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FINAL HEALTH AND SAFETY PLAN FOR SITE CHARACTERIZATION OF BASE SERVICE
STATION NAS FORT WORTH TX
7/1/1996
INTERNATIONAL TECHNOLOGIES

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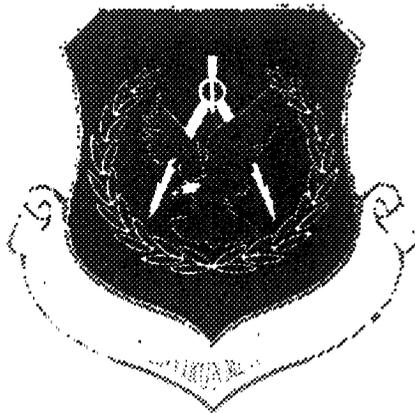
**NAVAL AIR STATION
FORT WORTH JRB
CARSWELL FIELD
TEXAS**

**ADMINISTRATIVE RECORD
COVER SHEET**

AR File Number 297

HQ Air Force Center for Environmental Excellence

Final Site Health and Safety Plan



Prepared for:

Site Characterization of Base Gas Station
Naval Air Station Fort Worth Joint Reserve Base
Carswell Field, Texas

F41624-94-D8047-032
Project No. 765725

July 1996

SITE HEALTH AND SAFETY PLAN
For
Site Characterization of Base Gas Station

Final
for
Naval Air Station Fort Worth
Fort Worth, Texas
Revision 1, JULY 1996

Preparer: Miss GSA

Date 7/3/96

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Date 7/3/96

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Date 7/3/96

Approved: _____
TNRCC

Date _____

Approved: _____
AFCEE Team Chief

Date _____

Final

**Site Health and Safety Plan
Remedial Investigation Base Gas Station
Naval Air Station Fort Worth
Joint Reserve Base, Carswell Field
Fort Worth, Texas**

Prepared for:

**Air Force Center for Environmental Excellence
Brooks Air Force Base, Texas
Contract No. F41624-94-D-8047
Delivery Order No. 0032**

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**Project No. 765725
Revision 1**

July 1996

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List of Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
AFCEE	Air Force Center for Environmental Excellence
AIDS	Acquired Immune Deficiency Syndrome
ANSI	American National Standards Institute
AST	abandoned storage tank
CBC	circulating bed combustor
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
dB	decibels
dBa	decibels
°C	degrees Celsius
°F	degrees Fahrenheit
EPA	U.S. Environmental Protection Agency
ERP	Environmental Restoration Program
EZ	exclusion zone
GFCI	ground fault circuit interrupter
H&S	health and safety
HBV	hepatitis B virus
HEPA	high-efficiency particulate air
HIV	human immunodeficiency virus
HSP	health and safety plan
IT	IT Corporation
IRB	Joint Reserve Base
mm	millimeter
MSDS	Material Data Safety Sheet
MSHA	Mine Safety and Health Administration
NAS	National Academy of Science
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Health and Safety Administration

List of Acronyms (Continued)

PAH	polynuclear aromatic hydrocarbon
PPE	personal protective equipment
psig	pounds per square inch gage
STEL	short-term exposure limit
SVOC	semivolatile organic compound
SZ	support zone
TLV	threshold limit value
TWA	time-weighted average
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

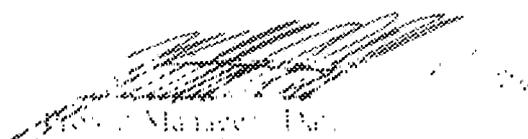
Health and Safety Plan Approvals and Acknowledgement _____

Approvals

I have read and approved this health and safety plan (HSP) with respect to project hazards, regulatory requirements, and IT Corporation (IT) procedures (please indicate if Certified Industrial Hygienist [CIH] or Certified Health Physicist [CHP]).

Project Name CARLSWELL AFB

Project Number 765725


Project Manager (IC)

Miss G. J. [Signature] 7/3/96
Project/Location HS Staff / Date

Acknowledgements

The final approved version of this HSP has been provided to the Site Supervisor. I acknowledge my responsibility to provide the Site Supervisor with the equipment, materials, and qualified personnel to implement fully all safety requirements in this HSP. I will formally review this plan with the health and safety staff every 6 months until project completion.

Project Manager  Date 7/3/96

I acknowledge receipt of this HSP from the Project Manager, and that it is my responsibility to explain its contents to all site personnel and cause these requirements to be fully implemented. Any change in conditions, scope of work, or other change that might affect worker safety requires me to notify the Project Manager and/or the Health and Safety Representative.

Site Supervisor _____ Date _____

1.0 Introduction

1.1 Objective

This health and safety plan (HSP) establishes the work practices necessary to help ensure protection of IT Corporation (IT) personnel, subcontractors, and authorized visitors during the field investigations at the Base Gas Station at the Naval Air Station (NAS) Fort Worth, Texas 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 (BCA). This HSP was prepared under Air Force Center for Environmental Excellence (AFCEE) contract F41624-94-D-8047, Delivery Order No. 0032.

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 NAS Fort Worth JRB health and safety (H&S) regulations and procedures. All IT employees and subcontractors must comply with the requirements of this plan.

1.2 Site/Facility Description

1.2.1 Location and Description

NAS Fort Worth JRB is located in north-central Texas in Tarrant County, 8 miles west of downtown Fort Worth (Figure 1-1). The base property, totaling 2,555 acres, consists of the main base and two, noncontiguous parcels. The main base comprises 2,264 acres and is bordered by Lake Worth to the north, the West Fork of the Trinity River and Westworth Village to the east, Fort Worth to the northeast and southeast, White Settlement to the west and southwest, and Air Force Plant 4 to the west. The area surrounding NAS Fort Worth JRB is mostly suburban,

including the residential areas of the cities of Fort Worth, Westworth Village, and White Settlement.

1.2.2 Description of Site

The Base Gas Station is located at the northwest corner of the intersection of Jennings Drive and Knights Lake Road along the eastern edge of NAS Fort Worth JRB (Figure 1-2). The Base Gas Station is located approximately 500 feet west of the western bank of the West Fork Trinity River and approximately 450 feet west of the eastern installation boundary. The Base Gas Station provided gasoline service to base personnel. The six 10,000-gallon aboveground storage tanks (AST) formerly servicing the Base Gas Station were located aboveground in the center of the service station and were removed in January 1994.

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 HSP prescribes the procedures that must be followed by all site personnel. Operational changes that could affect the H&S 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 HSP 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 HSP complies with applicable OSHA and U.S. Environmental Protection Agency (EPA) regulations. This plan follows the guidelines established in the following documents:

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- *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).

Contents of this plan are consistent with the following IT H&S policies and procedures.

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.

2.2 Health and Safety Manager

The H&S Manager is responsible for developing and coordinating the site-specific HSP 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 HSP 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 Principal Investigator

The IT Principal Investigator supervises all IT activities at the site and is responsible for field implementation of the HSP. 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 HSP. Other responsibilities include:

- Reading and becoming familiar with this HSP and IT policies and procedures
- Enforcing the HSP 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 6.0)
- Establishing exclusion, decontamination, and clean zones (see Section 7.0)
- Presenting tailgate safety meetings and maintaining attendance logs and records
- Ensuring that the respiratory protection program is implemented (see Section 5.0)
- Ensuring that decontamination procedures meet established criteria
- Ensuring 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 this HSP and sign the acknowledgement in Appendix A.

2.7 On-Site Personnel and Visitors

All on-site personnel and visitors are required to comply with the provisions of this HSP and all applicable federal, state, and local regulations. Each person is responsible for his/her own safety and health for completing tasks in a safe manner and for reporting any unsafe acts or conditions to his/her 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 investigations at the Base Gas Station at NAS Fort Worth JRB. This will include the following tasks:

- Drilling and installation of groundwater monitoring and recovery wells, and soil borings
- Installation of direct-push technology soil borings
- High-pressure water jetting operations
- Groundwater sampling
- Collection of groundwater level data
- Aquifer pumping tests
- Collection of surface water samples
- 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 investigation projects, supervisors must continually inspect the work site to identify hazards that may harm site personnel, the community, or the environment. The Project Manager, Principal Investigator, Supervisor, and designated On-Site Safety Coordinator must be aware of these changing conditions and discuss them with the H&S Manager.

This site contains volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and fuel-related organic compounds that present potential hazards to project personnel. All IT

personnel and subcontractors will be familiar with these hazards and will 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 Appendix B.

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 Soil Borings, Groundwater Monitoring Wells, and Collecting Subsurface Soil Samples

IT will drill and install soil borings, groundwater monitoring wells, and Geoprobos® near the Base Gas Station.

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

- ***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 that 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 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 listed specific hazards, 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, SVOCs and VOCs, and contaminated soil cuttings. Sections 3.5 and 3.6 discuss the possible chemical hazards and their exposure standards.

3.2.2 High-Pressure Water Jetting Operations

The use of high-pressure water jetting equipment (1,000 pounds per square inch gage [psig]) for decontamination may result in lacerations from accidental water spray, and slip, trip, and falls. Accidents can occur as a result of improper operation of the high-pressure water jetting equipment, failing to adequately isolate the worker area from other activities, use of faulty or damaged equipment, and improper use of adequate PPE.

3.2.3 Groundwater Sampling

IT will collect and analyze groundwater samples from 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 sampling equipment.

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 more than 60 pounds without assistance.

Chemical Hazards. Inhalation of SVOCs and VOCs from groundwater wells may pose a potential hazard for exposure during this task. Skin absorption of SVOCs and 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 Collection of Groundwater Level Data

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

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

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 more than 60 pounds without assistance.

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

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

3.2.5 Aquifer Pumping Tests

IT personnel will perform aquifer pumping tests.

Physical Hazards. The physical hazards associated with the pumping tests involve handling of pumps, hoses, and electrical extension cords.

Splash hazards will be present and employees should be made aware of the hazards and use appropriate PPE and caution when performing aquifer pumping tests.

Employees will follow proper lifting techniques when performing aquifer pumping tests. No one will be permitted to lift more than 60 pounds without assistance.

Chemical Hazards. Inhalation of SVOCs and VOCs from groundwater wells may pose a potential hazard for exposure during this task. Skin absorption of SVOCs and 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 Collection of Surface Water Samples

IT will complete the sampling of surface water from the bank of the Trinity River.

Physical Hazards. Because of the steep slope and possible wet and slippery conditions, employees must be alert for slip, trip, fall, and cut hazards. Tall grass and reeds may have to be cut, so extra precautions will be taken to avoid having an employee in the range of any cutting device.

Snakes, fire ants, and spiders might inhabit the area so caution will be taken to avoid them.

Chemical Hazards. Skin absorption of SVOCs and VOCs may pose a potential hazard if the investigator comes in contact with the water in the river with the sheen.

3.2.7 Surveying

IT will conduct site surveys of existing monitoring wells in the vicinity of Base Gas and Base Service stations.

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 more than 60 pounds without assistance.

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

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 ($^{\circ}\text{C}$) (equivalent to 98.6 $^{\circ}\text{F}$). 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 occurs.

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 are experienced.
- 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 SVOCs and VOCs, benzene, toluene, ethyl benzene, xylene, and petroleum fuel. Potential health effects including routes of entry, symptoms of exposure, and relative toxicity can be found in Table 3-1.

3.6 Exposure Standards

Threshold limit values (TLV) refer to airborne concentrations of substances that 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 work day and a 40-hour work week. Several chemical substances have short-term exposure limits or ceiling values that 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 as a 15-minute TWA exposure that should not be exceeded at any time during a work day even if the 8-hour TWA is within the

TLV. A "ceiling" value is an employee exposure to a substance, which shall at no time exceed the exposure limit for that chemical constituent. This notation appears as the letter "C" after the chemical name. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute TWA exposure, which shall not be exceeded at any time during the working day.

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 3-2 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 5 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.

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. 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) (Appendix C) 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 with 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.

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.

4.2 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 ACGIH method of determining permissible heat exposure TLVs, and also by monitoring heart rates as personnel come out for rest and cooling off.

Ambient temperature and other environmental factors provide basic guidelines to implement work/rest periods. When ambient temperatures exceed 78° Fahrenheit, a work/rest cycle of 75 percent work, 25 percent rest each hour will be initiated. However, because 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 77°F. The physiological parameter that each individual will monitor is:

- **Heart Rate** - Each individual will count his/her radial pulse prior to the first work period. This number will be recorded as a baseline pulse. Normal pulse is 72 beats per minute. 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.

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 excess temperatures or elevated heart rate.

- 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 as listed in the ACGIH TLV booklet.
- 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, stocking caps, and heavy socks, when the air temperature is below 4 to 7°C (equivalent to 40 to 45°F).
- Protective clothing may be used to protect the employee when the air temperature is below 0 to 7°C (equivalent to 32 to 40°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 that would cause sweating
 - Insulated gloves
 - Boots.
- At air temperatures below 2°C (equivalent to 35°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 that 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.

Rig Setup. The drill rig must be properly blocked and leveled prior to raising the derrick. The wheels that remain on the ground must be chocked. The rig must be moved only after the derrick has been lowered. The leveling 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 labeled 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 labeled 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 that 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 because 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 of 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 High-Pressure Water Jetting Operation Safety

Job Setup. All machinery and mechanized equipment shall be operated only by personnel who have been trained in accordance with the original manufacturer's instructional training program, and have been qualified through demonstrating the knowledge, experience, and ability to perform the assigned task.

The jetting operator shall be responsible for the safe operation of the high-pressure water jetting equipment. To ensure the safety of the operator and nearby workers, and to ensure that proper

equipment selection is followed, the Reservice and Operational Checklist (see Appendix D) or the manufacturer's checklist shall be completed prior to starting work.

The work area should be isolated with use of suitable barriers (i.e., rope, safety tape, barrels, etc.) to warn personnel they are entering a hazardous area. The perimeter should be outside the effective range of the jet whenever possible. The work area must be as clean as feasible to prevent slip, trip, and fall hazards.

