work area will be barricaded off.
		Personnel will wear reflective vests for high visibility.
	Hazard communication	Obtain MSDs for materials used on site. Label all containers as to contents.

OPERATION OF GROUNDWATER TREATMENT PLANT

Principal Steps	Potential Hazards	Recommended Controls
Routine Inspection	Potential uneven walking/working surfaces and trip hazards	Be sure of footing and clear path of travel.
Sampling of Influent and Effluent	Nip/pinch points and cuts	Use the proper hand tools. Wear hand protection. Use care when handling glassware.
	Chemical contamination	Sampling technicians will wear proper protective clothing and equipment to safeguard against potential contamination.
	Hazard Communication	Label all containers as to contents.
Handling of Process Chemicals	Potential uneven walking/working surfaces and trip hazards	Be sure of footing and clear path of travel.
	Heavy material handling	Utilize appropriate material handling equipment.
		Do not lift over 60 lbs. without assistance or mechanical device.
	Sharp objects and edges (burrs) on drums/pinch points	Wear prescribed PPE, wear work gloves over chemical resistant gloves.
		Inspect drums prior to handling them.
	Release of liquid under pressure	Keep an emergency eyewash/shower readily available.
		Wear prescribed PPE (Table 2).
		Inspect hoses and connections prior to startup.
	Release of liquids under pressure	Maintain adequate containment and cleanup supplies in work area.
Handling of Process Chemicals	Nip/pinch/cut/puncture (reinforcement wire in hoses) and caught by moving parts	Utilize appropriate machine guarding techniques per 29 CFR 1910.122 and EM 385-1-1, 16A, 16B, and 17A.
		Inspect hoses prior to use.
		Use barricades and signs to warn personnel away from work area.
	Contact with chemicals	Wear prescribed PPE (Table 2).

SURVEYING

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Principal Steps	Potential Hazards	Recommended Controls
Surveying	Vehicular traffic	Orange reflective safety vests will be worn by the surveying crew while working in close proximity to traffic.
	Slip, trip and fall hazards	Individuals must be aware of the terrain and look before stepping.
	Sharp objects	Individuals must be alert to sharp objects that may be lying under brush. Metal inserts may be used inside boots to make them puncture resistant.
	Poisonous plants, snakes, and insects	Individuals must be aware of the potential for these hazards to be present. Precautionary measures to be taken will be addressed in daily tailgate safety meetings.
	Heavy lifting	Any lifting over 60 lbs requires assistance of the use of a mechanical lifting device.
Falling trees	Dropping trees onto personnel	Only qualified personnel will drop trees.
		The work area shall be cleared to permit safe working conditions and an escape route planned before any cutting is started.
		Just before the tree or limb is ready to fall an audible warning shall be given to those in the area. All personnel in the vicinity shall be safely out of range.
		Employees shall work from the uphill side whenever possible.

Principal Steps	Potential Hazards	Recommended Controls
Falling trees	Dropping trees onto personnel	Prior to falling operations, the surrounding area, the shape of the tree, the lean of the tree, wind force and direction, and the location of other employees will be reviewed.
	Chainsaw operations	The chainsaw will not be fueled while running, when hot, or near open flame. The saw will not be started within 10 ft. of a fuel container.
		The operator will hold the saw with both hands during all cutting operations.
		Operators must wear eye, ear, hand, foot and leg protection.
		The chainsaw must never be used to cut above the operator's shoulder height.
		The idle speed will be adjusted so that the chain does not move when the engine is idling.
		The operator will shut off the saw when carrying it over slippery surfaces, through heavy brush, and when adjacent to personnel.
		All chainsaws on site shall have an automatic chain brake or kick back device.
	Noise	Sound levels above 85 dBA mandates hearing protection.
Clearing, brush and debris	Slip, trip and fall hazards	Individuals must survey the terrain and look before stepping.

Principal Steps	Potential Hazards	Recommended Controls
Clearing, brush and debris	Sharp objects	Individuals must be alert to sharp objects that may be lying under brush. Metal inserts may be used inside boots to make them puncture resistant.
	Poisonous plants, snakes and insects	Individuals must be aware of the potential for these hazards to be present. Precautionary measures to be taken will be addressed in daily tailgate safety meetings.
	Use of machetes	Keep other personnel clear of swing area. Use extreme caution when using.

**HANDLING, STORAGE AND INTRODUCTION OF MATERIALS
FOR ACID WASHING OF TREATMENT PLANTS**

Principal Steps	Potential Hazards	Recommended Controls
Charging acid in 30-gallon storage tank with 5-gallon containers	Contact with acid or contaminated materials	Use funnels
		Use appropriate PPE which includes full-face respirator with acid mist cartridges. Wear Saranex or two layers of polycoated Tyvek. Tape both ankles and wrists. Use hood and tape to assure no face, neck, or head parts are exposed.
		Protect concrete below tank prior to charging since HCl reacts with it.
		Real time air monitoring will take place.
		Decon or properly dispose of all equipment and empty containers that contained acid.
		Good housekeeping will be stressed to safeguard against cross contamination of near by areas and eliminate safety hazards.
		All site personnel will practice good personal hygiene by utilizing the decon facility on site. Always dispose of all "over" gloves.
		The work area will be demarcated. All unnecessary personnel will be kept out of the work area and in an upwind location.
	Noise	Noise levels above 85 dBA mandates hearing protection.
	Slip, trip and fall hazards	Good housekeeping, keep work area picked up and as clean as feasible. Continually inspect the work area for slip, trip and fall hazards.
	Pinch points	Keep feet and hands clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times!

Principal Steps	Potential Hazards	Recommended Controls
Charging acid in 30-gallon storage tank with 5-gallon containers	Strains and sprains/ heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs requires assistance or mechanical equipment. Size up the lift. Recommend wearing a back support if possible.
		Use the proper tool for the job being performed.
		Get assistance if required.
		Avoid twisting/turning while lifting materials.
	Cut hazards	Wear adequate hand protection.
	Falling objects	Hardhats, remove unsecured tools and materials before operating equipment.
		Stay clear of materials suspended overhead.
	Biological hazards - bees, spiders, and snakes	Inspect the work area carefully and avoid placing hands and feet into concealed areas.
	Working at elevated heights/falls	Personnel working at heights of 6 feet or more must be secured with fall protection.
	Fire	Real time air monitoring will take place to determine oxygen content and lower explosive limit.
		No smoking or open flames within 50 ft. of the work area. (work area will be posted)
		Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
		All hoses, couplings, fixtures etc. shall be properly bonded and grounded.
	Fire	IT Corporation's HS314 "Hot Work in Hazardous Locations" Policy and Procedure shall be adhered to at all times.
	Electrical safety	Electrical equipment will be locked out and tagged.
	Staging equipment	Signal person will assist in positioning equipment.

Principal Steps	Potential Hazards	Recommended Controls
Charging acid in 30-gallon storage tank with 5-gallon containers	Ladders	Ladder safety will be discussed at the Morning Tailgate Safety Meeting.
		Ladders will be inspected prior to each use.
		Faulty ladders will be tagged and taken out of service.
		Ladders will be secured by top, bottom, and intermediate fastenings as required.
		Personnel working at heights of 6 feet or more must be secured with fall protection (safety belt/lanyard).
	Unattended worker	"Buddy System" - visual contact will be maintained with personnel engaged in the transfer/removal of the acid tank contents.
	Structural collapse	Inspect the integrity of the acid tank before climbing or working on it.
	Lighting	Adequate lighting will be provided to ensure a safe working environment.
	Slip, trip, and fall hazards	Determine best access route before transporting materials and equipment.
		Good housekeeping, keep work area picked up and clean as feasible. Continually inspect the work area for slip, trip, and fall hazards.
		Look before you step, ensure safe and secure footing.
	Hazard communication	All containers shall be labeled as to contents and disposed of properly.
	Spills	Absorbent/neutralization material and 55-gallon drums will be kept available where leaks, spills, or ruptures may occur.
		Spilled materials shall be cleaned up immediately.
		Assure adequate ventilation.
	Reaction to other materials	Do not add to or mix with other chemicals. If dilution is necessary, always add acid to water slowly. Never add water to acid.

Principal Steps	Potential Hazards	Recommended Controls
Adding acid to the system	Contact with acid or contaminated materials and spills	Follow same procedures as above for charging the system.
		Assure no fittings are leaking.
		Reactions in the system
Disposal to POTW	Contact with acid or contaminated materials and spills	Control additions by not overadding.
		Follow same procedures as for charging acid
		Monitor air for O ₂ , since CO ₂ is produced in system by acid neutralization.
		Spills
Charging acid in 1,000-gallon storage tank with supply truck	Contact with acid or contaminated materials	Check pH before draining system.
		Absorbent/neutralization materials and 55-gallon drums will be kept available where leaks, spills, or ruptures may occur.
		Use non-sparking, chemically compatible transfer hoses supplied by the acid supplier. Avoid splashing and surging of the acid in the tank during acid transfer.
		Use appropriate PPE which includes full-face respirator with acid mist cartridges. Wear Saranex or two layers of polycoated Tyvek. Tape both ankles and wrists. Use hood and tape to assure no face, neck, or head parts are exposed.
		Protect concrete below tank prior to charging since HCl reacts with it.
		Real time air monitoring will take place.
		Decon or properly dispose of all equipment and empty containers that contained acid.
		Good housekeeping will be stressed to safeguard against cross contamination of near by areas and eliminate safety hazards.
All site personnel will practice good personal hygiene by utilizing the decon facility on site. Always dispose of all "over" gloves.		

Charging acid in 1,000-gallon storage tank with supply truck		The work area will be demarcated. All unnecessary personnel will be kept out of the work area and in an upwind location.
	Noise	Noise levels above 85 dBA mandates hearing protection.
	Slip, trip and fall hazards	Good housekeeping, keep work area picked up and as clean as feasible. Continually inspect the work area for slip, trip and fall hazards.
	Pinch points	Keep feet and hands clear of moving/suspended materials and equipment.
		Beware of contact points.
		Stay alert at all times!
	Strains and sprains/ heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs requires assistance or mechanical equipment. Size up the lift. Recommend wearing a back support if possible.
		Use the proper tool for the job being performed.
		Get assistance if required.
		Avoid twisting/turning while lifting materials.
	Cut hazards	Wear adequate hand protection.
	Falling objects	Hardhats, remove unsecured tools and materials before operating equipment.
		Stay clear of materials suspended overhead.
	Biological hazards - bees, spiders, and snakes	Inspect the work area carefully and avoid placing hands and feet into concealed areas.
	Working at elevated heights/falls	Personnel working at heights of 6 feet or more must be secured with fall protection.
	Fire	Real time air monitoring will take place to determine oxygen content and lower explosive limit.
		No smoking or open flames within 50 ft. of the work area. (work area will be posted)

Charging acid in 1,000-gallon storage tank with supply truck		Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
		All hoses, couplings, fixtures etc. shall be properly bonded and grounded.
	Fire	IT Corporation's HS314 "Hot Work in Hazardous Locations" Policy and Procedure shall be adhered to at all times.
	Electrical safety	Electrical equipment will be locked out and tagged.
	Staging equipment	Signal person will assist in positioning equipment.
	Ladders	Ladder safety will be discussed at the Morning Tailgate Safety Meeting.
		Ladders will be inspected prior to each use.
		Faulty ladders will be tagged and taken out of service.
		Ladders will be secured by top, bottom, and intermediate fastenings as required.
		Personnel working at heights of 6 feet or more must be secured with fall protection (safety belt/lanyard).
	Unattended worker	"Buddy System" - visual contact will be maintained with personnel engaged in the transfer/removal of the acid tank contents.
	Structural collapse	Inspect the integrity of the acid tank before climbing or working on it.
	Lighting	Adequate lighting will be provided to ensure a safe working environment.
	Slip, trip, and fall hazards	Determine best access route before transporting materials and equipment.
		Good housekeeping, keep work area picked up and clean as feasible. Continually inspect the work area for slip, trip, and fall hazards.
		Look before you step, ensure safe and secure footing.

Charging acid in 1,000-gallon storage tank with supply truck	Hazard communication	All containers shall be labeled as to contents and disposed of properly.
	Spills	Absorbent/neutralization material and 55-gallon drums will be kept available where leaks, spills, or ruptures may occur.
		Spilled materials shall be cleaned up immediately.
		Assure adequate ventilation.
	Reaction to other materials	Do not add to or mix with other chemicals. If dilution is necessary, always add acid to water slowly. Never add water to acid.
Adding acid to the system	Contact with acid or contaminated materials and spills	Follow same procedures as above for charging the system.
		Assure no fittings are leaking.
	Reactions in the system	Control additions by not overadding.
Disposal to NPDES	Contact with acid or contaminated materials and spills	Follow same procedures as for charging acid
		Monitor air for O_2 , since CO_2 is produced in system by acid neutralization.
	Spills	Check pH before draining system.
		Absorbent/neutralization materials and 55-gallon drums will be kept available where leaks, spills, or ruptures may occur.

ATTACHMENT D

Acid Spill Contingency Plan

Both hydrochloric (or muriatic -30% HCl) and sulfuric H_2SO_4 acids are used as additives in the various water treatment systems to prevent calcium carbonate ($CaCO_3$) precipitation. (Muriatic used at Window Area, sulfuric used at Landfills 4 and 5)

- The metering control acid pump (Landfills 4 and 5 Treatment Plant) must be interlocked to shutdown when the influent pumps (well) go down automatically due to a high level in the feed tank. Also, an automatic failsafe shutoff valve should close when the system goes down for any reason. The system must be checked periodically to assure that it is working properly.
- If an acid spill does occur, the necessary spill containment and recovery materials must be available at all times. Absorbent and neutralization compounds in sufficient enough quantities to handle a spill of the acid storage supply tank must be maintained at all times.
- Assure that all spill containments such as diking around acid tank and pump is free of other materials such as rain water and capable of holding the entire acid tank contents.
- Polydrums must be made available for cleaning up all acid contaminated and neutralized materials following a spill.
- Assure eyewash/shower station is operable.

- The level of protection designated is "C." This includes complete skin protection with taping of wrists, ankles, and hood to the respirator. The suit must be a PVC acid protection suit. The gloves and boots must be neoprene. The respirator cartridges must be approved for organic vapor/acid gases/HEPA protection.
- Air monitoring for LEL/O₂ must be conducted on a continual basis since the release of hydrogen gas is possible.
- Follow heat stress monitoring as described in the H&S Plan.
- Reportable Quantities
 - Hydrochloric Acid 5000 lbs (2270 kg)
 - Sulfuric Acid 1000 lbs (454 kg)
- If a reportable quantity spill occurs immediately, notify the National Response Center at 1-800-424-8802.
- Notify Pittsburgh Project H&S Manager if a reportable quantity spill occurs.

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ATTACHMENT E

Material Safety Data Sheet

from Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
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GENIUM PUBLISHING CORP.

No. 30

HYDROGEN CHLORIDE
(Revision B)
Issued: October 1977
Revised: November 1988

SECTION 1. MATERIAL IDENTIFICATION

27 3123

Material Name: HYDROGEN CHLORIDE

Description (Origin/Uses): Used in the manufacture of pharmaceutical hydrochlorides, vinyl chloride from acetylene, alkyl chlorides from olefins, and arsenious chloride from arsenious oxide. Also used in the chlorination of rubber; as a gaseous flux for babbling operations; and in many organic reactions involving isomerization, polymerization, and alkylation.



NFPA

Other Designations: Anhydrous Hydrochloric Acid; HCl; CAS No. 7647-01-0

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

HMIS

H	3	R	1
F	0	I	4
R	0	S	4
PPG*			

*See sect. 8 K 0

SECTION 2. INGREDIENTS AND HAZARDS

EXPOSURE LIMITS

Hydrogen Chloride, CAS No. 7647-01-0

Ca 100

OSHA PEL
Ceiling: 5 ppm, 7 mg/m³

ACGIH TLV, 1988-89
TLV-Ceiling: 5 ppm, 7 mg/m³

Toxicity Data*

Human, Inhalation, LC₅₀: 1300 ppm
(30 Mins)

Rat, Inhalation, LC₅₀: 3124 ppm (1 Hr)

Rabbit, Oral, LD₅₀: 900 mg/kg

*See NIOSH, RTECS (MW4025000), for additional data with references to reproductive and mutagenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: -121°F (-85°C)

Melting Point: -173°F (-114°C)

Vapor Density (Air = 1): 1.268

Molecular Weight: 36.27 Grams/Mole

Solubility in Water (%): Complete

Appearance and Odor: A colorless, corrosive, acidic, nonflammable gas; characteristic, suffocating, pungent odor. This material fumes strongly in moist air and provides good warning properties for voluntary removal from continued exposure. The odor is detectable at 1 to 5 ppm and becomes disagreeable and irritating at 5 to 10 ppm.

SECTION 4. FIRE AND EXPLOSION DATA

LEL

UEL

Flash Point and Method

Autoignition Temperature

*

*

% by Volume

*

*

Extinguishing Media: *Hydrogen chloride gas does not burn. Use extinguishing agents that will put out the surrounding fire. Unusual Fire or Explosion Hazards: In the presence of water, hydrogen chloride can react with certain metals such as iron to produce highly flammable and explosive hydrogen gas. If hydrogen gas is produced, direct all fire-fighting techniques at it. If cylinders of hydrogen chloride are in the fire area, remove them, if feasible, or cool them with a water spray to prevent the release of the hydrogen chloride by way of the fusible plug and pressure-rupture disc on the cylinders. Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Special neutralization procedures, if applicable, include the application of chemically basic substances such as soda ash or slaked lime.

SECTION 5. REACTIVITY DATA

Stability/Polymerization: Hydrogen chloride is stable in closed, pressurized cylinders during routine operations at room temperature. Hazardous polymerization cannot occur. Chemical Incompatibilities: Hydrogen chloride gas is a very reactive, acidic, corrosive gas; use it with caution. Hazardous reactions occur between it and calcium carbide, cesium acetylene carbide, cesium carbide, lithium silicide, magnesium borate, mercuric sulfate, rubidium acetylene carbide, rubidium carbide, and sodium (Genium ref. 84). Conditions to Avoid: Avoid exposure to incompatible chemicals and to any other material whose compatibility with hydrogen chloride has not yet been established. Prevent accidental water contamination of any system that contains this material because it becomes corrosive to many metals in the presence of moisture. The corrosive action can liberate extremely flammable/explosive hydrogen gas. Avoid direct exposure of the hydrogen chloride gas to organic materials such as ethylene because exothermic (heat-producing) reactions are likely. Avoid excessive heat. Hazardous Products of Decomposition: During fires hydrogen chloride may decompose by reacting with certain metals to produce very flammable and explosive hydrogen gas (H₂).

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: Hydrogen chloride is not listed as a carcinogen by the NTP, IARC, or OSHA.