High-Pressure Water Jetting Operations

- The equipment must be operated within the limitations specified by the manufacturer.
- The system shall incorporate at least one fluid shut-off or dump service. The orifice operator must always be able to shut down the water jet by releasing pressure on the trigger, switch, or foot valve pedal.
- Hoses shall be arranged so that a tripping hazard does not occur.
- The hoses shall be checked for evidence of damage, wear, or imperfections.
- Any electrical equipment in the immediate area of the operation that presents a hazard to the operator shall be de-energized, shielded, or otherwise made safe. Ground fault circuit interrupters (GFCI) shall be used for any necessary power hook-ups.
- Only approved safety cans shall be used to store fuel. Do not refuel equipment while it is operating.
- Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
- The minimum PPE shall be worn during jetting operations including hard hats, impact-resistant safety glasses, and safety shoes. In addition, the jetting gun operator will wear metatarsal guards for the legs and feet, hearing protection (if appropriate), and liquid-resistant clothing.
- The jet operator shall not be distracted until the jet has stopped.

- When pressurizing the system, increase pressure slowly on the system while it is being inspected for leaks or faulty components, or both. Repair or replace components only when equipment is properly locked out and tagged.
- During jetting operations, a minimum of two persons, one at the orifice or gun and one accessible to the pump, shall be employed at all times.
- The operator and other team members shall be capable of performing the required operations safely. All shall be capable of speaking and reading the instructions and warnings in the language of their place of work.

Shotgunning

- The person operating the nozzle shall have direct control of the dump system.
- The pressurized system shall never be left unattended.
- When more than one shotgunning operation is being performed within the same area, install a physical barrier or maintain adequate spacing between operators to prevent the possibility of injury from the pressure water.
- Never manually hold objects to be cleaned.
- The point where the hose connects to the gun shall be shrouded by a protective device such as a heavy duty hose, shoulder guard, etc., to prevent injury to the operator should the hose, pipe, or fitting rupture.
- When used, the minimum length of the shotgun lance extension shall be 4 feet (1.2 millimeters [mm]) from the triggering device to the nozzle.
- Use steel-braided hoses on air-operated, fail-safe systems to keep the system from being activated by someone stepping on the hose or running over it.

Moleing or Flex Lancing

- The operator shall have direct control of the dump system.
- A positive method shall be used to prevent the nozzle from reversing direction inside the item being cleaned. Safety guards for this purpose shall be used.

- During manual operations, the entrance to a line or pipe shall not be cleaned with a nozzle containing back jets without adequate shielding.
- The clearance between the outside diameter of the hose, lance, and nozzle assembly and the inside wall of the item being cleaned shall be sufficient to allow adequate washout of water and debris.
- During manual operation, insert the nozzle into the tube prior to pressurizing. Conversely, depressurize the system before removing the nozzle from the tube.
- Hoses shall be conspicuously marked no closer than 24 inches (600 mm) from the nozzle to warn the operator of the nozzle location.
- Where the length of the nozzle and rigid coupling is less than the inside diameter of the pipe, a length of rigid pipe of not less than the diameter of the pipe being cleaned shall be fitted directly behind the nozzle, or a suitable safety shield shall be provided to protect the operator. This is to prevent the nozzle from turning around 180° and doubling back towards the operator. Specific safety guards shall be used for this purpose.

Rigid Lancing

- The operator inserting the nozzle shall have direct control of the dump system.
- The clearance between the outside diameter of the lance and nozzle and the inside wall of the item being cleaned shall be sufficient to allow adequate washout of water and debris.
- When under manual operation, the nozzle shall be inserted into the tube prior to pressurizing. Conversely, the system shall be depressurized before removal of the nozzle from the tube, unless proper shielding is provided.
- When lancing tubes with a rigid lance, a guard shall be installed around the lance to prevent a lance nozzle from being inadvertently withdrawn and causing injury.
- Any water additive (chemical, detergent, or solid particle) shall be used in accordance with the manufacturer's recommendations.

4.6 Sanitation

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

4.6.1 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.

4.6.2 Potable Water

If the facility does not have a water supply available, potable water will be carried to the site for use in drinking, decontamination, and employee cleanup. Potable water will be available from a designated area near the work site.

4.6.3 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.

4.7 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 nonpermit confined space provided the H&S Manager or his designee approved the reclassification and the space meets the criteria outlined in IT's Confined Space Entry Procedure.

5.0 Personnel Protective Equipment

The PPE outlined in this chapter 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.

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:

- Examine the head straps for breaks, loss of elasticity, broken or malfunctioning buckles and other attachments.
- Examine the face-piece for excessive dirt, cracks, tears, distortion, holes, or inflexibility.

- Examine 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.
- Examine air purifying elements for incorrect cartridge, expired shelf-life of the cartridge, cracks or dents in the cartridge or cartridge-holder.
- Examine for proper insertion of the cartridges into the face-piece and check of the gaskets inside the cartridge-holder.
- Examine 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 or when breathing resistance is detected. 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 American National Standards Institute (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. Exclusion zone is defined in Section 7.0. 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 anticipated during this investigation.

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 5-1 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 that 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
- Gloves (Inner) - chemical resistant latex
- Boots (Outer) - chemical resistant steel-toed boots, 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).

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 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 5-1. 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).

5.2.5 Modified Level D Protection

Modified Level D protection is similar to Level C except no respirator is required. This level of protection offers skin and slash protection above the protection offered by Level D. The Site H&S Manager will determine when to institute Modified Level D protection. Modified Level D protection will be worn during site operations that include high-pressure water jetting operations, so long as airborne concentrations of toxic contaminants do not exceed the action levels established in Table 5-1. The following equipment will be used for Modified Level D protection:

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

- Chemical resistant nitrile gloves with surgical latex undergloves as necessary
- Hard hat
- Hearing protection (if necessary)

Note: In addition to Level D PPE, the operator shall wear metatarsal guards for the legs and feet during high-pressure water jetting operations.

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 5-2 describes the PPE required for each task and Table 5-1 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.
- 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 5-2.

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 NAS Fort Worth JRB without satisfactory proof of United States citizenship or without specific authorization from the appropriate Air Force, BCA AFCEE representative.

The Project Manager, Senior Project Engineer, or Site Manager may grant authorization to enter the site. Access to contaminated work areas is regulated and limited to authorized personnel. Only persons 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 HSP 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 HSP. 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 these 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 in 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 monitored against unauthorized entry.

7.1.1 Exclusion Zone

An EZ is the area where soil, water, or air 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.

7.1.2 Contamination Reduction Zone

A Contamination Reduction Zone (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. Tools and equipment will be cleaned within the containment.

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 in the SZ 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 or CRZ.
- 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, and 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 (on page). All decontamination activities will be conducted on watertight bases such as pools or basins, and contaminated solvents and waters generated from the cleaning operation will be collected and containerized for disposal by use of portable pumps and 55-gallon disposal drums.

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.
- Proceed to the clean area.
- 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.

7.5 Decontamination During Medical Emergencies

In any medical emergency, 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

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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 SVOCs and VOCs will be conducted in the work area by using an HNu photo-ionization analyzer or equivalent to indicate exposure levels. SVOCs and VOCs will be monitored in the breathing zones of employees.

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.

Air monitoring will be completed each time a well is opened for water level monitoring. During drilling operations, air monitoring will be completed initially, then periodically with each 5- to 10-foot drilling depth. 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; 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 not be conducted because previous noise monitoring during similar drilling activities have indicated noise levels greater than 85 A-weighted dB (dBA) near the motor of the rig. Hearing protection is mandatory for all employees in noise hazardous areas or when operating drilling 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 follows:

- 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.

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 these training requirements. Personnel, including subcontractors, whose activities are limited to nonhazardous activities within the work zone must complete 24 hours of training off site and 8 hours of on-site training.

For nonhazardous construction work and some nonintrusive actions, this training may not be required. Only the H&S Manager can exempt personnel 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
- MSDSs
- HSPs.

9.1.1 Tailgate Safety Meetings

The Site Manager or a designee conducts a tailgate safety meeting at 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.

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 and Safety Plans

IT prepares a site-specific HSP for each project falling within the scope and application of 29 CFR 1910.120. The H&S Coordinator presents the HSP and discusses it with all personnel assigned to the project. All workers and visitors must read and sign the HSP 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 overexposure 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 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

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 that 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
- Electrocardiogram for employees over 35 years old or when other complications indicate the necessity

- Drug and alcohol screening
- Visual acuity.

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 that 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. 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.

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 HSP 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 as follows:

- 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 the H&S Department within 24 hours after notification by the employee.

11.6 Emergency Information

11.6.1 Public Agencies

- | | | |
|----------------------------------|------------------------------------|----------------|
| • FIRE* | Fort Worth Fire Department | (817) 922-3000 |
| | NAS Fort Worth JRB Fire Department | (817) 782-6330 |
| • POLICE* | Fort Worth Police Department | (817) 335-4222 |
| | NAS Fort Worth JRB Security | (817) 782-5200 |
| • NATIONAL SPILL RESPONSE CENTER | | (800) 424-8802 |

- 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.

A hospital location map is presented in Appendix E.

11.6.2 Key IT Personnel

A listing of key personnel is shown in Appendix E.

12.0 Bloodborne Pathogen Exposure Control Plan

This exposure control plan presents H&S guidelines for voluntary first aid and CPR care providers. To meet the requirements of OSHA 29 CFR 1910.151, during day shift operations, at least one person on site will adequately trained in first aid and CPR, and in the requirements of the Bloodborne Pathogens Standard as listed in 29 CFR 1910.1030, IT Procedure HS512, and the contents of this plan.

12.1 Definition

Bloodborne pathogens are those agents (i.e., bacteria, virus, fungi) found in blood components, certain body fluids, and other materials, objects, or surfaces that have had contact with blood that are capable of causing human disease or death to unprotected people who came into contact with blood or blood-affected items. Diseases caused by bloodborne pathogens include, but are not limited to, hepatitis B virus (HBV), human immunodeficiency virus (HIV), hepatitis C, malaria, and syphilis. The most significant and of greatest concern are HBV and HIV.

12.1.1 Hepatitis B Virus

HBV is the major bloodborne pathogen hazard that first-aid/CPR care providers are most likely to encounter. The HBV can remain infectious for up to 10 days even in dried blood. The virus adversely affects 8,000 to 10,000 workers annually, resulting in approximately 200 deaths each year.

Hepatitis Exposure Symptoms. Hepatitis means "inflammation of the liver" causing severe liver damage or cirrhosis. Exposure symptoms include fever, fatigue, nausea, vomiting, muscle aches, loss of appetite, and jaundice (yellowing of the eyes or skin). Hepatitis diagnosis is difficult because some symptoms are similar to the flu and may remain mild for an extended period of time.

Presently, no cure exists for hepatitis, but it can be prevented with a vaccination.

12.1.2 Human Immunodeficiency Virus

HIV attacks and deteriorates the body's immune system and eventually weakens it to the point that infection sets in, causing the disease Acquired Immune Deficiency Syndrome (AIDS). HIV is primarily transmitted through sexual contact, but may also be transmitted through contact with blood and body fluids. HIV is not transmitted by touching or working with people who are HIV-positive.

Human Immunodeficiency Virus Exposure Symptoms. HIV leads to AIDS-related illnesses that eventually cause neurological problems, cancer, pneumonia, and death. People carry the virus for many years of their lives without experiencing any symptoms. Upon development, symptoms may include weight loss, skin lesions, dry cough, fever, fatigue, diarrhea, or swelling of the lymph glands.

Presently, no cure exists for HIV or AIDS, and no vaccination is currently available.

12.2 Exposure Determination

The guidelines in this plan are designed to limit occupational exposure of site workers to infectious blood materials that could result in disease or possibly death. The contents of this plan are intended to protect the IT employees trained in first aid and CPR who are responsible for administering medical assistance to site workers.

Means of Transmission. The major activity that may expose any of these IT employees to bloodborne pathogens is their response and care to on-site personal injuries or decontamination of equipment/surfaces contaminated by blood or other potentially infectious materials during the incident.

These IT employees could be subject to bloodborne pathogens during rendering of first aid or CPR by accidental exposure due to:

- Punctures through the skin with a contaminated sharp object (i.e., scissors)

- Contact or absorption of blood or blood-contaminated objects through open or broken skin (i.e., cuts, scratches, rashes)
- Blood splashes to their eyes, nose, or mouth, or other mucous membranes.

Workers can reduce their risk of contacting HBV or HIV by implementing the recommended work practices (outlined in this plan) before, during, and after responding to emergency medical incidents involving personal injuries.

12.3 Measures for Prevention

The establishment of work practice controls is an integral part of an effective exposure control plan in preventing accidental infection of employees. These work practices are designed to protect employees from reasonably foreseeable occupational exposures to bloodborne pathogens from blood and other potentially infectious material. The work practice controls outlined in this section are applicable to the administration of first aid in emergency situations and subsequent cleanup only.

12.3.1 Universal Precautions

Universal precautions is an approach to infection control that operates on the assumption that all human blood and bodily fluids are to be treated as if they are known to be contaminated with HIV, HBV, or other infectious diseases. Universal precautions shall be implemented whenever there exists a foreseeable potential for contact with blood or bodily fluids.

12.3.2 Engineering Controls

Due to the remote location of the work site, the nature of work in outdoor locations with potential exposure to airborne chemical contaminants, and the potential for exposure being limited to emergency situations, the implementation of engineering controls is not feasible. Exposure control shall be accomplished through implementation of work practice controls and use of PPE.

12.3.3 Work Practice Controls

Work practice controls shall be instituted whenever foreseeable potential contact with, or exposure to, blood and bodily fluid exists. Examples of situations in which these controls are to be implemented include, but are not limited to, accidents or injuries in which administration of first aid is required, application of bandages to minor cuts and abrasions of another person, and contact with sores, wounds, or broken skin.

Following are specific work practice controls that shall be implemented:

- Open wounds or cuts will be promptly bandaged.
- Hands and face will be washed as soon as possible after administering first aid or CPR. If wash facilities are not readily available, stock disposable one-time use towelettes.
- No eating, drinking, or smoking is allowed in any work area where a potential exists for occupational exposure to bloodborne pathogens.
- Nondisposable equipment or materials that have or may have blood or infectious fluid contact must be washed immediately after their use. (A 1-to-10 solution of bleach and water is recommended for proper decontamination.)
- Any clothing that comes in contact with blood or infectious fluids shall be removed as soon as possible after administering first aid or CPR.
- No personal clothing that comes in contact with blood or infectious fluids shall be laundered off site.
- First-aid kits on site will be equipped with a pair of surgical gloves and CPR mouth pieces.

Minimization of Contact. Direct contact with blood and bodily fluids should be kept to an absolute minimum, as required in a particular situation. In situations where direct contact is likely, PPE shall be worn to help prevent infection.

Based upon professional judgment, an employee may choose to temporarily forego the use of PPE if he determines that the use of the PPE will further jeopardize his well-being or that of the injured worker. This limited application must be carefully evaluated by the employee.

If this situation does occur, IT is obligated to investigate and document the circumstances in an effort to provide alternative means to avoid further occurrence.

12.3.4 Personal Protective Equipment

The following are specific PPE items that shall be implemented:

- Always use CPR mouthpieces or ventilation devices.
- Inspect PPE prior to use to ensure it is in good working order and without flaws.
- Do not reuse gloves once removed.
- After use, remove gloves from top to bottom inside-out, not allowing unprotected skin to contact the exterior of the gloves.

12.3.5 Waste Handling

Disposable items that have or may have blood contact must be bagged separately from other trash. These wastes must be placed in leak-proof containers or bags and labeled.

A collection container for contaminated articles will be available on site. Wastes used in medical emergency treatment (i.e., gloves, towels, gauze) shall be disposed of in the infectious waste container(s). The container will be replaced as needed and will not be overfilled.

12.3.6 Waste Disposal

The waste will remain on site in approved container(s) until an approved disposal facility capable of receiving medical wastes is identified. Disposal of the infectious waste container(s) shall be in accordance with applicable local, state, and federal regulations.

12.4 Medical Requirements

The medical requirements of the exposure control plan include provision of a hepatitis B vaccination to all exposed employees, and postexposure procedures and evaluation.

12.4.1 Hepatitis B Vaccination

All potentially exposed employees will have made available to them at no cost a hepatitis B vaccination. The employee will also receive training as to the vaccine's efficacy, safety, benefits, and consequences prior to administration. The vaccination series shall be initiated within 24 hours of providing first aid/CPR in an incident and shall be administered under the supervision of a licensed physician. Employees may at their own discretion decline the vaccination, in which case documentation of declination will be completed and employees may be assigned immediately. If an employee covered by this exposure plan decides to accept the vaccination at a later date, the vaccination will be offered at that time at no cost to the employee.

12.4.2 Postexposure Procedures and Evaluation

Subsequent to all reported exposure incidents, a confidential medical evaluation and follow-up shall be made available to each employee exposed in the incidents.

Documentation Procedures. Documentation of the exposure incident shall be recorded as soon as possible, and shall include the route(s) of exposure, the circumstances surrounding the incident, and the identification of the source individual. Additionally, each incident shall be placed on the "first aid incident list" attached to the location OSHA Log of Occupational Injuries and Illnesses.

Blood Testing

Source Individuals. As soon as feasible, the source individual in an exposure incident will be asked to consent to a blood test to determine HBV and HIV infectivity. Where applicable laws require employee consent, documented consent shall be obtained prior to testing. If an employee

refuses the blood test, documentation of the refusal will be made. Documentation of the test results shall be made available to the exposed employee(s). All results should be kept confidential, because criminal and civil penalties may be charged against persons negligently or willfully releasing such information, depending on local laws.

Exposed Employees. Exposed employees will be asked to consent to a blood test for HBV and HIV serological status. If consent to HIV testing is denied, the blood sample will be preserved for 90 days; within this time, the employee may elect to consent to the HIV test.

12.4.3 Postexposure Medical Evaluations

Exposed employees shall receive a health care professional's written opinion for postexposure evaluations. The written opinion shall include the results of the evaluation and any medical conditions resulting from the exposure incident that require further medical treatment.

12.5 Hazard Communication

12.5.1 Warning Labels

Containers used for disposal of blood contaminated supplies and waste will be labeled in accordance with the word "biohazard."

12.5.2 Warning Signs

Because first aid will be provided on an emergency basis only, there are no designated areas for medical treatment on site; therefore, warning signs are not applicable. In cases of potential exposure, observers and nonessential personnel should be verbally warned to keep a safe distance from injured personnel.

12.5.3 Employee Training Program

All associates who are first aid/CPR trained and may provide assistance shall be trained in the requirements for voluntary providers as described in HS512, this HSP and its addenda (if any), and the general provisions of HS512.

12.6 Record Keeping

12.6.1 Training Records

All employees selected to attend the training program that covers the contents of this plan shall sign the Acknowledgment Form and the Training Attendance Form.

The training record will contain the date, training outline, name and qualifications of the trainer, and names and job titles of attendees.

At the completion of the training program, all participants must take and pass the training quiz.

The training records will be maintained by the IT Training Department for at least 3 years from the training date.

12.6.2 Medical Records

Medical records necessary for IT employees must include documentation of HBV vaccination status, medical follow-up, postexposure testing, and a medical professional's written evaluation.

Confidentiality. The employee medical records will be forwarded to Washington Occupational Health Associates Consulting Services for inclusion in the employee's medical file.

Maintenance and Transfer of Records. IT shall maintain the employee medical records for the duration of the employee's employment plus 30 years thereafter.

If, for whatever reason, IT no longer does business and no successor exists, IT will notify the director of NIOSH in writing 3 months prior to the disposal of records. If so directed, the records shall be transferred to the director of NIOSH.

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12.6.3 Incident Recording

An incident that occurs as a result of rendering emergency medical care will be recorded on the OSHA 200 log as OSHA defines work-related injuries and illnesses. All injuries involving the release of blood or bodily fluids must be immediately reported to the H&S Department to ensure proper reporting and follow-up.

Appendix A
Contractor Certification

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

Appendix B
Activity Hazard Analysis

**Drilling and Monitoring and Recovery Well Installation
Carswell Base Gas Station, NAS Fort Worth, Carswell Field, Texas**

inspection	being utilized to perform work	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.	
	support, inadequate clearances, contact with utilities	Faulty/unsafe equipment will be tagged and if	
		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	
		shall be set. Equipment parked on inclines will have the wheels chocked.	
operation		Inspect brakes and tire pressure on drill rig before	
		operated only by designated personnel.	
		Jacks/outriggers	Insure proper footing and cribbing.
		Falling objects	Hard hats; remove unsecured tools and materials before raising or lowering the derrick.
		Stay alert and clear of materials suspended overhead.	

**Drilling and Monitoring Well and Recovery Installation
(Continued)**

Principal Step	Principal Hazard	Recommended Controls
Drilling operation (continued)	Pinch points	Keep feet and hands clear of moving/suspended materials and equipment. Stay alert at all times!!!
	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 feet.
	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 pounds require assistance or mechanical equipment to 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.

**Direct-Push Soil Borings
Carswell Base Gas Station, NAS Fort Worth, Carswell Field, Texas**

297085

Activity	Potential Hazards	Recommended Controls
Direct push soil boring	Cross-contamination and contact with potentially contaminated materials	<ul style="list-style-type: none"> • Sampling technicians will wear proper protective clothing and equipment to safeguard against potential contamination. • Only essential personnel will be in the work area. • Initial real time air monitoring will take place before and during sampling activities. • All personnel will follow good hygiene practices. • Proper decontamination procedures will be followed. • All liquids and materials used for decontamination will be contained and disposed of in accordance with federal, state, and local regulations.
	Cut hazards	<ul style="list-style-type: none"> • Use care when handling glassware. • Wear adequate hand protection.
	Hazard communication	<ul style="list-style-type: none"> • Label all containers as to contents.
	Strains/sprains	<ul style="list-style-type: none"> • Use the proper tool for the job being performed. • Get assistance if needed. • Avoid twisting/turning while pulling on tools, hoses, equipment, etc.
	Spills/residual materials	<ul style="list-style-type: none"> • Absorbent material and containers will be kept available where leaks or spills may occur.
	Unattended worker	<ul style="list-style-type: none"> • "Buddy System" - visual contact will be maintained with the sampling technician during sampling activities.

**High-Pressure Water Jetting Operation
Carswell Base Gas Station, NAS Fort Worth, Carswell Field, Texas**

Activity	Potential Hazards	Recommended Controls
Use of equipment and/or materials	Slip, trip, fall	<ul style="list-style-type: none"> • Do not stand on materials.
	Back injury	<ul style="list-style-type: none"> • Size up the job. • Use mechanical equipment to lift and move items, when necessary. • Lift with your legs, not your back. • Do not lift awkwardly sized items and those items over 60 pounds • Get assistance when necessary • If a worker loses control of item, STAND CLEAR and DO NOT try to prevent its fall
	Pinch points	<ul style="list-style-type: none"> • Keep hands and feet clear of moving/suspended materials and equipment. • Wear hard toe/shank safety shoes/boots.

**Groundwater Sampling and Collection of Groundwater Level Data
Carswell Base Gas Station, NAS Fort Worth, Carswell Field, Texas**

Task	Hazard	Control
Setting up equipment	Equipment/vehicles	Equipment will be laid out in an area free of traffic flow.
	Cut hazards	Use care when handling any glassware. Wear adequate hand protection
Collecting 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 HSP.
	Cuts	Use care when handling glassware. Wear adequate hand protection
Moving and shipping collected samples	Heavy lifting	Any lifting of 60 pounds or more requires assistance or a mechanical lifting device. Follow safe lifting procedures.
	Hazard communication	Label all containers as to contents and associated hazards.

**Aquifer Pumping Tests
Carswell Base Gas Station, NAS Fort Worth, Carswell Field, Texas**

Principal Steps	Potential Hazard	Recommended Controls
Staging equipment	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.
	Cut hazards	Use care when handling any glassware.
Heavy lifting		Any lifting of 60 pounds or more requires assistance or a mechanical lifting device. 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. All repairs on machinery or equipment will be made at a location that provides protection from traffic for
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.
	Hazard communication	Label all containers as to contents and dispose of properly.

**Collection of Surface Water Samples
Carswell Base Gas Station, NAS Forth Worth, Carswell Field, Texas**

	equipment/vehicles	barricaded/demarcated. Equipment will be laid out in an area free of traffic flow.
	Cut hazards	Wear adequate hand protection. Use care when handling any glassware.
Sampling		<ul style="list-style-type: none"> • and worn by workers over or near water where the danger of drowning exists. • PFDs shall be inspected prior to and after each use. • Defective PFDs will be tagged and removed from service. • At least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water. • Use the buddy system. • Personnel trained in launching and operating the skiff shall be readily available during work hours.
	Chemical contamination	Sampling technicians will wear proper protective clothing and equipment to safeguard against potential contamination.
	Heavy Lifting	Any lifting of 60 pounds or more requires assistance or a mechanical lifting device. Follow safe lifting procedures.
	Cuts	Use care when handling glassware. Wear adequate hand protection.
	Sprains/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. All repairs on machinery or equipment will be made at a location that provides protection from traffic for repair persons.

Collection of Surface Water Samples
Carswell Base Gas Station, NAS Fort Worth, Carswell Field, Texas
(Continued)

Activity	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

Surveying
Carswell Base Gas Station, NAS Fort Worth, Carswell Field, Texas

Principal Task	Potential Hazard	Control Measures
Surveying	Slip, trip, fall	<ul style="list-style-type: none"> • Site workers will be required to wear hard hats, safety glasses with side shields, work gloves, and steel-toe boots when working in the field. • Provide adequate lighting in all work areas. • Whenever possible, avoid routing cords and hoses across walking pathways. • Flag or cover inconspicuous holes to protect against falls. • Work areas will be kept clean and orderly. • Garbage and trash will be disposed of daily in approved refuse containers. • Tools and accessories will be properly maintained and stored. • Work areas and floors will be kept free of dirt, grease, and slippery materials.
	Heavy lifting	<p>Any lifting of 60 pounds or more requires assistance or a mechanical lifting device.</p> <p>Follow safe lifting procedures</p>

Appendix C
Material Safety Data Sheets



Genium Publishing Corporation

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Schenectady, NY 12303-1836 USA
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Sheet No. 83
Chromium Metal/Powder

Issued: 3/81 Revision: A, 11/89

Section 1. Material Identification

chromium plating other metals; for greatly increasing metal resistance and durability; in manufacturing chrome-steel or chrome-nickel-steel alloys (stainless steel); as a constituent of inorganic pigments; as protective coating for automotive and equipment accessories; and in nuclear and high-temperature research.

Other Designations: Chrome; Cr; CAS No. 7440-47-3.

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

S 1
K 1



HMIS
H 2
P 1
R 1
PPC*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Chromium metal/powder, ca 100%

OSHA PEL	ACGIH TLV, 1988-89*	NIOSH REL, 1987†	Toxicity Data‡
8-hr TWA: 1 mg/m ³	TLV-TWA: 0.5 mg/m ³	8-hr TWA (for chromium metal and insoluble salts): 1 mg Cr/m ³	Rat. implant, TD ₀₁ : 1200 µg/kg body weight administered intermittently over six weeks

* This TLV is applicable to Cr²⁺ and Cr³⁺ compounds. For water soluble and water-insoluble Cr⁶⁺, the 8-hr TWA is 0.05 mg Cr⁶⁺/m³. Certain water-insoluble Cr⁶⁺ compounds (zinc chromate, calcium chromate, lead chromate, barium chromate, strontium chromate, and sintered chromium trioxide) are designated as A1a (human carcinogen).

† The NIOSH REL (10-hr TWA) for carcinogen Cr⁶⁺ compounds is 1 µg/m³; for noncarcinogenic Cr⁶⁺ compounds (including chromic acid), the RELs (10-hr TWAs) are 25 µg/m³ and 50 µg/m³ (15-min ceiling). The noncarcinogenic compounds include mono- and dichromates of hydrogen, cesium, sodium, lithium, potassium, rubidium, ammonia, and Cr⁶⁺ (chromic acid anhydride). Any and all Cr⁶⁺ materials excluded from the noncarcinogenic group above are carcinogenic Cr⁶⁺ compounds.