Summary of Risks: Contact with hydrogen chloride causes corrosive damage to body tissue. Inhalation of hydrogen chloride at levels greater than 50 ppm for a short time causes choking, coughing, and severe irritation and damage to the mucous membranes of the upper

Section 6. Health Hazard Data, continued

Acute Effects: Inhalation of vapors or mists is corrosive to the respiratory tract and can cause tracheal and bronchial epithelium necrosis (tissue death), cough, choking, ulceration. Liquid aspiration can cause pulmonary edema, lung collapse, emphysema and damage to the pulmonary blood vessels. Skin contact with HCl solutions causes burns and ulcerations. Permanent eye damage may result from splashes. Ingestion is unlikely but if it occurs, symptoms include gray tongue color, corrosion of mucous membranes, esophagus, and stomach, nausea, vomiting, intense thirst, diarrhea, difficulty swallowing, circulatory collapse and possible death. **Chronic Effects:** Repeated or prolonged exposure can cause dermatitis, conjunctivitis, gastritis, photosensitization, tooth erosion, and repeated exposure to mists from heated-metal pickling solutions can cause nose and gum bleeds, ulceration of oral or nasal mucosa, and "renders facial skin so tender that shaving is painful."⁽¹³³⁾

FIRST AID

Eyes: Do not allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Treat skin with a 5% triethanolamine solution. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have that conscious and alert person drink 1 to 2 glasses of water to dilute. Do not induce vomiting!

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Consider a chest x-ray in acute overexposure.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Neutralize spills with crushed limestone, soda ash, lime, or sodium bicarbonate. After neutralizing, take up small spills with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for disposal; flush large spills to containment area and reclaim (if possible) or await disposal. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** In soil, HCl will infiltrate moving faster in the presence of moisture. It may dissolve some soil matter, particularly those of a carbonate base will be neutralized to some degree and will be transported to groundwater. **Ecotoxicity Values:** Chronic plant toxicity = 100 ppm; injurious to irrigatable crops at 350 mg/L; trout, LC₁₀₀, 10 mg/L/24 hr shrimp, LC₅₀, 100 to 330 ppm/starfish, LC₅₀, 100 to 330 mg/L/48 hr; shore crab, LC₅₀, 240 mg/L/48 hr. **Disposal:** Neutralize to between 5.5 & 8.5 before disposal. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.23, 0.01N solution or higher): No. D002, Characteristic of corrosivity

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 5000 lb (2270 kg) [* per CWA, Sec. 311 (b)(4)]

SARA Extremely Hazardous Substance (40 CFR 355), TPQ: Not listed

Listed as a SARA Toxic Chemical (40 CFR 372.65)

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 50 ppm, use a cartridge respirator with acid gas cartridges, or any supplied-air respirator (SAR) or SCBA. For < 100 ppm, use any chemical cartridge respirator with a full facepiece and cartridge that protects against HCl inhalation, or any SAR or SCBA with a full facepiece. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. **Warning!** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Polycarbonate, butyl rubber, polyvinyl chloride, and chlorinated polyethylene are recommended materials for PPE. Polyvinyl alcohol is not recommended. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰³⁾ **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in a cool, dry, well-ventilated area on a cement floor away from direct sunlight and heat sources. Use decanting pumps or pouring frames to minimize spillage during loading and unloading operations.

Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. HCl should be manufactured in closed systems. Pay close attention to leak detection. Aqueous scrubbers are used to control hydrogen chloride emissions from vent stacks and other sources. Workers shouldn't enter tanks previously containing HCl until they have been cleaned.

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the eyes, skin, and respiratory tract. Pulmonary function tests (FEV, FVC) are useful in determining lung disorders. Conduct difficult operations in fume hoods.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Hydrochloric acid, solution

DOT Hazard Class: 8

ID No.: UN1789

DOT Label: Corrosive

DOT Packing Group: II

Special provisions (172.102): A3, A6, B2, B15, N41, T9, T27

Packaging Authorizations

a) Exceptions: 173.154

b) Non-bulk Packaging: 173.202

c) Bulk Packaging: 173.242

Quantity limitations

a) Passenger, Aircraft, or Railcar: 1 L

b) Cargo Aircraft Only: 30 L

Vessel Stowage Requirements

a) Vessel Stowage: C

b) Other: 8

MSDS Collection References: 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 148, 149, 153, 159, 163, 164, 167, 168, 171, 174, 180

Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MPH, MD



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Section 1. Material Identification

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Jet Fuel Description: A petroleum distillate similar to kerosine composed of C₇ to C₁₆ aliphatics, monocycloparaffins, aromatics, and olefins (for turbine engines only). Aromatics are a lower percentage for jet fuels, but there are a number of jet fuel types with somewhat different compositions and properties.
Other Designations: Jet A, Jet A-1, Jet B, Jet fuel HEF-3, JP-1, JP-4, JP-5, JP-6.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*^(TM) for a suppliers list.
Cautions: *Jet fuel is volatile, combustible, and thus, a dangerous fire hazard. It is a skin, eye, and respiratory tract irritant. Ingestion can be harmful, even fatal.*

R 1	(a) NFPA	(b)
I -		
S 2		
K 2-4*		
* Varying flash points		
	HMIS	HMIS
	H 1	H 1
	F 2	F 3
	R 0	R 0
	PPG†	PPG†
		† Sec. 8

- (a) Jet A and Jet A-1 (combustible) and JP-5 (flammable to combustible).
- (b) Jet B (dangerous fire hazard) and JP-4 (dangerous fire hazard and moderate explosion hazard in the form of vapor).

Section 2. Ingredients and Occupational Exposure Limits

Jet fuel, ca 100%			
1989 OSHA PEL None established	1989-90 ACGIH TLV None established	1988 NIOSH REL None established	1985-86 Toxicity Data* Rat, oral, LD ₅₀ : 40 mg/kg Rat, inhalation, LC ₅₀ : 23 ppm/4 hr Rat, skin, LD ₅₀ : 317 mg/kg

* These toxicity data pertain to jet fuel HEF-3. See NIOSH, RTECS (MH5425100), for additional toxicity data.

Section 3. Physical Data*

Boiling Point: 300 to 350 °F (149 to 288 °C) **Relative Density (15 °C/4 °C):** 0.79 to 0.84
Vapor Pressure: 0.1 mm Hg at 20 °C **Water Solubility:** Negligible
Viscosity: 1.0 to 2.0 cSt at 72 °F (40 °C)
Appearance and Odor: A clear liquid with a hydrocarbon odor.

* Physical data vary with fuel type. These data pertain to kerosine jet fuels in general.

Section 4. Fire and Explosion Data

Flash Point: 100 °F (37.8 °C), OC*	Autoignition Temperature: 446 °F (230.2 °C)*	LEL: 0.6% v/v	UEL: 3.7% v/v
Jet A and Jet A-1: 110 to 150 °F (43.4 to 65.6 °C) Jet B: -16 to -30 °F (-26.7 to -34.5 °C) JP-1: 95 to 145 °F (35.0 to 62.8 °C) JP-4†: -10 to 30 °F (-23.4 to -1.1 °C) JP-5: 95 to 145 °F (35.0 to 62.8 °C)	JP-1: 442 °F (228 °C) JP-4: 468 °F (242 °C) JP-5: 475 °F (246 °C)	JP-4: 1.3% v/v	JP-4: 8.0% v/v

Extinguishing Media: For large fire, use water spray, fog, or foam. For small fires, use dry chemical or CO₂. Water may be ineffective in fighting fires involving materials with low flash points. Apply in the form of a spray.
Unusual Fire or Explosion Hazards: Jet fuel is volatile and combustible.
Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

* A higher kerosene cut than JP-4 with fewer impurities.
† 65% gasoline and 35% light petroleum distillate.

Section 5. Reactivity Data

Stability/Polymerization: Jet fuels are stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: A violent reaction occurs with fluorine (F₂). Jet fuels are also incompatible with halogens, strong acids, alkalines, and oxidizers.
Conditions to Avoid: Avoid heat, sparks, flame, and build up of static electricity.
Hazardous Products of Decomposition: Thermal oxidative decomposition of jet fuel can produce carbon monoxide from incomplete combustion.

**Section 1. Material Identification**

42

Toluene (C₇H₈CH₃) Description: Derived from petroleum i.e., dehydrogenation of cycloparaffin fractions followed by the aromatization of saturated aromatic hydrocarbons or by fractional distillation of coal-tar light oil and purified by rectification. Used widely as a solvent (replacing benzene in many cases) for oils, resins, adhesives, natural rubber, coal tar, asphalt, pitch, acetyl celluloses, cellulose paints and varnishes; a diluent for photogravure inks, raw material for organic synthesis (benzoyl & benzilidene chlorides, saccharine, TNT, toluene diisocyanate, and many dyestuffs), in aviation and high octane automobile gasoline, as a nonclinical thermometer liquid and suspension solution for navigational instruments.

Other Designations: CAS No. 108-88-3, Methacide, methylbenzene, methylbenzol, phenylmethane, toluol, Tolu-sol.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*⁽⁷³⁾ for a suppliers list.

R	1	NFPA
I	3	
S	2*	
K	3	
* Skin absorption		

HMIS	
H	2- Chronic effect
F	3
R	0
PPE-Sec. 1	

Cautions: Toluene is an eye, skin, and respiratory tract irritant becoming narcotic at high concentrations. Liver and kidney damage has occurred. Pregnant women chronically exposed to toluene have shown teratogenic effects. Toluene is highly flammable.

Section 2. Ingredients and Occupational Exposure Limits

Toluene, < 100%; may contain a small amount of benzene (~ 1%), xylene, and nonaromatic hydrocarbons.

1991 OSHA PELs

8-hr TWA: 100 ppm (375 mg/m³)

15-min STEL: 150 ppm (560 mg/m³)

1990 IDLH Level

2000 ppm

1990 NIOSH RELs

TWA: 100 ppm (375 mg/m³)

STEL: 150 ppm (560 mg/m³)

1992-93 ACGIH TLV (Skin)

TWA: 50 ppm (188 mg/m³)

1990 DFG (Germany) MAK*

TWA: 100 ppm (380 mg/m³)

Half-life: 2 hr to end of shift

Category II: Substances with systemic effects

Peak Exposure Limit: 500 ppm, 30 min

average value, 2/shift

1985-86 Toxicity Data†

Man, inhalation, TC_{Lo}: 100 ppm caused hallucinations, and changes in motor activity and changes in psychophysiological tests.

Human, oral, LD₅₀: 50 mg/kg; toxic effects not yet reviewed

Human, eye: 300 ppm caused irritation.

Rat, oral, LD₅₀: 5000 mg/kg

Rat, liver: 30 μmol/L caused DNA damage.

* Available information suggests damage to the developing fetus is probable.

†See NIOSH, RTECS (XSS250000), for additional irritation, mutation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 232 °F (110.6 °C)

Melting Point: -139 °F (-95 °C)

Molecular Weight: 92.15

Density: 0.866 at 68 °F (20/4 °C)

Surface Tension: 29 dyne/cm at 68 °F (20 °C)

Viscosity: 0.59 cP at 68 °F (20 °C)

Refraction Index: 1.4967 at 20 °C/D

Water Solubility: Very slightly soluble, 0.6 mg/L at 68 °F (20 °C)

Other Solubilities: Soluble in acetone, alcohol, ether, benzene, chloroform, glacial acetic acid, petroleum ether, and carbon disulfide.

Vapor Pressure: 22 mm Hg at 68 °F (20 °C); 36.7 mm Hg at 86 °F (30 °C)

Saturated Vapor Density (Air = 0.075 lb/ft³ or 1.2 kg/m³): 0.0797 lb/ft³ or 1.2755 kg/m³

Odor Threshold (range of all referenced values): 0.021 to 69 ppm

Appearance and Odor: Colorless liquid with a sickly sweet odor.

Section 4. Fire and Explosion Data

Flash Point: 40 °F (4.4 °C) CC

Autoignition Temperature: 896 °F (480 °C)

LEL: 1.27% v/v

UEL: 7.0% v/v

Extinguishing Media: Toluene is a Class 1B flammable liquid. To fight fire, use dry chemical carbon dioxide, or 'alcohol-resistant' foam. Water spray may be ineffective as toluene floats on water and may actually spread fire. **Unusual Fire or Explosion Hazards:** Concentrated vapors are heavier than air and may travel to an ignition source and flash back. Container may explode in heat of fire. Toluene's burning rate = 5.7 mm/min and its flame speed = 37 cm/sec. Vapor poses an explosion hazard indoors, outdoors, and in sewers. May accumulate static electricity. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing provides only limited protection. Apply cooling water to sides of tanks until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from fire and let burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire because a BLEVE (boiling liquid expanding vapor explosion) may be imminent. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Toluene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization can't occur. **Chemical Incompatibilities:** Strong oxidizers, concentrated nitric acid, nitric acid + sulfuric acid, dinitrogen tetroxide, silver perchlorate, bromine trifluoride, tetranitromethane, and 1,3-dichloro-5,5-dimethyl-2,4-imidazolidione. **Conditions to Avoid:** Contact with heat, ignition sources, or incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of toluene can produce carbon dioxide, and acrid, irritating smoke.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,⁽¹⁶⁴⁾ NTP,⁽¹⁶⁹⁾ and OSHA⁽¹⁶⁴⁾ do not list toluene as a carcinogen. **Summary of Risks:** Toluene is irritating to the eyes, nose, and respiratory tract. Inhalation of high concentrations produces a narcotic effect sometimes leading to coma as well as liver and kidney damage. 93% of inhaled toluene is retained in the body of which 80% is metabolized to benzoic acid, then to hippuric acid and excreted in urine. The remainder is metabolized to *o*-cresol and excreted or exhaled unchanged. Toluene metabolism is inhibited by alcohol ingestion and is synergistic with benzene, asphalt fumes, or chlorinated hydrocarbons (i.e. perchloroethylene). Toluene is readily absorbed through the skin at 14 to 23 mg/cm²/hr. Toluene is absorbed quicker during exercise than at rest and appears to be retained longer in obese versus thin victims; presumably due to its lipid solubility. There is inconsistent data on toluene's ability to damage bone marrow; chronic poisoning has resulted in anemia and leucopenia with biopsy showing bone marrow hypo-plasia. These reports are few and some authorities argue that the effects may have been due to benzene contaminants. Chronic inhalation during pregnancy has been associated with teratogenic effects on the fetus including microcephaly, CNS dysfunction, attentional deficits, developmental delay + language impairment, growth retardation, and physical defects including a small midface, short palpebral fissures, with deep-set eyes, low-set ears, flat nasal bridge with a small nose, micrognathia, and blunt fingertips. There is some evidence that toluene causes an autoimmune illness in which the body produces antibodies that cause inflammation of its own kidney.

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Section 1. Material Identification

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Trichloroethylene (C₂HCl₃) Description: Derived by treating tetrachloroethane with lime or other alkali in the presence of water, or by thermal decomposition of tetrachloroethane followed by steam distillation. Stabilizers such as epichlorohydrin, isobutanol, carbon tetrachloride, chloroform, benzene, or pentanol-2-triethanolamine are then added. Used as a degreasing solvent in electronics and dry cleaning, a chemical intermediate, a refrigerant and heat-exchange liquid, and a diluent in paint and adhesives; in oil, fat, and wax extraction and in aerospace operations (flushing liquid oxygen). Formerly used as a fumigant (food) and anesthetic (replaced due to its hazardous decomposition in closed-circuit apparatus).
Other Designations: CAS No. 79-01-6; acetylene trichloride; Alglylen; Anarmenth; Benzinol; Cecolene; Chlorylen; Dow-Tri; ethylene trichloride; Germalgene; Narcogen; Triasol; trichloroethene; TCE; 1,1,3-trichloroethylene.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*⁽⁷³⁾ for a suppliers list.

R 1
I 2
S 2*
K 3
* Skin absorption

NFPA

HMIS
H 2†
F 2
R 0
PPE†
† Chronic Effects
† Sec. 8

Cautions: TCE is irritating and toxic to the central nervous system (CNS). Inhalation of high concentrations have lead to death due to ventricular fibrillation. Chronic exposure may lead to heart, liver, and kidney damage. The liquid is absorbed through the skin. Although it has a relatively low flash point, TCE burns with difficulty.

Section 2. Ingredients and Occupational Exposure Limits

Trichloroethylene, < 100% [contains stabilizers (Sec. 1)].

1991 OSHA PELs
8-hr TWA: 50 ppm (270 mg/m³)
15-min STEL: 200 ppm (1080 mg/m³)
1990 IDLH Level
1000 ppm
1990 NIOSH REL
10-hr TWA: 25 ppm (~135 mg/m³)

1992-93 ACGIH TLVs
TWA: 50 ppm (269 mg/m³)
STEL: 200 ppm (1070 mg/m³)
1990 DFG (Germany) MAK
Ceiling: 50 ppm (270 mg/m³)
Category II: Substances with systemic effects
Half-life: 2 hr to shift length
Peak Exposure Limit: 250 ppm, 30 min average value; 2 peaks/shift

1985-86 Toxicity Data*
Human, inhalation, TC₅₀: 160 ppm/83 min caused hallucinations and distorted perceptions.
Human, lymphocyte: 5 mL/L caused DNA inhibition.
Rabbit, skin: 500 mg/24 hr caused severe irritation.
Rabbit, eye: 20 mg/24 hr caused moderate irritation.
Mouse, oral, TD₅₀: 455 mg/kg administered intermittently for 78 weeks produced liver tumors.

* See NIOSH, RTECS (KX4550000), for additional irritation, mutation, reproductive, tumorigenic and toxicity data.

Section 3. Physical Data

Boiling Point: 189 °F (87 °C)
Freezing Point: -121 °F (-85 °C)
Viscosity: 0.0055 Poise at 77 °F (25 °C)
Molecular Weight: 131.38
Density: 1.4649 at 20/4 °C
Refraction Index: 1.477 at 68 °F (20 °C/D)
Odor Threshold: 82 to 108 ppm (not an effective warning)

Vapor Pressure: 58 mm Hg at 68 °F (20 °C); 100 mm Hg at 32 °F (0 °C)
Saturated Vapor Density (Air = 0.075 lbs/ft³; 1.2 kg/m³): 0.0956 lbs/ft³; 1.53 kg/m³
Water Solubility: Very slightly soluble; 0.1% at 77 °F (25 °C)
Other Solubilities: Highly soluble in organic solvents (alcohol, acetone, ether, carbon tetrachloride, & chloroform) and lipids.
Surface Tension: 29.3 dyne/cm

Appearance and Odor: Clear, colorless (sometimes dyed blue), mobile liquid with a sweet chloroform odor.

Section 4. Fire and Explosion Data

Flash Point: 90 °F (32 °C) CC; **Autoignition Temperature:** 788 °F (420 °C); **LEL:** 8% (25 °C); 12.5% (100 °C); **UEL:** 10% (25 °C); 90% (100 °C)

Extinguishing Media: A Class 1C Flammable Liquid. Although it has a flash point of 90 °F, TCE burns with difficulty. For small fires, use dry chemical, carbon dioxide, water spray, or regular foam. For large fires, use water spray, fog, or regular foam. **Unusual Fire or Explosion Hazards:** Vapor/air mixtures may explode when ignited. Container may explode in heat of fire. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection against TCE. Apply cooling water to sides of container until well after fire is out. Stay away from ends of tanks. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: TCE slowly decomposes in the presence of light and moisture to form corrosive hydrochloric acid. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Include alkalis (sodium hydroxide), chemically active metals (aluminum, beryllium, lithium, magnesium, sodium, potassium, and titanium), epoxides, and oxidants (nitrogen tetroxide, perchloric acid). Contact with 1-chloro-2,3-epoxy propane or the mono and di 2,3-epoxypropyl ethers of 1,4-butanediol + 2,2-bis-4(2',3'-epoxypropoxy)-phenylpropane can, in the presence of catalytic quantities of halide ions, cause dehydrochlorination of TCE to explosive dichloroacetylene. **Conditions to Avoid:** Exposure to light, moisture, ignition sources, and incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of TCE (above 300 °C) or exposure to ultraviolet light can produce carbon dioxide (CO₂) and toxic dichloro acetylene (explosive), chlorine, hydrogen chloride, and phosgene gas.