‡ See NIOSH, *STECS* (OS420000), for additional data with references to tumorigenic effects.

Section 3. Physical Data

Boiling Point: 4788 °F (2642 °C)	Atomic Weight: 51.996 g/mol
Melting Point: 3452 °F (1900 °C)	Specific Gravity (H ₂ O = 1 at 39 °F (4 °C)): 7.2 at 68 °F (20 °C)
Vapor Pressure: 1 mm Hg at 2941 °F (1616 °C)	Water Solubility: Insoluble
Vapor Density (Air = 1): 1.79	

Appearance and Odor: Steel-gray, lustrous metal; no odor.

Section 4. Fire and Explosion Data

Flash Point: None reported	Autoignition Temperature: Cloud, 1076 °F (580 °C); dust layer, 752 °F (400 °C)	LEL: Dust cloud explosion, 0.230 oz/ft ³	UEL: None reported
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Extinguishing Media: Use dry chemical or sand.

Unusual Fire or Explosion Hazards: Particle size and dispersion in air determine reactivity. Chromium powder explodes spontaneously in air, while chromium dust suspended in CO₂ is ignitable and explosive when heated.

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

*One hundred percent of dust goes through a 74-µm sieve; 4.100-mL each can make a dust cloud

Section 5. Reactivity Data

Stability Polymerization: A compound that is not expected to undergo polymerization.

Chemical Incompatibilities: Chromium reacts readily with dilute, not nitric, acids to form chromous salts. It is soluble in acids (not nitric) and strong alkalis. Its powder is incompatible with strong oxidizing agents, including high O₂ concentration. Evaporation of mercury (Hg) from Cr amalgam leaves pyrophoric chromium. Finely divided Cr attains incandescence with nitrogen oxide, potassium chlorate, and sulfur dioxide. Molten lithium at 18 °C severely attacks Cr. Fused ammonium nitrate below 200 °C reacts explosively and may ignite or react violently with bromine pentafluoride.

Hazardous Products of Decomposition: Thermal oxidative decomposition of Cr can produce toxic chromium oxide fumes.

Section 6. Health Hazard Data

Summary of Risks: When ingested chromium is a human poison, with gastrointestinal (GI) effects. Chromium 3 (Cr^{+3}) compounds show little or no toxicity. Less soluble chromium 6 (Cr^{+6}) compounds are suspected carcinogens and severe irritants of the larynx, nasopharynx, lungs, and skin (Sec. 2). Chromic acid or chromate salts cause irritation of the skin and respiratory passage. Ingestion leads to severe irritation of the gastrointestinal tract, renal damage, and circulatory shock. Chromium metal (when heated to high temperatures) and insoluble salts are said to be involved in histological fibrosis of the lungs, which may progress to clinically evident pneumoconiosis. Exposure to chromate dust and powder can cause skin (dermatitis) and eye irritation (conjunctivitis).

Medical Conditions Aggravated by Long-Term Exposure: An increased incidence of bronchogenic carcinoma occurs in workers exposed to chromate dust.

Target Organs: Respiratory system.

Primary Entry: Inhalation, percutaneous absorption, and ingestion.

Acute Effects: Acute exposures to dust may cause headache, coughing, shortness of breath, pneumoconiosis, fever, weight loss, nasal irritation, inflammation of the conjunctiva, and dermatitis.

Chronic Effects: Asthmatic bronchitis.

FIRST AID

Eyes: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min.

Skin: Brush off chromium dust. After rinsing affected area with flooding amounts of water, wash it with soap and water.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that conscious person slowly drink 1 to 2 glasses of water to dilute. Do not induce vomiting. A physician should evaluate all ingestion cases.

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

Physician's Note: Acute toxicity causes a two-phase insult: 1) multisystem shock due to gastrointestinal corrosivity and 2) hepatic, renal, hematopoietic insult. Treatment should use ascorbic acid as a neutralizer with gastric lavage. If the ingestion is substantial, exchange transfusions and/or consider hemodialysis. Treat allergic dermatitis with local cortisone or 10% ascorbic acid to reduce Cr^{+6} to Cr^{+3} . Ten percent EDTA in a lanolin base applied every 24 hr helps heal skin ulcers.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel of large spills. Cleanup personnel should wear protective clothing and approved respirators. Remove heat and ignition sources. Provide adequate ventilation. Keep airborne dust at a minimum. Remove spills quickly and place in appropriate containers for disposal or reuse.

Disposal: Reclaim salvageable metal. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

OSHA Designations

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

EPA Designations

RCRA Hazardous Waste (40 CFR 261.33): Not listed

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1 lb (0.454 kg) [* per Clean Water Act, Sec. 307(a)]

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

Listed as a SARA Toxic Chemical (40 CFR 372.65)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Wear a NIOSH-approved respirator if necessary. Wear an SCBA with a full facepiece when the particle concentration's upper limit is 50 mg/m^3 .

Warning: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Other: Wear impervious rubber gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact.

Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA standard (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by eliminating it at its source (Genium ref. 103).

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

Contaminated Equipment: Never wear contact lenses in the work area; soft lenses may absorb, and all lenses concentrate, irritants. Launder contaminated clothing before wearing. Remove this material from your shoes and 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: Store material in cool, dry, well-ventilated area separate from acids and oxidizing agents. Seal and protect containers from physical damage. Keep away from heat or ignition sources.

Engineering Controls: Avoid dust inhalation. Practice good housekeeping (vacuuming and wet sweeping) to minimize airborne particulates and to prevent dust accumulation. Use nonsparking tools and ground electrical equipment and machinery.

Transportation Data (49 CFR 172.101, .102): Not listed

MSDS Collection References: 1, 2, 26, 38, 80, 87, 88, 89, 100, 109, 124, 126

Prepared by: MJ Allison, BS; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: MJ Hardies, MD

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Material Safety Data Sheet

GenCorp Reference Publications
 10000 North Central Expressway
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 Chicago, Illinois 60634
 (312) 777-4000



No. 300 297095
 ACETONE
 Revision 1
 Issued September 1985
 Revised November 1987

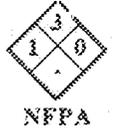
SECTION 1. MATERIAL IDENTIFICATION

Material Name: ACETONE

Description (Origin/Uses): Used as a solvent for fats, oils, waxes, resins, rubber, plastics, varnishes, and rubber cements; also used in the manufacture of methyl isobutyl ketone, mesityl oxide, acetic acid, diacetone alcohol, chloroform, iodine, and many other chemicals. Used in the production of photographic films, and isoprene. Used to store acetylene gas. Widely used in the chemical industry (CPI).

Other Designations: Dimethylformaldehyde; Dimethylketal; Dimethyl Ketone; Ketone Propane;
 Pyroacetic Acid; Pyroacetic Ether; C₃H₆O; CAS No. 0067-64-1

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek*
 Supplier Guide (GenCorp, Inc.) for a full listing.



NFPA
 HMIS
 H 1 R 1
 P 3 I 1
 R 0 S 2
 PPG*
 H 4

SECTION 2. INGREDIENTS AND HAZARDS

Acetone, C₃H₆O, 0067-64-1

EXPOSURE LIMITS

OSHA PELs

8-Hr TWA: 750 ppm, 1800 mg/m³

STEL: 1000 ppm, 2400 mg/m³

ACGIH TLVs, 1988-89

TLV-TWA: 750 ppm, 1780 mg/m³

TVL-STEL: 1000 ppm, 2375 mg/m³

Toxicity Data*

Man. Inhalation, TD₀₁: 440 µg/m³ (6 Mins)

Man. Inhalation, TD₀₁: 10 mg/m³ (6 Hrs)

*See NIOSH, *RTECS* (AL315000), for additional data with references to reproductive, mutagenic, and irritative effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 134°F (56°C)

Melting Point: -137°F (-94°C)

Vapor Density (Air = 1): 2

Vapor Pressure: 180 Torr at 68°F (20°C)

Evaporation Rate: Faster than That of n-Butyl Acetate

Molecular Weight: 58 Grams/Mole

Solubility in Water (%): Complete

Specific Gravity (H₂O = 1): 0.778 at 77°F (25°C)

% Volatile by Volume: 100

Appearance and Odor: A clear, colorless, highly flammable, volatile liquid with a characteristic, pleasant, sweetish odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point: 1.4°F (-17°C) CC

Autoignition Temperature: 869°F (465°C)

LEL: 2.9% v/v

UEL: 12.8% v/v

Extinguishing Media: Use "alcohol" foam, dry chemical, or carbon dioxide. Use a blanketing effect to smother flames. Use water spray to reduce the rate of burning and to cool containers. Water will probably not be effective in directly extinguishing an acetone fire.

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

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

SECTION 5. REACTIVITY DATA

Stability/Polymerizations: Acetone is stable in closed containers during routine operations. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Acetone can react dangerously with strong oxidizing agents such as nitrates, perchlorates, permanganates, and concentrated sulfuric acid; chromic anhydride; chromyl chloride; hydrogen peroxide; hexachloroammine; nitrosyl chloride; permono-sulfuric acid; mixtures of sulfuric acid and nitric acid; mixtures of nitric acid and acetic acid; and potassium *tert*-butoxide.

Conditions to Avoid: Do not expose acetone to sources of ignition and incompatible chemicals.

Hazardous Products of Decomposition: Carbon monoxide and carbon dioxide can be produced during acetone fires.

SECTION 6. HEALTH HAZARD INFORMATION

CAUTION: This information is intended for use by trained personnel only.

Summary of Risks: See Section 2.

incoordination, slurred speech, drowsiness. Prolonged or repeated skin contact with acetone has a defatting effect causing dryness, irritation, and mild itching conditions the amount of acetone absorbed through the skin is small. Ingestion of acetone may cause irritation of the gastrointestinal tract and narcosis. Acetone acts primarily as a depressant to the central nervous system (CNS) when exposures are severe or prolonged. Medical Conditions Aggravated by Long-Term Exposure: None reported. Target Organs: Skin, eyes, respiratory system, and CNS. Primary Entry: Inhalation, skin contact. Acute Effects: See Summary of Risks, above. Chronic Effects: None reported. FIRST AID: Eyes. Immediately flush eyes, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 minutes. Skin. Rinse the affected area with flooding amounts of water, then wash it with soap and water. Inhalation. Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have qualified medical personnel administer oxygen as required. Monitor the exposed person for symptoms of depression of the CNS such as incoordination and drowsiness. Ingestion. Unlikely.* If a small amount is ingested, dilute it slowly with 1 to 2 glasses of water or milk. Get medical help (in plant, paramedic, community) for all exposures. Seek prompt medical assistance for further treatment, observation, and support after first aid. *Note to Physician: Treatment for accidental ingestion of a small amount of acetone is unnecessary. If a large amount has been ingested, administer a charcoal slurry, either aqueous or mixed with a saline cathartic or sorbitol.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, evacuate unnecessary personnel, eliminate all sources of ignition immediately, and provide adequate ventilation. Cleanup personnel need protection against this liquid's contact with skin or eyes as well as inhalation of its vapor (see sect. 8). Contain large spills and collect waste or absorb it with an inert material such as sand, earth, or vermiculite. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways. **Waste Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations. Consider saving the waste hydrochloric acid for use as a neutralizing agent during cleanup operations of basic materials.

OSHA Designations

Listed in Air Contaminant: 29 CFR 1910.1000 Subpart Z).

EPA Designation: 49 CFR 159.24.

EPA Designation: 49 CFR 159.24.

CERCLA Hazardous Substance, Reportable Quantity: 5000 lbs (2270 kg), per the Resource Conservation and Recovery Act, § 3001.

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Use a NIOSH-approved respirator per Genium reference 88 for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (spills or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators will not protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious butyl or natural rubber gloves, boots, aprons, and gauntlets, etc., to prevent prolonged or repeated contact with this material. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of acetone below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do not wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from your shoes and equipment. **Other:** Automatic sprinkler systems for fire protection are desirable in work areas. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Keep it off your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do not eat, drink, or smoke in any work area. Do not inhale acetone vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store acetone in closed containers (carbon steel is recommended) in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage. **Engineering Controls:** Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. Electrically ground and bond all containers and pipelines, etc., used in shipping, transferring, reacting, production, and sampling operations to prevent generating static sparks. **Other Precautions:** Use labeled safety cans when handling small amounts of acetone. Acetone presents a dangerous fire hazard; perform all work operations involving it carefully and in a way that will prevent exposing the liquid or its vapor to sources of ignition.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Acetone

IMO Hazard Class: 3.1

DOT Hazard Class: Flammable Liquid

IMO Label: Flammable Liquid

ID No. UN1090

IMDG Packaging Group: II

DOT Label: Flammable Liquid

References: 1, 26, 58, 84-94, 100, 116, 117, 120, 122.

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Prepared by PJ Igoe, BS

Industrial Hygiene Review: DJ Wilson, CIH

Medical Review: MJ Hardies, MD

SECTION 6. HEALTH HAZARD INFORMATION, cont.

flooding amounts of flammable water (e.g., seas) or water. Skin: Keep the affected area with flooding amounts of water and then wash it with soap and water. Inhalation: Remove the cause of exposure by fresh air, or help and support his or her breathing as needed. Have qualified medical personnel administer oxygen as required. Note to Attending Physicians: Do not administer alcohol. Ingestion: Unlikely. Should this type of exposure occur, do not induce vomiting because of the hazard of aspiration. If spontaneous vomiting occurs, do not position the exposed person's head below his or her neck or try to restrain it. Get medical help (physician, paramedic, community) for all exposures. Seek prompt medical assistance for irritant effects on the eyes, skin, and respiratory tract. Note to Physicians: Absorbed methylene chloride is stored in body fat and metabolized to carbon dioxide. The maximum methylene chloride increases and, as well as carboxyhemoglobin levels in the blood, which is a common indicator of the oxygen-carrying capacity of the blood. NIOSH advises replacement and annual medical exams that emphasize heart, lung, and kidney function, CNS, and respiratory system functions and a complete blood count. Simultaneous exposure to tobacco smoke, air pollution, or other irritants along with heavy manual labor increases the body burden of a worker as well as the toxic hazards of the methylene chloride. In significant exposures, serum methylene chloride levels are of no clinical importance. Neurologic and hepatic status as well as carboxy hemoglobin should be monitored.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, evacuate unnecessary personnel, eliminate all sources of ignition immediately, and provide adequate explosion-proof ventilation. Clean up spill as needed. Use caution against this liquid's contact with the skin or eyes as well as inhalation of its vapor. Contain large spills and collect waste or at least it with inert material, such as sand, earth, or vermiculite. Use nonsparking tools to place waste in a properly labeled and closed container for disposal. Keep waste out of sewers, waterways, and waterways. Waste **Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z).

EPA Designations (40 CFR 302.4)

RCRA Hazardous Waste, NO 10050

CERCLA Hazardous Substance. Reportable Quantity: 1000 lbs (454 kg), per the Clean Water Act (CWA), § 307 (a), and the Resource Conservation and Recovery Act (RCRA), § 302.

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. When rotating a piston, wear a full face shield. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Use a NIOSH-approved respirator per Genium reference 58 for the maximum-use concentrations and/or exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or a nonroutine operations (fills or a venting regulator vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators will not protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious neoprene, PVA, or Viton gloves, boots, aprons, and gauntlets, etc., to prevent any skin contact with liquid methylene chloride. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of acetone below the exposure limits cited in section 2. Local exhaust ventilation is preferred because it prevents dispersal of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. Floor or ramp ventilation may be necessary. **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses permanently them. Do not wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from shoes and equipment. **Other:** Because the health effects of carbon disulfide and methylene chloride are additive (see sect. 6), workplaces should be equipped with automatic locking equipment that identifies wet/dry atmospheric levels of both of these materials. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material and before eating, drinking, smoking, using the toilet, or applying cosmetics. Keep it off your clothing and equipment. Avoid transferring it to your mouth while eating, drinking, or smoking. Do not eat, drink, or smoke in any work area. Do not make methylene chloride levels.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store methylene chloride in closed, unopened, metal containers in a cool, dry, well-ventilated area away from sources of ignition, strong oxidizers, acids, and incompatible materials (see sect. 5). Protect containers from physical damage. **Special Handling/Storage:** Prevent leaks and from entering storage container. Provide ventilation at the floor level in storage rooms. Methylene chloride vapor is denser than air. Installation of a cover and safety seal on each tank is recommended. Although not recommended for use as a storage material, approved storage material include galvanized steel, black iron, or steel. **Engineering Controls:** Make sure all engineering systems (production, transportation, and maximum explosion-proof design. Electrical ground and bond all containers and pipelines used in supporting, filling, venting, and sampling operations or prevent generating static sparks.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Dichloromethane or Methylene Chloride

DOT Hazard Class: ORM-A

ID No. UN1595

DOT Packaging Requirements: 49 CFR 173.605

DOT Packaging Exceptions: 49 CFR 173.505

IMO Shipping Name: Dichloromethane

IMO Hazard Class: 6.1

IMO Label: Saint Andrew's Cross (X)*

IMDG Packaging Group: III

*Harmful-Stay away from Foodstuffs.

References: 1, 26, 38, 84-94, 100, 116, 117, 120, 122.

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Prepared by PJ Igloe, BS

MSD 11 Review: M. H. H. S. M.D.

Material Safety Data Sheet

Eastman Chemical Company
 2700 Eastman Drive
 Eastman, KY 40321-0001
 606-526-5000



No. 312
TRICHLOROETHYLENE
 Revision 1
 297092
 Issued Jan. 1978
 Revised August 1987

SECTION 1. MATERIAL IDENTIFICATION

SYMBOLIC NAME: TRICHLOROETHYLENE
DESCRIPTION: Colorless liquid, freonized form of carbon tetrachloride. It is a chlorinated hydrocarbon with a boiling point of 84.7°F (29.3°C). It is used as a solvent for fats, waxes, rubbers, oils, paints, varnishes, and other materials.
OTHER DESIGNATIONS: Freon 113, TCE, Trichloroethene, 1,1,2-Trichloroethylene.
OSHA PEL (PEL) (MMSHA): 300 ppm (5 min) (5) (6)
SAFETY DATA SHEET: See also other suppliers, including:
 Eastman Chemical Company, Eastman, KY 40321-0001
 Dupont, P.O. Box 1000, Newark, NJ 07102
COMMENTS: Trichloroethylene is a toxic solvent and a suspected occupational carcinogen.
 * See sect. 8



HMIS			
H	2	R	1
F	1	I	3
P	1	S	1
RPE*		K	0

SECTION 2. INGREDIENTS AND HAZARDS

Chemical Structure:
ClC(Cl)=CCl

HAZARD DATA

TLV-TWA: 50 ppm (300 mg/m³)
TLV-STEL: 100 ppm (600 mg/m³)
OSHA PEL: 300 ppm (5 min) (5) (6)
Human, Inhalation, TC_{Lo}: 6900 mg/m³ (10 Min)
Human, Inhalation, TC_{Lo}: 160 ppm (83 Min)
Human, Inhalation, TD_{Lo}: 812 mg/kg

* The TLV-TWA is set to control subjective complaints such as headache, fatigue, and irritability.
 ** The TLV-STEL is set to prevent incoordination and other beginning anesthetic effects from TCE. These levels should provide a wide margin of safety in preventing liver injury.
 *** The OSHA PEL is 300 ppm for 5 minutes in any 2 hours.

SECTION 3. PHYSICAL DATA

Boiling Point: 84.7°F (29.3°C)
Vapor Pressure: 58 Torr at 68°F (20°C)
Water Solubility: Insoluble
Vapor Density (Air = 1): 4.53

Appearance and odor: Colorless, nonflammable mobile liquid; sweetish odor like chloroform.

COMMENTS: TCE is highly soluble in lipids. A high vapor pressure at room temperature provides the potential for TCE vapors to contaminate use areas.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoxidative Temperature	Flammable Limits (Vol% in Air)	LOWER	UPPER
None	None	None	None	None

OSHA Flammability Class (29 CFR 1910.106): Not Regulated

COMMENTS: TCE emits highly toxic and irritating fumes, including DIFURANS. Wear a self-contained breathing apparatus with a mode. At TCE vapor levels of 300-1000 ppm, fire hazards will not be properly extinguished unless the extinguisher is specifically labeled for use on chlorinated hydrocarbons.

SECTION 5. REACTIVITY DATA

Chemical Incompatibilities: include magnesium or aluminum powder, NaOH, KOH, or other strong alkaline materials. These materials may lead to the formation of dangerous explosive mixtures of chloroacetylenes.

When TCE is heated (as in the case with vapor degreasers) or exposed to sunlight, it requires extra stabilization against oxidation, degradation, and polymerization. It is slowly decomposed by light when moist.

PRODUCTS OF HAZARDOUS DECOMPOSITION include hydrochloric acid and phosgene under certain conditions at elevated temperatures.

COMMENTS: TCE is stable under normal handling and storage conditions, and hazardous polymerization is not expected to occur. However, failure of the stabilizer at elevated temperatures or other extreme conditions may allow polymerization to take place.

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
914-377-0222



GENIUM PUBLISHING CORP.

No. 315 297101

CHLOROFORM
(Revision D)
Issued: August 1979
Revised: April 1988

SECTION 1. MATERIAL IDENTIFICATION

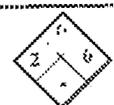
Material Name: CHLOROFORM

Description (Origin/Uses): Used as a solvent for fats, oils, rubber, alkaloids, waxes, and resins; as a cleansing agent.

Other Designations: Trichloromethane; CHCl₃; NIOSH RTECS No. FS9100000; CAS No. 0067-66-3

Manufacturer: Contact: Consult the latest edition of the *Chemicalweek*
Buyers' Guide (Genium ref)

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



SECTION 2. INGREDIENTS AND HAZARDS

Chloroform, CAS No. 0067-66-3

Ca 100

EXPOSURE LIMITS

OSHA PEL
Ceiling: 50 ppm, 240 mg/m³

ACGIH TLV, 1987-88
TLV-TWA: 10 ppm, 50 mg/m³

NIOSH REL
Ceiling: 2 ppm, 9.78 mg/m³

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

Toxicity Data*
Human, Oral, LD₅₀: 140 mg/kg
Rat, Oral, LD₅₀: 908 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 147°F (65°C)

Melting Point: -82.3°F (-63.5°C)

Vapor Pressure: 158.4 Torr at 68°F (20°C)

Vapor Density (Air = 1): 4.13

Water Solubility (%): 0.822 ml of CHCl₃ per 100 ml of H₂O at 68°F (20°C)

% Volatile by Volume: 100

Molecular Weight: 119 Grams/Mole

Specific Gravity (H₂O = 1): 1.484 at 68°F (20°C)

Appearance and Odor: A heavy, colorless, clear, volatile liquid; characteristic, pleasant, ethereal, sweet odor (recognition threshold: 0.3 mg/m³); sweet taste.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method: Auto-ignition Temperature: Thermal Stability Limits in Air

Extinguishing Media: None reported.

Unusual Fire or Explosion Hazards: None reported.

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

SECTION 5. REACTIVITY DATA

Chloroform is stable under normal conditions of use. However, even when stabilized with ethanol, this material develops acidity from prolonged exposure to air and light.

Chemical Incompatibilities: This material is incompatible with strong alkalis.

Conditions to Avoid: Avoid prolonged exposure to air and light and to strong alkalis.

Hazardous Products of Decomposition: Toxic and corrosive gases like hydrochloric acid (HCl), chlorine (Cl₂), carbon monoxide (CO), and oxides of chlorine (ClO_x) can be produced during fires.

Material Safety Data Sheet

Genium Publishing Corporation
1,45 Canal Street
Newburgh, NY 12551-1876 USA
518-537-8150



No. 317
TOLUENE
Revision: 1.0
Issued: August 1979
Revision: April 1986

SECTION 1. MATERIAL IDENTIFICATION

20

MATERIAL NAME: Toluene

Other Names: Methyl Benzene, Methyl Benzol, Phenylmethane, Toluol.

Manufacturer/Supplier: Genium Publishing Corporation
1,45 Canal Street, Newburgh, NY 12551-1876 USA
Tel: 518-537-8150
Fax: 518-537-8150

H:MS

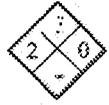
H: 2

F: 3

R: 0

PPE*

*See sect. 8



R 1

I 3

S 2

K 4

SECTION 2. INGREDIENTS AND HAZARDS

%

HAZARD DATA

Toluene



ca 100

Sub TLV: 100 ppm, or
175 mg/m³ (5km)^{**}

Man. Inhalation, TClO:
100 ppm: Psychotropic^{***}

Rat, Oral, LD₅₀: 5000 mg/kg

Rat, Inhalation, LCLo:

4000 ppm/4 hrs.

Rabbit, Skin, LD₅₀: 14 gm/kg

Human, Eye: 300 ppm

* Current (1985-86) ACGIH TLV. The OSHA PEL is 300 ppm with an acceptable ceiling concentration of 300 ppm and an acceptable maximum peak of 500 ppm/10 minutes.

** Skin designation indicates that toluene can be absorbed through intact skin and contribute to overall exposure.

*** Affects the mind.

SECTION 3. PHYSICAL DATA

Boiling Point ... 110.6°C
Vapor Pressure @ 20°C, mm Hg ... 22
Water Solubility @ 20°C, wt. % ... 0.05
Vapor Density (Air = 1) ... 3.14

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

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

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temp.

Flammability Limits in Air

40°F (4°C): CC

596°F (480°C)

% by Volume

1.27

7.1

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

HAZARD: This OSHA class 3 flammable liquid is a dangerous fire hazard. It is a moderate fire hazard when exposed to oxidizers, heat, sparks, or open flame. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.

SPECIAL FIRE FIGHTING PROCEDURES: Fire fighter, wear self-contained breathing apparatus with full facepiece, working in a positive-pressure mode when fighting fires in closed spaces.

SECTION 5. REACTIVITY DATA

REACTIVITY: Stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. This material is incompatible with strong oxidizing agents, disorganizing agents, super peroxides, and compounds of chromium sesquioxide. Contact with these materials may cause fire or explosion. Nitric acid and toluene, especially in the presence of sulfuric acid, will produce explosive compounds that are dangerously explosive.

Reactivity: Ignites on exposure to sparks, open flame, hot surfaces, and all sources of heat and ignition. Toluene reacts with strong oxidizers, rubber, and coatings. Thermal decomposition or burning produces carbon dioxide and/or carbon monoxide.

SECTION 6. HEALTH HAZARD INFORMATION TLV

... considered a carcinogen by the NCI. ... may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure ... may cause weakness, depression, dizziness, headache, and paraesthesiae (numbness or tingling) ... on the skin it may be an irritant. Exposure to higher concentrations may cause weakness, dizziness, dilated pupils, and convulsions, and, in severe cases, may cause unconsciousness and death. The liquid is irritating to the eyes and skin. Contact with the eyes may cause transient conjunctival damage and possible irritation, and burns if not promptly removed. Repeated minor prolonged contact with the skin may cause drying and cracking. It may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor. Chronic overexposure to vapors may cause reversible bloody and liver injury. **FIRST AID: EYE CONTACT:** Immediately flush eyes including under eyelids, with running water for at least 15 minutes. Get medical attention if irritation persists. **SKIN CONTACT:** Immediately flush skin if at least 15 minutes while removing contaminated shoes and clothing. Wash exposed area with soap and water. Get medical attention if irritation persists or if a large area has been exposed. **INHALATION:** Remove victim to fresh air. Restore and/or support breathing as required. Keep victim warm and quiet. Get medical help. **INGESTION:** Give victim 1 to 2 glasses of water or milk. Contact a poison control center. Do not induce vomiting unless directed to do so. Transport victim to a medical facility. Never give anything by mouth to a person who is unconscious or convulsing. **GET MEDICAL ASSISTANCE:** In plant, paramedic community. Get medical help for further treatment, observation, and support after first aid, if indicated.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL/LEAK: Notify safety personnel of large spills or leaks. Remove all sources of heat and ignition. Provide maximum explosion proof ventilation. Limit access to spill area to necessary personnel only. Remove leaking containers to safe place if feasible. Cleanup personnel must protect against contact with liquid and inhalation of vapor (see sect. 8). Small spills with paper towel or vermiculite. Contain large spills and collect if feasible, or place in suitable container for disposal. Place waste solvent or absorbent into closed containers for disposal using nonsparking tools. Liquid can be flushed with water to an open holding area for handling. Do not flush to sewer, watershed, or waterway. **COMMENTS:** Place in suitable container for disposal by a licensed contractor or burn in an approved incinerator. Consider reclaiming by distillation. Contaminated absorbent can be buried in a sanitary landfill. Follow all Federal, state, and local regulations. TLV 96: 100-10 ppm. Toluene is designated as a hazardous waste by the EPA. The EPA (RCRA) HW No. is U220 (40 CFR 261). The reportable quantity (RQ) is 1000 lbs/454 kg (40 CFR 117).