Section 6. Health Hazard Data

Carcinogenicity: The following agencies have rated TCE's carcinogenicity: IARC (Class 3, limited animal evidence & insufficient human data), Germany MAK (Class B, justifiably suspected of having carcinogenic potential), & NIOSH (Class X, carcinogen defined with no further categorization). **Summary of Risks:** TCE vapor is irritating to the eyes, nose, and respiratory tract and inhalation of high concentrations can lead to severe CNS effects such as unconsciousness, ventricular arrhythmias, and death due to cardiac arrest. Mild liver dysfunction was also seen at levels high enough to produce CNS effects. Contact with the liquid is irritating to the skin and can lead to dermatitis by defatting the skin. Chronic toxicity is observed in the victims increasing intolerance to alcohol characterized by 'degreasers flush', a transient redness of the face, trunk, and arms. The euphoric effect of TCE has led to craving, and habitual sniffing of its vapors.

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Sheet No. 316
Benzene

263128

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Section 1. Material Identification

32

Benzene (C₆H₆) Description: Derived by fractional distillation of coal tar, hydrodealkylation of toluene or pyrolysis of gasoline, catalytic reforming of petroleum, and transalkylation of toluene by disproportionation reaction. Used as a fuel; a chemical reagent; a solvent for a large number of materials such as paints, plastics, rubber, inks, oils, and fats; in manufacturing phenol, ethylbenzene (for styrene monomer), nitrobenzene (for aniline), dodecylbenzene (for detergents), cyclohexane (for nylon), chlorobenzene, diphenyl, benzene hexachloride, maleic anhydride, benzene-sulfonic acid, artificial leather, linoleum, oil cloth, varnishes, and lacquers; for printing and lithography; in dry cleaning; in adhesives and coatings; for extraction and rectification; as a degreasing agent; in the tire industry; and in shoe factories. Benzene has been banned as an ingredient in products intended for household use and is no longer used in pesticides.

Other Designations: CAS No. 0071-43-2, benzol, carbon oil, coal naphtha, cyclohexatriene, mineral naphtha, nitration benzene, phene, phenyl hydride, pyrobenzol.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*^(TM) for a suppliers list.

R	1	NFPA
I	4	
S	2*	
K	4	



*Skin absorption

HMS
H 3
F 3
R 0
PPG†
† Sec. 8

Cautions: Benzene is a confirmed *human carcinogen* by the IARC. *Chronic low-level exposure may cause cancer (leukemia) and bone marrow damage, with injury to blood-forming tissue.* It is also a dangerous fire hazard when exposed to heat or flame.

Section 2. Ingredients and Occupational Exposure Limits

Benzene, ca 100%*

1989 OSHA PELs

(29 CFR 1910.1000, Table Z-1-A)

8-hr TWA: 1 ppm, 3 mg/m³

15-min STEL: 5 ppm, 15 mg/m³

(29 CFR 1910.1000, Table Z-2)

8-hr TWA: 10 ppm

Acceptable Ceiling Concentration: 25 ppm

Acceptable Maximum Peak: 50 ppm (10 min)†

1989-90 ACGIH

TLV-TWA: 10 ppm, 32 mg/m³

1988 NIOSH RELs

TWA: 0.1 ppm, 0.3 mg/m³

Ceiling: 1 ppm, 3 mg/m³

1985-86 Toxicity Data‡

Man, oral, LD₅₀: 50 mg/kg; no toxic effect noted

Man, inhalation, TC₅₀: 150 ppm inhaled intermittently over 1 yr in a number of discrete, separate doses affects the blood (other changes) and nutritional and gross metabolism (body temperature increase)

Rabbit, eye: 2 mg administered over 24 hr produces severe irritation

* OSHA 29 CFR 1910.1000, Subpart Z, states that the final benzene standard in 29 CFR 1910.1028 applies to all occupational exposures to benzene except in some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.

† Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift.

‡ See NIOSH, *RTECS* (CY1400000), for additional irritative, mutative, reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 176 °F (80 °C)

Melting Point: 42 °F (5.5 °C)

Vapor Pressure: 100 mm Hg at 79 °F (26.1 °C)

Vapor Density (Air = 1): 2.7

Evaporation Rate (Ether = 1): 2.8

Molecular Weight: 78.11

Specific Gravity (15 °C/4 °C): 0.8787

Water Solubility: Slightly (0.180 g/100 g of H₂O at 25 °C)

% Volatile by Volume: 100

Viscosity: 0.6468 mPa at 20 °C

Appearance and Odor: A colorless liquid with a characteristic sweet, aromatic odor. The odor recognition threshold (100% of panel) is approximately 5 ppm (unfatigued) in air. Odor is *not* an adequate warning of hazard.

Section 4. Fire and Explosion Data

Flash Point: 12 °F (-11.1 °C), CC

Autoignition Temperature: 928 °F (498 °C)

LEL: 1.3% v/v

UEL: 7.1% v/v

Extinguishing Media: Use dry chemical, foam, or carbon dioxide to extinguish benzene fires. Water may be ineffective as an extinguishing agent since it can scatter and spread the fire. Use water spray 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 is a Class 1B flammable liquid. A concentration exceeding 3250 ppm is considered a potential fire explosion hazard. Benzene vapor is heavier than air and can collect in low lying areas or travel to an ignition source and flash back. Explosive and flammable benzene vapor-air mixtures can easily form at room temperature. Eliminate all ignition sources where benzene is used, handled, or stored.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Structural firefighter's protective clothing provides limited protection. Stay out of low areas. Be aware of runoff from fire control methods. Do not release to sewers or waterways. Runoff to sewer can create pollution, fire, and explosion hazard.

Section 5. Reactivity Data

Stability/Polymerization: Benzene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Benzene explodes on contact with diborane, permanganic acid, bromine pentafluoride, peroxodisulfuric acid, and peroxomonosulfuric acid. It ignites on contact with dioxygen difluoride, dioxygenyl tetrafluoroborate, iodine heptafluoride, and sodium peroxide + water. Benzene forms sensitive, explosive mixture with iodine pentafluoride, ozone, liquid oxygen, silver perchlorate, nitryl perchlorate, nitric acid, and arsenic pentafluoride + potassium methoxide (explodes above 30 °C). A vigorous or incandescent reaction occurs with bromine trifluoride, uranium hexafluoride, and hydrogen + Raney nickel (above 410 °F (210 °C)). Benzene is incompatible with oxidizing materials.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of benzene can produce toxic gases and vapors such as carbon monoxide.



Section 1 - Chemical Product and Company Identification

44

Product/Chemical Name: Methylene Chloride

Chemical Formula: CH2Cl2

CAS No.: 75-09-2

Synonyms: DCM, dichloromethane, Freon 30, methylene bichloride, methylene dichloride, NCI-C50102, Solmethine

Derivation: Produced by chlorination of methane.

General Use: Used as a solvent for cellulose acetate, adhesives, food processing, and pharmaceuticals; in degreasing and cleaning fluids, paint and varnish removers, decaffeination of coffee, in propellant mixtures for aerosols; as a blowing agent in foams, dewaxing agent, component of fire extinguishing compound, chemical intermediate, low temperature heat-transfer medium, and as a fumigant. Formerly used as an anesthetic.

Vendors: Consult the latest Chemical Week Buyers' Guide. (73)

Section 2 - Composition / Information on Ingredients

Methylene chloride, ca < 100 % vol

Trace Impurities: Stabilizers may be added such as: amines, 4-cresol, hydroquinone, methanol, 2-methyl-2-ene, 1-naphthol, nitromethane + 1,4-dioxane, phenol, resorcinol, and thymol.

OSHA PELs

8-hr TWA: 500 ppm*

Ceiling: 1000 ppm (2000 ppm 5 min. peak in any 2 hr period)

ACGIH TLV

TWA: 50 ppm (174 mg/m3)

NIOSH REL

Carcinogen; lowest feasible concentration.

IDLH Level

Ca [5000 ppm]

DFG (Germany) MAK

TWA: 100 ppm (360 mg/m3)

Category II: Substances with systemic effects

Onset of Effect: < 2 hr

Half-life: 2 hr to shift length

Peak Exposure Limit:

500 ppm, 30 min. average value, 2/shift

*Proposed change to: 25 ppm (TWA); 125 ppm (STEL)

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Methylene chloride is a colorless, volatile liquid with a sweet odor. It is irritating to the eyes, skin, and respiratory tract. At high concentrations it can cause narcosis (unconsciousness). Methylene chloride is metabolized to carbon monoxide in the body which contributes to much of its toxicity. It can form flammable mixtures with air (forming toxic phosgene when burned) and becomes explosive when mixed with oxygen.

Potential Health Effects

Primary Entry Routes: Inhalation, skin and eye contact.

Target Organs: Eyes, skin, central nervous system (CNS), cardiovascular system (CVS), blood.

Acute Effects

Inhalation: Symptoms include headache, giddiness, irritability, nausea, stupor, numbness and tingling of limbs, fatigue, anemia and polymorphonuclear leukocytosis, digestive disturbances, and neurasthenic disorders (emotional and psychic disorders characterized by easy fatigue, lack of motivation, feelings of inadequacy, and psychosomatic symptoms). Many symptoms are attributed to the metabolism of methylene chloride to carbon monoxide in the body. The carbon monoxide forms carboxyhemoglobin in the blood, which unlike hemoglobin, does not have the ability to carry oxygen. This lack of oxygen leads to CNS and CVS problems. However, CNS effects have been seen in persons without a significantly elevated blood carbon monoxide level.

Eye: Exposure to vapors produces irritation, tearing, and conjunctivitis. Direct contact with the liquid causes severe pain, but permanent damage does not occur.

Skin: Contact is irritating and can be painful (burns) if confined to skin (i.e. trapped under gloves or clothing). Methylene chloride can be absorbed through the skin to cause systemic effects.

Ingestion: Expected to cause gastrointestinal irritation, nausea, vomiting, and systemic effects (see inhalation).

Carcinogenicity: IARC (Class 2B, possibly carcinogenic to humans with limited human and sufficient animal evidence), NTP (Class 2, reasonably anticipated to be a carcinogen with limited human and sufficient animal evidence), ACGIH (TLV-A2, suspected human carcinogen as agent is carcinogenic in animals at dose levels considered relevant to worker exposure but insufficient epidemiological studies are available to confirm an increased cancer risk), NIOSH (Class X, carcinogen defined without further categorization), EPA (Class B2, sufficient evidence from animal studies and inadequate or no data from epidemiologic studies), and DFG (MAK B, justifiably suspected of having carcinogenic potential).

Medical Conditions Aggravated by Long-Term Exposure: Skin and cardiovascular disorders.

Wilson Risk Scale

R 1
I 3
S 2*
K 1

*Skin absorption

HMIS

H 2*
F 1
R 0

*Chronic Effects

PPE †

† Sec. 8

periodically. Any level above 5% should prompt investigation of employee and workplace to determine the cause (smokers will already have an increased level of carboxyhemoglobin and are at increased risk). Use less hazardous solvents where possible.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For any detectable concentration, use any SCBA or supplied-air respirator (with auxiliary SCBA) with a full facepiece and operated in pressure demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA.

Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Polyvinyl alcohol and Viton laminated with Neoprene are suitable materials for PPE. Natural rubber, synthetic rubbers, and polyvinyl chloride *do not* provide protection against methylene chloride. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove methylene chloride from your shoes and clean personal protective equipment.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using methylene chloride, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance and Odor: Colorless; volatile with a sweet odor.

Odor Threshold: 205 to 307 ppm

Vapor Pressure: 350 mm Hg at 68 °F (20 °C); 440 mm Hg at 77 °F (25 °C)

Saturated Vapor Density (Air = 1.2 kg/m³, 0.075 lb/ft³):
2.256 kg/m³ or 0.141 lb/ft³

Formula Weight: 84.9

Specific Gravity (H₂O=1, at 4 °C): 1.33 at 15 °C

Water Solubility: 2%

Octanol/Water Partition Coefficient: log Kow = 1.25

Other Solubilities: Soluble in alcohol, acetone, chloroform, carbon tetrachloride, ether, and dimethylformamide.

Boiling Point: 104 °F (40 °C)

Freezing Point: -142 °F (-97 °C)

Viscosity: 0.430 cP at 68 °F (20 °C)

Refractive Index: 1.4244 at 68 °F (20 °C/D)

Surface Tension: 0.5 to 2.3 g/L (in oxygen)

Bulk Density: 11.07 lb/gal at 68 °F (20 °C)

Ionization Potential: 11.32 eV

Critical Temperature: 473 °F (245 °C)

Critical Pressure: 60.9 atm

Section 10 - Stability and Reactivity

Stability: Methylene chloride is stable at room temperature in closed containers under normal storage and handling conditions. Tends to carbonize when vapor contacts steel or metal chlorides at high temperatures 572 to 842 °F (300 to 450 °C).

Polymerization: Hazardous polymerization does not occur.

Chemical Incompatibilities: Include aluminum, lithium, sodium, aluminum bromide, azides, dimethyl sulfoxide + perchloric acid, N-methyl-N-nitrosourea + potassium hydroxide, sodium-potassium alloy, potassium *t*-butoxide, dinitrogen pentoxide, dinitrogen tetroxide, nitric acid, and oxidizers. Methylene chloride will attack some forms of plastic, rubber, and coatings.

Corrodes iron, some stainless steel, copper, and nickel.

Conditions to Avoid: Exposure to heat, ignition sources, and incompatibles.

Hazardous Decomposition Products: Hydrogen chloride, carbon monoxide and phosgene.

Section 11- Toxicological Information

Toxicity Data:*

Eye Effects:

Rabbit, eye: 162 mg caused moderate irritation.

Skin Effects:

Rabbit, skin: 810 mg/24 hr caused severe irritation.

Carcinogenicity:

Rat, inhalation: 3500 ppm/2 yr (intermittently) caused endocrine tumors.

Mutagenicity:

Rat, oral: 1275 mg/kg caused DNA damage.

Human, fibroblast: 5000 ppm/1 hr (continuously) caused DNA inhibition.

Acute Inhalation Effects:

Human, inhalation, TC_{Lo}: 500 ppm/1 yr (intermittently) caused altered sleep time, somnolence, and change in heart rate.

Human, inhalation, TC_{Lo}: 500 ppm/8 hr caused euphoria.

Acute Oral Effects:

Human, oral, LD_{Lo}: 357 mg/kg caused somnolence, paresthesia, and convulsions or effect on seizure threshold.

Rat, oral, LD₅₀: 1600 mg/kg

Multiple Dose Toxicity Data:

Rat, inhalation: 8400 ppm/6 hr/13 weeks (intermittently) caused changes in liver weight.

* See NIOSH, RTECS (PA8050000), for additional toxicity data.



Section 1. Material Identification

Xylene (Mixed Isomers) (C8H10) Description: The commercial product is a blend of the three isomers [ortho-(o-), meta-(m-), para-(p-)] with the largest proportion being m-xylene. Xylene is obtained from coal tar, toluene by transalkylation, and pseudocumene. Used in the manufacture of dyes, resins, paints, varnishes, and other organics; as a general solvent for adhesives, a cleaning agent in microscope technique; as a solvent for Canada balsam microscopy; as a fuel component; in aviation gasoline, protective coatings, sterilizing catgut, hydrogen peroxide, perfumes, insect repellants, pharmaceuticals, and the leather industry; in the production of phthalic anhydride, isophthalic, and terephthalic acids and their dimethyl esters which are used in the manufacture of polyester fibers; and as an indirect food additive as a component of adhesives. Around the home, xylene is found as vehicles in paints, paint removers, degreasing cleaners, lacquers, glues and cements and as solvent/vehicles for pesticides.

Other Designations: CAS No. 1330-20-7 [95-47-6; 108-38-3; 106-42-3 (o-, m-, p-isomers)], dimethylbenzene, methyltoluene, NCI-C55232, Violet 3, xylol.

Manufacturer: Contact your supplier or distributor. Consult latest Chemical Week Buyers' Guide(73) for a suppliers list.

Cautions: Xylene is an eye, skin, and mucous membrane irritant and may be narcotic in high concentrations. It is a dangerous fire hazard.

Table with hazard codes: R 1, I 2, S 2, K 3 and NFPA diamond (3, 2, 0, -)

HMS H 2+, F 3, R 0, PPE ‡, † Chronic Effects, ‡ Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Xylene (mixed isomers): the commercial product generally contains ~ 40% m-xylene; 20% each of o-xylene, p-xylene, and ethylbenzene; and small quantities of toluene. Unpurified xylene may contain pseudocumene.

1991 OSHA PELs 8-hr TWA: 100 ppm (435 mg/m3) 15-min STEL: 150 ppm (655 mg/m3)

1992-93 ACGIH TLVs TWA: 100 ppm (434 mg/m3) STEL: 150 ppm (651 mg/m3) BEI (Biological Exposure Index): Methylhippuric acids in urine at end of shift: 1.5 g/g creatinine

1985-86 Toxicity Data* Human, inhalation, TCLo: 200 ppm produced olfaction effects, conjunctiva irritation, and other changes involving the lungs, thorax, or respiration. Man, inhalation, LCLo: 10000 ppm/6 hr; toxic effects not yet reviewed. Human, oral, LDLo: 50 mg/kg; no toxic effect noted. Rat, oral, LD50: 4300 mg/kg; toxic effect not yet reviewed. Rat, inhalation, LC50: 5000 ppm/4 hr; toxic effects not yet reviewed.

1990 IDLH Level 1000 ppm

1990 NIOSH RELs TWA: 100 ppm (435 mg/m3) STEL: 150 ppm (655 mg/m3)

1990 DFG (Germany) MAK TWA: 100 ppm (440 mg/m3) Category II: Substances with systemic effects Half-life: < 2 hr Peak Exposure: 200 ppm, 30 min, average value, 4 peaks per shift

* See NIOSH, RTECS (XE2100000), for additional toxicity data.

Section 3. Physical Data

Boiling Point Range: 279 to 284 °F (137 to 140 °C)* Boiling Point: ortho: 291 °F (144 °C); meta: 281.8 °F (138.8 °C); para: 281.3 °F (138.5 °C) Freezing Point/Melting Point: ortho: -13 °F (-25 °C); meta: -53.3 °F (-47.4 °C); para: 55 to 57 °F (13 to 14 °C) Vapor Pressure: 6.72 mm Hg at 70 °F (21 °C) Saturated Vapor Density (Air = 1.2 kg/m3): 1.23 kg/m3, 0.077 lbs/ft3 Appearance and Odor: Clear, sweet-smelling liquid. * Materials with wider and narrower boiling ranges are commercially available.