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation to meet TLV requirements. Ventilation fans and other electrical service must be nonsparking and have an explosion-proof design. Exhaust hoods should have a face velocity of at least 100 fpm (linear feet per minute) and be designed to capture heavy vapor. For enclosures or atmosphere exposures where the TLV may be exceeded, use an organic chemical cartridge respirator if concentration is less than 100 ppm and an approved canister gas mask or self-contained breathing apparatus with full facepiece if concentration is greater than 200 ppm. Safety glasses or splash goggles should be worn in all work areas. Neoprene gloves, apron, face shield, boots, and other appropriate protective clothing and equipment should be available and worn as necessary to prevent skin and eye contact. Remove contaminated clothing immediately and do not wear it until it has been properly laundered. Eyewash stations and safety showers should be readily available in use and handling areas. Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE/SEGREGATION: Store in a cool, dry, well-ventilated area away from oxidizing agents, heat, sparks, or open flame. Storage areas must meet OSHA requirements for class IB flammable liquids. Use metal safety cans for handling small amounts. Protect containers from physical damage. Use only with adequate ventilation. Avoid contact with eyes, skin, or clothing. Do not inhale or ingest. Use caution when handling this compound because it can be absorbed through intact skin in toxic amounts. **SPECIAL HANDLING/STORAGE:** Ground and bond metal containers and equipment to prevent static sparks when making transfers. Do not smoke in use or storage areas. Use nonsparking tools. **ENGINEERING CONTROLS:** Preplacement and periodic medical exams emphasizing the liver, kidneys, nervous system, lungs, heart, and blood should be provided. Workers exposed to concentrations greater than the action level (50 ppm) should be examined at least once a year. Use of alcohol can aggravate the toxic effects of toluene. **COMMENTS:** Empty containers contain product residues. Handle accordingly! Toluene is designated as a hazardous substance by the EPA (40 CFR 116). DOT Classification: Flammable liquid. UN1294. Data Source(s) Code: 1-9, 12, 16, 20, 21, 24, 26, 34, 51, 52, CR

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Approvals *JO. P. ... 11/86*
 Indust. Hygiene/Safety *[Signature]* 2-86
 Medical Review *[Signature]* Oct 86

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Capital Street
Schenectady, NY 12305 USA
(518) 377-8855



GENIUM PUBLISHING CORP.

No. 318 297107

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

SECTION 1. MATERIAL IDENTIFICATION

26

Material Name: XYLENE (Mixed Isomers)

Description (Origin/Uses): Used as a raw material for the production of terephthalic acid, phthalic anhydride, isophthalic acid, terephthalic acid, and their dimethyl esters in the manufacture of polyester fibers; in sterilizing caugut; with aromatic esters as a preservative in microscopical and as a cleaning agent in microscopic techniques.

Other Designations: Phthalobenzene; Nilsol; C₈H₁₀; CAS No. 1330-20-7

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

Buyers Guide (Genium Vol. 7) for a list of suppliers.

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



NFPA

HMIS

H	2	R	1
F	3	I	3
R	0	S	2
PPC*		K	3

*See sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

%

EXPOSURE LIMITS

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

IDLH** Level: 1000 ppm

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

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

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

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

***Immediately dangerous to life and health.

**** See NIOSH, *RTECS* (No. ZEZ100000), for additional data with references to reproductive, irritative, and mutagenic effects.

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

Toxicity Data****
Human, Inhalation, TC₅₀: 200 ppm
Man, Inhalation, LC₅₀: 10000 ppm/6 Hrs
Rat, Oral, LD₅₀: 4300 mg/kg

SECTION 3. PHYSICAL DATA

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

Melting Point: 13°F (-25°C)

Evaporation Rate: 0.6 Relative to BuAc = 1

Specific Gravity (H₂O = 1): 0.86

Water Solubility (%): Insoluble

Molecular Weight: 106 Grams/Mole

% Volatile by Volume: Ca 100

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

Vapor Density (Air = 1): 3.7

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

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

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

115°F (40°C) (CC) (30)

Autoignition Temperature

530°F (277°C)

Flammability Limits in Air

3 to 10 Volume

1%

7%

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

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

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

SECTION 5. REACTIVITY DATA

Xylene is stable and does not contain any reactive functional groups. It is not an oxidizer, reducer, or polymerizer.

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

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

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

SECTION 6. HEALTH HAZARD INFORMATION

Xylene is classified as a carcinogen by the IARC, NTP, or OSHA.

Summary of Risks: Inhalation may cause irritation and causes irritation, dizziness, and drowsing; prolonged exposure may cause a numbness, tingling, or sore and burning of the hands and feet; excessive inhalation results in respiratory irritation, discomfort, and possible pulmonary edema; repeated or prolonged inhalation may irritate the CNS and cause respiratory conditions. **Aggravated by Long-Term Exposure:** Symptoms with eyes, skin, central nervous system, kidneys, and liver may be worsened by (ANS) in aviation. **Largest Organ:** CNS (eye, kidney, central nervous system, kidneys, skin). **Primary Entry:** Inhalation, skin contact/absorption. **Acute Effects:** Irritation, eye irritation, dizziness, drowsing, staggering, irritation of eyes, nose, and throat; corneal irritation, irritation of the mouth, sore throat, and irritation of the skin. **Chronic Effects:** Irritation of eyes, damage, headache, irritation of the mouth, sore throat, and skin.

FIRST AID: Eyes: Immediately flush eyes, including under the eyelids, with lukewarm water for at least 15 minutes. Wash immediately with mild soap and water. **Ventilation:** Remove the exposed person to fresh air; restore and/or supplement breathing as needed. Have a trained person administer oxygen. **Ingestion:** Never give anything by mouth to someone who is unconscious or has vomited. Administer maximum stomach pumping only if vomiting has not occurred; keep exposed person's head below his or her hips to prevent aspiration (breathing the liquid xylene into the lungs). Severe hemorrhagic pneumonia is with acute, possibly fatal, pulmonary edema. Do not attempt to administer very small quantities of xylene.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid. If exposure is severe, hospitalization for at least 72 hours with careful monitoring for delayed onset of pulmonary edema is recommended.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all sources of ignition immediately. Cleanup personnel wear protection against contact with any inhalable or visible vapor (see section 8). Clean up large spills and collect waste (absorb it with an inert material such as sand, earth, or vermiculite) in fire-retardant bags for disposal. Do not allow any of absorption into drainage or waterways. Keep waste out of sewers, waterheds, and waterways.

Waste Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Air Contaminant: 29 CFR 1910.1000 Subpart Z

EPA Designation: 40 CFR 302.4

RCRA Hazardous Waste: No. U239

CERCLA Hazardous Substance, Reportable Quantity: 1000 lb (454 kg) for Oil Clean Water Act (CWA), section 311 (b) (6)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear eye protection (eye goggles or chemical safety goggles). Eye protection should wear a full face shield as a supplementary protection measure. Follow OSHA eye and face protection regulations (29 CFR 1910.133). **Respirator:** Use a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* for the maximum use concentrations and/or the exposure limits cited in section 2. Follow OSHA respiratory regulations (29 CFR 1910.134) for emergencies or nonroutine use (leaks or leaking reactor vessel and storage tanks); wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will not protect workers in a oxygen-deficient atmosphere. **Other:** Wear impervious gloves, boots, aprons, gaiters, etc., as required by the specification of the work operation to prevent prolonged or repeated skin contact with xylene. **Ventilation:** Install and operate general and local maximum exposure limit ventilation systems (permitted) if enough to maintain airborne levels of xylene below the OSHA PEL. **Containment:** Local exhaust ventilation is preferred because it prevents dispersion of xylene into general work areas or communities; at all times, consult the latest edition of *Chemical Reference 103* for detailed recommendations. **Safety Stations:** Make eyewash stations, shower, and first aid kits available in areas of use and handling. **Contaminated Equipment:** Contaminated items have a special hazard soft lenses that absorb irritants and all senses concentrate them. Do not use contaminated work area. Remove contaminated clothing and launder it before wearing it again. Clean xylene from shoes and clothing. **Personal Hygiene:** Immediately wash thoroughly after using this material. Keep a cloth of your clothing and equipment. Do not transfer it to your hat, hands or your face or neck during, or smoking. Do not eat, drink, or smoke in any work area. Do not inhale xylene vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage Segregation: Store xylene in a well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage.

Special Handling/Storage: Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. Ground and bond all containers, pipelines, etc., used in shipping, transferring, reacting, producing, and sampling operations.

Transportation Data (49 CFR 172.101-3)

DOT Shipping Name: Xylene

DOT Label: Flammable Liquid

IMO Label: Flammable Liquid

DOT ID No.: UN1307

DOT Hazard Class: Flammable Liquid

IMO Class: 3.2 or 3.3

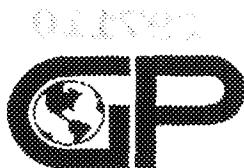
References: 1, 2, 12, 73, 84-94, 100, 103.

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Prepared by PJ Igoc, BS

Industrial Hygiene Review: DJ Wilson, CIH

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Material Safety Data Sheets Collection:

Sheet No. 358
o-Dichlorobenzene

297109

Issued: 11/77

Revision: C, 8/90

Section 1. Material Identification

32

o-Dichlorobenzene (C6H4Cl2) Description: Prepared by...
Other Designations: CAS No. 0095-50-1, DCB, 1,2-dichlorobenzene, orthodichlorobenzene.
Manufacturer: Contact your supplier or distributor. Consult the latest Chemicalweek Buyers' Guide for a suppliers list.

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



HMS
H 2
F 2
R 0
PPG*
* Sec. 8

... irritation of the skin over years of exposure... CNS depression and a liver and kidney poison.

Section 2. Ingredients and Occupational Exposure Limits

o-Dichlorobenzene*

1989 OSHA PEL

15-min STEL (ceiling): 50 ppm, 300 mg/m³

1989-90 ACGIH

TLV-STEL (ceiling): 50 ppm, 301 mg/m³

1985-86 Toxicity Data†

Rat, inhalation, LC50: 821 ppm inhaled over 7 hr produces changes in behavior (general anesthetic), liver (hepatitis: hepatocellular necrosis, zonal) and sense organs, and special senses (tearing)
Rat, oral, LD50: 500 mg/kg; toxic effects not yet reviewed
Rabbit, eye: 100 mg/30-s rinse produces mild irritation

1987 IDLH Level
1700 ppm

1988 NIOSH REL
None established

* This material may contain some impurities. It is at least 85% o-dichlorobenzene, but may contain varying percentages of para- and meta-dichlorobenzene.

† See NIOSH NIOSH 77-5000A for additional available material, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 179.9 °C (353.8 °F)

Melting Point: 1.4 °F (-17 °C)

Vapor Pressure: 1.47 mm Hg at 25 °C

Vapor Density (Air = 1): 5.05

Appearance and Odor: A colorless liquid with a disagreeable, aromatic odor. The high and low odor thresholds are 300 and 12 mg/m³; o-dichlorobenzene is irritating at 50 mg/m³. The odor is perceptible at 2 to 4 ppm.

Specific Gravity 20°C/4°C: 1.3059

Water Solubility: Practically insoluble (137 mg/liter at 25°C)

Evaporation Rate (BuAc = 1): <1

Section 4. Fire and Explosion Data

Flash Point: 101 °F (38.3 °C)

Autoignition Temperature: 500 °F (260 °C)

LEL: 2.29 vol %

UEL: 27.5 vol %

Extinguishing Media: Extinguish fires involving this or reactive material with a jet spray dry chemical, foam or carbon dioxide.

Usual Fire or Explosion Hazards: Under normal working conditions, o-dichlorobenzene should not pose a fire hazard because of its high flash point. However, explosive mixtures may form if this material is heated to a fire situation.

Special Fire-fighting Procedures: Such fire may involve fire flows, 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. Use water to cool fire-exposed containers, to flush spills away from exposures, and to protect workers attempting to stop a leak. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: o-Dichlorobenzene is stable in air at room temperature. It does not polymerize under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: This material can react vigorously with oxidizing materials. If o-dichlorobenzene is stored in sealed aluminum containers, a slow reaction with the aluminum could lead to an explosion.

Conditions to Avoid: Avoid heat and hot surfaces.

Hazardous Products of Decomposition: Thermal oxidative decomposition of o-dichlorobenzene can emit toxic fumes of chlorine (Cl).

Section 6. Health Hazard Data

Carcinogen Data: IARC has classified o-Dichlorobenzene as a possible carcinogen based on evidence of increased tumor and anemia incidence. However, other workers have classified o-Dichlorobenzene as a known carcinogen. Other studies have shown o-Dichlorobenzene has carcinogenic, mutagenic, and reproductive effects in laboratory animals.

Summary of Risks: This material is a skin, eye, and mucous membrane irritant. Noticeable eye irritation at 25 to 30 ppm is reported after a few minutes' exposure; at 60-80 ppm eye irritation results after 15 minutes' exposure. Irritation of the respiratory tract is reported due to good warning properties (odor, eye, and respiratory irritation). Excess exposure may cause central nervous system (CNS) depression.

Medical Conditions Aggravated by Long-Term Exposure: Toxic effects include hematologic (blood) disorders and liver and kidney damage. Leukemia has been reported, but without definite link to o-Dichlorobenzene.

Target Organs: Liver, kidney, hematopoiesis.

Primary Entry Routes: Inhalation, skin absorption.

Acute Effects: Inhalation causes headache and throat irritation. Liquid contact with skin causes irritation. Prolonged or repeated contact may cause blister formation. Ingestion of o-Dichlorobenzene causes burning pain of the stomach, nausea, vomiting, and diarrhea.

Chronic Effects: Symptoms include headache, anorexia, nausea, vomiting, weight loss, jaundice, and cirrhosis.

FIRST AID

Eyes: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min.

Skin: Quickly remove contaminated clothing. Thoroughly wash affected skin with liberal amounts of water, wash it again in hot water.

Inhalation: Remove exposed persons to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have the person drink 2 to 3 glasses of water or milk to dilute. Spontaneous vomiting may occur. Position to prevent aspiration and observe for 24 hours. Do not induce vomiting and do not administer emetics. Contact a physician immediately.

Physician's Note: There is a chemical apparatus failure if vomiting is induced with symptomatic. Serum bicarbonate levels are not indicative of acid-base balance. Values other than acute exposure and may be misleading. The National Pesticide Telecommunication

Network (NTPRS) 24-hr provides 24-hr consultation to health professionals.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, remove all personnel from the spill area, provide adequate ventilation, and evacuate all unnecessary personnel. Clean-up personnel should protect against vapor inhalation and contact with skin. Use of cleanup agents should be by diking, collecting, or if feasible, absorbent materials and transfer to some other container and place in a closed metal drum for disposal or reclamation. Follow applicable OSHA regulations (29 CFR 1910.120).

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 261.33), No. U070

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 100 lb (45.4 kg) [* per Clean Water Act, Sec. 311(b)(4) and Sec. 307(a) per RCRA, Sec. 3001]

HAZARDOUS Extremely hazardous substance (40 CFR 355); Not listed

Listed as a SARA Title 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 safety eye goggles or chemical safety goggles per OSHA eye and face-protection regulations (29 CFR 1910.133).

Respirator: See professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH approved respirator. A chemical cartridge respirator with an organic vapor cartridge and full facepiece can be used with a 50 ft open. For emergency or non-routine operations, a canister respirator with a 50 ft open or a self-contained breathing apparatus (SCBA) is recommended.

Other: Wear gloves or gloves, boots, aprons, and coveralls to prevent skin contact. Neoprene or nitrile gloves are recommended.

Ventilation: Provide general and local exhaust or forced ventilation systems to maintain airborne concentrations below the OSHA PEL and ACGIH TLV (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.⁽⁶⁹⁾

Safety Stations: Make available in the work area emergency eyewash station, safety shower, and washing facilities.

Contaminated Equipment: Never wear contact lenses in the work area. Contact lenses may absorb and concentrate irritants. Remove this material from contact lenses and equipment. Launder contaminated clothing before wearing.

Hygiene: Do not 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: Store in closed containers in a cool, dry, well-ventilated area away from oxidizing agents and heat and ignition sources.

Outside or detached storage is preferred. Protect containers from lightning strikes. Containers should be electrically grounded and bonded to prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transfer.

Engineering Controls: A good vapor monitor and control system should be used in conjunction with personal protective gear. Institute a respiratory protection program if conditions require training, maintenance, inspection, and evaluation. Practice good personal hygiene and housekeeping procedures.

Other Precautions: Provide a preplacement questionnaire with emphasis on detecting a history of skin, liver, or kidney disease. Such individuals may be at an increased risk from exposure. Individual may develop tolerance to high levels of exposure.

Transportation Data (49 CFR 172.101-102)

DOT Shipping Name: Dichlorobenzene, ortho, liquid	IMO Shipping Name: o-Dichlorobenzene
DOT Hazard Class: ORM-A	IMO Hazard Class: 6.1
ID No.: UN1591	IMO Label: 5.1 Andrews Cross
DOT Label: None	IMDG Packaging Group: III
DOT Packaging Requirements: 173.510	ID No.: UN1591
DOT Packaging Exceptions: 173.505	

MSDS Collection References: 38, 73, 84, 85, 88, 89, 100, 101, 103, 109, 124-127, 129, 132, 133-136, 138

Prepared by: M. Alton, B.I. Industrial Hygiene Review; J. Wang, C.H. Medical Review; M. Elwood, N.D. Edited by: J.K. Stuart, J.S.

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Material Safety Data Sheet

From G
Genie
Schenectady

(518) 377-8855



No. 359 **297111**
ETHYLENE DICHLORIDE
 (Formerly 1,2-Dichloroethane)
 (Revision C)
 Issued: November 1978
 Revised: August 1987

SECTION 1. MATERIAL IDENTIFICATION

SYNOPSIS: ETHYLENE DICHLORIDE is a colorless liquid commonly used in industrial processes.

DESCRIPTION: Made in a liquid and used as a depressant, a scavenger of residual moisture in the manufacture of vinyl chloride, or vapor recovery in waste and generation plants. It is used in processes of a fumigant and as a solvent for paints, inks, waxes, and gums.

TRADE DESIGNATIONS: 1,2-Dichloroethane; vinylchloroethane; Fluor Liquor; Orlon Oil; EDC.

MANUFACTURER: Ethylene Chloride, 128 Street, Union City, N.J.; Lachemite, 1000 Cl...

MANUFACTURER'S REFERENCE: CAS # 107-06-2

MANUFACTURER'S REFERENCE: Any and every other manufacturer.

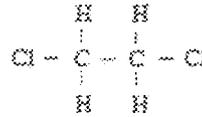
MANUFACTURER'S REFERENCE: 2100 New Center, Schenectady, NY 12305, Telephone: (518) 377-8855



Health
 Environment
 Reactivity
 PPE*
 * See Sect 9

SECTION 2. INGREDIENTS AND HAZARDS

Ingredient: Ethylene Chloride, CAS # 107-06-2, 100% Pure



Concentration (above the ceiling level value) or 5 minutes in any 3-hour period, causing toxic effects and tumorigenic. is listed (with references) in the NIOSH 865-66.

HAZARD DATA	
LD50 Values (Rat)	1.57 g/kg
TLV-TWA	10 ppm, 40 mg/m ³
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. (LD50)	1.57 g/kg
Hum. (LD50)	1.57 g/kg
Man. (LD50)	1.57 g/kg
Rat. (LD50)	1.57 g/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 83.5°F (28.6°C)
Vapor Pressure: 87 Torr at 77°F (25°C)
Water Solubility: Soluble in about 120 Parts Water
Vapor Density (Air = 1): 3.4
Appearance and odor: Colorless, clear liquid. Sweet chloroform-like odor is typical of chlorinated hydrocarbons. The recognition threshold (100% of test panel) is reported to be about 40 ppm. Odor detection probably indicates an excessive exposure to vapor. High volatility and flammability, combined 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

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
			% by Volume	% by Volume
See Below	255°F (124°C)	See Below	5.7	15

EXHAUSTIBLE MEDIA: Use chemical, carbon, or active material for removal of this material from air or dry state to light duty, including dry ice, water spray may be ineffective or cause secondary hazards. May be successfully used to coat fire-resistant materials. Use a minimum of 200 g of dry ice per liter of liquid. **LABORATORY FIRE/EXPLOSION:**

HAZARDOUS: 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 may travel along surfaces to distant, low-lying sources of ignition and then back. It is a severe irritant to the eyes and skin. Ethylene dichloride burns with a smoky flame.

SEVERAL HAZARDOUS REACTIONS: When a red, white, or blue flame appears with a red furnace, observed in a laboratory setting, the reaction is exothermic and produces acrolein.

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. Avoid the accumulation of vapors in confined spaces. If concentrate there. vinyl chloride, chloride fumes, and phosgene. Phosgene is an (i.e., fire conditions) must be treated with appropriate caution.

Material Safety Data Sheet

From Genium's Reference Collection



No. 382

297113

VINYL CHLORIDE
(Revision A)

First Edition: 1978

Revised Edition: 1988

SECTION 1. MATERIAL IDENTIFICATION

26

Material Name: VINYL CHLORIDE

Description (Origin/Uses): Widely used to make PVC resins and plastics; also used in organic synthesis.

Other Designations: VCM; Vinyl Chloride Monomer; Chloroethylene; Chloroethene; C_2H_3Cl ; CAS No. 0075-01-4

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



NFPA

HMIS
H 2 R 1
P 4 I 4
R 1 S 3
PPG* K 4
*See sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

Vinyl Chloride, CAS No. 0075-01-4

%

EXPOSURE LIMITS

OSHA PEL
8-hr TWA: 1 ppm*

ACGIH TLV, 1987-88
TLV-TWA: 5 ppm, 10 mg/m³

Toxicity Data**
Rat. Oral LD₅₀: 500 mg/kg

*The amount of vinyl chloride (SHA 29 CFR 1910.1000) is 1 ppm. Employees above this level are to be regulated by extensive medical monitoring, reporting, surveillance, and other requirements. Consult 29 CFR 1910.1000 for details.

**See NIOSH, *NIHCS*, No. K1-9625 (90) for additional data with regard to carcinogenic, reproductive, and teratogenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 61°F (16°C)

Water Solubility (%): Insoluble

Molecular Weight: 62.5 Grams/Mole

Vapor Density (Air = 1): 2.2

Appearance and Odor: A colorless gas; mild, sweet odor at high concentrations.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

-108.4°F (-78°C)

Autoignition Temperature

882°F (472°C)

Flammability Limits in Air

3% by Volume

16%

33%

Extinguishing Media: Vinyl chloride gas is a severe fire and explosion hazard. Avoid any use involving it as an emergency. Try to shut off the flow of gas. Use a water spray to protect the personnel attempting this and to cool fire-exposed cylinders/containers of vinyl chloride.

Unusual Fire or Explosion Hazards: This heavier-than-air gas can flow along surfaces, reach distant sources of ignition, and flash back. Eliminate sources of ignition in the workplace, particularly in low-lying areas such as sumps, cellars, basement utility rooms, and underground piping systems.

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

SECTION 5. REACTIVITY DATA

Vinyl chloride is stable at normal, ambient, pressurized conditions at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization if it is stored in suitable, well-ventilated containers and the concentration/activity of the added inhibitor is maintained at 10%.

Chemical Incompatibilities: This material is incompatible with copper, aluminum, and other polymerization catalysts or free radical initiators like hydroquinone.

Conditions to Avoid: Do not allow sources of ignition such as open flame, unprotected heaters, lighted tobacco products, electric sparks, or excessive heat in work areas. Avoid prolonged exposure to air, especially in the presence of moisture, because dangerous levels of polymerization can occur. The polymerization of vinyl chloride is exothermic and the heat of polymerization can cause violent ruptures of containers of this gas can occur.

Hazardous Products of Decomposition: During fires, vinyl chloride may decompose into toxic gases such as hydrogen chloride, carbon monoxide, and hydrogen.

SECTION 6. HEALTH HAZARD INFORMATION

Vinyl chloride is listed as a carcinogen by the ACGIH, NTP, and IARC with sufficient epidemiological evidence from human studies. **Summary of Risks:** Vinyl chloride depresses the central nervous system (CNS), causing effects that resemble mild alcohol intoxication; however, these effects can progress to narcosis, eventual collapse, and even death as the intensity and/or duration of the exposure continues. Thrombocytopenia (decrease in blood platelets) has been reported following exposures. **Medical Conditions Aggravated by Long Term Exposure:** Possible Infections **Target Organs:** Respiratory system, skin, eyes, kidneys, reproductive system, and musculoskeletal system. **Primary Entry:** Inhalation. **Acute Effects:** Headache, dizziness, lightheadedness, skin and eye irritation. **Chronic Effects:** Cancer, especially angiosarcoma of the liver. **FIRST AID:** **Eyes:** Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. **Skin:** Skin contact with liquid vinyl chloride causes frostbite (cryogenic injury). Treat this accordingly. **Inhalation:** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. **Ingestion:** Unlikely. **GET MEDICAL HELP IN PLANT, PARAMEDIC COMMUNITY, OR ALL EXPOSURES:** Seek prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Treat any vinyl chloride gas leak as an emergency. Preplan emergency response and make sure all personnel know about them. Notify safety personnel, evacuate all nonessential personnel, provide maximum explosion-proof ventilation, and eliminate all sources of ignition immediately. Make sure cleanup personnel have protection against contact with this material and inhalation of its vapor (see MSDS). **Waste Disposal:** Contact your supplier or a chemical waste disposal contractor for detailed recommendations for disposal. Follow Federal, state, and local regulations. **OSHA Designations:** Air Contaminant (29 CFR 1910.101, Part Z) Vinyl chloride is specifically regulated by OSHA at 29 CFR 1910.1017 as a suspected carcinogenic agent. **EPA Designations:** 40 CFR 301.41 **EPA Hazardous Waste No. U034** **CERCLA:** Quantity: 1 lb (0.454 kg), per Clean Water Act (CWA), section 307 (a); Clean Air Act (CAA), section 112 (b) **Recovery Act (RCRA), section 3001.**

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Follow OSHA eye and face protection regulations (29 CFR 1910.133). **Respirator:** Consult the *NIOSH Respirator Guide: Chemical Hazards* for general recommendations on respirators. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or maintenance use (leaks or cleaning reaction vessels and storage tanks), wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air purifying respirators will not protect workers in oxygen deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, head covers, and clean coveralls. Wear covering clothing to prevent any exposure of skin contact with vinyl chloride. All clothing must be flame resistant. **Ventilation:** Install and operate general and local ventilation systems powerful enough to maintain airborne levels of vinyl chloride below the OSHA PEL standard cited in section 2. All ventilation systems must be of maximum explosion-proof design, e.g., nonsparking, electrically grounded and bonded. **Safety Stations:** Make eyewash stations, safety showers, and washing facilities available in areas of use and handling. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. Do not wear contact lenses in any work area. **Other:** Design all engineering systems to be explosion-proof in areas where vinyl chloride gas may occur. Pressure check all pipes and equipment used with this gas and make sure that all connections are leak tight. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do not eat, drink, or smoke in any work area.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store vinyl chloride in a cool, dry, well-ventilated area away from sources of ignition and incompatible chemicals. Outside or detached storage is recommended. Shade containers from radiant heat and direct sunlight. **Special Handling/Storage:** Vinyl chloride is shipped/stored as a pressurized gas in cylinders or tank cars. Protect these containers against physical damage and regularly inspect them for cracks, leaks, or faulty valves. Secure and bond all containers used in shipping/transferring operations. Store cylinders upright, secure them tightly, do not drag or slide them, move them in a carefully supervised manner with a suitable hand truck. Monitor the activity and concentration of the added inhibitor in the vinyl chloride product. Follow your supplier's recommendations concerning proper shelf life, rotation of inventory, and maintenance of purity. **Engineering Controls:** Make all engineering systems (ventilation, production, etc.) of maximum explosion-proof design. **Comments:** Perform all operations with vinyl chloride carefully to prevent accidental ignition. Do not smoke in any use or storage area. Maintain the valve protection cap in place until immediately before using vinyl chloride. Insert a check valve or trap into the transfer line to prevent a dangerous backflow into the original container. Use pressure-reducing regulators when connecting cylinders to lower pressure piping systems. Obtain details, handling, shipping, and storage information from your supplier. A trained chemist or safety specialist familiar with the physical and chemical properties of this material should be present during all work operations.