Molecular Weight: 106.16 Specific Gravity: 0.864 at 20 °C/4 °C Water Solubility: Practically insoluble Other Solubilities: Miscible with absolute alcohol, ether, and many other organic liquids. Octanol/Water Partition Coefficient: logKow = 3.12-3.20 Odor Threshold: 1 ppm Viscosity: <32.6 SUS

Section 4. Fire and Explosion Data

Flash Point: 63 to 77 °F (17 to 25 °C) CC Autoignition Temperature: 982 °F (527 °C) (m-) LEL: 1.1 (m-, p-); 0.9 (o-) UEL: 7.0 (m-, p-); 6.7 (o-)

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO2), water spray or regular foam. For large fires, use water spray, fog or regular foam. Water may be ineffective. Use water spray to cool fire-exposed containers. Unusual Fire or Explosion Hazards: Xylene vapors or liquid (which floats on water) may travel to an ignition source and flash back. The heat of fire may cause containers to explode and/or produce irritating or poisonous decomposition products. Xylene may present a vapor explosion hazard indoors, outdoors, or in sewers. Accumulated static electricity may occur from vapor or liquid flow sufficient to cause ignition. Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing will provide limited protection. If feasible and without risk, move containers from fire area. Otherwise, cool fire-exposed containers until well after fire is extinguished. Stay clear of tank ends. Use unmanned hose holder or monitor nozzles for massive cargo fires. If impossible, withdraw from area and let fire burn. Withdraw immediately in case of any tank discoloration or rising sound from venting safety device. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Xylene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Xylene is easily chlorinated, sulfonated, or nitrated. Chemical Incompatibilities: Incompatibilities include strong acids and oxidizers and 1,3-dichloro-5,5-dimethyl-2,4-imidazolidindione (dichlorohydrantoin). Xylene attacks some forms of plastics, rubber, and coatings. Conditions to Avoid: Avoid heat and ignition sources and incompatibles. Hazardous Products of Decomposition: Thermal oxidative decomposition of xylene can produce carbon dioxide, carbon monoxide, and various hydrocarbon products.

Section 6. Health Hazard Data

Carcinogenicity: The IARC, (164) NTP, (169) and OSHA (164) do not list xylene as a carcinogen. Summary of Risks: Xylene is an eye, mucous membrane, and respiratory tract irritant. Irritation starts at 200 ppm; severe breathing difficulties which may be delayed in onset can occur at high concentrations. It is a central nervous system (CNS) depressant and at high concentrations can cause coma. Kidney and liver damage can occur with xylene exposure. With prolonged or repeated cutaneous exposure, xylene produces a defatting dermatitis. Chronic toxicity is not well defined, but it is less toxic than benzene. Prior to the 1950s, benzene was often found as a contaminant of xylene and the effects attributed to xylene such as blood dyscrasias are questionable. Since the late 1950s, xylenes have been virtually benzene-free and blood dyscrasias have not been associated with xylenes. Chronic exposure to high concentrations of xylene in animal studies have demonstrated milk reversible decrease in red and white cell counts as well as increases in platelet counts.

Continue on next page

**Section 1. Material Identification**

Chloroform (CHCl₃) Description: Derived by chlorination of methane, hydrochlorination of methanol, or reaction of chlorinated lime with acetone, acetaldehyde, or ethanol. Purified by extraction with concentrated sulfuric acid and rectification. Used in the manufacture of fluorocarbons (mainly FC-22) for refrigerants, in plastics, photographic processing, fire extinguishers, insecticides, and dry cleaning; as a solvent for fats, oils, waxes, rubbers, alkaloids, Gutta-Percha, and resins. Used as an anesthetic since 1847 but abandoned within the last few decades because of cardiac arrest during surgery and delayed death due to liver injury.

Other Designations: CAS No. 67-66-3, Freon-20, methane trichloride, methenyl chloride, R-20 (refrigerant), trichloroform, trichloromethane, TCM. Improperly called 'formyl chloride.'

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*⁽⁷³⁾ for a suppliers list.

Cautions: Chloroform is considered one of the most dangerous and volatile chlorinated hydrocarbons. It is a central nervous system (CNS) and cardiac depressant, an eye, skin, and respiratory tract irritant, and causes liver and kidney damage from acute and chronic exposure.

R	1	NFPA
I	3	
S	2*	
K	2	
* Skin absorption		HMIS
		H 3†
		F 0
		R 0
		PPE‡
		† Chronic effects
		‡ Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Chloroform, ca 99%. Usually contains 0.75% ethanol as a stabilizer. Impurities include bromodichloromethane, vinylidene, and diethyl carbonate.

1991 OSHA PEL
8-hr TWA: 2 ppm (9.78 mg/m³)

1992-93 ACGIH TLV
TWA: 10 ppm (49 mg/m³)

1985-86 Toxicity Data*

Human, inhalation, TC_{Lo}: 10 mg/m³/1 year caused anorexia, nausea, and vomiting.

1990 IDLH Level
1000 ppm

1990 DFG (Germany) MAK
TWA: 10 ppm (50 mg/m³)

Rat, oral, TD_{Lo}: 13832 mg/kg given continuously for 2 years caused leukemia.

1990 NIOSH REL
60 min STEL: 2 ppm (9.78 mg/m³)

Category II: Substances with systemic effects. Half-life = 2 hr
Peak Exposure Limit: 20 ppm, 30 min average value, 4/shift

Rat, oral, LD₅₀: 908 mg/kg caused weight loss or decreased weight gain.
Rat, inhalation, TC_{Lo}: 30 ppm/7 hr administered from the 6 to 15 day of pregnancy caused fetotoxicity or developmental abnormalities of the musculoskeletal system.

Rabbit, eye: 20 mg/24 hr caused moderate irritation.

* See NIOSH, RTECS (FS9100000), for additional irritation, mutation, reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 143 °F (62 °C)
Freezing Point: -82 °F (-63.5 °C)
Molecular Weight: 119.39
Viscosity: 5.63 mP at 68 °F (20 °C)
Relative Evaporation Rate (BuAc=1): 11.6
Surface Tension: 27.1 dyne/cm at 68 °F (20 °C)
Refraction Index: 1.4422 at 77 °F (25 °C)

Density: 1.49845 at 59 °F (15 °C)
Water Solubility: Nearly insoluble; 0.5% at 77 °F (25 °C)
Other Solubilities: Soluble in ethanol, ethyl ether, benzene, acetone, carbon disulfide, and carbon tetrachloride.
Odor Threshold: 85 to 307 ppm (range from combined sources)
Vapor Pressure: 160 mm Hg at 68 °F (20 °C); 200 mm Hg at 77 °F (25 °C)
Saturated Vapor Density (Air = 0.075 lb/ft³ or 1.2 kg/m³): 0.136 lb/ft³ or 2.183 kg/m³

Appearance and Odor: Colorless, volatile liquid with a heavy, ethereal odor.

Section 4. Fire and Explosion Data

Flash Point: Nonflammable **Autoignition Temperature:** Nonflammable **LEL:** None reported **UEL:** None reported

Extinguishing Media: Nonflammable from standard tests in air but will burn on prolonged exposure to flame or high temperature. To fight fire, use extinguishing agents suitable for surrounding fire. *Do not scatter material with a high-pressure water stream.* **Unusual Fire or Explosion Hazards:** Container may explode in heat of fire. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing is *not* effective. Stay away from ends of tanks. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Chloroform is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. It's pH decreases on prolonged exposure to air and light due to hydrochloric acid (HCl) formation. The recommended shelf-life is 2 months for full containers and 2 weeks for partially full containers. **Chemical Incompatibilities:** Incompatible with acetone, alkalis, aluminum, disilane, lithium, magnesium, dinitrogen dioxide, nitrogen tetroxide, perchloric acid, phosphorus pentoxide, potassium, potassium hydroxide, methyl alcohol, potassium *tert*-butoxide, sodium, sodium hydroxide, sodium methylate, sodium-potassium alloy, triisopropylphosphine, calcium hydroxide, and fluorine and any strong oxidizers. **Conditions to Avoid:** Exposure to light, prolonged heat, and incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of CHCl₃ can produce carbon dioxide and toxic chlorine, HCl, and phosgene gas. CHCl₃ decomposes at 437 °F to formic acid, carbon monoxide, and HCl on prolonged heating with water.

Section 6. Health Hazard Data

Carcinogenicity: Chloroform is considered a carcinogen by the IARC (Class-2B, possibly carcinogenic in humans with limited human and sufficient animal evidence),⁽¹⁶⁴⁾ NTP (Class 2, reasonably anticipated to be a carcinogen, limited human and sufficient animal evidence),⁽¹⁶⁹⁾ and NIOSH (Class X, carcinogen defined with no further categorization),⁽¹⁶⁴⁾ DFG (MAK-B, justifiably suspected of having carcinogenic potential),⁽¹⁶³⁾ and ACGIH (Class A2, suspected human carcinogen based on limited epidemiologic evidence or demonstration)⁽¹⁶³⁾. Carcinogenicity tends to be organ specific primarily to the liver and kidneys. **Summary of Risks:** Chloroform is a CNS depressant, eye, skin, and respiratory tract irritant, and causes damage to the liver and kidneys. Symptoms range from dizziness to cardiac arrhythmias resulting in death. Chloroform's toxicity is due to its easy lipid solubility. Avoid exposure during pregnancy because CHCl₃ diffuses readily across the placenta. Alcoholics seem to be affected sooner and more severely than others from chloroform exposure (alcohol may already have damaged the liver). Ethanol, polybrominated biphenols, steroids, and ketones potentiate chloroform's toxicity.

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Section 1. Material Identification

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Nitric Acid (HNO3) Description: A solution of nitrogen dioxide in water commercially available in many concentrations. Derived by oxidation of ammonia by catalytic process (heated platinum catalyst); or by direct synthesis, combining atmospheric nitrogen and oxygen in an electric arc (an expensive process, thus largely abandoned). HNO3 is usually found in conjunction with nitrogen dioxide, which is considered more hazardous. Used in fertilizer: production (ammonium nitrate), in photoengraving, steel etching, explosives (TNT, nitroglycerin, trinitrophenol); manufacture of metallic nitrates, sulfuric acid, aqua regia and oxalic acid, jewelry, various dyes and dyestuffs, pharmaceuticals; as a laboratory reagent, in metallurgy (mainly as a pickling agent) and the printing industry. Other Designations: CAS No. 7697-37-2, aqua fortis, aqua regia, azotic acid, engravers nitrate, hydrogen nitrate, red fuming nitric acid (RFNA), white fuming nitric acid (WFNA). Manufacturer: Contact your supplier or distributor. Consult latest Chemical Week Buyers' Guide for suppliers list.

Table with 4 columns: H, F, R, PPE. Rows for different concentrations: Fuming nitric acid, > 40% nitric acid, and ≤ 40% nitric acid. Includes NFPA hazard diamonds.

Cautions: Nitric acid is a corrosive, strong oxidizer that causes irritation or severe burns to the skin, eyes, and respiratory tract. Exposures to high levels of the concentrated acid can be fatal. Increases the flammability of combustibles. Use extreme caution when handling HNO3.

* Chronic effects ** See Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Nitric acid, various %. Commercially available in nearly all concentrations; most common are 56 and 68%. RFNA (85%), WFNA (97.5%).

Table with 3 columns: 1991 OSHA PELs, 1992-93 ACGIH TLVs, 1985-86 Toxicity Data*. Includes rows for 8-hr TWA, 15-min STEL, 1990 IDLH Level, 1990 NIOSH REL, and Category I: local irritants.

* See NIOSH, RTECS [QU5775000 (nitric acid), QU5900000 (RFNA), QU6000000 (WFNA)], for additional reproductive and toxicity data.

Section 3. Physical Data

Boiling Point: 186.8 °F (86 °C)
Melting Point: -43.6 °F (-42 °C)
Vapor Pressure: 67% HNO3 = 6.8 mm Hg at 68 °F (20 °C); 95 to 98% = 113 at 100.4 °F (38 °C)
Saturated Vapor Density (Air = 1.2 kg/m3): 1.212 kg/m3 or 0.0757 lb/ft3 (67 % HNO3)
pH: 1
Molecular Weight: 63.02
Density: 1.50269 at 77/39.2 °F (25/4 °C)
Water Solubility: Soluble (releases heat)
Ionization Potential: 11.95 eV

Appearance and Odor: Transparent, clear to yellow, fuming liquid with an acrid, suffocating odor which darkens to a brownish color on aging and exposure to light. "Fuming" nitric acid is red-brown in color.

Section 4. Fire and Explosion Data

Flash Point: Noncombustible
Autoignition Temperature: Noncombustible
LEL: None reported
UEL: None reported
Extinguishing Media: For small fires (< 40% HNO3), use dry chemical, carbon dioxide (CO2), water spray, or regular foam. For large fires, use water spray, fog, or regular foam. For small fires (> 40% HNO3), use water spray, dry chemical, or soda ash. For large fires, flood area with water (do not get inside HNO3 containers). Apply water from as far a distance as possible.
Unusual Fire or Explosion Hazards: HNO3 is noncombustible but is an oxidizer which increases fire involving combustibles and can initiate an explosion. It releases flammable hydrogen gas in contact with many metals.
Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing is not effective for fires involving nitric acid. Acid-resistant clothing is needed. Apply cooling water to sides of containers until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Nitric acid decomposes in air and in contact with light and organic matter. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Nitric acid reacts explosively with combustibles, organics or readily oxidizable materials such as wood, turpentine, metal powder and hydrogen sulfide, carbides, cyanides, and alkalis; causes spattering with strong bases; is corrosive to paper, cloth and most metals (except aluminum, gold, platinum, thorium, and tantalum). Will also attack some forms of plastics, rubber, and coatings. There are at least 150 chemicals and chemical combinations which are incompatible with nitric acid. HNO3 reacts with water to produce heat and toxic corrosive fumes. Refer to Genium references 126 and 159 for further detail. Conditions to Avoid: Avoid exposure to moisture, heat, and incompatibles.
Hazardous Decomposition Products: Thermal oxidative decomposition of HNO3 produces nitrogen peroxide and toxic, irritating nitrogen oxides.

Section 6. Health Hazards Data

Carcinogenicity: The IARC, (164) NTP, (169) and OSHA (164) do not list nitric acid as a carcinogen.
Summary of Risks: Nitric acid is very corrosive to the skin, eyes, digestive and respiratory tract or any tissue it comes in contact with. 58 to 63% (nitric acid) vapors are moderately irritating and can't be tolerated at high concentrations. 95% (nitric acid) vapors cause severe irritation at very low levels and the liquid causes 2nd and 3rd degree burns on short contact with skin or eyes. Vapor inhalation may cause pulmonary edema (fluid in lungs) leading to death. HNO3 vapor or mist can slowly corrode teeth when chronically exposed. Medical Conditions Aggravated by Long Term Exposure: Chronic respiratory diseases. Target Organs: Eyes, skin, respiratory tract, teeth.

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Sheet No. 8
Phosphoric Acid

203134

Issued: 3/83

Revision: C, 4/90

Section 1. Material Identification

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Phosphoric Acid Description: Obtained commercially by: 1) the action of sulfuric acid or hydrochloric acid in combination with tributylphosphate extraction on phosphate rock and 2) heating phosphate rock, silica, and coke in an electric furnace, burning the elemental phosphate produced, and then hydrating the phosphoric oxide. Used to manufacture fertilizers, detergents, foods, beverages, gelatin, animal feeds, yeasts, waxes and polishes; in pharmaceuticals, water treatment, and electro-polishing; as a catalyst for ethanol manufacture; as a soil stabilizer; as a binder for ceramics; as a laboratory reagent; for pickling and rust-proofing metals; in dental cements; to coagulate rubber latex; and to purify hydrogen peroxide.

R 1
I 3
S 3
K 0



Other Designations: CAS No. 7664-38-2; H₃PO₄;* orthophosphoric acid; phosphoric acid, liquid (DOT); phosphoric acid, solid (DOT).

HMS
H 2
F 0
R 0
PPG†
† Sec. 8

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*^(TM) for a suppliers list.

* In industrial practice, phosphoric anhydride (P₂O₅) is shipped for phosphoric acid. The addition of water yields phosphoric acid.

Section 2. Ingredients and Occupational Exposure Limits

Phosphoric acid, ca 100%

OSHA PELs
8-hr TWA: 1 mg/m³
STEL: 3 mg/m³

ACGIH TLVs, 1989-90
TWA: 1 mg/m³
STEL: 3 mg/m³

NIOSH REL, 1987
1 mg/m³

Toxicity Data*
Rat, oral, LD₅₀: 1530 mg/kg
Rabbit, skin, LD₅₀: 2740 mg/kg
Man, unreported route, LD₅₀: 220 mg/kg

* See NIOSH, RTECS (TB6300000), for additional irritative and toxicity data.

Section 3. Physical Data

Boiling Point: 502 °F/261 °C
Melting Point: 108.23 °F/42.35 °C
Vapor Pressure: 0.0285 mm Hg at 68 °F/20 °C
Viscosity at 68 °F/20 °C: 140

Molecular Weight: 98 g/mol
Water Solubility: Completely soluble
pH (0.1 N in H₂O): 1.5
Specific Gravity (H₂O = 1 at 39 °F/4 °C): 1.834 at 64.4 °F/18 °C

Appearance and Odor: Viscous, water-white, odorless liquid.

Section 4. Fire and Explosion Data

Flash Point: None reported **Autoignition Temperature:** None reported **LEL:** None reported **UEL:** None reported

Extinguishing Media: Use water to extinguish phosphoric acid fires. Otherwise, use extinguishing media appropriate for surrounding fire. If water is used, use it abundantly to control heat and acid buildup.

Unusual Fire or Explosion Hazards: Phosphoric acid is noncombustible, but contact with common metals may liberate hydrogen, a flammable gas that readily forms explosive mixtures with air.

Special Fire-fighting Procedures: Phosphoric acid is hazardous in a fire situation. Since toxic vapors may form, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Avoid skin and eye exposure to splashes and mists of phosphoric acid. Cool fire-exposed containers and sealed tanks with water spray to avoid rupture from heat-generated pressure. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Phosphoric acid is stable at room temperature in closed containers under normal storage and handling conditions.

Violent polymerization can occur with epoxides, azo compounds, and polymerizable compounds.

Chemical Incompatibilities: This material is a strong acid that reacts with alkalis (bases) to form phosphate salts and is corrosive (especially when hot) to many metals and alloys. It liberates explosive hydrogen gas when reacting with chlorides and stainless steel, and can react violently with sodium tetrahydroborate. Exothermic reactions with aldehydes, amines, amides, alcohols and glycols, azo-compounds, carbamates, esters, caustics, phenols and cresols, ketones, organophosphates, epoxides, explosives, combustible materials, unsaturated halides, and organic peroxides. Phosphoric acid forms flammable gases with sulfides, mercaptans, cyanides, and aldehydes. It also forms toxic fumes with cyanides, sulfides, fluorides, organic peroxides, and halogenated organics. Hot, dilute phosphoric acid reacts with nickel carbonate to form trinickel orthophosphate. Mixtures with nitromethane are explosive.

Hazardous Products of Decomposition: Thermal oxidative decomposition of phosphoric acid can produce toxic phosphorous oxide (PO₂) fumes.



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(518) 377-8854

Section 1. Material Identification		39										
<p>Sulfuric Acid Concentrated (H₂SO₄) Description: Prepared by the "Cat-Ox" process; by the contact process (vanadium pentoxide catalyst) with sulfur, pyrite (FeS₂), hydrogen sulfide, or sulfur-containing smelter gases; and from gypsum (calcium sulfate). Sulfuric acid is by far the most widely used industrial chemical. Its uses include: in the manufacture of fertilizers, chemicals, nitrate explosives, parchment paper, glue, dyes and pigments; as an etchant, a lab reagent, an electrolyte in lead/acid batteries, a dehydrating agent in the manufacture of ethers and esters, and an alkylation catalyst; in the purification of petroleum, the refining of mineral and vegetable oils, the leather industry, the carbonization of wool fabrics, the recuperation of fatty acids from soapworks waste water, the production of rayon and film, the extraction of uranium from pitchblende, and pickling of metal; in electroplating baths, gas drying and nonferrous metallurgy; and to obtain glucose by the hydrolysis of cellulose.</p> <p>Other Designations: CAS No. 7664-93-9, battery acid, BOV, Caswell No 815, dipping acid, electrolyte acid, hydrogen sulfate, matting acid, oil of vitriol, sulphuric acid, vitriol brown oil.</p> <p>Manufacturer: Contact your supplier or distributor. Consult latest <i>Chemical Week Buyers' Guide</i>⁽⁷³⁾ for a suppliers list.</p> <p>Cautions: Handle concentrated sulfuric acid with extreme caution because it is corrosive to all body tissues. Vapor inhalation can cause severe lung damage. Skin or eye contact can produce severe burns; blindness may result.</p>		<table border="0"> <tr><td>R</td><td>1</td><td rowspan="4">NFPA </td></tr> <tr><td>I</td><td>3</td></tr> <tr><td>S</td><td>4</td></tr> <tr><td>K</td><td>0</td></tr> </table> <p>HMIS H 3* F 0 R 2 PPE† * Chronic effects † Sec. 8</p>	R	1	NFPA 	I	3	S	4	K	0	
R	1	NFPA 										
I	3											
S	4											
K	0											
Section 2. Ingredients and Occupational Exposure Limits												
<p>Sulfuric acid concentrated, 93-98% sulfuric acid; remainder is water. Impurities include nonvolatiles, 0.02-0.03 ppm; SO₂, 40-80 ppm; iron, 50-100 ppm; nitrate, 5-20 ppm.</p> <table border="0"> <tr> <td>1991 OSHA PEL 8-hr TWA: 1 mg/m³</td> <td>1992-93 ACGIH TLVs TWA: 1 mg/m³ STEL: 3 mg/m³</td> <td>1985-86 Toxicity Data* Human, inhalation, TC_{Lo}: 3 mg/m³ for 24 weeks; toxic effects not yet reviewed. Man, unreported route, LD_{Lo}: 135 mg/kg; toxic effects not yet reviewed. Rat, oral, LD₅₀: 2140 mg/kg; toxic effects not yet reviewed. Rabbit, eye: 100 mg rinse produced severe irritation.</td> </tr> <tr> <td>1990 IDLH Level 80 mg/m³</td> <td>1990 DFG (Germany) MAK TWA: 1 mg/m³ Category: Local irritants Peak: 2 mg/m³, 5 min, momentary value †, 8 peaks per shift</td> <td></td> </tr> <tr> <td>1990 NIOSH REL TWA: 1 mg/m³</td> <td></td> <td></td> </tr> </table> <p>* See NIOSH, RTECS (WS5600000), for additional toxicity data. † The momentary value is a level which the concentration should never exceed.</p>			1991 OSHA PEL 8-hr TWA: 1 mg/m ³	1992-93 ACGIH TLVs TWA: 1 mg/m ³ STEL: 3 mg/m ³	1985-86 Toxicity Data* Human, inhalation, TC _{Lo} : 3 mg/m ³ for 24 weeks; toxic effects not yet reviewed. Man, unreported route, LD _{Lo} : 135 mg/kg; toxic effects not yet reviewed. Rat, oral, LD ₅₀ : 2140 mg/kg; toxic effects not yet reviewed. Rabbit, eye: 100 mg rinse produced severe irritation.	1990 IDLH Level 80 mg/m ³	1990 DFG (Germany) MAK TWA: 1 mg/m ³ Category: Local irritants Peak: 2 mg/m ³ , 5 min, momentary value †, 8 peaks per shift		1990 NIOSH REL TWA: 1 mg/m ³			
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Section 3. Physical Data												
<table border="0"> <tr> <td>Boiling Point: 554 °F (290 °C); decomposes at 644 °F (340 °C) into sulfur trioxide and water.</td> <td>Molecular Weight: 98.08</td> </tr> <tr> <td>Melting Point (100%): 50.65 °F (10.36 °C)</td> <td>Density/Specific Gravity (96-98%): 1.841</td> </tr> <tr> <td>Vapor Pressure: <0.001 mm Hg at 20 °C</td> <td>Water Solubility: Soluble; reacts!* Other Solubilities: Ethyl alcohol</td> </tr> <tr> <td>Saturated Vapor Density (air = 1.2 kg/m³): 1.2 kg/m³, 0.075 lbs/ft³</td> <td>Odor Threshold: 0.150 ppm</td> </tr> <tr> <td>pH: 1 N sol = 0.3, 0.1 N sol = 1.2, 0.01 N sol = 2.1</td> <td></td> </tr> </table> <p>Appearance and Odor: Colorless (pure) to dark brown (impure), odorless, dense, oily liquid. Pure compound is a solid below 51 °F (11 °C). * Sulfuric acid reacts violently with water with the evolution of heat. Always add the acid to water or other diluent, not the water to acid!</p>			Boiling Point: 554 °F (290 °C); decomposes at 644 °F (340 °C) into sulfur trioxide and water.	Molecular Weight: 98.08	Melting Point (100%): 50.65 °F (10.36 °C)	Density/Specific Gravity (96-98%): 1.841	Vapor Pressure: <0.001 mm Hg at 20 °C	Water Solubility: Soluble; reacts!* Other Solubilities: Ethyl alcohol	Saturated Vapor Density (air = 1.2 kg/m ³): 1.2 kg/m ³ , 0.075 lbs/ft ³	Odor Threshold: 0.150 ppm	pH: 1 N sol = 0.3, 0.1 N sol = 1.2, 0.01 N sol = 2.1	
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Section 4. Fire and Explosion Data												
<table border="0"> <tr> <td>Flash Point: Not combustible</td> <td>Autoignition Temperature: None reported</td> <td>LEL: None reported</td> <td>UEL: None reported</td> </tr> </table> <p>Extinguishing Media: Use extinguishing media appropriate to surrounding fire. Only use water if absolutely necessary and use with great caution. Water applied directly to sulfuric acid results in violent heat liberation and splattering of the material. Use water spray only to keep fire-exposed containers cool. Unusual Fire or Explosion Hazards: Sulfuric acid, a strong dehydrating agent, reacts with organic materials and produces enough heat ignition, chars wood, and may cause ignition of finely divided materials on contact. Reaction with metals may produce highly flammable, hydrogen gas. Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing is not effective. Stay away from ends of tanks. Do not release runoff from fire control methods to sewers or waterways.</p>			Flash Point: Not combustible	Autoignition Temperature: None reported	LEL: None reported	UEL: None reported						
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Section 5. Reactivity Data												
<p>Stability/Polymerization: Sulfuric acid is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Chemical Incompatibilities: Include acetic acid; acetone cyanohydrin; (acetone + nitric acid); (acetone + potassium dichromate); acetonitrile; acrolein; acrylonitrile; acrylonitrile + water; (alcohol + hydrogen peroxide); allyl alcohol; allyl chloride; ammonium hydroxide; 2-amino ethanol; ammonium; triperchromate; aniline; (bromates + metals); bromine pentafluoride; n-butylaldehyde; carbides; cesium acetylene carbide; chlorates; (chlorates + metals); chlorine trifluoride; chlorosulfonic acid; cuprous nitride; diisobutylene; (dimethylbenzylcarbinol + hydrogen peroxide); epichlorohydrin; ethylene cyanohydrin; ethylene diamine; ethylene glycol; ethylene imine; fulminates; hydrochloric acid; hydrogen; iodine heptafluoride; (indene + nitric acid); iron; isoprene; lithium silicide; mercuric nitride; mesityl oxide; powdered metals; (nitric acid + glycerides); p-nitrotoluene; pentasilver trihydroxydianinophosphate; perchlorates; perchloric acid; (permanganates + benzene); (1-phenyl-2-methylpropyl alcohol + hydrogen peroxide); phosphorus; phosphorus isocyanate; picrates; potassium tert-butoxide; potassium chlorate; (potassium permanganate + potassium chloride); (potassium permanganate + water); beta-propiolactone; propylene oxide; pyridine; rubidium acetylene carbide; silver permanganate; sodium; sodium carbonate; sodium chlorate; sodium hydroxide; steel; styrene monomer; (toluene + nitric acid); vinyl acetate; and water. Conditions to Avoid: Water, combustibles, heat, ignition sources, and other incompatibles. Hazardous Products of Decomposition: Thermal oxidative decomposition of sulfuric acid can produce sulfur oxides.</p>												
Section 6. Health Hazard Data												
<p>Carcinogenicity: The IARC,⁽¹⁶⁴⁾ NTP,⁽¹⁶⁵⁾ and OSHA⁽¹⁶⁴⁾ do not list sulfuric acid as a carcinogen. However, a number of studies have associated exposures to sulfuric acid or to acid mists in general with laryngeal cancer. In 50 confirmed cases there was an approximately four-fold increased risk among highly exposed individuals relative to matched controls. It is not known if sulfuric acid can act as a direct carcinogen, as a promoter, or in combination with other substances.⁽¹⁶⁷⁾ Summary of Risks: Concentrated sulfuric acid is a severe respiratory tract, skin, and eye irritant.</p>												

Continue on next page



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Material Safety Data Sheets Collection:

Sheet No. 703
1,2-Dichloroethylene

263136

Issued: 4/90

Section 1. Material Identification

31

1,2-Dichloroethylene Description: An industrial solvent composed of 60% cis- and 40% trans-isomers. Both isomers, cis and trans, are made by partial chlorination of acetylene. Used as a general solvent for organic materials, lacquers, dye extraction, thermoplastics, organic synthesis, and perfumes. The trans-isomer is more widely used in industry than either the cis-isomer or the mixture. Toxicity also varies between the two isomers.

Other Designations: CAS No. 0540-59-0; C₂H₂Cl₂; acetylene dichloride; cis-1,2-dichloroethylene; sym-dichloroethylene; trans-1,2-dichloroethylene, dioform.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*TM for a suppliers list.

R 1
I 2
S 2
K 1



HMS
H 2
F 3
R 1
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

1,2-Dichloroethylene, ca 100%

OSHA PEL

8-hr TWA: 790 mg/m³, 200 ppm

ACGIH TLV, 1989-90

TLV-TWA: 790 mg/m³, 200 ppm

NIOSH REL, 1987

790 mg/m³, 200 ppm

Toxicity Data*

Rat, oral, LD₅₀: 770 mg/kg; toxic effects not yet reviewed
Frog, inhalation, TC₁₀: 117 mg/m³ inhaled for 1 hr affects the peripheral nerve and sensation (flaccid paralysis without anesthesia); behavior (excitement); lungs, thorax, or respiration (respiratory depression)

* See NIOSH, RTECS (KV936000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: 119 °F/48 °C

Melting Point: -56 to -115 °F/-49 to -82 °C

Vapor Pressure: 180 to 264 torr at 68 °F/20 °C

Vapor Density (Air = 1): 3.4

Molecular Weight: 96.95 g/mol

Specific Gravity (H₂O = 1 at 39 °F/4 °C): 1.27 at 77 °F/25 °C

Water Solubility: Insoluble

Appearance and Odor: A colorless, low-boiling liquid with a pleasant odor.

Section 4. Fire and Explosion Data

Flash Point: 37 °F/2.8 °C, CC

Autoignition Temperature: 860 °F/460 °C

LEL: 5.6% v/v

UEL: 12.8% v/v

Extinguishing Media: Use dry chemical, CO₂, halon, water spray, or standard foam. Water may be ineffective unless used to blanket the fire.
Unusual Fire or Explosion Hazards: This material's vapors are a dangerous fire hazard and moderate explosion hazard when exposed to any heat or ignition source or oxidizer.

Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and a fully encapsulating suit. Vapors may travel to heat or ignition sources and flash back. Stay upwind and out of low areas. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: This material is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: This material is incompatible with alkalis, nitrogen tetroxide, difluoromethylene, strong oxidizers, and dihydrofluorite. When in contact with copper or copper alloys or by reaction with potassium hydroxide, explosive chloroacetylene may be released.

Conditions to Avoid: Addition of hot liquid to cold 1,2-dichloroethylene may cause sudden emission of vapor that could flash back to an ignition source.

Hazardous Products of Decomposition: Thermal oxidative decomposition of 1,2-dichloroethylene can produce highly toxic fumes of chlorine (Cl₂).



SECTION 1. MATERIAL IDENTIFICATION			20
<p>MATERIAL NAME: METHYL n-BUTYL KETONE</p> <p>OTHER DESIGNATIONS: MBK; 2-Hexanone; n-Butyl Methyl Ketone; CH₃CO(CH₂)₃CH₃; CAS #0591-78-6</p> <p>MANUFACTURER/SUPPLIER: Available from several sources, including: Eastern Chemical Div. of United-Guardian, Inc., PO Box 2500, Smithtown, NY 11787; Telephone: (516) 273-0900</p> <p>HMIS H: 1 F: 3 R: 1 PPE* *See sect. 8</p> <p>R 1 I 4 S 3 K 3</p>			
SECTION 2. INGREDIENTS AND HAZARDS			HAZARD DATA
Methyl n-Butyl Ketone	%		<p>8-hr TWA 5 ppm or 20 mg/m³*</p> <p>Rat, Oral, LD₅₀: 2590 mg/kg</p> <p>Rat, Inhalation, LC₅₀: 8000 ppm/4 hrs.</p>
<p>* ACGIH (1985-86) TLV. OSHA PEL is 100 ppm or 410 mg/m³.</p> <p>Significant contribution to overall exposure by skin absorption: G.D. DiVincenzo et al., <i>Tox. Appl. Pharm.</i> 36 (1976):511.</p>			
SECTION 3. PHYSICAL DATA			
<p>Boiling Point, 1 atm ... 262.4°F (128°C) Vapor Pressure @ 38.8°C, mm Hg ... 10 Vapor Density (Air = 1) ... 3.45 Water Solubility @ 25°C, g/100 g H₂O ... 3.5</p>		<p>Specific Gravity, 20/4°C ... 0.810 Volatiles, % ... ca 100 Melting Point ... -134.6°F (-57°C) Evaporation Rate (nBuAc = 1) ... 0.87 Molecular Weight ... 100.16</p>	
<p>Appearance and odor: Clear, colorless liquid. Characteristic acetone-like odor.</p>			
SECTION 4. FIRE AND EXPLOSION DATA			LOWER UPPER
Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	
77°F (24.9°C) CC	991°F (532.2°C)	Volume %	1.22 8.0
<p>EXTINGUISHING MEDIA: Foam, dry chemical, carbon dioxide. Use water spray to cool metal containers that are exposed to fire.</p> <p>This material is a moderate fire and explosion hazard when exposed to heat and flame. Its heavier-than-air vapors can flow along surfaces to distant ignition sources and flash back.</p> <p>Fire fighters should use self-contained breathing equipment when fighting fires in which this material is involved.</p>			
SECTION 5. REACTIVITY DATA			
<p>Methyl n-butyl ketone is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.</p> <p>MBK is incompatible with oxidizing agents.</p> <p>It is an OSHA class IC flammable liquid.</p> <p>Thermal-oxidative degradation in air can produce toxic vapors and gases, including carbon monoxide (CO).</p>			

**Section 1. Material Identification**

39

Vinyl Chloride (C₂H₃Cl) Description: Derived from ethylene dichloride and alcoholic potassium, by reaction of acetylene and hydrogen chloride (as gas or liquids), or by oxychlorination where ethylene reacts with hydrochloric acid and oxygen. Inhibitors such as butyl catechol, hydroquinone, or phenol are added to prevent polymerization. Used in the plastics industry for the production of polyvinyl chloride resins, in organic synthesis and formerly as a refrigerant, extraction solvent, and propellant (banned in 1974 because of its carcinogenic activity).

Other Designations: CAS No. 75-01-4, chloroethylene, chloroethene, ethylene monochloride, Trovidur, VC, VCM.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*⁽⁷³⁾ for a suppliers list.

Cautions: Vinyl chloride is a confirmed human carcinogen. Vapor inhalation leads to central nervous system (CNS) depression. The liquid can cause frostbite. It is a flammable gas at room temperature and polymerizes on exposure to air or sunlight. Avoid exposure to VC through engineering controls and wearing PPE

R	2	NFPA
I	4	
S	4	
K	4	

HMS
H 3*
F 4
R 2
PPE - Sec. 8
* Chronic effects

Section 2. Ingredients and Occupational Exposure Limits

Vinyl Chloride, ca 98 to 99%. Impurities include water, acetaldehyde, hydrogen chloride, hydrogen peroxide, methyl chloride, butane, 1,3-butadiene, chlorophene, diacetylene, vinyl acetylene, and propine.

1991 OSHA PELs

8-hr TWA: 1 ppm
Ceiling: 5 ppm; OSHA-X

1992-93 ACGIH TLV

TWA: 5 ppm (13 mg/m³)
TLV-A1

1985-86 Toxicity Data†

Man, inhalation, TC_{Lo}: Intermittent exposure to 200 ppm for 14 yr caused liver tumors.

Man, inhalation, TC_{Lo}: 30 mg/m³/5 yr caused spermatogenesis.

Human, inhalation, TC: Continuous exposure to 300 mg/m³ for an undetermined number of weeks caused blood tumors.

Rat, oral, LD₅₀: 500 mg/kg; toxic effects not yet reviewed

1990 NIOSH REL

NIOSH-X

1990 DFG (Germany) TRK*

Existing Installations: 3 ppm
MAK-A1

* TRK (technical exposure limit) is used in place of MAK when a material is a carcinogen. Unlike an MAK below which no adverse effects are expected, the TRK is a limit set below which adverse effects may still occur. This is based on the theory that 1 molecule of a carcinogenic substance may still produce a tumor. The TRK is set to allow for an acceptable risk (for example, 1 tumor in 1 million persons may be an acceptable risk).
† See NIOSH, *RTECS* (KU9625000), for additional mutation, reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 7 °F (-13.9 °C)

Freezing Point: -245 °F (-159.7 °C)

Molecular Weight: 62.5

Specific Gravity: 0.9106 at 68 °F (20 °C)

Ionization Potential: 9.99 eV

Refraction Index: 1.370 at 20 °C/D

Surface Tension: 23.1 dyne/cm at -4 °F (-20 °C)

Odor Threshold: 2000 to 5000 ppm*

Vapor Density (Air = 1): 2.155

Water Solubility: Slightly soluble, 0.1% at 77 °F (25 °C)

Other Solubilities: alcohol, benzene, carbon tetrachloride, ether, hydrocarbon and oils.

Vapor Pressure: 2530 mm Hg at 68 °F (20 °C), 400 mm Hg at -18.4 °F (-28 °C)

Critical Temperature: 304.7 °F (151.5 °C)

Critical Pressure: 56.8 atm

Viscosity: 0.01072 cP at 68 °F (20 °C), gas; 0.28 cP at -4 °F (-20 °C), liquid

Appearance and Odor: A gas at room temperature. Usually found as a compressed/cooled liquid. The colorless liquid forms a vapor with a pleasant ethereal odor.

*The actual vapor concentration that can be detected by humans has not been adequately determined and varies from one individual to another, from impurities, and probably from exposure duration. The odor threshold is not an accurate warning of exposure.

Section 4. Fire and Explosion Data

Flash Point: -108.4 °F (-78 °C) OC

Autoignition Temperature: 882 °F (472 °C)

LEL: 3.6% v/v

UEL: 33% v/v

Extinguishing Media: For small fires, use dry chemical or carbon dioxide. For large fires, use water spray, fog, or regular foam. Unusual Fire or Explosion Hazards: Large fires can be practically inextinguishable. Vapors may travel to an ignition source and flash back. VC may polymerize in cylinders or tank cars and explode in heat of fire. Vapors pose an explosion hazard indoors, outdoors, and in sewers. VC decomposes in fire to hydrogen chloride, carbon monoxide, carbon dioxide, and phosgene. Burning rate = 4.3 mm/min. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Stop gas leak if possible. Let tank, tank car, or tank truck burn unless leak can be stopped. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if this is impossible, withdraw from area and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. *Do not* release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Long term exposure to air may result in formation of peroxides which initiates explosive polymerization of the chloride. VC can polymerize on exposure to light or in presence of a catalyst. **Chemical Incompatibilities:** VC can explode on contact with oxide of nitrogen, may liberate hydrogen chloride on exposure to strong alkalis, and is incompatible with copper, oxidizers, aluminum, and peroxides. In the presence of moisture, VC attacks iron and steel. **Conditions to Avoid:** Exposure to sunlight, air, heat, and incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of vinyl chloride can produce carbon oxides, and chloride gas.

Section 6. Health Hazard Data

Carcinogenicity: Vinyl chloride is listed as a carcinogen by the IARC (Class 1, *sufficient human evidence*),⁽¹⁶⁴⁾ NTP (Class 1, *sufficient human evidence*),⁽¹⁶⁹⁾ NIOSH (Class X, *carcinogen defined without further categorization*),⁽¹⁶³⁾ ACGIH (TLV-A1, *confirmed human carcinogen*),⁽¹⁶³⁾ DFG (MAK-A1, *capable of inducing malignant tumors in humans*),⁽¹⁶³⁾ and OSHA (Class X, *carcinogen defined without further categorization*).⁽¹⁶⁴⁾ Liver tumors (angiosarcomas) are confirmed from VC exposure. Other tumors of the CNS, respiratory system, blood, and lymphatic system have occurred from exposure to the polyvinyl chloride manufacture process but VC itself may not be the causative agent. **Summary of Risks:** Vapor inhalation causes varying degrees of CNS depression with noticeable anesthetic effects at levels of 1% (10,000 ppm). Studies have shown loss of libido and sperm in men exposed to VC and in Russian studies, 77% of exposed women experienced ovarian dysfunction, cervical uterine growths, and prolapsed genital organs. However, no teratogenic effects have been seen in offspring of exposed workers.

Continued

Material Safety Data Sheet

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



No. 359
ETHYLENE DICHLORIDE
 (Formerly 1,2-Dichloroethane)
 (Revision C)
 Issued: November 1978
 Revised: August 1987

283139

SECTION 1. MATERIAL IDENTIFICATION

CHEMICAL NAME: ETHYLENE DICHLORIDE (Changed to reflect common industrial practice)
DESCRIPTION (Origin/Uses): Made from acetylene and HCl. Used as a degreaser, a scavenger in leaded gasoline, as an intermediate in the manufacture of vinyl chloride, in paint removers, in wetting and penetration agents, in ore flotation processes, as a fumigant, and as a solvent for fats, oils, waxes, and gums.
OTHER DESIGNATIONS: 1,2-Dichloroethane; *sym*-Dichloroethane; Dutch Liquid; Dutch Oil; EDC; Ethane Dichloride; Ethylene Chloride; 1,2-Ethylene Dichloride; Glycol Dichloride; C₂H₄Cl₂;
NIOSH RTECS K10525000; CAS #0107-06-2
MANUFACTURERS/SUPPLIERS: Available from several suppliers, including:
 Dow Chemical USA, 2020 Dow Center, Midland, MI 48640; Telephone: (517) 636-1000



HMIS		R	1
H	1	I	4
F	3	S	2
R	0	K	4
PPE*			

COMMENTS: Ethylene dichloride is a flammable, toxic liquid.

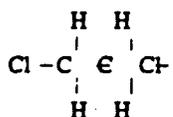
* See Sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

Ethylene Dichloride, CAS #0107-06-2; NIOSH RTECS #K10525000

%

HAZARD DATA



100

ACGIH Values 1987-88
 TLV-TWA: 10 ppm, 40 mg/m³
 OSHA PEL* 1986-87
 8-Hr TWA: 50 ppm;
 Ceiling: 100 ppm (15 Min.)
 NIOSH REL 1986-87
 10-Hr TWA: 1 ppm
 Ceiling: 2 ppm (15 Min.)
Toxicity Data
 Man, Inhalation, TC_{Lo}: 4000 ppm/1 Hr
 Human, Oral, TD_{Lo}: 428 mg/kg
 Man, Oral, TD_{Lo}: 892 mg/kg
 Man, Oral, LD_{Lo}: 714 mg/kg
 Rat, Oral, LD₅₀: 670 mg/kg

*The maximum allowable peak concentration (above the ceiling level value) of ethylene dichloride is 200 ppm for 5 minutes in any 3-hour period.
COMMENTS: Additional data concerning toxic doses and tumorigenic, reproductive, and mutagenic effects is listed (with references) in the NIOSH RTECS 1983-84 supplement, pages 865-66.

SECTION 3. PHYSICAL DATA

Boiling Point ... 182.3°F (83.5°C)
 Vapor Pressure ... 87 Torr at 77°F (25°C)
 Water Solubility ... Soluble in about 120 Parts Water
 Vapor Density (Air = 1) ... 3.4

Evaporation Rate (n-BuAc = 1) ... Not Listed
 Specific Gravity ... 1.2569 at 69°F (20°C)
 Freezing Point ... -31.9°F (-35.5°C)
 Molecular Weight ... 98.96 Grams/Mole

Appearance and odor: Colorless, clear liquid. Sweet, chloroformlike odor is typical of chlorinated hydrocarbons. The recognition threshold (100% of test panel) for ethylene dichloride is 40 ppm. Odor detection probably indicates an excessive exposure to vapor. High volatility and flammability, coupled with its toxicity and carcinogenic potential, make this material a major health hazard.

COMMENTS: Ethylene dichloride is miscible with alcohol, chloroform, and ether.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

See Below

775°F (413°C)

% by Volume

6.2

15.9

EXTINGUISHING MEDIA: Use chemical, carbon dioxide, alcohol foam, water spray/fog, or dry sand to fight fires involving ethylene dichloride. Direct water sprays may be ineffective extinguishing agents, but they may be successfully used to cool fire-exposed containers. Use a smothering effect to extinguish fires involving this material. **UNUSUAL FIRE/EXPLOSION**

HAZARDS: Ethylene dichloride is a dangerous fire and explosion hazard when exposed to sources of ignition such as heat, open flames, sparks, etc. Its vapors are heavier than air and can flow along surfaces to distant, low-lying sources of ignition and flash back. If it is safe to do so, remove this material from the fire area. Ethylene dichloride burns with a smoky flame.

SPECIAL FIRE-FIGHTING PROCEDURES: Wear a self-contained breathing apparatus with a full facepiece operated in a pressure-demand or another positive-pressure mode.

COMMENTS: Flash Point and Method: 56°F (13°C) CC; 65°F (18°C) OC.

OSHA Flammability Class (29 CFR 1910.106): IB. DOT Flammability Class (49 CFR 173.115): Flammable Liquid

SECTION 5. REACTIVITY DATA

Ethylene dichloride is stable. Hazardous polymerization cannot occur.

CHEMICAL INCOMPATIBILITIES include strong oxidizing agents. Explosions have occurred with mixtures of this material and liquid ammonia or dimethylaminopropylamine. Finely divided aluminum or magnesium metal may be hazardous in contact with ethylene dichloride.

CONDITIONS TO AVOID: Eliminate sources of ignition such as excessive heat, open flames, or electrical sparks, particularly in low-lying areas, because the explosive, heavier-than-air vapors will concentrate there.

PRODUCTS OF HAZARDOUS DECOMPOSITION can include vinyl chloride, chloride fumes, and phosgene. Phosgene is an extremely poisonous gas. Products of thermal-oxidative degradation (i.e., fire conditions) must be treated with appropriate caution.



UNION CARBIDE CHEMICALS AND PLASTICS COMPANY INC.

263110



Specialty Chemicals Division
MATERIAL SAFETY DATA SHEET

EFFECTIVE DATE 06/15/92

Union Carbide urges each customer or recipient of this MSDS to study it carefully to become aware of and understand the hazards associated with the product. The reader should consider consulting reference works or individuals who are experts in ventilation, toxicology, and fire prevention, as necessary or appropriate to use and understand the data contained in this MSDS.

To promote safe handling, each customer or recipient should: (1) notify its employees, agents, contractors and others whom it knows or believes will use this material or the information in this MSDS and any other information regarding hazards or safe use; (2) furnish this same information to each of its customers for the product; and (3) request its customers to notify their employees, customers, and other users of the product of this information.

I. IDENTIFICATION

PRODUCT NAME: UCON Lubricant LB-170-X

CHEMICAL NAME: Mixture

CHEMICAL FAMILY: Polyalkylene Glycol

FORMULA: Trade Secret

MOLECULAR WEIGHT: Mixture

SYNONYMS: None

CAS # AND NAME: See "SECTION III"

II. PHYSICAL DATA (Determined on Typical Material)

BOILING POINT, 760 mm Hg: Decomposes
> 200 C (> 392 F)

SPECIFIC GRAVITY (H2O = 1): 0.987 AT 20/20 C

FREEZING POINT: Pour point
< -29 C (< -20 F)

VAPOR PRESSURE AT 20°C: < 0.01 mmHg

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EMERGENCY PHONE NUMBERS: 1 800 UCC-HELP (NUMBER AVAILABLE AT ALL TIMES) OR (304) 744-3487

UNION CARBIDE CHEMICALS AND PLASTICS COMPANY INC

Specialty Chemicals Division

39 Old Ridgebury Road, Danbury, CT 06817-0001

PRODUCT NAME: UCON Lubricant LB-170-X

283141

VAPOR DENSITY (AIR = 1): >1

EVAPORATION RATE (Butyl Acetate = 1): Nil

SOLUBILITY IN WATER by wt: <0.1

APPEARANCE: Amber

ODOR: Mild

PHYSICAL STATE: Liquid

III. INGREDIENTS

<u>%</u>	<u>MATERIAL</u>	<u>CAS#</u>	<u>EXPOSURE LIMIT</u>
> 95	Polypropylene Glycol Monobutyl Ether	9003-13-8	None established
< 5	N-phenyl-alpha- naphthylamine	90-20-2	None established

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT(test method(s)): 368 F (188 C)
Pensky Martens Closed Cup ASTM D 93
480 F (232 C)
Cleveland Open Cup ASTM D 92

FLAMMABLE LIMITS IN AIR LOWER: Not Determined
% by volume: UPPER: Not Determined

SPECIAL FIRE FIGHTING PROCEDURES: Do not direct a solid stream of water or foam into hot, burning pools; this may cause frothing and increase fire intensity. Use self contained breathing apparatus and protective clothing.

EXTINGUISHING MEDIA: Apply alcohol-type or all-purpose-type foam by manufacturer's recommended technique for large fires. Use carbon dioxide or dry chemical media for small fires.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This material may produce a floating fire hazard in extreme fire conditions. During a fire, oxides of nitrogen may be produced.

V. HEALTH HAZARD DATA

EXPOSURE LIMIT(S): None established by OSHA or ACGIH.

EFFECTS OF SINGLE OVEREXPOSURE:

SWALLOWING: No evidence of harmful effects from available information.

SKIN ABSORPTION: No evidence of harmful effects from available information.

INHALATION: Short-term harmful health effects are not expected from vapor generated at ambient temperature.

SKIN CONTACT: Brief contact is not irritating. Prolonged contact may cause reddening, itchiness, a burning sensation, and possible drying and flaking of the skin.

EYE CONTACT: May cause irritation, experienced as stinging with excess blinking and tear production. Excess redness of the conjunctiva may occur.

EFFECTS OF REPEATED OVEREXPOSURE: No adverse effects anticipated from available information.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Skin contact may aggravate an existing dermatitis. Exposure to this material may decrease the oxygen-carrying capacity of the blood. Individuals with cardiovascular disease or impairment of the respiratory function may be at increased risk.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: Contains one or more amines which may react with nitrites to form nitrosamines. Some nitrosamines have been shown to be carcinogenic in laboratory animals.

OTHER EFFECTS OF OVEREXPOSURE: Overexposure to vapor generated at high temperatures may result in eye and respiratory tract irritation, dizziness, nausea and the inhalation of harmful amounts of material.

EMERGENCY AND FIRST AID PROCEDURES:

SWALLOWING: No emergency care anticipated.

SKIN: Wash skin with soap and water.

INHALATION: Remove to fresh air.

PRODUCT NAME: UCON Lubricant LB-170-X

263143

EYES: Immediately flush eyes with water and continue washing for several minutes. Remove contact lenses, if worn. Obtain medical attention.

NOTES TO PHYSICIAN: There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

VI. REACTIVITY DATA

STABILITY: Stable

CONDITIONS TO AVOID: **WARNING:** Do not mix this product with nitrites or other nitrosating agents because a nitrosamine may be formed. Nitrosamines may cause cancer.

INCOMPATIBILITY (materials to avoid): Normally unreactive; however, avoid strong bases at high temperatures, strong acids, strong oxidizing agents and materials reactive with hydroxyl compounds.

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS:
Combustion may produce the following products:
Oxides of carbon and nitrogen.
Carbon monoxide is highly toxic if inhaled; carbon dioxide in sufficient concentrations can act as an asphyxiant.
Acute overexposure to the products of combustion may result in irritation of the respiratory tract.
See Section V, "Other Effects of Overexposure."

HAZARDOUS POLYMERIZATION: Will Not Occur

CONDITIONS TO AVOID: None

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Wear suitable protective equipment, especially eye protection.
See Section VIII.
Small spills can be flushed with large amounts of water; larger spills should be collected for disposal.
See Section IX, Other Precautions.

WASTE DISPOSAL METHOD: Incinerate in a furnace or otherwise dispose of in accordance with appropriate Federal, State, and local regulations.

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type):
None expected to be needed at low temperatures.

VENTILATION: General (mechanical) room ventilation is satisfactory for use at low temperatures. If used at high temperatures, special local ventilation

PRODUCT NAME: UCON Lubricant LB-170-X

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is recommended at points where vapors can be expected to escape to the workplace air.

PROTECTIVE GLOVES: Polyvinyl chloride coated

EYE PROTECTION: Monogoggles

OTHER PROTECTIVE EQUIPMENT:
Eye Bath, Safety Shower

IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

WARNING!
CAUSES EYE AND SKIN IRRITATION.
VAPOR GENERATED AT HIGH TEMPERATURES
(THERMAL DEGRADATION) CAN BE IRRITATING.

Avoid contact with eyes, skin and clothing.
Avoid breathing vapor.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.

Do not add nitrites or other nitrosating agents.
A nitrosamine, which may cause cancer, may be formed.

FOR INDUSTRY USE ONLY

OTHER PRECAUTIONS:

SPILLS: This product has very low solubility in water and will float on the surface. Avoid drainage of large spills to sewers or to natural waters.

PROCESS HAZARD: Sudden release of hot organic chemical vapors or mists from process equipment operating at elevated temperature and pressure, or sudden ingress of air into vacuum equipment, may result in ignitions without the presence of obvious ignition sources. Published "autoignition" or "ignition" temperature values cannot be treated as safe operating temperatures in chemical processes without analysis of the actual process conditions.

Any use of this product in elevated-temperature processes should be thoroughly evaluated to establish and maintain safe operating conditions. Further information is available in a technical bulletin entitled "Ignition Hazards of Organic Chemical Vapors."

X. REGULATORY INFORMATION

STATUS ON SUBSTANCE LISTS:

The concentrations shown are maximum or ceiling levels (weight %) to be used for calculations for regulations. Trade Secrets are indicated by "TS".

FEDERAL EPA

Comprehensive Environmental Response Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center of release of quantities of Hazardous Substances equal to or greater than the reportable

PRODUCT NAME: UCON Lubricant LB-170-X

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quantities (RQs) in 40 CFR 302.4.

Components present in this product at a level which could require reporting under the statute are:
**** NONE ****

Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires emergency planning based on Threshold Planning Quantities (TPQs) and release reporting based on Reportable Quantities (RQs) in 40 CFR 355 (used for SARA 302, 304, 311 and 312).

Components present in this product at a level which could require reporting under the statute are:
**** NONE ****

Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires submission of annual reports of release of toxic chemicals that appear in 40 CFR 372 (for SARA 313). This information must be included in all MSDSs that are copied and distributed for this material.

Components present in this product at a level which could require reporting under the statute are:
**** NONE ****

Toxic Substances Control Act (TSCA) STATUS:

The ingredients of this product are on the TSCA inventory.

STATE RIGHT-TO-KNOW

CALIFORNIA Proposition 65

This product contains trace amounts of ALPHA-NAPHTHYLAMINE, BETA-NAPHTHYLAMINE and ANILINE which the State of California has found to cause cancer.

MASSACHUSETTS Right-To-Know, Substance List (MSL) Hazardous Substances and Extraordinarily Hazardous Substances on the MSL must be identified when present in products.

Components present in this product at a level which could require reporting under the statute are:
EXTRAORDINARILY HAZARDOUS SUBSTANCES (= > 0.0001%)

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %
beta Naphthylamine	91-69-8	0.00010
alpha Naphthylamine	134-32-7	0.00100
Aniline	62-63-3	0.00800

PENNSYLVANIA Right-to-Know, Hazardous Substance List Hazardous Substances and Special Hazardous Substances on the list must be identified when present in products.

Components present in this product at a level which could require reporting under the statute are:
**** NONE ****

CALIFORNIA SCAQMD RULE 443.1 VOC'S:

**** NOT DETERMINED ****

OTHER REGULATORY INFORMATION:

EPA Hazard Categories: Immediate Health, Delayed Health



TAILGATE SAFETY MEETING

263146

Division/Subsidiary _____ Facility _____

Date _____ Time _____ Job Number _____

Customer _____ Address: _____

Specific Location _____

Type of Work _____

Chemicals Used _____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____

Chemical Hazards _____

Physical Hazards _____

Emergency Procedures _____

Hospital / Clinic _____ Phone () _____ Paramedic Phone () _____

Hospital Address _____

Special Equipment _____

Other _____

ATTENDEES

NAME PRINTED

SIGNATURE

Meeting conducted by:

NAME PRINTED

SIGNATURE

Supervisor _____

Manager _____



PROJECT OPERATIONS SAFETY INSPECTION REPORT

263147

DATE: _____ TIME FROM: _____ TO: _____

PROJECT NAME: _____ PROJECT NUMBER: _____

PROGRAM MANAGER: _____ PROJECT MANAGER: _____

GENERAL PROJECT DESCRIPTION: _____

SITE ACTIVITIES AT TIME OF INSPECTION: _____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED: _____ DATE: _____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED: _____ DATE: _____

INSPECTION COMPLETED BY: _____ DATE: _____

HEALTH AND SAFETY REVIEW BY: _____ DATE: _____


SAFETY INSPECTION CHECKLIST
263148

	Not Applicable	Not* Acceptable	Acceptable		Not Applicable	Not* Acceptable	Acceptable
HEALTH AND SAFETY DOCUMENTATION				SITE CONTROL			
Tailgate Safety Meeting				Security Maintained			
Hot Work Permit				Clearly Marked Exclusion Zone			
Confined Space Entry Permit				Clearly Marked Contamination Reduction Zone			
Hospital Route Map				Clearly Marked Support Zone			
OSHA 200 Log				Sign In/Out Log			
MSDSs				Decontamination Procedures			
Air Monitoring Logs				Client Specific Passes			
Equipment Calibration Logs				PERSONAL PROTECTIVE EQUIPMENT			
Personnel Training Records				Hard Hats			
Personnel Medical Records				Safety Glasses			
Accident Forms				Steel-Toed Boots			
Emergency Phone Numbers				Gloves			
OSHA Job Protection Posters				Hearing Protection			
IT's H&S Policies and Procedures				Traffic Vests			
Client Specific Documentation				Faceshields			
H&S Plan Acknowledgement				Chemical Resistant Coveralls			
				Chemical Resistant Boots/Gloves			
EMERGENCY EQUIPMENT				Respiratory Protection			
Fire Extinguishers				Back Support Devices			
Shower/Eyewash				Chaps			
Alarm System				Lifelines/Harness			
Transport Vehicle				Welder's Hood w/ Hard Hat			
Communication System				Welder's Sleeves/Leathers			
First-Aid/CPR Provider				Personal Flotation Device			



	Not Applicable	Not* Acceptable	Acceptable		Not Applicable	Not* Acceptable	Acceptable
HOUSEKEEPING AND SANITATION				ELECTRICAL			
Adequate Illumination				GFCIs in Place			
Drinking Water/Disposable cups				Lockout/Tagout Procedures			
Sanitary Facilities				Equipment UL Listed or FM Approved			
Break Area				Adequate Clearance from Overhead Lines			
General Housekeeping				Grounding and Bonding			
Walkways Clear				Qualified Electricians			
				Uncompromised Insulation			
				Utility Markouts Completed			
VEHICLE/EQUIPMENT OPERATIONS				HAND TOOLS			
Record of Regular Inspection and Maintenance				Correct Tool Being Used for Job			
Safe Driver Training				Damaged Tools Repaired or Replaced			
Back-up Alarms				All Guards in Place			
Qualified Operators				Neat Storage, Safe Carrying			
Proof of Insurance				Grounded 3-Prong Plugs			
Wheels Chocked				LADDERS			
Brake Lights, Warning Devices Operative				Regular Inspections			
Weight Limits and Load Sizes Controlled				Secured at Top and Bottom			
DOT Requirements Met				Side Rails Extended 3 Feet Above Top of Landing			
Fire Extinguisher				Ladders Not Painted			
All Glass in Good Condition				Step Ladders Fully Opened When in Use			
SITE MONITORING				Safety Feet in Use			
Volatile Organics				Rungs not Over 1 Foot on Center			
Dust				Ladder Training			
Noise				Top of Step Ladder Not Used as Step			
Radiation							
Illumination							
Semi Volatile Organics							
Inorganic							

*Any "Not Acceptable" response must be documented on the corrective action form.

SAFETY INSPECTION CHECKLIST CORRECTIVE ACTIONS

NOT ACCEPTABLE FINDINGS	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETED	VERIFIED BY



GENERAL LIABILITY, PROPERTY DAMAGE, AND LOSS REPORT

FOR ADMINISTRATION USE ONLY

263151

Date Claim Submitted

Agent

DIVISION/SUBSIDIARY _____ DATE / /

ADDRESS _____

HOW DID DAMAGE OR LOSS OCCUR: _____

DESCRIPTION OF DAMAGE OR LOSS: _____

IDENTIFICATION OF DAMAGED OR LOST PROPERTY: _____

LOCATION OF DAMAGED OR LOST PROPERTY (Before Loss): _____

DATE AND TIME OF DAMAGE OR LOSS: Date / / Time _____ AM
PM

OWNER OF DAMAGED OR LOST PROPERTY:

Name _____ Phone No. _____

Address _____ City _____

Employer _____

INJURED PARTIES (Complete also a Supervisors Employee Injury Report if an IT Employee):

1. Name _____ Phone No. _____

Address _____ City _____

Employer's Name & Address _____

Nature Of Injury _____

2. Name _____ Phone No. _____

Address _____ City _____

Employer's Name & Address _____

Nature Of Injury _____

WITNESSES:

1. Name _____ Phone No. _____

Address _____ City _____

Employer's Name & Address _____

2. Name _____ Phone No. _____

Address _____ City _____

Employer's Name & Address _____

WERE PICTURES TAKEN YES NO

WERE POLICE NOTIFIED YES NO DEPT. _____

COMPLETED BY: _____ Date / /
Name Printed Signature

Manager _____ Date / /

Signature

1 ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT <input type="checkbox"/> CIVILIAN <input type="checkbox"/> MILITARY	<input type="checkbox"/>	<input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> CONTRACTOR	<input type="checkbox"/>	<input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> PUBLIC	<input type="checkbox"/> FATAL <input type="checkbox"/> OTHER	PROPERTY DAMAGE		DIVING

2 PERSONAL DATA

a. NAME (Last,First,MI)	b. AGE	c. SEX <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE
f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT <input type="checkbox"/> ON DUTY <input type="checkbox"/> TDY <input type="checkbox"/> OFF DUTY		h. EMPLOYMENT STATUS AT TIME OF ACCIDENT <input type="checkbox"/> ARMY ACTIVE <input type="checkbox"/> ARMY RESERVE <input type="checkbox"/> VOLUNTEER <input type="checkbox"/> PERMANENT <input type="checkbox"/> FOREIGN NATIONAL <input type="checkbox"/> SEASONAL <input type="checkbox"/> TEMPORARY <input type="checkbox"/> STUDENT <input type="checkbox"/> OTHER (Specify)	

3 GENERAL INFORMATION

a. DATE OF ACCIDENT (month/day/year)	b. TIME OF ACCIDENT (Military time)	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:
e. CONTRACT NUMBER <input type="checkbox"/> CIVIL WORKS <input type="checkbox"/> MILITARY <input type="checkbox"/> OTHER (Specify)	f. TYPE OF CONTRACT <input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> SERVICE <input type="checkbox"/> A/E <input type="checkbox"/> DREDGE <input type="checkbox"/> OTHER (Specify)	g. HAZARDOUS/TOXIC WASTE ACTIVITY <input type="checkbox"/> SUPERFUND <input type="checkbox"/> DERP <input type="checkbox"/> IRP <input type="checkbox"/> OTHER (Specify)	

4 CONSTRUCTION ACTIVITIES ONLY (Fill in line and corresponding code number in box from list - see instructions)

a. CONSTRUCTION ACTIVITY (CODE)	b. TYPE OF CONSTRUCTION EQUIPMENT (CODE)
#	#

5 INJURY / ILLNESS INFORMATION (Include name on line and corresponding code number in box for items e, f & g - see instructions)

a. SEVERITY OF ILLNESS / INJURY (CODE)	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY
#			
e. BODY PART AFFECTED (CODE)	g. TYPE AND SOURCE OF INJURY/ILLNESS		
PRIMARY #	TYPE #		
SECONDARY #	SOURCE #		
f. NATURE OF ILLNESS / INJURY (CODE)			
#			

6 PUBLIC FATALITY (Fill in line and corresponding code number in box - see instructions)

a. ACTIVITY AT TIME OF ACCIDENT (CODE)	b. PERSONAL FLOATATION DEVICE USED?
#	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A

7 MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE <input type="checkbox"/> PICKUP/VAN <input type="checkbox"/> AUTOMOBILE <input type="checkbox"/> TRUCK <input type="checkbox"/> OTHER (Specify)	b. TYPE OF COLLISION <input type="checkbox"/> SIDE SWIPE <input type="checkbox"/> HEAD ON <input type="checkbox"/> REAR END <input type="checkbox"/> BROADSIDE <input type="checkbox"/> ROLL OVER <input type="checkbox"/> BACKING <input type="checkbox"/> OTHER (Specify)	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
		(1) FRONT SEAT			
		(2) REAR SEAT			

8 PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. \$ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9 VESSEL / FLOATING PLANT ACCIDENT (Fill in line and corresponding code number in box from list - see instructions)

a. TYPE OF VESSEL/FLOATING PLANT (CODE)	b. TYPE OF COLLISION/MISHAP (CODE)
#	#

10 ACCIDENT DESCRIPTION (Use additional paper, if necessary)

<p>a. (Explain YES answers in item 13)</p> <p>DESIGN: Was design of facility, workplace or equipment a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>OPERATING PROCEDURES: Were operating procedures a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p>	<p>a. (CONTINUED)</p> <p>CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p>	<p>YES NO</p> <p style="font-size: 2em; font-weight: bold;">263152A</p>
<p>b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?</p> <p><input type="checkbox"/> YES (If yes, attach a copy.) <input type="checkbox"/> NO</p>		

12. TRAINING		
<p>a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?</p> <p><input type="checkbox"/> YES <input type="checkbox"/> NO</p>	<p>b. TYPE OF TRAINING.</p> <p><input type="checkbox"/> CLASSROOM <input type="checkbox"/> ON JOB</p>	<p>c. DATE OF MOST RECENT FORMAL TRAINING.</p> <p style="text-align: center;">(Month) / (Day) / (Year)</p>

13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES (See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).

DESCRIBE FULLY:

15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.

a. BEGINNING (Month/Day/Year) / /	b. ANTICIPATED COMPLETION (Month/Day/Year) / /		
c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT	d. DATE (Mo/Da/Yr)	e. ORGANIZATION IDENTIFIER (Div. Br. Sect)	f. OFFICE SYMBOL
CORPS _____	___ / ___ / ___		
CONTRACTOR _____	___ / ___ / ___		

16. MANAGEMENT REVIEW (1st).

a. CONCUR b. NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE
-----------	-------	------

17. MANAGEMENT REVIEW (2nd - Chief Operations, Construction, Engineering, etc.)

a. CONCUR b. NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE
-----------	-------	------

18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a. CONCUR b. NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS.

SIGNATURE	TITLE	DATE
-----------	-------	------

19. COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE	DATE
---------------------	------

GENERAL. Complete a separate report for each person injured, caused, or contributed to the accident (excluding uninjured personnel and witnesses). Use of this form for reporting USACE employee first-aid type injuries not submitted to the Office of Workers' Compensation Programs (OWCP) shall be at the discretion of the FOA commander. Please type or print legibly. Appropriate items shall be marked with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16 and 17.

INSTRUCTIONS FOR SECTION 1— ACCIDENT CLASSIFICATION. (Mark All Boxes That Are Applicable.)

- a. **GOVERNMENT.** Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.
- (1) **INJURY/ILLNESS/FATALITY**—Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 (injury), CA-2 (illness), or CA-6 (fatality) to OWCP; mark if accident resulted in military personnel lost-time or fatal injury or illness.
 - (2) **PROPERTY DAMAGE**—Mark the appropriate box if accident resulted in any damage of \$1000 or more to government property (including motor vehicles).
 - (3) **VEHICLE INVOLVED**—Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.
 - (4) **DIVING ACTIVITY**—Mark if the accident involved an in-house USACE diving activity.
- b. **CONTRACTOR.**
- (1) **INJURY/ILLNESS/FATALITY**—Mark if accident resulted in any contractor lost-time injury/illness or fatality.
 - (2) **PROPERTY DAMAGE**—Mark the appropriate box if accident resulted in any damage of \$1000 or more to contractor property (including motor vehicles).
 - (3) **VEHICLE INVOLVED**—Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.
 - (4) **DIVING ACTIVITY**—Mark if the accident involved a USACE Contractor diving activity.
- c. **PUBLIC.**
- (1) **INJURY/ILLNESS/FATALITY**—Mark if accident resulted in public fatality or permanent total disability. (The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander).
 - (2) **VOID SPACE**—Make no entry.
 - (3) **VEHICLE INVOLVED**—Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" is marked.
 - (4) **VOID SPACE**—Make no entry.

INSTRUCTIONS FOR SECTION 2—PERSONAL DATA

- a. **NAME**—(MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS). Enter last name, first name, middle initial of person involved.
- b. **AGE**—Enter age.
- c. **SEX**—Mark appropriate box.
- d. **SOCIAL SECURITY NUMBER**—(FOR GOVERNMENT PERSONNEL ONLY) Enter the social security number (or other personal identification number if no social security number issued).
- e. **GRADE**—(FOR GOVERNMENT PERSONNEL ONLY) Enter pay grade. Example: O-6; E-7; WG-8; WS-12; GS-11; etc.

pay plan, full series number, and job title, e.g., GS-05 Civil Engineer. For *military personnel* enter the primary military occupational specialty (PMOS), e.g., 1SA30 or 11GS0. For *contractor employees* enter the job title assigned to the injured person, e.g., carpenter, laborer, surveyor, etc..

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- g. **DUTY STATUS**—Mark the appropriate box.
- (1) **ON DUTY**—Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.
 - (2) **TDY** - Person was on official business, away from the duty station and with travel orders at time of accident. Line-of-duty investigation required.
 - (3) **OFF DUTY** - Person was not on official business at time of accident
- h. **EMPLOYMENT STATUS**—(FOR GOVERNMENT PERSONNEL ONLY) Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

INSTRUCTION FOR SECTION 3—GENERAL INFORMATION

- a. **DATE OF ACCIDENT**—Enter the month, day, and year of accident.
- b. **TIME OF ACCIDENT**—Enter the local time of accident in military time. Example: 1430 hrs (not 2:30 p.m.).
- c. **EXACT LOCATION OF ACCIDENT**—Enter facts needed to locate the accident scene. (installation/project name, building number, street, direction and distance from closest landmark, etc..).
- d. **CONTRACTOR NAME**
- (1) **PRIME**—Enter the exact name (title of firm) of the prime contractor.
 - (2) **SUBCONTRACTOR**—Enter the name of any subcontractor involved in the accident.
- e. **CONTRACT NUMBER**—Mark the appropriate box to identify if contract is civil works, military, or other: if "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 09-85-C-0100.
- f. **TYPE OF CONTRACT**—Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.
- g. **HAZARDOUS/TOXIC WASTE ACTIVITY (HTW)**—Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program (IRP) HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site (FUDS) activities and IRP activities will be treated separately. For Civil Works O&M HTW activities mark the "OTHER" box.

INSTRUCTIONS FOR SECTION 4—CONSTRUCTION ACTIVITIES

- a. **CONSTRUCTION ACTIVITY**—Select the *most appropriate* construction activity being performed at time of accident from the list below. Enter the activity name and place the corresponding code number identified in the box.

CONSTRUCTION ACTIVITY LIST

- | | |
|-------------------------|----------------------------|
| 1. MOBILIZATION | 14. ELECTRICAL |
| 2. SITE PREPARATION | 15. SCAFFOLDING/ACCESS |
| 3. EXCAVATION/TRENCHING | 16. MECHANICAL |
| 4. GRADING (EARTHWORK) | 17. PAINTING |
| 5. PIPING/UTILITIES | 18. EQUIPMENT/MAINTENANCE |
| 6. FOUNDATION | 19. TUNNELING |
| 7. FORMING | 20. WAREHOUSING/STORAGE |
| 8. CONCRETE PLACEMENT | 21. PAVING |
| 9. STEEL ERECTION | 22. FENCING |
| 10. ROOFING | 23. SIGNING |
| 11. FRAMING | 24. LANDSCAPING/IRRIGATION |
| 12. MASONRY | 25. INSULATION |
| 13. CARPENTRY | 26. DEMOLITION |

b. TYPE OF CONSTRUCTION EQUIPMENT — Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

CONSTRUCTION EQUIPMENT

- | | |
|------------------------------------|--------------------------------|
| 1. GRADER | 13. DUMP TRUCK (OFF HIGHWAY) |
| 2. DRAGLINE | 14. TRUCK (OTHER) |
| 3. CRANE (ON VESSEL/BARGE) | 15. FORKLIFT |
| 4. CRANE (TRACKED) | 16. BACKHOE |
| 5. CRANE (RUBBER TIRE) | 17. FRONT-END LOADER |
| 6. CRANE (VEHICLE MOUNTED) | 18. PILE DRIVER |
| 7. CRANE (TOWER) | 19. TRACTOR (UTILITY) |
| 8. SHOVEL | 20. MANLIFT |
| 9. SCRAPER | 21. DOZER |
| 10. PUMP TRUCK (CONCRETE) | 22. DRILL RIG |
| 11. TRUCK (CONCRETE/TRANSIT MIXER) | 23. COMPACTOR/VIBRATORY ROLLER |
| 12. DUMP TRUCK (HIGHWAY) | 24. OTHER |

INSTRUCTIONS FOR SECTION 5—INJURY/ILLNESS INFORMATION

a. SEVERITY OF INJURY / ILLNESS - Reference para 2-10 of USACE Suppl 1 to AR 385-40 and enter code and description from list below.

- | | |
|-----|---|
| NOI | NO INJURY |
| FAT | FATALITY |
| PTL | PERMANENT TOTAL DISABILITY |
| PPR | PERMANENT PARTIAL DISABILITY |
| LWD | LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK |
| NLW | RECORDABLE CASE WITHOUT LOST WORKDAYS |
| RFA | RECORDABLE FIRST AID CASE |
| NRI | NON-RECORDABLE INJURY |

- b. ESTIMATED DAYS LOST — Enter the estimated number of workdays the person will lose from work.
- c. ESTIMATED DAYS HOSPITALIZED — Enter the estimated number of workdays the person will be hospitalized.
- d. ESTIMATED DAYS RESTRICTED DUTY — Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.
- e. BODY PART AFFECTED — Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH

ELBOW

FINGER

TOE

HEAD, EXTERNAL

KNEE

LEG, HIP, ANKLE, BUTTOCK

HAND

FOOT

TRUNK, BONES

SHOULDER

THUMB

TRUNK, INTERNAL ORGANS

f. NATURE OF INJURY/ILLNESS - Select the most appropriate nature of injury / illness from the list below. This nature of injury / illness shall correspond to the primary body part selected in 5e, above. Enter the nature of injury / illness name on the line and place the corresponding CODE letters in the box provided.

UY	YUG
CR	THROAT, OTHER
CT	TONGUE
CZ	HEAD OTHER INTERNAL
EB	BOTH ELBOWS
ES	SINGLE ELBOW
F1	FIRST FINGER
F2	BOTH FIRST FINGERS
F3	SECOND FINGER
F4	BOTH SECOND FINGERS
F5	THIRD FINGER
F6	BOTH THIRD FINGERS
F7	FOURTH FINGER
F8	BOTH FOURTH FINGERS
G1	GREAT TOE
G2	BOTH GREAT TOES
G3	TOE OTHER
G4	TOES OTHER
H1	EYE EXTERNAL
H2	BOTH EYES EXTERNAL
H3	EAR EXTERNAL
H4	BOTH EARS EXTERNAL
HC	CHIN
HF	FACE
HK	NECK/THROAT
HM	MOUTH/LIPS
HN	NOSE
HS	SCALP
KB	BOTH KNEES
KS	KNEE
LB	BOTH LEGS/HIPS/ ANKLES/BUTTOCKS
LS	SINGLE LEG/HIP ANKLE/BUTTOCK
MB	BOTH HANDS
MS	SINGLE HAND
PB	BOTH FEET
PS	SINGLE FOOT
R1	SINGLE COLLAR BONE
R2	BOTH COLLAR BONES
R3	SHOULDER BLADE
R4	BOTH SHOULDER BLADES
RB	RIB
RS	STERNUM (BREAST BONE)
RV	VERTEBRAE (SPINE; DISC)
RZ	TRUNK BONES OTHER
SB	BOTH SHOULDERS
SS	SINGLE SHOULDER
TB	BOTH THUMBS
TS	SINGLE THUMB
V1	LUNG, SINGLE
V2	LUNGS, BOTH
V3	KIDNEY, SINGLE
V4	KIDNEYS, BOTH
VH	HEART
VL	LIVER
VR	REPRODUCTIVE ORGANS
VS	STOMACH
VV	INTESTINES
VZ	TRUNK, INTERNAL; OTHER

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The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
TRAUMATIC INJURY OR DISABILITY	TA	AMPUTATION
	TB	BACK STRAIN.
	TC	CONTUSION; BRUISE; ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TQ	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/ INFECTIVE/PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
T3	TRAUMATIC HEART CONDITION	
T4	TRAUMATIC MENTAL DISORDER; STRESS; NERVOUS CONDITION	
T8	TRAUMATIC INJURY - OTHER (EXCEPT DISEASE, ILLNESS)	

**A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time. For practical purposes, an occupational illness/disease or disability is any reported condition which does not meet the definition of traumatic injury or disability as described above.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
**NON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY		
RESPIRATORY DISEASE	RA	ASBESTOSIS
	RB	BRONCHITIS
	RE	EMPHYSEMA
	RP	PNEUMOCONIOSIS
	RS	SILICOSIS
	R9	RESPIRATORY DISEASE, OTHER
VIROLOGICAL, INFECTIVE & PARASITIC DISEASES	VB	BRUCELOSIS
	VC	COCCIDIOMYCOSIS
	VF	FOOD POISONING
	VH	HEPATITIS
	VM	MALARIA
	VS	STAPHYLOCOCCUS
	VT	TUBERCULOSIS
	V9	VIROLOGICAL/INFECTIVE/ PARASITIC - OTHER
	DISABILITY, OCCUPATIONAL	DA
DB		BACK STRAIN, BACK SPRAIN
DC		CEREBRAL VASCULAR CONDITION; STROKE
DD		ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)
DE		EFFECT OF ENVIRONMENTAL CONDITION
DH		HEARING LOSS
DK		HEART CONDITION
DM		MENTAL DISORDER, EMOTIONAL STRESS NERVOUS CONDITION
DR		RADIATION
DS		STRAIN, MULTIPLE
DU		ULCER
DV		OTHER VASCULAR CONDITIONS
D9		DISABILITY, OTHER

GENERAL NATURE CATEGORY	CODE	NAME
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL
	SC	CHEMICAL
	S9	DERMATITIS, UNCLASSIFIED

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g. TYPE AND SOURCE OF INJURY/ILLNESS (CAUSE) - Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the initiating source of the incident (see example 1, below). Examples:

(1) An employee tripped on carpet and struck his head on a desk.
TYPE: 210 (fell on same level) SOURCE: 0110 (walking/working surface)

NOTE: This example would NOT be coded 120 (struck against) and 0140 (furniture).

(2) A Park Ranger contracted dermatitis from contact with poison ivy/oak.
TYPE: 510 (contact) SOURCE: 0920 (plant)

(3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.
TYPE: 410 (punctured by) SOURCE: 0830 (metal)

(4) An employee was driving a government vehicle when it was struck by another vehicle..
TYPE: 800 (traveling in) SOURCE: 0421 (government-owned vehicle, as driver)

NOTE: The Type Code 800, "Traveling In" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST
	FELL, SLIPPED, TRIPPED
0210	FELL ON SAME LEVEL
0220	FELL ON DIFFERENT LEVEL
0230	SLIPPED, TRIPPED (NO FALL)
	CAUGHT
0310	CAUGHT ON
0320	CAUGHT IN
0330	CAUGHT BETWEEN
	PUNCTURED, LACERATED
0410	PUNCTURED BY
0420	CUT BY
0430	STUNG BY
0440	BITTEN BY
	CONTACTED
0510	CONTACTED WITH (INJURED PERSON MOVING)
0520	CONTACTED BY (OBJECT WAS MOVING)
	EXERTED
0610	LIFTED, STRAINED BY (SINGLE ACTION)
0620	STRESSED BY (REPEATED ACTION)
	EXPOSED
0710	INHALED
0720	INGESTED
0730	ABSORBED
0740	EXPOSED TO
0800	TRAVELING IN
CODE	SOURCE OF INJURY NAME
0100	BUILDING OR WORKING AREA
0110	WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC)
0120	STAIRS, STEPS
0130	LADDER
0140	FURNITURE, FURNISHINGS, OFFICE EQUIPMENT
0150	BOILER, PRESSURE VESSEL
0160	EQUIPMENT LAYOUT (ERGONOMIC)
0170	WINDOWS, DOORS
0180	ELECTRICITY

0200 ENVIRONMENTAL CONDITION
 0210 TEMPERATURE EXTREME (INDOOR)
 0220 WEATHER (ICE, RAIN, HEAT, ETC.)
 0230 FIRE, FLAME, SMOKE (NOT TOBACCO)
 0240 NOISE
 0250 RADIATION
 0260 LIGHT
 0270 VENTILATION
 0271 TOBACCO SMOKE
 0280 STRESS (EMOTIONAL)
 0290 CONFINED SPACE
 0300 MACHINE OR TOOL
 0310 HAND TOOL (POWERED: SAW, GRINDER, ETC.)
 0320 HAND TOOL (NONPOWERED)
 0330 MECHANICAL POWER TRANSMISSION APPARATUS
 0340 GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)
 0350 VIDEO DISPLAY TERMINAL
 0360 PUMP, COMPRESSOR, AIR PRESSURE TOOL
 0370 HEATING EQUIPMENT
 0380 WELDING EQUIPMENT
 0400 VEHICLE
 0411 AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE
 0412 AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE
 0421 DRIVER OF GOVERNMENT VEHICLE
 0422 PASSENGER OF GOVERNMENT VEHICLE
 0430 COMMON CARRIER (AIRLINE, BUS, ETC.)
 0440 AIRCRAFT (NOT COMMERCIAL)
 0450 BOAT, SHIP, BARGE
 0500 MATERIAL HANDLING EQUIPMENT
 0510 EARTHMOVER (TRACTOR, BACKHOE, ETC.)
 0520 CONVEYOR (FOR MATERIAL AND EQUIPMENT)
 0530 ELEVATOR, ESCALATOR, PERSONNEL HOIST
 0540 HOIST, SLING CHAIN, JACK
 0550 CRANE
 0551 FORKLIFT
 0560 HANDTRUCK, DOLLY
 0600 DUST, VAPOR, ETC.
 0610 DUST (SILICA, COAL, ETC.)
 0620 FIBERS
 0621 ASBESTOS
 0630 GASES
 0631 CARBON MONOXIDE
 0640 MIST, STEAM, VAPOR, FUME
 0641 WELDING FUMES
 0650 PARTICLES (UNIDENTIFIED)
 0700 CHEMICAL, PLASTIC, ETC.
 0711 DRY CHEMICAL—CORROSIVE
 0712 DRY CHEMICAL—TOXIC
 0713 DRY CHEMICAL—EXPLOSIVE
 0714 DRY CHEMICAL—FLAMMABLE
 0721 LIQUID CHEMICAL—CORROSIVE
 0722 LIQUID CHEMICAL—TOXIC
 0723 LIQUID CHEMICAL—EXPLOSIVE
 0724 LIQUID CHEMICAL—FLAMMABLE
 0730 PLASTIC
 0740 WATER
 0750 MEDICINE
 0800 INANIMATE OBJECT
 0810 BOX, BARREL, ETC.
 0820 PAPER
 0830 METAL ITEM, MINERAL
 0831 NEEDLE
 0840 GLASS
 0850 SCRAP, TRASH
 0860 WOOD
 0870 FOOD
 0880 CLOTHING, APPAREL, SHOES
 0900 ANIMATE OBJECT
 0911 DOG
 0912 OTHER ANIMAL
 0920 PLANT
 0930 INSECT
 0940 HUMAN (VIOLENCE)
 0950 HUMAN (COMMUNICABLE DISEASE)
 0960 BACTERIA, VIRUS (NOT HUMAN CONTACT)

1000 PERSONAL PROTECTIVE EQUIPMENT
 1010 PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
 1020 RESPIRATOR, MASK
 1021 DIVING EQUIPMENT
 1030 SAFETY BELT, HARNESS
 1040 PARACHUTE

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INSTRUCTIONS FOR SECTION 6 — PUBLIC FATALITY

- a. **ACTIVITY AT TIME OF ACCIDENT**—Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the most appropriate primary activity area (water related, non-water related or other activity), the code number for "Other", and write in the activity being performed at the time of the accident.

WATER RELATED RECREATION

- | | |
|-----------------------------------|--|
| 1. Sailing | 9. Swimming/designated area |
| 2. Boating—powered | 10. Swimming/other area |
| 3. Boating—unpowered | 11. Underwater activities (skin diving, scuba, etc.) |
| 4. Water skiing | 12. Wading |
| 5. Fishing from boat | 13. Attempted rescue |
| 6. Fishing from bank dock or pier | 14. Hunting from boat |
| 7. Fishing while wading | 15. Other |
| 8. Swimming/supervised area | |

NON-WATER RELATED RECREATION

- | | |
|--|---|
| 16. Hiking and walking | 23. Sports/summer (baseball, football, etc.) |
| 17. Climbing (general) | 24. Sports/winter (skiing, sledding, snowmobiling etc.) |
| 18. Camping/picnicking authorized area | 25. Cycling (bicycle, motorcycle, scooter) |
| 19. Camping/picnicking unauthorized area | 26. Gliding |
| 20. Guided tours | 27. Parachuting |
| 21. Hunting | 28. Other non-water related |
| 22. Playground equipment | |

OTHER ACTIVITIES

- | | |
|--|----------------------------------|
| 29. Unlawful acts (fights, riots, vandalism, etc.) | 33. Sleeping |
| 30. Food preparation/serving | 34. Pedestrian struck by vehicle |
| 31. Food consumption | 35. Pedestrian other acts |
| 32. Housekeeping | 36. Suicide |
| | 37. "Other" activities |

- b. **PERSONAL FLOTATION DEVICE USED**—If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

INSTRUCTIONS FOR SECTION 7—MOTOR VEHICLE ACCIDENT

- a. **TYPE OF VEHICLE**—Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.
- b. **TYPE OF COLLISION**—Mark appropriate box.
- c. **SEAT BELT**—Mark appropriate box.

INSTRUCTIONS FOR SECTION 8—PROPERTY/MATERIAL INVOLVED

- a. **NAME OF ITEM**—Describe all property involved in accident. Property/material involved means material which is damaged whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number whenever applicable.
- b. **OWNERSHIP**—Enter ownership for each item listed. (Enter the following: *USACE; OTHER GOVERNMENT; CONTRACTOR; PRIVATE*)
- c. **AMOUNT OF DAMAGE**—Enter the total estimated dollar amount of damage (parts and labor), if any.

**INSTRUCTIONS FOR SECTION 9—VESSEL/
FLOATING PLANT ACCIDENT**

a. **TYPE OF VESSEL/FLOATING PLANT**—Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel/floating plant.

VESSEL/FLOATING PLANTS

- | | |
|------------------------|----------------------------|
| 1. ROW BOAT | 7. DREDGE/DIPPER |
| 2. SAIL BOAT | 8. DREDGE/CLAMSHELL BUCKET |
| 3. MOTOR BOAT | 9. DREDGE/PIPE LINE |
| 4. BARGE | 10. DREDGE/DUST PAN |
| 5. DREDGE/HOPPER | 11. TUG BOAT |
| 6. DREDGE/SIDE CASTING | 12. OTHER |

b. **COLLISION/MISHAP**—Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

- | | |
|-----------------------------|-----------------------|
| 1. COLLISION W/OTHER VESSEL | 7. HAULAGE UNIT |
| 2. UPPER GUIDE WALL | 8. BREAKING TOW |
| 3. UPPER LOCK GATES | 9. TOW BREAKING UP |
| 4. LOCK WALL | 10. SWEEP DOWN ON DAM |
| 5. LOWER LOCK GATES | 11. BUOY/DOLPHIN/CELL |
| 6. LOWER GUIDE WALL | 12. WHARF OR DOCK |
| | 13. OTHER |

INSTRUCTIONS FOR SECTION 10—ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT—Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

INSTRUCTIONS FOR SECTION 11—CAUSAL FACTORS

a. Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:

- (1) **DESIGN**—Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?
- (2) **INSPECTION/MAINTENANCE**—Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?
- (3) **PERSON'S PHYSICAL CONDITION**—Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?
- (4) **OPERATING PROCEDURES**—Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?
- (5) **JOB PRACTICES**—Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?

(6) **HUMAN FACTORS**—Was the person under undue stress (either internal or external to the job)? Did the task tend toward overloading the capabilities of the person; i.e., did the job require tracking and reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Was the person inadequately rested to perform safely?

(7) **ENVIRONMENTAL FACTORS**—Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in the accident?

(8) **CHEMICAL AND PHYSICAL AGENT FACTORS**—Did exposure to chemical agents (either single shift exposure or long-term exposure) such as dusts, fibers (asbestos, etc.), silica, gases (carbon monoxide, chlorine, etc.), mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, by-products of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation (UV radiation created during welding, etc.) contribute to the accident/incident?

(9) **OFFICE FACTORS**—Did the fact that the accident occurred in an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?

(10) **SUPPORT FACTORS**—Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources (in terms of employee skills, number of workers, and adequate supervision) available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation, etc.?

(11) **PERSONAL PROTECTIVE EQUIPMENT**—Did the person fail to use appropriate personal protective equipment (gloves, eye protection, hard-toed shoes, respirator, etc.) for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard(s)? Did lack of or inadequate maintenance of protective gear contribute to the accident?

(12) **DRUGS/ALCOHOL**—Is there any reason to believe the person's mental or physical capabilities, judgement, etc. were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".

b. **WRITTEN JOB/ACTIVITY HAZARD ANALYSIS**—Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. If one was performed, attach a copy of the analysis to the report.

INSTRUCTIONS FOR SECTION 12—TRAINING

a. **WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK**—For the purpose of this section "trained" means the person has been provided the necessary information (either formal and/or on-the-job (OJT) training) to competently perform the activity/task in a safe and healthful manner.

b. **TYPE OF TRAINING**—Mark the appropriate box that best indicates the type of training; (classroom or on-the-job) that the injured person received before the accident happened

c. **DATE OF MOST RECENT TRAINING**—Enter the month and year of the last formal training completed that covered the activity/task being performed at the time of the accident.

INSTRUCTIONS FOR SECTION 13—CAUSES

- a. **DIRECT CAUSES**—The direct cause is that single factor which most directly lead to the accident. See examples below.
- b. **INDIRECT CAUSES**—Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13:

- a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.
Direct cause: failure to provide fall protection at elevation.
Indirect causes: failure to enforce USACE safety requirements; improper training/motivation of employee (possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.
- b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (note USACE vehicle was in proper/safe working condition).
Direct cause: failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.
Indirect cause: Failure of employee to pay attention to driving (defensive driving).

INSTRUCTIONS FOR SECTION 14—ACTION TO ELIMINATE CAUSE(S)

DESCRIPTION—Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

INSTRUCTIONS FOR SECTION 15—DATES FOR ACTION

- a. **BEGIN DATE**—Enter the date when the corrective action(s) identified in Section 14 will begin.
- b. **COMPLETE DATE**—Enter the date when the corrective action(s) identified in Section 14 will be completed.
- c. **TITLE AND SIGNATURE**—Enter the title and signature of supervisor completing the accident report. For a **GOVERNMENT** employee accident/illness the immediate supervisor will complete and sign the report. For **PUBLIC** accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For **CONTRACTOR** accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE Supervisor shall also sign the report. Upon entering the information required in 15.d, 15.e and 15.f below, the responsible USACE supervisor shall forward the report for management review as indicated in Section 16.
- d. **DATE SIGNED**—Enter the month, day, and year that the report was signed by the responsible supervisor.
- e. **ORGANIZATION NAME**—For **GOVERNMENT** employee accidents enter the USACE organization name (Division, Branch, Section, etc.) of the injured employee. For **PUBLIC** accidents enter the USACE organization name for the person identified in block 15.c. For **CONTRACTOR** accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

- f. **OFFICE SYMBOL**—Enter the most complete USACE Office Symbol for the USACE organization identified in block 15.e.

INSTRUCTIONS FOR SECTION 16—MANAGEMENT REVIEW (1st)

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1ST REVIEW—Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15.c shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief (2nd review) for review and comment.

INSTRUCTIONS FOR SECTION 17—MANAGEMENT REVIEW (2nd)

2ND REVIEW—The FOA Staff Chief (i.e., FOA Chief of Construction, Operations, Engineering, Planning, etc.) shall mark the appropriate box, review the completed report, provide substantive comments, sign, date, and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18—SAFETY AND OCCUPATIONAL HEALTH REVIEW

3RD REVIEW—The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc, are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review, comment, and signature.

INSTRUCTION FOR SECTION 19—COMMAND APPROVAL

4TH REVIEW—The FOA Commander shall (to include the person designated Acting Commander in his absence) review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Health Office. Signature authority shall not be delegated.

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