Transportation Data (49 CFR 172.101-3)

DOT Shipping Name: Vinyl Chloride

DOT Label: Flammable Gas

IMO Label: Flammable Gas

DOT ID No. UN1086

DOT Hazard Class: Flammable Gas

IMO Class: 2.1

References: 1, 2, 12, 73, 84, 94

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Industrial Hygiene Review: DJ Wilson, CIH

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Material Safety Data Sheet

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No. 425
METHYL n-BUTYL KETONE
(Revision A)

Issued: October 1979
Revised: March 1986

SECTION 1. MATERIAL IDENTIFICATION		20	
MATERIAL NAME: METHYL n-BUTYL KETONE			
OTHER DESIGNATIONS: MBK; 2-Hexanone; n-Butyl Methyl Ketone; CH ₃ CO(CH ₂) ₃ CH ₃ ; CAS #0591-78-6			
<p>Obtainable from several sources, including: Inc., PO Box 2300, Smithtown, NY 11787; Telephone: (516) 273-0900</p>		<p>HMSI H: 1 F: 3 R 1 R: 1 I 4 PPE* S 3 *See sect. 8 K 3</p>	
SECTION 2. INGREDIENTS AND HAZARDS		HAZARD DATA	
Methyl n-Butyl Ketone		8-hr TWA 5 ppm or 20 mg/m ³ *	
* ACGIH (1985-86) TLV. OSHA PEL is 100 ppm or 410 mg/m ³ .		Rat, Oral, LD ₅₀ : 2590 mg/kg	
Significant contribution to overall exposure by skin absorption: G.D. DiVincenzo et al., <i>Tox. Appl. Pharm.</i> 36 (1976):511.		Rat, Inhalation, LC ₅₀ : 8000 ppm/4 hrs.	
SECTION 3. PHYSICAL DATA			
Boiling Point, 1 atm ... 262.4°F (128°C)		Specific Gravity, 20/4°C ... 0.810	
Vapor Pressure @ 38.8°C, mm Hg ... 10		Volatiles, % ... ca 100	
Vapor Density (Air = 1) ... 3.45		Melting Point ... -134.6°F (-57°C)	
Water Solubility @ 25°C, g/100 g H ₂ O ... 3.5		Evaporation Rate (nBuAc = 1) ... 0.87	
Molecular Weight ... 100.16			
Appearance and odor: Clear, colorless liquid. Characteristic acetone-like odor.			
SECTION 4. FIRE AND EXPLOSION DATA		LOWER	UPPER
Flash Point and Method	Autoignition Temp	Flammable Limits in Air	
100°F (38°C)	500°F (260°C)	None	
<p>EXHAUSTIVE INFORMATION: 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>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>			
SECTION 5. REACTIVITY DATA			
Methyl n-butyl ketone is a weak oxidizer and is not a strong oxidizing agent under normal conditions. It does not undergo hazardous polymerization.			
MBK is incompatible with oxidizing agents.			
It is an OSHA class IC flammable liquid.			
Thermal-oxidative degradation in air can produce toxic vapors and gases, including carbon monoxide (CO).			

SECTION 6. HEALTH HAZARD INFORMATION

Methyl n-butyl ketone is not listed as a carcinogen by the NTP, IARC, or OSHA. MBK can cause nerve damage when exposure is made through or absorbed through the skin, resulting in a progressive loss of sensitivity from the peripheral nervous system. It is known that MBK is metabolized to 2,5 hexanedione, which appears to act as a neurotoxic agent causing nerve fiber (axon) damage (*Neurology* 26 [1976]:919). The condition appears to be reversible after cessation of exposure. Flammable vapors can irritate the respiratory tract and cause impaired judgment and then narcosis by the central nervous system at low concentration. Liquid contact irritates the eyes and defats the skin. Irritation can be minimized by prompt or repeated contact with liquid. MBK readily penetrates the skin and causes systemic effects. MBK is toxic when ingested.

FIRST AID: Get medical help when ever exposed to MBK. **EYE CONTACT:** Flush with plenty of running water for 15 minutes. Get medical help if irritation persists. **SKIN CONTACT:** Immediately wash affected area with soap and water. Remove contaminated clothing. Get medical help if irritation persists or if severe skin irritation is observed.

INHALATION: Remove victim to fresh air. Restore or support his breathing if he cannot breathe. Get medical help.

INGESTION: Get medical help.*

* GET MEDICAL ASSISTANCE = In plant, paramedic, community. Seek medical assistance for further treatment, transportation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel of spills. Provide optimum explosion-proof ventilation. Remove sources of ignition. Provide cleanup personnel with protection against contact with liquid and inhalation of vapors. Absorb small spills on paper and evaporate in exhaust hood.

Contain large spills and absorb on vermiculite or sand. Pick up with nonsparking scoop and place in a closed metal container for disposal.

Spills can be flushed with water to remove them from hazardous area; flush them in open area or to ground for evaporation. Prevent their discharge into sewers, drains, and waterways.

DISPOSAL: Burn waste material in an approved incinerator. Follow Federal, state, and local regulations.

SECTION 8. SPECIAL PROTECTION INFORMATION

FLAMMABLE VAPORS AND LIQUID SPILLS REQUIRE A HIGH LEVEL OF PROTECTION. A minimum protection is required for emergency clean up and removal. Above the TLV, a full-face respirator with organic vapor cartridge (or self-contained breathing apparatus) can be used from 50 to 250 ppm; for higher or unknown concentrations, an air-supplied respirator (positive pressure) should be used. Gloves of material resistant to MBK and additional protective clothing (apron, boots, coveralls, etc.) that are appropriate to working conditions must be used to prevent skin contact with liquid. Chemical safety goggles and/or full face shield must be used for eye protection where splashing may occur.

Eyewash stations, safety showers, and washing facilities must be readily available in areas of use and handling.

Clothing contaminated with MBK must be removed promptly and the liquid washed off the skin.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Store in a clean, cool, well-ventilated area away from heat, ignition, and oxidizing agents. Containers should be electrically interconnected and grounded for liquid transfers to prevent static sparks. Storage and use areas should be NO SMOKING areas. Use nonsparking tools. Small amounts should be handled in approved safety cans with proper labeling. Electrical services must meet code requirements.

Avoid skin and eye contact. Avoid breathing vapors. Do not ingest! Wash thoroughly after handling. Storage must be suitable for an OSHA class IC flammable liquid.

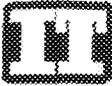
Provide preplacement and periodic medical examinations for workers exposed to MBK with special attention given to the central and peripheral nervous system, the respiratory system, skin, and eyes. Monitor nerve conduction velocity if neuropathy is suspected.

DOT Classification: FLAMMABLE LIQUID.
Data Source(s) Code: 1, 2-4, 6, 7, 10-12, 19, 23, 26, 47, 52, 84, CK

Approvals	JO Acrono, 11/86.
Indust. Hygiene/Safety	[Signature] 9-86
Medical Review	[Signature] 9-86

Appendix D

Reservice and Operational Checklist



ATTACHMENT 2

297118

RESERVICE & OPERATIONAL CHECKLIST FOR
PRESSURE WATER JET CLEANING AND CUTTING EQUIPMENT

The following information is to be filled in before the start of the job.

ITEM #	DESCRIPTION	
2.	Location: (Print)	
3.	Equipment being cleaned: (Print)	
5.	Have precautions been taken to protect all electrical equipment?	
10.	Are all fittings in good operating condition?	
11.	Are all nozzles free from plugging and in good operating condition?	
12.	Have precautions been taken to prevent line-mole reversal?	
13.	Is the filter on the pump suction clean and in good operating condition?	
14.	Is there an adequate water supply?	
15.	Have precautions been taken against freezing?	
16.	Do all personnel have proper personal protective equipment for this job?	
19.	Has the complete hook-up been flushed and air removed from the system prior to installing the nozzle?	
	operating pressure?	
21.	Is the dump system operating properly (will it dump when released)?	
22.	Are all control systems operational?	

Appendix E

E1 - Site and Hospital Location Maps

E2 - Numbers to Know

Appendix E1

Site and Hospital Location Maps

Appendix E2
Numbers to Know

NUMBERS TO KNOW

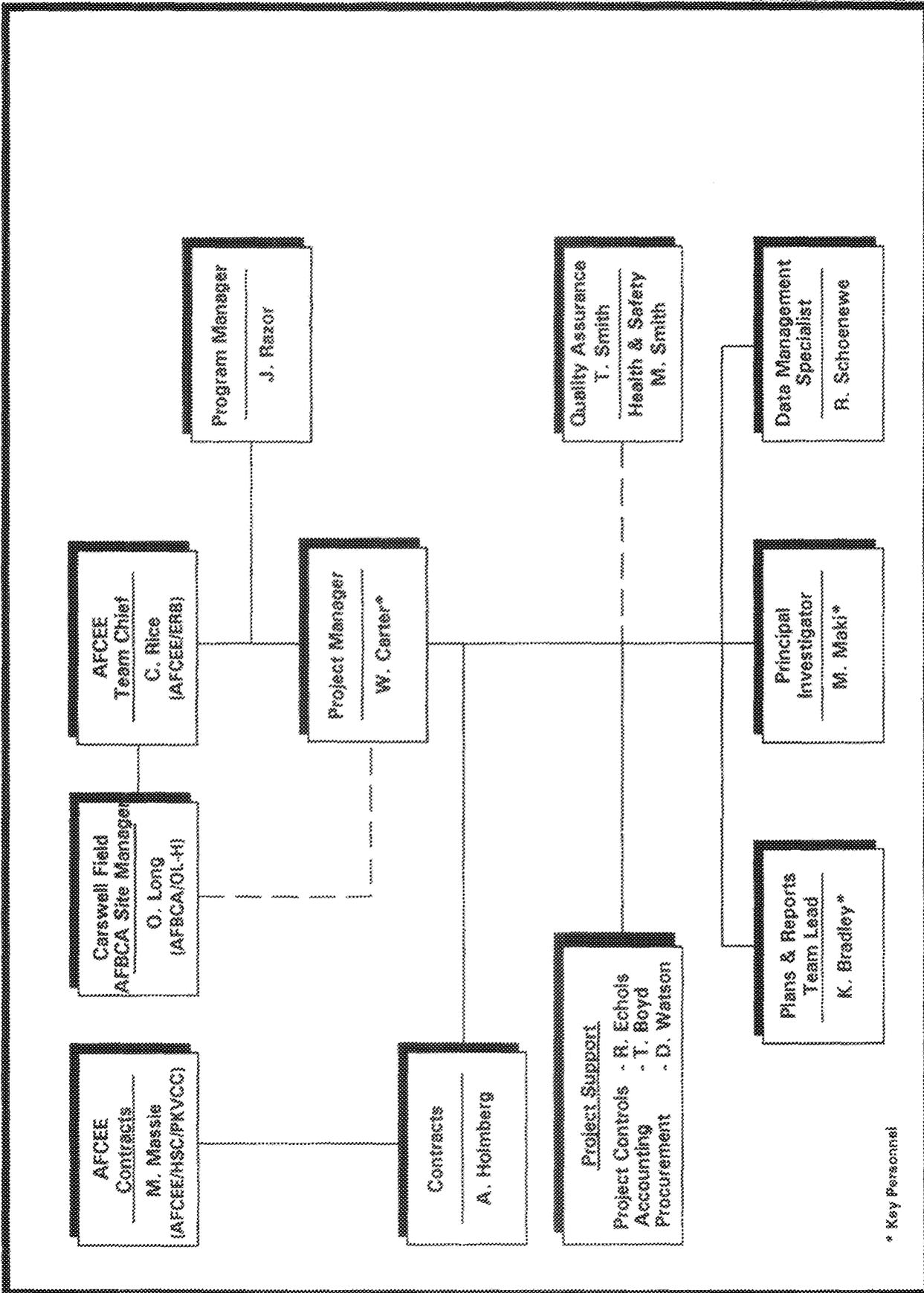
EMERGENCY NUMBERS

Fire Department - River Oaks	626-3786
Police Department - River Oaks	626-1991
NAS Forth Worth Information	817/782-5000
Hospital - Osteopathic Hospital	817/731-4311
Fire Dept. - NAS Forth Worth	782-6336
Police - NAS Fort Worth	782-5200
Sheriff	844-1212
U.S. EPA (24-hour hotline)	800/424-8802
Chemtrec	800/424-9300
National Poison Control Center	404/588-4400
IT Knoxville	423/690-3211
Olen Long - AFBCA Base Office	731-8284
Alan Flolo - AFBCA Base Office	731-8973

UTILITY NUMBERS

Electric Co.	817/336-9454
Water Co.	871-8300/871-8294
Gas Co. Lone Star	800/725-1252

Appendix E3
Key Personnel



* Key Personnel

Figure E-3. Project Organization
NAS Fort Worth
765725

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE

297127

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE