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REVISED DRAFT
Work Plan for Systems Cleaning
For North and South Groundwater Treatment Plants
Operable Unit 1, Site 78
MCB Camp Lejeune, North Carolina

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-93-D-3032
Delivery Order 0118

Prepared by

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OHM Project No. 18859

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1.0 INTRODUCTION

This Work Plan (WP) reviews OHM Remediation Services Corp.'s (OHM) approach to implementation of the scope of work under Delivery Order No. 0118 of Navy Atlantic Division (LANTDIV) Contract N62470-93-D-3032. A site specific health and safety plan (OHM Site Safety Plan) has been developed for this delivery order and is to be considered as a complementary component to this work plan.

This WP identifies and describes how OHM will implement the major tasks encompassing the engineering review of remedial system cleaning and repair for both the North and South groundwater treatment systems located at Site 78 in the Hadnot Point Industrial area at MCB Camp Lejeune in conformance with the contract requirements. A Site Specific Health and Safety Plan has also been prepared and included to this work plan as Appendix A to this work plan which includes the following sections:

- Section 2.0 Objectives
- Section 3.0 Mobilization and Site Setup
- Section 4.0 Scope of Work
- Section 5.0 Demobilization/Quarterly Report

1.1 SITE BACKGROUND

MCB Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), National Priorities List (NPL) effective October 4, 1989 (54 Federal Register 41015, October 4, 1989). Subsequent to this listing, the United States Environmental Protection Agency (USEPA) Region IV, the North Carolina Department of Environment, Health and Natural Resources (NCDEHNR) and the United States Department of the Navy (DoN) entered into a Federal Facilities Agreement (FFA) for MCB Camp Lejeune. The primary purpose of the FFA was to ensure that environmental impacts associated with past and present activities at MCB Camp Lejeune were thoroughly investigated and appropriate CERCLA response/Resources Conservation and Recovery Act (RCRA) corrective action alternatives were developed and implemented as necessary to protect the public health and the environment.

1.2 SITE DESCRIPTION

The information presented in this section was obtained from the scope of work contained in the request for proposal from LANTDIV.

Camp Lejeune is a training base for the U.S. Marine Corps, located in Onslow County, North Carolina. The base covers approximately 170 square miles and includes 14 miles of coast line. MCB Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina is located north of the Base (Figure 1).

Site 78 encompasses the industrial area of MCB, Camp Lejeune and is bordered by Holcomb Boulevard, Sneads Ferry Road, Duncan Street, and Main Service Road. This area is comprised of maintenance shops, warehouses, painting shops, printing shops, automobile body shops, and other similar industrial facilities. Site 78 covers approximately 590 acres. With the exception of buildings, the majority of the site area is paved (e.g., roadways, parking lots, loading dock areas, and storage lots); however, there are many small lawn areas associated with individual buildings within the site and along lengthy stretches of roadways. In addition, there are several acres of woods in the southern portion of the site. Recreational ball fields and a parade ground are located in the southwest corner of the site. Figure 1 identifies Site 78.

1.3 SITE HISTORY

Site 78, constructed in the late 1930s, was the first developed area at MCB Camp Lejeune. It was comprised of approximately 75 buildings and facilities including maintenance shops, gas stations, administration offices, commissaries, snack bars, warehouses, and storage yards. There is presently no known uncontrolled disposal of wastes related to the various industrial activities at the site. Due to the industrial nature of the site, many spills and leaks have occurred over the years. Most of these spills and leaks have consisted of petroleum-related products and solvents from underground storage tanks (USTs), drums and uncontained waste storage areas.

The plants were designed by Baker Environmental and built by O'Brien & Gere in 1995. OHM assumed operation and maintenance (O&M) of the plants in June 1996. Prior to OHM's assumption of operation and maintenance, PDG Environmental Services, Inc. was contracted for O&M of the plants for the period of July 5, 1995, through June 28, 1996. Prior to PDG's assumption of O&M, the plants were subject to a 6-month shakedown performed by the constructor O'Brien & Gere, from June 1, 1995 to July 4, 1995.

Both plants have a history of prior operational problems which have been summarized into the following list:

- Heavy calcification discovered downstream of air stripper – both plants

- Polymer feed system shut down at both plans due to fouling of downstream treatment components

- Carbon units taken off-line due to high influent pressure – North Plant

- Inserts installed in wells to reduce sand infiltration

- Sequestering system installed to inhibit calcium backup in system post air stripping – Both Plants

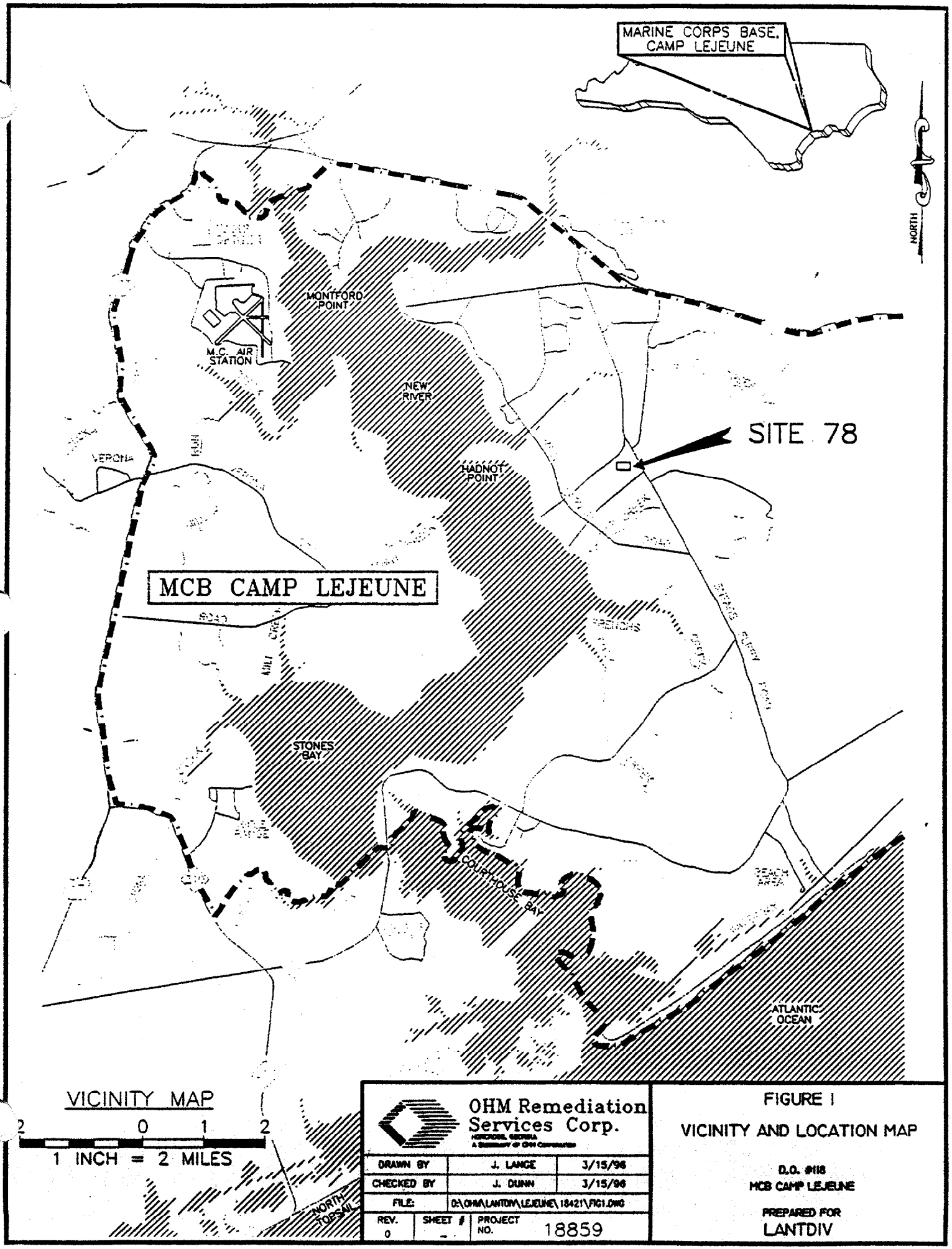
- Flow meters malfunctioned – Both Plants

- Well seam failed on air stripper sump tank – South Plant

- Air dryer failed – South Plant

- Impellers shaved in primary, secondary and backwash pumps to improve efficiency – Both Plants

- Additional control valves were installed on the primary, secondary and backwash systems – Both Plants



VICINITY MAP

2 0 1 2

1 INCH = 2 MILES

OHM Remediation Services Corp.

DRAWN BY	J. LANGE	3/15/96
CHECKED BY	J. DUNN	3/15/96
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FIGURE 1

VICINITY AND LOCATION MAP

D.O. #118

MCB CAMP LEJEUNE

PREPARED FOR

LANTDIV

2.0 OBJECTIVES

The objectives for Site 78, North and South plants, are to perform routine operation and maintenance (O&M) of the plants, to perform major cleaning of the plants, and to recommend modifications or changes to the systems to enhance their performance.

As part of the routine O&M, the plants will be sampled monthly to verify plant performance. The remedial goals of the plants are listed below.

Parameter	Remedial Goals
VOCs	
Benzene	<1.0 µg/L
1,2-DCE	<1.0 µg/L
TCE	<1.0 µg/L
Vinyl chloride	<1.0 µg/L
Metals	
Sb	<1.0 µg/L
As	10 µg/L
Be	<1.0 µg/L
Cr	10 µg/L
Fe	10,000 µg/L
Pb	<15 µg/L
Mn	<5.0 µg/L
Hg	<0.2 µg/L
Ni	<20 µg/L

A quarterly report will be co-authored by OHM and Baker and includes a review of the preliminary report prepared by Baker, preparation of the operational portion of the report and a review of the final document after all comments have been addressed. Samples of the daily, weekly, monthly, quarterly and annual/semi-annual forms are located at the end of Section 4.0. These forms will be modified to fit actual operating conditions after the engineering review and/or modifications to the plants are completed.

3.0 SITE PREPARATION AND MOBILIZATION

Concurrent with mobilization, OHM will arrange a pre-construction meeting at MCB Camp Lejeune with LANTDIV and base personnel. The purpose of this meeting will be to:

- Confirm roles and responsibilities of key personnel and flow of communication for project execution
- Review the project schedule, sequence of tasks and key milestones
- Identify and discuss Base-specific issues relative to the upcoming mobilization and cleaning activities
- Obtain the necessary security clearances for operations personnel
- Obtain photographs of the sites for documentation of existing site conditions

OHM will mobilize personnel and equipment from its existing labor force at MCB Camp Lejeune to perform this project. Prior to beginning work on site, a training meeting will be conducted to brief all site personnel on the Site-Specific Health and Safety Plan, construction drawings, and other relevant site-specific plans. Site hazards and conditions will be discussed and all personnel will acknowledge their understanding and compliance with the plan by signing an approved acceptance form.

Project mobilization and site setup will consist of the following main activities:

- **Temporary Facilities Installation** - OHM will utilize its office trailer already located at Lot 203 as an administrative area and command center. This area will serve as the control check point for contractor/subcontractor personnel entering the site.
- **Site Security** - All persons entering the site will be required to sign in and out daily. OHM reserves the right to deny access to any individual not showing proper identification.
- **Health and Safety Zones** - The site will be segregated into work areas on the basis of degree of hazard and PPE requirements. OHM health and safety personnel will provide site air monitoring and will adjust work zone boundaries as appropriate.

4.0 SCOPE OF WORK

During the site visit conducted on June 7, 1996, with LANTDIV and Base personnel from MCB Camp Lejeune, the scope of work was refined to include the work activities which are detailed below. Further delineation of the system review and repair activities was provided in the Statement of Work prepared by LANTDIV dated June 20, 1996, which accompanies the Request for Proposal.

4.1 ROUTINE O&M

OHM will continue to perform routine maintenance of the North and South plants in accordance with the existing O&M manual provided by LANTDIV including sampling and analysis of plant performance and transportation and disposal of nonhazardous waste generated from plant activities. Routine operating instructions are summarized as follows:

Well Pump Recovery System
There are two groundwater recovery well/pump system at the North Plant and four systems at the South plant. Each pump system is an Ejector Systems, Inc. S2 with a model TF air operated pump and a model STD controller. Information on the start-up and maintenance of these systems can be found in Volume II of the O&M Manual. Air is supplied to these pumps by an Ingersoll-Rand type T30 two stage industrial air compressor. Start-up and maintenance instruction for the compressor can be found in Volume III of the O&M Manual.

Influent Flow Meter
The plant influent flow meter is a magnetic flow device which monitors and records plant inflow. The meter is a model FM655 Tigermag by Sparling Instruments Co., Inc. Information on the maintenance of this device can be found in Volume II of the O&M Manual.

Polymer Mixing and Feed System
(This system is not in use and has been replaced by the sequestering system.) The furnished system is a POLYMAX Model #4001-40/1.0 liquid (neat) polymer blending unit. Information on the operation and maintenance of the unit can be found in Volume II of the O&M manual. To mix polymer into the flocculation tank:

- Start the unit up as described in Volume II of the O&M Manual
- Open valve No. 25

To cease polymer mixing:

- Allow system to flush with potable water before shutdown
- Shut the unit down as described in Volume II of the O&M Manual
- Close Valve No. 25

Sequestering System
The system consists of a chemical feed pump, Model 1601 manufacturer by D. K. which feeds sequestering agent (Calsperse) from a drum to the main treatment stream at the bottom of the inlet pipe to the air stripper. Speed and stroke of the pump are variable and set based upon system influent flow rates. Maximum pump delivery is 0.22 gallons per hour. For both plants, the speed of frequency is set at 25 percent and the stroke at 50 percent.

Oil/Water Separator
The furnished system is a Remedial Systems Inc. Oil/Water Separator. Water flows into the system under pressure from the groundwater recovery pumps. System start up and maintenance is discussed in Volume III of the O&M Manual.

During normal operation, the oil recovery chamber will transfer collected LNAPL from the tank to the oil storage tank by gravity. Water will also flow by gravity to the flocculation tank.

Occasionally, it will necessary to clean the coalescing plates in the unit. To clean the unit:

- Shut off all flow to the system and allow water to drain from the tank
- Close valves No. 1 and No. 3
- Clean the unit as described in Volume III of the O&M Manual
- Start up the system using only potable water as described in Volume III of the O&M Manual
- Open valves No. 1 and No. 3
- Resume pumping of influent groundwater

Flocculation Tank and Mixer
The flocculation tank is a 1,200-gallon nominal capacity FRP tank. The flocculation mixer is a model BGM 33/50 by Braun Mixer, Inc. The mixer motor is a variable speed mixer

motor, Model V-1000 by AC Tech Incorporated. The mixer speed can be controlled through the mixer control panel located adjacent to the flocculation tank. Information on the start up and maintenance of this equipment can be found in Volume II of the O&M Manual.

Solids collecting in the flocculation tank must be pumped to the solids holding tank by manually activating the sludge transfer pump. To transfer solids from the tank:

- Open valve No. 4
- Manually activate the sludge transfer pump
- Turn off the pump when finished transferring solids
- Close valve No. 4

In addition, a pH probe is located inside this tank to monitor a record pH of plant influent. This probe requires removal and recalibration once per month.

Surge Settling Tank and Primary Feed Pumps

The surge settling tank is a 2,900-gallon (nominal) FRP tank. Water flows via gravity from the flocculation tank to the settling tank. The two primary feed pumps, Model 324A-BF by Aurora Pump Company, pump the water from the surge settling tank through the multi media filters. These pumps are each capable of 40 gpm at 10 ft. of TDH and are activated on a preset level sensor in the surge settling tank. The pump can be activated manually as well. Information on start up and maintenance of these pumps can be found in Volume III of the O&M Manual.

To drain settled solids from the tank:

- Open valve No. 5
- Manually activate the sludge transfer pump
- Turn off the pump when finished transferring solids
- Close valve No. 5

Multi-Media Filter System

The multi-media filters are Model no. ML-30HF-2 twin filters manufactured by Bruner Corporation. Information on the start up and maintenance of these filters can be found in Volume III of the O&M Manual. During normal operation, one filter is in operation while the other is either off-line or in backwash mode. Water is pumped through the filter from the primary feed pumps. The filter system is equipped with a timer to automatically backwash the filters (see Volume III of the O&M Manual for instructions on how to set the timer). The initial setting for backwash is once per twenty-four hours, this setting is adjustable. System backwash can also be performed by manually activating the sand filter backwash pump and adjusting the valves.

The multi-media filter backwash pump is a model 344A by Aurora Pump Co. This pump is capable of pumping 75 gpm of flow at 50 ft. TDH. The backwash cycle lasts approximately ten minutes. Treated effluent from the GAC units is stored in a 2500 gallon backwash tank. This tank serves to store treated water for use as backwash water or for eventual discharge to the sanitary sewers. Backwash water from the multi-media filters is directed to the sludge holding tank. To backwash the filters manually:

- Check the level of the backwash tank and make sure that sufficient water exists for backwash
- Push the red button marked manual backwash momentary switch on the altwinator
- Monitor the system

Low Profile Air Stripping System
The low profile air stripping system consists of the air blower, two secondary feed pumps, and the air stripping unit.

During normal operations, the secondary feed pumps (each capable of 40 gpm), manufactured by Carver Pump Company, will pump flocculated, filtered water through the air stripper and the GAC units.

The air stripping unit is a tray air stripper by Remedial Systems Inc. The system is designed to remove volatile organic compound (VOCs) from water at a rate of 80 gpm. The stripper blower is model no. PB-15 by Cincinnati Fan & Blower Corp. The blower is designed to run continuously regardless of whether there is water flow to the stripper unless an alarm deactivates the blower. Information on the start up and maintenance of the low profile air stripping system can be found in Volume III of the O&M Manual.

Cartridge Filters
Water effluent from the low profile air stripper is pumped via the secondary feed pumps through dual cartridge bag filters prior to entering the GAC units. These bag filters are used as a final polishing to remove suspended solids prior to carbon adsorption. The filters are high capacity bag filters as manufactured by HARMSCO Industrial Filters Corp. Information on these cartridge filters can be found in Volume IV of the O&M Manual. The filter bags can be replaced as follows:

- Close valve No. 14 to isolate filter No. 1 or close valve No. 15 for filter No. 2
- Remove used filter bag and install a clean bag
- Open valve No. 14 or No. 15
- Dispose of used filter bag in an appropriate manner

Granular Activated Carbon Units

The cartridge filter effluent is directed to two granular activated carbon (GAC) units model No. ZCC-H by Monarch Water Systems Inc. These units can operate in series, with one unit as a standby, or in parallel, but are designed specifically for parallel operations. The carbon units can also be completely bypassed. Each unit is charged with 2,000 lbs. of granular activated carbon.

Information on the specific operation and maintenance of these units can be found in Volume IV of the O&M Manual.

The units are designed to be backwashed when a significant pressure drop is observed (5 to 7 psi) over the unit as measured by reading the pressure gauges located along the piping through the system. Backwash water for the carbon units is taken from the backwash tank and is pumped through the carbon unit backwash pump. The pump is a model 344A-BF by Aurora Pump Corp. and is capable of 100 gpm at 50 ft. TDH. Carbon filter backwash must be performed manually and requires taking the units off-line. The backwash cycle lasts approximately 5-7 minutes. To backwash the carbon units:

- Open valve No. 17, close carbon unit influent valves to temporarily bypass the carbon units
- Open valves Nos. 21, 22, and 23
- Manually activate the carbon backwash pump for 5 to 7 minutes
- Close valves Nos. 21, 22, and 23
- Turn off the backwash pump
- Reset the valves as desired for operation

Backwash water from the carbon units is directed to a plant drain which feeds into building drainage sump and is recycled to the head of the plant.

Effluent Pumps

To direct treated water from the backwash tank to the sanitary sewer, two effluent pumps are provided. Each pump is a model 324A-BF by Aurora Pump Co. and are capable of 40 gpm at 10 ft. TDH. Information on the start up and maintenance of these pumps can be found in Volume III of the O&M Manual. These pumps are activated via level switches in the backwash tank. In this way, the level in the backwash tank is controlled and treated water can be directed to the sanitary sewer as it is processed.

Sludge Holding Tank and Dewatering System
The sludge holding tank is a 2,500-gallon nominal capacity FRP tank which receives solids from the flocculation tank, the surge settling tank the multi-media filter backwash water. This tank has a conical shaped bottom where solids are consolidated. Supernatant from this tank is directed to the building drainage sump. Information on this tank can be found in Volume IV of the O&M Manual.

The consolidated sludge from the sludge holding tank must be manually pumped from the tank to the dewatering filter press. An air operated sludge feed pump has been provided to transfer the solids. This pump is a Model SB2-A Type 3 by Warren Rupp Co. Information on this pump can be found in Volume III of this O&M Manual. The sludge dewatering press is a model E2470 by D.R. Sperry & Co. This is a plate and frame filter press designed to dewater the sludge for solid waste disposal. Information concerning the detailed start up and maintenance of this press can be found in Volume III of the O&M Manual.

To transfer solids from the sludge holding tank and dewater the sludge:

- Open the valves directing sludge to the filter press
- Activate the filter press feed pump
- Start up filter press
- Shut off the press and sludge feed pump after completion of the operation and reset the above valves to their original position

WARNING: Do not operate the sludge transfer pump while multi-media filter backwash is occurring.

Building Drainage Sump System
The building drainage sump collects water from the sludge holding tank overflow, dewatering press supernatant, carbon unit backwash, and backwash tank overflow. This sump is equipped with level sensors and two pumps. The pumps are model SK60M3 by Aurora Pump Company. These pumps are installed to pump water from the sump after it reaches a pre- set level. Water from the sump is directed back to the oil/water separator influent. Information on the maintenance of the sump pumps can be found in Volume III of the O&M Manual.

HVAC
The plant is equipped with a heating, ventilation and air conditioning system to control the climate of the plant building enclosure. The system includes and air handling unit (heating

& cooling), roof vents and wall louvers (control dampers). Information on the maintenance of the HVAC system can be found in Volume III of the O&M manual.

Fire Alarm

The treatment building for each system is equipped with a fire alarm system. The system is supplied by Electro Micro Security Systems if Durham, North Carolina. The system consists of a primary control panel, horn/strobe alarm, radio transmitter, and smoke detectors. The system will detect symptoms of a fire and sound an audible alarm as well as send an alarm signal to the base fire department.

Treatment Building

The treatment building housing the groundwater treatment equipment is a structural steel frame building provided by American Building Company of Eufala, Alabama.

Forms for daily, weekly, monthly, quarterly and annual/semi-annual maintenance checks have been prepared and samples are presented at the end of this section. These forms will be revised/updated following the major cleaning of the plants.

4.1.1 Sampling and Analysis

OHM will continue to perform routine monthly sampling in addition to performance sampling for systems review. These samples will be collected from sample ports from five different locations: the influent, after oil/water separator, after sand filter, after air stripper, and the final effluent. Table 4.1 identifies the sample points with corresponding analysis parameters.

North and South Plants Monthly Sampling
MCB Camp Lejeune

	Method Number	Detection Limits	Influent	O&W Separator	Sand Filter	Air Stripper	Effluent
VOCs							
Benzene	8021	0.50 µg/L	X			X	X
TCE	8021	0.50 µg/L	X			X	X
1,2-DCE	8021	0.50 µg/L	X			X	X
Vinyl Chloride	8021	0.50 µg/L	X			X	X
Metals							
Antimony	6010	0.0030 mg/L	X		X		X
Arsenic	7060	0.0010 mg/L	X		X		X
Beryllium	6010	0.0010 mg/L	X		X		X

North and South Plants Monthly Sampling MCB Camp Lejeune							
	Method Number	Detection Limits	Influent	O&W Separator	Sand Filter	Air Stripper	Effluent
Chromium	6010	0.010 mg/L	X		X		X
Iron	6010	0.030 mg/L	X		X		X
Lead	7421	0.0010 mg/L	X		X		X
Manganese	6010	0.010 mg/L	X		X		X
Mercury	7470	0.00020 mg/L	X		X		X
Nickel	6010	0.040 mg/L	X		X		X
Calcium	6010	0.040 mg/L	X				X
Oil & Grease	9071	1.0 mg/L	X	X			X
TDS	160.1	1.0 mg/L	X		X		X
TSS	160.2	1.0 mg/L	X		X		X
pH	9040		X				X

During the system review period, OHM will also collect samples from various points throughout the system and analyze for parameters determined by the site engineer. These results will be compared with the routine sampling results to aid in systems evaluation.

A disposal sample of filter cake will also be collected and analyzed for both nonhazardous and hazardous waste characteristics when a sufficient amount is collected for disposal purposes.

4.1.2 Transportation and Disposal

OHM will maintain chronological organized files for all shipping paperwork per shipment for waste disposal. Copies of the manifest and database printouts will be provided to the LANTDIV and Camp Lejeune representatives upon request and at the completion of the project in the contractor's final report. Any solids generated are assumed nonhazardous and will be disposed of in the Base landfill and accomplished by the appropriate approval.

4.2 SYSTEM CLEANING

In each plant, all equipment downstream of the clarifier will be disassembled and hydro-blast cleaned to remove any and all calcium buildup. Major items to be cleaned include the air stripper, bag filters, carbon units, miscellaneous piping and pumps. Piping, equipment,

or media that cannot be satisfactorily cleaned will be replaced, if warranted. Water generated during this activity will be collected and processed through the treatment system.

4.3 SYSTEM REVIEW

OHM will perform a system review of both the North and South plants and submit results of the findings to LANTDIV approximately 60 days after the major cleaning event. This task will involve:

- Troubleshooting of the plants for mechanical and chemical efficiency both before and following cleaning shutdown
- Collecting samples to test system efficiency and unit operations performance prior to plant shutdown
- Updating O&M manuals and as-built drawings to reflect changes
- Formation and submission of system review findings with recommendations to LANTDIV
- Implementation of approved recommended revisions to the treatment systems

Attached as Appendix B are the as-built drawings provided by O'Brien & Gere.

4.4 SYSTEM REPAIR

Several pieces of equipment which require immediate repair or replacement are identified below.

- Sump pump – North Plant
- Floc mixer motor – North Plant
- Flow totalizers – Both Plants
- Well pump – North Plant
- Nylon screens for filter press – Both Plants

This repair or replacement will occur during the plant shutdown for cleaning and review.

Additional items which could require replacement due to their use over a 2-year period and due, in part, to the adverse operating conditions (calcium build-up). The parts list includes replacement of one sludge pump, an impeller for the feed pump, one well pump and

controller, one air end for the air compressor, a recharge for the air dryer, the air stripper blower replacement, two trays for the stripper, various valves and fittings.

Daily Maintenance Sheet

Enter Information/Check Off As Applicable

	North	South
Flow Meter		
Total Gallons	GAL	GAL
Inf. Rate (GPM)	GPM	GPM
Ck. for Errors		
Sequestering Agent Pump		
Ck. Proper Operation		
Flocculation Tank		
Ck. Leaks		
Air Compressor		
Ck. Auto Drain		
Ck. Noise/Vibration		

	North	South
Sand Filters		
Ck. Inlet Pressure Left		
Ck. Inlet Pressure Right		
Ck. Outlet Pressure Left		
Ck. Outlet Pressure Right		
Ck. Timers		
Air Stripper		
Ck. Water Temperature		
Ck. Diff. Pressure		
Ck. For Cracks		
Air Stripper Control Panel		
Ck. System for Faults		
Ck. Cycles		
Ck. Hours		
Carbon Contactors		
Ck. Inf. Pressure Left		
Ck. Out Eff. Pressure Left		
Ck. Inf. Pressure Right		
Ck. Out Eff. Pressure Right		

COMMENTS

Date

Signature

Weekly Maintenance Sheet

North/South Plant

	North	South
Pumping System		
Depth/Oper. RW		
RW11		RW5
RW12		RW6
		RW7
		RW8
Ck./Adj. S2		
Ck. Refill/Disch. S2		
RW10	R D.	RW5 R D.
RW11	R D.	RW6 R D.
		RW7 R D.
		RW8 R D.
Ck. Ejector Reg.		
Ck. Auto Drain Flt.		
Ck. Manhole		
Empty Reg. Bowl		
Ph/MW Controller		
Clean Probe		
Ck. Paper		
Ck. Pens		
Ck. Controller		
Flow Meter/Recorder		
Change Chart		
Ck. Pens		
Repair as necessary		
Flocculation Tk.		
Ck. for Leaks		
Oil and Water Sep.		
Ck. Operation		
Pump off Sludge/Sand		
Sludge Holding Tk.		
Ck. for Leaks		
Press Feed Pump		
Ck. Operation		
Lube Air Valve		

	North	South
Product Storage Tank		
Ck. Free Prod.		
Sludge Pump		
Ck. Operation		
Lube Air Valve		
Air Compressor		
Ck. Oil		
Drain Rec.		
Ck. Noise/Vib.		
Ck. Intake Filt.		
Air Dryer		
Ck. Auto Drain		
Cartridge Filter		
Change Filt.		
Monday		
Wednesday		
Friday		
Dewatering Press		
Operate Pump		
Operate Press		
Ck. Hyd. Pressure		
Ck. Sludge Bin		
Empty Air Filt. Bowl		
Ck. Oil		
Monday		
Wednesday		
Friday		
Comments		

Signature

Date

Monthly Maintenance Sheet

	North	South
Pumping System		
Ck. Level Sensing Lines		
Sample Plant Inf.		
Flocculation Tank		
Insp. for Sludge		
Operate/Insp. Tk. Mixer		
Oil and Water Separator		
Sample Effluent		
Dewatering Press		
Clean Air Line Filter		
Surge/Settling Tank		
Rem./Clean/Resinst.		
Floats		
Multimedia Filters (Sand)		
Sample Effluent		
Air Compressor		
Ck. Clean Inlet Filter		
Insp. Oil for Cont.		
Clean Intercooler		
Ck. Safety Valve		
Clean Cooling Fins		
Ck. Belt Tension/Cond.		
Clean Aftercooler		
Torque Bolts		
Ck. for Air Leaks		
Clean Motor		
Air Dryer		
Clean Cond. Coils		
Contractor Signature		
Date		

	North	South
Air Stripper		
Sample Effluent		
Vent/Rezero Gauge		
Rem./Clean/Reinstall Floats		
Carbon Units		
Ck. Inf. Pressure Left		
Ck. Eff. Pressure Left		
Ck. Inf. Pressure Right		
Ck. Eff. Pressure Right		
Sample Effluent		
Backwash Tank		
Rem./Clean/Reinstall Floats		
Building Services		
Insp. Lights, replace as needed		
Wash down floor		
Cut grass		
Emergency Eye Wash		
Flush out wash/shower		
Clean & wipe down area		
Heating and Ventilating		
Replace filters		
Comments		

Quarterly Maintenance Sheet

	North	South
Sludge Pump		
Ck. Proper Operation		
Sludge Holding Tank		
Washout Tank		
Press Feed Pump		
Ck. Proper Operation		
Dewatering Press		
Change Oil & Filter		
Surge Settling Tank		
Clean, Adj. Floats		
Submersible Sump Pump		
Clean/Adj./Repair Pump & Floats		
Air Compressor		
Change Compressor Oil		
Ck. Low Oil Switch		
Air Stripper Control Panel		
Clean Interior of Cabinet		
Install new bag of desiccant		
Heating/Ventilating Unit		
Ck. Belts		
Ck. Blower Wheel		
Insp. Traps/Air Valves		
Clean Strainers		
Ck. Linkage on Dampers/Motor		
Lube Damper Bushing		
Exhaust Fan Service		
Ck. and Clean PRV Unit		
Ck./Empty Trough and Drain		
Ck. Belts		

Mon./Recovery Well Sample

Sample Each Well/Water Level

RW1		RW2	
RW3		RW4	
RW5		RW6	
RW7		RW8	
RW9		RW10	
RW11		78GW01	
78GW04-1		78GW05	
78GW08		78GW09-1	
78GW10		78GW11	
78GW14		78GW17-1	
78GW19		78GW21	
78GW23		78GW22-1	
78GW25		78GW24-1S	
78GW24-2		78GW09-2	
78GW24-3		78GW31-3	

Comments

Contractor Signature

Date

Annual/Semi-Annual Maintenance Sheet

	North	South
Semi-Annual Flocculation Tank		
Drain/Pressure Wash Tank		
Oil & Water Separator		
Drain/Pressure Wash Tank		
Surge/Settling Tank		
Drain/Pressure Wash Tank		
Sludge Holding Tank		
Drain/Pressure Wash Tank		
Air Stripper		
Drain/Remove Stages and		
Pressure Wash Stripper		
Fan Bearings		
Clean Blower Motor		
Ck. Fan for Wear/Cracks		
Ck. Sump for Cracks		
Drain Lines		
Clean Drain Lines		
W/Pressure Washer		
Overhead Garage Doors		
Lube Mechanical Parts		
Ck./Adjust Brake		
Clean Electrical Compartments		
Primary/Secondary Pumps/Valves		
Ck. Operation/Repair		
Ck. Build up Calcium/Iron		
Lube Bearings		
Carbon Backwash Pump/Valve		
Ck. Operation/Repair		
Lube Bearings		
Sand Filter Backwash Pump		
Ck. Operation/Repair		
Lube Bearings		

	North	South
Annual		
Recovery Well		
Replace Auto-Drain Filters		
Insp./Lube Pumps		
Insp./Air Line & Bubbler		
Insp. Air/Water Lines		
Air Compressor		
Lube Inlet Unloader O Ring		
Insp. Compressor Valves		
Insp. Lube Motor Bearings		
Clean Aftercooler Inter. Air Flow		
Air Dryer		
Diss./Clean Auto Drain Valve		
Diss./Clean Separator Bowl		
Lube Fan Motors		
Multi-Media Filters		
Ck./Clean Pilot Strainer		
Ck./Clean Soft Water Sample		
Painting		
Clean & Paint Corroded Areas		
Heating		
Ck. for Defective Elements		
Ck. Aux. Heaters		

Comments

Contractor Signature

Date

5.0 *DEMOBILIZATION/FINAL REPORT*

OHM will submit an interim and a final report documenting final modifications performed after the system review. Along with the final report, corrected as-built drawings and revisions/additions for the O&M manual will be submitted.

Appendix A

Health and Safety Plan

Site Specific
Health and Safety Plan
for
Groundwater Treatment System Descaling
Marine Corps Base
Camp Lejeune, North Carolina

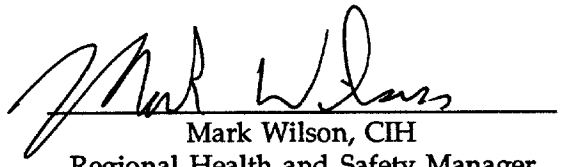
Submitted to:

Department of the Navy
Atlantic Division
Naval Facilities Engineering Services Center
Norfolk, VA

Submitted by:

OHM Remediation Services Corp.
Norcross, GA 30092

Approved by:



Mark Wilson, CIH
Regional Health and Safety Manager

November 1996

Project No. 18859

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1.0 INTRODUCTION

OHM has developed this Site-Specific Health and Safety Plan (SHSP) specifically for groundwater treatment system descaling at the MCB Camp Lejeune Site 78. This SHSP establishes the policies and procedures which protect workers and the public from potential hazards posed by work at this site. The health and safety procedures contained in this SHSP are a part of OHM's Corporate Health and Safety Program, which complies with 29 CFR 1910.120(b)(1) through (b)(4). All project activities will be conducted in a manner, that minimizes the probability of injury, accident or incident occurrence.

Although the plan focuses on the specific work activities planned for this site, it must remain flexible because of the nature of this work. Conditions may change and unforeseen situations may arise that require deviations from the original plan. This flexibility allows modification by the OHM supervisors and health and safety officials.

This SHSP has been prepared in accordance with OSHA's "Hazardous Waste Operations and Emergency Response" standard contained in 29 CFR 1910.120, the U.S. Army Corps of Engineer's "Safety and Health Requirements Manual," and the program health and safety plan developed for this contract.

1.1 SITE DESCRIPTION

Camp Lejeune is a training base for the U. S. Marine Corps, located in Onslow County, North Carolina. The base covers approximately 170 square miles and includes 14 miles of coast line. MCB Camp Lejeune is bound to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U. S. Route 17. The town of Jacksonville, North Carolina, is located north of the base.

Site 78 encompasses the industrial area of MCB, Camp Lejeune and is bordered by Holcomb Boulevard, Sneads Ferry Road, Duncan Street, and Main Service Road. This area is comprised of maintenance shops, warehouses, painting shops, printing shops, automobile body shops, and other similar industrial facilities. Site 78 covers approximately 590 acres. With the exception of buildings, the majority of the site area is paved (e.g., roadways, parking lots, loading dock areas, and storage lots); however, there are many small lawn areas associated with individual buildings within the site and along lengthy stretches of roadways. In addition, there are several acres of woods in the southern portion of the site. Recreational ball fields and a parade ground are located in the southwest corner of the site.

1.2 SITE HISTORY

Site 78, constructed in the late 1930s, was the first developed area at MCB Camp Lejeune. It was comprised of approximately 75 buildings and facilities including maintenance shops, gas stations, administration offices, commissaries, snack bars, warehouses, and storage yards. There is presently no known uncontrolled disposal of wastes related to the various industrial activities at the site. Due to the industrial nature of the site, many spills and leaks have occurred over the years. Most of these spills and leaks have consisted of petroleum-related products and solvents from underground storage tanks (USTs), drums and uncontained waste storage areas.

The plants were designed by Baker Environmental and built by O'Brien & Gere in 1995. OHM assumed O&M of the plants in June 1996.

1.3 SCOPE OF WORK

Upon completion of the Remedial Action Work Plan (RAWP), OHM will implement the plan through performance of the following major tasks:

- **Mobilization and Site Preparation** which will include construction and installation of an office facility; personnel and equipment decontamination facilities; utilities installation; and delineation of work zones.

- **System Operation and Maintenance (O&M)** will be performed by OHM.

- **Decontamination of Water Treatment Plant** – OHM will use high pressure wash and muriatic acid, if necessary, to remove the scale in the pipes and vessels.

- **Decontamination of personnel and equipment.**

- **Demobilization.**

2.0 KEY PERSONNEL AND MANAGEMENT

OHM maintains a policy of providing its employees, subcontractors, and authorized visitors with information and procedures in order to protect them and the adjacent community from any adverse effects that might result from work at a job site involving potentially hazardous substances. All personnel involved with this project will follow the health and safety procedures set forth in this plan. Visitors will not be given entry unless they read and agree to comply with this plan. The site safety plan acknowledgement will be signed by all personnel required to enter contaminated work areas.

2.1 SITE SAFETY OFFICER

OHM designates a site safety officer (SSO) who defines, implements and enforces the project safety program and procedures. The SSO will conduct the daily safety meetings and will interface as required with other site representatives. The SSO takes the following action(s) when appropriate:

- Orders the immediate shut-down of site activities in the case of a medical emergency or unsafe practice.
- Ensures protective clothing and equipment are properly stored and maintained.
- Ensures that the environmental and personnel monitoring operations are on-going and in accordance with this SHSP.
- Restricts visitors from areas of potential exposure to harmful substances.

A safety log will be kept for all OHM activities. This log will include daily safety meeting topics, training given, air monitoring information, first aid administered, visits of all outside personnel and any incidents of a health and safety nature.

The SSO has responsibility for implementing and enforcing the site safety program and procedures. He will oversee any personnel monitoring and will decide when action levels have been reached which require more stringent personnel protection. The SSO establishes and enforces the use of protective equipment for various site activities. The SSO will maintain contact with OHM Regional and Corporate Certified Industrial Hygienists (CIH).

2.2 SITE SUPERVISOR

The site supervisor (SS) has responsibility for all field activities and enforces safe work practices by all crew members. He watches for any ill effects on any of the crew members,

especially those symptoms caused by heat stress or chemical exposure. The SS oversees the safety of any visitors who enter the site. The SS maintains communication with the OHM project manager and client representative(s). The SS will ensure that the SSO establishes proper communications with local health care providers, the NOSC/NOSDR, the LEPC and other local agencies who may be required to provide emergency support on-site.

2.3 EQUIPMENT OPERATORS

Equipment operators will be responsible for the maintenance, inspection, and safe operation of their equipment. Operators are responsible for daily inspection of their equipment and assuring it is in safe operating condition.

2.4 EMPLOYEE SAFETY RESPONSIBILITY

Each employee is responsible for his own safety as well as the safety of those around him. The employee shall use all equipment provided in a safe and responsible manner as directed by his supervisor. All OHM personnel will follow the policies set forth in OHM's Health and Safety Procedures Manual which will be maintained in the site office trailer. Health and Safety Procedures relevant to site operations are attached to this SHSP.

2.5 RESPONSIBLE OHM HEALTH AND SAFETY PERSONNEL

The following personnel are responsible for health and safety on site:

Project Manager:	James Dunn (770) 729-3900
Site Supervisor:	Randy Smith (910) 451-2390
Site Safety Officer:	TBD (on-site)
Regional Health and Safety Director:	Mark Wilson, CIH (770) 734-8086
Regional Manager:	John Martin (770) 729-3900

3.0 JOB HAZARD ANALYSIS

This section discusses concerns to workers on the site.

3.1 CHEMICAL HAZARDS

Hydrochloric acid (muriatic acid) *Threshold Limit Value – 2 ppm*

Hydrochloric acid is irritating to the nose, throat and respiratory system. It is corrosive to the eyes and skin and may cause severe burns, nausea, coughing and shortness of breath.

The types of chemicals that have gone through the water treatment system are listed below. The system has been flushed with clean water and the residual chemical concentrations are very low.

North and South Plants Monthly Sampling – MCB Camp Lejeune							
	Method Number	Detection Limits	Influent	O&W Separator	Sand Filter	Air Stripper	Effluent
VOCs							
Benzene	8021	0.50 µg/L	X			X	X
TCE	8021	0.50 µg/L	X			X	X
1,2-DCE	8021	0.50 µg/L	X			X	X
Vinyl Chloride	8021	0.50 µg/L	X			X	X
Metals							
Antimony	6010	0.0030 mg/L	X		X		X
Arsenic	7060	0.0010 mg/L	X		X		X
Beryllium	6010	0.0010 mg/L	X		X		X
Chromium	6010	0.010 mg/L	X		X		X
Iron	6010	0.030 mg/L	X		X		X
Lead	7421	0.0010 mg/L	X		X		X
Manganese	6010	0.010 mg/L	X		X		X
Mercury	7470	0.00020 mg/L	X		X		X
Nickel	6010	0.040 mg/L	X		X		X
Calcium	6010	0.040 mg/L	X				X
Oil & Grease	9071	1.0 mg/L	X	X			X
TDS	160.1	1.0 mg/L	X		X		X
TSS	160.2	1.0 mg/L	X		X		X
pH	9040		X				X

3.2 HAZARD COMMUNICATION

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at this field project site are transmitted (communicated) according to 29 CFR 1926.59 to all OHM personnel and OHM subcontractors. Hazard communication will include the following:

- **Container Labeling**
  OHM personnel will ensure that all drums and containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced on site by operations. All incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.

- **MSDSs**
  There will be an MSDS located on site for each hazardous chemical known to be used or otherwise present on-site. All MSDSs are located in Appendix A of this SHSP. This SHSP will be maintained in the project office trailer for the duration of site activities.

- **Employee Information and Training**
  Training employees on chemical hazards is accomplished through an ongoing corporate training program. Additionally, chemical hazards are communicated to employees through daily safety meetings held at OHM field projects and by an initial site orientation program.

At a minimum, OHM and related subcontractor employees will be instructed on the following:

- Chemicals and their hazards in the work area
- How to prevent exposure to these hazardous chemicals
- What the company has done to prevent workers' exposure to these chemicals
- Procedures to follow if they are exposed to these chemicals.
- How to read and interpret labels and MSDSs for hazardous substances found on OHM sites
- Emergency spill procedures

- Proper storage and labeling

Before any new hazardous chemical is introduced on site, each OHM and related subcontractor employee will be given information in the same manner as during the safety class. The site supervisor will be responsible for seeing that the MSDS on the new chemical is available for review by on site personnel. The information pertinent to the chemical hazards will be communicated to project personnel.

Morning safety meetings will be held and the hazardous materials used on site will be discussed. Attendance is mandatory for all on site employees.

Refer to Appendix A of this plan to find a list of hazardous chemicals anticipated to be brought to the site and the MSDSs for these chemicals.

3.3 PHYSICAL HAZARDS

There are numerous physical hazards associated with this project which, if not identified and addressed, could present operational problems as well as cause accidents and personal injury to the work force. Hazard identification and mitigation, training, adherence to work rules and careful housekeeping can prevent many problems or accidents arising from physical hazards. The following outlines the major physical hazards and the suggested preventative measures to be followed during this project:

- **Heavy and Bulky Loads**
  Intelligent thought shall be exercised before heavy and bulky loads are lifted or handled manually by personnel. Mechanical equipment such as fork-lifts, wheel barrows, hand-trucks, loaders, and cranes shall be utilized when possible and needed. **Note: Back injuries are real, debilitating, unproductive, and costly to both employees and employers, and sometime permanent. Back injury prevention must be given high priority on all project sites. If you think the load you are about to lift is too heavy or bulky, it probably is! Get help or utilize mechanical equipment.**

- **Explosion Hazard**
  Flammable materials in confined spaces (i.e., excavation areas) can produce an explosive atmosphere which can be triggered by a spark or other energy source. To prevent this type of accident, the concentration of flammable material in air will be carefully monitored and confined space entry procedures will be followed.

- **Hoisting Accidents**
  Employees can have suspended loads dropped on them, be pinned between a load and a stationary object, or be crushed or struck by the counterweight. All hoisting will be done by qualified personnel only after safety checks are made of chokes and cables. In addition, no hoisting will take place without a designated signal man present.

- **Heavy Equipment**
  Heavy construction equipment present construction safety hazards to operating and support personnel. OHM has standard operating procedures (SOPs) for the use of heavy construction equipment. Only trained and qualified operators are authorized to operate heavy construction equipment. The operator is responsible for performing daily equipment inspections on their equipment to identify, take out of service, and correct any equipment defects of non-functioning safety devices that would render the equipment unsafe to operate. Standard safety devices and equipment required to be inspected and functional during use includes:

  - Seat belts,
  - Safety glass in enclosed cab,
  - Braking system,
  - Back-up alarms,
  - Portable fire extinguisher,
  - Horn
  - Tires, and
  - Steering and hydraulic systems.

  Operators are required to wear seatbelts when operating equipment and are responsible for the location of ground personnel in their work area. The are within the turning radius of trackhoes is kept clear to prevent contact between the equipment counterweight and ground personnel.

- **Bulk Fuel Storage**
  A bulk fuel storage area will be designated for storage of bulk fuels and other flammable materials. The bulk fuel vessels will be grounded with bonding cables attached. The area will be prominently posted as a flammable fuels area and no smoking signs erected. At least one 20-pound dry chemical, ABC-type fire extinguisher will be positioned in this area.

- **Flame, Heat or Spark Producing Operations**
  Because of the possibilities of flammable materials being present at this site, flame, heat, or spark producing operations will be limited. If a case arises where hot work

is necessary, OHM will follow the hot work procedures and permit detailed in Appendix B.

- **High Pressure Washing**
  Washing or cleaning certain pieces of equipment may require the use of high pressure washers referred to as lasers. These devices can be hazardous if not used properly. Refer to Appendix B for specific laser safety instructions.

- **Small Quantity Flammable Liquids**
  Small quantities of flammable liquids will be stored in "safety"cans and labeled according to contents.

- **Electrical Hazards**
  Overhead power lines, downed electrical wires, and buried cables all pose a danger of shock or electrocution if workers contact or sever them during site operations. Electrical equipment used on-site may also pose a hazard to workers. To help minimize this hazard, low-voltage equipment with ground-fault interrupters and water-tight, corrosion-resistant, connecting cables will be used on-site. In addition, lightning is a hazard during outdoor operations, particularly for workers handling metal containers or equipment. To eliminate this hazard, weather conditions will be monitored and work will be suspended during electrical storms. An additional electrical hazard involves capacitors that may retain a charge. All such items will be properly grounded before handling. OSHA's standard 29 CFR Part 1910.137 describes clothing and equipment for protection against electrical hazards.

  Electrical devices and equipment must be de-energized prior to working near them. All extension cords must be kept out of water, protected from crushing, and inspected regularly to ensure structural integrity. Temporary electrical circuits must be protected with ground fault interrupters. Only qualified electricians are authorized to work on electrical circuits.

- **Slip/Trip/Fall Hazards**
  Some areas may have wet surfaces which will greatly increase the possibility of inadvertent slips. Caution must be exercised when using steps and stairs due to slippery surfaces in conjunction with fall hazards. Good housekeeping practices are essential to minimize trip hazards.

- **Confined Spaces**
  Some activities may require personnel to enter spaces which may be confined and have other associated physical and chemical hazards. Whenever confined space entry is necessary, a confined space permit shall be completed and confined space

entry procedures must be followed before personnel begin work. See Appendix B for more information.

- **Ground Personnel**
  All ground personnel should be constantly aware of the possibility of slips, trips, and falls due to poor and possibly slippery footing in the work areas. Before crossing either in front of or behind a piece of heavy equipment, ground personnel will signal the equipment operator and receive confirmation before moving.

- **Stairs and Ladders**
  Access to high places will be provided by approved ladders and stairs in accordance with ANSI 14.1-3. Stairs and platforms will be constructed in compliance with OSHA regulations.

- **Excavations and Trenching**
  Excavations and trenching present a special risk to workers due to the hazard of trench wall collapse. If any OHM personnel must enter excavations 5 feet in depth or greater, the sides of the excavation will be sloped 1:1/2:1 (horizontal:vertical) or shored in accordance with 29 CFR 1926.650 through 652. Excavation or trench entries performed in excavations greater than 4 feet deep will be performed in accordance with OHM's Confined Space Entry procedures. See Appendix B for more information.

- **Pumping Equipment**
  Various types of pumps may be used for the removal of materials from ditches, ponds, lagoons, etc. The handling of pressurized hoses that could rupture and violently release liquid materials to the work will be controlled by inspecting all hose fittings for secure connections [all OPW (camlock) and fittings must be secured with the wire]. All employees must wear splash gear including splash shields when moving or disconnecting pumps and hoses.

- **Noise**
  Work around large equipment often creates excessive noise. The effects of noise can include:

  - Workers being startled, annoyed, or distracted.

  - Physical damage to the ear, pain of the ear, or temporary and/or permanent hearing loss.

- Communication interference that may increase potential hazards due to the inability to warn of danger and the proper safety precautions to be taken.

  If employees are not able to hear normal conversation without shouting, noise levels exceeding 85 dBA are likely and hearing protection is required to be worn. The use of portable power tools and the operation of certain heavy construction equipment (i.e. bulldozers), requires mandatory use of hearing protection. OHM maintains an effective hearing conservation program as described in OSHA Regulation 29 CFR Part 1910.95.

All OHM personnel are familiar with the field activities which will be conducted at the site. They are trained to work safely under various field conditions. In addition, the AS will observe the general work practices of each crew member and equipment operator, and enforce safe procedures to minimize physical hazards. Also, hard hats, safety glasses, and safety boots will be required in all areas of the site. Specific health and SOPs that apply to site remedial operations procedures are included in Appendix B.

3.4 ENVIRONMENTAL HAZARDS

Cold stress is not an environmental hazard during site operations due to the warm weather anticipated at the site. However, due to the combination of warm ambient temperature and use of protective clothing anticipated during site operations makes the potential for heat stress a concern. The potential exists for:

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

Heat stroke, heat cramps, and heat exhaustion are covered in detail during OHM's 40-hour OSHA 29 CFR 1910. 120 approved pre-employment course. In addition, this information is discussed during a safety "tailgate" meeting before each work day. Workers are encouraged to increase consumption of water and electrolyte-containing beverages such as Gatorade during warm weather. Water and electrolyte-containing beverages will be provided on-site and will be available for consumption during work breaks.

An action level for heat stress has been established at 75°F ambient temperature when site personnel are wearing chemical protective clothing during the performance of field activities. The following work/rest schedule is recommended, with personnel drinking fluids (tepid water and/or electrolyte) at rest periods consistent with their fluid loss:

Ambient Temperature (degrees F)	Work Period (minutes)	Rest Period (minutes)
75 - 80 F	120	15
80 - 85 F	90	15
85 - 90 F	60	15
90 - 95 F	30	15
95 - 100 F	15	15

The above work/rest schedule is only a guideline for use during field activities when personnel are wearing protective clothing. The actual work/rest schedule will be determined by conducting pulse monitoring before and after the work period and by performing daily pre/post work shift body weights. The action level for adjusting the work/rest schedule would be 110 beats per minute (bpm), obtained immediately after the work period in a seated, shaded position. When a person's pulse exceeds 110 bpm, that person is undergoing heat stress, which will require the work period to be reduced in 15 minute intervals, while maintaining the same rest period, until post work period pulse monitoring is maintained below 110 bpm. In addition, should a person's body weight change at the end of the work day by more than 1.5%, the work period must be reduced in 15 minute intervals, while maintaining the same rest period, until no daily body weight changes greater than 1.5% are observed.

Field activities, in which site personnel are required to wear chemical protective clothing at ambient temperatures higher than 95 degrees F, will be avoided, whenever feasible, by scheduling these activities during the work day to avoid peak ambient temperatures (10 a.m. -- 2 p.m.). Site personnel who have experienced a heat-related illness (heat cramps, heat exhaustion) will be restricted to Level D tasks for a minimum of one day after illness occurrence and will return to tasks requiring chemical protective clothing only with the concurrence of the attending physician. Site personnel will follow OHM's SOPs for heat stress prevention.

3.5 TASK SPECIFIC RISK ASSESSMENT

Task 1 – Site Preparation and Mobilization

Principle Steps Set-up work zones and support facilities; construct decontamination facilities	
Potential Hazards Involved	**Hazard Control Measures**
1) Manual lifting and material handling hazards	1) The rated lifting capacity cannot be exceeded 1) Forklifts must have open guards 1) All operators must be trained 1) Do not carry personnel or lift anyone except in an approved safety platform 1) Follow OHM SOP for Powered Industrial Trucks (No. 32) 1) Employees will make certain the load can be safely lifted 1) No loads over 60 pounds will be lifted 1) Proper lifting techniques will be utilized 1) Follow OHM SOP for Personnel Lifting Safety (No. 33) 1) Follow procedures on MSDS when handling/pouring concrete
2) Electrical hazards	2) Electrical work will only be performed by approved electricians 2) No electrical work should be done on an energized circuit/circuit must be tested 2) Follow OHM SOP for Lockout/Tagout (No. 27) 2) Hand tools must be grounded or double insulated 2) GFI must be used 2) Follow OHM SOP for Electrical Safety (No. 32)
3) Slips, trips, and falls	3) Tools and debris must be picked up 3) Spills will be cleaned up immediately 3) Personnel shall not walk or climb on equipment not designed as walking surfaces 3) Follow OHM SOP for Slips, Trips and Falls (No. 34)
4) Heavy construction equipment traffic and use	4) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 4) Do not carry personnel or lift anyone except in an approved safety platform 4) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 4) Heavy equipment shall have fully functioning safety devices 4) Follow OHM SOP for Equipment Inspection (No. 51)
5) Overhead electrical utility hazards	5) Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
6) Portable power tool hazard	6) All hand tools and power tools shall be in good repair 6) When working, overhead tools will be secured when not in use 6) Tools cannot be thrown or dropped from heights 6) Follow OHM SOP for Equipment and Hand Tools (No. 41)
7) Underground utility hazards	7) Locate all buried utilities and pipelines prior to initiating excavation/grading operations.

Task 2 – System Operation and Maintenance

Principle Steps Water sampling (influent, effluent) well testing, bailing and maintenance; clean oil water separator; acid wash air stripper packing; change out air stripper packing; Replace pumps/blowers; clean/replace bag filter; carbon backwashing/replacement; control panel repairs/troubleshooting	
Potential Hazards Involved	**Hazard Control Measures**
1) Inhalation, dermal contact with process chemicals, filtration media (spent carbon) and chemical contaminant spikes	1) Wear appropriate PPE 1) Follow chemical handling procedures on MSDSs 1) Follow this SHSP Section 3.1 and 5.2 1) Follow MSDS for Hydrochloric Acid
2) Confined space entry hazard	2) The OHM Confined Space Permit will be completed before entry 2) The atmosphere will be monitored for oxygen, combustible gases, and toxins. 2) All personnel will be trained for confined space entry 2) The confined space will be isolated, locked out, and tagged-out if there are mechanical or electrical hazards 2) Follow OHM SOP for Confined Space Entry (No. 24)
3) Spill, splash hazards	3) Wear splash protection 3) Clean up spills immediately
4) Noise	4) Follow SOP for Hearing Conservation Program (No. 19) 4) Personnel will wear hearing protection above 85 dBa 4) Personnel will be included in a hearing conservation program
5) Electrical hazards	5) Electrical work will only be performed by approved electricians 5) No electrical work should be done on an energized circuit/circuit must be tested 5) Follow OHM SOP for Lockout/Tagout (No. 27) 5) Hand tools must be grounded or double insulated 5) GFI must be used 5) Follow OHM SOP for Electrical Safety (No. 32)
6) Material handling/manual lifting	6) Do not carry personnel or lift anyone except in an approved safety platform 6) Employees will make certain the load can be safely lifted 6) No loads over 60 pounds will be lifted 6) Proper lifting techniques will be utilized 6) Follow OHM SOP for Lifting Safety (No. 33)
7) Pumping equipment operation hazards	7) Emergency eye wash stations will be located adjacent to pumping equipment operations 7) Follow equipment manufacturer's recommendation for pump operation and maintenance 7) Hoses will be appropriate for materials and temperature and secured

Task 3 – Water Treatment Descaling

Principle Steps Decontaminate water treatment equipment; collect and containerize decontamination water	
Potential Hazards Involved	**Hazard Control Measures**
1) Slips, trips, and falls	1) Tools and debris must be picked up 1) Spills will be cleaned up immediately 1) Personnel shall not walk or climb on equipment not designed as walking surfaces 1) Follow OHM SOP for Slips, Trips and Falls (No. 34)
2) Exposure to hazardous materials	2) Follow this SHSP Section 3.1 and 5.2 2) Follow MSDS for Hydrochloric Acid
3) Manual lifting and material handling hazards	3) Do not carry personnel or lift anyone except in an approved safety platform 3) Employees will make certain the load can be safely lifted 3) No loads over 60 pounds will be lifted 3) Proper lifting techniques will be utilized 3) Follow OHM SOP for Lifting Safety (No. 33)
4) Spill/splash hazard	4) Wear splash protection 4) Cleanup spills immediately 4) Follow this SHSP Section 3.1 and 5.2
5) Noise	5) Follow SOP for Hearing Conservation Program (No. 19) 5) Personnel will wear hearing protection above 85 dBa 5) Personnel will be included in a hearing conservation program
6) Pressure washing hazard	6) Wear appropriate PPE 6) Only trained personnel will operate high pressure washer 6) The equipment cannot be altered 6) Follow OHM SOP for Pressure Washing (No. 30)
7) Confined space entry	7) The OHM Confined Space Permit will be completed before entry 7) The atmosphere will be monitored for oxygen, combustible gases, and toxins 7) Al personnel will be trained for confined space entry 7) The confined space will be isolated, locked out, and tagged out if there mechanical or electrical hazards
8) Heavy equipment operating hazards	8) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 8) Do not carry personnel or lift anyone except in an approved safety platform 8) Personnel shall be cognizant of the boom swing area and stay clear 8) Heavy equipment shall have fully functioning safety devices
9) Overhead electrical utility hazards	8) Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
10) Overhead hazard to ground personnel	9) Do not suspend or travel with load over ground personnel

Task 4 – Decontamination

Principle Steps Decontaminate personnel; decontaminate equipment; collect and containerize decontamination water	
Potential Hazards Involved	**Hazard Control Measures**
1) Slips, trips, and falls	1) Tools and debris must be picked up 1) Spills will be cleaned up immediately 1) Personnel shall not walk or climb on equipment not designed as walking surfaces 1) Follow OHM SOP for Slips, Trips and Falls (No. 34)
2) Exposure to hazardous materials	2) Follow this SHSP Section 3.1 and 5.2
3) Manual lifting and material handling hazards	3) Do not carry personnel or lift anyone except in an approved safety platform 3) Employees will make certain the load can be safely lifted 3) No loads over 60 pounds will be lifted 3) Proper lifting techniques will be utilized 3) Follow OHM SOP for Lifting Safety (No. 33)
4) Spill/splash hazard	4) Wear splash protection 4) Cleanup spills immediately 4) Follow this SHSP Section 3.1 and 5.2
5) Noise	5) Follow SOP for Hearing Conservation Program (No. 19) 5) Personnel will wear hearing protection above 85 dBa 5) Personnel will be included in a hearing conservation program
6) Pressure washing hazard	6) Wear appropriate PPE 6) Only trained personnel will operate high pressure washer 6) The equipment cannot be altered 6) Follow OHM SOP for Pressure Washing (No. 30)

Task 5 – Demobilization

Principle Steps Take down work zones fencing; remove decontamination facilities	
Potential Hazards Involved	**Hazard Control Measures**
1) Manual lifting and material handling hazards	1) The rated lifting capacity cannot be exceeded 1) Forklifts must have open guards 1) All operators must be trained 1) Do not carry personnel or lift anyone except in an approved safety platform 1) Follow OHM SOP for Powered Industrial Trucks (No. 32) 1) Employees will make certain the load can be safely lifted 1) No loads over 60 pounds will be lifted 1) Proper lifting techniques will be utilized 1) Follow OHM SOP for Personnel Lifting Safety (No. 33) 1) Follow procedures on MSDS when handling/pouring concrete
2) Electrical hazards	2) Electrical work will only be performed by approved electricians 2) No electrical work should be done on an energized circuit/circuit must be tested 2) Follow OHM SOP for Lockout/Tagout (No. 27) 2) Hand tools must be grounded or double insulated 2) GFI must be used 2) Follow OHM SOP for Electrical Safety (No. 32)
3) Slips, trips, and falls	3) Tools and debris must be picked up 3) Spills will be cleaned up immediately 3) Personnel shall not walk or climb on equipment not designed as walking surfaces 3) Follow OHM SOP for Slips, Trips and Falls (No. 34)
4) Heavy construction equipment traffic and use	4) Personnel approaching heavy equipment will make eye contact and signal the operator to cease activity 4) Do not carry personnel or lift anyone except in an approved safety platform 4) Personnel shall be cognizant of the boom swing area and stay clear. Do not suspend or travel with load over ground personnel. 4) Heavy equipment shall have fully functioning safety devices 4) Follow OHM SOP for Equipment Inspection (No. 51)
5) Overhead electrical utility hazards	5) Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
6) Portable power tool hazard	6) All hand tools and power tools shall be in good repair 6) When working, overhead tools will be secured when not in use 6) Tools cannot be thrown or dropped from heights 6) Follow OHM SOP for Equipment and Hand Tools (No. 41)

4.0 WORK AND SUPPORT AREAS

To prevent migration of contamination caused through tracking by personnel or equipment, work areas and personal protective equipment are clearly specified prior to beginning operations. OHM has designated work areas or zones as suggested by the NIOSH/OSHA/USCG/EPA'S document titled, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities". Each work area will be divided into three zones: an exclusion or "hot" zone, a contamination reduction zone (CRZ), and a support zone.

4.1 EXCLUSION ZONE

The exclusion zone will consist of areas where inhalation, oral contact, or dermal contact with contaminants will be possible. The boundaries of the site exclusion will be marked with flagging, tape, and/or fencing before site operations commence.

4.2 CONTAMINATION-REDUCTION ZONE

The CRZ or transition zone will be established between the exclusion zone and support zone. In this area, personnel will begin the sequential decontamination process required to exit the exclusion zone. To prevent off-site migration of contamination and for personnel accountability, all personnel will enter and exit the exclusion zone through the CRZ. Personnel and equipment decontamination facilities will be located in the CRZ.

4.3 SUPPORT ZONE

The support zone will consist of a clearly marked area where the office and decontamination trailer are located. Smoking and drinking will be allowed only in designated areas. Eating will be allowed in the breakroom only.

4.4 ACCESS CONTROLS

The SSO and the SS will establish the physical boundaries of each zone and will instruct all workers and visitors on the limits of the restricted areas. No one will be allowed to enter the restricted area without the required protective equipment for that area. The SS will ensure compliance with all restricted area entry and exit procedures.

The SS will also designate a decontamination point for personnel to exit from the contaminated area and enter into the clean area where personnel may rest and drink.

Visitors will be required to check in immediately upon arrival. Only authorized visitors will be allowed access to the contaminated areas. Each visitor will be required to provide the necessary protective equipment for use during the visits and shall be escorted by the SS while on site. Two full sets of personal protective equipment will be maintained on-site for use by LANTDIV representatives. All visitors who seek access to the exclusion zone and/or contamination reduction zone, will be required to show proof of completion, as a minimum, the 24-hour training required by OSHA for occasional visits to hazardous waste sites. 24-hour OSHA training is only applicable when visitors are unlikely to be exposed over the permissible exposure limit and published exposure limits and are not required to wear respirators, otherwise 40-hour OSHA training will be required prior to granting access to these site zones.

All visitors, subcontractors and personnel will be required to sign a safety plan acknowledgement sheet to certify that they have read and will comply with the site health and safety plan. Failure to comply with this site entry procedure will result in expulsion from the site.

5.0 PROTECTIVE EQUIPMENT

This section details the personal protective equipment (PPE) that will be provided and worn by site personnel to protect them against dermal contact and inhalation exposure to hazardous chemicals present on site.

5.1 LEVELS OF PROTECTION

The following levels of protection and accompanying PPE will be used during site operations.

Level C Protection

- Full facepiece air-purifying respirator with combination organic vapor/HEPA cartridges
- Tyvek or saran-coated tyvek coveralls
- Inner latex and outer nitrile/butyl gloves
- Steel toe/shank boots with latex overboots
- Tape overboots and outer gloves to Tyvek
- Hard hat
- Splash protection - as required by task
- Hearing protection - as required by task

Modified Level D Protection

- Tyvek or saran-coated tyvek
- Inner latex and outer nitrile/butyl gloves
- Steel toe/shank boots with latex overboots
- Tape overboots outer gloves to Tyvek
- Hard hat
- Safety glasses with side shields

- Splash protection - as required by task
- Hearing protection - as required by task

Level D Protection

- Long pants and long sleeved shirt or coveralls
- Steel toe/shank boots
- Safety glasses with side shield
- Work gloves - as required by task
- Splash protection - as required by task
- Hearing protection - as required by task

5.2 TASK-SPECIFIC LEVELS OF PROTECTION

The following minimum levels of protection are specified for tasks performed during site operations. Upgrades or downgrades in levels of protection will be based on air monitoring results when compared to the appropriate action level or by the Regional Health and Safety Director, as detailed in Section 7.0 Air Monitoring.

Task No. 1: Mobilization/Site Preparation
Level of Protection: Level D

Task No. 2: System Operation and Maintenance
Level of Protection: Level D – Operation; Level C/Modified D – Maintenance; Level B – Confined Space

Task No. 3: Water Treatment Descaling
Level of Protection: Level C/Modified Level D with saran and chemical goggles/face shield

Task No. 4: Decontamination
Level of Protection: Level Modified D with sarans, chemical goggles/face shield

Task No. 5: Demobilization
Level of Protection: Level D

5.3 RESPIRATOR CARTRIDGES

The crew members working in Level C will wear respirators equipped with Mine Safety Appliance (MSA) GMC-H air purifying cartridges. The GMC-H cartridge holds approval for:

- Organic vapors <1,000 ppm
- Chlorine gas <10 ppm
- Hydrogen chloride <50 ppm
- Sulfur dioxide <50 ppm
- Dusts, fumes and mists with a TWA <0.05 mg/m3
- Asbestos-containing dusts and mists
- Radon daughters
- Radionuclides
- Pesticides

5.4 AIR-PURIFYING RESPIRATORS

OHM's air-purifying respirators for this project will be MSA's ultratwin full facepiece respirator with nose cups. OHM's Respirator Protection Program for air purifying respirators is adhered to on site.

5.5 CARTRIDGE CHANGES

All cartridges will be changed a minimum of once daily. However, water saturation of the HEPA filter or dusty conditions may necessitate more frequent changes. Changes will occur when personnel begin to experience increased inhalation resistance, or breakthrough of a chemical warning property.

5.6 INSPECTION AND CLEANING

Respirators are checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after use.

5.7 FIT TESTING

All personnel are fit tested at the time of initial employment. Annual respirator fit tests are required of all personnel wearing negative pressure respirators. The test will utilize isoamyl

acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used.

5.8 FACIAL HAIR

No personnel who have facial hair which interferes with the respirator's sealing surface will be permitted to wear a respirator.

5.9 CORRECTIVE LENSES

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided.

5.10 CONTACT LENSES

Contact lenses shall not be worn with any type of respirator.

5.11 MEDICAL CERTIFICATION

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator.

6.0 DECONTAMINATION PROCEDURES

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

6.1 PERSONNEL DECONTAMINATION

Decontamination of personnel shall be accomplished to ensure that any material, which, personnel may have contacted in the hot zone, is removed in the contamination-reduction zone. Decontamination of personnel exiting the exclusion zone will utilize the following steps for Level C/Modified Level D personnel decontamination:

- Step 1: Equipment/backpack/egress system drop
- Step 2: Scrub outer boots and gloves with a detergent-water solution.
- Step 3: Remove tape and discard.
- Step 4: Remove and discard outer boots and gloves.
- Step 5: Remove hard hat and wipe clean.
- Step 6: Remove chemical protective clothing (Tyvek/sarans) and discard.
- Step 7: Remove respirator/facepiece (Levels B/C only) and suitably store while on breaks and during lunch. At the end of shift, discard the cartridges, then clean, disinfect, rinse and air dry the respirator.
- Step 8: Discard inner gloves.
- Step 9: Depart transition zone in work clothes and boots.
- Step 10: Wash hands, face and neck before breaks and lunch.

6.2 SUSPECTED CONTAMINATION

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed to the decontamination facility. Here the worker will remove clothing, shower, don clean clothing, and immediately be taken to the First Aid Station.

6.3 PERSONAL HYGIENE

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck and face. To promote personal hygiene and to control personnel exposure to contaminants, project-issued work coveralls worn under chemical protective clothing will remain at the job site and will be laundered at regular intervals during the course of the project.

6.4 OTHER DECONTAMINATION PROCEDURES

All disposable items (i.e., protective clothing) or other items which cannot be adequately decontaminated (i.e., miscellaneous sampling equipment) will be disposed of in accordance with EPA requirements.

6.5 HEAVY EQUIPMENT DECONTAMINATION

Gross contamination (soil, mud) of heavy equipment will be removed from the equipment with a high pressure washer prior to exiting the exclusion zone. Those parts of the equipment that come into direct contact with contaminated materials (i.e., buckets, tires, tracks) will receive special attention.

Decontamination solutions, soil, mud, etc., removed with the high pressure washer will be collected, placed into containers and disposed of according to EPA requirements.

7.0 AIR MONITORING

Air monitoring will be conducted in order to determine airborne contamination levels. This ensures that respiratory protection is adequate to protect personnel against the chemicals that are encountered.

Table 7.1 describes the air monitoring required and appropriate action levels. Additional air monitoring may be conducted at the discretion of the SSO.

Table 7.1
Required Action Levels

Monitoring Device	Monitoring Frequency	Action Level	Action
LEL	At start-up and periodic daily during drilling/ well installation	>10% LEL <20.8% 02	Stop operations; allow vapors to vent to <10% LEL before continuing
PID/OVA (Breathing Zone)	At start-up and periodic daily during trenching/ drilling, well installation, well sampling/bailing	>5 ppm for 5 min. >500 ppm for 5 min.	Upgrade to Level C Upgrade to Level B

The LEL action levels noted above only apply to LEL readings obtained in an area where flammable/explosive vapors may be present. Personnel entry into the area will not occur. The confined space entry LEL and oxygen action levels for personnel entry into a confined space are 0% LEL and 20.9% oxygen, with LEL/oxygen readings taken at representative locations inside the space. The hot work LEL and oxygen levels for UST cold-cutting operations and any related hot work are less than 10% LEL and less than 8% oxygen.

7.1 LOWER EXPLOSIVE LIMIT/OXYGEN (LEL/O2) METER

Prior to entering a confined space area or hot work involving welding, cutting, or other high heat-producing operations where flammable or combustible vapors may be present, LEL/O2 measurements must be obtained. LEL monitoring will be conducted at each borehole when drilling in suspected contaminated areas on site.

7.2 PHOTOIONIZATION DETECTOR (PID)/ ORGANIC VAPOR ANALYZER (OVA)

A 10.2eV PID or OVA will be used to monitor total organic contaminants in ambient air. A PID/OVA will prove useful as a direct reading instrument which will aid in determining if

respiratory protection needs to be worn (Level C) and to indicate if the exclusion zone encompasses the required areas. PID/OVA monitoring will be performed in personnel breathing zone during site operations to document that the proper level of protection is worn by site personnel.

The SSO will take measurements before operations begin in an area to determine the amount of volatile organic compounds (VOCs) naturally occurring in the air. This is referred to as a background level. The PID/OVA breathing zone action level only applies to PID/OVA readings above background (i.e. 1 ppm for 5 minutes above background).

7.3 REAL-TIME AEROSOL MONITOR (MINIRAM)

A real-time aerosol monitor (miniram) will be used to measure airborne particulate in personnel breathing zones and site work area locations. A breathing zone action level has been specified that requires upgrading to Level C protection based on sustained (5-minute average) miniram results. The miniram will be used to monitor personnel breathing zones when wearing Modified Level D protection and to determine when an upgrade to Level C is warranted.

7.4 AIR SAMPLING AND ANALYSIS

Personal air samples will be collected in personnel breathing zones to document that the appropriate level of protection was worn during remedial actions. Air samples will be collected on personnel with the greatest potential for exposure during each major project phase. Air samples will be analyzed by an AIHA accredited laboratory. Air samples will be collected and analyzed for chlorinated pesticides during excavation and load-out operations.

Personal air samples will be collected in accordance with NIOSH Method 5503 for ChloroDiphenyls and analyzed in accordance with EPA Method 8080 for chlorinated pesticides.

7.5 AIR MONITORING LOG

The SSO will ensure that all air-monitoring data are logged into a monitoring notebook. Data will include instrument used, instrument reading, location, type of reading (breathing zone or work area) and site operations being performed. The Regional and Corporate OHM CIH will periodically review this data.

7.6 CALIBRATION REQUIREMENTS

The PID/OVA, LEL/O2 meter, miniram and air sampling pumps will be calibrated daily prior to use, and after each use, in accordance with the manufacturer's procedures. A separate log will be kept detailing date, time, span, gas, or other standard, and name of person performing the calibration.

7.7 AIR MONITORING RESULTS

Air monitoring results will be posted for personnel inspection, and will be discussed during morning safety meetings.

8.0 EMERGENCY RESPONSE

Prior to field activities, the SS will plan emergency egress routes and discuss them with all personnel who will be conducting the field work. Initial planning includes establishing emergency warning signals and evacuation routes in case of an emergency. Communications and coordination of this plan will be made with the NOSC/NOSCDR prior to commencement of work.

8.1 EMERGENCY SERVICES

A tested system will exist for rapid and clear distress communication. All personnel will be provided concise and clear directions and accessible transportation to local emergency services. A map outlining directions to the nearest hospital will be posted on site.

The following emergency equipment will be present on the site:

- Fire extinguishers
- Industrial first aid kit
- Portable eye wash/emergency shower in conformance with ANSI 2358.1-1990

8.2 EMERGENCY EVACUATION FROM EXCLUSION AND CONTAMINATION-REDUCTION ZONES

Any personnel requiring emergency medical attention will be evacuated immediately from exclusion and contamination-reduction zones. Personnel will not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury and the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life saving first aid. For others, decontamination may aggravate the injury or delay life saving treatment. If decontamination does not interfere with essential treatment, it should be performed.

If decontamination can be performed:

- Wash external clothing and cut it away.

If decontamination cannot be performed:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel.

- Alert emergency and off-site medical personnel to potential contamination; instruct them about specific decontamination procedures.

- Send along site personnel familiar with the incident.

8.3 FIRST AID

Only qualified personnel will provide first aid and stabilize an individual needing assistance. At least two persons trained and certified in First Aid/CPR will be present on-site at all times during remedial actions. All OHM personnel certified in FA and CPR are trained in the bloodborne pathogen standard as required by 29 CFR 1910.1030. Life support techniques such as CPR and treatment of life threatening problems, such as airway obstruction and shock, will be given top priority. Professional medical assistance will be obtained at the earliest possible opportunity.

To provide first-line assistance to field personnel in the case of sickness or injury, the following items will be immediately available:

- First aid kit
- Portable emergency eye wash
- Supply of clean water

8.4 EMERGENCY ACTIONS

If actual or suspected serious injury occurs, these steps shall be followed:

- Remove the exposed or injured person(s) from immediate danger.

- Render first aid if necessary. Decontaminate affected personnel after critical first aid given.

- Obtain paramedic services or ambulance transport to local hospital. This procedure will be followed even if there is no visible injury.

- Other personnel in the work area will be evacuated to a safe distance until the site supervisor determines that it is safe for work to resume. If there is any doubt regarding the condition of the area, work shall not commence until all hazard control issues are resolved.

- Notify NOSC/NOSCDR

- Notify MCB Camp Lejeune ROICC Office, Brent Rowse (910) 451-2583 and LANTDIV Ms. Katherine Landman (804) 322-4818 of incident.

- Follow up each incident with a post incident critique and submit a written report to the Regional Health and Safety Director within 30 days of incident closure.

8.5 GENERAL EVACUATION PLAN

In the general case of a large fire, explosion, or toxic vapor release, a site evacuation shall be ordered and shall follow these steps:

- Sound the applicable alarm and advise client representative.

- Evaluate the immediate situation and downwind direction. All personnel will evacuate in the upwind direction.

- All personnel will assemble in an upwind area when the situation permits, a head count will be taken.

- Determine the extent of the problem. Dispatch a response team in protective clothing and self-contained breathing apparatus on site to evacuate any missing personnel or to correct the problem.

- Notify MCB Camp Lejeune ROICC Office Brent Rowse (910) 451-2583) and LANTDIV Ms. Katherine Landman (804) 322-4818 of incident.

8.6 SPILL CONTROL

Spill control throughout the project will be achieved on an ongoing basis in all areas of operations. OHM personnel are trained on spill control/response in their initial 40-hour training, at 8-hour annual refresher training and for site specific training prior to conducting site work.

Primary spill control operations will include a system of temporary dikes and sand bag berms in all areas of operation. The containment dikes will be erected around those operations where a spill potential exists. The containment dikes will be set up to avert run-on from work areas as well as contain any materials released inside the work area.

Gasoline and diesel fuels, bulk lubricants, and waste oils will be stored in clearly marked areas dedicated for this purpose. Storage will be skid-mounted above-ground steel tanks or 55-gallon drums as appropriate. Storage units will be located in areas away from routine

traffic patterns to prevent accidental damage. Each storage area will be constructed with an impermeable liner and surrounded by a containment berm.

Table 8.1
Emergency Contacts

(Completed on site during project start-up)

Ambulance Phone Number: 911 (on-base)
(910) 455-9119 (off-base)

Hospital: USMC Base Hospital (on-base)/Onslow County Hospital (off-base)

Hospital Phone Number: (910) 451-4840 (on-base)/(910) 577-2240 (off-base)

Fire Department: 911 (on-base)

Police: 911 (on-base)/(910) 451-3855 (off-base)

Poison Control: 800-382-9097

Insert route to hospital below:

On-Base

1. Proceed north on Holcomb Boulevard and turn left
2. Base hospital is approximately 1/2 mile ahead on right
3. Follow signs to the emergency room entrance

Off-Base

1. Proceed north on Holcomb Boulevard and exit MCB Camp Lejeune through the main gate.
2. Follow Highway 24 West (approximately 2.5 miles) to Western Boulevard and turn right (north).
3. Continue on Western Boulevard (approximately 1.5 miles) to the fifth stoplight and the hospital is on the left side of the street.
4. Follow signs to the emergency room entrance.

A map depicting the route to the Onslow County Memorial Hospital and the Base Naval Hospital will be posted in each trailer.

9.0 TRAINING REQUIREMENTS

As a prerequisite to employment at OHM, all field employees are required to take a 40-hour training class and pass a written examination. This training is comprehensive and covers all forms of personal protective equipment. In addition, this course covers the toxicological effects of various chemicals including nerve agents, handling of unknown tanks and drums, confined space entering procedures and electrical safety. In addition to this training, all personnel receive 3-day supervised on-site training with a qualified supervisor. This course is in full compliance with OSHA requirements as set forth in 29 CFR 1910.120(e). Training certificates will be maintained on-site by the SSO for all project assigned personnel.

In addition, all personnel will be required to have certification for updated 8-hour refresher training. Supervisory personnel will have documentation of 8-hour supervisory training.

All personnel entering the exclusion zone will be trained in the provisions of this site safety plan and will be required to sign the SHSP acknowledgement (Appendix C). OHM has a full-time training department which, in addition to providing in-house training, has assisted Federal OSHA and USEPA in developing training program requirements.

OHM subcontractors, who will be working in the site exclusion zone, will be required to certify, in writing, that their employees have been trained in accordance with 29 CFR 1910.120(e).

MATERIAL SAFETY DATA SHEET

DATE August 1985

PRODUCT NAME OL ACTIVATED CARBON

CALGON CARBON CORPORATION

SECTION I

MANUFACTURER'S NAME	Calgon Carbon Corporation	EMERGENCY TELEPHONE NO.	412-787-6700
ADDRESS	P.O. Box 717 Pittsburgh, PA 15230-0717		
CHEMICAL NAME AND SYNONYMS	Carbon	FORMULA	C

SECTION II HAZARDOUS INGREDIENTS

PRINCIPAL HAZARDOUS COMPONENT (S)	CAS #	% BY WEIGHT	ORAL LD_{50}	DERMAL LD_{50}	TLV (Units) ACGIH	OSHA	OTHER
Chemical Name Carbon / Common Name Activated Carbon	7440-44-0	100%	>10g/Kg* (rat)	--	N/A	N/A	N/A
Chemical Name / Common Name							
Chemical Name / Common Name							
Chemical Name / Common Name							
Chemical Name / Common Name							

*No animal mortalities during course of 14-day study.

CAUTION!! Wet activated carbon removes oxygen from air causing a severe hazard to workers inside carbon vessels and enclosed or confined spaces. Before entering such an area, sampling and work procedures for low oxygen levels should be taken to ensure ample oxygen availability, observing all local, state, and federal regulations.

This product is non-hazardous according to the definitions for "health hazard" and "physical hazard" provided in the OSHA Hazard Communication Law (29 CFR part 1910).

SECTION III PHYSICAL DATA

BOILING POINT (° F)	N/A	SPECIFIC GRAVITY (H_2O=1)	2.3g/cc real density
VAPOR PRESSURE (mmHg.)	N/A	PERCENT VOLATILE BY VOLUME (%)	N/A
VAPOR DENSITY (AIR=1)	N/A	pH	N/A
SOLUBILITY IN WATER	insoluble	OTHER packing density	0.4 to 0.7g/cc

APPEARANCE AND ODOR black particulate solid

While this information and recommendations set forth herein are believed to be accurate as of the date hereof, CALGON CARBON CORPORATION MAKES NO WARRANTY WITH RESPECT HERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

SECTION IV FIRE AND EXPLOSION HAZARD DATA

(Method Used) N/A

GUISHING MEDIA

If involved in fire, flood with plenty of water.

FIGHTING

None

AL FIRE AND SION HAZARDS

Contact with strong oxidizers such as ozone, liquid oxygen, chlorine, permanganate, etc. may result in fire.

SECTION V HEALTH HAZARD DATA

ECT OF OVEREXPOSURE

A. ACUTE

1. INGESTION

The product is non-toxic through ingestion. The acute oral LD_{50} (rat) is >10g/Kg.

2. INHALATION

The acute inhalation LC_{50} (rat) is >64.4 mg/ℓ (nominal concentration) for activated carbon.

3. DERMAL EXPOSURE

a. TOXIC

Non-toxic

b. IRRITATION

The product is not a primary skin irritant. The primary skin irritation index (rabbit) is 0.

c. SENSITIZATION

None

TABLE	X	CONDITIONS TO AVOID	None
TABLE			

NCOMPATABILITY (Materials to Avoid) Strong oxidizers such as ozone, liquid oxygen, chlorine, permanganate, etc.

OUS DECOMPOSITION S

Carbon monoxide may be generated in the event of fire.

SECTION VII SPILL OR LEAK PROCEDURES

EPORTABLE QUANTITIES (RQ) N LBS OF EPA HAZARDOUS UBSTANCES IN PRODUCT

1. N/A
2.
3.

NOTIFY EPA OF PRODUCT SPILLS EQUAL TO OR EXCEEDING N/A LBS.

TEPS TO BE TAKEN IN CASE IATERIAL IS RELEASED R SPILLED

Sweep up unused carbon and discard in refuse container or repackage.

ASTE DISPOSAL METHOD

Dispose of unused carbon in refuse container. Dispose of in accordance with local, state, and federal regulations.

SECTION VIII HANDLING & STORAGE

ROTECTIVE GLOVES	EYE PROTECTION
Rubber gloves recommended	Safety glasses or goggles recommended

THER PROTECTIVE OTHING Not required

TORY PROTECTION A NIOSH approved particulate filter respirator is recommended if excessive dust is generated.

ENTILATION	LOCAL EXHAUST	OTHER
	Recommended	
	MECHANICAL (General) Recommended	

ORAGE & HANDLING

CAUTION!! Wet activated carbon removes oxygen from air causing a severe hazard to workers inside carbon vessels and enclosed or confined spaces. Before entering such an area, sampling and work procedures for low oxygen levels should be taken to ensure ample oxygen availability, observing all local, state, and federal regulations.

THER PRECAUTIONS

Wash thoroughly after handling. Exercise caution in the storage and handling of all chemical substances.

PREPARED BY S. D. Cifrulak

MATERIAL SAFETY DATA SHEET

BAUSCH & LOMB, INCORPORATED
PERSONAL PRODUCTS DIVISION

Effective Date: August 30, 1995 Supersedes: NA

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: SIGHT SAVERS brand ANTI-FOG LIQUID
Product Code: 24, 25, 68, 69, 8565, 8569, 8570, 143060
Chemical Family: NA

For Information: 1-800-553-5340
For Emergency: 1-800-553-5340

Manufacturer: Bausch & Lomb, Inc.
Personal Products Division
P. O. Box 450
1400 N. Goodman St.
Rochester, New York 14692

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT:	CAS #	PERCENTAGE (W/V)	EXPOSURE STANDARDS/GUIDELINES*				
			OSHA		ACGIH		
			TWA	STEL	TWA	STEL	UNITS
Isopropyl alcohol	67-63-0	12	400	500	400	500	ppm
Dipropylene glycol methyl ether	34590-94-8	2	100	150	100	150	ppm

Other components considered as non-hazardous ingredients

NE = Not Established
STEL = Short Term Exposure Limit
OSHA = Occupational Safety & Health Administration

NA = Not Applicable
TWA = Time Weighted Average
ACGIH = American Conference of Governmental Industrial Hygienists

Section 3: HAZARDS IDENTIFICATION

PRECAUTIONS TO CONSIDER: This product is intended to be used to clean lenses in personal items such as eyeware, face shields, etc. This product is not intended to be ingested nor administered through any other routes of exposure. If you are sensitive to any ingredient in this product, do not use.

EYE CONTACT: This product is intended to be used per label instructions. Avoid eye contact. In the event of accidental eye contact flush with water for 15 minutes and obtain medical assistance.

SKIN CONTACT: This product is intended to be used per label instructions. Discontinue use if skin irritation develops.

INGESTION: In the event of ingestion of this product or any other untoward events, contact a Poison Control Center or other emergency service and obtain the appropriate medical attention. Accidental ingestion of Sight Savers Anti-fog liquid may cause gastric and intestinal irritation. Ingestion of larger quantities may cause nausea, vomiting, headache, dizziness, abdominal pain or related gastrointestinal disturbance. Give fluids and seek medical care.

INHALATION: Normal use of this product will not present an inhalation hazard. An acute exposure to high concentrations, as from a large spill, may result in upper respiratory tract irritation and central nervous system depression. Move to fresh air and seek medical attention.

CARCINOGENICITY: None of the ingredients contained in this product are listed under IARC, NTP or 29 CFR 1910 subpart Z (as a suspect or known carcinogen).

Section 4: FIRST AID MEASURES

SKIN, INGESTION, INHALATION: Skin irritation is not expected. Should irritation develop discontinue use. This product is not intended to be ingested or taken internally. In the event of ingestion of contents or any untoward events, contact a Poison Control Center or other emergency service and obtain the appropriate medical attention. Refer to the statements in sections 3 and 11.

Section 5: FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES: This product is flammable.

FLASH POINT: 88° F Method: closed cup
FLAMMABLE LIMITS: Lower Flammable Limit: NA Upper Flammable Limit: NA
AUTO IGNITION TEMPERATURE: NA

HAZARDOUS DECOMPOSITION/ COMBUSTION PRODUCTS: Carbon dioxide and carbon monoxide.

Section 5: FIRE FIGHTING MEASURES - CONTINUED

FIRE FIGHTING INSTRUCTIONS:	As with all fires, evacuate personnel to safe area. Normal fire fighting procedures may be used.
EXTINGUISHING MEDIA:	Use foam, CO_2, dry chemical, or water fog.

Section 6: ACCIDENTAL RELEASE MEASURES

SPILL: Remove sources of ignition and absorb with vermiculite or other absorbent. Use respiratory protection and gloves.

DISPOSAL: Dispose of in accordance with all applicable Federal, State, and local environmental regulations. This product does not meet the definition of hazardous waster per 40 CFR, Part 261.11

Section 7: HANDLING AND STORAGE

HANDLING/STORAGE CONDITIONS: This product is stable and non-reactive. Keep away from heat, sparks and flame.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

The following information assumes and pertains to situations where an event (such as warehouse storage or an industrial accident) occurs with large quantities of this product.

ENGINEERING CONTROLS: Not Applicable

RESPIRATORY PROTECTION:
Ventilation: General room ventilation
Respirator: A respirator with organic vapor cartridges should be used for spill cleanup.

SKIN AND EYE PROTECTION: Eye protection should worn to protect against splash hazards and gloves should be used to prevent prolonged skin contact during spill cleanup.

ADDITIONAL PROTECTIVE CLOTHING & EQUIPMENT: Not Applicable

HYGIENIC WORK PRACTICES: No special work practices are required.

Section 9 PHYSICAL AND CHEMICAL PROPERTIES

PRODUCT APPEARANCE: Purple liquid. Refer to product labeling for description.
ODOR: Slight odor of rubbing alcohol.
PHYSICAL STATE: Liquid

CHEMICAL PROPERTIES:

BOILING POINT:	212 ° F	MELTING POINT:	NA
VAPOR PRESSURE:	30 mm @ 77 ° F	VAPOR DENSITY:	NA
SOLUBILITY IN WATER:	Soluble	SPECIFIC GRAVITY:	1.0
VISCOSITY:	Same as water	EVAPORATION RATE:	<1 (i.e. Butyl Acetate = 1)
pH:	7	% VOLATILE:	100%
MOLECULAR WEIGHT:	NA	FREEZING POINT:	0 ° C or 32 ° F

Section 10: STABILITY AND REACTIVITY

GENERAL STABILITY CLASSIFICATION: This product is stable and non-reactive.

INCOMPATIBLE MATERIALS/ CONDITIONS TO AVOID: Prevent contact with strong acids and bases, as with water.

HAZARDOUS DECOMPOSITION: None

Section 11: TOXICOLOGICAL INFORMATION

TOXICITY: Under normal use of this product (per label instructions) there is low toxicity potential associated with this product.

COMPONENT	PERCENTAGE (W/W)	TOXICOLOGICAL DATA
Isopropyl alcohol	12	LCLo 16,000 ppm/4 hours
Dipropylene glycol methyl ether	2	LD₅₀(dog) 7500 mg/kg

Section 12: ECOLOGICAL INFORMATION

Ecological effects have not been determined at this time.

Section 13: DISPOSAL CONSIDERATIONS

Dispose of in accordance with all applicable Federal, State, and local environmental regulations. This product does not meet the definition of hazardous waste per 40 CFR, Part 261.11

Section 14: TRANSPORT INFORMATION

There is no unreasonable risk (health, safety or property) that this product would pose when transported in commerce. Hazard class definitions (49 CFR, Part 173) are not applicable to this product.

Section 15: REGULATORY INFORMATION

TSCA: NA

CERCLA: NA

SARA TITLE III:

- SECTION 302 (Extremely Hazardous Substances): NA
- SECTION 311/312 (Hazard Categories): NA
- SECTION 313 (Toxic Chemicals): NA

TSCA = Toxic Substance Control Act
CERCLA = Comprehensive Response Compensation, and Liability Act
Sara Title III = Superfund Amendment and Reauthorization Act

SECTION 16: OTHER INFORMATION

The information contained herein is provided upon request without warranty of any kind. The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Users should make independent determinations of the suitability and completeness of information from other sources to assure proper use and disposal of these materials and the safety and health of employees and customers. Bausch and Lomb Incorporated recommends that use of this product is in accordance with product labeling and appropriate safety practices and handling procedures.

BETZ

BETZ MATERIAL SAFETY DATA SHEET

EFFECTIVE DATE: 29-AUG-1995
PRINTED DATE: 28-JUN-1996

1) CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : BETZ ENTEC E660

PRODUCT APPLICATION AREA: COAGULANT.

COMPANY ADDRESS:
Betz Water Management Group, Division Betz Laboratories,Inc.
200 Witmer Road, Horsham, PA 19044
Information phone number (215) - 773-6269

EMERGENCY TELEPHONE (HEALTH/ACCIDENT): (800)-877-1940 (USA)

2) COMPOSITION / INFORMATION ON INGREDIENTS

Information for specific product ingredients as required by the OSHA HAZARD COMMUNICATIONS STANDARD is listed. Refer to additional sections of this MSDS for our assessment of the potential hazards of this formulation.

HAZARDOUS INGREDIENTS:

This product is not hazardous as defined by OSHA regulations.

No component is considered to be a carcinogen by the National Toxicology Program, the International Agency for Research on Cancer, or the Occupational Safety and Health Administration at OSHA thresholds for carcinogens.

4) FIRST AID MEASURES

SKIN CONTACT:
Remove contaminated clothing. Wash exposed area with a large quantity of soap solution or water for 15 minutes.
EYE CONTACT:
Immediately flush eyes with water for 15 minutes. Immediately contact a physician for additional treatment.
INHALATION:
Remove victim from contaminated area to fresh air. Apply appropriate first aid treatment as necessary.
INGESTION:
Do not feed anything by mouth to an unconscious or convulsive victim. Do not induce vomiting. Immediately contact physician. Dilute contents of stomach using 3-4 glasses milk or water.

5) FIRE FIGHTING MEASURES

FIRE FIGHTING INSTRUCTIONS:
Fire fighters should wear positive pressure self-contained breathing appartus (full face-piece type).
EXTINGUISHING MEDIA:
Dry chemical, carbon dioxide, foam or water.
HAZARDOUS DECOMPOSITION PRODUCTS:
Thermal decomposition (destructive fires) yields elemental oxides.
FLASH POINT:
> 200F P-M(CC)

6) ACCIDENTAL RELEASE MEASURES

PROTECTION AND SPILL CONTAINMENT:
Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container. Flush area with water. Wet area may be slippery. Spread sand/grit.
DISPOSAL INSTRUCTIONS:
Water contaminated with this product may be sent to a sanitary sewer treatment facility,in accordance with any local agreement,a permitted waste treatment facility or discharged under a permit. Product as is - Incinerate or land dispose in an approved landfill.

7) HANDLING AND STORAGE

HANDLING:
Normal chemical handling.
STORAGE:
Keep containers closed when not in use. Do not freeze. If frozen, thaw and mix completely prior to use.

10) STABILITY AND REACTIVITY

STABILITY:
Stable
HAZARDOUS POLYMERIZATION:
Will not occur.
INCOMPATIBILITIES:
May react with strong oxidizers.
DECOMPOSITION PRODUCTS:
Thermal decomposition (destructive fires) yields elemental oxides.
BETZ INTERNAL PUMPOUT/CLEANOUT CATEGORIES:
"A"

11) TOXICOLOGICAL INFORMATION

Oral LD50 RAT:	>5,200 mg/kg
Dermal LD50 RABBIT:	>5,200 mg/kg
Skin Irritation Score RABBIT:	0.17
Eye Irritation Score RABBIT:	6.3

NOTE - 6.3 maximum at 24 hours. Completely reversible at day 7.

Ames Assay BACTERIA:	Negative

NOTE - Negative both with and without metabolic activation.

Non-Ames Mutagenicity MOUSE:	Negative

NOTE - Mouse Micronucleus Cytogenetic Assay

12) ECOLOGICAL INFORMATION

AQUATIC TOXICOLOGY

Fathead Minnow 96 Hour Static Renewal Bioassay

LC50: 2 mg/L
No Effect Level: .6 mg/L

Daphnia magna 48 Hour Static Renewal Bioassay

LC50: 307 mg/L
No Effect Level: 89 mg/L

Ceriodaphnia 48 Hour Static Renewal Bioassay

LC50: 1.7 mg/L
No Effect Level: .63 mg/L

BIODEGRADATION

COD (mg/gm):	440
TOC (mg/gm):	230
BOD-5 (mg/gm):	34
BOD-28 (mg/gm):	60

16) OTHER INFORMATION

NFPA/HMIS		CODE TRANSLATION
Health	2	Moderate Hazard
Fire	1	Slight Hazard
Reactivity	0	Minimal Hazard
Special	NONE	No special Hazard
(1) Protective Equipment	B	Goggles,Gloves

(1) refer to section 8 of MSDS for additional protective equipment recommendations.

CHANGE LOG

	EFFECTIVE DATE	REVISIONS TO SECTION:	SUPERCEDES
MSDS status:	22-AUG-95	REVISED FORMAT	

BETZ

BETZ MATERIAL SAFETY DATA SHEET

EFFECTIVE DATE: 01-NOV-1995
PRINTED DATE: 28-JUN-1996

1) CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : BETZ ENTEC 690

PRODUCT APPLICATION AREA: FLOCCULANT.

COMPANY ADDRESS:
Betz Water Management Group, Division Betz Laboratories,Inc.
200 Witmer Road, Horsham, PA 19044
Information phone number (215) - 773-6269

EMERGENCY TELEPHONE (HEALTH/ACCIDENT): (800)-877-1940 (USA)

2) COMPOSITION / INFORMATION ON INGREDIENTS

Information for specific product ingredients as required by the U.S. OSHA HAZARD COMMUNICATION STANDARD is listed. Refer to additional sections of this MSDS for our assessment of the potential hazards of this formulation.

HAZARDOUS INGREDIENTS:

CAS#	CHEMICAL NAME
64742-47-8	ISOPARAFFINIC PETROLEUM DISTILLATE Combustible liquid; irritant
12125-02-9	AMMONIUM CHLORIDE Irritant (eyes)
84133-50-6	ALCOHOLS,C12-14-SECONDARY,ETHOXYLATED Irritant (eyes)

No component is considered to be a carcinogen by the National Toxicology Program, the International Agency for Research on Cancer, or the Occupational Safety and Health Administration at OSHA thresholds for carcinogens.

CONTINUED

4) FIRST AID MEASURES

SKIN CONTACT:
Remove contaminated clothing. Wash exposed area with a large quantity of soap solution or water for 15 minutes.
EYE CONTACT:
Immediately flush eyes with water for 15 minutes. Immediately contact a physician for additional treatment.
INHALATION:
Remove victim from contaminated area to fresh air. Apply appropriate first aid treatment as necessary.
INGESTION:
Do not feed anything by mouth to an unconscious or convulsive victim. Do not induce vomiting. Immediately contact physician. Dilute contents of stomach using 3-4 glasses milk or water.

5) FIRE FIGHTING MEASURES

FIRE FIGHTING INSTRUCTIONS:
Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type).
EXTINGUISHING MEDIA:
Dry chemical, carbon dioxide, foam or water.
HAZARDOUS DECOMPOSITION PRODUCTS:
Thermal decomposition (destructive fires) yields elemental oxides.
FLASH POINT:
> 200F P-M(CC)

6) ACCIDENTAL RELEASE MEASURES

PROTECTION AND SPILL CONTAINMENT:
Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container. Flush area with water. Wet area may be slippery. Spread sand/grit.
DISPOSAL INSTRUCTIONS:
Water contaminated with this product may be sent to a sanitary sewer treatment facility,in accordance with any local agreement,a permitted waste treatment facility or discharged under a permit. Product as is - Incinerate or land dispose in an approved landfill.

7) HANDLING AND STORAGE

HANDLING:
Normal chemical handling.
STORAGE:
Keep containers closed when not in use. Protect from freezing. Product forms an unusable solid that can not be thawed, even at room temperature, if subjected to freezing conditions.

10) STABILITY AND REACTIVITY

STABILITY:
Stable
HAZARDOUS POLYMERIZATION:
Will not occur.
INCOMPATIBILITIES:
May react with strong oxidizers.
DECOMPOSITION PRODUCTS:
Thermal decomposition (destructive fires) yields elemental oxides.
BETZ INTERNAL PUMPOUT/CLEANOUT CATEGORIES:
"B"

11) TOXICOLOGICAL INFORMATION

Oral LD50 RAT:	>2,000 mg/kg
NOTE - Estimated value	
Dermal LD50 RABBIT:	>2,000 mg/kg
NOTE - Estimated value	

12) ECOLOGICAL INFORMATION

AQUATIC TOXICOLOGY
No Data Available.

BIODEGRADATION

No Data Available.

13) DISPOSAL CONSIDERATIONS

If this undiluted product is discarded as a waste, the US RCRA hazardous waste identification number is :
Not applicable.

Please be advised; however, that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

14) TRANSPORT INFORMATION

DOT HAZARD:	Not Applicable
UN / NA NUMBER:	Not applicable
DOT EMERGENCY RESPONSE GUIDE #:	Not applicable

The Clorox Company
7200 Johnson Drive
Pleasanton, California 94588
Tel. (510) 847-6100

Material Safety Data Sheet

I Product: CLOROX BLEACH - FOR INSTITUTIONAL USE

Description: CLEAR, LIGHT YELLOW LIQUID WITH CHLORINE ODOR

Other Designations	Manufacturer	Emergency Telephone No.
EPA Reg. No. 5813-1 Sodium hypochlorite soultion Liquid chlorine bleach Clorox Liquid Bleach Clorox Germicidal Bleach	The Clorox Company 1221 Broadway Oakland, CA 94612	For Medical Emergencies, call Rocky Mountain Poison Center: 1-800-446-1014 For Transportation Emergencies, call: Chemtrec: 1 800-424-9300

II Health Hazard Data

Causes substantial but temporary eye injury. May irritate skin. May cause nausea and vomiting if ingested. Exposure to vapor or mist may irritate nose, throat and lungs. The following medical conditions may be aggravated by exposure to high concentrations of vapor or mist; heart conditions or chronic respiratory problems such as asthma, chronic bronchitis or obstructive lung disease. Under normal consumer use conditions the likelihood of any adverse health effects are low.

FIRST AID: EYE CONTACT: Immediately flush eyes with plenty of water. If irritation persists, see a doctor. SKIN CONTACT: Remove contaminated clothing. Wash area with water. INGESTION: Drink a glassful of water and call a physician. INHALATION: If breathing problems develop remove to fresh air.

III Hazardous Ingredients

Ingredients	Concentration	Worker Exposure Limit
Sodium hypochlorite CAS # 7681-52-9	5.25%	not established

None of the ingredients in this product are on the IARC, NTP or OSHA carcinogen list. Occasional clinical reports suggest a low potential for sensitization upon exaggerated exposure to sodium hypochlorite if skin damage (e.g. irritation) occurs during exposure. Routine clinical tests conducted on intact skin with Clorox Liquid Bleach found no sensitization in the test subjects.

IV Special Protection and Precautions

Hygienic Practices: Wear safety glasses. With repeated or prolonged use, wear gloves.

Engineering Controls: Use general ventilation to minimize exposure to vapor or mist.

Work Practices: Avoid eye and skin contact and inhalation of vapor or mist.

Keep out of the reach of children.

V Transportation and Regulatory Data

U.S. DOT Hazard Class: Not restricted

U.S. DOT Proper Shipping Name: Hypochlorite solution with not more than 7% available chlorine. Not Restricted per 49CFR172.101(c)(12)(iv).

EPA CERCLA/SARA TITLE III Superfund Amendment and Reauthorization Act:

	CERLA/304		
	RQ (lbs)	311/312	313
Sodium hypochlorite	100	—	—
Sodium hydroxide	1000	Yes	—

VI Spill or Leak Procedures

Small Spills (<5 gallons)
1) Absorb, containerize, and landfill in accordance with local regulations. (2) Wash down residual to sanitary sewer.*

Large Spills (>5 gallons)
1) Absorb, containerize, and landfill in accordance with local regulations; wash down residual to sanitary sewer.* - OR - (2) Pump material to waste drum(s) and dispose in accordance with local regulations; wash down residual to sanitary sewer.*

VII Reactivity Data

Stable under normal use and storage conditions. Strong oxidizing agent. Reacts with other household chemicals such as toilet bowl cleaners, rust removers, vinegar, acids or ammonia containing products to produce hazardous gases, such as chlorine and other chlorinated species. Prolonged contact with metal may cause pitting or discoloration.

VIII Fire and Explosion Data

Non-flammable or explosive. In a fire, cool containers to prevent rupture and release of sodium chlorate.

IX Physical Data

Boiling point ..... 212°F/100°C decomposes)
Specific Gravity (H_2O=1) 1.085
Solubility in Water ..... complete
pH 11.4

DATE PREPARED 11/92

The Clorox Company
7200 Johnson Drive
Pleasanton, California 94588
Tel. (510) 847-6100

Material Safety Data Sheet

I Product: REGULAR CLOROX BLEACH

Description: CLEAR, LIGHT YELLOW LIQUID WITH CHLORINE ODOR

Other Designations	Manufacturer	Emergency Telephone No.
Sodium hypochlorite solution Liquid chlorine bleach Clorox Liquid Bleach	The Clorox Company 1221 Broadway Oakland, CA 94612	Notify your Supervisor Rocky Mountain Poison Center (800) 446-1014 For Transportation Emergencies Chemtrec (800) 424-9300

II Health Hazard Data

*Causes substantial but temporary eye injury. May irritate skin. May cause nausea and vomiting if ingested. Exposure to vapor or mist may irritate nose, throat and lungs. The following medical conditions may be aggravated by exposure to high concentrations of vapor or mist; heart conditions or chronic respiratory problems such as asthma, chronic bronchitis or obstructive lung disease. Under normal consumer use conditions the likelihood of any adverse health effects are low.

FIRST AID: EYE CONTACT: Immediately flush eyes with plenty of water. If irritation persists, see a doctor. SKIN CONTACT: Remove contaminated clothing. Wash area with water. INGESTION: Drink a glassful of water and call a physician. INHALATION: If breathing problems develop remove to fresh air.

III Hazardous Ingredients

Ingredients	Concentration	Worker Exposure Limit
Sodium hypochlorite CAS # 7681-52-9	5.25%	not established

None of the ingredients in this product are on the IARC, NTP or OSHA carcinogen list. Occasional clinical reports suggest a low potential for sensitization upon exaggerated exposure to sodium hypochlorite if skin damage (e.g. irritation) occurs during exposure. Routine clinical tests conducted on intact skin with Clorox Liquid Bleach found no sensitization in the test subjects.

IV Special Protection and Precautions

Hygienic Practices: Wear safety glasses. With repeated or prolonged use, wear gloves.

Engineering Controls: Use general ventilation to minimize exposure to vapor or mist.

Work Practices: Avoid eye and skin contact and inhalation of vapor or mist.

Keep out of the reach of children.

V Transportation and Regulatory Data

U.S. DOT Hazard Class: Not restricted

U.S. DOT Proper Shipping Name: Hypochlorite solution with not more than 7% available chlorine. Not Restricted per 49CFR172.101(e)(12)(iv).

Section 313 (Title III Superfund Amendment and Reauthorization Act): As a consumer product, this product is exempt from supplier notification requirements under Section 313 Title III of the Superfund Amendment and Reauthorization Act of 1986 (reference 40 CFR Part 372).

VI Spill or Leak Procedures

Small Spills (<5 gallons)
1) Absorb, containerize, and landfill in accordance with local regulations. (2) Wash down residual to sanitary sewer.*
Large Spills (>5 gallons)
1) Absorb, containerize, and landfill in accordance with local regulations; wash down residual to sanitary sewer.* - OR - (2) Pump material to waste drum(s) and dispose in accordance with local regulations; wash down residual to sanitary sewer.*

* Contact the sanitary treatment facility in advance to assure ability to process washed-down material.

VII Reactivity Data

Stable under normal use and storage conditions. Strong oxidizing agent. Reacts with other household chemicals such as toilet bowl cleaners, rust removers, vinegar, acids or ammonia containing products to produce hazardous gases, such as chlorine and other chlorinated species. Prolonged contact with metal may cause pitting or discoloration.

VIII Fire and Explosion Data

Non-flammable or explosive. In a fire, cool containers to prevent rupture and release of sodium chlorate.

IX Physical Data

Boiling point	212°F/100°C decomposes
Specific Gravity (H_2O=1)	1.085
Solubility in Water	complete
pH	11.4

ACA Gas Inc.
6225 Oaktree Blvd.
P.O. Box 94737
Cleveland, Ohio 44101-4737

Telephone
(216) 642-6600

MATERIAL SAFETY DATA SHEET No. 12

PRODUCT NAME	CAS #
Compressed Air	N/A
TRADE NAME AND SYNONYMS Compressed Air; Air; Compressed Air, Breathing Quality	DOT I.D. No. UN 1002
CHEMICAL NAME AND SYNONYMS See last page.	DOT Hazard Class Nonflammable gas
ISSUE DATE AND REVISIONS 25 November 1985	Formula See last page.
	Chemical Family N/A

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

None listed (ACGIH, 1985-86)

SYMPTOMS OF EXPOSURE Air is nontoxic and necessary to support life. Inhalation of air in a high pressure environment such as underwater diving, caissons or hyperbaric chambers can result in symptoms similar to overexposure to pure oxygen. These include tingling of fingers and toes, abnormal sensations, impaired coordination and confusion. Decompression sickness pains or "bends" are possible following rapid decompression.

TOXICOLOGICAL PROPERTIES

High pressure effects (greater than two atmospheres of oxygen) are on the central nervous system. Improper decompression results in the accumulation of nitrogen in the blood.

RECOMMENDED FIRST AID TREATMENT

Facilities or practices at which air is breathed in a high pressure environment should be prepared to deal with the illnesses associated with decompression (bends or caisson disease). Decompression equipment may be required.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

N/A

PHYSICAL DATA

BOILING POINT -317.8°F (-194.3°C)	LIQUID DENSITY AT BOILING POINT 54.56 lb/ft^3 (874 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C): Above the critical temp. of -221.1°F (-140.6°C)	GAS DENSITY AT 70°F, 1 atm .0749 lb/ft^3 (1.200 kg/m^3)
SOLUBILITY IN WATER Very slightly	FREEZING POINT N/A
EVAPORATION RATE N/A	SPECIFIC GRAVITY (AIR=1) 1.0
APPEARANCE AND ODOR Colorless, odorless gas	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMABLE LIMITS - BY VOLUME LEL N/A	UEL N/A
EXTINGUISHING MEDIA Nonflammable gas		ELECTRICAL CLASSIFICATION Nonhazardous	

SPECIAL FIRE FIGHTING PROCEDURES

N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS

Compressed air at high pressures will accelerate the burning of materials to a greater rate than they burn at atmospheric pressure.

REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
Unstable		
Stable	X	N/A

INCOMPATIBILITY (Materials to avoid)

None

HAZARDOUS DECOMPOSITION PRODUCTS

None

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur		
Will Not Occur	X	N/A

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

N/A

WASTE DISPOSAL METHOD

N/A

RESPIRATORY PROTECTION (Specify type)
N/A

VENTILATION	LOCAL EXHAUST	SPECIAL
N/A	N/A	N/A
	MECHANICAL (General)	OTHER
	N/A	N/A

PROTECTIVE GLOVES
Any material

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Air, compressed DOT Hazard Class: Nonflammable gas
DOT Shipping Label: Nonflammable gas I.D. No.: UN 1002

SPECIAL HANDLING RECOMMENDATIONS
Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult the Compressed Gas Association's Pamphlets P-1, G-7 and G-7.1.

SPECIAL STORAGE RECOMMENDATIONS
Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excesssive periods of time.

For additional storage recommendations, consult the Compressed Gas Association's Pamphlets P-1, G-7, and G-7.1.

SPECIAL PACKAGING RECOMMENDATIONS
Dry air is noncorrosive and may be used with all materials of construction. Moisture causes metal oxides which are formed with air to be hydrated so that they increase in volume and lose their protective role (rust formation). Concentrations of SO_2, Cl_2, salt, etc. in the moisture enhances the rusting of metals in air.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

CHEMICAL FORMULA: (Continued)

Atmospheric air which is compressed is composed of the following concentrations of gases:

Gas	Molar %
Nitrogen	78.09
Oxygen	20.94
Argon	0.93
Carbon Dioxide	0.033*
Neon	18.18×10^{-4}
Helium	5.239×10^{-4}
Krypton	1.139×10^{-4}
Hydrogen	0.5×10^{-4}
Xenon	0.086×10^{-4}
Radon	6×10^{-18}
Water vapor	Varying concentrations

*Concentrations may have slight variations.

Compressed air is also produced by reconstitution using only oxygen and nitrogen. This product contains 79 molar percent nitrogen and 21 molar percent oxygen plus trace amounts of other atmospheric gases which are present in the oxygen and nitrogen.

REMEDE
Products, Inc.

MATERIAL SAFETY DATA SHEET

IDENTITY - CALSPERSE 500

==========

SECTION I - PRODUCT INFORMATION

MANUFACTURER'S NAME -

Remede Products, Inc.
280 Callegari Drive
West Haven, CT 06516

TELEPHONE NUMBER FOR INFORMATION - 203/932-3655

EMERGENCY TELEPHONE NUMBER - CHEMTREC (800) 424-9300

DATE PREPARED - March 28, 1989

PREPARED BY -
Technical Manager
Remede Products, Inc.
West Haven, CT 06516

==========

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

COMPONENT	OSHA PEL	ACGIH TLV	Other Limits Recommended
Polyhydroxyacid salt	NDA	NDA	-
Organic phosphorus compound	NDA	NDA	-

==========

N/A = Not Applicable NDA = No Data Available

REMEDE Products, Inc.

MATERIAL SAFETY DATA SHEET

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point, (oF):	210 - 220
Specific Gravity, (water=1):	1.00 - 1.05
Vapor Pressure, (mm Hg.):	NDA
Melting Point, (oF):	N/A
Vapor Density, (air=1):	NDA
Evaporation Rate, (Butyl Acetate = 1):	NDA
Solubility in Water:	Complete
Appearance and Odor:	Pale straw to yellow, odorless liquid.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point, (Method Used): Non-flammable/aqueous solution.

Flammable Limits: N/A

LEL: N/A

UEL: N/A

Extinguishing Media:

N/A

Special Fire Fighting Procedures:

Firefighters should wear self-contained breathing apparatus and body covering protective clothing.

Unusual Fire and Explosion Hazards:

None

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MATERIAL SAFETY DATA SHEET

SECTION V - REACTIVITY DATA

Stability:

Stable X Unstable _____

Conditions to Avoid: NONE

Incompatibility (Materials to Avoid):

Quaternary amines, acids, sulfides and strong oxidizers.

Hazardous Decomposition or Byproducts:

Carbon dioxide and carbon monoxide.

Hazardous Polymerization:

May Occur _____ Will Not Occur X

Conditions to Avoid: NONE

SECTION VI - HEALTH HAZARD DATA

Route(s) of Entry:

Inhalation? YES Skin? YES Ingestion? YES

Health Hazards (Acute and Chronic):

Mild irritant. May be harmful or fatal if swallowed.

Carcinogenicity:

NTP? NO IARC Monographs? NO OSHA Regulated? NO

Signs and Symptons of Exposure:

Eye and skin irritant. Material may cause burns on exposed tissues with corneal injury which may result in permanent impairment of vision, or even blindness. Prolonged or repeated skin contact may cause irritation or even a burn.

Medical Conditions Generally Aggravated by Exposure:

Skin conditions

Emergency and First Aid Procedures:

Ingestion:

NEVER give anything by mouth to an unconscious person. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. If available, give several glasses of milk. If vomiting occurs spontaneously, keep airway clear. Seek medical attention immediately.

Inhalation:

Remove person to fresh air. If breathing has stopped, resuscitate and give oxygen if readily available. Seek medical attention immediately.

Eye Contact:

Immediately flush eyes with large amounts of water for at least 15 minutes, holding lids apart to ensure flushing of the entire surface. Washing eyes within 1 minute is essential to achieve maximum effectiveness. Seek medical attention immediately.

Skin Contact:

Immediately wash contaminated areas with plenty of water. Remove contaminated clothing and footwear and wash clothing before reuse. Discard footwear which cannot be decontaminated. Seek medical attention immediately.

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MATERIAL SAFETY DATA SHEET

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE:

Steps To Be Taken in Case Material is Released or Spilled:

Wear protective equipment outlined below. Absorb with inert ingredient such as sand or vermiculite, shovel into closeable container for disposal. Thoroughly flush residual with water.

Waste Disposal Method:

By methods consistant with applicable federal, state and local regulations.

Precautions to be Taken in Handling and Storing:

Wear recommended protective equipment when handling. Store in a cool, dry and well ventilated area.

Other Precautions:

None

SECTION VIII - CONTROL MEASURES:

Respiratory Protection:

NONE REQUIRED

Ventilation:

Local Exhaust - NONE

Mechanical - NONE

Special - NONE

Other - General Dilution

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MATERIAL SAFETY DATA SHEET

Protective Gloves :

RUBBER or NEOPRENE gloves.

Eye Protection:

Safety goggles or full face shield.

Other Protective Equipment:

Protective clothing or rubber apron.

Work/Hygienic Practices:

Wash hands thoroughly after handling.

==========

All information, recommendations and suggestions appearing herein concerning our product are based upon tests and data believed to be reliable. However, it is the user's responsibility to determine the safety, toxicity, and suitability for his own use of the product described herein. Since the actual use by others is beyond our control, no guarantee, expressed or implied, is made by Remede Products, Inc. as to the effects of such use, the results to be obtained, or the safety and toxicity of the product, nor does Remede Products, Inc. assume any liability arising out of use, by others, of the product referred to herein. The information herein is not be construed as absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations.

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Material Safety Data Sheets Collection:

Sheet No. 470
Diesel Fuel Oil No. 2-D

Issued: 10/81 Revision: A, 11/90

Section 1. Material Identification

33

Diesel Fuel Oil No. 2-D Description: Diesel fuel is obtained from the middle distillate in petroleum separation; a distillate oil of low sulfur content. It is composed chiefly of unbranched paraffins. Diesel fuel is available in various grades, one of which is synonymous with fuel oil No. 2-D. This diesel fuel oil requires a minimum Cetane No. (efficiency rating for diesel fuel comparable to octane number ratings for gasoline) of 40 (ASTM D613). Used as a fuel for trucks, ships, and other automotive engines; as mosquito control (coating on breeding waters); and for drilling muds.

Other Designations: CAS No. 68334-30-5, diesel fuel.

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

Cautions: Diesel fuel oil No. 2-D is a skin irritant and central nervous depressant with high mist concentrations. It is an environmental hazard and moderate fire risk.

NFPA

R	1
I	-
S	2
K	2

HMIS

H	0
F	2
R	0

PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Diesel fuel oil No. 2-D*

1989 OSHA PEL	1990-91 ACGIH TLV	1988 NIOSH REL	1985-86 Toxicity Data‡
None established	Mineral Oil Mist TWA: 5 mg/m³† STEL: 10 mg/m³	None established	Rat, oral, LD_{50}: 9 g/kg produces gastrointestinal (hypermotility, diarrhea) effects

* Diesel fuel No. 2-D tends to be low in aromatics and high in paraffinics. This fuel oil is complex mixture of: 1) >95% paraffinic, olefinic, naphthenic, and aromatic hydrocarbons, 2) sulfur (<0.5%), and 3) benzene (<100 ppm). [A low benzene level reduces carcinogenic risk. Fuel oils can be exempted under the benzene standard (29 CFR 1910.1028)]. Although low in the fuel itself, benzene concentrations are likely to be much higher in processing areas.

† As sampled by nonvapor-collecting method.

‡ Monitor NIOSH, *RTECS* (HZ1800000), for future toxicity data.

Section 3. Physical Data

Boiling Point Range: 340 to 675 °F (171 to 358 °C)

Specific Gravity: <0.86

Viscosity: 1.9 to 4.1 centistoke at 104 °F (40 °C)

Water Solubility: Insoluble

Appearance and Odor: Brown, slightly viscous liquid.

Section 4. Fire and Explosion Data

Flash Point: 125 °F (52 °C) min.	Autoignition Temperature: >500 °F (932 °C)	LEL: 0.6% v/v	UEL: 7.5% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, or foam to fight fire. Use a water spray to cool fire exposed containers. Do not use a forced water spray directly on burning oil since this will scatter the fire. Use a smothering technique for extinguishing fire.

Unusual Fire or Explosion Hazards: Diesel fuel oil No. 2-D is a OSHA Class II combustible liquid. Its volatility is similar to that of gas oil. Vapors may travel to a source of ignition and flash back.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective clothing. If feasible, remove containers from fire. Be aware of runoff from fire control methods. Do not release to sewers or waterways due to pollution and fire or explosion hazard.

Section 5. Reactivity Data

Stability/Polymerization: Diesel fuel oil No. 2-D is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: It is incompatible with strong oxidizing agents; heating greatly increases the fire hazard.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of diesel fuel oil No. 2-D can produce various hydrocarbons and hydrocarbon derivatives, and other partial oxidation products such as carbon dioxide, carbon monoxide, and sulfur dioxide.

Section 6. Health Hazard Data

Carcinogenicity: Although the IARC has not assigned an overall evaluation to diesel fuels as a group, it has evaluated occupational exposures in petroleum refining as an IARC probable human carcinogen (Group 2A). It has evaluated distillate (light) diesel oils as not classifiable as human carcinogens (Group 3).

Summary of Risks: Although diesel fuel's toxicologic effects should resemble kerosine's, they are somewhat more pronounced due to additives such as sulfurized esters. Excessive inhalation of aerosol or mist can cause respiratory tract irritation, headache, dizziness, nausea, vomiting, and loss of coordination, depending on concentration and exposure time. When removed from exposure area, affected persons usually recover completely. If vomiting occurs after ingestion and if oil is aspirated into the lungs, hemorrhaging and pulmonary edema, progressing to renal involvement and chemical pneumonitis, may result. A comparative ratio of oral to aspirated lethal doses may be 1 pt vs. 5 ml. Aspiration may also result in transient CNS depression or excitement. Secondary effects may include hypoxia (insufficient oxygen in body cells), infection, pneumatocele formation, and chronic lung dysfunction. Inhalation may result in euphoria, cardiac dysrhythmias, respiratory arrest, and CNS toxicity. Prolonged or repeated skin contact may irritate hair follicles and block sebaceous glands, producing a rash of acne pimples and spots, usually on arms and legs.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Target Organs: Central nervous system, skin, and mucous membranes.

Primary Entry Routes: Inhalation, ingestion.

Acute Effects: Systemic effects from ingestion include gastrointestinal irritation, vomiting, diarrhea, and in severe cases central nervous system depression, progressing to coma or death. Inhalation of aerosols or mists may result in increased rate of respiration, tachycardia (excessively rapid heart beat), and cyanosis (dark purplish discoloration of the skin and mucous membranes caused by deficient blood oxygenation).

Chronic Effects: Repeated contact with the skin causes dermatitis.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. If large areas of the body have been exposed or if irritation persists, get medical help immediately. Wash affected area 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, *do not induce vomiting* due to aspiration hazard. Contact a physician immediately. Position to avoid aspiration.

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

Note to Physicians: Gastric lavage is contraindicated due to aspiration hazard. Preferred antidotes are charcoal and milk. In cases of severe aspiration pneumonitis, consider monitoring arterial blood gases to ensure adequate ventilation. Observe the patient for 6 hr. If vital signs become normal or symptoms develop, obtain a chest x-ray.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate area for large spills, remove all heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Clean up spills promptly to reduce fire or vapor hazards. Use a noncombustible absorbent material to pick up small spills or residues. For large spills, dike far ahead to contain. Pick up liquid for reclamation or disposal. Do not release to sewers or waterways due to health and fire and/or explosion hazard. Follow applicable OSHA regulations (29 CFR 1910.120). Diesel fuel oil No. 2-D spills may be environmental hazards. Report large spills.

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

EPA Designations

RCRA Hazardous Waste (40 CFR 261.21): Ignitable waste

CERCLA Hazardous Substance (40 CFR 302.4): Not listed

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

SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations

Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

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: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, use a NIOSH-approved respirator with a mist filter and organic vapor cartridge. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.

Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations that promote worker safety and productivity. Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]

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

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

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: Use and storage conditions should be suitable for a OSHA Class II combustible liquid. Store in closed containers in a well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Use nonsparking tools and explosion-proof electrical equipment. No smoking in storage or use areas.

Engineering Controls: Avoid vapor or mist inhalation and prolonged skin contact. Wear protective rubber gloves and chemical safety glasses where contact with liquid or high mist concentration may occur. Additional suitable protective clothing may be required depending on working conditions. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Practice good personal hygiene and housekeeping procedures. Do not wear oil contaminated clothing. At least weekly laundering of work clothes is recommended. Do not put oily rags in pockets. When working with this material, wear gloves or use barrier cream.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Fuel oil

DOT Hazard Class: Combustible liquid

ID No.: NA1993

DOT Label: None

DOT Packaging Exceptions: 173.118a

DOT Packaging Requirements: None

RTECS Collection References: 1, 6, 7, 12, 73, 84, 101, 103, 126, 127, 132, 133, 136, 143, 146

Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MD; **Edited by:** JR Stuart, MS

17-325; 17-325-2; 17-325-3 No. 7

ANSUL ANSUL FIRE PROTECTION MARINETTE, WI 54143-2542

MATERIAL SAFETY DATA SHEET

FORAY
QUICK IDENTIFIER (In Plant Common Name)

Manufacturer's Name:	ANSUL FIRE PROTECTION, WORMALD U.S., INC.	Emergency Telephone No.:	(715) 735-7411
Address:	One Stanton Street, Marinette, WI 54143-2542	Other Information Calls:	Same
Prepared By:	Safety and Health Department	Date Prepared:	June 1, 1989

SECTION 1 — IDENTITY

Common Name: (used on label) (Trade Name and Synonyms)	FORAY Dry Chemical Extinguishing Agent	CAS No.:	N/A
Chemical Name:	N/A This is a Mixture	Chemical Family:	Mixture
Formula:	N/A		

SECTION 2 — INGREDIENTS

PART A — HAZARDOUS INGREDIENTS

Principal Hazardous Component(s) (chemical and common name(s)):	%	CAS No.	ACGIH TLV	Acute Toxicity Data
Muscovite Talc	Less than 5	12001-26-2	20 mppcf*	NDA
Magnesium Aluminum Silicate	Less than 10	8031-18-3	10 mg/M3	NDA

*Million particles per cubic foot

PART B — OTHER INGREDIENTS

Other Component(s) (chemical and common name(s)):	%	CAS No.	Acute Toxicity Data
Monoammonium Phosphate	Greater than 75	7722-76-1	NDA
Ammonium Sulfate	Greater than 10	7783-20-2	NDA
Methyl Hydrogen Polysiloxane	Less than 1	63148-57-2	NDA
Yellow Pigment	Less than 0.1	5468-75-7	NDA

SECTION 3 — PHYSICAL AND CHEMICAL CHARACTERISTICS (Fire and Explosion Data)

Boiling Point:	N/A			Specific Gravity (H_2O = 1):	N/A	Vapor Pressure (mm Hg):	N/A
Percent Volatile by Volume (%):	N/A	Vapor Density (Air = 1):	N/A	Evaporation Rate (= 1):	N/A		
Solubility in Water:	Slight			Reactivity in Water:	Unreactive		
Appearance and Odor:	Yellow colored powder, no characteristic odor						
Flash Point:	None	Flammable Limits in Air % by Volume:	N/A	Extinguisher Media:	N/A	Auto-Ignition Temperature:	N/A
Special Fire Fighting Procedures:	NONE - THIS IS AN EXTINGUISHING AGENT						
Unusual Fire and Explosion Hazards:	None						

SECTION 4 — PHYSICAL HAZARDS

Stability:	Unstable ☐ Stable ☒	Conditions to Avoid:	N/A
Incompatibility (Materials to Avoid):	Strong alkalis, Mg		
Hazardous Decomposition Products:	NH_3 and/or PO_x may be evolved		
Hazardous Polymerization:	May Occur ☐ Will Not Occur ☒	Conditions to Avoid:	N/A

No. 5

SECTION 5 — HEALTH HAZARDS

Threshold Limit Value:	OSHA nuisance dust limit of 15 mg/M3 or ACGIH nuisance dust value of 10 mg/M3 for the eight hour time-weighted average.
Routes of Entry: Eye Contact:	Mildly irritating for a short period of time.
Skin Contact:	May be mildly irritating.
Inhalation:	Treat as a mineral dust. Irritant to the respiratory tract.
Ingestion:	Not an expected route of entry.
Signs and Symptoms: Acute Overexposure:	Transient cough, shortness of breath.
Chronic Overexposure:	Chronic fibrosis of the lung, pneumoconiosis.
Medical Conditions Generally Aggravated by Exposure:	Reactive airway
Chemical Listed as Carcinogen or Potential:	National Toxicology Program: Yes ☐ No ☒ I.A.R.C. Monographs: Yes ☐ No ☒ OSHA: Yes ☐ No ☒

SECTION 6 — EMERGENCY AND FIRST AID PROCEDURES

Eye Contact:	Flush with large amounts of water; if irritation persists, seek Medical attention.
Skin Contact:	Wash with soap and water; if irritation persists, seek Medical attention.
Inhalation:	Remove victim to fresh air. Seek Medical attention if discomfort continues.
Ingestion:	If patient is conscious, give large amounts of water and induce vomiting. Seek Medical help.

SECTION 7 — SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type):	Dust mask where dustiness is prevalent, or TLV exceeded. Mechanical filter respirator if exposure is prolonged.			
Ventilation:	Local Exhaust:	Discretionary	Mechanical (General):	Recommended
Protective Gloves:	N/A		Eye Protection:	Recommended as mechanical barrier for prolonged exposure.
Other Protective Clothing or Equipment:	If irritation occurs, long sleeves and impervious gloves should be worn.			

SECTION 8 — SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage:	Should be stored in original container or Ansul fire extinguisher.
Other Precautions:	Do not mix agents.
Steps to be Taken in Case Material is Released or Spilled:	Sweep up.
Waste Disposal Methods:	Dispose of in compliance with local, state, and federal regulations.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM RATINGS

HAZARD INDEX:	
4 Severe Hazard 3 Serious Hazard 2 Moderate Hazard 1 Slight Hazard 0 Minimal Hazard	1 HEALTH 0 FLAMMABILITY 0 REACTIVITY

N/A = Not Applicable NDA = No Data Available

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Material Safety Data Sheets Collection:

Sheet No. 467
Automotive Gasoline, Lead-free

Issued: 10/81 Revision: A, 9/91

Section 1. Material Identification

Automotive Gasoline, Lead-free, Description: A mixture of volatile hydrocarbons composed mainly of branched-chain paraffins, cycloparaffins, olefins, naphthenes, and aromatics. In general, gasoline is produced from petroleum, shale oil, Athabasca tar sands, and coal. Motor gasolines are made chiefly by cracking processes, which convert heavier petroleum fractions into more volatile fractions by thermal or catalytic decomposition. Widely used as fuel in internal combustion engines of the spark-ignited, reciprocating type. Automotive gasoline has an octane number of approximately 90. A high content of aromatic hydrocarbons and a consequent high toxicity are also associated with a high octane rating. Some gasolines sold in the US contain a minor proportion of tetraethyllead, which is added in concentrations not exceeding 3 ml per gallon to prevent engine "knock." However, methyl-tert-butyl ether (MTBE) has almost completely replaced tetraethyllead.

Other Designations: CAS No. 8006-61-9, benzin, gasoline, gasolene, motor spirits, natural gasoline, petrol.

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

R 1
I 2
S 2*
K 4
* Skin absorption

NFPA

HMIS
H 2
F 3
R 1
PPG†
† Sec. 8

Cautions: Inhalation of automotive gasoline vapors can cause intense burning in throat and lungs, central nervous system (CNS) depression, and possible fatal pulmonary edema. Gasoline is a dangerous fire and explosion hazard when exposed to heat and flames.

Section 2. Ingredients and Occupational Exposure Limits

Automotive gasoline, lead-free*

1990 OSHA PELs
8-hr TWA: 300 ppm, 900 mg/m³
15-min STEL: 500 ppm, 1500 mg/m³

1990-91 ACGIH TLVs
TWA: 300 ppm, 890 mg/m³
STEL: 500 ppm, 1480 mg/m³

1990 NIOSH REL
None established

1985-86 Toxicity Data*
Man, inhalation, TC_{Lo}: 900 ppm/1 hr; toxic effects include sense organs and special senses (conjunctiva irritation), behavioral (hallucinations, distorted perceptions), lungs, thorax, or respiration (cough)
Human, eye: 140 ppm/8 hr; toxic effects include mild irritation
Rat, inhalation, LC_{50}: 300 g/m³/5 min

* A typical modern gasoline composition is 80% paraffins, 14% aromatics, and 6% olefins. The mean benzene content is approximately 1%. Other additives include sulfur, phosphorus, and MTBE.
† See NIOSH, *RTECS* (LX3300000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: Initially, 102 °F (39 °C); after 10% distilled, 140 °F (60 °C); after 50% distilled, 230 °F (110 °C); after 90% distilled, 338 °F (170 °C); final boiling point, 399 °F (204 °C)
Vapor Density (air = 1): 3.0 to 4.0
Density/Specific Gravity: 0.72 to 0.76 at 60 °F (15.6 °C)
Water Solubility: Insoluble

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

Section 4. Fire and Explosion Data

Flash Point: -45 °F (-43 °C)	Autoignition Temperature: 536 to 853 °F (280 to 456 °C)	LEL: 1.3% v/v	UEL: 6.0% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, or alcohol foam as extinguishing media. Use of water may be ineffective to extinguish fire, but use water spray to knock down vapors and to cool fire-exposed drums and tanks to prevent pressure rupture. Do not use a solid stream of water since it may spread the fuel.

Unusual Fire or Explosion Hazards: Automobile gasoline is an OSHA Class IB flammable liquid and a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow to an ignition source and flash back. Automobile gasoline can also react violently with oxidizing agents.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode, and full protective clothing. When the fire is extinguished, use nonsparking tools for cleanup. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

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

Chemical Incompatibilities: Automotive gasoline can react with oxidizing materials such as peroxides, nitric acid, and perchlorates.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of automotive gasoline can produce oxides of carbon and partially oxidized hydrocarbons.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC list gasoline as a possible human carcinogen (Group 2B). Although the IARC has assigned an overall evaluation to gasoline, it has not assigned an overall evaluation to specific substances within this group (inadequate human evidence).
Summary of Risks: Gasoline vapors are considered moderately poisonous. Vapor inhalation can cause central nervous system (CNS) depression and mucous membrane and respiratory tract irritation. Brief inhalations of high concentrations can cause a fatal pulmonary edema. Reported responses to gasoline vapor concentrations are: 160 to 270 ppm causes eye and throat irritation in several hours; 500 to 900 ppm causes eye, nose, and throat irritation, and dizziness in 1 hr; and 2000 ppm produces mild anesthesia in 30 min. Higher concentrations are intoxicating in 4 to 10 minutes. If large areas of skin are exposed to gasoline, toxic amounts may be absorbed. Repeated or prolonged skin exposure causes dermatitis. Certain individuals may develop hypersensitivity. Ingestion can cause CNS depression. Pulmonary aspiration after ingestion can cause severe pneumonitis. In adults, ingestion of 20 to 50 g gasoline may produce severe symptoms of poisoning.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Skin, eye, respiratory and central nervous systems.
Primary Entry Routes: Inhalation, ingestion, skin contact.
Acute Effects: Acute inhalation produces intense nose, throat, and lung irritation; headaches; blurred vision; conjunctivitis; flushing of the face; mental confusion; staggering gait; slurred speech; and unconsciousness, sometimes with convulsions. Ingestion causes inebriation (drunkenness), vomiting, dizziness, fever, drowsiness, confusion, and cyanosis (a blue to dark purplish coloration of skin and mucous membrane caused by lack of oxygen). Aspiration causes choking, cough, shortness of breath, increased rate of respiration, excessively rapid heartbeat, fever, bronchitis, and pneumonitis. Other symptoms following acute exposure include acute hemorrhage of the pancreas, fatty degeneration of the liver and kidneys, and passive congestion of spleen.
Chronic Effects: Chronic inhalation results in appetite loss, nausea, weight loss, insomnia, and unusual sensitivity (hyperesthesia) of the distal extremities followed by motor weakness, muscular degeneration, and diminished tendon reflexes and coordination. Repeated skin exposure can cause blistering, drying, and lesions.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area 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, *do not induce vomiting* due to aspiration hazard. Give conscious victim a mixture of 2 tablespoons of activated charcoal mixed in 8 oz of water to drink. Consult a physician immediately.
After first aid, get appropriate in-plant, paramedic, or community medical support.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Use nonsparking tools. Take up small spills with sand or other noncombustible adsorbent. Dike storage areas to control leaks and spills. Follow applicable OSHA regulations (29 CFR 1910.120).
Aquatic Toxicity: Bluegill, freshwater, LC_{50}, 8 ppm/96 hr.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
RCRA Hazardous Waste (40 CFR 261.21): Characteristic of ignitability
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. There are no specific NIOSH recommendations. However, for vapor concentrations not immediately dangerous to life or health, use chemical cartridge respirator equipped with organic vapor cartridge(s), or a supplied-air respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Materials such as neoprene or polyvinyl alcohol provide excellent/good resistance for protective clothing. Note: Resistance of specific materials can vary from product to product.
Ventilation: Provide general and local explosion-proof exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
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 in closed containers in a cool, dry, well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. Avoid direct sunlight. Storage must meet requirements of OSHA Class IB liquid. Outside or detached storage preferred.
Engineering Controls: Avoid vapor inhalation and skin or eye contact. Consider a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Indoor use of this material requires explosion-proof exhaust ventilation to remove vapors. Only use gasoline as a fuel source due to its volatility and flammable/explosive nature. Practice good personal hygiene and housekeeping procedures. Wear clean work clothing daily.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Gasoline (*including casing-head and natural*)
DOT Hazard Class: Flammable liquid
ID No.: UN1203
DOT Label: Flammable liquid
DOT Packaging Exceptions: 173.118
DOT Packaging Requirements: 173.119

IMO Shipping Name: Gasoline
IMO Hazard Class: 3.1
ID No.: UN1203
IMO Label: Flammable liquid
IMDG Packaging Group: II

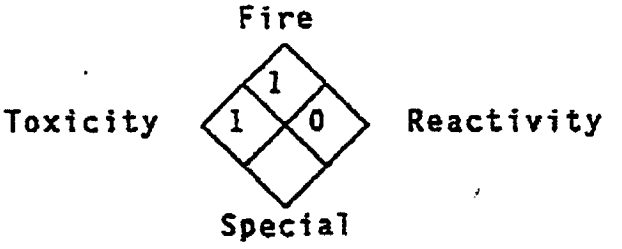
MSDS Collection **References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 138, 140, 143, 146, 153, 159
Prepared by: M Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD; **Edited by:** JR Stuart, MS

W I T C O M A T E R I A L S A F E T Y D A T A S H E E T

AMALIE MULTI-PURPOSE LS GEAR LUBRICANT

Product Code: 473 6752

NFPA HAZARD RATING
4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant



DIVISION AND LOCATION---SECTION I

Division: AMALIE REFINING COMPANY
Location: BRADFORD, PENNSYLVANIA
ONE AMALIE WAY,BRADFORD,PA,16701
Emergency Telephone Number: (814) 368-6111
Transportation Emergency: CHEMTREC 1-(800) 424-9300 (U.S. and Canada)

CHEMICAL AND PHYSICAL PROPERTIES---SECTION II

Chemical Name:
petroleum hydrocarbon plus additives
Formula: not applicable
Hazardous Decomposition Products:
carbon monoxide and carbon dioxide from burning.
oxides of phosphorous from burning
oxides of sulfur
Incompatibility (Keep away from):
strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.
Toxic and Hazardous Ingredients:
none
Form: liquid Odor: pungent,sulfur type
Appearance: viscous liquid Color: green to brown
Specific Gravity (water=1): .89
Boiling Point: greater than 330°C (625°F)
Melting Point: -18°C (0°F)
Solubility in Water (by weight %): 0 at 20°C
Volatile (by weight %): 0
Evaporation Rate: 0
Vapor Pressure (mm Hg at 20°C): 0
Vapor Density (air=1): not volatile
pH (as is): not applicable
Stability: Product is stable under normal conditions
Viscosity SUS at 100°F: Less than 100

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

Product Code: 473 6752

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:
Do not use water except as fog.

Unusual Fire and Explosion Hazards:
none

Flashpoint: (Method Used) Cleveland open cup greater than 190°C (375°F).

Flammable limits %: not applicable

Extinguishing agents:
Drychemical or Waterfog or CO_2 or Foam
Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):
If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m^3 for mineral oil mist (OSHA and ACGIH).

Chronic effects of overexposure:
Prolonged or repeated skin contact may cause dermatitis (skin irritation)

Acute toxicological properties:
no data available

Emergency First Aid Procedures:
Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.
Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.
Inhalation: Remove victim to fresh air. Call a physician.
If Swallowed: Call a physician immediately. DO NOT induce vomiting. (Vomiting may cause aspiration into lungs resulting in chemical pneumonia.)

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local,mechanical,special):
Local if necessary to maintain allowable PEL(permissible exposure limit) or TLV(threshhold limit value)

Respiratory Protection (Specify type):
Use NIOSH/MSHA certified respirator with dual organic vapor/mist and particulates cartridge if vapor concentration exceeds permissible exposure limit.

Protective Gloves:
neoprene type

Eye Protection:
chemical safety goggles

Other Protective Equipment:
none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

Product Code: 473 6752

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:
Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.

Waste Disposal:
Dispose of in accordance with all applicable federal, state and local regulations.

SPECIAL PRECAUTIONS---SECTION VII

Precautions to be taken in handling and storage:
Do not handle or store at temperatures over
Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated
Reportable Quantity: not applicable
Freight Classification: Petroleum Lubricating Oil
Special Transportation Notes:
none

COMMENTS

* STATE REGULATORY INFORMATION:
Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).
Hydrocarbon oils CAS. NO. 8020-83-5
The additive mixtures in this product have been declared a trade secret by the additive manufacturers.

Prepared by: Robert Kellam
Title: Group Supervisor, Lubricants Testing, Maintenance, and Safety
Original Date: 05/20/81 Sent to: _____
Revision Date: 07/19/94 _____
Supersedes : 04/01/93 _____
Date Sent : _____

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

Product Code: 473 6752

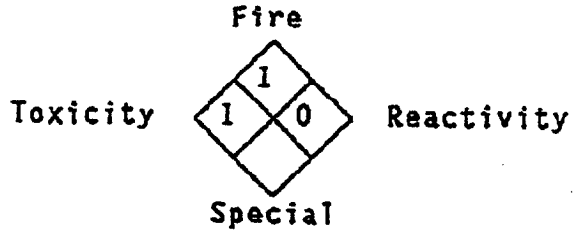
We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

WITCO MATERIAL SAFETY DATA SHEET

Kendall C-915 Grease

Product Code: J63 7834

NFPA HAZARD RATING
4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant



DIVISION AND LOCATION---SECTION I

Division: KENDALL REFINING COMPANY
Location: BRADFORD, PENNSYLVANIA
77 N. KENDALL AVE.,BRADFORD,PA,16701
Emergency Telephone Number: (814) 368-6111
Transportation Emergency: CHEMTREC 1-(800) 424-9300 (U.S. and Canada)

CHEMICAL AND PHYSICAL PROPERTIES---SECTION II

Chemical Name:
petroleum hydrocarbon and calcium stearate
Formula: not applicable
Hazardous Decomposition Products:
carbon monoxide and carbon dioxide from burning.
Incompatibility (Keep away from):
strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.
Toxic and Hazardous Ingredients:
none
Form: semi-solid Odor: mineral oil
Appearance: grease Color: black
Specific Gravity (water=1): .94
Boiling Point: greater than 260°C (500°F)
Melting Point: not applicable
Solubility in Water (by weight %): negligible
Volatile (by weight %): negligible
Evaporation Rate: negligible
Vapor Pressure (mm Hg at 20°C): negligible
Vapor Density (air=1): not applicable
pH (as is): not applicable
Stability: Product is stable under normal conditions
Viscosity SUS at 100°F: Greater than or = to 100

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:
Do not use water except as fog.
Unusual Fire and Explosion Hazards:
none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

(Section III continued)

Flashpoint: (Method Used) ASTM D92 greater than 210°C (410°F)
Flammable limits %: not applicable
Extinguishing agents:
Drychemical or Waterfog or CO_2 or Foam or Sand/Earth
Water may cause frothing.
Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):
not applicable
Chronic effects of overexposure:
Extended skin contact may cause dermatitis to some individuals.
Acute toxicological properties:
no data available
Emergency First Aid Procedures:
Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.
Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.
Inhalation: Remove victim to fresh air. Call a physician.
If Swallowed: Contact a physician immediately.

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local,mechanical,special):
none required
Respiratory Protection (Specify type):
none required
Protective Gloves:
rubber
Eye Protection:
chemical safety goggles
Other Protective Equipment:
none

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:
Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.
Waste Disposal:
Dispose of in accordance with all applicable federal, state and local regulations.

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

Kendall C-915 Grease

Product Code: J63 7834

SPECIAL PRECAUTIONS- --SECTION VII

Precautions to be taken in handling and storage:
Do not handle or store at temperatures over
Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated
Reportable Quantity: not applicable
Freight Classification: Petroleum Lubricating Grease
Special Transportation Notes:

COMMENTS

* STATE REGULATORY INFORMATION:
Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).
Hydrocarbon oils CAS. NO. 8020-83-5
Partial contents are withheld as trade secret information.

Prepared by: Robert Kellam
Title: Group Supervisor, Lubricants Testing, Maintenance, and Safety
Original Date: 06/18/82 Sent to: _____
Revision Date: 08/09/94 _____
Supersedes : 04/01/93 _____
Date Sent : _____

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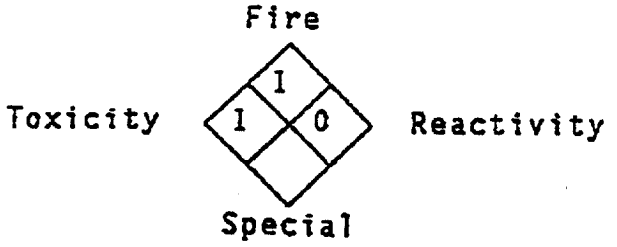
WITCO MATERIAL SAFETY DATA SHEET

KENDALL FOUR SEASONS HYDRAULIC FLUID
AW-22,32,46,68,100 and 150

NFPA HAZARD RATING
4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant



DIVISION AND LOCATION---SECTION I

Division: KENDALL REFINING COMPANY
Location: BRADFORD, PENNSYLVANIA
77 N. KENDALL AVE.,BRADFORD,PA,16701
Emergency Telephone Number: (814) 368-6111
Transportation Emergency: CHEMTREC 1-(800) 424-9300 (U.S. and Canada)

CHEMICAL AND PHYSICAL PROPERTIES---SECTION II

Chemical Name:
petroleum hydrocarbon
Formula: not applicable
Hazardous Decomposition Products:
carbon monoxide and carbon dioxide from burning.
oxides of phosphorous from burning
oxides of sulfur
Incompatibility (Keep away from):
strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.
Toxic and Hazardous Ingredients:
none
Form: liquid Odor: bland
Appearance: liquid Color: amber
Specific Gravity (water=1): .87 to .88
Boiling Point: greater than 330°C (625°F)
Melting Point: less than -18°C (0°F)
Solubility in Water-(by weight %): 0 at 20°C
Volatile (by weight %): 0
Evaporation Rate: 0
Vapor Pressure (mm Hg at 20°C): 0
Vapor Density (air=1): not volatile
pH (as is): not applicable
Stability: Product is stable under normal conditions
Viscosity SUS at 100°F: Greater than or = to 100

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:
Do not use water except as fog.
Unusual Fire and Explosion Hazards:
none
Flashpoint: (Method Used) Cleveland open cup greater than 200°C (390°F)
Flammable limits %: not applicable
Extinguishing agents:
Drychemical or Waterfog or CO_2 or Foam
Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):
see COMMENTS section
Chronic effects of overexposure:
no data available
Acute toxicological properties:
no data available
Emergency First Aid Procedures:
Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.
Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.
Inhalation: Remove victim to fresh air. Call a physician.
If Swallowed: Contact a physician immediately.

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local,mechanical,special):
see COMMENTS section
Respiratory Protection (Specify type):
Use NIOSH/MSHA certified respirator with dual organic vapor/mist and particulates cartridge if vapor concentration exceeds permissible exposure limit.
Protective Gloves:
neoprene type
Eye Protection:
chemical safety goggles
Other Protective Equipment:
none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:
Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.

Waste Disposal:
Dispose of in accordance with all applicable federal, state and local regulations.

SPECIAL PRECAUTIONS---SECTION VII

Precautions to be taken in handling and storage:
Do not handle or store at temperatures over
Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated
Reportable Quantity: not applicable
Freight Classification: Petroleum Lubricating Oil
Special Transportation Notes:
none

ENVIRONMENTAL/SAFETY REGULATIONS---SECTION IX

Section 313 (Title III Superfund Amendment and Reauthorization Act):

This product does not contain any chemical in sufficient quantity to be subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

COMMENTS

If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m3 for mineral oil mist (OSHA and ACGIH).

* STATE REGULATORY INFORMATION:

Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).
Hydrocarbon oils CAS. NO. 8020-83-5
The additive mixtures in this product have been declared a trade secret by the additive manufacturers.

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

(COMMENTS continued)

Prepared by: Robert Kellam
Title: Group Supervisor, Lubricants Testing, Maintenance, and Safety
Original Date: 05/24/89 Sent to: _____
Revision Date: 08/09/94 _____
Supersedes : 04/01/93 _____
Date Sent : _____

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

Genium Publishing Corporation
One Genium Plaza
Schenectady, NY 12304-4690 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 30A
Hydrochloric Acid
Issued: 10/77 Revision: C, 9/92 Erratum: 5/93

Section 1. Material Identification

Hydrochloric Acid (HCl) Description: An aqueous solution of hydrogen chloride. Derived by dissolving hydrogen chloride gas in water at various concentrations. Hydrochloric acid is also formed as a byproduct from oxychlorination and/or oxyhydrochlorination of organic materials. Used in metal pickling and cleaning (boiler and heat exchange equipment scale removal), ore reduction, processing (corn syrup, hydrolyzing starch), dye and dye intermediate production, electroplating, leather tanning, in fertilizer, artificial silk, and paint pigment production, refining soaps and edible fats and oils, petroleum extraction, toilet bowl cleaners; as an alcohol denaturant, a chemical intermediate and solvent in organic synthesis, and in the photographic, textile, and rubber industries.

Other Designations: CAS No. 7647-01-0, Caswell No. 486, chlorohydric acid, Muriatic acid, spirits of salt.

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

Cautions: Hydrochloric acid is highly corrosive and causes serious skin and eye burns as well as acute and chronic respiratory problems.

R	1
I	4
S	4
K	0

NFPA

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

Section 2. Ingredients and Occupational Exposure Limits

Hydrochloric acid; ~38% (commercial), 20% ("azeotrope"). Trace impurities include ammonia, arsenic, iron, sulfate, free Cl-, and heavy metals.

1991 OSHA PEL
Ceiling: 5 ppm (7 mg/m^3)

1990 IDLH Level
100 ppm

1990 NIOSH REL
Ceiling: 5 ppm (7 mg/m^3)

1992-93 ACGIH TLV
Ceiling: 5 ppm (7.5 mg/m^3)

1990 DFG (Germany) MAK
Ceiling: 5 ppm (7 mg/m^3)
Category 1: local irritants
Peak Exposure Limit: 10 ppm, 5 min momentary value/8 per shift

1985-86 Toxicity Data*
Human, inhalation, LC_{Lo}: 1300 ppm/30 min; toxic effects not yet reviewed
Rabbit, oral, LD_{50}: 900 mg/kg; toxic effects not yet reviewed
Rat, inhalation, TC_{Lo}: 450 mg/m^3/1 hr (1 day prior to pregnancy) produced fetotoxicity (except death) & specific developmental abnormalities (homeostasis).
Rabbit, eye: 100 mg rinse caused mild irritation.

*See NIOSH, *RTECS* (MW4025000), for additional irritation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: -120.64 °F (-84.8 °C)*
Vapor Pressure: 4 atm at 64 °F (17.8 °C)
Vapor Density (Air = 1): 1.257
Surface Tension: 23 at 244.68 (118.16 °C)
Molecular Weight: 36.46
Odor Threshold: 0.1 to 5 ppm
Ionization Potential: 12.74 eV

Freezing Point: 1.1 °F (-17.14 °C) for 10.81%, -51.16 °F (-46.2 °C) for 31.24%
Density: 1.194 at -14.8 °F (-26 °C)
Water Solubility: Soluble, 823 g/L at 32 °F (0 °C); 561 g/L at 140 °F (60 °C).
Other Solubilities: Soluble in alcohol, benzene, and ether; insoluble in hydrocarbons.
pH: 1N (0.1), 0.1N (1.1), 0.01N (2.02), 0.001N (3.02), 0.0001N (4.01)
Refraction Index (1N solution): 1.34168 at 64.4 °F (18 °C/D)

Appearance and Odor: Colorless liquid that fumes in air and has a strong pungent odor. Can be slightly yellow from traces of iron, chlorine, or organic matter. Forms a constant boiling azeotrope at 20 % HCl, 108.58 °C and 760 mm Hg.

* Decomposes at 3239.6 °F (1782 °C).

Section 4. Fire and Explosion Data

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

Extinguishing Media: Use extinguishing agents suitable for surrounding fire.
Unusual Fire or Explosion Hazards: *Extreme heat or contact with many metals liberates hydrogen gas which has explosion limits of 4 to 75%.
Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing is *ineffective* for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out. *Do not* release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Hydrochloric acid has high thermal stability (decomposes at 3239.6 °F/1782 °C). Hazardous polymerization does not occur unless exposed to aldehydes or epoxides.
Chemical Incompatibilities: Polymerizes on contact with aldehydes or epoxides; attacks most metals (except mercury, silver, gold, platinum, tantalum, and some alloys), some plastics, rubber, and coatings; reacts explosively with alcohols + hydrogen cyanide, potassium permanganate, tetraselenium tetranitride; ignites on contact with fluorine, hexalithium disilicide, metal acetylides or carbides (cesium acetylide, rubidium acetylide); and is incompatible with acetic anhydride, 2-amino ethanol, ammonium hydroxide, calcium phosphide, chlorosulfonic acid, 1,1-difluoroethylene, ethylene diamine, ethylene imine, oleum, perchloric acid, ß-propiolacetone, propylene oxide, sodium hydroxide, silver perchlorate + carbon tetrachloride, sulfuric acid, uranium phosphide, acetate, calcium carbide, magnesium bromide, mercuric sulfate, and chlorine + dinitroaniline.
Conditions to Avoid: Avoid contact with incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition of HCl produces toxic chloride fumes and explosive hydrogen gas.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,(164) NTP,(169) and OSHA(164) do not list HCl as a carcinogen.
Summary of Risks: HCl is a highly corrosive liquid and depending on concentration and duration of exposure, symptoms range from irritation to ulcerations and permanent injury. **Target Organs:** Eyes, skin, respiratory tract, and liver (in animals). **Primary Entry Routes:** Inhalation, skin and eye contact. **Medical Conditions Aggravated by Long-Term Exposure:** Respiratory disorders.

Continue on next page

Section 6. Health Hazard Data, *continued*

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

FIRST AID

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

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

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

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Neutralize spills with crushed limestone, soda ash, lime, or sodium bicarbonate. After neutralizing, take up small spills with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for disposal; flush large spills to containment area and reclaim (if possible) or await disposal. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** In soil, HCl will infiltrate moving faster in the presence of moisture. It may dissolve some soil matter, particularly those of a carbonate base will be neutralized to some degree and will be transported to groundwater. **Ecotoxicity Values:** Chronic plant toxicity = 100 ppm; injurious to irrigatable crops at 350 mg/L; trout, LC_{100}, 10 mg/L/24 hr shrimp, LC_{50}, 100 to 330 ppm/starfish, LC_{50}, 100 to 330 mg/L/48 hr; shore crab, LC_{50}, 240 mg/L/48 hr. **Disposal:** Neutralize to between 5.5 & 8.5 before disposal. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.23, *0.01N solution or higher*): No. D002, Characteristic of corrosivity
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 5000 lb (2270 kg) [* per CWA, Sec. 311 (b)(4)]
SARA Extremely Hazardous Substance (40 CFR 355), TPQ: Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)

OSHA Designations

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

Section 8. Special Protection Data

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

Section 9. Special Precautions and Comments

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

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

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

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Hydrochloric acid, solution
DOT Hazard Class: 8
ID No.: UN1789
DOT Label: Corrosive
DOT Packing Group: II
Special provisions (172.102): A3, A6, B2, B15, N41, T9, T27

Packaging Authorizations
a) **Exceptions:** 173.154
b) **Non-bulk Packaging:** 173.202
c) **Bulk Packaging:** 173.242

Quantity limitations
a) **Passenger, Aircraft, or Railcar:** 1 L
b) **Cargo Aircraft Only:** 30 L

Vessel Stowage Requirements
a) **Vessel Stowage:** C
b) **Other:** 8

***MSDS Collection* References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 148, 149, 153, 159, 163, 164, 167, 168, 171, 174, 180
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MPH, MD

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

PRODUCT NAME	Isobutylene
TELEPHONE (415) 977-8500 EMERGENCY RESPONSE INFORMATION ON PAGE 2	

LIQUID AIR CORPORATION ALPHAGAZ DIVISION One California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94596	TRADE NAME AND SYNONYMS Isobutylene	CAS NUMBER 115-11-7
	CHEMICAL NAME AND SYNONYMS Isobutene, Isobutylene, 2-Methylpropene	
ISSUE DATE AND REVISIONS OCTOBER 1, 1985 CORPORATE SAFETY DEPT.	FORMULA (iso) C_4H_8	MOLECULAR WEIGHT 56.03
		CHEMICAL FAMILY Monolefin

See last page.

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT Isobutylene is defined as a simple asphyxiant. Oxygen levels should be maintained at greater than 18 molar percent at normal atmospheric pressure which is equivalent to a partial pressure of 135 mm Hg. (ACGIH. 1984-85)

SYMPTOMS OF EXPOSURE

Inhalation: Moderate concentrations so as to exclude an adequate supply of oxygen to the lungs causes dizziness, drowsiness and eventual unconsciousness. It also has a very mild anesthetic effect which might cause lack of co-ordination or lessened mental alertness.

Skin and Eye Contact: It is mildly irritating to mucous membranes. Due to its rapid rate of evaporation, it can cause tissue freezing or frostbite on dermal contact.

TOXICOLOGICAL PROPERTIES

It has a very mild anesthetic effect; however, the major property is the exclusion of an adequate supply of oxygen to the lungs.

Frostbite effects are a change in color of the skin to gray or white possibly followed by blistering.

Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	Yes ☐ No ☒	I.A.R.C. Monographs	Yes ☐ No ☒	OSHA	Yes ☐ No ☒
---	---	---	---	---	---	---

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO ISOBUTYLENE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Medical assistance should be sought immediately.

Dermal Contact or Frostbite: Remove contaminated clothing and flush affected areas

(Continued on last page.)

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Isobutylene is flammable over a wide range in air.

PHYSICAL DATA

BOILING POINT 19.18°F (-7.12°C)	**LIQUID DENSITY AT BOILING POINT** 39.09 lb/ft^3 (626.2 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C) = 38.43 psia (265 kPa)	**GAS DENSITY AT 70°F 1 atm** .148 lb/ft^3 (2.37 kg/m^3)
SOLUBILITY IN WATER Insoluble	**FREEZING POINT** -220.63°F (-140.35°C)

APPEARANCE AND ODOR Colorless gas with an unpleasant odor similar to that which is emitted when burning anthracite coal. Specific gravity @70°F (Air = 1.0) is 1.98.

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) -105°F (-76°C) Closed cup	**AUTO IGNITION TEMPERATURE** 869°F (465°C)	**FLAMMABLE LIMITS % BY VOLUME** LEL: 1.8 UEL: 9.6
EXTINGUISHING MEDIA Water, carbon dioxide, dry chemical		**ELECTRICAL CLASSIFICATION** Class 1, Group not specified

SPECIAL FIRE FIGHTING PROCEDURES

possible, stop the flow of isobutylene. Use water spray to cool surrounding containers.

UNUSUAL FIRE AND EXPLOSION HAZARDS Isobutylene is heavier than air and may travel a considerable distance to a source of ignition. Should flame be extinguished and flow of gas continue, increase ventilation to prevent flammable mixture formation in low areas or pockets.

REACTIVITY DATA

STABILITY Unstable		**CONDITIONS TO AVOID**
Stable	X	

INCOMPATIBILITY (Materials to avoid) Oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS None

HAZARDOUS POLYMERIZATION May Occur		**CONDITIONS TO AVOID**
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact the closest Liquid Air Corporation location.

WASTE DISPOSAL METHOD

Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to Liquid Air Corporation for proper disposal. For emergency disposal, contact the closest Liquid Air Corporation location.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air-line with mask or self-contained breathing apparatus should be available for emergency use.

VENTILATION	LOCAL EXHAUST	SPECIAL
Hood with forced ventilation	To prevent accumulation above the LEL.	
	MECHANICAL (Gen.) In accordance with electrical codes.	**OTHER**

PROTECTIVE GLOVES
Plastic or rubber

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes, safety shower, eyewash "fountain"

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Liquefied petroleum gas DOT Hazard Class: Flammable gas
DOT Shipping Label: Flammable gas I.D. No.: UN 1075

SPECIAL HANDLING RECOMMENDATIONS
Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<250 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations consult L'Air Liquide's *Encyclopedia de Gaz* or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS
Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and emptry cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional storage recommendations consult L'Air Liquide's Encyclopedia de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS
Isobutylene is noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Earth-ground and bond all lines and equipment associated with the isobutylene system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ADDITIONAL DATA

RECOMMENDED FIRST AID TREATMENT: (Continued)

with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.

TIME WEIGHTED AVERAGE EXPOSURE LIMIT (Continued)

TWA (OSHA, 1985) for LPG (Liquefied Petroleum Gas) is 1,000 molar PPM.

No. 14

Genium Publishing Corp.
One Genium Plaza
Schenectady, NY 12304-4690
(518) 377-8854

Material Safety Data Sheets Collection

Isopropyl Alcohol MSDS No. 324

**Note: 2 pages

Date of Preparation: 9/85 Revision: A, 10/93

Section 1 - Chemical Product and Company Identification 42

Product/Chemical Name: Isopropyl Alcohol
Chemical Formula: $(CH_3)_2CHOH$
CAS No.: 67-63-0
Synonyms: Dimethyl carbinol, 2-hydroxypropane, IPA, Isohol, Lutosol, isopropanol, Petrohol, 2-propanol, *sec*-propyl alcohol, rubbing alcohol, Spectrar.
Derivation: Treating propylene with sulfuric acid and then hydrolyzing or direct hydration of propylene using superheated steam. Most commonly available as rubbing alcohol (70% IPA).
General Use: As a solvent for gums, shellac, and essential oils, chemical intermediate, dehydrating agent, vehicle for germicidal compounds, de-icing agent for liquid fuels; for denaturing ethyl alcohol, preserving pathological specimens; in extraction of alkaloids, quick-drying inks and oils, and an ingredient of skin lotions, cosmetics, window cleaner, liquid soaps, and pharmaceuticals.
Vendors: Consult the latest *Chemical Week Buyers' Guide.* (73)

Section 2 - Composition / Information on Ingredients

Isopropyl alcohol, 100% vol. Most commonly sold as 70% isopropyl alcohol (rubbing alcohol).

OSHA PELs 8-hr TWA: 400 ppm (980 mg/m^3) STEL: 500 ppm (1225 mg/m^3) *	**NIOSH REL** 10-hr TWA: 400 ppm (980 mg/m^3) STEL: 500 ppm (1225 mg/m^3)	**DFG (Germany) MAK** TWA: 400 ppm (980 mg/m^3) Category II: Substances with systemic effects Half-life: < 2 hr
ACGIH TLVs TWA: 400 ppm (983 mg/m^3) STEL: 500 ppm (1230 mg/m^3)	**IDLH Level** 12,000 ppm	Peak Exposure Limit: 800 ppm, 30 min. average value, 4/shift

* Vacated 1989 Final Rule Limits

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Isopropyl alcohol is a highly flammable, volatile liquid. It is considered more toxic than ethyl alcohol, but less toxic than methyl alcohol. Inhalation can cause irritation of the eyes and respiratory tract and central nervous system depression at high concentrations. Repeated skin contact may cause dermatitis. Systemic toxicity appears to occur mostly in cases of heavy ingestion or inhalation. There is recent evidence that skin absorption may be more likely to cause systemic effects than previously thought.

Wilson Risk Scale	
R	1
I	2
S	2*
K	3

*Skin absorption

HMIS	
H	1
F	3
R	0

PPE†
†Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation, ingestion, skin contact/absorption.
Target Organs: Eyes, skin, respiratory system.
Acute Effects
Inhalation: Vapor inhalation is irritating to the respiratory tract and can cause central nervous system depression at high concentrations. *Volunteers exposed to 400 ppm for 3 to 5 min experienced mild eye and respiratory irritation.* At 800 ppm, irritation was not severe, but most people found the air uncomfortable to breathe.
Eye: Exposure to the vapor or direct contact with the liquid causes irritation and possible corneal burns.
Skin: Some irritation may occur after prolonged exposure.
Ingestion: Accidental ingestions have provided the most information on isopropyl alcohol toxicity. Symptoms include nausea and vomiting, headache, facial flushing, dizziness, lowered blood pressure, mental depression, hallucinations and distorted perceptions, difficulty breathing, respiratory depression, stupor, unconsciousness, and coma. Kidney insufficiency including oliguria (reduced urine excretion), anuria (absent urine excretion), nitrogen retention, and edema (fluid build-up in tissues) may occur. One post-mortem examination in a case of heavy ingestion showed extensive hemorrhagic tracheobronchitis, broncho-pneumonia, and hemorrhagic pulmonary edema. Death can occur in 24 to 36 h post-ingestion due to respiratory paralysis.
Carcinogenicity: NTP and OSHA do not list isopropyl alcohol as a carcinogen. The IARC has studied IPA and has classified it as Class-3 (unclassifiable, inadequate human and animal evidence). There appears to be an association between the *manufacture* (strong acid process, rather than the alcohol itself) of isopropanol and parasinus cancer, but this may be due to the diisopropyl sulfate or isopropyl oil by-products.
Medical Conditions Aggravated by Long-Term Exposure: Dermatitis or respiratory or kidney disorders.
Chronic Effects: Repeated skin contact can cause drying of skin and delayed hypersensitivity reactions in some individuals.

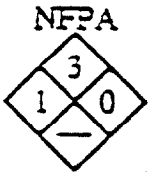
Other: Isopropyl alcohol is oxidized in the body to acetone where it is excreted by the lungs or kidneys. Some acetone may be further metabolized to acetate, formate, and finally carbon dioxide. Probable oral lethal dose is 240 mL.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.
Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. Vomiting may be contraindicated because of the rapid onset of central nervous system depression. Gastric lavage is preferred.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Diagnostic test: acetone in urine.

Section 5 - Fire Fighting Measures

Flash Point: 53 °F (12 °C)
Flash Point Method: CC
Burning Rate: 2.3 mm/min.
Autoignition Temperature: 750°F (399°C)
LEL: 2 % v/v
UEL: 12.7 % v/v at 200 °F
Flammability Classification: Class 1B Flammable Liquid



Extinguishing Media: Carbon dioxide, dry chemical, water *spray* (solid streams can spread fire), alcohol-resistant foam, or fog.
Unusual Fire or Explosion Hazards: Container may explode in heat of fire. Vapors may travel to an ignition source and flash back. Isopropyl alcohol poses an explosion hazard indoors, outdoors, and in sewers.
Hazardous Combustion Products: Carbon oxides and acrid smoke.
Fire-Fighting Instructions: If possible without risk, move container from fire area. Apply cooling water to container side until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. *Do not* release runoff from fire control methods to sewers or waterways.
Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection.

Section 6 - Accidental Release Measures

Spill/Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel should protect against vapor inhalation and skin/eye contact. Water spray may reduce vapor, but may not prevent ignition in closed spaces.
Small Spills: Take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers.
Large Spills
Containment: For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use non-sparking tools to open containers.
Storage Requirements: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec 10). Install electrical equipment of Class I, Group D.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all equipment used with and around IPA.
Ventilation: Provide general or local exhaust ventilation systems to maintain airborne levels below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.(103)
Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the skin, kidneys, and respiratory system. Be extra cautious when using IPA concurrently with carbon tetrachloride because animal studies have shown it enhances carbon tetrachloride's toxicity.
Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Nitrile rubber (breakthrough time > 8 hr), Neoprene and Teflon (breakthrough time > 4 hr) are suitable materials for PPE. Do not use PVA, PVC or natural rubber (breakthrough time < 1 hr). Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use any powered, air purifying respirator with organic vapor cartridges or any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s). For < 10,000 ppm, use any supplied-air respirator (SAR) operated in continuous-flow mode. For < 12,000 ppm, use any air-purifying, full facepiece respirator (gas mask) with a chin-style, front-or back-mounted organic vapor canister or any SCBA or SAR with a full facepiece. For emergency or entrance into unknown concentrations, use any SCBA or SAR (with auxiliary SCBA) with a full facepiece and operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

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

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

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

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance and Odor: Colorless with a slight odor and bitter taste.

Odor Threshold: 22 ppm*

Vapor Pressure: 44 mm Hg at 25 °F (77 °C)

Saturated Vapor Density(Air = 1.2 kg/m^3, 0.075 lb/ft^3): 1.274 kg/m^3 or 0.080 lb/ft^3

Formula Weight: 60.09

Density (H_2O=1, at 4 °C): 0.78505 at 68°F (20 °C)

Water Solubility : > 10 %

Ionization Potential: 10.10 eV

Other Solubilities: Soluble in alcohol, ether, chloroform, and benzene. Insoluble in salt solutions.

Boiling Point: 180.5 °F (82.5 °C)

Freezing Point: -129.1 °F (-89.5 °C)

Viscosity: 2.1 cP at 77 °F (25 °C)

Refraction Index: 1.375 at 68 °F (20 °C)

Surface Tension: 20.8 dyne/cm at 77 °F (25 °C)

Critical Temperature: 455 °F (235 °C)

Critical Pressure: 47 atm

Octanol/Water Partition Coefficient: log Kow = 0.05

* References range from 1 to as high as 610 ppm.

Section 10 - Stability and Reactivity

Stability: Isopropyl alcohol is stable at room temperature in closed containers under normal storage and handling conditions.

Polymerization: Hazardous polymerization does not occur.

Chemical Incompatibilities: Include acetaldehyde, chlorine, ethylene oxide, acids and isocyanates, hydrogen + palladium, nitroform, oleum, phosgene, potassium *t*-butoxide, oxygen (forms unstable peroxides), trinitromethane, barium perchlorate, tetrafluoroborate, chromium trioxide, sodium dichromate + sulfuric acid, aluminum, aluminum triisopropoxide, and oxidizers. Will attack some forms of plastic, rubber, and coatings.

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

Hazardous Decomposition Products: Thermal oxidative decomposition of isopropyl alcohol can produce carbon oxides and acrid smoke.

Section 11 - Toxicological Information

Toxicity Data:*

Eye Effects:
Rabbit, eye: 100 mg caused severe irritation.

Skin Effects:
Rabbit, skin: 500 mg caused mild irritation.

Reproductive:
Rat, inhalation: 3500 ppm/7 hr given from 1 to 19 days of pregnancy caused fetotoxicity.

Acute Oral Effects:
Human, oral, TD_{Lo}: 223 mg/kg caused hallucinations, distorted perceptions, lowered blood pressure, and a change in pulse rate.
Human, oral, LD_{Lo}: 3570 mg/kg caused coma, respiratory depression, nausea, and vomiting.
Rat, oral, LD_{50}: 5045 mg/kg caused a change in righting reflex, and somnolence (general depressed activity).

* See NIOSH, *RTECS* (NT3050000), for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: Guppies (*Poecilia reticulata*) LC_{50} = 7,060 ppm/7 days; fathead minnow (*Pimephales promelas*) LC_{50} = 11,830 mg/L/1 hr. BOD = 133 %/5 days.

Environmental Degradation: On soil, IPA will volatilize or leach into groundwater. Biodegradation is possible but rates are not found in available literature. It will volatilize (est. half-life = 5.4 days) or biodegrade in water. It is not expected to bioconcentrate in fish. In the air, it reacts with photochemically produced hydroxyl radicals with a half-life of one to several days. Because it is soluble, removal by rain, snow or other precipitation is possible.

Section 13 - Disposal Considerations

Disposal: Microbial degradation is possible by oxidizing isopropyl alcohol to acetone by members of the genus *Desulfovibrio*. Spray waste into incinerator (permit-approved facilities only) equipped with an afterburner and scrubber. Isopropyl alcohol can be settled out of water spills by salting with sodium chloride. Note: Salt may harm aquatic life, so weigh the benefits against possible harm before application. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
Container Cleaning and Disposal: Triple rinse containers.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Isopropanol or isopropyl alcohol
Shipping Symbols: –
Hazard Class: 3
ID No.: UN1219
Packing Group: II
Label: Flammable Liquid
Special Provisions (172.102): T1

Packaging Authorizations
a) Exceptions: 173.150
b) Non-bulk Packaging: 173.202
c) Bulk Packaging: 173.242

Quantity Limitations
a) Passenger, Aircraft, or Railcar: 5 L
b) Cargo Aircraft Only: 60 L

Vessel Stowage Requirements
a) Vessel Stowage: B
b) Other: –

Section 15 - Regulatory Information

EPA Regulations:
Listed as a RCRA Hazardous Waste Number (40 CFR 261.21)
RCRA Hazardous Waste Classification (40 CFR 261.21): Characteristic of Ignitability
Listed (Unlisted Hazardous Waste, Characteristic of Ignitability) as a CERCLA Hazardous Substance (40 CFR 302.4) per RCRA, Sec. 3001
CERCLA Reportable Quantity (RQ), 100 lb (45.4 kg)
SARA 311/312 Codes: 1, 2, 3
Listed as a SARA Toxic Chemical (40 CFR 372.65); *only persons who manufacture by the strong acid process are subject: no supplier notification.*
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed
OSHA Regulations:
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)

Section 16 - Other Information

References: 73, 103, 124, 126, 127, 132, 136, 139, 148, 153, 159, 164, 167, 168, 176, 187

Prepared By ____ M Gannon, BA
Industrial Hygiene Review ____ PA Roy, MPH, CIH
Medical Review ____ T Thoburn, MD, MPH

MATERIAL SAFETY DATA SHEET

NOTE: This Material Safety Data Sheet (MSDS) is prepared for . industrial/commercial use situations. The preparation of this MSDS may be required by law but this is not an assertion that this product presents a risk in the normal consumer use situation.

1. PRODUCT IDENTIFICATION

PRODUCT (AS LABELED):	Dove® Dishwashing Liquid
GENERAL USE:	A consumer hand dishwashing liquid
MANUFACTURER'S NAME: **ADDRESS:**	LEVER BROTHERS COMPANY 390 Park Avenue New York, NY 10022
BUSINESS PHONE:	212-688-6000
DATE OF PREPARATION **MSDS#:**	8/01/95 C024, Replaces version dated 2/2/95

2. COMPOSITION and INFORMATION ON INGREDIENTS

INGREDIENTS: The cleaning agents in Dove are biodegradable. Dove contains no phosphorous.

		EXPOSURE LIMITS IN AIR*			
		ACGIH		OSHA	
CHEMICAL NAME:	**CAS#**	**TLV mg/m³**	**STEL mg/m³**	**PEL mg/m³**	**STEL mg/m³**
Ammonium alkyl benzene sulfonate	1331-61-9	NA	NA	NA	NA
Ammonium alcohol ethoxysulfate	NA	NA	NA	NA	NA
Lauric-Myristic monoethanolamide	NA	NA	NA	NA	NA
Sodium aryl sulfonate	NA	NA	NA	NA	NA
Ethanol	64-17-5	1000ppm	NA	1000ppm	3300ppm

NA = Not Applicable
*See Section 12. for DEFINITION OF TERMS

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: **EMERGENCY OVERVIEW:** This product is a liquid detergent with a perfumed odor. It presents a low risk other than a possible slip hazard in the event of a spill.

POTENTIAL HEALTH EFFECTS:

CONTACT WITH SKIN: No irritation with brief contact. Possible irritation from prolonged or repeated industrial contact.
CONTACT WITH EYES: May cause mild irritation and discomfort.
INGESTION: May cause gastrointestinal irritation with nausea, vomiting, and delayed diarrhea.
INHALATION: While inhalation of a product mist is unlikely, such exposure may cause transient upper respiratory irritation.
CHRONIC HEALTH EFFECTS: None expected.
CONSUMER PRODUCT PRECAUTIONARY STATEMENT: Not for use in automatic dishwashers. Do not mix with chlorine bleach or other household cleaning products.KEEP OUT OF REACH OF CHILDREN.

4. FIRST-AID MEASURES

SKIN EXPOSURE: Rinse with water.
EYE EXPOSURE: Flush with water for 15 minutes.
INGESTION: Do not induce vomiting. Drink a glass of milk or water.
INHALATION: Move individual to fresh air.
Note: If symptoms persist, seek medical attention.

5. FIRE-FIGHTING MEASURES

FLASH POINT: No flash to 200 F..
AUTOIGNITION TEMPERATURE: Not applicable.
FLAMMABLE LIMITS(in air by volume,%): Not applicable.
FIRE EXTINGUISHING MATERIALS: Not applicable.

Water Spray: Yes	Carbon Dioxide: Yes	Foam: Yes
Dry Chemical: Yes	Halon: Yes	

UNUSUAL FIRE AND EXPLOSION HAZARDS: Product is not combustible. Use appropriate fire extinguishing agent for the packaging material.

SPECIAL FIRE FIGHTING PROCEDURES; None.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Disposal is to be performed in compliance with applicable laws. Small or household quantities may be disposed of in refuse or sewer. Product contains biodegradable ingredients. Contains no phosphorous. For large (industrial) releases, prevent spill from entering a waterway. Absorbent materials may be used.

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: Use personal protective equipment appropriate for the task.
STORING AND HANDLING PRACTICES: None required with normal use.
PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Use personal protective equipment when contact is likely.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Mechanical ventilation not normally required during normal operation.
EYE PROTECTION: Wear safety glasses.
HAND PROTECTION: Wear rubber gloves for prolonged contact.

BODY PROTECTION: None required.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: Not applicable.
SPECIFIC GRAVITY:1.032 - 1.048
SOLUBILITY IN WATER: soluble.
VAPOR PRESSURE,mm Hg @ 20 C:(approximately) 18
EVAPORATION RATE(water=1): 1
MELTING POINT OR RANGE: < 0 C
BOILING POINT: > 100 C
pH(1% solution): 6.0 - 6.9 (as is)
APPEARANCE AND COLOR: This liquid is a pleasant smelling, slippery, opaque white solution.

10. STABILITY and REACTIVITY

STABILITY: Stable.
DECOMPOSITION PRODUCTS: None.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Do not mix with chlorine bleach.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Do not use in automatic dishwasher.

11. TRANSPORTATION INFORMATION

THIS MATERIAL IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Not applicable.
HAZARD CLASS NUMBER and DESCRIPTION: Not applicable.
UN IDENTIFICATION NUMBER: Not applicable.
PACKING GROUP: Not applicable.
DOT LABEL(S) REQUIRED: Not applicable.
EMERGENCY RESPONSE GUIDE NUMBER: Not applicable.
MARINE POLLUTANT: Not applicable.

CANADIAN TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS NOT CLASSIFIED AS" DANGEROUS GOODS".

12. OTHER INFORMATION

PREPARED BY: LEVER BROTHERS COMPANY
NEW YORK, NY 10022

The information contained in this MSDS is based on data which is believed to be accurate. While Lever Brothers Company believes that the data contained herein comply with 29 CFR 1910.1200, they are not to be taken as a warranty or representation for which Lever Brothers Company assumes legal responsibility. They are offered solely for your consideration and verification. This MSDS is not prepared for consumer use situations.

Genium Publishing Corporation
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Material Safety Data Sheets Collection:

Sheet No. 440
Methane

Issued: 7/80 Revision: A, 8/89

Section 1. Material Identification

29

Methane Description: Widely distributed in nature, methane comprises 0.00022% by volume of the earth's atmosphere. American natural gas is mostly methane (85%). At temperatures greater than 2012 °F (1100 °C), pure carbon combines with pure hydrogen to form methane. Above 2732 °F (1500 °C), the amount of methane produced increases with temperature. Obtained from sodium acetate and sodium hydroxide or from aluminum carbide and water. Commercially prepared from natural gas or by fermentation of cellulose and sewage sludge. Constituent of illuminating and cooking gas. Used in the manufacture of hydrogen, hydrogen cyanide, ammonia, acetylene, formaldehyde, and many other organics.
Other Designations: Fire damp; marsh gas; methyl hydride; CH_4; CAS No. 0074-82-8.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide* (Genium ref. 73) for a suppliers list.

R	1
I	-
S	-
K	4

NFPA

HMIS
H 1
F 4
R 0
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Methane, ca 100%*

OSHA PEL	ACGIH TLV, 1988-89	NIOSH REL	Toxicity Data†
None established	None established	None established	Not listed

* Check with your supplier to determine the exact composition of the purchased methane. Possible contaminants are ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}), higher molecular weight alkanes, carbon dioxide (CO_2), nitrogen (N_2), and oxygen(O_2).
† Monitor NIOSH, *RTECS* (PA1490000), for future toxicity data.

Section 3. Physical Data

Boiling Point: -259 °F (161.6 °C)
Vapor Density (Air = 1): 0.544 at 32 °F (0 °C)
Molecular Weight: 16 g/mol
Water Solubility: Slight*
Melting Point: -296.5 °F (-182.5 °C)

Appearance and Odor: A colorless, odorless, tasteless, extremely flammable gas. Commercial methane's trace amounts of a suitable mercaptan compound give it natural gas's familiar rotten egg smell.

*Soluble in alcohol and ether.

Section 4. Fire and Explosion Data

Flash Point: -213 °F (-136.11 °C)	Autoignition Temperature: 999 °F (537 °C)	LEL: 5% v/v*	UEL: 15% v/v*

Extinguishing Media: Methane's extreme flammability, extensive explosibility range, and very low flash point represent dangerous fire and explosion risks. *Treat any fire situation involving rapidly escaping and burning methane gas as an emergency.* Extinguish methane fires by shutting off the source of the gas. Use water sprays to cool fire-exposed containers and to protect the personnel attempting to seal the source of the escaping gas.
Unusual Fire or Explosion Hazards: Methane gas is very flammable with an extensive explosibility range. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipelines. Never extinguish the burning gas without first locating and sealing its source. Otherwise, the still leaking gas could explosively re-ignite without warning and cause more damage than if it burned itself out.
Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

* The loudest methane-air explosions occur when 1 volume of methane is mixed with 10 volumes of air (or 2 volumes of oxygen). **Warning:** Air with more than 14% by volume methane burns *noiselessly*. Methane burns with a pale, faintly luminous, not always easily detected flame.

Section 5. Reactivity Data

Stability/Polymerization: Methane is stable at room temperature in closed, pressurized containers during routine operations. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Genium reference 84 reports that methane can react violently with bromine pentafluoride, chlorine, chlorine dioxide, nitrogen trifluoride, liquid oxygen, and oxygen difluoride.
Conditions to Avoid: Never expose methane to ignition sources such as open flame, lighted cigarettes or pipes, uninsulated heating elements, or electrical or mechanical sparks. Prevent any accidental or uncontrollably rapid release of methane gas from high-pressure cylinders, tank cars, or pipelines.
Hazardous Products of Decomposition: Thermal oxidative degradation of methane can produce carbon dioxide and toxic carbon monoxide (CO).

Section 6. Health Hazard Data

Carcinogenicity: Neither the NTP, IARC, nor OSHA lists methane as a carcinogen. **Summary of Risks:** As a simple asphyxiant, methane does not cause significant physiological responses, but it can displace the minimum required atmospheric oxygen level. Significant displacement results in an oxygen-deficient atmosphere with no adequate warning properties. Asphyxiation can occur especially in confined, poorly ventilated, undisturbed spaces infrequently entered by workers. Frostbite (cryogenic damage) can result from contact with liquid methane's extremely low temperature. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** None reported. **Primary Entry:** Inhalation. **Acute Effects:** The initial symptoms of simple asphyxiant gases's effects are rapid respiration and air hunger, diminished mental alertness, and impaired muscular coordination. Continuing lack of oxygen causes faulty judgement, depression of all sensations, rapid fatique, emotional instability, nausea, vomiting, prostration, unconsciousness, and finally, convulsions, coma, and death. **Chronic Effects:** None reported.

FIRST AID

Skin: *(Liquid methane): Promptly flush the affected area with lots of tepid/lukewarm water to reduce freezing of tissues. Never apply direct heat to frostbitten areas.* Loosely apply dry, bulky dressings to protect the area from further injury. Get treatment from qualified medical personnel. **Inhalation:** Rescuers must consider their own safety when entering confined, poorly ventilated, oxygen-deficient areas. Self-contained breathing equipment must be readily available. Rescuers must use nonsparking tools and equipment; e.g., floodlights lowered into any incident area must be electrically grounded and bonded, shatter-resistant, and sparkproof. **After first aid, get appropriate in-plant, paramedic, or community *medical attention and support for inhalation exposures in oxygen-deficient atmospheres.*** *Seek prompt medical assistance for further* observation and treatment.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: *Design and practice a methane spill control and countermeasure plan (SCCP).* When a leak occurs, notify safety personnel, eliminate heat and ignition sources, evacuate unnecessary personnel, provide maximum explosion proof ventilation, and implement the SCCP. Use only nonsparking tools and equipment. Locate and seal the source of the leaking gas. Use water sprays to protect the personnel attempting this shutoff. Large methane releases can result in spectacular explosions. If attempts to shut off the leaking gas are unsuccessful, evacuate the likely explosion area. **Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. Remove leaking or defective cylinders to a safe, outside, posted, discharge location. Let the methane gas discharge at a moderate rate. When it is empty, return the cylinder to the supplier after it is properly tagged, labelled, or stenciled MT (empty) or defective.

OSHA Designations

Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

EPA Designations

RCRA Hazardous Waste (40 CFR 261.33): Not listed
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). **Gloves:** To prevent skin contact, workers handling liquid methane should wear appropriate insulating gloves, safety glasses, and splash aprons, as required by the particular work conditions. **Respirator:** Wear a NIOSH-approved respirator if necessary. 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 do *not* protect workers in oxygen-deficient atmospheres; use self-contained breathing equipment there. **Ventilation:** Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the 5% v/v LEL (Sec. 4). Local exhaust ventilation is preferred since it prevents methane dispersion into the work area by eliminating it at its source (Genium ref. 103). Give special attention to proper ventilation of enclosed areas. **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, washing facilities, fire extinguishers, and oxygen bottles for emergency first-aid. **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. **Other:** If appropriate, consider installing automatic sensing equipment that warns workers of oxygen-deficient atmospheres or of potentially explosive air-gas mixtures. All engineering systems in any methane gas storage, handling, or processing area must be explosion-proof so they have no spark potential or hot spots. Pressurized systems must use only approved valves, manifolds, flanges, and flame arrestors. **Comments:** Methane gas presents dangerous fire, explosion, and reactivity risks. Regularly inspect and service all the piping systems which transport methane gas in production and storage areas. Before use, thoroughly test methane lines with nitrogen gas for leaking, especially in enclosed areas.

Section 9. Special Precautions and Comments

Storage Requirements: Store methane in closed, pressurized cylinders, tank cars, pipelines, or other containers in a cool, dry, well ventilated, fireproof area away from heat and ignition sources and incompatible chemicals (Sec. 5). Protect these containers from physical damage and heat. Shield them from direct sunlight. **Special Handling/Storage:** Electrically ground and bond all containers, tanks, cylinders, tank cars and pipelines used in methane shipping, receiving, or transferring operations. Never smoke in any work area where the possibility of exposure to methane gas (fire hazard) exits. Recommended storage containers include steel.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Methane
DOT Hazard Class: Flammable gas
DOT ID No.: UN1971
DOT Label: Flammable gas
DOT Packaging Requirements: 49 CFR 173.302
DOT Packaging Exceptions: 49 CFR 173.306

IMO Shipping Name: Methane, compressed
IMO Hazard Class: 2.1
IMO Label: Flammable gas

***MSDS Collection* References:** 1, 6, 7, 84-94, 100, 116, 117, 119, 120, 122
Prepared by: PJ Igoe, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** MJ Hardies, MD

WITCO MATERIAL SAFETY DATA SHEET

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:
Do not use water except as fog.
Unusual Fire and Explosion Hazards:
none
Flashpoint: (Method Used) Cleveland open cup greater than 190°C (380°F)
Flammable limits %: not applicable
Extinguishing agents:
Drychemical or Waterfog or CO_2 or Foam
Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):
If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m^3 for mineral oil mist (OSHA and ACGIH).
Chronic effects of overexposure:
Prolonged or repeated skin contact may cause dermatitis (skin irritation)
Acute toxicological properties:
no data available
Emergency First Aid Procedures:
Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.
Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.
Inhalation: Remove victim to fresh air. Call a physician.
If Swallowed: Contact a physician immediately.

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local,mechanical,special):
Local if necessary to maintain allowable PEL(permissible exposure limit) or TLV(threshhold limit value)
Respiratory Protection (Specify type):
Use NIOSH/MSHA certified respirator with dual organic vapor/mist and particulates cartridge if vapor concentration exceeds permissible exposure limit.
Protective Gloves:
neoprene type
Eye Protection:
chemical safety goggles
Other Protective Equipment:
none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:
Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.

Waste Disposal:
Dispose of in accordance with all applicable federal, state and local regulations.

SPECIAL PRECAUTIONS---SECTION VII

Precautions to be taken in handling and storage:
Do not handle or store at temperatures over
Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated
Reportable Quantity: not applicable
Freight Classification: Petroleum Lubricating Oil
Special Transportation Notes:
none

ENVIRONMENTAL/SAFETY REGULATIONS---SECTION IX

Section 313 (Title III Superfund Amendment and Reauthorization Act):

This product does not contain any chemical in sufficient quantity to be subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

COMMENTS

* STATE REGULATORY INFORMATION:
Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).
Hydrocarbon oils CAS. NO. 8020-83-5
The additive mixtures in this product have been declared a trade secret by the additive manufacturers.

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

(COMMENTS continued)

Prepared by: Robert Kellam
Title: Group Supervisor, Lubricants Testing, Maintenance, and Safety
Original Date: 05/18/81 Sent to: _____
Revision Date: 08/09/94 _____
Supersedes : 04/01/93 _____
Date Sent : _____

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LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

	PRODUCT NAME: Pentane	
	TELEPHONE (415) 977-6500 EMERGENCY RESPONSE INFORMATION ON PAGE 2	
LIQUID AIR CORPORATION ALPHAGAZ DIVISION California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94596	TRADE NAME AND SYNONYMS: Pentane; n-Pentane	CAS NUMBER: 109-66-0
	CHEMICAL NAME AND SYNONYMS: Pentane; n-Pentane	NFPA 704 NUMBER (HFR): 0 4 0
ISSUE DATE AUGUST 1, 1987 AND REVISIONS CORPORATE SAFETY DEPT.	FORMULA: C_5H_{12} MOLECULAR WEIGHT: 72.15	CHEMICAL FAMILY: ATkane

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT
600 Molar PPM; STEL = 750 Molar PPM (ACGIH 1986-87). OSHA (1985)TWA = 1,000 Molar PPM.

SYMPTOMS OF EXPOSURE Vapors may cause mild irritation of the eyes, skin or lungs.

Inhalation: High concentrations of pentane so as to exclude an adequate supply of oxygen to the lungs causes dizziness, deeper breathing due to air hunger, possible nausea and eventual unconsciousness.

Contact with rapidly evaporating liquid can cause cryogenic "burns" or frostbite.

TOXICOLOGICAL PROPERTIES

Pentane is inactive biologically and essentially nontoxic; therefore, the major property is the exclusion of an adequate supply of oxygen to the lungs.

Frostbite effects are a change in color of the skin to gray or white, possibly followed by blistering.

Pentane is not listed in the IARC, NTP or by OSHA as a carcinogen or a potential carcinogen.

Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	I.A.R.C. Monographs	OSHA
	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO PENTANE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

Dermal contact or frostbite: Remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Pentane is flammable in air.

PHYSICAL DATA

BOILING POINT 97°F (36°C)	**LIQUID DENSITY AT BOILING POINT** @ 60°F (15.5°C) = 39.3 lb/ft^3 (629.4 kg/m^3)
VAPOR PRESSURE @ 100°F (37.8°C) = 15 psia (103 kPa)	**GAS DENSITY AT 70°F 1 atm** @ 60°F (15.5°C) = .2015 lb/ft^3 (3.228 kg/m^3)
SOLUBILITY IN WATER Negligible	**FREEZING POINT** -201.5°F (-129.7°C)
APPEARANCE AND ODOR Colorless liquid and vapor with mild paraffinic odor. Specific gravity (air=1) = 2.48	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) <-40° F & C (C.C.)	**AUTO IGNITION TEMPERATURE** Unknown	**FLAMMABLE LIMITS % BY VOLUME** LEL = 1.4 UEL = 8.3
EXTINGUISHING MEDIA Water (foam), dry chemical, carbon dioxide		**ELECTRICAL CLASSIFICATION** Class 1, Group not specified

SPECIAL FIRE FIGHTING PROCEDURES

If possible, stop flow of pentane. Use water spray to cool surrounding containers.

UNUSUAL FIRE AND EXPLOSION HAZARDS

None

REACTIVITY DATA

STABILITY Unstable		**CONDITIONS TO AVOID**
Stable	X	N/A

INCOMPATIBILITY (Materials to avoid)
Oxygen, other oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS
None

HAZARDOUS POLYMERIZATION May Occur		**CONDITIONS TO AVOID**
Will Not Occur	X	N/A

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest Liquid Air location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest Liquid Air location or call the emergency telephone number listed herein.

EMERGENCY RESPONSE INFORMATION
IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT (800) 231-1366
OR CALL CHEMTREC AT (800) 424-9300

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

VENTILATION	LOCAL EXHAUST	SPECIAL
Hood with forced ventilation	To prevent accumulation above the TWA.	N/A
	MECHANICAL (Gen.) In accordance with electrical codes	**OTHER** N/A

PROTECTIVE GLOVES
Plastic or rubber

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes, safety shower, eyewash "fountain"

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Pentane
DOT Shipping Label: Flammable liquid
DOT Hazard Class: Flammable liquid
DOT I.D. No.: UN 1265

SPECIAL HANDLING RECOMMENDATIONS
Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<50 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Do not tamper with (valve) safety device. Close valve after each use and when empty.

For additional handling recommendations consult L'Air Liquide's Encyclopedia de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS
Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no source of ignition in the storage or use area.

For additional storage recommendations consult L'Air Liquide's Encyclopedia de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS
Pentane is noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Earth-ground and bond all lines and equipment associated with the Pentane system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

Always secure cylinders in an upright position before transporting them. NEVER transport cylinders in trunks of vehicles, (Continued on last page)

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which may not be contained herein. The customer or user of this product should be familiar with these regulations.

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ADDITIONAL DATA

OTHER RECOMMENDATIONS OR PRECAUTIONS: (Continued) enclosed vans, truck cabs or in passenger compartments. Transport cylinders secured in open flatbed or in open pick-up type vehicles.

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Material Safety Data Sheets Collection:

Sheet No. 3
Sodium Hydroxide

Issued: 10/77 Revision: C, 11/91

Section 1. Material Identification

36

Sodium Hydroxide (NaOH) Description: Derived by electrolysis of sodium chloride brines, by reacting calcium chloride with sodium carbonate, or by electrolytic production using the diaphragm cell. Sodium hydroxide often contains as impurities minimal amounts of sodium chloride, sodium carbonate, sodium sulfate, sodium chlorate, iron, or nickel. Used to hydrolyze fats and form soaps; in making plastics to dissolve casein; in treating cellulose to make rayon and cellophane; in explosives, dyestuffs, electrolytic extraction of zinc, reclaiming rubber, tin plating, oxide coating, etching and electroplating, laundering and bleaching, pulp and paper manufacture; in vegetable oil refining; in peeling of fruits and vegetables in the food industry; and in veterinary medicine as a disinfectant.

R	0	NFPA
I	2	
S	4	
K	0	

HMIS
H 3
F 0
R 1
PPG*
* Sec. 8

Other Designations: CAS No. 1310-73-2; Aetznatron; caustic soda; Collo-Grillrein; Collo-Tapette; Feurs Rohp; Lewis-Red Devil Lye; soda, hydrate; soda lye; sodium hydrate.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

Cautions: Sodium hydroxide is moderately toxic by ingestion and inhalation and can be seriously corrosive to eyes, skin, and mucous membranes.

Section 2. Ingredients and Occupational Exposure Limits

Sodium hydroxide, ca 100%

1990 OSHA PEL
Ceiling: 2 mg/m³

1990 DFG (Germany) MAK
2 mg/m³

1985-86 Toxicity Data*
Rabbit, oral, LD_{Lo}: 500 mg/kg; no toxic effect noted
Rabbit, skin: 500 mg applied over 24 hr causes severe irritation
Mouse, intraperitoneal, LD_{50}: 40 mg/kg; toxic effects not yet reviewed

1990 IDLH Level
250 mg/m³ (solution mists)

1990 NIOSH REL
Ceiling: 2 mg/m³

1991-92 ACGIH TLV
Ceiling: 2 mg/m³

* See NIOSH, *RTECS* (WB4900000), for additional irritation, mutation, and toxicity data.

Section 3. Physical Data

Boiling Point: 2534 °F (1390 °C)
Melting Point: 605 °F (318.4 °C)
Vapor Pressure: 1 mm Hg at 1362 °F (739 °C)
pH (0.5% solution): 13
Molecular Weight: 40.01

Specific Gravity: 2.13 at 77 °F (25 °C)
Water Solubility: 1 g/0.9 ml water, 1 g/0.3 ml boiling water
Other Solubilities: 1 g/7.2 ml alcohol, 1 g/4.2 ml methanol, soluble in glycerol; insoluble in acetone and ether

Appearance and Odor: Odorless, hydroscopic (readily absorbs water) white flakes, cake, lumps, chips, pellets, or sticks.

Section 4. Fire and Explosion Data

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

Extinguishing Media: Although noncombustible as a solid, when in contact with moisture or water sodium hydroxide can generate enough heat to ignite surrounding combustibles. If possible without risk, remove containers from area. Use extinguishing agents suitable for surrounding fire. For small fire, use dry chemical, carbon dioxide (CO_2), or regular foam. Avoid water spray since water reacts with sodium hydroxide to generate substantial heat. If you must use water, be sure it is as cold as possible. For large fires, use fog or regular foam.
Unusual Fire or Explosion Hazards: Sodium hydroxide may melt and flow when heated.
Special Fire-fighting Procedures: Since fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear fully protective clothing. Structural firefighters' protective clothing provides limited protection. Apply cooling water to fire-exposed sides of container until fire is well out. *Do not* splatter or splash this material. Stay away from ends of tanks. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Sodium hydroxide is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Violent polymerization can occur when in contact with acrolein or acrylonitrile. Since sodium hydroxide readily absorbs water and carbon dioxide from air, keep containers tightly closed.
Chemical Incompatibilities: Sodium hydroxide generates large amounts of heat when in contact with water and may steam and splatter. It reacts with mineral acids to form corresponding salts; reacts with weak-acid gases like hydrogen sulfide, sulfur dioxide, and carbon dioxide; ignites when in contact with cinnamaldehyde or zinc; and has exploded when exposed to a mixture of chloroform and methane. Sodium hydroxide can be very corrosive to metals such as aluminum, tin, and zinc as well as to alloys such as steel, and may cause formation of flammable hydrogen gas. An increase in temperature and pressure occurs in closed containers when sodium hydroxide is mixed with: acetic anhydride, glacial acetic acid, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, oleum, 36% hydrochloric acid, 48.7% hydrofluoric acid, 70% nitric acid, or 96% sulfuric acid.
Conditions to Avoid: Avoid generation of sodium hydroxide dusts, and contact with water, metals, and the chemicals listed above.
Hazardous Products of Decomposition: Thermal oxidative decomposition of sodium hydroxide can produce toxic sodium oxide (Na_2O) and sodium peroxide (Na_2O_2) fumes.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA do not list sodium hydroxide as a carcinogen (see Chronic Effects).
Summary of Risks: Sodium hydroxide is toxic by inhalation of dusts or mists, ingestion, or direct skin or eye contact. Damage is immediate and without prompt medical attention can become permanent. This strong, corrosive alkali dissolves any living tissue it contacts.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Eyes, digestive tract, respiratory system, and skin.
Primary Entry Routes: Ingestion, inhalation, and skin and eye contact.

Continue on next page

Section 6. Health Hazard Data, *continued*

Acute Effects: Ingestion causes immediate burning of mouth, esophagus, and stomach; painful swallowing; excessive salivation; edematous (excess fluid in surrounding tissue) lips, chin, tongue, and pharynx covered with exudate (fluid oozed from swollen tissue); esophageal edema (swelling from fluid buildup in esophagus walls that can prevent all swallowing within hours); possibly edematous, gelatinous, and necrotic (localized tissue death) mucous membranes; vomiting (sometimes coffee grounds-like material due to digestive hemorrhage); and rapid, faint pulse; and cold, clammy skin. Death results commonly from shock, asphyxia (oxygen loss due to interrupted breathing), or pneumonia by the second or third day after ingestion. Dust inhalation can cause many small burns, temporary hair loss (in nasal passages since sodium hydroxide breaks down keratin), and possibly pulmonary edema (fluid in lungs). Skin contact causes slippery, soapy feeling that is not usually painful for 3 min after contact—even though skin damage begins immediately. It causes burns, keratin (hair and nails) destruction, and intracellular edema (excess fluid in skin cells), with damage progressing to severe burns, tissue corrosion, deep ulcerations, and permanent scarring if not immediately washed off. The cornea begins to corrode on contact. Disintegration and sloughing of conjunctival and corneal epithelium may progress to temporary or permanent corneal opacification (cloudiness, becoming impervious to light) or symblepharon (adhesion of lid to eyeball).
Chronic Effects: Dermatitis may result from repeated exposure to dilute solutions. Cases of squamous cell carcinoma (malignant tumors of epithelial origin) of the esophagus are reported 12 to 42 years after sodium hydroxide ingestion, although it is unclear whether the cancer results from scar formation caused by tissue destruction or directly from the chemical's possible carcinogenicity.
FIRST AID: Emergency personnel should protect against contamination.
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of cold water until transported to an emergency medical facility. *Do not* allow victim to keep eyes tightly shut. *Warning!* Although splashed directly in only one eye, sodium hydroxide may affect the other eye's sight if prompt medical attention is not received. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. *Be aware* that this substance can become very hot when in contact with water. For reddened or blistered skin, consult a physician. Wash affected area 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 and alert* person drink 1 to 2 glasses of water, followed by vinegar or fruit juice to neutralize the poison. *Do not induce vomiting!*
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Perform endoscopy in all suspected cases of sodium hydroxide ingestion. Perform blood analysis to determine if dehydration, acidosis, or other electrolyte imbalances have occurred.

Section 7. Spill, Leak and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate hazard area, deny entry, and stay upwind of spills. Cleanup personnel should protect against vapor inhalation and skin or eye contact. Use water spray to disperse vapors, but do not spray directly on spills. For small dry spills, avoid excess dust generation by carefully scooping or vacuuming (with appropriate filter) into a suitable container (above 60 °C sodium hydroxide corrodes steel) for later disposal. For large dry spills, cover with plastic sheet or other impermeable layer and contain for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120).
Environmental Transport: Sodium hydroxide is not mobile in solid form, although it absorbs moisture very easily. Once liquid, sodium hydroxide leaches rapidly into soil, possibly contaminating water sources.
Environmental Degradation: Ecotoxicity values: TLm, mosquito fish, 125 ppm/96 hr (fresh water); TLm, bluegill, 99 mg/48 hr (tap water).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
RA Designations
ted as a RCRA Hazardous Waste (40 CFR 261.22): Characteristic of corrosivity
sted as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1000 lb (454 kg) [* per Clean Water Act, Sec. 311 (b)(4)]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed

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

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select the respirator based on its suitability to provide adequate worker protection for the given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent any skin contact.
Ventilation: Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in dry, well-ventilated area away from water, acids, metals, flammable liquids, and organic halogens. Keep containers tightly closed since sodium hydroxide can decompose to sodium carbonate and carbon dioxide upon exposure to air. Since corrosion occurs easily above 140 °F (60 °C), do not store or transport sodium hydroxide in aluminum or steel containers at temperatures near this level. Store containers in rooms equipped with trapped floor drains, curbs, or gutters.
Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control hazardous contaminants and to maintain concentrations at the lowest practical level.
Other Precautions: Consider preplacement and periodic medical examinations of exposed workers that emphasize eyes, skin, and respiratory tract. Consider a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Inform employees of the possible hazards in using sodium hydroxide.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Sodium hydroxide; dry, solid, flake, bead *or* granular
DOT Hazard Class: Corrosive material
No.: UN1823
DOT Label: Corrosive
DOT Packaging Exceptions: 173.244
DOT Packaging Requirements: 173.245b

IMO Shipping Name: Sodium hydroxide, solid
IMO Hazard Class: 8
ID No.: UN1823
IMO Label: Corrosive
IMDG Packaging Group: II

MSDS Collection **References:** 26, 38, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 143, 146, 148, 149, 153, 159, 161, 163
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD; **Edited by:** ER O'Connor, MS

III. HAZARDOUS INGREDIENTS

(includes IARC, NTP, OSHA and ACGIH listed carcinogens greater than 0.1%)

MATERIAL	%	CAS #	EXPOSURE LIMIT	SOURCE
Ethyl ether	40-70	60-29-7	400 ppm TWA	(3)
			500 ppm STEL	(3)
n-heptane	25-60	142-82-5	400 ppm TWA	(3)
			500 ppm STEL	(3)
Methylcyclohexane	25-60	108-87-2	400 ppm TWA	(3)
Carbon dioxide	5-10	124-38-9	10000 ppm TWA	(1)
			5000 ppm TWA	(2)
			30000 ppm STEL	(3)

NON-HAZARDOUS INGREDIENTS > 1%
None

None of the other ingredients is listed as a carcinogen or potential carcinogen by OSHA, NTP or IARC.

The source for exposure limits listed above are:
(1) OSHA Permissible Exposure Limit (effective 9/89)
(2) ACGIH Threshold Limit Value (1988-89 Edition)
(3) Both the OSHA PEL and ACGIH TLV
(4) Recommended by the Manufacturer

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT

Tag Open Cup: Not determined
Pensky-Martens Closed Cup: -49°F

AEROSOL FLAME EXTENSION

Greater than 18 inches

FLASHBACK

Yes

AEROSOL FIRE PROTECTION LEVEL
Level 3 Aerosol (NFPA 30B)

FLAMMABLE LIMITS IN AIR, % BY VOLUME
LOWER: 1.85
UPPER: 36.5

AUTOIGNITION TEMPERATURE
180°C

EXTINGUISHING MEDIA
Foam, alcohol foam, carbon dioxide, and dry chemical. Water may be unsuitable except as cooling medium.

SPECIAL FIRE FIGHTING PROCEDURES
Use self-contained breathing apparatus. Toxic fumes may be emitted.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Extremely flammable contents, pressurized containers. Vapors are heavier than air and may travel or be moved by air currents and be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges or other ignition sources at locations distant from product handling point.

V. HEALTH HAZARD DATA

EFFECTS OF SINGLE OVEREXPOSURE

SWALLOWING	May cause signs and symptoms of systemic intoxication, with incoordination, blurred vision, headache, analgesia, unconsciousness and respiratory failure due to depression of the central nervous system. Due to high volatility, may rapidly distend the stomach, causing discomfort and may make breathing difficult. May also cause pneumonitis if aspirated.
SKIN ABSORPTION	Significant absorption not expected.
INHALATION	Acts as a narcotic or general anesthetic. May cause irritation of the respiratory tract with cough and also signs and symptoms of intoxication, with incoordination, blurred vision, headache, analgesia, unconsciousness, cardiac irregularities, and respiratory failure due to depression of the central nervous system. Breathing high vapor concentrations may cause heart rate irregularities, possibly fatal, particularly in persons with heart disease.
SKIN CONTACT	May cause mild irritation, experienced as local redness.

EYE CONTACT — Exposure to liquid or high concentrations of vapor may cause irritation, experienced as redness, excess tearing, and possible swelling of the conjunctiva.

EFFECTS OF REPEATED OVEREXPOSURE

Repeated skin exposure can cause cracking and drying. Repeated inhalation may cause loss of appetite, exhaustion, headaches, drowsiness, dizziness, cardiac arrhythmia, central nervous system excitability, and psychic disturbances.

OTHER EFFECTS OF OVEREXPOSURE

May cause albuminuria and polycythemia.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE

Because of its irritating and defatting properties, this material may aggravate an existing dermatitis. Existing cardiac conditions may be aggravated if inhaled in high concentrations and may be fatal as a result of serious arrhythmia and cardiac decompensation.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARDS

None currently known.

EMERGENCY AND FIRST AID PROCEDURES

SWALLOWING — Give at least 2 glasses of milk or water if the patient is conscious. Do not induce vomiting. Call a physician immediately.

SKIN — Wash with soap and water.

INHALATION — Remove to fresh air. Give artificial respiration if not breathing. CPR may be required if cardiac arrest occurs. Oxygen may be given if necessary. Call a physician.

EYES — Immediately flush eyes with plenty of water for least 15 minutes. Seek medical attention, preferably an ophthalmologist.

NOTES TO PHYSICIAN — May produce arrhythmia, especially in a person with an irritable myocardium. Because of possible arrhythmogenic effects, sympathomimetics should be used with caution. Avoid the use of epinephrine.

There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition. Artificial ventilation may be required if coma is deep and breathing shallow.

VI. REACTIVITY DATA

STABILITY Stable.

HAZARDOUS POLYMERIZATION
Will not occur.

CONDITIONS TO AVOID Heat, sparks and open flames.

INCOMPATIBILITY (Materials to Avoid)
Strong oxidizing agents.

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
Extremely flammable. Will burn to form carbon dioxide, carbon monoxide. May form oxides of nitrogen.

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED
Wear appropriate personal protective equipment and remove all sources of ignition. Contain spill using absorbent material and collect material for disposal in a container suitable for flammable waste. See Section IV, "Unusual Fire and Explosion Hazards."

WASTE DISPOSAL METHOD
Waste material is a RCRA hazardous waste due to ignitability if discarded in its purchased form. Incineration, treatment or landfilling should be carried out in accordance with applicable RCRA Federal, State, and Local regulations.

VIII. SPECIAL PROTECTION INFORMATION

(for manufacturing and bulk spill cleanup)

RESPIRATORY PROTECTION
Use NIOSH/MSHA approved chemical cartridge respirator for operations which may result in employee exposure above the Permissible Exposure Limit (PEL).

VENTILATION Use local exhaust ventilation for operations which may result in employee exposure above the PEL.

PROTECTIVE GLOVES None required under normal use. PVA (polyvinyl alcohol) gloves are recommended for operations which may result in repeated skin contact.

EYE PROTECTION Safety glasses are considered adequate for normal use.

OTHER PROTECTIVE EQUIPMENT
None required

IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

- DANGER: Extremely flammable. Do not store near heat, sparks or open flame.
- Do not inhale vapors; use in well ventilated area.
- Avoid eye and prolonged skin contact.
- Do not drink or swallow contents.
- Contents under pressure; do not store at temperatures above 120°F.

OTHER PRECAUTIONS

Observe all requirements of plant, company or government regulations.

KEEP OUT OF REACH OF CHILDREN.

FIRST BRANDS

Material Safety Data Sheet
PRESTONE® Engine Starting Fluid

X. DEPARTMENT OF TRANSPORTATION

HAZARDOUS MATERIALS	Engine Starting Fluid
HAZARD CLASSIFICATION	Flammable Gas
IDENTIFICATION NUMBER	UN1960
LABEL(S) REQUIRED	Flammable Gas

XI. ENVIRONMENTAL DATA

EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW INFORMATION

This product contains the following chemicals subject to SARA TITLE III, Section 313 reporting:

Chemical Name	CAS#	Weight %
None		

This MSDS is directed to professional users and bulk handlers of the product. Consumer products are labeled in accordance with Federal Hazardous Substances Act regulations.

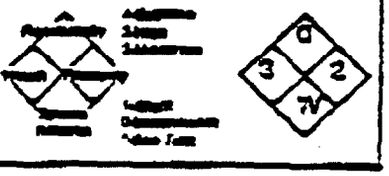
While First Brands Corporation believes that the data contained herein are factual and the opinions expressed are those of qualified experts regarding the results of the tests conducted, the data are not to be taken as a warranty or representation for which First Brands Corporation assumes legal responsibility. They are offered solely for your consideration, investigation and verification. Any use of these data and information must be determined by the user to be in accordance with applicable federal, state and local laws and regulations.

If more information is needed, please contact:

R. L. Lewis
First Brands Corporation
88 Long Hill Street
East Hartford, CT 06108
(203)728-6181

KOCH

MATERIAL SAFETY DATA SHEET

24-HOUR EMERGENCY ASSISTANCE		GENERAL ASSISTANCE	NFPA FIRE HAZARD SYMBOL
Koch Industries, Inc.:	316-828-6777	316-828-6777	
CHEMTREC Assistance:	800-424-9300	316-828-6754	
		316-828-8468	
MSDS Number >	5371		

MANUFACTURER/SUPPLIER: Koch Sulfur Products Company
ADDRESS: PO Box 2256, Wichita, KS 67201

PRODUCT IDENTIFICATION

NAME:
SULFURIC ACID

CAS NUMBER: 7664-93-9
SYNONYM/PRODUCT NAME:
OIL OF VITRIOL
CHEMICAL FAMILY: MINERAL ACID
MOLECULAR FORMULA: H2SO4
MOLECULAR WEIGHT: 98.07
MSDS PRODUCT CODE: NO

PRODUCT HAZARD SUMMARY

HEALTH DANGER!

MAY BE CORROSIVE TO THE SKIN, EYES AND RESPIRATORY TRACT
ASPIRATION HAZARD IF SWALLOWED-CAN ENTER LUNGS AND CAUSE DAMAGE
CANCER HAZARD
* * SEE SPECIAL TOXIC EFFECTS SECTION FOR MORE INFORMATION

FLAMMABILITY NON-COMBUSTIBLE

REACTIVITY MAY REACT VIOLENTLY WITH WATER

PRODUCT HEALTH HAZARD INFORMATION

INGESTION:
CORROSIVE. May cause painful irritation and burning of the mouth and throat, painful swallowing, laborad breathing, burns or perforation of the gastrointestinal tract leading

to ulceration and secondary infection. Corrosive damage to the stomach and oesophagus may be delayed.

Aspiration into lungs may cause chemical pneumonia and lung damage.

SKIN:

CORROSIVE. Contact may cause reddening, itching, inflammation, burns, blistering and possibly severe tissue damage.

Repeated or prolonged contact may result in drying, reddening, itching, pain, inflammation, cracking and possible secondary infection with tissue damage.

EYE:

CORROSIVE. Exposure may cause severe burns, destruction of eye tissue and possible permanent injury or blindness.

Prolonged or repeated exposure may cause irritation and conjunctivitis.

INHALATION:

EXTREMELY IRRITATING AND CORROSIVE. May cause severe burns and tissue damage to the respiratory tract. Symptoms may include throat burns, constriction of the windpipe (bronchospasms), severe pulmonary edema and death, depending on the concentration and duration of exposure.

Other specific symptoms of exposure are listed under "Special Toxic Effects."

Overexposure to this material may cause systemic damage including target organ effects listed under "Special Toxic Effects."

SPECIAL TOXIC EFFECTS:

Exposure may cause the following specific symptoms, depending on the concentration and duration of exposure: attacks enamel of teeth, vomiting, clammy skin, weak and rapid pulse. Other symptoms of exposure may include the following: shallow respiration, chronic bronchitis, lung function changes and scanty urine.

Acute or chronic overexposure to this material or its components may cause systemic toxicity, including adverse effects to the following: circulatory system, respiratory system, kidney, liver, heart and teeth.

This material contains sulfuric acid or sulfuric acid solution which is not listed by IARC, NTP or OSHA as a carcinogen. IARC has determined that there is sufficient evidence for the carcinogenicity of occupational exposure to strong inorganic acid mists containing sulfuric acid in humans. (IARC Class group 1).

Pre-existing medical conditions which may be aggravated by exposure include disorders of the respiratory system and skin.

FIRST AID

INGESTION:

If victim is conscious and alert, give 1-3 glasses of water to dilute stomach contents. Rinse mouth out with water. Do not induce vomiting unless directed by medical personnel. If spontaneous vomiting occurs keep head below hips to prevent aspiration and monitor for breathing difficulty. GET IMMEDIATE MEDICAL ATTENTION.

Keep affected person warm and at rest.

SKIN CONTACT:
Immediately flush skin with plenty of water, for at least 15 minutes, while removing contaminated clothing and shoes. GET IMMEDIATE MEDICAL ATTENTION.

Place contaminated clothing in closed container for storage until laundered or discarded. If clothing is to be laundered, inform person performing operation of contaminant's hazardous properties. Discard contaminated leather goods.

EYE CONTACT:
Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing.

GET IMMEDIATE MEDICAL ATTENTION.

INHALATION:
Remove to fresh air. If not breathing, institute cardiopulmonary resuscitation (CPR). If breathing is difficult, ensure clear airway and give oxygen. Keep affected person warm and at rest.

GET IMMEDIATE MEDICAL ATTENTION.

PERSONAL PROTECTION INFORMATION

EYE PROTECTION:
Wear chemical safety goggles and face shield. Have eye washing facilities readily available where eye contact can occur.

SKIN PROTECTION:
Avoid skin contact with this material. Use appropriate chemical protective gloves when handling. Additional protection may be necessary to prevent skin contact including use of apron, gauntlets, boots, impervious protective suit and face shield or splash goggles. Provide safety showers at any location where skin contact can occur.

Use good personal hygiene.

RESPIRATORY PROTECTION:
Ventilation and other forms of engineering controls are the preferred means for controlling exposures.

A NIOSH/MSHA approved air purifying respirator with an appropriate acid gas cartridge or canister may be appropriate under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

PHYSICAL PROPERTIES

BOILING POINT: 20-70% - 221-338 F, 93% - 541 F, 96% - 586 F, 99% - 625 F
SPECIFIC GRAVITY: 20-70% - 1.14-1.62, 93% - 1.84, 96% - 1.84, 99% - 1.84
MELTING POINT: ND
% VOLATILE: ND
VAPOR PRESSURE: MM HG @ 100 F 20-70% - 43 - <1, 93% - <1, 96% - <1, 99% - <1
EVAPORATION RATE (WATER=1): ND

ND = No Data
NA = Not Applicable

VAPOR DENSITY (AIR=1): NA
VISCOSITY: ND
% SOLUBILITY IN WATER: 100 %
OCTANOL/WATER PARTITION COEFFICIENT: ND
POUR POINT: ND
pH: < 1
FREEZING POINT: 20-70% - 14-(-44) F, 93% - (-29) F, 96% - 10 F, 99% - 45 F
APPEARANCE/ODOR: COLORLESS TO CLOUDY OILY LOOKING LIQUID WITH A PUNGENT ODOR

FIRE AND EXPLOSION DATA

FLASH POINT: ND
AUTOIGNITION TEMPERATURE: ND
FLAMMABILITY LIMITS IN AIR (% BY VOL.) LOWER: ND
FLAMMABILITY LIMITS IN AIR (% BY VOL.) UPPER: ND

BASIC FIREFIGHTING PROCEDURES:
Do not add water to acid. Water applied directly results in evolution of heat and splattering of acid. Also, acid, especially when diluted with water, can react with metals to liberate flammable hydrogen gas. Evacuate area and fight fire from a safe distance.

Use water spray to cool adjacent structures and to protect personnel. Do not get water inside containers.

Firefighters must wear MSHA/NIOSH approved positive pressure breathing apparatus (SCBA) with full face mask and full protective equipment.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Material will not burn.

Reacts with most metals to produce hydrogen gas, which can form an explosive mixture with air.

REACTIVITY DATA

STABILITY/INCOMPATIBILTY:
Avoid contact with water. Incompatible with oxidizing agents. See precautions under Handling/Storage.

HAZARDOUS REACTIONS/DECOMPOSITION PRODUCTS:
Decomposes to form sulfur dioxide and sulfur trioxide.

ENVIRONMENTAL INFORMATION

SPILL OR RELEASE TO THE ENVIRONMENT:
If product is released to the environment, take immediate steps to stop and contain release. Caution should be exercised regarding personnel safety and exposure to the released product. Notify local authorities and the National Response Center, if required.

Emergency Action:
Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind. (See Personal Protection Information Section.)

ND = No Data
NA = Not Applicable

Ill or Leak Procedure:
Large spills may be neutralized with dilute alkaline solutions of soda ash or lime. Shut off leak if safe to do so.

See Personal Protection Information section.

Notification:
This product, as supplied, contains Sulfuric acid, a Hazardous Substance as per 40 CFR Part 302.4. The reportable quantity for Sulfuric acid is 1000 pound(s). Any release of this product that results in a release of Sulfuric acid equal to or exceeding the reportable quantity must be reported to the National Response Center (800-424-8802) and appropriate state and local regulatory agencies as described in 40 CFR Part 302.6 and 40 CFR 355.40, respectively.

Failure to report may result in substancial civil and criminal penalties.

WASTE DISPOSAL:
This product, as supplied, when discarded or disposed of, is a hazardous waste according to Federal Regulations (40 CFR 261.22) due to its corrosivity and reactivity.

The transportation, storage, treatment and disposal of this waste material must be conducted in compliance with 40 CFR 262, 263, 264, 268 and 270. Disposal can occur only in properly permitted facilities. Check state and local regulations for any additional requirements as these may be more restrictive than federal laws and regulations. Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete,inaccurate or otherwise inappropriate. Disposal of this material must be conducted in compliance with all federal, state and local regulations.

SARA TITLE III INFORMATION:

Listed below are the hazard categories for the Superfund Amendments and Reauthorization Act (SARA) Section 311/312 (40 CFR 370):

Immediate Hazard: X Delayed Hazard: X Fire Hazard: __ Pressure Hazard: __ Reactivity Hazard: X

This product contains the following toxic chemicals subject to the annual toxic chemical release reporting requirements of the Superfund Amendments and Reauthorization Act (SARA) Section 313 (40 CFR 372):

Component	CAS Number	Maximum %
SULFURIC ACID	7664-93-9	100

This information is provided for SARA313 information purposes only - not for health and safety determination.

This product contains sulfuric acid which is listed as an extremely hazardous substance and is subject to the notification and inventory reporting requirements of the Superfund Amendments and Reauthorization Act (SARA) Section 302 (40 CFR 355) and Section 311/312, respectively.

ADDITIONAL ENVIRONMENTAL REGULATORY INFORMATION:
This product contains one or more components designated as hazardous substances or toxic pollutants pursuant to the Federal Clean Water Act (40 CFR 116.4 Table A; 40 CFR 401.15).

ND = No Data
NA = Not Applicable

Any unpermitted introduction of this product into a facility stormwater or wastewater discharge may constitute a violation of the Clean Water Act. Facilities must notify the appropriate permitting agency prior to introducing this product into the aforementioned discharges.

This product contains one or more substances listed as hazardous, toxic or flammable air pollutants under Section 112 of the Clean Air Act.

There may be specific regulations at the local, regional or state level that pertain to this product.

REGULATORY INFORMATION

Based on available information this product does not contain any components or chemicals currently known to the State of California to cause cancer, birth defects or reproductive harm at levels which would be subject to Proposition 65. Reformulation, use or processing of this product may affect its composition and requires re-evaluation.

All major components of this product are listed on the TSCA Inventory.

SPECIAL PRECAUTIONS/SUPPLEMENTAL INFORMATION

HANDLING/STORAGE:
Avoid contact with strong oxidizers. Store in a vented container. Do not use with materials or equipment sensitive to acidic solutions.

Ground lines and equipment used during transfer to reduce the possibility of static spark-initiated fire or explosion. Use non-sparking tools.

Do not eat, drink or smoke in areas of use or storage.

EMPTY CONTAINERS:
Do not cut, grind, drill, weld or reuse containers unless adequate precautions are taken against these hazards. Empty containers may contain product residue. Do not reuse without adequate precautions.

TRANSPORTATION REQUIREMENTS

GENERAL TRANSPORTATION INFORMATION:

D.O.T. PROPER SHIPPING NAME (49 CFR 172.101):	SULFURIC ACID
D.O.T. HAZARD CLASS (49 CFR 172.101):	8
UN/NA CODE (49 CFR 172.101):	UN1830, UN2796
PACKING GROUP (49 CFR 172.101):	PG II
BILL OF LADING DESCRIPTION (49 CFR 172.202):	RQ, Sulfuric Acid, 8, UN1830, PG II (use with more than 51% acid) * * * * * OR * * * * * * RQ, Sulfuric Acid, 8, UN2796, PG II (use with not more than 51% acid)
D.O.T. LABELS REQUIRED (49 CFR 172.101):	CORROSIVE
D.O.T. PLACARDS REQUIRED (49 CFR 172.504):	CORROSIVE, UN1830 (>51%), UN2796 (<=51%)

ND = No Data
NA = Not Applicable

INGREDIENTS/HEALTH HAZARD INFORMATION

COMPONENT	CAS NO.	TYPICAL %	PPM	EXPOSURE LIMITS - REFERENCES
SULFURIC ACID	7664-93-9	20-100	1 mg/m3	8-HOUR TWA (OSHA)
			1 mg/m3	8-HOUR TWA (ACGIH)
			3 mg/m3	15-MIN STEL (ACGIH)

* Values do not reflect absolute minimums and maximums; these values may vary from time to time.

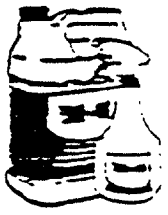
** See Regulatory Information Section for more information.

REVISION DATE: 13-DEC-1995 REPLACES SHEET DATED: 16-JAN-1995

COMPLETED BY: Environment, Health & Safety, Koch Industries, Inc.

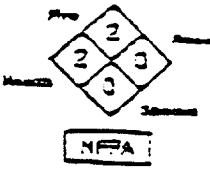
ND = No Data
NA = Not Applicable

No. 19



WD-40®

MATERIAL SAFETY DATA SHEET



I. PRODUCT IDENTIFICATION

Manufacturer:	WD-40 Company	Telephone:	
		Emergency Only:	1 (800) 424-9300 (CHEMTREC)
Address:	1061 Cudahy Place (92110) P.O. Box 80607 San Diego, California 92138-9021	Information:	(619) 275-1400
		Chemical Name:	Organic Mixture
		Trade Name:	WD-40 Bulk Liquid

II. HAZARDOUS INGREDIENTS

Chemical Name	CAS Number	%	Exposure Limit ACGIH/OSHA
Aliphatic Petroleum Distillates	8052-41-3	70	100 ppm (PEL)
Petroleum Base Oil	64742-65-0	> 20	5 mg/M³ (TWA)
Non-hazardous Ingredients		< 10	

III. PHYSICAL DATA

Boiling Point:	300°F (minimum)	Evaporation Rate:	Not determined
Vapor Density (air = 1):	Greater than 1	Vapor Pressure:	Not determined
Solubility in Water:	Insoluble	Appearance:	Cloudy light amber
Specific Gravity (H_2O = 1):	.900 @ 70°F	Odor:	Characteristic odor
Percent Volatile (volume):	74%	VOC:	576 grams per liter

IV. FIRE AND EXPLOSION

Flash Point:	Tag Open Cup 110°F (minimum)
Flammable Limits:	(solvent portion) [Lel] 1.0% [Uel] 6.0%
Extinguishing Media:	CO_2, Dry Chemical, Foam
Special Fire Fighting Procedures:	None
Unusual Fire and Explosion Hazards:	None

V. HEALTH HAZARD / ROUTE(S) OF ENTRY

Threshold Limit Value

Aliphatic Petroleum Distillates (Stoddard solvent) lowest TLV (ACGIH 100 ppm.)

Symptoms of Overexposure

Inhalation (Breathing): May cause anesthesia, headache, dizziness, nausea and upper respiratory irritation.

Skin Contact: May cause drying of skin and or irritation.

Eye Contact: May cause irritation, tearing and redness.

Ingestion (Swallowed): May cause irritation, nausea, vomiting and diarrhea.

First Aid Emergency Procedures

Ingestion (Swallowed): Do not induce vomiting, seek medical attention.

Eye Contact: Immediately flush eyes with large amounts of water for 15 minutes.

Skin Contact: Wash with soap and water.

Inhalation (Breathing): Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

DANGER!

Aspiration Hazard: If swallowed can enter lungs and may cause chemical pneumonitis. Do not induce vomiting. Call Physician immediately.

Suspected Cancer Agent

Yes_____ No__X__ The components in this mixture have been found to be noncarcinogenic by NTP, IARC and OSHA.

<2.3/5 BULK No. 1C

VI. REACTIVITY DATA

Stability:	Stable X	Unstable ____
Conditions to avoid:	NA	
Incompatability:	Strong oxidizing materials	
Hazardous decomposition products:	Thermal decomposition may yield carbon monoxide and/or carbon dioxide.	
Hazardous polymerization:	May occur ____	Will not occur X

VII. SPILL OR LEAK PROCEDURES

Spill Response Procedures

Absorb small quantities with sand, earth, sawdust. Large quantities pump into tank.

Waste Disposal Method

Incinerate liquid, bury saturated absorbent in land fill. Dispose of in accordance with local, state and federal regulations.

VIII. SPECIAL HANDLING INFORMATION

Ventilation:	Sufficient to keep solvent vapor less than TLV.
Respiratory Protection:	Advised when concentrations exceed TLV.
Protective Gloves:	Advised to prevent possible skin irritation.
Eye Protection:	Approved eye protection to safeguard against potential eye contact, irritation or injury.
Other Protective Equipment:	None required.

IX. SPECIAL PRECAUTIONS

Keep from open flame, do not take internally. Avoid excessive inhalation of spray particles. Keep from children.

X. TRANSPORTATION DATA

Domestic Surface	
Description:	Petroleum Distillate Mixture
Hazard Class:	Combustible Liquid
ID No.:	UN 1268
Label Required:	NONE, for containers less than 100 Gallons
Domestic Air	
Description:	Petroleum Distillate Mixture
Hazard Class:	Combustible Liquid
Label Required:	NONE, for containers less than 110 Gallons

SIGNATURE: R. Miles R Miles TITLE: Technical Director

REVISION DATE: March 1990 SUPERSEDES: April 1988

NA = Not applicable NCA = No data available < = Less than > = More than

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

	PRODUCT NAME: Hydrogen Cyanide TELEPHONE (415) 977-8500 EMERGENCY RESPONSE INFORMATION ON PAGE 2	
LIQUID AIR CORPORATION ALPHAGAZ DIVISION One California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94596	TRADE NAME AND SYNONYMS: Hydrogen Cyanide, Hydrocyanic acid	CAS Number: 74-90-8
	CHEMICAL NAME AND SYNONYMS: Hydrogen Cyanide, Formonitrile	
ISSUE DATE AND REVISIONS: OCTOBER 1, 1985 CORPORATE SAFETY DEPT.	FORMULA: HCN MOLECULAR WEIGHT: 27.018	CHEMICAL FAMILY: Cyanide compound

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT Pure hydrogen cyanide is a liquid, is unstable, and must be stabilized with the addition of sulfuric or phosphoric acid. Liquid Air Corporation
(Continued on last page.)

SYMPTOMS OF EXPOSURE

Inhalation: At approximately 1 molar PPM concentration, the detection of its odor of "bitter almonds" is possible.

At levels of 20-40 molar PPM, slight symptoms of digestive irritation, mental confusion, and slowing of the breathing rate are evident after several hours of exposure. Cyanosis also appears even though the circulatory function is only slightly impaired.
(Continued on last page.)

TOXICOLOGICAL PROPERTIES

It is one of the quickest acting poisons. It hinders the vital oxydation-reduction reactions in the body resulting in anoxia affecting the central nervous system resulting in respiratory paralysis.

Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	Yes ☐ No ☒	I.A.R.C. Monographs	Yes ☐ No ☒	OSHA	Yes ☐ No ☒
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RECOMMENDED FIRST AID TREATMENT

PROMPT RENDERING OF FIRST AID IS IMPERATIVE.

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO HYDROGEN CYANIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

Treatment is based on forming methemaglobin in the blood which complexes with the cyanide ion rendering it incapable of acting as a poison. It is reported that up to 20% of the hemoglobin can be converted to methemaglobin without danger of anoxia. The formation of methemoglobin is accomplished by injecting intravenously 10 ml of a sterile 3% solution of sodium nitrate followed immediately by 50 ml of a 25% sterile solution of
(Continued on last page.)

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Hydrogen cyanide is slowly polymerized to ammonia. In the presence of moisture, cyanides, potassium and bases, this exothermic, autocatalytic reaction is accelerated. Acids retard this reaction.

PHYSICAL DATA

BOILING POINT 78.3°F (25.7°C)	**LIQUID DENSITY AT BOILING POINT** 41.7 lb/ft^3 (668 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C) 12.3 psia (85 kPa)	**GAS DENSITY AT 70°F 1 atm** .071 lb/ft^3 (1.14 kg/m^3)
SOLUBILITY IN WATER @ 68°F (20°C) Bunsen coefficient = 224	**FREEZING POINT** 8.1°F (-13.3°C)
APPEARANCE AND ODOR Colorless liquid with a bitter almond odor. Specific gravity @70°F (Air = 1.0) is .95.	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) -0.4°F (-18°C) Closed cup	**AUTO IGNITION TEMPERATURE** 1000°F (538°C)	**FLAMMABLE LIMITS % BY VOLUME** LEL = 5.6 UEL = 40
EXTINGUISHING MEDIA Water, carbon dioxide		**ELECTRICAL CLASSIFICATION** Class 1, Group not specified
SPECIAL FIRE FIGHTING PROCEDURES		
UNUSUAL FIRE AND EXPLOSION HAZARDS		

REACTIVITY DATA

STABILITY Unstable	X	**CONDITIONS TO AVOID** See Hazardous Polymerization below
Stable		
INCOMPATIBILITY (Materials to avoid) Moisture, cyanides, potassium or bases		
HAZARDOUS DECOMPOSITION PRODUCTS Ammonia		
HAZARDOUS POLYMERIZATION May Occur	X	**CONDITIONS TO AVOID** Pure HCN slowly polymerizes to ammonia. With incompatible materials this reaction is accelerated. Acids are added to pure HCN to retard this exothermic polymerization.
Will Not Occur		

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact the closest Liquid Air Corporation location.

WASTE DISPOSAL METHOD

Do not attempt to dispose of residual or unused quantities. Return in the shipping container properly labled, with any valve outlet plugs or caps secured and valve protection cap in place to Liquid Air Corporation for proper disposal. For emergency disposal, contact the closest Liquid Air Corporation location.

EMERGENCY RESPONSE INFORMATION
IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT (800) 231-1366
OR CALL CHEMTREC AT (800) 424-9300

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

VENTILATION	LOCAL EXHAUST	SPECIAL
Hood with forced ventilation.	To prevent accumulation above the TWA.	
	MECHANICAL (Gen.)	OTHER

PROTECTIVE GLOVES
Rubber

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes, safety shower

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Hydrocyanic acid, liquefied (RQ 10/4.54) I.D. No.: NA 1051
DOT Shipping Label: Poison gas and flammable gas DOT Hazard Class: Poison A

SPECIAL HANDLING RECOMMENDATIONS
Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area. It may also be advisible to post signs indicating that a poison is stored in this area.

For additional storage recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS
Most common structural materials are compatible with hydrogen cyanide. Equipment for containing HCN must be kept scrupulously dry and leak-tight.

OTHER RECOMMENDATIONS OR PRECAUTIONS Because of hydrogen cyanide's extreme toxicity, it is recommended that a continuous monitoring system with alarm be installed to monitor the atmosphere wherever hydrogen cyanide is being handled or used. The system should have sensitivity and accuracy to a level at least one half of the TWA. Earth-ground and bond all lines and equipment associated with the hydrogen cyanide system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which may not be contained herein. The customer or user of this product should be familiar with these regulations.

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ADDITIONAL DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT: (Continued)

only offers HCN for sale as low concentrations of vapor diluted in other gases. The Ceiling Limit for hydrogen cyanide is 10 molar PPM. (ACGIH, 1984-85) TWA (skin) 10 molar PPM (OSHA, 1985). ....

SYMPTOMS OF EXPOSURE: (Continued)

135 Molar PPM - death within 30 minutes of exposure.

180 Molar PPM - death within 10 minutes of exposure.

270 Molar PPM - death within 5 minutes of exposure.

RECOMMENDED FIRST AID TREATMENT: (Continued)

sodium thiosulfate - both solutions injected at a rate of 2.5-5.0 ml per minute.

If the victim is unconscious, assisted respiration should be started immediately on clearing the contaminated area.

For further information refer to L'Air Liquide's Encyclopedie des Gaz.

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

	PRODUCT NAME: Hydrogen Sulfide TELEPHONE (415) 977-6900 EMERGENCY RESPONSE INFORMATION ON PAGE 2	
LIQUID AIR CORPORATION ALPHAGAZ DIVISION One California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94596	TRADE NAME AND SYNONYMS: Hydrogen Sulfide CHEMICAL NAME AND SYNONYMS: Hydrogen Sulfide	CAS NUMBER: 7783-06-04
ISSUE DATE AND REVISIONS: OCTOBER 1, 1985 CORPORATE SAFETY DEPT.	FORMULA: H_2S MOLECULAR WEIGHT: 34.06	CHEMICAL FAMILY: Nonmetal hydride

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

10 molar PPM; STEL = 15 molar PPM (ACGIH, 1984-85)

SYMPTOMS OF EXPOSURE

Continuous exposure to low (15-50 PPM) concentrations will generally cause irritation to mucous membranes and conjunctivae of the eyes. It may also cause headache, dizziness or nausea. Higher concentrations (200-300 PPM) can result in respiratory arrest leading to coma or unconsciousness. Exposures for more than 30 minutes at concentrations of greater than 700 PPM have been fatal. Continuous inhalation of low concentrations may cause olfactory fatigue or paralysis rendering the detection of its presence by odor ineffective.

TOXICOLOGICAL PROPERTIES

Inhalation of hydrogen sulfide is highly toxic. It is also an irritant to mucous tissue, membranes and the conjunctivae of the eyes. Continued exposure renders the olfactory sensors inoperative. Toxicologically its reaction with enzymes in the blood stream inhibit cell respiration resulting in pulmonary paralysis, sudden collapse and death. This overshadows its irritant effect on mucous membranes and tissues which at worst will cause pulmonary edema or conjunctival lesions.

Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	Yes ☐ No ☒	I.A.R.C. Monographs	Yes ☐ No ☒	OSHA	Yes ☐ No ☒	

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO HYDROGEN SULFIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. RESCUE PERSONNEL SHOULD RECOGNIZE THE HAZARDS OF OVEREXPOSURE DUE TO OLFACTORY FATIGUE.

Inhalation: Extreme fire hazard when rescuing semi-conscious or unconscious persons due to flammability of hydrogen sulfide. Avoid use of rescue equipment which might contain ignition sources or cause static discharge. Move affected person to an uncontaminated area. If breathing has stopped, give assisted respiration. Oxygen or a mixture of 5% carbon dioxide in oxygen should be administered by a qualified person. Keep victim warm and calm. Seek immediate medical assistance. (Continued on last page.)

AG 0624

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Hydrogen sulfide will explode or burn over a wide range of mixtures in air. It becomes dangerously reactive when mixed with concentrated nitric acid or other strong oxidizers such as sulfuric acid. Vapors will combust spontaneously when mixed with vapors of chlorine, oxygen difluoride or nitrogen trifluoride.

PHYSICAL DATA

BOILING POINT -76.4°F (-60.2°C)	**LIQUID DENSITY AT BOILING POINT** 57.11 lb/ft^3 (914.9 kg/m^3)
VAPOR PRESSURE 266.9 psia (1840 kPa)	**GAS DENSITY AT 70°F, 1 atm** .091 lbs/ft^3 (1.45 kg/m^3)
SOLUBILITY IN WATER Soluble	**FREEZING POINT** -122.3°F (-85.7°C)
APPEARANCE AND ODOR Shipped and stored as a liquid under its own vapor pressure. Vapor is colorless with a characteristic "rotten egg" odor. Specific gravity (Air=1.0) is 1.21	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED)	**AUTO IGNITION TEMPERATURE**	**FLAMMABLE LIMITS % BY VOLUME**
Gas	554°F (290°C)	LEL: 4.0 UEL: 44.0

EXTINGUISHING MEDIA
Carbon dioxide, dry chemical or water spray

ELECTRICAL CLASSIFICATION
NEC Class I

SPECIAL FIRE FIGHTING PROCEDURES
Shut off flow of gas. Cool surrounding fire-exposed containers with water spray. Fire fighters should use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Hydrogen sulfide is slightly heavier than air so may accumulate in low spots and may "travel" a considerable distance to a flame or other source of ignition.

REACTIVITY DATA

STABILITY Unstable		**CONDITIONS TO AVOID**
Stable	X	Avoid heat, flame or other sources of ignition.

INCOMPATIBILITY (Materials to avoid) Concentrated nitric acid, chlorine, nitrogen trifluoride, oxygen difluoride or other strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Oxides of sulfur

HAZARDOUS POLYMERIZATION May Occur		**CONDITIONS TO AVOID**
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact the closest Liquid Air Corporation location.

WASTE DISPOSAL METHOD
Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to Liquid Air Corporation for proper disposal. For emergency disposal, contact the closest Liquid Air Corporation location.

EMERGENCY RESPONSE INFORMATION
IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT (800) 231-1366
OR CALL CHEMTREC AT (800) 424-9300

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION Hood with forced ventilation.	**LOCAL EXHAUST** To prevent accumulation above the TWA for H_2S	**SPECIAL**
	MECHANICAL (Gen.)	**OTHER**
PROTECTIVE GLOVES Neoprene or butyl rubber, PVC, polyethylene		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower, eyewash "fountains"		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Hydrogen sulfide (RQ-100/45.4) I.D. No.: UN 1053
DOT Hazard Class: Flammable gas DOT Shipping Label: Flammable gas, Poison

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<750 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations consult L'Air Liquide's Encyclopedia de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional storage recommendations consult L'Air Liquide's Encyclopedia de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS

Many metals corrode rapidly with wet hydrogen sulfide. Anhydrous (water content <-40F or C) hydrogen sulfide can be handled in carbon steel, aluminum, Inconel®, Stellite® and 304 and 316 stainless steels. Avoid hard steels which are highly stressed since they may be susceptible to hydrogen embrittlement from hydrogen sulfide.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Earth-ground and bond all lines and equipment associated with the hydrogen sulfide system. All electrical equipment should be non-sparking or explosion proof. Do not rely on the olfactory sense to detect the presence of hydrogen sulfide. Analytical devices and instrumentation are readily available for this purpose. Perform frequent analytical tests to be certain that the TWA is not being exceeded.

Compressed gas cylinders should not be refilled except by qualified producers of

(Continued on last page.)

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which may not be contained herein. The customer or user of this product should be familiar with these regulations.

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ADDITIONAL DATA

Recommended First Aid Treatment: (Continued)

Eye Contact: PERSONS WITH POTENTIAL EXPOSURE TO HYDROGEN SULFIDE SHOULD NOT WEAR CONTACT LENSES.

Flush contaminated eye(s) with copious quantities of water. Part eyelids with fingers to assure complete flushing. Continue for at least 15 minutes.

Other Recommendations or Precautions: (Continued)

compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

APPENDIX B

SPECIFIC HEALTH AND SAFETY PROCEDURES

SOP No. 18	Respiratory Protection
SOP No. 21	Decontamination
SOP No. 24	Confined Space Entry
SOP No. 27	Lockout/Tagout
SOP No. 30	High Pressure Washers
SOP No. 31	Cranes and Hoisting
SOP No. 33	Personal Lifting Safety
SOP No. 34	Slip, Trip, Fall Prevention
SOP No. 41	Equipment and Hand Tools
SOP No. 45	Vehicle Safety
SOP No. 51	Equipment Inspection

1. OBJECTIVE

No individual will enter an area where the use of respiratory protective equipment is required unless the person has been trained in the selection, use, care and limitations of the respirators, and the proper respirator has been selected for the task and fit tested.

2. PURPOSE

The purpose of this procedure is to provide information and guidelines for the selection, use, and care of respiratory protective equipment for all OHM Remediation Services Corp. (OHM) and contractor personnel. This procedure complies with the requirements of 29 CFR 1910.134.

3. GENERAL

3.1 The use of engineering controls should be the primary respiratory hazards method to limit employee exposure to respiratory hazards.

3.2 Respirators shall be worn when engineering controls are unsuccessful and:

- When the PEL (Permissible Exposure Limit), TLV (threshold limit value), or ceiling limit for the material exposure is approached or exceeded, as measured by sampling.
- As deemed appropriate by the regional health and safety manager.

3.3 Respirators can only be worn by individuals who have been properly trained and fit tested.

3.4 The regional health and safety manager will evaluate annually the effectiveness of the respirator program and report his findings to the vice president of health and safety.

3.5 The respirator program coordinator for each region will be the regional health and safety manager.

3.6 Only respirators approved by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) which are appropriate for the potential hazard shall be worn.

4. SELECTION OF RESPIRATORS

4.1 Engineering controls should always be the primary control of contaminated air (i.e. elimination of source of contamination, ventilation equipment, barriers, etc).

4.2 Once the need for respirators has been established, the respirators shall be selected on the basis of the hazards to which the worker is exposed.

4.1.1 Selection criteria should include:

- The concentration of the contaminant.
- Whether the contaminant may be sufficiently toxic to be immediately dangerous to life or health (IDLH).
- The possibility of oxygen deficiency.
- The useful life of the respirator or cartridge.
- The escape routes available.
- Whether the equipment is intended for emergency use, for periodic use, or for stand-by purposes.

4.3 Characterization of the hazard and proper respirator data will be performed to determine what type respirator will be used.

5. MEDICAL SCREENING

5.1 Prior to assigning personnel tasks requiring the use of respirators, the employee shall be medically evaluated in compliance of requirements of 29 CFR 1910.134(a)(10).

5.2 Employees not physically and psychologically capable of wearing respirators shall not be assigned to such work.

5.3 The medical status of each employee is to be reviewed as outlined in Procedure 10 and as may be deemed necessary if the physical status of the employee changes.

6. FIT TESTING

6.1 Fit testing will be performed in accordance with accepted fit test procedures by the regional health and safety manager or their designated employee who has been trained and qualified to do so.

6.2 Records of fit testing shall be maintained by the employee's division office and/or corporate human resources.

7. RESPIRATOR USE INSTRUCTIONS

7.1 Respirators must be used only by those employees who have been properly trained and qualified on the specific type of respirator to be worn.

7.2 All employees whose job assignment requires the use of respirators shall be given respirator training at the time of fit testing before being assigned to the job. Retraining must be performed annually on each type of respirator worn by the individual. Training records must be kept.

7.3 Only respirators and cartridges approved for the hazardous atmosphere to be encountered will be used.

7.4 Only NIOSH/MSHA approved, respirators will be worn by an individual.

7.5 CAUTION: Full face piece or one-half face piece air-purifying respirators are not to be used where there is an oxygen deficiency. Only air-supplied full-face respirators with an emergency escape cylinder or self-contained breathing apparatus will be worn when an oxygen deficiency exists.

7.6 CAUTION: A respirator does not protect against excessive heat or against hazardous substance that can attack the body through the skin.

7.7 Contact lenses shall not be worn with full-face respirators.

7.8 A person wearing a respirator must be clean-shaven in the area of the face piece seal. Long hair, sideburns, and skull caps that extend under the seal are not allowed. Glasses with temple pieces extending under the seal are not allowed. Persons with facial conditions that prevent a proper seal are not allowed to wear a full-face piece respirator until the condition is corrected. Facial conditions which may cause a seal problem include missing dentures, scars, severe acne, etc.

8. RESPIRATOR INSPECTION

8.1 Respirators shall be inspected by the user before and after each day's use and those not used routinely shall be inspected once a month.

8.2 Inspection procedure air purifying respirators (full-face piece and one half-face piece cartridge/canister respirators)

8.2.1 Examine the face piece for:

- Excessive dirt
- Cracks, tears, holes, or distortion from improper storage.
- Inflexibility
- Cracked or badly scratched lenses.
- Incorrectly mounted lens or broken or missing mounting clips.
- Cracked or broken air purifying element holder, badly worn threads, or missing gaskets.

8.2.2 Examine the head straps or head harness for:

- Breaks or cracks
- Broken or malfunctioning buckles. Excessively worn serrations on the head harness which may permit slippage.

8.2.3 Examine exhalation valve for the following after removing cover:

- Foreign material
- Cracks, tears, or distortion in the valve material.
- Improper insertion of the valve body in the face piece.
- Cracks, breaks, or chips in the valve body, particularly in the sealing surface.
- Missing or defective valve cover.
- Improper installation of the valve in the valve body.

8.2.4 Examine the air purifying elements for:

- Missing cartridge adapter gasket
- Incorrect cartridge/canister, or filter for the hazard.
- Incorrect installation, loose connections, missing or worn gaskets, or cross threading in the holder.
- Cracks or dents in outside case or threads of filter or cartridge/canister.

8.2.5 If the device has a corrugated breathing tube, examine it for:

- Broken or missing end connections.
- Missing or loose hose clamps.
- Deterioration, determined by stretching the tube and looking for cracks.

8.3 Inspection procedure air-supplied respirators (full-face piece air line respirators and self contained breathing apparatus (SCBA)) should be inspected as follows:

8.3.1 If the device has a tight-fitting face piece, use the procedures outlined for air purifying respirators will be followed, except those pertaining to the air purifying elements.

8.3.2 The inspection of air-supplied respirators should include checks on the following items:

- Tightness of connections
- Condition of all rubber parts
- Air cylinder (SCBA & egress) must be fully charged and the hydrotest certification must be current (SCBA cylinders-3 years/egress cylinders 5 years).
- Regulators and warning devices function properly.
- Does each unit (SCBA & egress) have a distinct identification number permanently affixed or engraved on the regulator?

8.4 A record of respirator inspections including date and inspectors initials and maintenance will be maintained for all pieces of respiratory protective equipment designated for emergency response. The SCBA inspection form follows this procedure.

9. CLEANING OF RESPIRATORS

9.1 Respirators assigned and worn by one individual must be cleaned after each day's use. Visitors's or multi-assigned respirators must be cleaned and disinfected after each use.

9.2 Extreme caution must be exercised to prevent damage from rough handling during the cleaning procedure.

9.3 After cleaning, respirators must be reassembled.

9.4 A respirator spray disinfectant is approved as disinfectant between continuous use but not for cleaning and sanitizing after each day's use.

9.5 Cleaning Procedure for Individually assigned Respirators

9.5.1 Washing: The respirator must be disassembled and washed with a mild liquid detergent in warm water. A brush should be used. To avoid damaging the rubber and plastic in respirator face pieces, use a soft bristle brush and a cleaner/water solution between 90 and 100°F.

9.5.2 Rinsing: The respirator should be rinsed thoroughly in clean water (140°F maximum) to remove all traces of detergent. This is very important to prevent dermatitis.

9.5.3 Drying: The following drying methods may be used: draining and drying on a clean surface; draining and drying when hung from racks (take care to prevent damage); towel drying with soft clothes or paper towels.

9.6 Cleaning Procedure for Visitor or Multi-Assigned Respirators

9.6.1 Washing: The respirator must be disassembled and washed with a brush in a cleaning solution in warm water. To avoid damaging the rubber and plastic in respirator face pieces, use a soft bristle brush and a cleaner/water solution between 90 and 100°F.

9.6.2 Rinsing: The respirator must be immersed in a disinfectant solutions noted below for at least 2 minutes and then rinsed in clean water at 140°F maximum.

9.6.3 Disinfection: 50 ppm of chlorine in a hypochloride solution made from household bleach (2 ml. to one liter of water).

9.6.4 Drying: The following drying methods may be used: draining and drying on a clean surface; draining and drying when hung from racks (take care to prevent damage); and drying in steel storage cabinets with built-in circulation fans. (Solid shelves should be replaced with steel mesh).

10. MAINTENANCE OF RESPIRATORS

10.1 Respirator maintenance shall only be performed by qualified personnel, for example site supervisors and site safety officers.

10.2 Approved replacement parts must be used. Substitution of parts from a different brand or type of respirator invalidates the technical approval of the respirator.

10.3 Maintenance performed on a self-contained breathing apparatus shall be done only by an individual who has been certified by the manufacturer.

11. STORAGE OF RESPIRATORS

11.1 When not in use, respirators must be stored to protect them from dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and physical damage.

11.2 Respirators must be stored in reusable plastic bags between shifts.

11.3 The respirator storage environment must be clean, dry and away from direct sunlight. Upright cabinets and wall-mounted cases are suggested.

12. BREATHING AIR

Breathing air shall meet at least the requirements of the specification for Grade D breathing air or better (D, E, or G not A, K, or L) as described in the American National Standard Commodity Specification for Air ANSI/CGA G-71-1989.

13. COLOR CODE

NIOSH recognizes the following standard color codes for respirator cartridges. The color codes can be used as a general guideline, however, personnel should refer to the NIOSH technical certification (TC) to verify adequate protection.

Acid gases	White
Organic vapors	Black
Ammonia gas	Green
Acid gases and organic vapors	Yellow
High Efficiency Particulate Air (HEPA)	
Dust, fumes, and mists (including asbestos and radioactive materials)	Magenta (Purple)
Dusts, fumes, and mists (other than asbestos and radioactive materials)	Orange

OHM Corporation

RESPIRATOR FIT TEST RECORD

Name:_____

Employee Number:_____

Date of Test:_____

Expiration Date:_____

Type of Fit Test:

☐ **Quantitative**
Protective Factor _____

☐ **Qualitative**

TESTING AGENT:

Isoamyl Acetate (Banana Oil) ☐

Irritant Smoke ☐

Saccharin ☐

RESPIRATOR DESCRIPTION

Manufacturer:_____

Model:_____

Size:_____

Test Conducted by:_____
(Please print)

Signature of Conductor:_____

I certify that I have been trained on the proper use, instructed on maintenance procedures, and have passed a respirator fit test as described above.

SIGNATURE OF EMPLOYEE:_____

COPY TO: Employee Home Division
Corporate Personnel Office (FAX Number: 419-425-6069)

1. OBJECTIVE

All personnel, tools and equipment which have entered the contaminated area (exclusion zone) on OHM Remediation Services Corp. (OHM) job sites involving hazardous materials require decontamination upon leaving the exclusion zone as required in 29 CFR 1910.120.

2. PURPOSE

The purpose of this procedure is to describe the requirements for decontamination.

3. REQUIREMENTS

3.1 The site health-and-safety plan will include a section on decontamination with specific requirements.

3.2 Every exit from the exclusion zone requires decontamination. The exception is an emergency situation. If an employee is injured, decontaminate to the extent possible given the nature of the injury.

3.3 Large equipment such as drill rigs and heavy equipment will be decontaminated by using a steam or hot water hose wash or by detergent wash.

3.4 Personnel decontamination will vary from site to site but will always include the following steps:

- Equipment drop
- Outer boots and gloves wash/rinse (step off)
- Outer boots and gloves removal
- Suit wash/rinse/removal
- Inner glove wash/rinse
- Face piece removal, wash/rinse
- Inner glove removal
- Field wash (face, hands)

3.5 Personnel assigned to the decontamination process will assist workers and decontaminate equipment and reusable protective gear.

3.6 An on-site shower facility will be provided whenever necessary.

3.7 During hazardous waste site activities, the site safety officer or the site supervisor will verify that proper decontamination procedures are being followed. Verification of decontamination for personal protective equipment and equipment may be accomplished by direct reading monitoring instruments and/or visual inspection as it is brought out of the contamination reduction zone. In some cases wipe samples may be collected to document that the decontamination effort is affective.

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) shall enforce this procedure as a means of protecting the health and safety of workers while entering, working in, and exiting confined spaces. Before entry, the worker will be made aware of the hazards of confined space work and the safe work practices necessary.

2. PURPOSE

The purpose of this procedure is to establish confined space entry standards for all OHM employees. This procedure meets and exceeds the guidelines in the Occupational Safety and Health Administration (OSHA) proposed Confined Space Entry standard 29 CFR 1910.146.

3. PROCEDURE

3.1 Permitting - All "permit required confined space" entries will be proceeded by the completion of a confined space entry permit. The OHM confined space entry permit follows this procedure.

3.2 Written Rescue Procedure - Prior to any confined space work, a site specific written rescue plan will be developed that addresses minimum requirements.

3.2.1 Rescue

- The equipment required to rescue an unconscious victim must be in-place before the first person enters the confined space.
- A trained stand-by person will be assigned to each confined space with a fully charged SCBA or airline and egress unit.
- The stand-by is to keep life lines clear, to maintain contact with all workers within the confined space and to summon help if needed.
- The stand-by must never enter the confined space unless relieved by rescue assistance.
- The stand-by may attempt rescue by lifeline while waiting for rescue assistance.

4. PERMIT SYSTEM

All confined space entry permits will address the following:

- Location
- Hazards-Isolation
- Lockout / Tagout
- PPE and special equipment
- Air monitoring requirements and results of such monitoring
- Personal monitoring
- Training required
- Stand-by persons to be present as alternates
- Communication procedures
- Emergency / rescue procedures
- Confined space classification
- Posting of notification

6. TRAINING

OHM will train employees involved in confined space entry and confined space rescue on the hazards associated with confined space work. This training will, as a minimum, cover the following:

- Hazard recognition
- Emergency entry and exit
- Respirator use
- First aid
- Lock-out procedures
- Safety equipment
- Rescue drills
- Permit system
- Work practices
- Communication requirements

7. TESTING AND MONITORING

7.1 Initial Monitoring - Entry into a confined space is prohibited until initial testing of the atmosphere for oxygen content and toxic gas concentration is conducted from the outside. Initial monitoring gives critical information concerning oxygen level, flammability and toxicity hazards.

7.2 Hot Work - All hot work is prohibited in confined space where monitoring indicates that there are flammable compounds in excess of 10% of the Lower Explosive Limit (LEL). The monitoring device will be intrinsically safe for flammable atmospheres or explosion proof. If hot work must be performed in the confined space, a hot work permit must be completed. Cutting gas cylinders and welding machines will not be taken into confined space.

7.3 Calibration - All monitoring equipment will be calibrated before each use and those calibrations will be logged in the equipment records. The calibration record will be kept for a minimum of one year from the date of measurement.

7.4 Oxygen Requirement - The percent oxygen for entry will not be less than 19.5% for confined space entry without supplied air respirators. If elevated (greater than 22%) oxygen levels are detected, the confined space must be ventilated prior to any "hot work". Any oxygen reading above or below 20.9% will be reported to the site safety officer before further entry is attempted.

7.5 Permissible Exposure Limits (PEL) - OHM employees will be provided with and will be required to properly use protective clothing and respiratory protective equipment when contaminants in the atmosphere reach or exceed the PEL. The personal protective equipment (PPE) selected will reduce exposure to contaminants to acceptable levels.

8. LABELING AND POSTING

8.1 Any signs warning of dangers in the work area will be in English and the predominant language of any non-English reading workers.

8.2 All entrances to confined spaces at OHM facilities and on-going projects will have appropriate signs posted. The signs should include the following, if applicable:

Danger
Confined Space Entry
Entry by Permit Only

The following statements shall be added where necessary:

Respirator Required for Entry
Lifeline Required for Entry
Hot Work Permitted
or
No Hot Work

8.3 Emergency numbers will be conspicuously posted near the work area or at the telephone nearest the work area.

9. SAFETY EQUIPMENT AND PPE

The site safety officer or site supervisor will determine and list on the confined space permit the necessary safety equipment and PPE. The site supervisor will ensure that the safety equipment is properly used and is maintained in the proper working condition. These items may include, but are not limited to:

- Eye / face protection
- Head protection
- Foot protection
- Protective clothing
- Hearing protection
- Respiratory protection
- Safety bells/Alarms
- Harnesses
- Lifelines
- Wrist harnesses
- Life jackets
- Fall nets
- Barricades
- Retrieval systems

10. WORK PRACTICES

10.1 Purge and Ventilation - During purge and ventilation procedures, blower controls will be a safe distance from the confined space. Initial testing is to be conducted prior to purge/ventilation to determine what precautions are necessary. If a flammable atmosphere exists, all electrical equipment must be intrinsically safe or explosion proof. Continuous ventilation will be required when welding or painting in a confined space, or where a toxic atmosphere may form from desorption from walls, or evaporation of chemicals. Ventilation systems must not prevent egress from the area or interfere with communications.

10.2 Isolation / Lock-out / Tag-out - Each confined space will have isolation procedures specifically developed. The confined space must be completely isolated from all systems by physical disconnect, block and bleed, or blanking and tagging. Electrical systems must be de-energized and locked-out. All systems should be checked for stored energy before any entry into confined space is attempted.

10.3 Cleaning - Cleaning procedures will be reviewed and approved by the qualified person. Initial cleaning will be conducted from outside the tank whenever possible to minimize exposures to employees. Cleaning may be accomplished by flushing with water or chemical cleaners. At times the use of a "Butterworth" cleaning head may be required. In any case, gross material must be removed before entry is performed.

11. EQUIPMENT AND TOOLS

All equipment that is used in confined space will be inspected and as a minimum, will meet the following requirements:

- Hand tools will be kept clean and in proper working condition.
- Electric tools, equipment and lighting will be intrinsically safe or explosion proof for flammable atmospheres and be equipped with ground fault circuits interrupters (GFCI).
- Extension cords will be industrial quality, 3 wire and 12 gauge as a minimum.
- Cylinders of compressed gas will never be taken into a confined space, with the exception of SCBA tanks or life saving equipment.
- Ladder and scaffolding will meet or exceed OSHA requirements in 29 CFR 1910.25-28.

OHM Corporation

CONFINED SPACE ENTRY PERMIT

Project No._____ Permit No._____

Good on this Date Only:_____ From: a.m. p.m._____ To: a.m. p.m._____

Location:_____ Description of Task:_____

Workers Authorized to Enter	Work Monitors	Rescue Personnel
_____	_____	_____
_____	_____	_____
_____	_____	_____

EMPLOYEE PRE-ENTRY BRIEFING

Pre-Entry Briefing Conducted by: _____ (Name) _____ (Date)

CONFINED SPACE PREPARATION

1. Is Illumination Adequate?	YES_____	NO_____	
2. Must Electrical Devices be Intrinsically Safe or Explosion Proof?	YES_____	NO_____	
3. Are Non-Sparking Tools Required?	YES_____	NO_____	
4. Are GFCI's In Use?	YES_____	NO_____	
5. Have All Power Cords and Tools Been Visually Inspected?	YES_____	NO_____	N/A_____
6. Fire Extinguisher Available at Entrance.	YES_____	NO_____	TYPE_____
7. Eye Wash/Safety Shower Available.	YES_____	NO_____	N/A_____
8. Is Rescue SCBA Available?	YES_____	NO_____	N/A_____
9. Work Area Isolated with Signs/Barriers?	YES_____	NO_____	N/A_____
10. All Energy Sources Locked/Tagged Out?	YES_____	NO_____	N/A_____
11. All Input Lines Capped/Blinded?	YES_____	NO_____	N/A_____
12. Vessel Contents Drained/Flushed/Neutralized?	YES_____	NO_____	N/A_____
13. Vessel Cleaned/Purged?	YES_____	NO_____	N/A_____
14. Ventilation Provided 30 Minutes Before Entry?	YES_____	NO_____	N/A_____
15. Communication Requirements	VISUAL_____	VOICE_____	RADIO_____
16. Level of Respiratory Protection.	B_____	C_____	D_____
17. Type of Chemical Protective Clothing Required.	TYVEK_____	SARAN_____	ACID_____
18. Type of Glove Material Required.	NITRILE_____	PVC_____	ACID_____

PRE-ENTRY ATMOSPHERIC TESTING

	Reading:	Time:	Initials:
1. Test for Oxygen Content:	_____ % O_2	_____	_____
2. Test for Flammable Concentration:	_____ % LEL	_____	_____
3. Test for Toxic Concentration:	_____ ppm of _____ (TLV = _____)	_____	_____
4. Continuous Monitoring Required?	YES_____ NO_____		

EMERGENCY/RESCUE PROCEDURES

1. Is a Site Specific Rescue Plan Required?	YES_____	NO_____
2. Are Personnel Trained for Confined Space Rescue Available?	YES_____	NO_____
3. If NO, Has an Outside Agency Been Notified?	YES_____	NO_____
4. Outside Rescue Agency Name:_____		Phone No._____

ENTRY/EGRESS REQUIREMENTS

1. Are Ladders Required for Entry?	YES_____	NO_____
2. Are Vertical Extraction/Rescue Devices Required?	YES_____	NO_____
3. Is Fall Protection Required?	YES_____	NO_____

OTHER POTENTIAL HAZARDS

1. Noise	YES_____	NO_____	CONTROL_____
2. Heat Stress	YES_____	NO_____	CONTROL_____
3. Cold Stress	YES_____	NO_____	CONTROL_____
4. Biological Agents	YES_____	NO_____	CONTROL_____

SUBCONTRACTOR NOTIFICATION

Contractor Notified of: Permit Conditions _____ Potential Hazards _____ N/A _____

PERMIT AUTHORIZATION

I certify that I have inspected the work area for safety and reviewed all safety precautions recorded on this permit.

Permit Authorized by (Signature): _____

1. OBJECTIVE

This procedure shall be used by OHM Remediation Services Corp. (OHM) personnel to ensure that the machine or equipment being worked on is isolated from all potential hazardous energy sources, and locked out or tagged out before an employee performs any servicing or maintenance activity where that unexpected energization, start-up or release of energy could cause an injury. Energy sources can be electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

2. PURPOSE

This procedure establishes the minimum safety requirements to ensure the proper deactivation of movable, electrically energized, pressurized equipment and systems, and systems containing hazardous materials prior to repairing, cleaning, oiling, adjusting, or similar work. This procedure complies with the requirements in 29 CFR 1910.147.

3. REQUIREMENTS

This procedure applies to all equipment that receives energy from electrical power, hydraulic fluid under pressure, compressed air, steam, energy stored in springs, potential energy from suspended parts, or any other source that may cause unexpected movement when it is necessary to perform work on that system. It also applies to similar functions performed on systems containing hazardous materials.

4. DEFINITIONS

4.1 Lockout - The placement of a lockout device on an energy isolating device, in accordance with this procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed. The lockout device can be key operated or a combination device.

4.2 Tagout - The placement of a tagout device on an energy isolating device, in accordance with this procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed by the authorized person who originally placed the tagout device in position.

4.3 Authorized employee. A person who locks or implements a tagout system procedure on machines or equipment to perform the servicing or maintenance on that machine or equipment.

5. PROGRAM ELEMENTS

Prior to initiating any repairs, modifications and/or adjustments to operating equipment, these steps will be followed.

5.1 The immediate supervisor with jurisdiction over the equipment and all affected employees will be notified that the energy sources are to be deactivated.

5.2 All sources of power that must be locked out, blocked or released will be identified by the immediate Supervisor and the employee who will work on the equipment.

5.3 In order to ensure that the equipment cannot be re-energized while maintenance activities are performed, the employee will lockout / blank out all potential energy sources. (The employees will be assigned padlocks with their names or identification numbers affixed to the locks. The locks will be individually keyed to prevent another employee from removing the lock inadvertently.) If more than one employee is assigned to work on the equipment, a multi-lockout hasp will be used so that all employees working on the equipment can apply their locks and ensure their safety.

5.4 A tagout device will be affixed to all components or systems de-energized to indicate that lockout has been performed.

Prior to performing any work activities, the employee will operate the start and stop controls on the equipment to ensure that the equipment has been properly deactivated. After the test, the equipment must be in neutral or off.

5.5 After the servicing and/or maintenance is complete and the equipment is ready for normal operations, check the area around the machine or equipment. After all tools have been removed from the machine or equipment, guards have been reinstalled, remove all lockout or tagout devices. Operate the energy isolating devices to restore energy to the machine or equipment.

6. SPECIAL CONDITIONS

During certain operations it may be necessary to energize the equipment for a short period of time. Employees in the immediate area will be notified and directed to stay clear of the equipment. If the operation is to be deactivated again, the employee should repeat steps 5.3 to 5.6 of this procedure before work resumes.

In some instances work will carry over to another shift. The maintenance supervisor shall affix a department lock to the equipment to ensure that it is not energized during the transition. During subsequent slight operations, employees will ensure that steps 5.2 to 5.6 are complete before work resumes on the equipment.

If the work is completed and a lock remains on the equipment, it shall not be removed until the employee responsible for the lock is found or the supervisor of the employee investigates and ascertains that the equipment is safe to operate. Unauthorized removal of a lock will subject the violator to disciplinary action up to dismissal.

7. TRAINING

Initial and annual training will be given to all employees to ensure that the purpose and function of this energy and control program are understood.

8. PERIODIC INSPECTION

Corporate health and safety will conduct an annual audit of the energy control program to ensure that the requirements of their procedures are being followed. A record of annual audits will be kept to comply with the certification requirement of periodic inspections.

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) personnel who have been trained in the proper set-up, use, and care of high pressure washers will be authorized to operate this equipment.

2. PURPOSE

This procedure describes requirements for the safe operation of the high-pressure washer.

3. PERSONAL PROTECTIVE EQUIPMENT

The following equipment will be worn by operators and assistants:

- Safety shoes or boots
- Metal foot and shin guards
- Eye protection (goggles and face shield)
- Hard hat
- Heavy duty PVC rain suit or equivalent
- Heavy chemical resistant gloves

4. OPERATION PROCEDURE

- Only trained, authorized personnel will operate the high-pressure washer.
- The lance must always be pointed at the work area.
- The operator must maintain good footing.
- The operator must have an assistant to aid in moving the hose to different areas and backing up the operator. The assistant must remain in back of the operator.

- Non-operators must remain a safe distance from the operator. The distance must be a minimum of 25 feet.
- The operating pressure should never exceed that which is necessary to complete the job.
- No unauthorized attachment may be made to the unit. (The trigger should never be tied down.)
- The operator should be changed at frequent intervals to avoid fatigue (at least hourly).
- Equipment should be cleaned often to avoid oil or dirt build-up, especially around the trigger and guard area.
- An assistant should always be standing by at the pressure generator to shut down the equipment and monitor the pressure.
- All users must be trained in emergency shut down procedures and general equipment maintenance.
- All lances must be made of seamless stainless steel. Do not use carbon steel which can corrode and result in weakening of the lance.
- DO NOT MODIFY THE LANCE. The lance barrel, from trigger block to the tip, should not be less than 48 inches as recommended by manufacturers of hydroblasting equipment.
- Always increase pressure slowly to inspect for leaks. All leaks or malfunctioning equipment must be repaired immediately or the unit taken out-of-service. Never exceed the operating pressure necessary to do the job.
- Attach a cable which connects the water supply hose to the laser wand to prevent whipping should they accidentally disconnect.
- A serious risk of infection and further complications is possible from a hydroblasting laceration. If an injection injury is suspected, the treating physician should be informed so he/she can request a surgeon who specializes in injection injuries. The specialist may have to perform surgery on the affected body part in order to remove the material (oil, particles) that was injected directly through the skin.

1. OBJECTIVE

All lifting activities performed by OHM Remediation Services Corp. (OHM) personnel using cranes and hoists shall comply with all federal, state, and local laws as well as safe practices dictated by this procedure and the crane and/or hoist manufacturers.

2. PURPOSE

This procedure describes requirements for maintenance and operation of hoisting equipment. This procedure is an overview of the guidelines of 29 CFR 1910.179, 1910.180 and 29 CFR 1926.550 which should be used as a reference.

3. REQUIREMENTS

3.1 OHM will only use cranes and other hoisting equipment that are in safe working order. All crane equipment at OHM facilities and project sites will be inspected for structural integrity, smooth operational performance, and proper functioning of all critical safety devices in accordance with the crane manufacturer's specifications. This inspection will be performed by the OHM site supervisor and/or site safety officer (SSO), and the crane operator. Inspection requirements for overhead cranes are found in 29 CFR 1910.179 (j) and for mobile cranes in 29 CFR 1926.550 (a).

3.2 All equipment not conforming to the operational and safety requirements set forth will not be put into service until all necessary repairs are made to the satisfaction of the inspection group.

3.3 Only qualified crane operators familiar with the equipment will be permitted to operate the crane. Subcontractors will supply proof of operator capability and experience to operate the crane in a safe manner. OHM reserves the right to remove from the work site any crane operator if there is question or doubt concerning the operator's capabilities.

3.4 Inspection of cranes and hoists will be recorded. A written record of the inspection will be maintained and kept for at least three years.

3.5 The crane operator will not operate the crane or hoist until everyone concerned has been instructed concerning the work to be done.

3.6 Weights of material sent to all OHM facilities shall be stenciled on the material.

3.7 All hooks, slings, and other fittings shall be of correct size for the work to be done and shall have strength sufficient to safely sustain the loads imposed on them.

3.8 Employees shall not stand or walk beneath crane booms.

3.9 In the event of emergency repair work of hoisting equipment with a suspended load, the area below the load shall be barricaded and the load blocked up or otherwise supported.

3.10 Employees are not to ride loads, hooks, headache balls, or slings suspended from hoisting equipment.

3.11 Side pulls shall be avoided in all cases. The load must be directly under the hoist.

3.12 The safety latch on the main hook of hoisting equipment must be installed and in a "closed" position.

3.13 Use of deformed or defective hooks, rings, pins, shackles, or other lifting attachments is prohibited. Wire rope shall be free of kinks, sharp bends, or twists.

3.14 Crane operations must not interfere with helicopter operations or helicopter operations must be restricted accordingly.

3.15 The crane operator shall refuse to perform any crane operation, if an unsafe condition would result.

3.16 Stringing and reeving shall be in accordance with manufacturer's recommendations.

3.17 All personnel working in and around the crane operation shall wear hard hats, safety shoes, and safety gloves at all times.

5.6.6 Shutdown crane during nearby helicopter operations (boom in cradle or pointed away from landing area).

5.6.7 Know the weight of the load to be lifted prior to lifting.

5.6.8 Weight indicators or scales shall be used to determine true load weight if the estimated weight is in excess of 75 percent of the cranes rated capacity.

5.6.9 Not use cranes for dragging a load unless rigged for a vertical pull and equipped with a weight indicator.

5.6.10 Ensure that three full wraps of wire rope remain on the hoisting drum unless otherwise specified by the crane manufacturer.

5.6.11 Stop or restrict crane operations during bad weather or poor visibility.

5.6.12 Not refuel the crane with the engine running.

5.6.13 Ensure the crane has a boom angle indicator which is functional and visible from the operator control station.

5.6.14 Ensure the proper load chart is posted and visible from the operator control station.

5.6.15 Ensure each crane has posted operating instructions.

5.6.16 Ensure crane load weight indicators are functional and calibrated in accordance with the manufacturer's recommendations.

5.6.17 Ensure an operable anti-two blocking device is installed on all cranes.

5.6.18 Ensure crane cab is kept clean.

5.6.19 Ensure slipping and tripping hazards are removed from work area.

6. RIGGING PRACTICES

The Rigger shall:

6.1 Stay from under the boom/load when there is tension on the load line and when there is no tension on the load line except for the minimum time necessary to hook/unhook the load.

6.2 Stop a load from being lifted when it is unsafe.

6.3 Wear leather or other hard surface gloves when handling wire rope.

6.4 Ensure safety latches are closed, shackle pins are screwed all the way in, and hooks without latches are secured.

6.5 Ensure sling angles are not less than 30 degrees from the horizontal.

7. RIGGING PRACTICES/EQUIPMENT

7.1 Multiple part lines shall not be twisted while lifting/lowering.

7.2 Shackles shall be used with all pad eyes.

7.3 Fiber rope or "soft line" shall be used only for tag lines.

7.4 Wire rope clips shall be placed with the U-bolts on the short end of the rope.

7.5 When less than all legs of a multi-legged sling are used, the other leg(s) must be secured before lifting.

7.6 Chain slings shall not be used unless the have an identification tag with the rated capacity and identification number.

7.7 All slings shall be immediately inspected if subjected to shock or impact loading.

7.8 Slings shall be used according to manufacturer specifications and properly stored when not in use.

8. LIFT STRATEGY PLAN

In order to address different types of lifts, a lift strategy plan has been established by OHM. Under this plan, OHM will use the crane's load capacity and specific rigging requirements to classify the lift. Under these guidelines various lift strategies will be followed.

8.1 General Lifts - General lifts are small scale hoisting activities which require daily rigging inspection. To distinguish what items are considered general lifts, the load capacity chart of the specific crane in use will be the criteria. General lifts for this plan are those lifts that do not exceed the crane's load capacity rating in its least stable, but safe operating position.

8.2 Major Lifts - Major lifts are lifts that require the attention of the OHM Site Safety Officer (SSO) or his designated representative to review the lift and rigging operations during the actual lift. Major lifts are those that are less than 75 percent of the crane's upper load rating on the load capacity chart. Major lifts may also include those lifts with unusual configurations that require special attention in rigging.

8.3 Critical Lifts - Critical lifts are those lifts which exceed 75 percent of the crane's load capacity rating. Critical lifts will not be enacted until an overall lift review detailing all weight calculations and lift strategy has been held.

Direct supervisory and safety supervision by OHM will be mandatory for all major and critical lifts.

9. OTHER CRANE SAFETY EQUIPMENT

9.1 A 5 pound A:B:C dry chemical or equivalent fire extinguisher shall be within the area of the crane cab.

9.2 Cranes without cabs shall have the fire extinguisher located within 25 feet of the crane.

9.3 All equipment and material hoists operating on rails, tracks, or trolleys shall have positive stop or limiting devices to prevent overrunning.

10. DESIGNATED CRANE OPERATORS

Cranes shall be operated only by the following personnel:

10.1 Crane operators qualified or designated by documented training and experience.

10.2 Trainee crane operator while under the direct supervision of an OHM qualified crane operator.

10.3 Maintenance personnel and inspectors when it is necessary in the performance of their duties.

10.4 Contract crane operators meeting operator qualification requirements equivalent to OHM crane operator requirements.

11. QUALIFICATIONS FOR CRANE OPERATOR POSITIONS

11.1 Physical Requirements:

11.1.1 Vision:

- Minimum vision of 20/30 in one eye and 20/50 in the other eye with or without eye correction.
- Satisfactory depth perception.

11.1.2 Hearing:

- Have hearing, with or without a hearing aid, adequate for the specific operation.

11.1.3 Medical History:

- Disabling medical condition(s) is sufficient for disqualification.
- Employee shall notify their supervisor of any physical condition that may affect safe crane operations.

1. OBJECTIVE

All OHM Remediation Services Corp. (OHM) employees will use the proper lifting techniques and will utilize mechanical means when an objects' weight or bulk cannot be safely lifted by manual means.

2. PURPOSE

This procedure provides the proper lifting technique to be used by OHM employees. By utilizing proper technique, OHM employees can avoid debilitating lower back injuries.

3. REQUIREMENTS

3.1 Use mechanical material handling equipment whenever practical; however, mechanical lifting equipment shall be used only by qualified personnel.

3.2 If the material must be lifted manually, the following procedures apply:

3.2.1 Make certain that the load lifted can be safely handled. Consider the size, weight, and shape of the load. If necessary, get help.

3.2.2 Warm up for the lift by bending, stretching, and turning.

3.2.3 Do not attempt to lift more than 60 pounds.

3.2.4 Ensure proper lifting technique as follows.

- Place feet about shoulder width apart.
- Place one foot alongside the object being lifted and the other foot in front of the object.
- Bend at the knees to grasp the load.
- Maintain slight arch in the back when positioning over load.
- Draw the load close to the body, keeping the arms and elbows tucked into the side of the body.

- Take a firm hold on the load with the palms of the hands, not just the fingers.
- Maintain same slight arch in the back.
- Lift gradually, using your leg muscles. Make sure you draw the load close to your body.
- Do not twist the body when lifting. If you have to change direction, turn with your feet, not your trunk.
- Carry the object close to the body and watch where you are going. Do not carry objects in a manner that obstructs your vision.
- Avoid throwing or dropping objects. When lowering, maintain a firm grip. Watch out for pinching of the fingers. Use your leg muscles to lower the object by bending at the knees and keeping your back straight.

1. OBJECTIVE

All OHM Remediation Services Corp. (OHM) employees and contractors shall, attempt to identify and eliminate situations where injuries or "near misses" could occur from slip, trip, or fall hazards.

2. PURPOSE

This procedure describes work practices that will reduce or eliminate slips, trips, and falls and thereby reduce or prevent the injuries associated with these types of accidents. The intent is to prevent injuries and maintain an efficient and healthy workforce.

3. REQUIREMENTS

3.1 Personnel shall keep the working area clean and orderly. Tools must not be left lying on the floor or decking where they present tripping hazards during a job or after a job is completed.

3.2 Small, loose items such as, disconnected joints of pipe, wood chips, other small objects and debris shall not be left lying around in any place, particularly in areas where personnel walk.

3.3 Walkways and grating shall be kept in good condition. Openings in walkways shall be repaired immediately, if possible. If not immediately repaired, the section must be roped off or closed until repairs can be made.

3.4 Holes in gratings shall be covered or surrounded by an adequate guard rail.

3.5 Oil spills and slippery spots shall be cleaned up immediately.

3.6 Extra precautions must be taken when walking on steel decking or catwalks during wet weather.

3.7 Personnel shall not take dangerous shortcuts. They shall avoid jumping from elevated places.

3.8 Personnel must always position themselves properly when using tools.

3.9 Personnel shall not walk or climb on piping, valves, fittings or any other equipment not designed as walking surfaces.

3.10 Stairways, walkovers or ramps shall be installed where personnel must walk or step over equipment in the course of their normal duties.

1. OBJECTIVE

All OHM Remediation Services Corp. (OHM) equipment and hand tools used at OHM facilities and project sites will be in good operating condition with all cords and safety guards in place.

2. PURPOSE

The purpose of this procedure is to describe the basic guidelines for the safe operation of hand and power tools used in OHM shops and project sites. This procedure is an overview of 29 CFR 1910.242 and .243.

3. REQUIREMENTS

3.1 All hand tools and power tools shall be in good repair and will be used only for the task for which they were designed.

3.2 Any tool that is damaged or defective will be tagged "out-of service" and will be repaired or destroyed.

3.3 Surfaces and handles shall be kept clean and free of excess oil to prevent slipping.

3.4 Sharp tools shall not be carried in pockets.

3.5 Upon completion of a job, tools will be cleaned and returned to the tool box or storage area.

3.6 Wrenches shall have a good bite before pressure is applied. Brace yourself by placing your body in the proper position so that in case the tool slips you will not fall. Make sure hands and fingers have sufficient clearance in the event the tool slips. Always pull on a wrench, never push.

3.7 When working with tools overhead, the tools will be placed in a holding receptacle or secured when not in use.

3.8 Throwing tools from place to place, from person to person, or dropping them from heights is not permitted.

3.9 Only non-sparking tools will be used in atmospheres which exhibit fire or explosive characteristics.

3.10 All tools should be inspected prior to start-up or use to identify any defects.

3.11 Powered hand tools should not be capable of being locked in the "on" position.

3.12 Power nailing or stapling tools must only be capable of activation when in contact with the work surface. All such power devices must have a safety interlock.

3.13 Loose clothing, long hair, loose jewelry, rings and chains will not be worn while working with power tools.

3.14 Cheater pipes will not be used.

3.15. In applications where injury to the operator might result if motors where to restart after power failure, provisions shall be made to prevent machines from automatically restarting upon restoration of power.

4. GRINDING TOOLS

4.1 The work rest for a grinder should be no more than 1/8 inch from the wheel and the tongue guard no more than 1/4 inch from the wheel. Frequent inspections are necessary to insure proper distances are maintained.

4.2 Work or tool rests should not be adjusted while the grinding wheel is moving.

4.3 Inspect the grinding wheel for cracks, chips or defects. Remove the wheel from service if any defects are found.

4.4 Goggles shall always be worn when grinding and a transparent full face shield may be worn in conjunction with the goggles.

4.5 The side of a grinding wheel shall never be used unless the wheel is designed for side grinding.

4.6 Grinding wheels are rated for specific speeds. Rating should be checked when installing a new wheel.

4.7 Grinding aluminum is prohibited.

5. POWER SAWS

5.1 Circular saws will be fitted with blade guards.

5.2 Damaged, bent or cracked saw blades will be immediately removed from service and destroyed.

5.3 Hand fed table saws will be fitted with a splitter to prevent the work from squeezing the blade and kicking back on the operator.

5.4 Hand held circular saws will be equipped with a lower guard which covers the blade to the depth of the teeth. The guard should freely return to the fully closed position when withdrawn from the work surface.

6. WOOD WORKING MACHINERY

6.1 Dust, chips and shavings are to be removed from the machines by brush or vacuum only. Do not use compressed air.

6.2 The on-off switch must be located to prevent accidental start up. The operator should be able to shut off the machine without leaving the work station.

6.3 Planers and joiners shall be guarded to prevent contact with the blades.

6.4 A push stick will be used when the cutting operation requires the hands of the operator to come close to the blade. Also, small pieces will require the use of a push stick.

6.5 Saw blades will be adjusted so that the blade only clears the top of the cut. The blade should never extend more than one-eighth of an inch above the top of the cut.

6.6 Automatic feed devices should be used whenever feasible.

7. PNEUMATIC TOOLS AND EQUIPMENT

7.1 Tool retainers will be installed and remain in operation on pneumatic impact tools to prevent the tool from being ejected from the barrel during use.

7.2 Safety lashing or tie wire will be used to secure connections between tool/hose/compressor if they are of the quick connection (Chicago fittings) type.

7.3 Hose should not be laid in walkways, on ladder or in any manner that presents a tripping hazard.

7.4 Compressed air should never be used to blow dirt from hands, face or clothing.

7.5 Compressed air should be reduced to less than 30 psi and be exhausted through a chip guarded nozzle if it is to be used for cleaning purposes. Proper respiratory, hand, eye and ear protection must be worn.

7.6 Never raise or lower a tool by the air hose.

8. EXPLOSIVE-ACTUATED FASTENER TOOLS

8.1 Explosive-actuated tools must comply with the requirements of the American National Standards Institute (ANSI) standard A 10.3 - 1970.

8.2 Explosive-actuated tools will be operated, repaired, serviced and handled only by individuals that have been trained by a manufacturer's representative and possess the proper license.

8.3 An explosive-actuated tool should never be used in a flammable or explosive atmosphere.

8.4 The operator must wear goggles or a full face shield as well as safety glasses.

8.5 All explosive-actuated tools must not be able to be fired unless the tool is pressed against the work surface with a force of at least 5 lb. greater than the weight of the tool.

8.6 The tool must not be able to fire if the tool is dropped when loaded.

8.7 Firing the tool should require two separate operations, with the firing movement being separate from the motion of bringing the tool to the firing position.

8.8 Never fire into soft substrate where there is potential for the fastener to penetrate and pass through, creating a flying projectile hazard.

8.9 Do not use explosive-actuated fasteners in reinforced concrete if there is the possibility of striking the re-bar. Nor should the tool be used on cast iron, glazed tile, surface hardened steel, glass block, live rock or face brick.

8.10 An explosive-actuated tool should be loaded only prior to the intended firing moment. Never load and leave an explosive-actuated tool unattended.

9. CHAIN SAWS

9.1 Inspect the saw prior to each use and periodically during daily use.

9.2 A chain saw must be operated with both hands at all times.

9.3 Never cut above chest height.

9.4 A saw chain should not move when the saw is in the idle mode.

9.5 Before a cut is initiated, the operator must first clear an escape path and have firm footing.

9.6 The saw must be shut off when carrying through brush and slippery surfaces. The saw may be carried while idling no more than 50 feet.

9.7 The operator of the saw must don all the applicable protective gear. This may include, but is not limited to, loggers safety hat, safety glasses, steel-toed boots, protective leggings, and hearing protection.

9.8 Saws should be fitted with an inertia break and hand guard.

10. HAND OPERATED PRESSURE EQUIPMENT

10.1 Pressure equipment such as grease guns, paint and garden sprayers shall be directed away from the body and other personnel in the area. The person operating any equipment such as this, which has a potential for eye injury, must wear protective goggles.

10.2 The noise produced when using certain types of pressure equipment may require the use of hearing protection.

10.3 Never allow the nozzle of a pressurized tool to come in contact with any body parts while operating. There is potential for injection of a chemical directly into the users body, resulting in severe injury or death.

10.4 Each operation must be evaluated for the need for respirator use.

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) is greatly concerned about safe operation of motor vehicles. Motor vehicle usage presents the most significant work risk to employees. United States Department of Labor statistics indicate that motor vehicle deaths and injuries continue to be the number one cause of work-related death and serious injury. Accordingly, it is essential that OHM have an effective vehicle safety program.

2. PURPOSE

This section establishes requirements for safe operation of vehicles and equipment. This procedure is an overview of the guidelines in the proposed OSHA Motor Vehicle Safety Standard 29 CFR 1910.140.

3. RESPONSIBILITIES

3.1 The driver of a Company owned, rented or leased vehicle is responsible for:

- Operating the vehicle in a safe and legal manner.
- The safety of passengers.
- Reporting immediately any motor vehicle that is found to be defective or not operating properly.

3.2 The regional health and safety manager or site safety officer (SSO) is responsible for the following:

- Ensuring that all vehicle accident reports are processed and the required number of copies submitted to local, state, and federal agencies, to the resource manager and to the insurance carrier.
- Assuring that appropriate individuals, including the corporate vice president of health and safety are notified by telephone of accidents that involve fatalities or multiple serious injuries.

- Assuring that all accidents are documented and investigated. The investigation should be of sufficient depth to determine the cause and action required to prevent recurrence. Copies of all motor vehicle investigations shall be forwarded to the regional resource manager.

- Ensuring that during the selection process for leased or purchased vehicles, consideration is given to obtaining vehicles with essential safety devices. Such devices include anti-locking brakes, air bags, both front and rear seat shoulder harnesses, and all season traction tires. Each motor vehicle must be equipped with safety kits. Shoulder safety belts must not be attached to doors.

4. SEAT BELTS

OSHA has determined that the use of seat belts in motor vehicles can significantly reduce the number and seriousness of occupational motor vehicle accidents, including crashes, by requiring employers to ensure that each employee uses occupant safety belts. Accordingly, all OHM employees driving motor vehicles on company business (including rental cars, pick-up trucks, personal vehicles which are used for company compensated business travel, etc.) shall ensure that all occupants use seat belts at all times.

5. STATE AND LOCAL LAWS

5.1 All drivers shall drive OHM vehicles in accordance with the law.

5.2 Drivers shall not operate OHM vehicles which are known to be defective or not in compliance with the law.

5.3 Drivers of OHM vehicles are personally liable and responsible for the consequences of state and community violations.

5.4 The use of devices designed to identify active police speed detection systems (i.e. radar detectors) is prohibited in all OHM owned, leased and rented vehicles and in personal vehicles used for company compensated business travel.

6. SAFE DRIVING PRACTICES

6.1 Personnel shall operate vehicles in a defensive manner, i.e., being always on the alert and trying to anticipate what might occur under the existing conditions and driving in such a manner as to avoid hazards.

6.2 Personnel operating vehicles shall be considerate of, and courteous to, the traveling public and/or pedestrians and should yield the right-of-way to avoid accidents.

6.3 Personnel shall drive at speeds consistent with posted speed limits and prevailing conditions, such as weather, traffic and road conditions.

6.4 Personnel shall drive at all times with sufficient space around the vehicle to provide time to see conflicts arising, to react quickly, and to stop. The five keys to defensive driving will help accomplish a good space cushion.

- Aim high in steering.
- Get the big picture.
- Keep your eyes moving.
- Leave yourself an out.
- Make sure they see you.

7. GENERAL SAFETY RULES

7.1 Blind Curves - Slow down and sound horn when approaching a blind curve.

7.1 Driver's License - Operation of a vehicle without a valid operator's license is prohibited. Personnel operating vehicles regulated by the United States Department of Transportation (DOT) shall have a current commercial drivers license (CDL).

7.3 School Buses - Obey school bus laws. Slow down and prepare to stop when approaching school buses, children on foot or on bicycles.

7.4 Emergency Vehicles - Give ambulances, fire fighting equipment and other vehicles the right-of-way during emergencies and lend assistance if required.

7.5 Gasoline - Gasoline and other flammable/combustible liquids shall not be carried in or on vehicles other than in permanent gas tanks or in approved safety cans. Approved safety containers must be properly secured when being carried in the back of pick-up trucks.

7.6 Laws and Regulations - Learn and obey all local, state, and federal laws.

7.7 Parking - Equipment and vehicles shall be parked off roads and highways whenever possible. When it is not possible, the vehicle shall be marked by red lights or flares at night and red flags during the day. Wheels should be blocked or chocked.

7.8 Passing - Do not pass when visibility is restricted for any reason.

7.9 Pedestrians - Be constantly alert for pedestrians. Remember they have the right-of-way.

7.10 Slow Down - Slow down and use caution at blind intersections and crossings when visibility is limited or when passing work crews.

7.11 Smoking - Smoking is prohibited in all OHM owned, leased or rented vehicles.

7.12 Speeding - Speeding is strictly prohibited.

7.13 Thumbs Up - Keep thumbs up when driving. Do not grasp the steering wheel with thumbs inside the spokes.

7.14 Visibility - Make sure all windshields, side and rear windows, mirrors and lights are clean before moving vehicles.

7.15 Warning Signs and Traffic Signals - Be alert for and strictly obey all directional and warning signs and signals.

7.16 Seat Belts - If unit is equipped with seat belts, operator and passengers must keep seat belts fastened at all times during operations.

8. DOT REGULATED VEHICLES

8.1 All OHM personnel operating a DOT regulated vehicle must hold a valid CDL from their state of residence.

8.2 Air Hose and Couplings - Periodically check air hoses and couplings and compressor hoses for worn or damaged parts. Do not crimp air hose to disconnect couplings; shut off air at the valve.

8.3 Backing Up - Never start or back up equipment or vehicles until you are sure the way is clear. If necessary, have another person guide you safely. Back up alarms, when required, must be working and audible over the surrounding noise.

8.4 Ear Protection - Ear plugs or other approved ear protection shall be worn when necessary. Use of ear plugs in cars or trucks on public highways may be against local laws.

8.5 Fueling and Repair - No fueling or repair shall be made to equipment while it is in operation. The motor shall be turned off and the bucket, blade, gate or boom shall be lowered to the ground or blocks.

8.6 Housekeeping - Operators should keep deckplates, steps, rung and hand rails on equipment free of grease, oil, ice, and mud. The inside of the cabs shall also be kept clean and free of flammable items.

8.7 Inspections - Equipment and vehicles shall not be used until known defects or discrepancies are corrected. Inspections shall be made at the start of each shift and defects or discrepancies shall be reported to the supervisor immediately.

8.8 Jumping - Jumping on or off equipment is prohibited. When climbing on or off equipment or vehicles, face the unit and use secure hand and foot holds to prevent slips and falls. Always look where you are stepping.

8.9 Know your Equipment or Vehicle - It is your responsibility to be thoroughly familiar with all features and manuals and if you are in doubt as to correct operating techniques or safety features, ask your supervisor at once.

8.10 Overloading - Avoid overloading vehicle beds and equipment buckets and beds. Excessive material can damage the unit and falling material can cause serious injury.

8.11 Power Lines - When operating trucks, cranes, shovels or other units, always use caution around power lines and maintain a minimum safe clearance of 10 feet or more depending upon the voltage.

8.12 Riders - Only authorized persons will be permitted to ride in equipment or vehicles.

8.13 Securing Loads - The operator of the vehicle is responsible for ensuring that their load is secure and will not shift during transport.

8.14 Long Hauls - On long hauls, binders should be checked periodically (at least during each rest or service stop) to make sure they are still secure and tight.

8.15 Overhanging and Oversize Loads - When it is necessary to transport overhanging or oversize loads, the appropriate signs and red flags and red lights will be used. When necessary, use flag cars.

8.16 Safety Chains - Safety chains of sufficient size and strength shall be installed on all trailers being towed.

8.17 Safety Hooks - Use safety hooks with latches on all winch truck cables.

8.18 Side Roads and Railroad Tracks - Stop and look both ways before crossing railroad tracks or before driving onto a highway from a side road.

8.19 Stopping - Do not stop vehicles in the middle of the road to talk to occupants in another vehicle. Always pull to the side or off the road to maintain a clear, safe road.

8.20 Turn signals - Always use turn signals, emergency and other signals as appropriate when turning, stopping, passing, or performing other vehicle operations.

8.21 Vehicle Maintenance - It is the driver's responsibility to see that his vehicle is in good mechanical condition before and during operation. Special emphasis should be placed on ensuring the brakes, lights, horn, windshield wiper, tires and steering assembly are in good order. Defects must be reported and corrected immediately.

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) will inspect all equipment before use to ensure that it is proper working order and free from all safety deficiencies.

2. PURPOSE

The procedure provides for the systematic inspection of tools and equipment thereby ensuring periodic maintenance and if necessary, the removal from service units which are found to be defective. OHM shall maintain a comprehensive equipment inspection plan that meets the requirements for portable tools and heavy equipment as found in 29 CFR 1926, Subpart I (1926.300 -.305) and 29 CFR 1910, Subpart P (1910.241-.247) and 29 CFR 1926, Subpart O.

3. PORTABLE TOOL REQUIREMENTS

3.1 All hand and power tools used at OHM facilities or project sites, whether furnished by OHM or the employee, shall be maintained in a safe condition. Each OHM supervisor is responsible for periodically inspecting all tools in the work area.

3.2 All tools shall be used in strict compliance with the manufacturer's instructions and only for the use intended.

3.3 Power tools shall be equipped and used with guards in place.

3.4 Any tools having reciprocating, rotating, or moving parts shall be guarded.

3.5 OHM supervisors shall ensure that unsafe hand tools are removed from service. Unsafe tools include, but are not limited to:

- Wrenches, with jaws sprung which slip when used.
- Impact tools (hammers, drift pins, wedges, chisels) with mushroomed heads.
- Wooden handles which are cracked, splintered, duct taped, and/or loose on the tool.

3.6 Electric power operated tools shall be approved double insulated, or grounded. Electric cords shall not be used for hoisting or lowering electric tools.

3.7 Pneumatic power tools shall be secured to the hose by a positive means to prevent accidental disconnection. Pneumatic hoses shall not be used for hoisting or lowering tools.

3.8 Fuel powered tools shall be stopped while being refueled, serviced or, maintained. When fuel powered tools are used in confined spaces, adequate ventilation shall be provided.

3.9 Tools which are not serviceable shall be immediately removed from service and repaired, or destroyed.

4. HEAVY EQUIPMENT REQUIREMENTS

The equipment operator is responsible to make daily inspections of their equipment and to note any deficiencies. These deficiencies, no matter how small, should be reported immediately to the site supervisor. In this way, many potential breakdowns of your machine or safety hazards can be avoided by corrective maintenance.

4.1 Check the engine oil level. If low, add enough to bring the level to the full mark.

4.2 Check the coolant level. Add water coolant if level is low.

4.3 Check fuel level. Refill if necessary.

4.4 Check tires for proper inflation, worn spots, cuts or breaks and objects imbedded in or between the tires. Correct or report conditions when found.

4.5 Check under the vehicle for signs of oil, water, fuel, or other leaks. If leaks are seen, report them to your supervisor.

4.6 Check head, tail, and clearance lights. If any are burned out, damaged, or missing, report them at once.

4.7 Check batteries at least once a week for proper electrolyte level, leaks, and loose connections.

4.8 Report any change in steering play or vibration in the steering mechanisms.

4.9 Check the horn. If inoperative, have it repaired.

4.10 Check the condition of the windshield, rear view mirrors and other glass. Report broken, cracked or missing glass. Clean all dirty or wet glass. Adjust rear view mirrors.

4.11 Check belts on air compressor, generator, water pump, and any other. If loose or torn, report to your supervisor.

4.12 Check special equipment such as wrenches, jacks, fire extinguisher, etc. Report any that are missing or unserviceable.

4.13 Check the tracks for any loose bolts, nuts, proper adjustment, unusual wear patterns, cracks etc.

4.14 Check for any worn or frayed cables.

4.15 Check the boom, buckets and gantry for cracks, bent members, worn teeth and cutting edges.

4.16 Check fluid level of the hydraulic system.

4.17 Check for dirty or inoperative air cleaners and filters.

4.18 Check for proper brake operation.

4.19 Check to make sure the equipment is equipped with a back-up alarm and the alarm is working properly.

4.20 Make a complete walk-around inspection of your unit. In this manner you may detect damage before you put the machine to work.

4.21 When walking up to or around the unit, observe its condition and notice if anyone or anything is on or under it. By checking now, you may prevent injury or damage when you start out.

4.22 If applicable, drain water off of the lubricating oil sump daily.

4.23 In cold weather, bleed the air tank and, if equipment is equipped, use the alcohol injector pump.

APPENDIX C

SAFETY PLAN ACKNOWLEDGEMENT

WORKER ACKNOWLEDGEMENT TO HEALTH-AND-SAFETY PLAN

I HAVE READ THE SITE-SAFETY PLAN FOR THIS SITE AND FULLY UNDERSTAND ITS CONTENTS.

NAME	DATE

APPENDIX D

HEALTH AND SAFETY FORMS

Accident/Injury/Illness Report Form
Accident/Injury/Illness Status Report Form
First Aid Log
OHM Safety Rules
Daily Safety Meeting Log
Instrument Calibration Logs (LEL/PID)
Air Monitoring Instrument (Direct Reading) Logs
Heavy Equipment Inspection Forms
Fire Extinguisher Checklist/Inventory Form
SCBA/SAR Inspection Forms
Project Site Safety Inspection Checklist (weekly)
SSO Daily Report

OHM Remediation
Services Corp.

SUPERVISOR'S ACCIDENT INVESTIGATION REPORT

Check all that apply: ☐ Injury/Illness ☐ Fatality ☐ Complaint ☐ Not Work Related
☐ Auto Liability ☐ Auto Physical Damage
☐ General Liability ☐ Property Damage ☐ Environmental

Exact Date and Time of Incident _____ ____ a.m. ____ p.m. Shift ☐ 1st ☐ 2nd ☐ 3rd

OHM CORPORATION _____
(Employee's Home Division/Regional Office/Subsidiary)

Address _____
City State

PROJECT IDENTIFICATION (Project Related Incidents Only)

Project No. _____ Project Start Date _____ Completion Date _____

Location (Full Address) _____

Telephone _____ Project Manager _____

EMPLOYEE INFORMATION

Employee's Full Name _____ Employee No. _____

☐ Regular Full Time ☐ Regular Part Time ☐ Temporary ☐ Non-Employee

Address _____

Date of Birth _____ Age ____ Social Security No. ____-____-____ Sex ☐ M ☐ F

Job Title _____ Department _____ Date Hired _____

Length of Employment ☐ In Training, ☐ ____ Mos. ☐ ____ Yrs. Time in Job Class ☐ In Training, ☐ ____ Mos. ☐ ____ Yrs.

Name of Employee's Direct Supervisor _____

Supervision at Time of Accident ☐ Directly Supervised ☐ Indirectly Supervised ☐ Not Supervised

Specific Location Where Incident Occurred _____

_____ ☐ OHM Facility ☐ Project Site ☐ Other _____

To Whom Was Incident Reported? _____ When? _____

Witness Name/Address _____

Witness Job Title/Reason in Area _____

Describe Employee's Job Duties Being Performed When Injured _____

_____

_____

Describe Fully the Events Which Resulted in the Accident/Injury/Illness _____

_____

_____

PLEASE CONTINUE ON BACK OF THIS FORM

(Use Extra Page if Needed)

...ribe the Injury/Illness in Detail; Indicate Part of Body Affected _____

Name of Object/Substance Which Directly Injured Employee _____

Has/Will Employee Seek Treatment? ☐ Yes ☐ No Did Employee Die? ☐ Yes ☐ No

Name/Address of Hospital/Doctor _____

Describe Treatment Given _____

Was Employee Able To Return To Work? ☐ Yes ☐ No

If YES: ☐ Regular Work ☐ Work with Restricted Activities

Restriction _____

If NO: Date Lost Time Began _____ Date/Est. Date To Return _____

...ify Personal Protective Equipment Used by Injured Employee _____

What Training or Instruction Had Been Given? _____

How Could This Accident Have Been Prevented? _____

Corrective Action _____

Signature _____ (Supvr/Manager) Date _____

Signature _____ (Safety Officer) Date _____

Signature _____ (Proj. Manager) Date _____

DISTRIBUTION Original To: Division Secretary at Employee's Home Office

Copy To: ☐ Corporate Health & Safety ☐ Regional Health & Safety Manager
☐ Project Manager ☐ Site Safety File

OHM Remediation
Services Corp.

EMPLOYEE'S ACCIDENT REPORT

Check all that apply: ☐ Injury/Illness ☐ Fatality ☐ Complaint ☐ Not Work Related
☐ Auto Liability ☐ Auto Physical Damage
☐ General Liability ☐ Property Damage ☐ Environmental

Date, Day, and Time of Incident _____ _____ ☐ am ☐ pm

Your Name: _____ Your Emp. No.: _____

Home Address: _____ Home Phone # _____

Birth Date: _____ Age: _____ Social Security No.: _____ Sex: _____

Job Title: _____ Dept.: _____ Date of Hire: _____

Accident location (If Project related, give Project #, Client, Address and Phone #): _____

_____ _____

On OHM premises? ☐ Yes ☐ No

Witness Name/Address _____

How did accident occur?: _____

_____

_____

Was medical attention required? ☐ Yes ☐ No

Did you return to work? ☐ Yes ☐ No Your usual Job? ☐ Yes ☐ No If not explain: _____

Was the accident reported to a supervisor? ☐ Yes ☐ No Supervisor's name: _____

_____

Employee's Signature Date

OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

Form 0085
H & S Dept.
2/95

INJURY/ILLNESS STATUS REPORT

Employee _____ Social Security No. _____

Home Address _____ Phone _____

Job Title _____ Home Division _____

Date of Injury/Illness _____ Description of Injury/Illness _____

AUTHORIZATION TO RELEASE INFORMATION

I hereby authorize all physicians, hospitals, clinics and all persons to discuss with, and release to OHM Remediation Services Corp. and its authorized agents, any information or copies thereof acquired in the course of my examination or treatment for the injury identified above. This authorization shall not extend to any other medical condition, past or present, unless the same is causally or historically relevant or related to the injury referred to above.

Employee Signature _____ Date _____

PHYSICIAN OR MEDICAL PERSONNEL TO COMPLETE REMAINDER OF FORM

WORK STATUS

☐ Employee may return to work with no limitations

_____
Date

☐ Employee may return to work on _____
Date
with limitations indicated. These restrictions are in effect until _____ or until Reevaluation
Date
on _____
Date

Employee may work _____ hours in a work day.

☐ Employee is totally incapacitated at this time.

Patient will be reevaluated on _____
Date

DEGREE

☐ **Sedentary Work.** Lifting 10 pounds maximum and occasionally lifting and/or carrying such articles as dockets, ledgers, and small tools. Although a sedentary job is defined as one which involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Jobs are sedentary if walking and standing are required only occasionally and other sedentary criteria are met.

☐ **Light Work.** Lifting 20 pounds maximum with frequent lifting and/or carrying of objects weighing up to 10 pounds. Even though the weight lifted may be only a negligible amount, a job is in this category when it requires walking or standing to a significant degree or when it involves sitting most of the time with a degree of pushing and pulling of arm and/or leg controls.

☐ **Medium Work.** Lifting 50 maximum with frequent lifting and/or carrying of objects weighing up to 25 pounds.

☐ **Heavy Work.** Lifting 100 pounds maximum with frequent lifting and/or carrying of objects weighing up to 50 pounds.

☐ **Very Heavy Work.** Lifting objects in excess of 100 pounds with frequent lifting and/or carrying of objects weighing 50 pounds or more.

LIMITATIONS

1. The Employee may:
   a. Stand/walk
      ☐ None ☐ 1-4 hours
      ☐ 4-6 hours ☐ 6-8 hours
   b. Sit
      ☐ 1-3 hours ☐ 3-5 hours
      ☐ 5-8 hours
   c. Drive
      ☐ 1-3 hours ☐ 3-5 hours
      ☐ 5-8 hours
2. Employee may use hands for repetitive:
   ☐ Single grasping ☐ Pushing & pulling
   ☐ Fine manipulation
3. Employee may use feet for repetitive movement as in operating foot controls:
   ☐ Yes ☐ No
4. Employee is able to:

	Frequently	Occasionally	Not at All
a. Bend	☐	☐	☐
b. Squat	☐	☐	☐
c. Climb	☐	☐	☐

PHYSICIAN'S REPORT

Diagnosis _____

Treatment _____

Other _____

_____

Date of this Report _____

☐ Referred to company physician
☐ Employee referred/admitted to:

Whom _____

Address _____

Phone _____

Date _____ Time _____

Physician's Name _____ Physician's Signature _____
Print

Address _____ Phone _____

White - Company Copy
Canary - Clinic Copy

OHM First Aid Log

Project

Project No.

Date/Time	Name	Employee Number	Job Working When Injured	Description of Injury/Illness and Treatment

OHM Remediation Services Corp
Project Safety Rules
Project No. _____

- All unsafe acts/conditions must be corrected promptly and reported to supervisor at first opportunity
- Participate in the Safety Observer Program
- Good housekeeping standards must be maintained at all times
- Non-work injuries that could become aggravated on the job must be reported to supervisor within 1/2 hour of starting work
- Lockout/tagout procedures must be followed at all times
- Use fall protection where required
- Inspect all vehicles and equipment before use
- Know proper emergency response procedures and location of emergency equipment
- Use safety guards on all machinery where required
- Know what contaminants are present in the work area and their exposure routes and symptoms
- Only authorized personnel may operate equipment
- Use the "Buddy System" at all times when working in an Exclusion Zone area
- Any person present in or passing through an area must observe the rules of that area
- Suit up and de-suit according to OHM procedures
- Wear proper personal protective equipment for the task
- Inspect, wash, store and care for respirator properly
- Eat, drink, smoke, chew only in designated areas of Support Zone
- Sign in and out whenever entering or leaving Exclusion Zone
- Be clean shaven
- _____
- _____
- _____

_____
Site Supervisor

Failure to comply with these rules will result in disciplinary action.

OHM Corporation

DAILY SAFETY MEETING LOG

Date:_____ Client:_____

Specific Location:_____ Job No.:_____

SAFETY TOPICS PRESENTED:

Protective Clothing/Equipment:_____

_____

Chemical Hazards:_____

_____

Physical Hazards:_____

_____

Emergency Procedures:_____

_____

Hospital/Clinic:_____ Phone:_____

Hospital Address:_____

EMS Phone:_____

Special Equipment:_____

_____

Other:_____

_____

ATTENDEES:

Name Printed:	Signature:
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Meeting Conducted By:

Name Printed	Signature:
_____	_____

DAILY SAFETY MEETING LOG
(CONTINUATION PAGE)

Date:_____ Client:_____

Specific Location:_____ Job No._____

SAFETY TOPICS PRESENTED:

ATTENDEES:

Name Printed:	Signature:

OHM Remediation Services Corp.

COMBUSTIBLE GAS INDICATOR CALIBRATION DATA SHEET

_____

_____

PROJECT # _____

INSTRUMENT NO.: _____ CALIBRATION GAS % LEL: _____

CALIBRATION GAS: _____ CHEMICAL MONITORED: _____

CAL GAS O_2 CONCENTRATION: _____ CONVERSION FACTOR: _____

DATE	PERSON CALIBRATING	CGI READING (% LEL)	OXYGEN READING	TOX IN PPM	REMARKS

NOTE: METER READING x CONVERSION FACTOR = LEL OF ATMOSPHERE
(Conversion factor can be found in instrument manual)

C M Corporation

HNU-PHOTOIONIZATION DETECTOR
CALIBRATION DATA SHEET

_____

_____

PROJECT # _____

DATE:_____
INSTRUMENT NO. _____ CALIBRATION GAS: _____
LAMP TYPE: _____ CALIBRATION PERFORMED BY:_____

TIME	WEATHER CONDITIONS (TEMP/HUMIDITY)	SPAN SETTING	READING (PPM)	REMARKS

DIRECT READING INSTRUMENT LOG

Date _____ Project _____

Operator _____ Project No. _____

Instruments _____

_____

Project Activities Being Monitored _____

_____

_____

_____

Instrument/Action Level Background Reading _____

Instrument	Time	Location/Activity	Reading	Duration	Comments

OHM Corporation

DAILY HEAVY EQUIPMENT SAFETY INSPECTION CHECKLIST

EQUIPMENT I.D. NO.: _____ EQUIPMENT NAME: _____ WEEK OF: _____

ITEM INSPECTED	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Falling Object Protective Structure (FOP)							
Roll-Over Protective Structure (ROP)							
Seat Belts							
Operator Seat Bar(s)							
Side Shields, Screens or Cab							
Lift Arm Restraining Device							
Grab Handles							
Back-Up Alarm - Working							
Lights							
Guards							
Horn							
Anti-Skid Tread Steps Clear of Mud							
Safety Signs (i.e. counterbalance swing area)							
Fire Extinguisher							
General Condition							
Fuel Connection							
Oil (full and no leaks)							
Clear Of Extra Materials							
Controls function properly							
Damaged Parts							
Hydraulic System (full and no leaks)							
Parking brake							
Lift Arm and Bucket							
Tires/Tracks							
Steering							
Inspectors Name and Employee No.							

INSTRUCTIONS - Inspect all applicable items indicated, each shift. If an unsatisfactory condition is observed, suspend operation of the equipment and report the unsatisfactory condition to the site supervisor immediately.

ORIM Corporation

PORTABLE FIRE EXTINGUISHER CHECKLIST

Office/Shop Location_____

INVENTORY

Serial No.	Location	Serial No.	Location
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Inspection Points

1. Fire extinguisher is in assigned location
2. Access is not obstructed
3. Fire extinguisher is fully charged
4. Lock-pin in place
5. Test tag attached and current

INSPECTIONS COMPLETED

Month	Initials	Month	Initials
January	_____	July	_____
February	_____	August	_____
March	_____	September	_____
April	_____	October	_____
May	_____	November	_____
June	_____	December	_____

OHM Corporation

SCBA MONTHLY INSPECTION CHECKLIST

SCBA ID NO._____ YEAR_____

ITEM INSPECTED	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Connections are tight												
Face-piece in good condition												
Rubber parts pliable												
Regulator functions properly												
Alarm bell functions properly												
Cylinder fully charged												
Cylinder hydrotest current (within 3 years)												
Unit is clean												
Emergency bypass functions properly												
Inspectors initials and employee number												

DEFICIENCIES IN ABOVE ITEMS REQUIRE UNIT TO BE TAGGED AND REMOVED FROM SERVICE.

OIIM Corporation

SAR MONTHLY INSPECTION CHECKLIST

SAR ID NO._____ EGRESS ID NO._____ YEAR_____

ITEM INSPECTED	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Connections are tight												
Face-piece in good condition												
Rubber part, hoses pliable and good condition												
Regulators function properly/without flutter or free flow												
Cylinder fully charged Pressure gauge intact												
Cylinder hydrostatic test current (due at 5 yrs)												
Unit is clean, straps in good condition												
Exhalation valve functions properly												
Cylinder recharged after inspection												
Inspectors initials and employee number												

OHM Corporation

OHM Corporation
Project Site Safety Inspection Checklist

Project Name:_____
Project Number:_____
Project Location:_____
Site Supervisor:_____
Inspector's Name:_____

		YES	NO
MEDICAL AND FIRST AID			
1.	Are First Aid Kits accessible and identified?	____	____
2.	Are emergency eye wash and safety showers available?	____	____
3.	Are daily logs for first aid present and up to date?	____	____
4.	Are First Aid Kits inspected weekly?	____	____
PERSONAL PROTECTIVE EQUIPMENT			
1.	Have levels of personnel protection been established?	____	____
2.	Do all employees know their level of protection?	____	____
3.	Are respirators used decontaminated, inspected, and stored according to standard procedures?	____	____
4.	Have employees been fit-tested?	____	____
5.	Is defective personal protective equipment tagged?	____	____
6.	Does compressed breathing air meet CGA Grade "D" minimum?	____	____
7.	Are there sufficient quantities of safety equipment and repair parts?	____	____
8.	Does Level D protection consist of safety glasses, hard hats, and steel toe boots?	____	____
FIRE PREVENTION			
1.	Is smoking prohibited in flammable storage areas?	____	____
2.	Are fire lanes established and maintained?	____	____
3.	Are flammable dispensing systems grounded and bonded?	____	____
4.	Are approved safety cans available for storage of flammable liquids?	____	____
5.	Has the local fire department been contacted?	____	____
6.	Are fire extinguishers available near refueling areas?	____	____
AIR MONITORING			
1.	Is air monitoring being conducted as required by the site safety plan?	____	____
2.	Are air monitoring instruments calibrated daily?	____	____
3.	Is the air monitoring logbooks up to date?	____	____
4.	Are user manuals available?	____	____
5.	Are instruments clean and charged?	____	____

WELDING AND CUTTING (29 CFR 1926 Subpart J)

1. Are fire extinguishers present at welding and cutting operations? ____ ____
2. Are confined spaces; such as, tanks, pipelines, and trenches; tested prior to cutting and welding operations? ____ ____
3. Are Hot Work Permits available? ____ ____
4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations? ____ ____
5. Are welding machines properly grounded? ____ ____
6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart? ____ ____
7. Are only trained personnel permitted to operate welding and cutting equipment? ____ ____

HAND AND POWER TOOLS (29 CFR 1926 Subpart I)

1. Are defective hand and power tools tagged and taken out of service? ____ ____
2. Is eye protection available and used when operating power tools? ____ ____
3. Are guards and safety devices in place on power tools? ____ ____
4. Are power tools inspected before each use? ____ ____
5. Are non-sparking tools available? ____ ____

MOTOR VEHICLES

1. Are vehicles inspected daily? ____ ____
2. Are personnel licensed for the equipment they operate? ____ ____
3. Are unsafe vehicles tagged and reported to supervision? ____ ____
4. Are vehicles shut down before fueling? ____ ____
5. When backing vehicles, are spotters provided? ____ ____
6. Is safety equipment on vehicles? ____ ____
7. Are loads secure on vehicles? ____ ____
8. Are vehicle occupants using safety belts if provided? ____ ____

EMERGENCY PLANS

1. Are emergency telephone numbers posted? ____ ____
2. Have emergency escape routes been designated? ____ ____
3. Are employees familiar with the emergency signal? ____ ____
4. Has the emergency route to the hospital been established and posted? ____ ____

MATERIALS HANDLING

1. Are materials stacked and stored as to prevent sliding or collapsing? ____ ____
2. Are flammables and combustibles stored in non-smoking areas? ____ ____
3. Is machinery braced when personnel are performing maintenance? ____ ____
4. Are tripping hazards labeled? ____ ____
5. Are semi-trailers chocked? ____ ____
6. Are fixed jacks used under semi-trailers? ____ ____
7. Are riders prohibited on materials handling equipment? ____ ____
8. Are cranes inspected as prescribed and logged? ____ ____
9. Are OSHA approved manlifts provided for the lifting of personnel?
10. Are personnel in manlifts wearing approved fall protection devices? ____ ____

FIRE PROTECTION

1. Has a fire alarm been established? ____ ____
2. Do employees know the location and use of all fire extinguishers? ____ ____
3. Are fire extinguisher locations marked? ____ ____

WALKING AND WORKING SURFACES

1. Are ladders a Type I or Type II? ____ ____
2. Are accessways, stairways, ramps, and ladders clean of ice, mud, snow, or debris? ____ ____

3. Are ladders being used in a safe manner? ____ ____
4. Are ladders kept out of passageways, doors, or driveways? ____ ____
5. Are broken or damaged ladders tagged and taken out of service? ____ ____
6. Are metal ladders prohibited in electrical service? ____ ____
7. Are stairways and floor openings guarded? ____ ____
8. Are safety feet installed on straight and extension ladders? ____ ____
9. Is general housekeeping up to OHM standards? ____ ____
10. Are ladders tied off? ____ ____

SITE SAFETY PLAN

1. Is a site safety plan available on site or accessible to all employees? ____ ____
2. Does the safety plan accurately reflect site conditions and tasks? ____ ____
3. Have potential hazards been described to employees on site? ____ ____
4. Is there a designated safety official on site? ____ ____
5. Have all employees signed the acknowledgement form? ____ ____

SITE POSTERS

1. Are the following documents posted in a prominent and accessible area?

   A. Minimum Wage ____ ____
   B. OSHA Health and Safety ____ ____
   C. Equal Employment Opportunity ____ ____

SITE CONTROL

1. Are work zones clearly defined? ____ ____
2. Are support trailers located to minimize exposure from a potential release? ____ ____
3. Are support trailers accessible for approach by emergency vehicles? ____ ____
4. Is the site properly secured during and after work hours? ____ ____

HEAVY EQUIPMENT (29 CFR 1926 Subpart O)

1. Is heavy equipment inspected as prescribed by the manufacturer? ____ ____
2. Is defective heavy equipment tagged and taken out of service? ____ ____
3. Are project roads and structures inspected for load capacities and proper clearances? ____ ____
4. Is heavy equipment shut down for fueling and maintenance? ____ ____
5. Are back-up alarms installed and working on equipment? ____ ____
6. Are designated operators only operating equipment? ____ ____
7. Are riders prohibited on heavy equipment? ____ ____
8. Are guards and safety appliances in place and used? ____ ____

EXCAVATION (29 CFR 1926 Subpart P)

1. Has a "competent person" been designated to supervise this excavation activity? ____ ____
2. Have utility companies been advised of excavation activities? ____ ____
3. Prior to opening excavations, are utilities located and marked? ____ ____
4. Has a professional engineer evaluated all excavations greater than 20 feet deep? ____ ____
5. Is there rescue equipment on-site and accessible to excavation? ____ ____
6. Is excavated material placed a minimum of 24 inches from the excavations? ____ ____
7. Are the sides of excavations sloped or shored to prevent caving in on employees? ____ ____

FIRE PROTECTION (Continued)

4. Are combustible materials segregated from open flames? ____ ____
5. Have fire extinguishers been professionally inspected during the last year? ____ ____
6. Are fire extinguishers visually inspected monthly? ____ ____

ELECTRICAL (29 CFR 1926 Subpart K)

1. Is electrical equipment and wiring properly guarded? ____ ____
2. Are electrical lines, extension cords, and cables guarded and maintained in good conditions? ____ ____
3. Are extension cords kept out of wet areas? ____ ____
4. Is damaged electrical equipment tagged and taken out of service? ____ ____
5. Have underground electrical lines been identified by proper authorities? ____ ____
6. Has positive lock-out system been established by a certified project electrician? ____ ____
7. Are GFCI's being used as needed? ____ ____
8. Are extension cords being inspected daily for ground continuity and structural integrity? (i.e., group pin in place, no unapproved splices) ____ ____
9. Are warning signs exhibited on high voltage equipment (250V or greater)? ____ ____
10. Is extension cord inspection documented?

CRANES AND RIGGING (29 CFR 1926.550)

1. Are cranes inspected daily? ____ ____
2. Are crane swing areas barricaded or demarked? ____ ____
3. Is all rigging equipment tagged with an identification number and rated capacity? ____ ____
4. Is rigging equipment inspection documented? ____ ____
5. Are slings, chains, and rigging inspected before each use? ____ ____
6. Are damaged slings, chains, and rigging tagged and taken out of service? ____ ____
7. Are slings padded or protected from sharp corners? ____ ____
8. Do employees keep clear of suspended loads? ____ ____
9. Are employees in the lift area wearing hard hats? ____ ____

COMPRESSED GAS CYLINDERS

1. Are breathing air cylinders charged only to prescribed pressures? ____ ____
2. Are like cylinders segregated in well ventilated areas? ____ ____
3. Is smoking prohibited in cylinder storage areas? ____ ____
4. Are cylinders stored secure and upright? ____ ____
5. Are cylinders protected from snow, rain, etc.? ____ ____
6. Are cylinder caps in place before cylinders are moved? ____ ____
7. Are fuel gas and 02 cylinders stored a minimum of 20 feet apart? ____ ____
8. Are propane cylinders stored and used outside the structure? ____ ____

SCAFFOLDING (29 CFR 1926.451)

1. Is scaffolding placed on a flat, firm surface? ____ ____
2. Are scaffold planks free of mud, ice, grease, etc.? ____ ____
3. Is scaffolding inspected before each use? ____ ____
4. Are defective scaffold parts taken out of service? ____ ____
5. Does mobile scaffold height exceed 4 times the width or base dimension? ____ ____
6. Does scaffold planking overlap a minimum of 12 inches? ____ ____
7. Does scaffold planking extend over end supports between 6 to 18 inches? ____ ____
8. Are employees restricted from working on scaffolds during storms and high winds? ____ ____
9. Are all pins in place and wheels locked? ____ ____
10. Is perimeter guarding (top rail, mid rail, and toe board) present? ____ ____

EXCAVATION (29 CFR 1926 Subpart P - Continued)

8. Has excavation greater than 4-feet deep been monitored for hazardous atmospheres (i.e. LEL/02 deficiency)? ____ ____
9. Are ladders used in excavations over 4-feet deep? ____ ____
10. Are ladders present every 25 feet? ____ ____
11. Are barriers, i.e. guardrails or fences placed around excavations near pedestrian or vehicle thoroughfares? ____ ____
12. Is excavation inspected daily by competent persons and documented? ____ ____

CONFINED SPACES (Proposed Regulation 29 CFR 1910.146)

1. Have employees been trained in the hazards of confined spaces? ____ ____
2. Are confined space permits available on project site? ____ ____
3. Is the contractors confined space safety procedure on the project? ____ ____
4. Has a rescue plan been established? ____ ____

PERSONNEL DECONTAMINATION

1. Are decontamination stations set up on site? ____ ____
2. Are waste receptacles available for contaminated clothing? ____ ____
3. Are steps taken to contain liquids used for decontamination? ____ ____
4. Have decontamination steps and procedures been covered by the site supervisor or safety official? ____ ____
5. Is all personal protective equipment and respiratory equipment being cleaned on a daily basis? ____ ____

EQUIPMENT DECONTAMINATION

1. Has equipment decontamination been established? ____ ____
2. Is contamination wash water properly contained and disposed of? ____ ____
3. Are all pieces of equipment inspected for proper decontamination before leaving the site? ____ ____
4. Is all equipment being cleaned on a daily basis? ____ ____

HAZARD COMMUNICATION (29 CFR 1926.59)

1. Is there a written program on-site? ____ ____
2. Is there a MSDS FOR EACH CHEMICAL present on-site? ____ ____
3. Are all containers properly labeled, as to content, hazard? ____ ____
4. Have employees been trained on chemical hazards? ____ ____
5. Are employee's trained on chemical hazards while doing non-routine tasks? ____ ____
6. Do employees (including subcontractors) know and understand the acute and chemical effects of exposure from the chemicals on-site? ____ ____
7. Have all subcontractors signed the Haz-Comm acknowledgement form? ____ ____

I have reviewed this inspection checklist with the safety inspector and fully understand the recommendation and will make every attempt to correct them immediately.

	Signature	Date
Site Supervisor:	_____	_____
Project Manager:	_____	_____
OHM Compliance Inspector:	_____	_____

OHM Remediation Services Corp.

SITE SAFETY OFFICER
DAILY REPORT

DATE: _____ PROJECT NO. _____

SSO: _____ PROJECT NAME: _____

SITE SUPERVISOR: _____

Safety Meeting Topics:		
Air Monitoring Instruments	Calculated/Checked	Task Monitored
Other Activities		

OHM Site Activities

Task Performed	Protection Level	Type Air Monitoring

Subcontractor Activities

Safety Observation/Issues

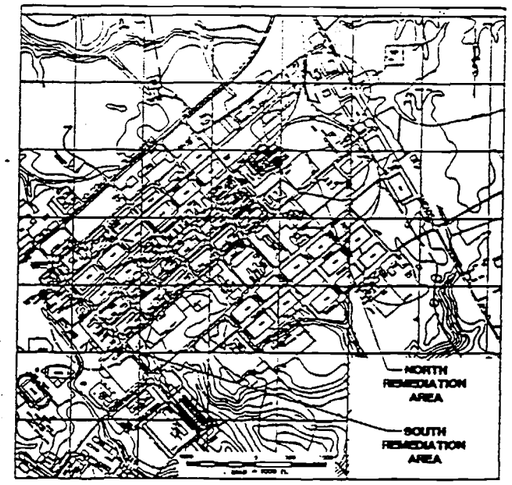
Appendix B

As-Built Drawings

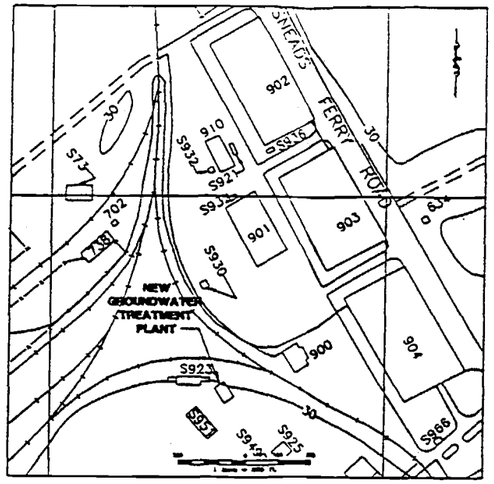
02357001Z

HADNOT POINT INDUSTRIAL AREA
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM

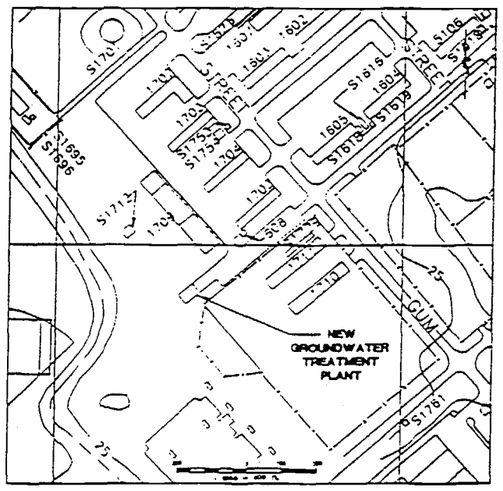
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA
ATLANTIC DIVISION, NORFOLK, VIRGINIA



VICINITY MAP



LOCATION MAP
NORTH REMEDIATION AREA
NEW GROUNDWATER TREATMENT PLANT



LOCATION MAP
SOUTH REMEDIATION AREA
NEW GROUNDWATER TREATMENT PLANT

GENERAL NOTES

1. THE SCOPE OF WORK INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
   - A. PROVIDE EXTRACTION WELLS, WELL HEAD PUMPS, PIPING AND APPURTENANCES.
   - B. PROVIDE FENCING, FOUNDATIONS AND GRADING IN TREATMENT PLANT AREAS.
   - C. PROVIDE TREATMENT PLANTS INCLUDING: METAL PRETREATMENT SYSTEMS, OIL/WATER SEPARATORS, AIR STRIPPERS, CARBON ADSORPTION TREATMENT UNITS, ELECTRICAL POWER AND CONTROL SYSTEMS, AND HOUSING FOR ALL UNITS.
   - D. SITE RESTORATION.
2. UTILITY LOCATIONS ARE APPROXIMATE. LOCATE UTILITIES AT THE JOB SITE. REPAIR ALL DAMAGE TO UTILITIES AT NO EXPENSE TO THE GOVERNMENT.
3. PLACE SILT FENCES AS SHOWN ON THESE DRAWINGS TO PREVENT SEDIMENT LADEN RUNOFF WATER FROM ENTERING STORM SEWERS OR LEAVING THE CONSTRUCTION SITE.
4. REMOVE ALL PAVEMENT, SIDEWALKS, AND CONCRETE CURBS DEMOLISHED DURING THE EXCAVATION IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
5. OPEN EXCAVATIONS SHALL NOT REMAIN OPEN FOR MORE THAN FIVE DAYS. CLEARLY MARK THE OPEN EXCAVATIONS USING ORANGE BARRIER TAPE.
6. RESTORE EACH SITE TO ITS ORIGINAL CONDITION UNLESS OTHERWISE NOTED, IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS. PROVIDE NEW PAVEMENT, SIDEWALKS AND CONCRETE CURBS AS SHOWN ON THESE DRAWINGS.
7. TEMPORARILY SUPPORT ALL GUY WIRES AND UTILITIES ENCOUNTERED IN THE PERIMETER OF THE CONSTRUCTION AREA THROUGHOUT THE DURATION OF THE CONSTRUCTION ACTIVITIES.

INDEX OF SHEETS

EFD DWG. NO.	NAVFAC. DWG. NO.	SHEET NO.	TITLE
368820	4268820	T-1	COVER SHEET AND GENERAL NOTES
368821	4268821	C-1	NEW PIPING PLAN - NORTH REMEDIATION AREA
368822	4268822	C-2	SITE PLAN - NORTH REMEDIATION AREA GROUNDWATER TREATMENT PLANT
368823	4268823	C-3	NEW PIPING PLAN - SOUTH REMEDIATION AREA
368824	4268824	C-4	SITE PLAN - SOUTH REMEDIATION AREA GROUNDWATER TREATMENT PLANT
368825	4268825	C-5	GROUNDWATER TREATMENT SCHEMATIC FLOW DIAGRAM
368826	4268826	C-6	EQUIPMENT LAYOUT
368827	4268827	C-7	EQUIPMENT ELEVATIONS
368828	4268828	C-8	DETAILS
368829	4268829	C-9	DETAILS
368830	4268830	S-1	FOUNDATION PLAN AND DETAILS
368831	4268831	S-2	BUILDING DRAINAGE PLAN AND DETAILS
368832	4268832	S-3	DETAILS
368833	4268833	A-1	BUILDING ELEVATIONS
368834	4268834	M-1	HEATING AND VENTILATION SCHEDULES, DETAILS, AND ABBREVIATIONS
368835	4268835	M-2	HEATING AND VENTILATION EQUIPMENT LAYOUT
368836	4268836	E-1	LEGEND AND FIXTURE SCHEDULE
368837	4268837	E-2	SITE PLAN - NORTH AND SOUTH REMEDIATION AREAS
368838	4268838	E-3	LIGHTING PLAN - NORTH GROUNDWATER TREATMENT PLANT
368839	4268839	E-4	POWER PLAN - NORTH GROUNDWATER TREATMENT PLANT
368840	4268840	E-5	LIGHTING PLAN - SOUTH GROUNDWATER TREATMENT PLANT
368841	4268841	E-6	POWER PLAN - SOUTH GROUNDWATER TREATMENT PLANT
368842	4268842	E-7	ELECTRICAL MAIN DISTRIBUTION AND DETAILS
368843	4268843	E-8	ELECTRICAL LADDER DIAGRAMS
368844	4268844	E-9	ELECTRICAL PANEL DIAGRAMS

ABBREVIATIONS

BLDG.	BUILDING	CONC.	TOP OF CONCRETE
TOC	TOP OF CASING	GRND.	GROUND SURFACE
ELEV.	ELEVATION		

QUALITY CONTROL REVIEW
SIGNATURE
DATE

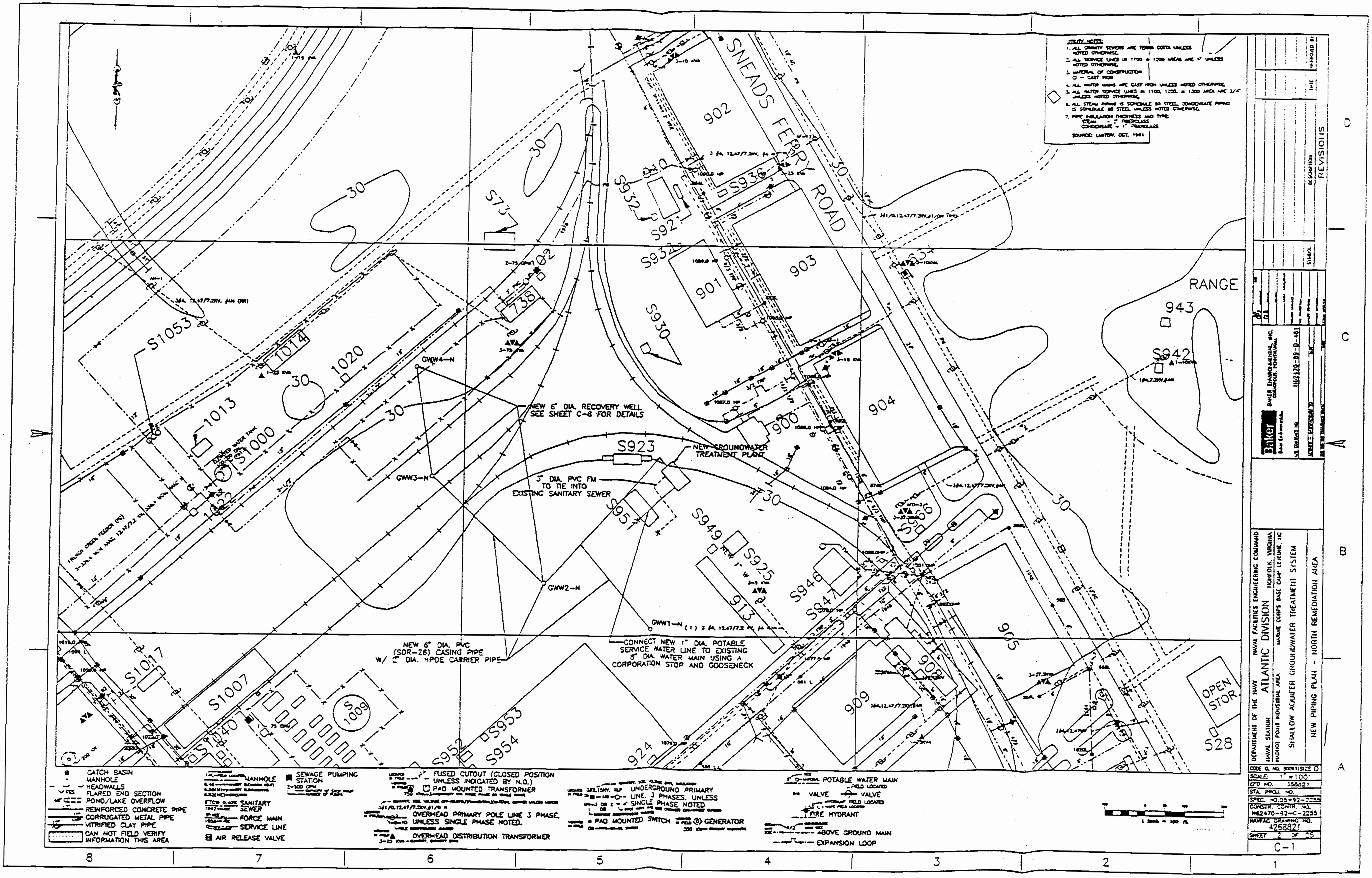
REVISIONS
SYMBOL
DESCRIPTION
DATE
APPROVED BY

Baker
BAKER ENVIRONMENTAL, INC.
CORAOPOLIS, PENNSYLVANIA
N62470-89-D-4814

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NAVAL STATION
NORFOLK, VIRGINIA
HADNOT POINT INDUSTRIAL AREA
MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
COVER SHEET AND GENERAL NOTES

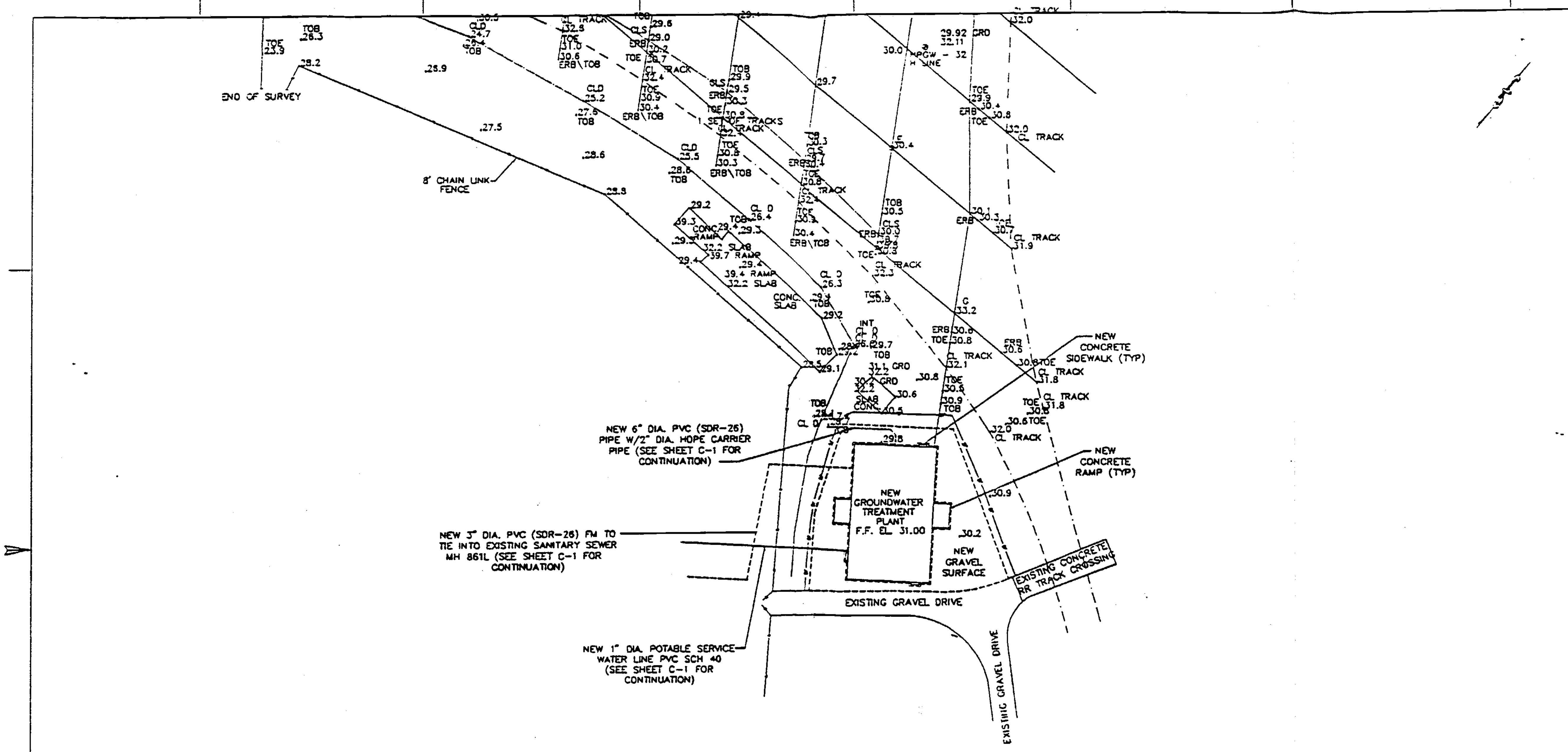
CODE ID. NO. 80091 SIZE D
SCALE: AS NOTED
EFD NO. 368820
STA. PROJ. NO.
SPEC. NO.05-92-2255
CONSTR. CONTR. NO. N62470-92-C-2255
NAVFAC DRAWING NO. 4268820
SHEET 1 OF 25
T-1

02357002Z



SNEADS FERRY ROAD
RANGE
NEW 6" DIA. RECOVERY WELL SEE SHEET C-8 FOR DETAILS
NEW GROUNDWATER TREATMENT PLANT
3" DIA. PVC FM TO TIE INTO EXISTING SANITARY SEWER
NEW 6" DIA. PVC (SDR-26) CASING PIPE W/ 2" DIA. HPDE CARRIER PIPE
CONNECT NEW 1" DIA. POTABLE SERVICE WATER LINE TO EXISTING 8" DIA. WATER MAIN USING A CORPORATION STOP AND GOOSENECK
GWW1-N
GWW2-N
GWW3-N
GWW4-N
OPEN STOR
CATCH BASIN
MANHOLE
HEADWALLS
FLARED END SECTION
POND/LAKE OVERFLOW
REINFORCED CONCRETE PIPE
CORRUGATED METAL PIPE
VITRIFIED CLAY PIPE
CAN NOT FIELD VERIFY INFORMATION THIS AREA
MANHOLE
SEWAGE PUMPING STATION
SANITARY SEWER
FORCE MAIN
SERVICE LINE
AIR RELEASE VALVE
FUSED CUTOUT (CLOSED POSITION UNLESS INDICATED BY N.O.)
PAD MOUNTED TRANSFORMER
OVERHEAD PRIMARY POLE LINE 3 PHASE UNLESS SINGLE PHASE NOTED.
OVERHEAD DISTRIBUTION TRANSFORMER
UNDERGROUND PRIMARY LINE, 3 PHASES, UNLESS SINGLE PHASE NOTED
PAD MOUNTED SWITCH
GENERATOR
POTABLE WATER MAIN
VALVE
FIRE HYDRANT
ABOVE GROUND MAIN
EXPANSION LOOP
REVISIONS
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
NEW PIPING PLAN - NORTH REMEDIATION AREA
Baker
BAKER ENVIRONMENTAL, INC.
N62470-89-D-4814
SCALE: 1" = 100'
EFD NO. 358821
NAVFAC DRAWING NO. 4258821
C-1

023570032



NOTES:
1. SITE BENCHMARK IS SOUTHWEST FRONT CORNER OF HEADWALL (NOT SHOWN ON THIS SHEET)
2. ELEVATIONS BASED ON 2nd TOPOGRAPHIC PLATOON MON. #A-26, ELEV. = 31.91

1 inch = 25 ft.

LEGEND:
R.R. = RAILROAD
GB = GRADE BREAK
CLD = CENTERLINE DITCH
GRD = GROUND
R.C.P. = REINFORCED CONCRETE PIPE
CLS = CENTERLINE SWALE
TOB = TOP OF BANK
ERB = EDGE OF RAILROAD BED
CL = CENTERLINE
INV. = INVERT
B.M. = BENCHMARK
P.P. = POWER POLE
Y.I. = YARD INLET (CATCH BASIN)
M.H. = MANHOLE
C.O. = CLEAN OUT
= CENTERLINE DITCH
= CENTERLINE RAILROAD TRACKS
= AREA OF NEW GRAVEL SURFACE
= NEW FORCE MAIN
= SILT FENCE
= NEW WATER LINE

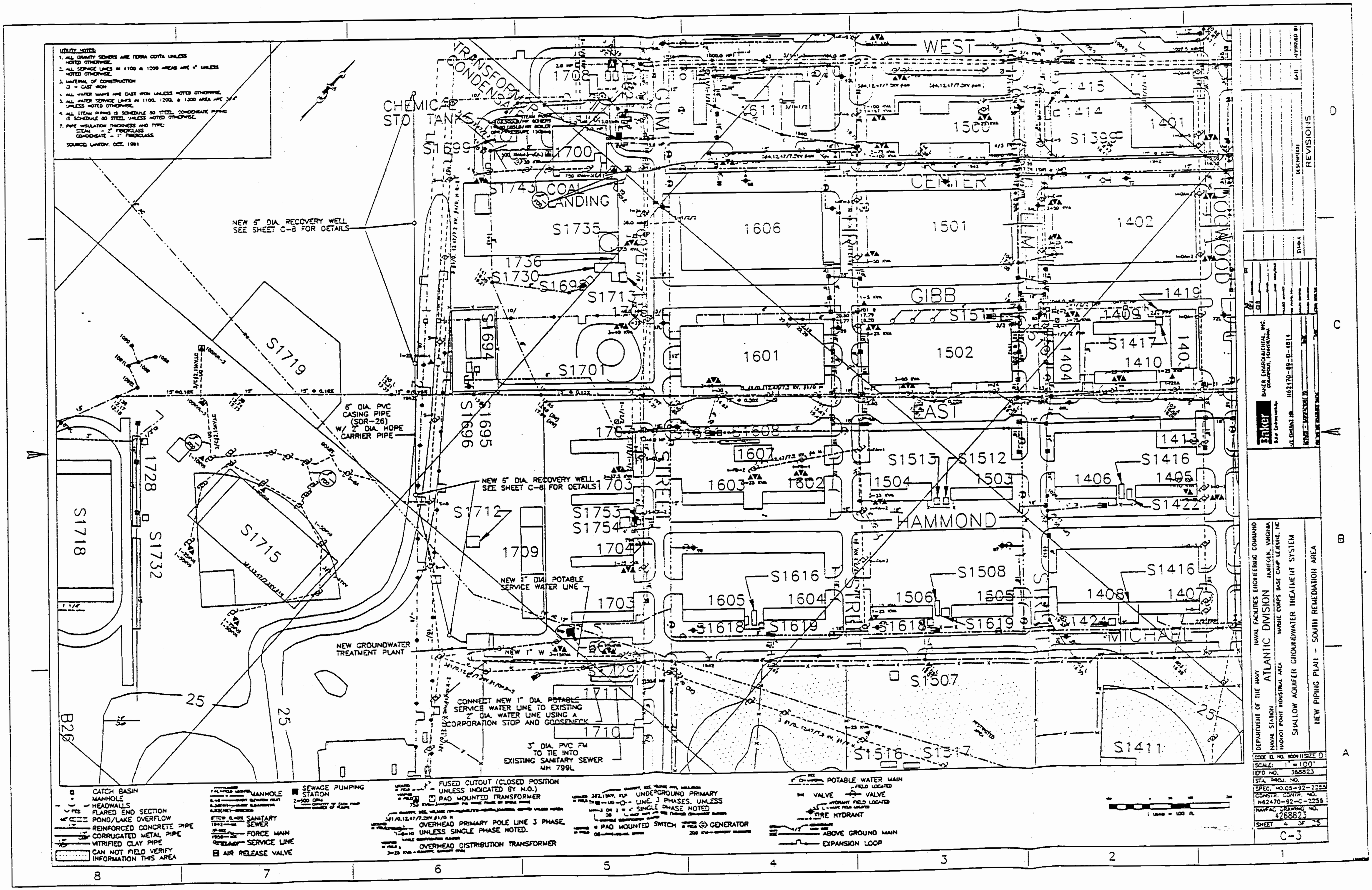
REVISIONS

Baker Environmental, Inc.

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION — NORFOLK, VIRGINIA
NAVAL STATION HADNOT POINT INDUSTRIAL AREA — MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
SITE PLAN - NORTH REMEDIATION AREA GROUNDWATER TREATMENT PLANT

CODE ID. NO. 80091 SIZE D
SCALE: 1" = 25'
EFD NO. 368822
STA. PROJ. NO.
SPEC. NO. 05-92-2255
CONSTR. CONTR. NO. N62470-92-C-2255
NAVFAC DRAWING NO. 4268822
SHEET 3 OF 25
C-2

023570042



DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
NAVAL STATION
HADNOT POINT INDUSTRIAL AREA
MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
NEW PIPING PLAN - SOUTH REMEDIATION AREA
CODE ID. NO. 80091 SIZE D
SCALE: 1" = 100'
EFD NO. 368823
STA. PROJ. NO.
SPEC. NO.05-92-2255
CONSTR. CONTR. NO. N62470-92-C-2255
NAVFAC DRAWING NO. 4268823
SHEET 4 OF 25
C-3
REVISIONS
Baker
Baker Environmental, Inc.
WEST
CENTER
GIBB
EAST
HAMMOND
MICHAEL
NEW 6" DIA. RECOVERY WELL SEE SHEET C-8 FOR DETAILS
6" DIA. PVC CASING PIPE (SDR-26) W/ 2" DIA. HDPE CARRIER PIPE
NEW 1" DIA. POTABLE SERVICE WATER LINE
NEW GROUNDWATER TREATMENT PLANT
CONNECT NEW 1" DIA. POTABLE SERVICE WATER LINE TO EXISTING 2" DIA. WATER LINE USING A CORPORATION STOP AND GOOSENECK
3" DIA. PVC FM TO TIE INTO EXISTING SANITARY SEWER MH 799L
CHEMICAL STO TANK
TRANSFORMER CONDENSATE
COAL LANDING
SOURCE: LANTDIV, OCT. 1991
CATCH BASIN
MANHOLE
HEADWALLS
FLARED END SECTION
POND/LAKE OVERFLOW
REINFORCED CONCRETE PIPE
CORRUGATED METAL PIPE
VITRIFIED CLAY PIPE
CAN NOT FIELD VERIFY INFORMATION THIS AREA
SEWAGE PUMPING STATION
SANITARY SEWER
FORCE MAIN
SERVICE LINE
AIR RELEASE VALVE
FUSED CUTOUT (CLOSED POSITION UNLESS INDICATED BY N.O.)
PAD MOUNTED TRANSFORMER
OVERHEAD PRIMARY POLE LINE 3 PHASE UNLESS SINGLE PHASE NOTED.
OVERHEAD DISTRIBUTION TRANSFORMER
UNDERGROUND PRIMARY LINE, 3 PHASES, UNLESS SINGLE PHASE NOTED
PAD MOUNTED SWITCH
GENERATOR
POTABLE WATER MAIN
VALVE
FIRE HYDRANT
ABOVE GROUND MAIN
EXPANSION LOOP

023570052

NEW 6" DIA. PVC (SDR-26) CASING PIPE W/2" DIA. HDPE CARRIER PIPE (SEE SHEET C-3 FOR CONTINUATION)

NEW GROUNDWATER TREATMENT PLANT F.F. EL± 30.50

NEW GRAVEL SURFACE

EXISTING ASPHALT ROAD

S 49°00'00" W
MICHAEL STREET

NEW 1" DIA. POTABLE SERVICE WATER LINE PVC SCH 40 (SEE SHEET C-3 FOR CONTINUATION)

CONNECT NEW 1" DIA. POTABLE SERVICE WATER LINE TO EXISTING 2" DIA. WATER LINE USING A CORPORATION STOP AND GOOSENECK

GUM STREET

NEW CONCRETE RAMP (TYP)

NEW CONCRETE SIDEWALK (TYP)

3" DIA. PVC (SDR-26) FM TO TIE INTO EXISTING SANITARY SEWER MH 7991L (SEE SHEET C-3 FOR CONTINUATION)

NOTES:
1. ELEVATIONS BASED ON 2nd TOPOGRAPHIC PLATOON MON. #F-2, ELEV. 23.27 (NOT SHOWN ON THIS SHEET)
2. PROVIDE NEW 3" GRAVEL SURFACE FOR ALL DISTURBED AREAS, AS SHOWN ON DRAWING AND SPECIFIED.

LEGEND

GB = GRADE BREAK
CLD = CENTERLINE DITCH
GRD = GROUND
R.C.P. = REINFORCED CONCRETE PIPE
CLS = CENTERLINE SWALE
TOB = TOP OF BANK
ERB = EDGE OF ROAD BED
INV. = INVERT
TBM = TEMPORARY BENCH MARK
P.P. = POWER POLE

Y.I. = YARD INLET
M.H. = MANHOLE
PC = POINT OF CURVATURE
PT = POINT OF TANGENCY
WP = WATER PIPE
G.V. = GATE VALVE
F.H. = FIRE HYDRANT
——— = CENTERLINE DITCH
———/——— = OVERHEAD POWERLINE

- - - - - - - = AREA OF NEW GRAVEL SURFACE
——— = NEW FORCE MAIN
——— = SILT FENCE
NEW 1" W = NEW WATER LINE
▨ = EXISTING ASPHALT PAVEMENT BE REMOVED

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED BY

Baker ENVIRONMENTAL, INC. Coraopolis, Pennsylvania

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION — ATLANTIC DIVISION — NORFOLK, VIRGINIA
NAVBOT POINT INDUSTRIAL AREA — MARINE CORPS BASE CAMP LEJEUNE, NC

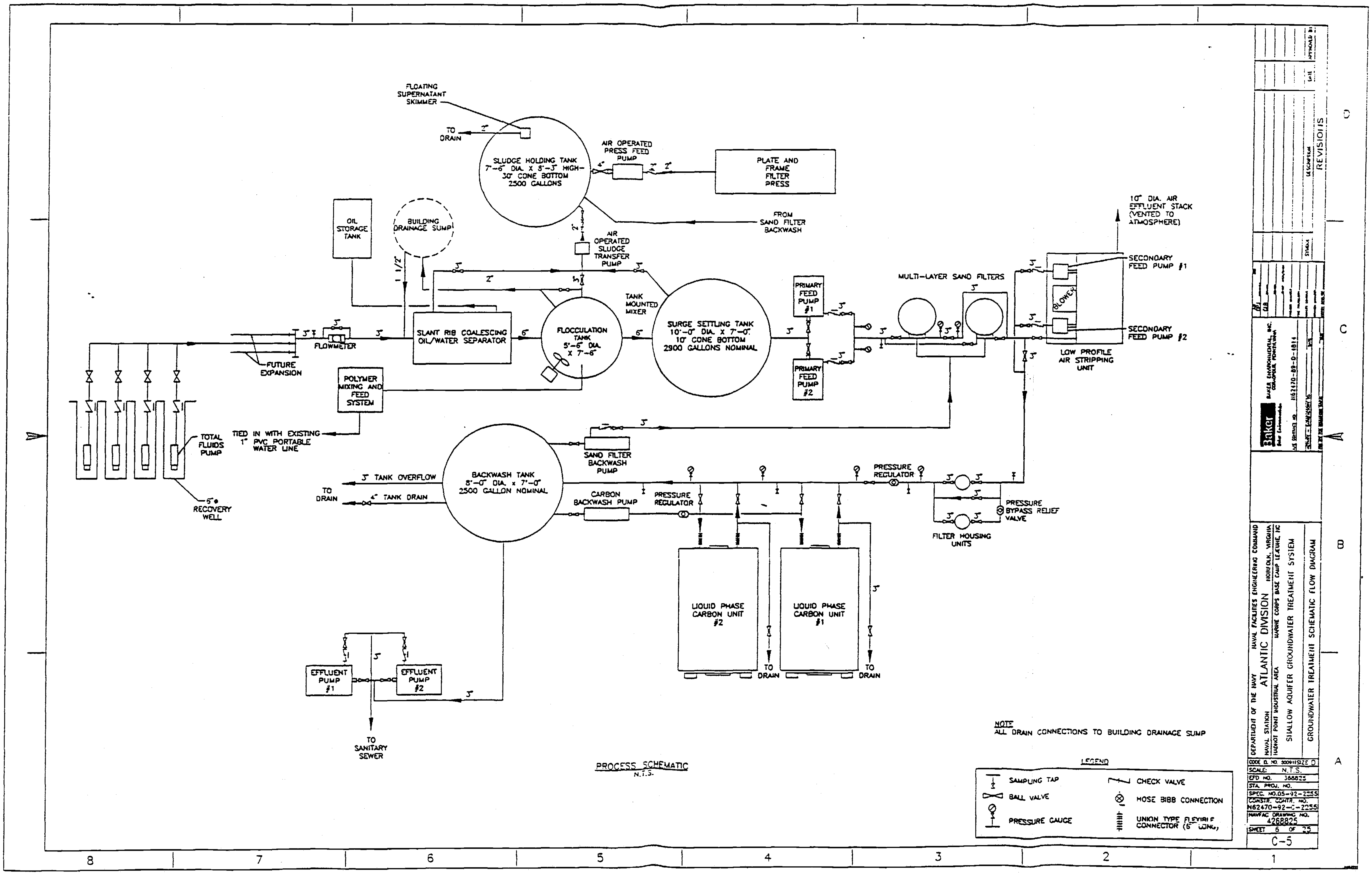
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM

SITE PLAN - SOUTH REMEDIATION AREA GROUNDWATER TREATMENT PLANT

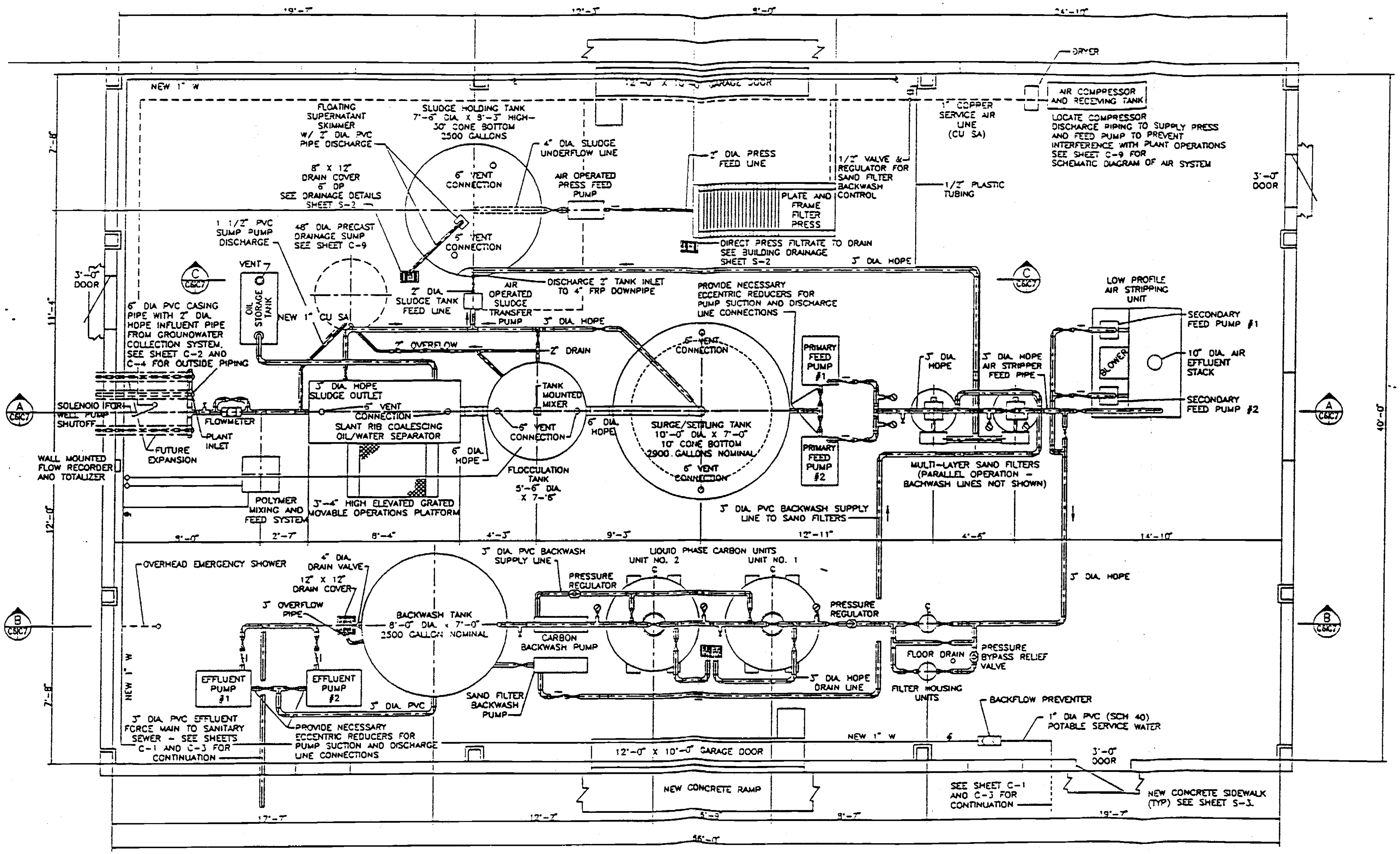
CODE ID. NO. 80091	SIZE D
SCALE:	1" = 25'
EFD NO.	368824
STA. PROJ. NO.	
SPEC. NO.	05-92-2255
CONSTR. CONTR. NO.	N6240-92-C-2255
NAVFAC DRAWING NO.	4268824
SHEET	3 OF 35

C-4

02357006Z



FLOATING SUPERNATANT SKIMMER
TO DRAIN
SLUDGE HOLDING TANK 7'-6" DIA. X 8'-3" HIGH- 30" CONE BOTTOM 2500 GALLONS
AIR OPERATED PRESS FEED PUMP
PLATE AND FRAME FILTER PRESS
FROM SAND FILTER BACKWASH
OIL STORAGE TANK
BUILDING DRAINAGE SUMP
AIR OPERATED SLUDGE TRANSFER PUMP
TANK MOUNTED MIXER
FLOWMETER
FUTURE EXPANSION
SLANT RIB COALESCING OIL/WATER SEPARATOR
FLOCCULATION TANK 5'-6" DIA. X 7'-6"
SURGE SETTLING TANK 10'-0" DIA. X 7'-0" 10" CONE BOTTOM 2900 GALLONS NOMINAL
PRIMARY FEED PUMP #1
PRIMARY FEED PUMP #2
MULTI-LAYER SAND FILTERS
10" DIA. AIR EFFLUENT STACK (VENTED TO ATMOSPHERE)
SECONDARY FEED PUMP #1
SECONDARY FEED PUMP #2
BLOWER
LOW PROFILE AIR STRIPPING UNIT
POLYMER MIXING AND FEED SYSTEM
TIED IN WITH EXISTING 1" PVC PORTABLE WATER LINE
TOTAL FLUIDS PUMP
6" RECOVERY WELL
SAND FILTER BACKWASH PUMP
BACKWASH TANK 8'-0" DIA. x 7'-0" 2500 GALLON NOMINAL
3" TANK OVERFLOW
4" TANK DRAIN
CARBON BACKWASH PUMP
PRESSURE REGULATOR
PRESSURE BYPASS RELIEF VALVE
FILTER HOUSING UNITS
LIQUID PHASE CARBON UNIT #2
LIQUID PHASE CARBON UNIT #1
EFFLUENT PUMP #1
EFFLUENT PUMP #2
TO SANITARY SEWER
PROCESS SCHEMATIC
N.T.S.
NOTE
ALL DRAIN CONNECTIONS TO BUILDING DRAINAGE SUMP
LEGEND
SAMPLING TAP
BALL VALVE
PRESSURE GAUGE
CHECK VALVE
HOSE BIBB CONNECTION
UNION TYPE FLEXIBLE CONNECTOR (6" LONG)
REVISIONS
Baker
BAKER ENVIRONMENTAL, INC. CORAOPOLIS, PENNSYLVANIA
N62470-89-D-4814
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION NORFOLK, VIRGINIA
NAVAL STATION HADNOT POINT INDUSTRIAL AREA MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
GROUNDWATER TREATMENT SCHEMATIC FLOW DIAGRAM
CODE ID. NO. 80091 SIZE D
SCALE: N.T.S.
EFD NO. 368825
SPEC. NO. 05-92-2255
CONSTR. CONTR. NO. N62470-92-C-2255
NAVFAC DRAWING NO. 4268825
SHEET 6 OF 25
C-5



NEW 1" W
12'-0" X 10'-0" GARAGE DOOR
FLOATING SUPERNATANT SKIMMER w/ 2" DIA. PVC PIPE DISCHARGE
SLUDGE HOLDING TANK 7'-6" DIA. X 9'-3" HIGH- 30" CONE BOTTOM 2500 GALLONS
4" DIA. SLUDGE UNDERFLOW LINE
2" DIA. PRESS FEED LINE
AIR OPERATED PRESS FEED PUMP
PLATE AND FRAME FILTER PRESS
1/2" VALVE & REGULATOR FOR SAND FILTER BACKWASH CONTROL
1" COPPER SERVICE AIR LINE (CU SA)
1/2" PLASTIC TUBING
DRYER
AIR COMPRESSOR AND RECEIVING TANK
LOCATE COMPRESSOR DISCHARGE PIPING TO SUPPLY PRESS AND FEED PUMP TO PREVENT INTERFERENCE WITH PLANT OPERATIONS SEE SHEET C-9 FOR SCHEMATIC DIAGRAM OF AIR SYSTEM
3'-0" DOOR
8" X 12" DRAIN COVER 6" DP SEE DRAINAGE DETAILS SHEET S-2
6" VENT CONNECTION
5" VENT CONNECTION
1 1/2" PVC SUMP PUMP DISCHARGE
48" DIA. PRECAST DRAINAGE SUMP SEE SHEET C-9
DIRECT PRESS FILTRATE TO DRAIN SEE BUILDING DRAINAGE SHEET S-2
3" DIA. HDPE
VENT
OIL STORAGE TANK
NEW 1" CU SA
2" DIA. SLUDGE TANK FEED LINE
AIR OPERATED SLUDGE TRANSFER PUMP
DISCHARGE 2" TANK INLET TO 4" FRP DOWNPIPE
PROVIDE NECESSARY ECCENTRIC REDUCERS FOR PUMP SUCTION AND DISCHARGE LINE CONNECTIONS
LOW PROFILE AIR STRIPPING UNIT
SECONDARY FEED PUMP #1
10" DIA. AIR EFFLUENT STACK
BLOWER
SECONDARY FEED PUMP #2
3'-0" DOOR
6" DIA PVC CASING PIPE WITH 2" DIA. HDPE INFLUENT PIPE FROM GROUNDWATER COLLECTION SYSTEM. SEE SHEET C-2 AND C-4 FOR OUTSIDE PIPING
2" OVERFLOW
2" DRAIN
3" DIA. HDPE SLUDGE OUTLET
5" VENT CONNECTION
SLANT RIB COALESCING OIL/WATER SEPARATOR
TANK MOUNTED MIXER
5" VENT CONNECTION
6" DIA. HOPE
6" VENT CONNECTION
SURGE/SETTLING TANK 10'-0" DIA. X 7'-0" 10' CONE BOTTOM 2900 GALLONS NOMINAL
6" VENT CONNECTION
PRIMARY FEED PUMP #1
PRIMARY FEED PUMP #2
3" DIA. HOPE
3" DIA. HOPE AIR STRIPPER FEED PIPE
SOLENOID (FOR WELL PUMP SHUTOFF)
FLOWMETER
PLANT INLET
FUTURE EXPANSION
WALL MOUNTED FLOW RECORDER AND TOTALIZER
POLYMER MIXING AND FEED SYSTEM
3'-4" HIGH ELEVATED GRATED MOVABLE OPERATIONS PLATFORM
6" DIA. HOPE
FLOCCULATION TANK 5'-6" DIA. X 7'-6"
MULTI-LAYER SAND FILTERS (PARALLEL OPERATION - BACHWASH LINES NOT SHOWN)
3" DIA. PVC BACKWASH SUPPLY LINE TO SAND FILTERS
OVERHEAD EMERGENCY SHOWER
4" DIA. DRAIN VALVE
12" X 12" DRAIN COVER
3" OVERFLOW PIPE
BACKWASH TANK 8'-0" DIA. X 7'-0" 2500 GALLON NOMINAL
3" DIA. PVC BACKWASH SUPPLY LINE
PRESSURE REGULATOR
LIQUID PHASE CARBON UNITS UNIT NO. 2 UNIT NO. 1
PRESSURE REGULATOR
3" DIA. HOPE
CARBON BACKWASH PUMP
FLOOR DRAIN
PRESSURE BYPASS RELIEF VALVE
3" DIA. HOPE DRAIN LINE
FILTER HOUSING UNITS
EFFLUENT PUMP #1
EFFLUENT PUMP #2
3" DIA. PVC
SAND FILTER BACKWASH PUMP
BACKFLOW PREVENTER
1" DIA PVC (SCH 40) POTABLE SERVICE WATER
NEW 1" W
3" DIA. PVC EFFLUENT FORCE MAIN TO SANITARY SEWER - SEE SHEETS C-1 AND C-3 FOR CONTINUATION
PROVIDE NECESSARY ECCENTRIC REDUCERS FOR PUMP SUCTION AND DISCHARGE LINE CONNECTIONS
12'-0" X 10'-0" GARAGE DOOR
3'-0" DOOR
NEW CONCRETE RAMP
SEE SHEET C-1 AND C-3 FOR CONTINUATION
NEW CONCRETE SIDEWALK (TYP) SEE SHEET S-3
56'-0"
40'-0"

LEGEND

- SAMPLING TAP
- BALL VALVE
- PRESSURE GAUGE
- CHECK VALVE
- HOSE BIBB CONNECTION
- PRESSURE REGULATOR

BUILDING ORIENTATION

NORTH BUILDING   SOUTH BUILDING

BUILDING PLAN

ONE PLAN SHOWN. TYPICAL FOR TWO NORTH AND SOUTH BUILDING
3/8" = 1'-0"

CONSTRUCTION NOTES:

1. PROVIDE HIGH DENSITY POLYETHELENE (HDPE) WITH FUSION WELDED JOINTS ON 3" PIPING AND LESS.
2. PROVIDE HDPE WITH FLANGED JOINTS ON 4" PIPING AND GREATER.
3. PROVIDE TRUE UNION TYPE BALL VALVES 3" AND LESS FOR EASY REMOVAL AND MAINTENANCE.
4. CHECK VALVES SHOWN ARE 3" DIAMETER, BALL TYPE, TRUE UNION.
5. ANCHOR ALL EQUIPMENT IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATION. PROVIDE EQUIPMENT PADS AS SHOWN.

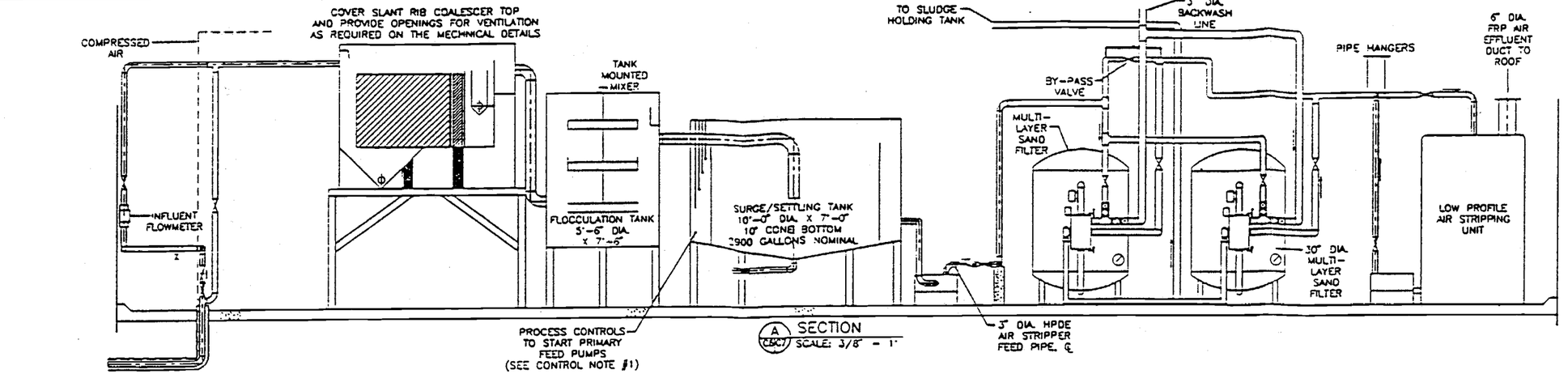
REVISIONS

Baker Environmental, Inc.

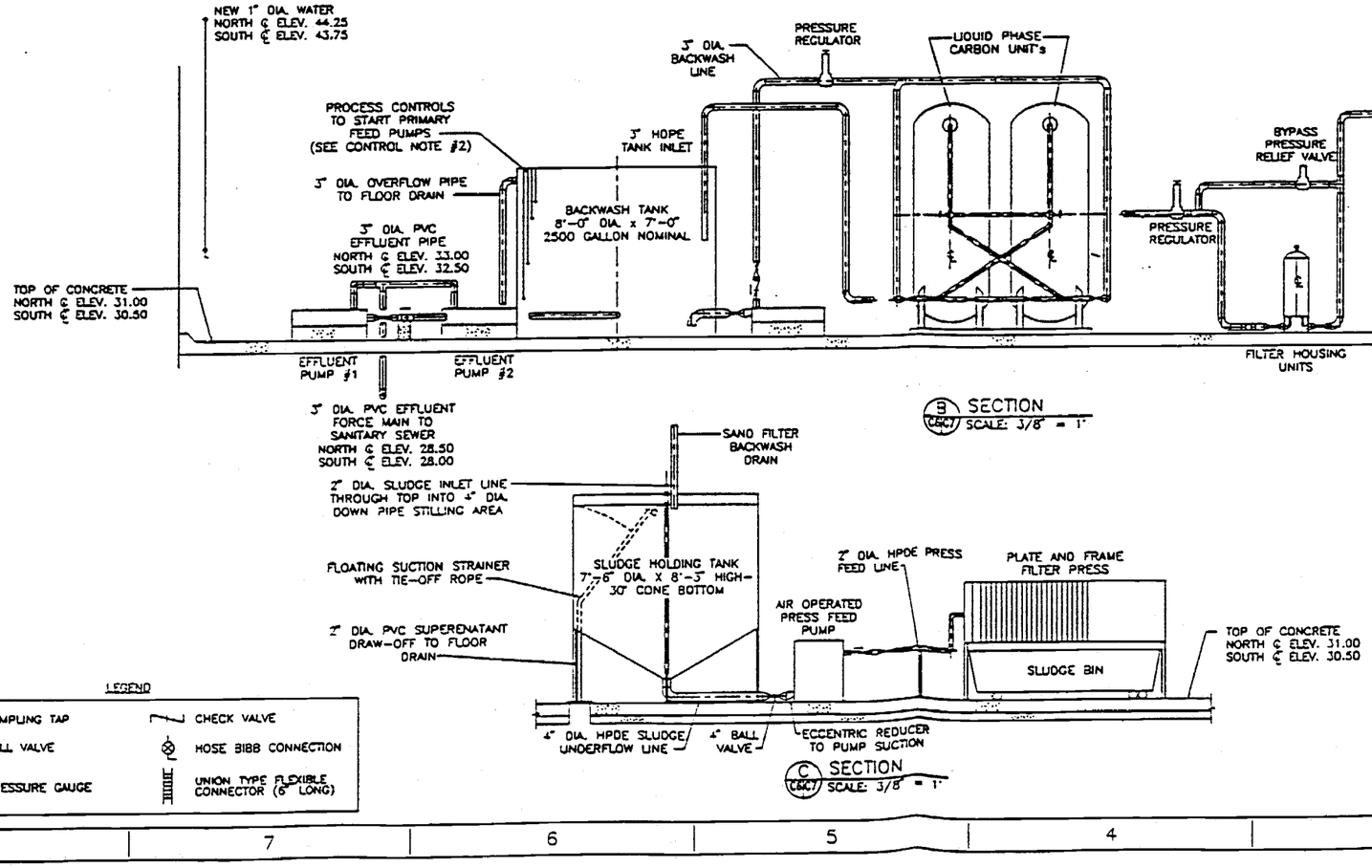
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION NORFOLK, VIRGINIA
NAVAL STATION
HADNOT POINT INDUSTRIAL AREA MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
EQUIPMENT LAYOUT

CODE ID. NO. 80091 SIZE D
SCALE: 3/8" = 1'
EFD NO. 368826
SPEC. NO. 05-92-2255
CONSTR. CONTR. NO. N62470-92-C-2255
NAVFAC DRAWING NO. 4268826
SHEET 7 OF 25
C-6

023570072



A SECTION (C&C7) SCALE: 3/8" = 1'



B SECTION (C&C7) SCALE: 3/8" = 1'

C SECTION (C&C7) SCALE: 3/8" = 1'

LEGEND

- SAMPLING TAP
- BALL VALVE
- PRESSURE GAUGE
- CHECK VALVE
- HOSE BIBB CONNECTION
- UNION TYPE FLEXIBLE CONNECTOR (6" LONG)

CONTROL NOTE:

	NORTH	SOUTH
1. ALARM ELEV.	37.73	37.23
HIGH WATER ELEV.	37.23	36.73
START SYSTEM ELEV.	35.23	34.73
STOP SYSTEM ELEV.	34.50	34.00

	NORTH	SOUTH
2. ALARM ELEV.	37.00	36.50
HIGH WATER ELEV.	36.50	36.00
START SYSTEM ELEV.	35.50	35.00
STOP SYSTEM ELEV.	32.50	32.00

CONSTRUCTION NOTES:

1. PROVIDE THE PIPE SUPPORTS UNDER ALL PROCESS PIPING TO PREVENT DEFLECTION AND TO SUPPORT VALVES, FITTINGS, ETC. IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS.
2. ANCHOR PIPE HANGERS INTO SOUND CEILING SUPPORTS. LOCATE AS TO PREVENT PIPE DEFLECTION AND STRAIN ON PIPE AND APPURTENANCES.
3. ANCHOR ALL TANKS TO THE BUILDING FLOOR TO PREVENT MOVEMENT AND IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED BY

Baker Environmental, Inc. Coraopolis, Pennsylvania

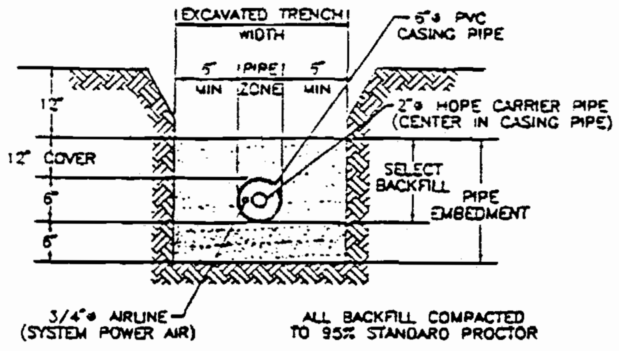
N62170-89-D-4814

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ATLANTIC DIVISION NORFOLK, VIRGINIA
NAVAL STATION MARINE CORPS BASE CAMP LEJEUNE, NC
SNOW'S POINT INDUSTRIAL AREA
SWALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
EQUIPMENT ELEVATIONS

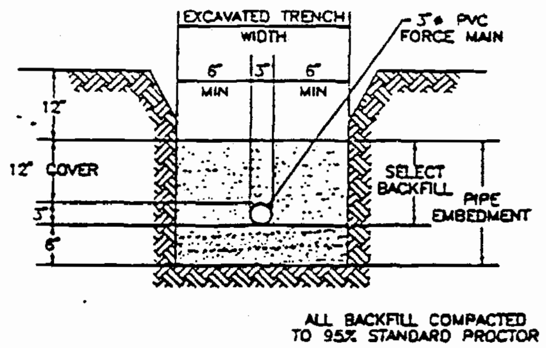
CODE ID. NO. 80091	SIZE D
SCALE: 3/8 = 1'	
EFD NO. 368827	
STA. PROJ. NO.	
SPEC. NO. 05-92-2256	
CONSTR. CONTR. NO. N62470-89-C-2256	
NAVFAC DRAWING NO. 4268827	
SHEET 8 OF 25	

C-7

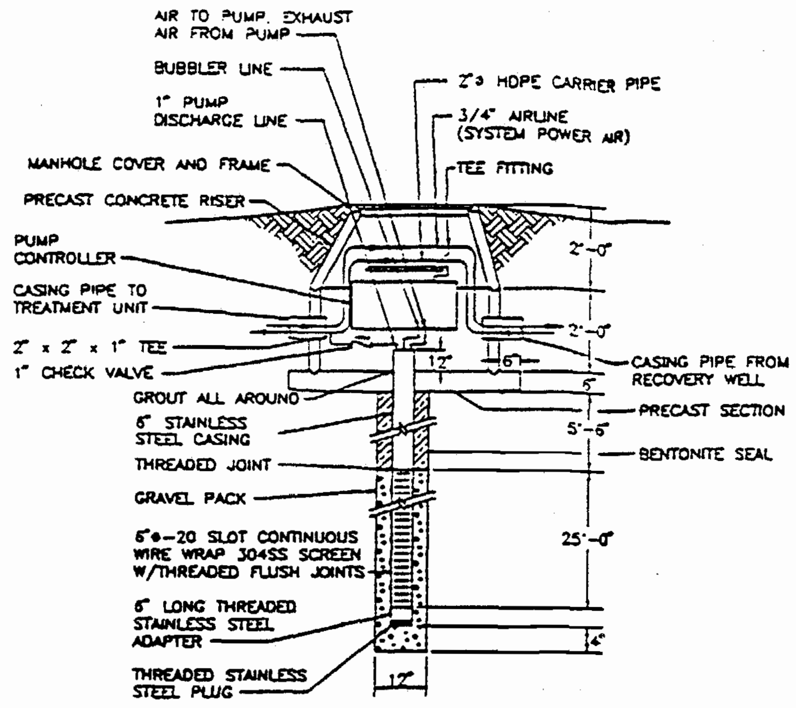
023570087



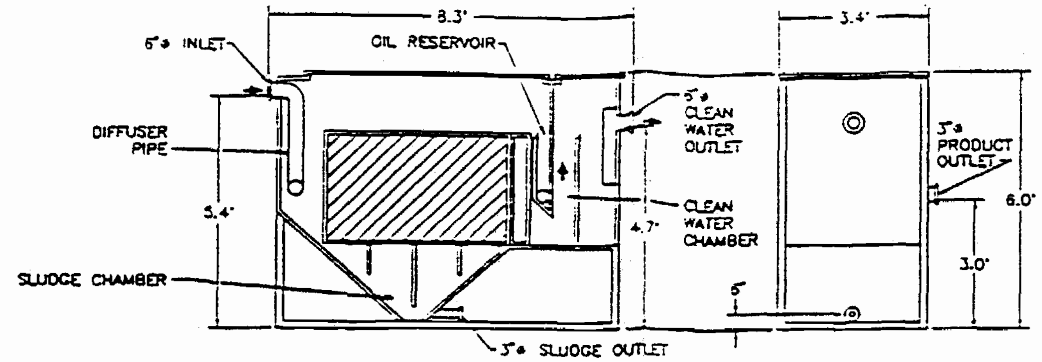
TYPICAL PIPE INSTALLATION
N.T.S.



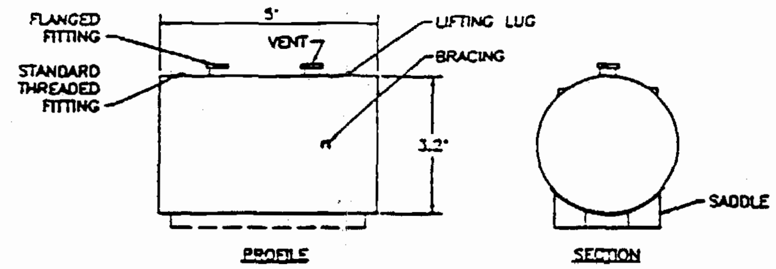
TYPICAL FORCE MAIN INSTALLATION
N.T.S.



RECOVERY WELL DETAIL
N.T.S.



OIL/WATER SEPARATOR
N.T.S.



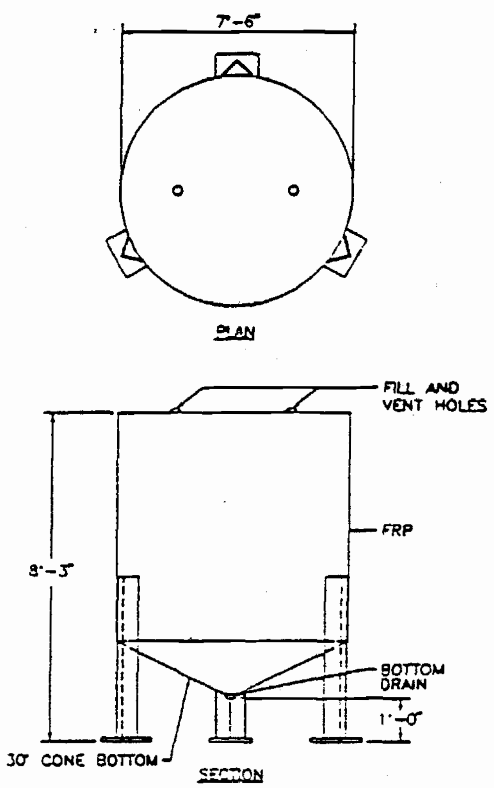
OIL STORAGE TANK
N.T.S.

MINIMUM CLEARANCE

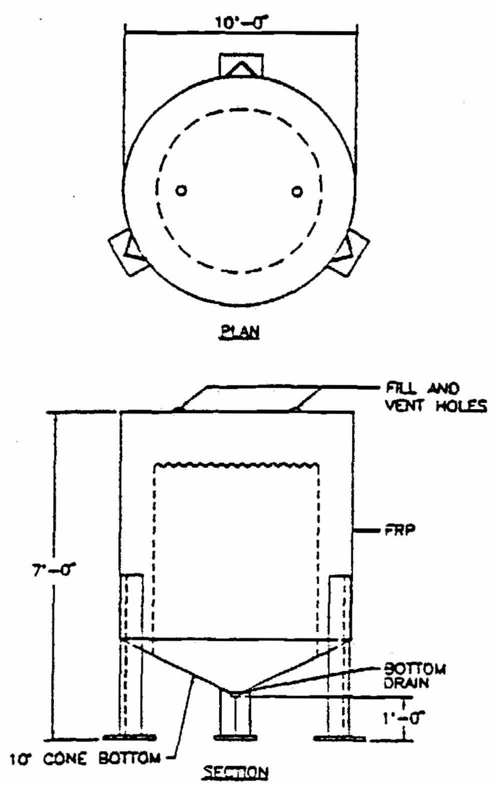
FRONT	1.5 FT.
TOP	34 IN.
REAR	N/A
LEFT	3.5 FT.
RIGHT	1 FT.

CONNECTION INFORMATION

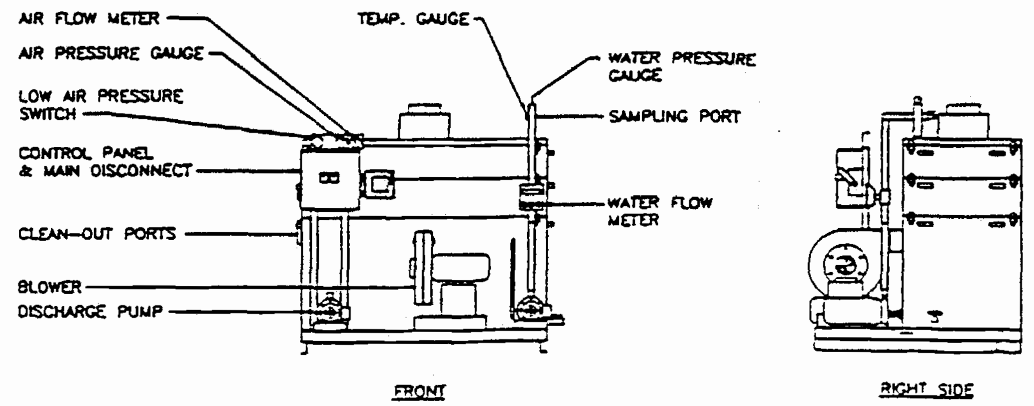
ITEM	SIZE
GRAVITY DISCHARGE	3 IN. DIA. FEMALE SLIP JOINT, PVC80
DISCHARGE PUMP	2 IN. DIA. FEMALE SLIP JOINT, PVC80
WATER INLET	2 IN. DIA. FEMALE SLIP JOINT, PVC30
AIR EXHAUST NOZZLE	8 IN. DIA. FLANGE



SLUDGE HOLDING TANK
N.T.S.



SURGE/SETTLING TANK
N.T.S.



TYPICAL AIR STRIPPER
N.T.S.

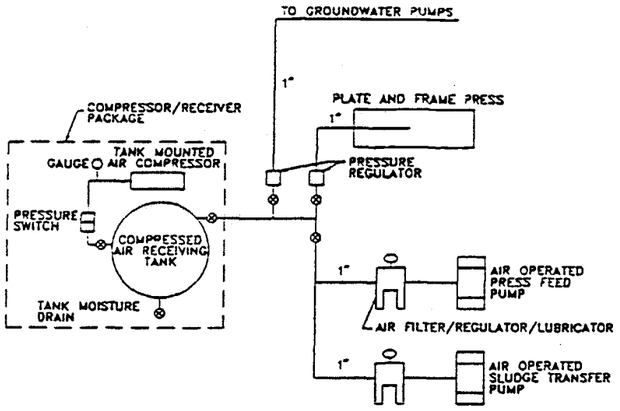
REVISIONS

Baker Environmental, Inc. Coraopolis, Pennsylvania
N62470-89-D-4814

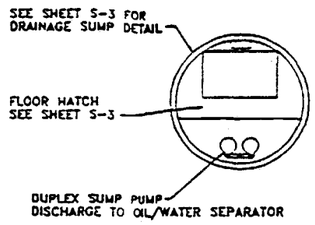
DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION — NORFOLK, VIRGINIA
NAVAL STATION — HADNOT POINT INDUSTRIAL AREA — MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
DETAILS

CODE ID. NO. 80091 SIZE D
SCALE: N.T.S.
EFD NO. 368828
STA. PROJ. NO.
SPEC. NO. 05-92-2255
CONSTR. CONTR. NO. N62470-92-C-2255
NAVFAC DRAWING NO. 4268828
SHEET 9 OF 25
C-8

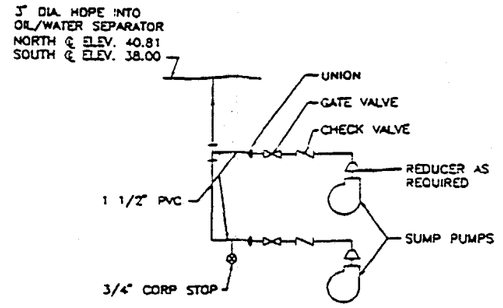
023570092



AIR SUPPLY SCHEMATIC
N.T.S.

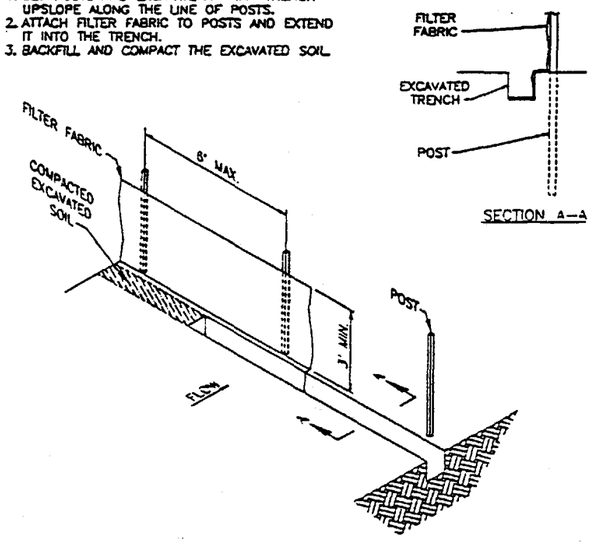


BUILDING SUMP PUMP DETAIL
N.T.S.

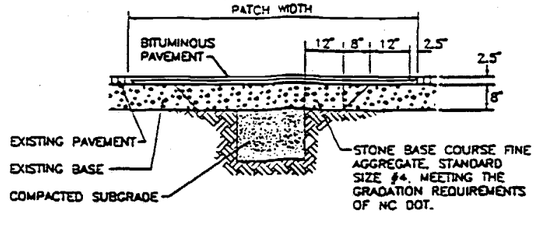


SUMP PUMP SCHEMATIC
N.T.S.

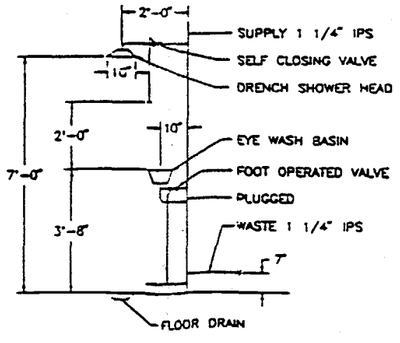
1. SET POSTS AND EXCAVATE A 4"x4" TRENCH UPSLOPE ALONG THE LINE OF POSTS.
2. ATTACH FILTER FABRIC TO POSTS AND EXTEND IT INTO THE TRENCH.
3. BACKFILL AND COMPACT THE EXCAVATED SOIL.



SILT FENCE
N.T.S.



PAVEMENT PATCHING
N.T.S.



EMERGENCY EYE WASH AND SHOWER
N.T.S.

REVISIONS

DESCRIPTION	DATE	APPROVED BY

Baker — Baker Environmental, Inc. Coraopolis, Pennsylvania

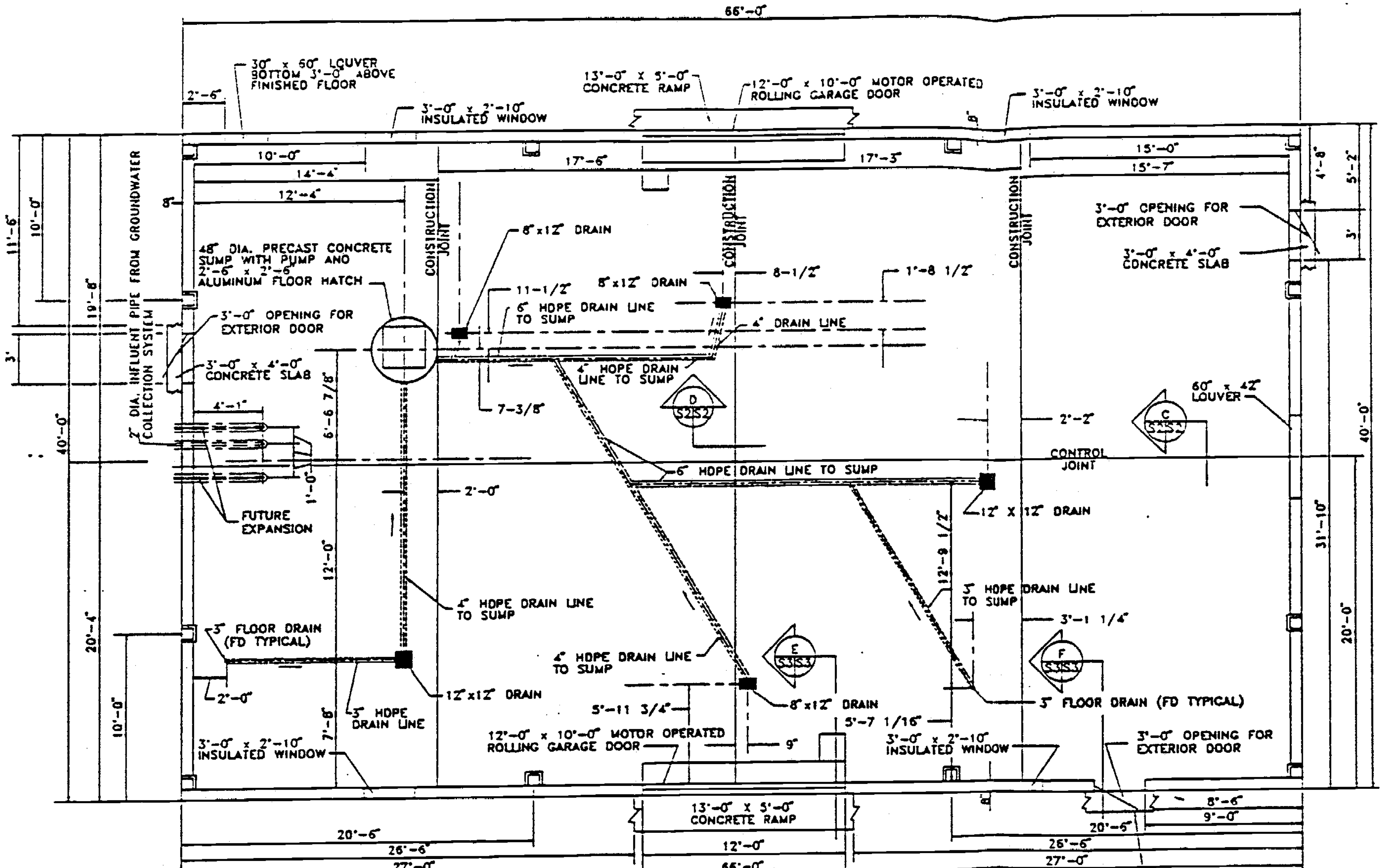
DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND — ATLANTIC DIVISION — NORFOLK, VIRGINIA
NAVAL STATION — MARINE CORPS BASE CAMP LEJEUNE, NC
MARINE CORPS BASE CAMP LEJEUNE, NC — HADNOT POINT INDUSTRIAL AREA
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
DETAILS

CODE ID. NO. 80091	SIZE D
SCALE:	N.T.S.
EFD NO.	268829
STA. PROJ. NO.	
SPEC. NO.	05-92-2255
CONSTR. CONTR. NO.	N62470-92-C-2255
MANFAC DRAWING NO.	4268829
SHEET	10 OF 25
	C-9

D C B A

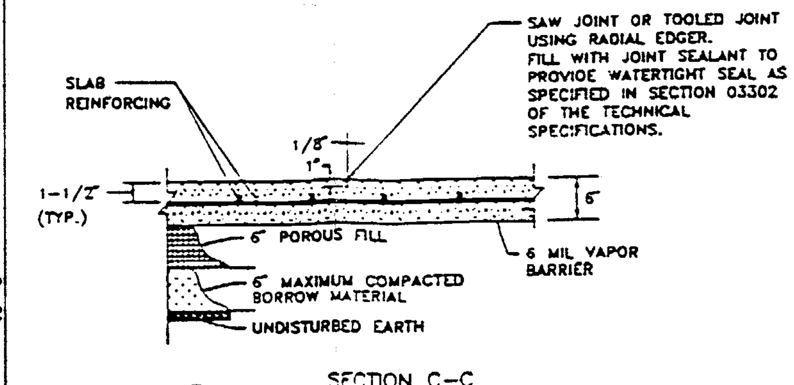
8 7 6 5 4 3 2 1

02357010Z

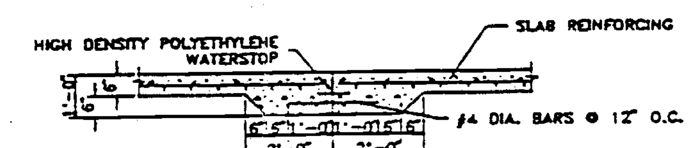


FLOOR AND DRAINAGE PLAN
SCALE: 1/4" = 1'-0"

NOTE: ONE PLAN SHOWN, TYPICAL FOR NORTH AND SOUTH BUILDINGS



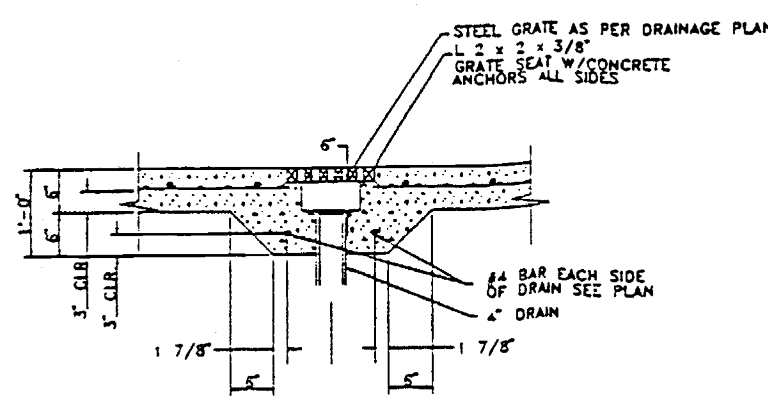
SECTION C-C
TYPICAL FLOOR CONTROL JOINT
SCALE: 1" = 1'-0"



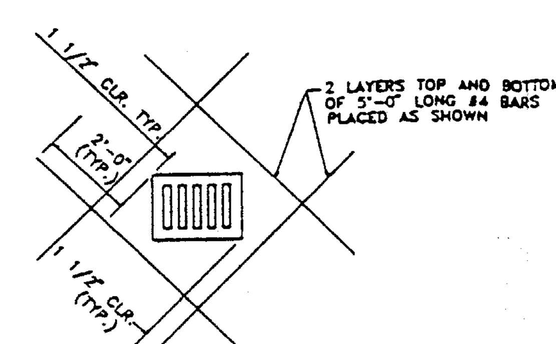
SECTION D-D
TYPICAL FLOOR CONSTRUCTION JOINT
SCALE: 1/2" = 1'-0"

GENERAL NOTES:

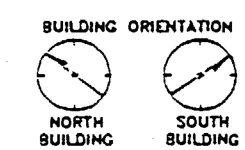
1. ALL CONCRETE TO BE f'c = 4000 PSI.
2. ALL REINFORCING TO BE GRADE 60 BAR. TO HAVE A COMPRESSIVE STRENGTH 2500 PSI.
3. SLOPE PLANT FLOOR TO FLOOR DRAINS, SUPERNATANT DRAIN OR FILTER PRESS DRAIN.
4. SEE SHEET S-1 FOR SLAB REINFORCING AND FOUNDATION.
5. ALL DRAINS ARE SUNK 1/4" OFF OF FINISHED FLOOR. FLOOR IS LEVEL AND SLOPES TO DRAINS IN AN 18" DIAMETER.



TYPICAL DRAIN SECTION
SCALE: 1" = 1'-0"



TYPICAL DRAIN PLAN
SCALE: 1" = 1'-0"



CAD NAME: 19134F01.DWG

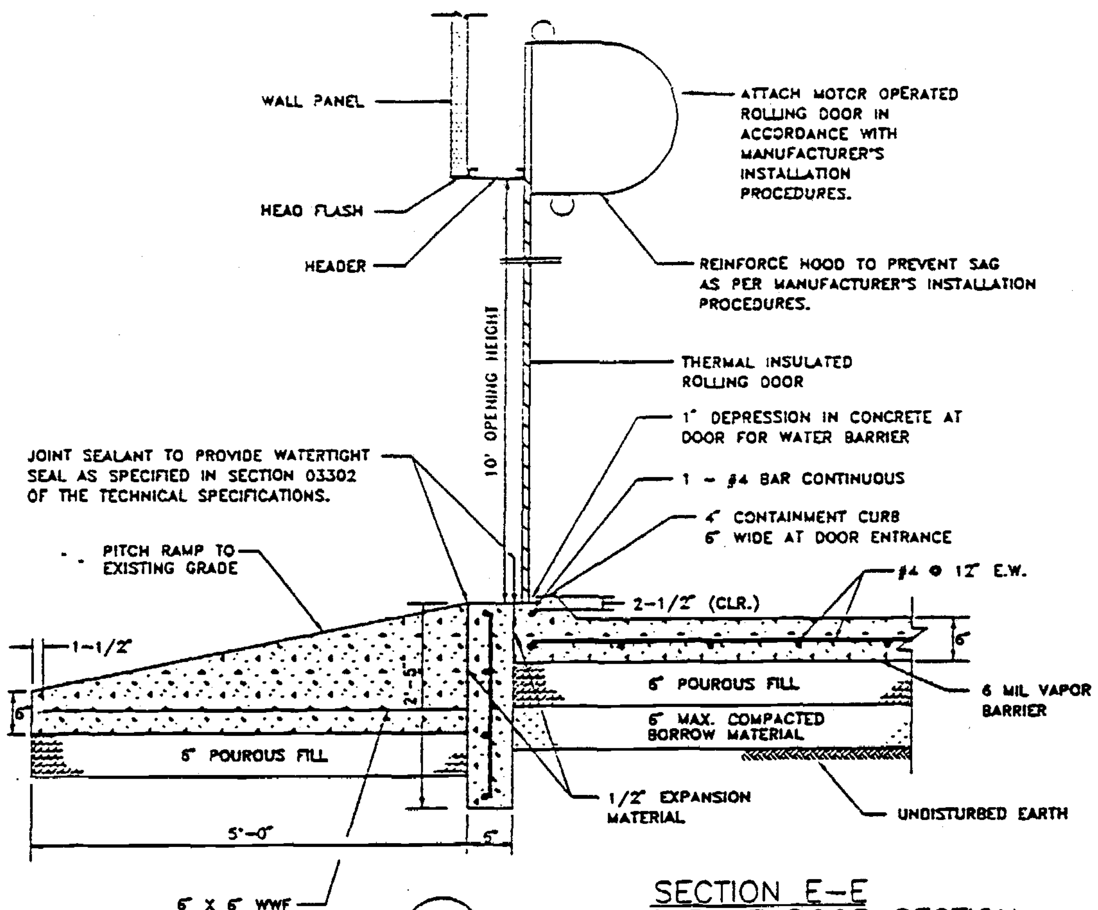
DEPARTMENT OF THE NAVY, NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION, NORFOLK, VIRGINIA
NAVAL STATION, MARINE CORPS BASE CAMP LEJEUNE, NC
HADNOT POINT INDUSTRIAL AREA
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
BUILDING DRAINAGE PLAN & DETAILS

Baker Environmental, Inc.
N 62470-89-D-4814

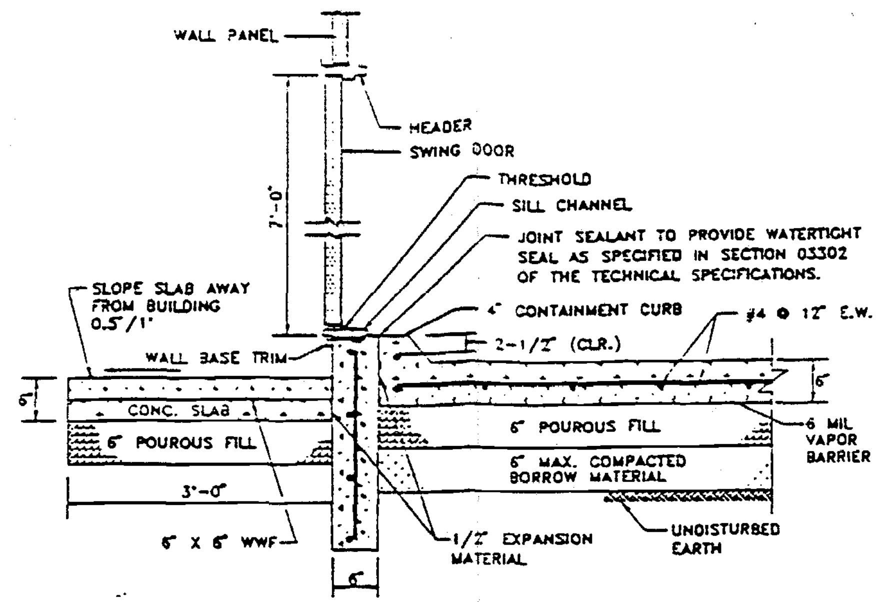
REVISIONS

SCALE: AS NOTED
EFD NO. 368831
SPEC. NO. 05-92-2255
CONSTR. CONTR. NO. 62470-92-C-2255
NAVFAC DRAWING NO. 4268831
SHEET 12 OF 25
S-2

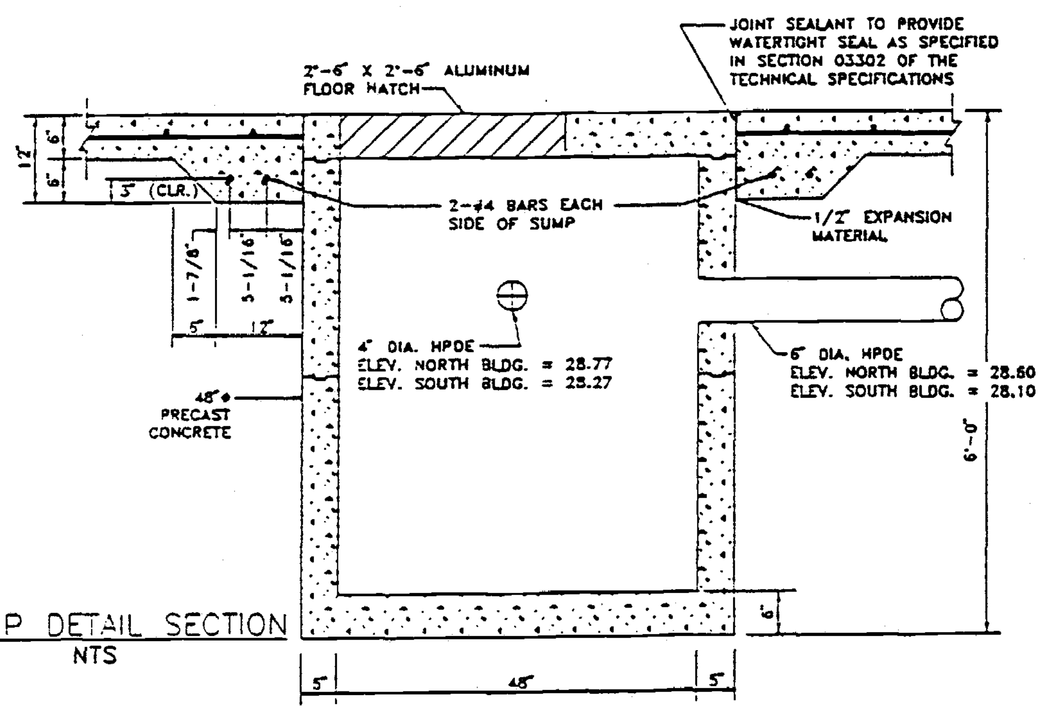
02357011Z



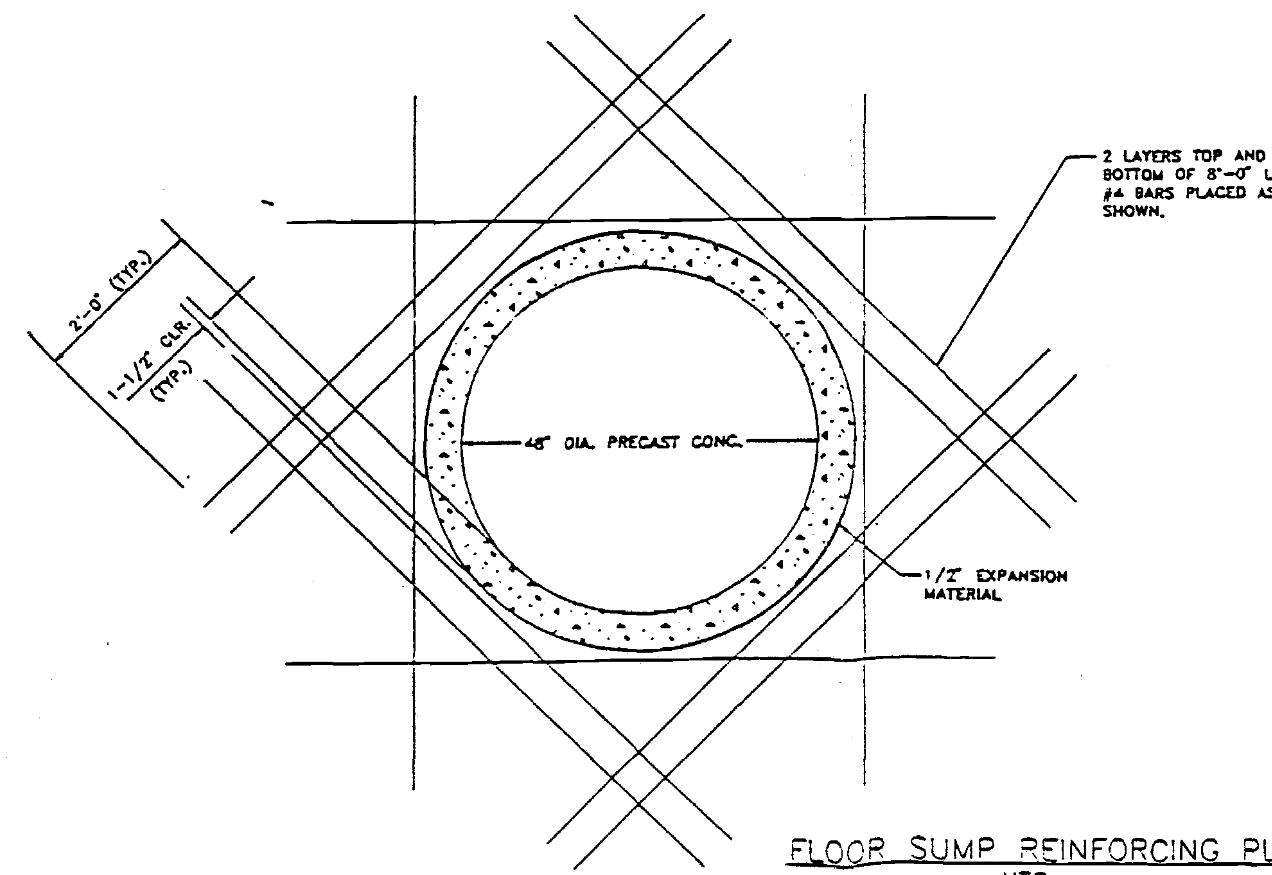
SECTION E–E
TYPICAL GARAGE DOOR SECTION
E S2|S2
NTS



SECTION F–F
TYPICAL SWING DOOR WALL SECTION
F S2|S2
NTS



SUMP DETAIL SECTION
NTS



FLOOR SUMP REINFORCING PLAN
NTS

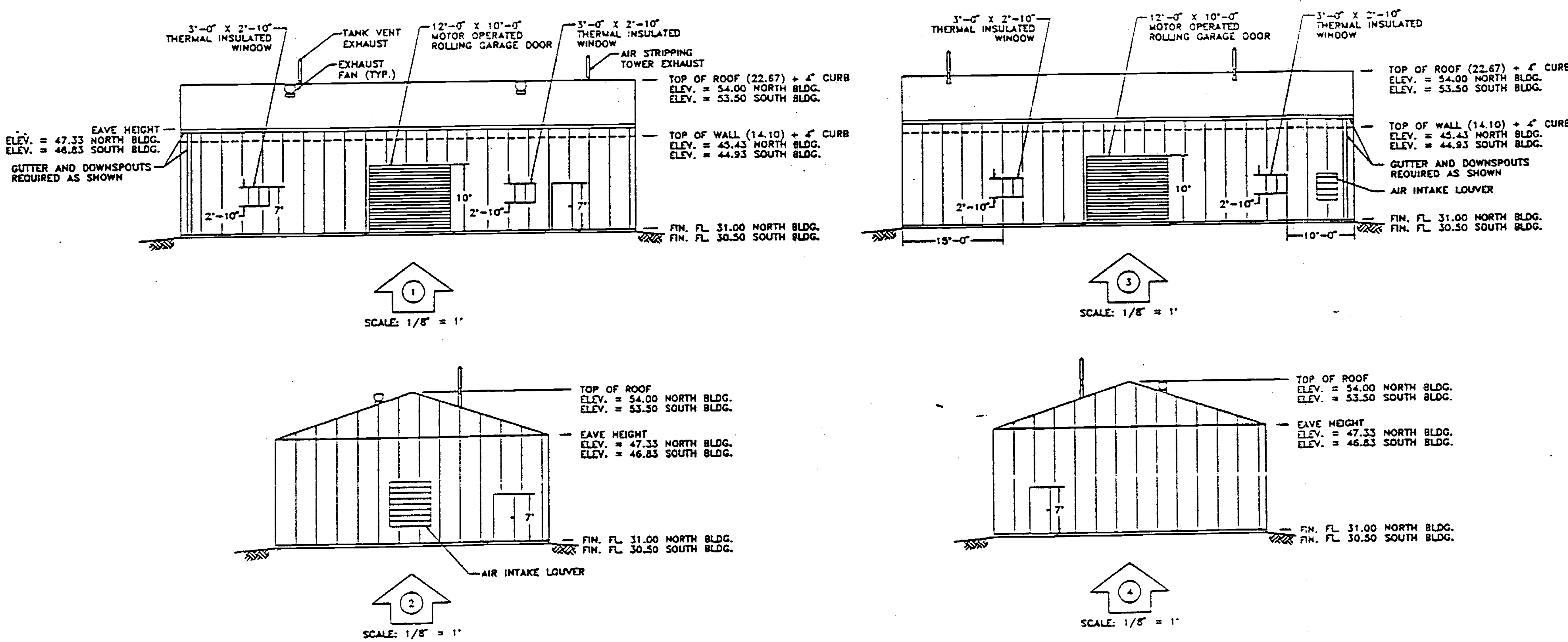
CAD NAME: 19134001.DWG

REVISIONS

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NAVAL STATION NORFOLK, VIRGINIA
HADNOT POINT INDUSTRIAL AREA — MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
DETAILS

CODE ID. NO. 80091	SIZE D
SCALE:	N.T.S.
EFD NO.	368832
STA. PROJ. NO.	
SPEC. NO. 05-92-2255	
CONSTR. CONTR. NO.	62470-92-C-2255
NAVFAC DRAWING NO.	4268832
SHEET	13 OF 25
	S-3

02357012Z



REVISIONS

Baker Environmental, Inc.

N 62470-89-D-4814

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION NORFOLK, VIRGINIA
NAVAL STATION HADNOT POINT INDUSTRIAL AREA MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
BUILDING ELEVATIONS

SIZE D
SCALE: AS NOTED
EFD NO. 368833
STA. PROJ. NO.
SPEC. NO. 05-92-2255
CONSTR. CONTR. NO. 62470-92-C-2255
NAVFAC DRAWING NO. 4268833
SHEET 14 OF 25
A-1

CAD NAME: 19134P01.DWG

02357013Z

02357014Z

HEATER SCHEDULE

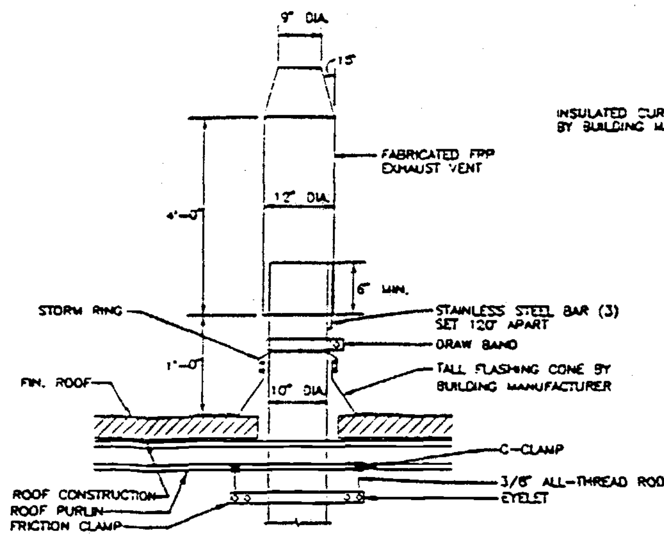
MARK	TYPE	NEMA STARTER SIZE	KW	CFM	VOLTS PHASE HERTZ	REMARKS
UH-1	PROPELLER	*	3.3	700	480V-3-60	W/ WALL MOUNTING BRACKET
UH-2	PROPELLER	*	3.3	700	480V-3-60	W/ WALL MOUNTING BRACKET
UH-3	PROPELLER	*	3.3	700	480V-3-60	W/ WALL MOUNTING BRACKET

EXHAUST FAN SCHEDULE

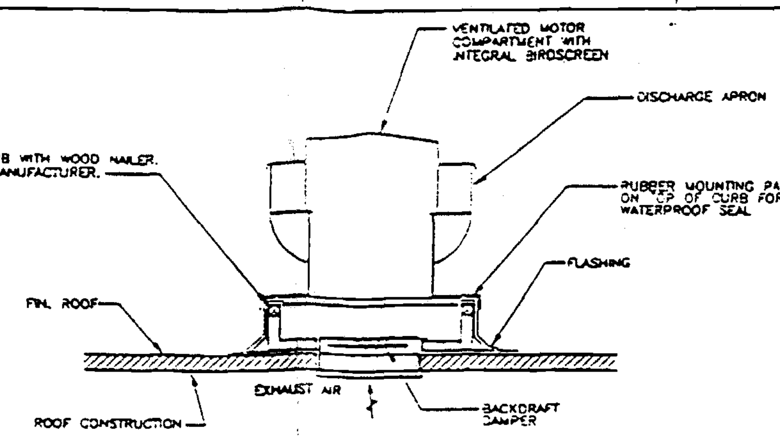
MARK	TYPE	DRIVE	CFM	RPM	MAX TIP SPEED FPM	MAX SONES	E.S.P. IN. W.G.	MOTOR HP	NEMA STARTER SIZE	VOLTS PHASE HERTZ	REMARKS
EF-1	UPBLAST	BELT	500	2190	–	–	1.75	3/4	00	480-3-60	AMCA-B FAN CONSTRUCTION
EF-2	UPBLAST	BELT	2630/1730	980/700	4234	11.8	0.125	1/4	00	120-1-60	TWO-SPEED MOTOR
EF-3	UPBLAST	BELT	5000	1070	5511	21.5	0.125	1	00	480-3-60	

HEATING AND VENTILATING UNIT SCHEDULE

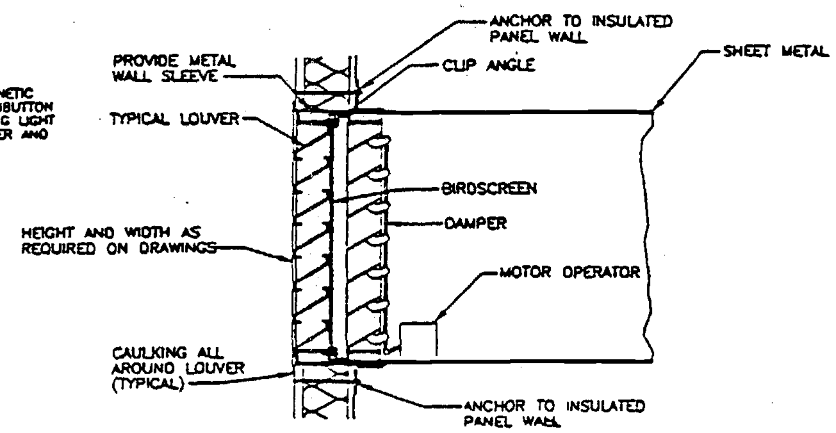
MARK	FAN				NEMA STARTER SIZE	RPM	EAT DB °F	LAT DB °F	VOLTS PHASE HERTZ	FILTER	ELEC. HEATER		MAX FACE VEL. (FPM)	REMARKS
	CFM	OA CFM	HP	SP							KW	STEPS		
HV-1	3350	3350	2	1.5	2	1794	23	45.5	480-3-60	THROWAWAY	24	6	510	



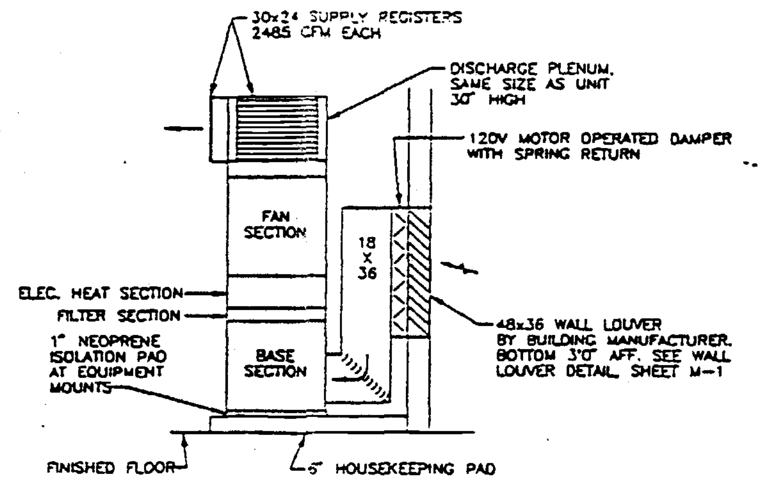
ROOF EXHAUST VENT DETAIL
N.T.S.



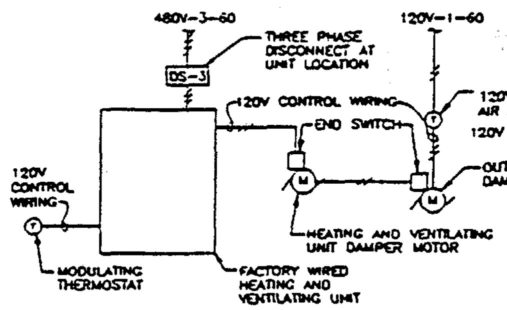
UPBLAST
EXHAUST FAN DETAIL (EF-1, EF-2 AND EF-3)
N.T.S.



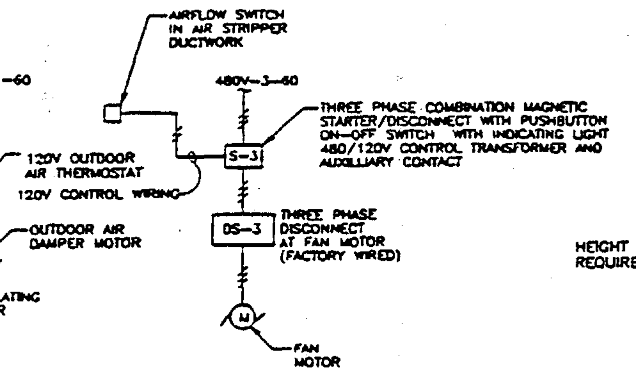
LOUVER MOUNTING DETAIL
N.T.S.



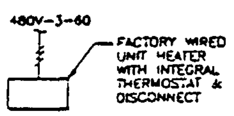
HV-1 UNIT SECTION
N.T.S.



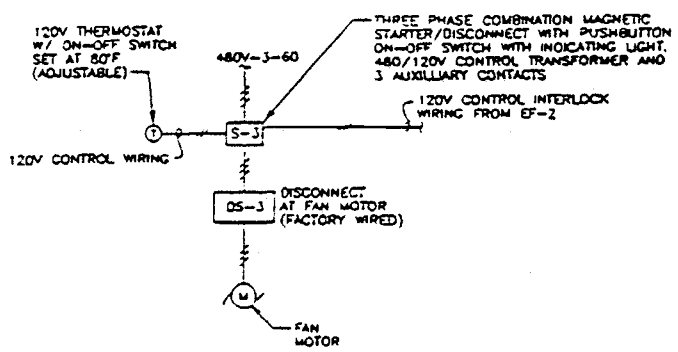
HEATING AND VENTILATING UNIT WIRING DIAGRAM



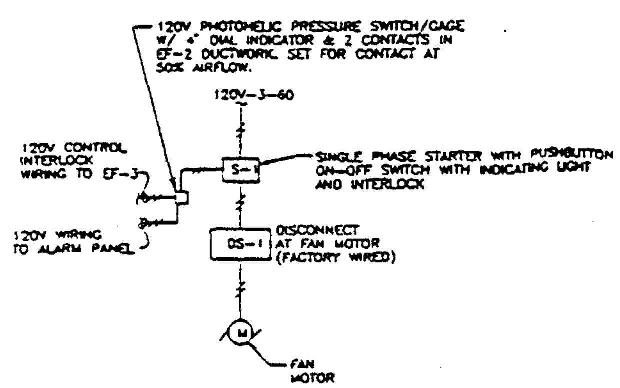
EXHAUST FAN EF-1 WIRING DIAGRAM



UNIT HEATER WIRING DIAGRAM



EXHAUST FAN EF-3 WIRING DIAGRAM



EXHAUST FAN EF-2 WIRING DIAGRAM

SEQUENCE OF OPERATIONS

HV-1 HEATING AND VENTILATING UNIT HV-1: FAN SHALL OPERATE WHEN THE OUDOOR AIR DAMPER IS CLOSED. ELECTRIC HEATING COIL STAGES SHALL BE ENERGIZED AS REQUIRED TO MAINTAIN THE THERMOSTAT SETPOINT (40°F. ADJUSTABLE). WHEN UNIT IS OPERATING, THE MOTOR OPERATED DAMPER SHALL BE ENERGIZED AND REMAIN OPEN.

EF-1 EXHAUST FAN EF-1 SHALL RUN CONTINUALLY.

EF-2 EXHAUST FAN EF-2 SHALL RUN CONTINUALLY. EF-2 SHALL OPERATE AT LOW SPEED WHEN THE AIR STRIPPER IS OPERATING AND AT HIGH SPEED WHEN THE AIR STRIPPER IS OFF.

EF-3 EXHAUST FAN EF-3 SHALL BE ENERGIZED WHEN ITS THERMOSTAT SENSES A TEMPERATURE OF 80°F (ADJUSTABLE). THE FAN SHALL STOP WHEN THE THERMOSTAT SENSES A TEMPERATURE OF 70°F (ADJUSTABLE). A PHOTOHELIC PRESSURE SWITCH IN EXHAUST FAN EF-2 DUCTWORK SHALL ENERGIZE EF-3 AND SEND A SIGNAL TO THE ALARM PANEL UPON SENSING 50 PERCENT AIRFLOW.

OUTDOOR AIR DAMPER THE OUTDOOR AIR DAMPER SHALL OPEN WHEN THE OUTDOOR AIR TEMPERATURE RISES ABOVE 45°F (ADJUSTABLE) AND CLOSE WHEN THE OUTDOOR AIR TEMPERATURE FALLS BELOW 43°F (ADJUSTABLE).

BUILDING DESIGN CONDITIONS

INDOOR	OUTDOOR		
WINTER °F DB	SUMMER °F DB	SUMMER %RH	WINTER °F DB
40	90	62	23

ABBREVIATIONS

CFM	CUBIC FEET/MINUTE
CLG	CEILING
DB	DRY BULB
DIA	DIAMETER
EAT	ENTERING AIR TEMPERATURE
EF	EXHAUST FAN
F	FAHRENHEIT
FLEX	FLEXIBLE
FPM	FEET PER MINUTE
FRP	FIBERGLASS REINFORCED PLASTIC
HP	HORSEPOWER
HV	HEATING AND VENTILATING
IN	INCH, INCHES
KW	KILOWATT
LAT	LEAVING AIR TEMPERATURE
MAX	MAXIMUM
MBH	1,000 BTUH
MFR	MANUFACTURER
MIN	MINIMUM
NTS	NOT TO SCALE
PRESS	PRESSURE
RPM	REVOLUTIONS PER MINUTE
SP	STATIC PRESSURE
TYP	TYPICAL
UH	UNIT HEATER
VEL	VELOCITY
VD	VOLUME DAMPER
W.G.	WATER GAUGE
W/	WITH

REVISIONS

Baker Environmental, Inc.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
NAVAL STATION
HADNOT POINT INDUSTRIAL AREA
MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
HEATING AND VENTILATION SCHEDULES, DETAILS & ABBREV.

CODE ID. NO. 80091	SIZE D
SCALE:	N.T.S.
EFD NO.	368834
STA. PROJ. NO.	
SPEC. NO. 05-92-2255	
CONSTR. CONTR. NO.	N62470-92-B-2255
NAVFAC DRAWING NO.	4268834
SHEET 15 OF 25	
M-1	

023570152

36x48 WALL LOUVER BY BUILDING MANUFACTURER BOTTOM 3'-0" ABOVE FINISHED FLOOR

3350 CFM 0.06 IN W.G. PRESS DROP

HEATING AND VENTILATING UNIT 120V MOTOR OPERATED DAMPER W/ SPRING RETURN

36x18 DN

SMOKE DETECTOR

FLEXIBLE CONNECTOR

ACCESS DOOR FOR DAMPER MAINTENANCE

6" HOUSEKEEPING PAD-EXTEND 6" BEYOND EQUIPMENT FOOTPRINT AND TO ADJACENT WALL

30x24 SUPPLY REGISTERS 2485 CFM EACH

HV-1 THERMOSTAT

EF-3 THERMOSTAT

SLUDGE HOLDING TANK

200 CFM EXHAUST FROM TANKS INDICATED

EF-1 ON ROOF ABOVE

10" FRP UP TO 12" TRANSITION TO 12" AT FAN INLET.

OIL STORAGE TANK

8" FRP

6" FRP

CONNECT TO FLANGED 6" VENT CONNECTION PROVIDED BY TANK MANUFACTURER. EXACT LOCATION TO BE COORDINATED.

10" FRP FROM LOW PROFILE AIR STRIPPING UNIT THRU ROOF. SEE ROOF EXHAUST VENT DETAIL.

72x60 WALL LOUVER BY BUILDING MANUFACTURER BOTTOM 2'-6" ABOVE FINISHED FLOOR. SEE WALL LOUVER MOUNTING DETAIL ON SHEET M-1.

LOW PROFILE AIR STRIPPING UNIT

BLOWER

SLOPE DOWN (TYP.)

SLANT RIB COALESCING OIL/WATER SEPARATOR

FLOCCULATION TANK

SURGE SETTLING TANK

8350 CFM 0.06 IN. W.G. PRESS DROP

CONNECT TO LOW PROFILE AIR STRIPPING UNIT STACK CONNECTION PROVIDED BY UNIT MANUFACTURER.

OUTDOOR AIR 120V MOTOR OPERATED DAMPER W/ SPRING RETURN

SUN SHIELD

120V OUDOOR AIR THERMOSTAT

EF-2 ON ROOF ABOVE

30x30

3'-4" HIGH ELEVATED GRATED MOVABLE OPERATIONS PLATFORM

6" VENT INTAKE PROVIDED BY TANK MANUFACTURER (TYPICAL)

EF-3 ON ROOF ABOVE

30x30

EXTEND DUCT BELOW ROOF DECK AND PROVIDE GALVANIZED BIRDSCREEN INLET. MOUNT BIRDSCREEN ON FABRICATED 1"x1"x1/4" GALVANIZED ANGLE FRAME. REINFORCE BIRDSCREEN WITH INTERMEDIATE ANGLES AS REQUIRED TO PREVENT SAGGING. (TYPICAL OF TWO)

EXHAUST FAN ROOF CURB SHALL BE A MINIMUM OF 12" HIGH - PROVIDED BY BUILDING MANUFACTURER TO MATCH EXHAUST FAN. (TYPICAL OF 2)

MOUNT UNIT HEATERS WITH BOTTOM 10'-0" ABOVE FINISHED FLOOR (TYPICAL)

WALL BRACKET (TYPICAL)

EF-1 STARTER

EF-2 STARTER

EF-3 STARTER

HV-1 STARTER

CONSTRUCTION NOTES:

1. FRP DUCTWORK SHALL SLOPE 1" PER 10 FOOT LENGTH IN DIRECTION INDICATED. INSTALL HORIZONTAL FRP DUCTWORK A MINIMUM OF 10'-0" ABOVE FINISHED FLOOR.

BUILDING PLAN

ONE PLAN SHOWN. TYPICAL FOR TWO NORTH AND SOUTH BUILDING

3/8" = 1'-0"

BUILDING ORIENTATION

NORTH BUILDING

SOUTH BUILDING

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED BY

BAKER ENVIRONMENTAL, INC. COLLEGEVILLE, PENNSYLVANIA

H82170-89-D-4814

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA
NAVAL STATION ATLANTIC DIVISION
NORFOLK INDUSTRIAL AREA MARINE CORPS BASE CAMP LEJEUNE, NC

SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM

HEATING AND VENTILATION EQUIPMENT LAYOUT

CODE ID. NO. 30011	SIZE D
SCALE: 3/8" = 1'-0"	
DWG NO. 568835	
STA. PROJ. NO.	
SPEC. NO. 05-92-2255	
CONTR. NO. N62470-92-B-2255	
NAVFAC DRAWING NO. 4268835	
SHEET 16 OF 25	

M-2

023570162

LEGEND

- FLOURESCENT LIGHTING FIXTURE.
- EXIT LIGHTING FIXTURE.
- HIGH INTENSITY DISCHARGE (HID) LIGHTING FIXTURE.
- LIGHTING FIXTURE TYPE. SEE LIGHTING FIXTURE SCHEDULE ON THIS SHEET.
- EMERGENCY BATTERY POWERED LIGHTING UNIT.
- WP GFI — DUPLEX CONVENIENCE RECEPTACLE 15A, 125V, MOUNT 48" AFF UON. W/INTERNAL GROUND FAULT PROTECTION (GFI) & WEATHER PROOF (WP) ENCLOSURE.
- S — SINGLE POLE SWITCH 20A, 120/277V.
- S_3 — THREE-WAY SWITCH 20A, 120/277V.
- S_P — SWITCH WITH PILOT LIGHT.
- E — EQUIPMENT CONNECTION AS NOTED.
- J — JUNCTION BOX.
- 1/2 M — MOTOR CONNECTION, HP INDICATED.
- MAGNETIC MOTOR CONTROLLER.
- COMBINATION MAGNETIC MOTOR STARTER, 600V IN NEMA 12 ENCLOSURE UON. PROVIDED BY MECANICAL CONTRACTOR. WIRED BY ELCTRICAL CONTRACTOR.
- 3P — DISCONNECT SWITCH, 600V, IN NEMA 12 ENCLOSURE UON. 3P=NO. OF POLES 60=SWITCH RATING 40=FUSE RATING. NF INDICATES NON-FUSIBLE.
- ELECTRICAL PANELBOARD (208Y/120VOLT).
- ELECTRICAL PANELBOARD (480Y/277VOLT).
- OR — BRANCH CIRCUIT OR FEEDER WIRING IN CONDUIT. NO TICK MARKS INDICATE 2 #12 CONDUCTORS & 1 #12GND. IN 3/4" CONDUIT UON. TICK MARKS WHEN SHOWN, INDICATE NUMBER OF #12 CONDUCTORS IF OTHER THAN THREE; (1) INDICATES GROUND. CONDUIT LARGER THAN 3/4" & WIRE LARGER THAN #12 SHALL BE INDICATED.
- A-1,3,5 — HOMERUNS TO PANELBOARD. PANEL AND CIRCUIT DESIGNATIONS AS INDICATED.
- INDICATES CONDUIT RUN IN FLOOR SLAB OR EXPOSED ON WALLS AND CEILING UON.
- TELEPHONE TERMINAL BACKBOARD
- TELEPHONE OUTLET, MOUNT 4'-9"AFF UON.
- CS — CONTROL STATION.
- FACP — FIRE ALARM CONTROL PANEL (FACP).
- F — FIRE ALARM MANUAL STATION, MOUNT 48"AFF.
- F — FIRE ALARM STROBE/HORN, MOUNT 7'-6"AFF.
- S — FIRE ALARM SYSTEM SMOKE DETECTOR.MOUNT AT THE UNDERSIDE OF CEILING OR ROOF DECK UON.
- C — CONTROL PANEL PROVIDED BY MECHANICAL CONTRACTOR WIRED BY ELECTRICAL CONTRACTOR.
- PUSH BUTTON STATION, UP-DOWN-STOP SUPPLIED BY DOOR MANUFACTURER. MOUNTED & WIRED BY ELECTRICAL CONTRACTOR.
- UH-1 — UNIT HEATER - PROVIDED BY THE MECHANICAL CONTRACTOR AND WIRED BY THE ELECTRICAL CONTRACTOR
- D — DUCT SMOKE DETECTOR

ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
C	CONDUIT
CB	CIRCUIT BREAKER
CKT	CIRCUIT
EC	EMPTY CONDUIT
EQUIP	EQUIPMENT
EXIST	EXISTING
GFI	GROUND FAULT INTERRUPTER
GFCI	GOVERNMENT FURNISHED CONTRACTOR INSTALLED
GFGI	GOVERNMENT FURNISHED GOVERNMENT INSTALLED
GND	GROUND
MLO	MAIN LUG ONLY
MT	MOUNT
MTG HT	MOUNTING HEIGHT
MCB	MAIN CIRCUIT BREAKER
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
PNL	PANEL
PNLBD	PANELBOARD
RECEPT	RECEPTACLE
REQ'D	REQUIRED
XFMR	TRANSFORMER
UON	UNLESS OTHERWISE NOTED
WP	WEATHER PROOF EQUIPMENT

LIGHTING FIXTURE SCHEDULE

TYPE LETTER	NAVFAC SKETCHES OR DETAILS	NUMBER & TYPE OF LAMPS	VOLTS	MOUNTING	NOTES
A	NL-8, TYPE B	2-F40CW/T12/RS	120	SUSPENDED W/1/2"C, 12"AFF	
B	NL-51 NL-54 TYPE E	PAR 36 2-25W SEALED BEAM	120	WALL 7'AFF	WITH REMOTE HEAD AS NOTED. MOUNT 10'-0" AFF
C	NL-61	RED-LIGHT EMMITTING DIODE	277	WALL 7'AFF	
D	TYPE A NL-25	1-70 HPS	120	WALL 10'AFF	WITH PHOTOCELL

REVISIONS

Baker Environmental, Inc.

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

ATLANTIC DIVISION — NORFOLK, VIRGINIA

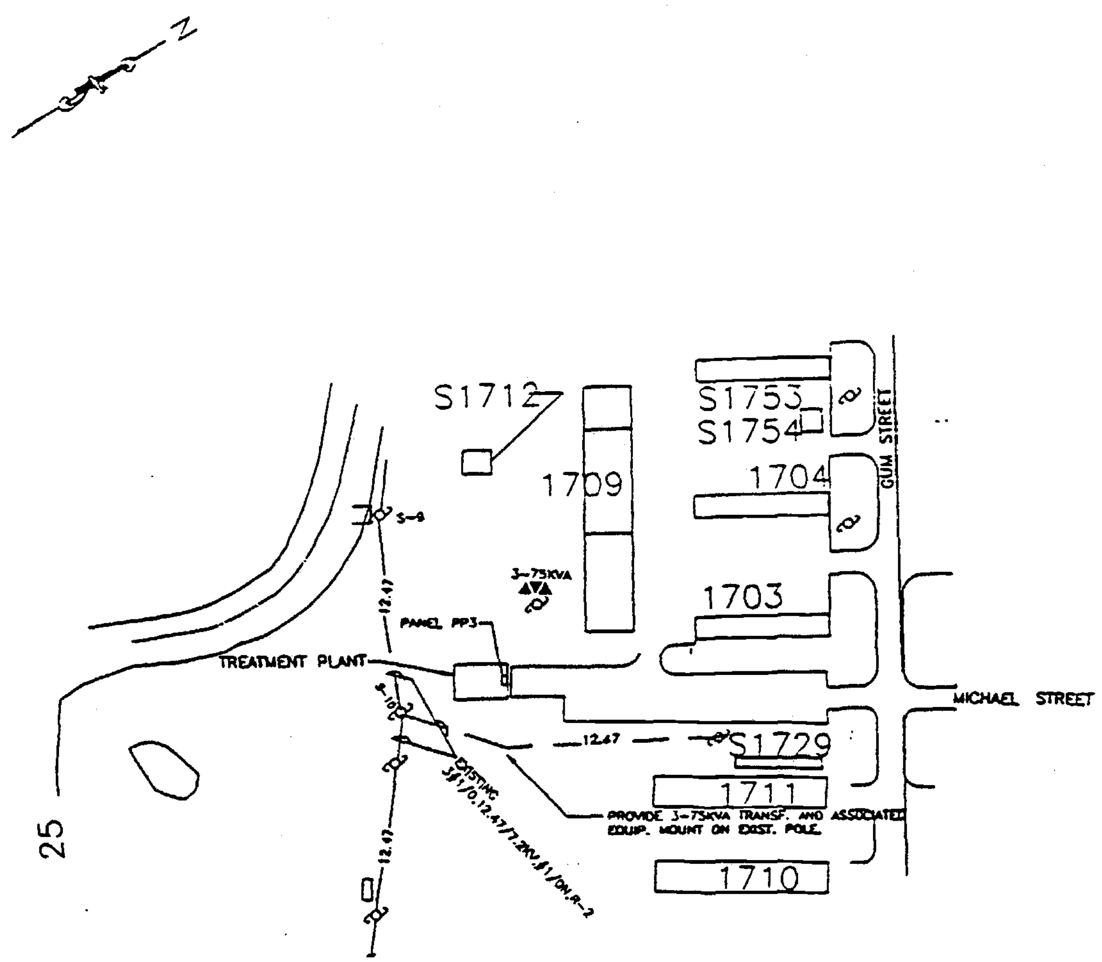
NAVAL STATION — HADNOT POINT INDUSTRIAL AREA — MARINE CORPS BASE CAMP LEJEUNE, NC

SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM

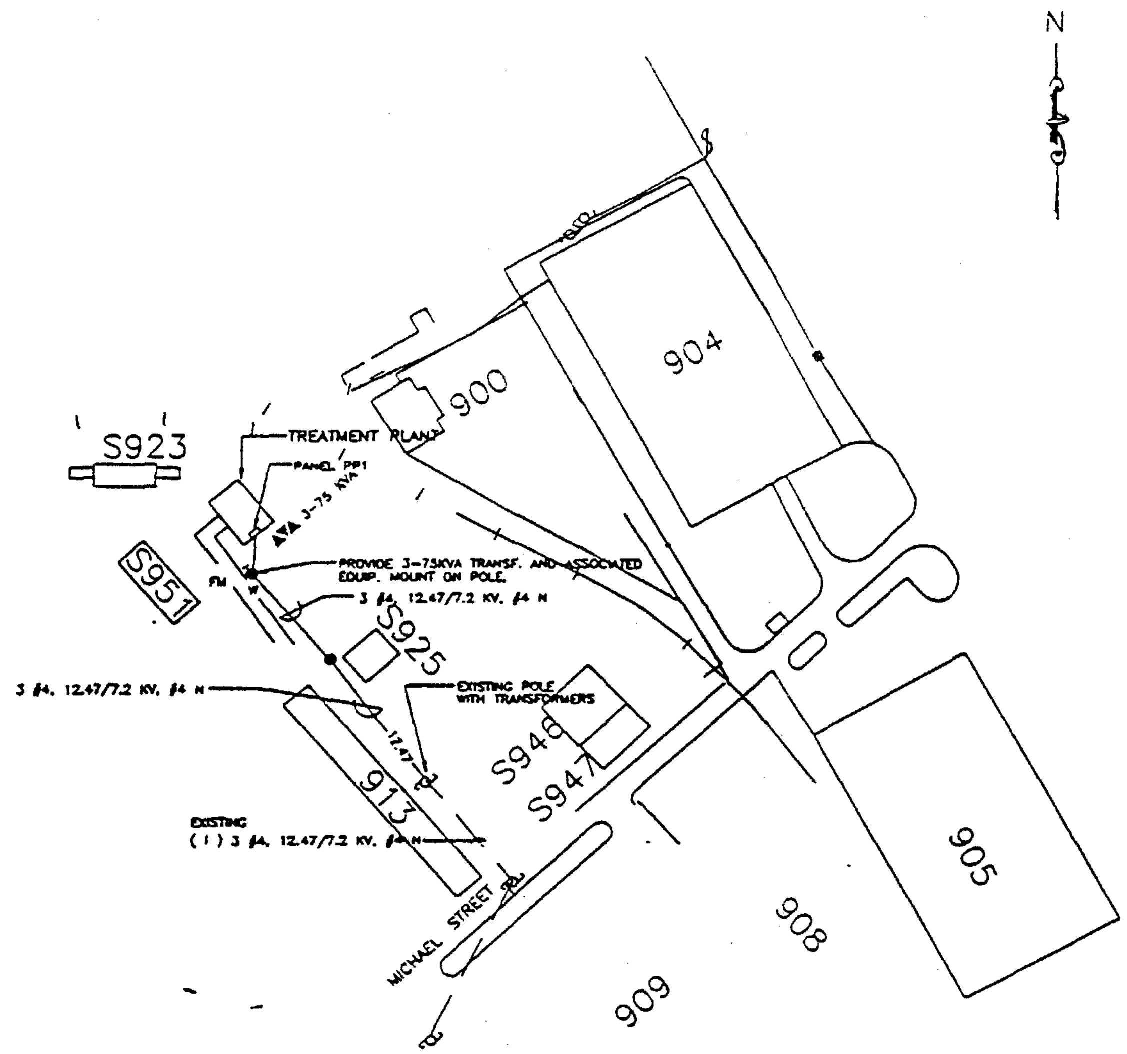
LEGEND AND LIGHTING FIXTURE SCHEDULE

CODE ID. NO. 80091	SIZE D
SCALE: NONE	
EFD NO. 368836	
STA. PROJ. NO.	
SPEC. NO. 05-92-2255	
CONSTR. CONTR. NO. N62470-92-B-2255	
NAVFAC DRAWING NO. 4268836	
SHEET 17	OF 25
E-1	

02357017Z



SOUTH REMEDIATION AREA



NORTH REMEDIATION AREA

NOTES:

1. PROVIDE TRANSFORMERS AND POLES (AS NOTED). PROVIDE ALL NECESSARY WIRING, CONDUITS, SWITCHES, FUSES, ETC. AND MAKE ALL CONNECTIONS ON SECONDARY & PRIMARY SIDE OF TRANSFORMERS FOR POWER INTO TREATMENT PLANT UNDER THE DIRECTION OF THE GOVERNMENT.

2. NOT ALL POLES HAVE LEGIBLE POLE NUMBERS. POLE NUMBERS SHOWN ARE ONLY ONE'S FOUND.

Symbol	Description
3Ø4 12.47/7.2 KV Ø4N.	QUANTITY, SIZE, VOLTAGE(KV—KILOVOLT)(N—NEUTRAL)
S-9	EXISTING OVERHEAD PRIMARY POLE LINE 3-PHASE, 4 WIRE; POLE IDENTIFICATION NUMBER
— — 12.47 — —	EXISTING 12.47 KV 3 PHASE 4 WIRE CIRCUIT (Ø1/0 ALUMINUM — SOUTH REMEDIATION AREA) (Ø4 ALUMINUM — NORTH REMEDIATION AREA)
—— 12.47 ——	12.47 KV 3 PHASE 4 WIRE CIRCUIT
▲▼▲	OVERHEAD DISTRIBUTION TRANSFORMERS 3-75 KVA — QUANTITY,CAPACITY(KVA)
●	NEW 40' POLE
⊢●	DOWN GUY & ANCHOR

1 inch = 100 ft.

REVISIONS

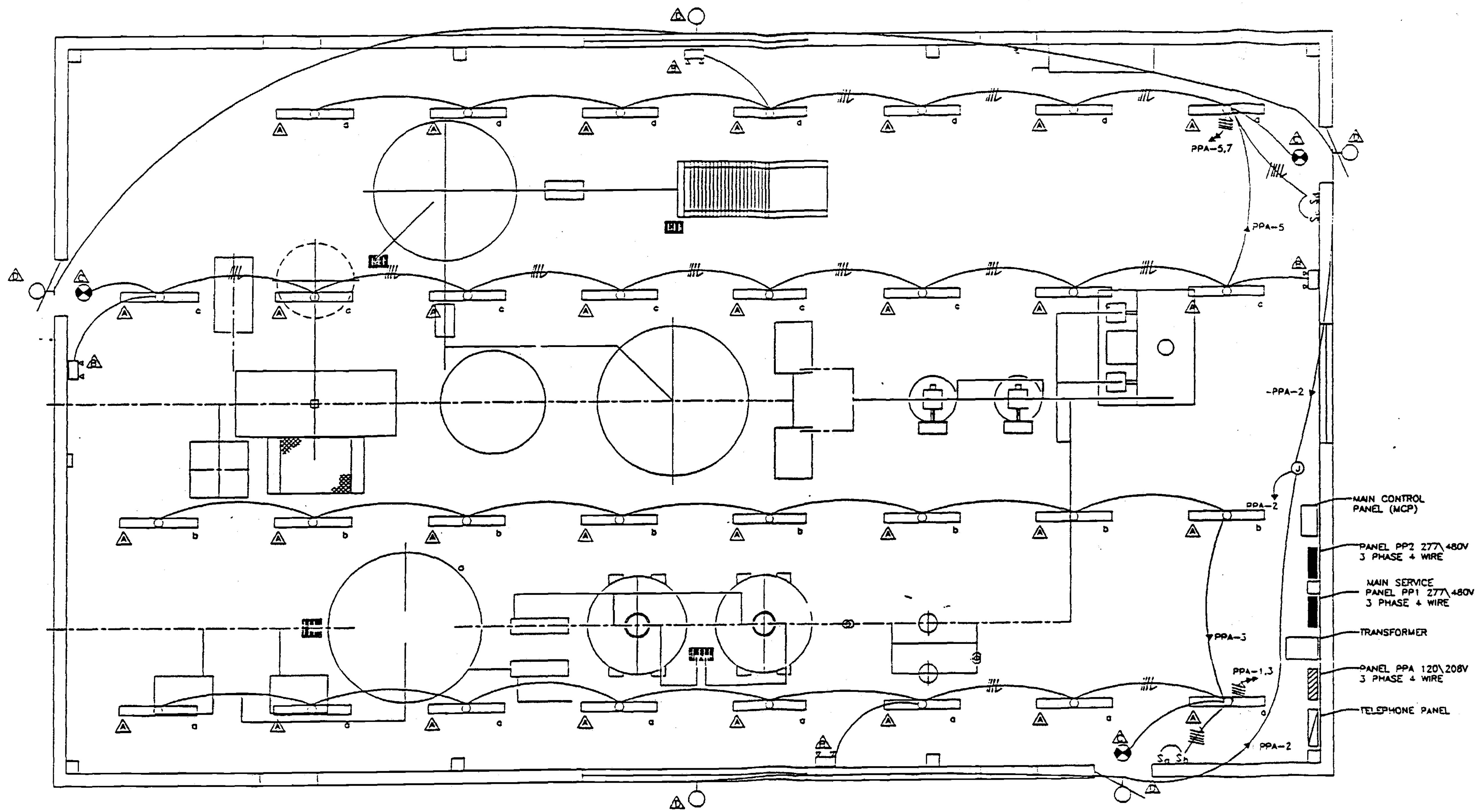
Baker Environmental, Inc. Coraopolis, Pennsylvania

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION NORFOLK, VIRGINIA
NAVAL STATION HADNOT POINT INDUSTRIAL AREA MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
SITE PLAN NORTH & SOUTH REMEDIATION AREAS

CODE ID. NO. 80091 SIZE D
SCALE: 1" = 100'
EFD NO. 388837
STA. PROJ. NO.
SPEC. NO. 05-92-2255
CONSTR. CONTR. NO. N62470-92-B-2255
NAVFAC DRAWING NO. 4268837
SHEET 18 OF 25

E-2

02357018Z



LIGHTING PLAN

SCALE: 3/8" = 1'-0"

REVISIONS

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

ATLANTIC DIVISION

NAVAL STATION — NORFOLK, VIRGINIA

HADNOT POINT INDUSTRIAL AREA — MARINE CORPS BASE CAMP LEJEUNE, NC

SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM

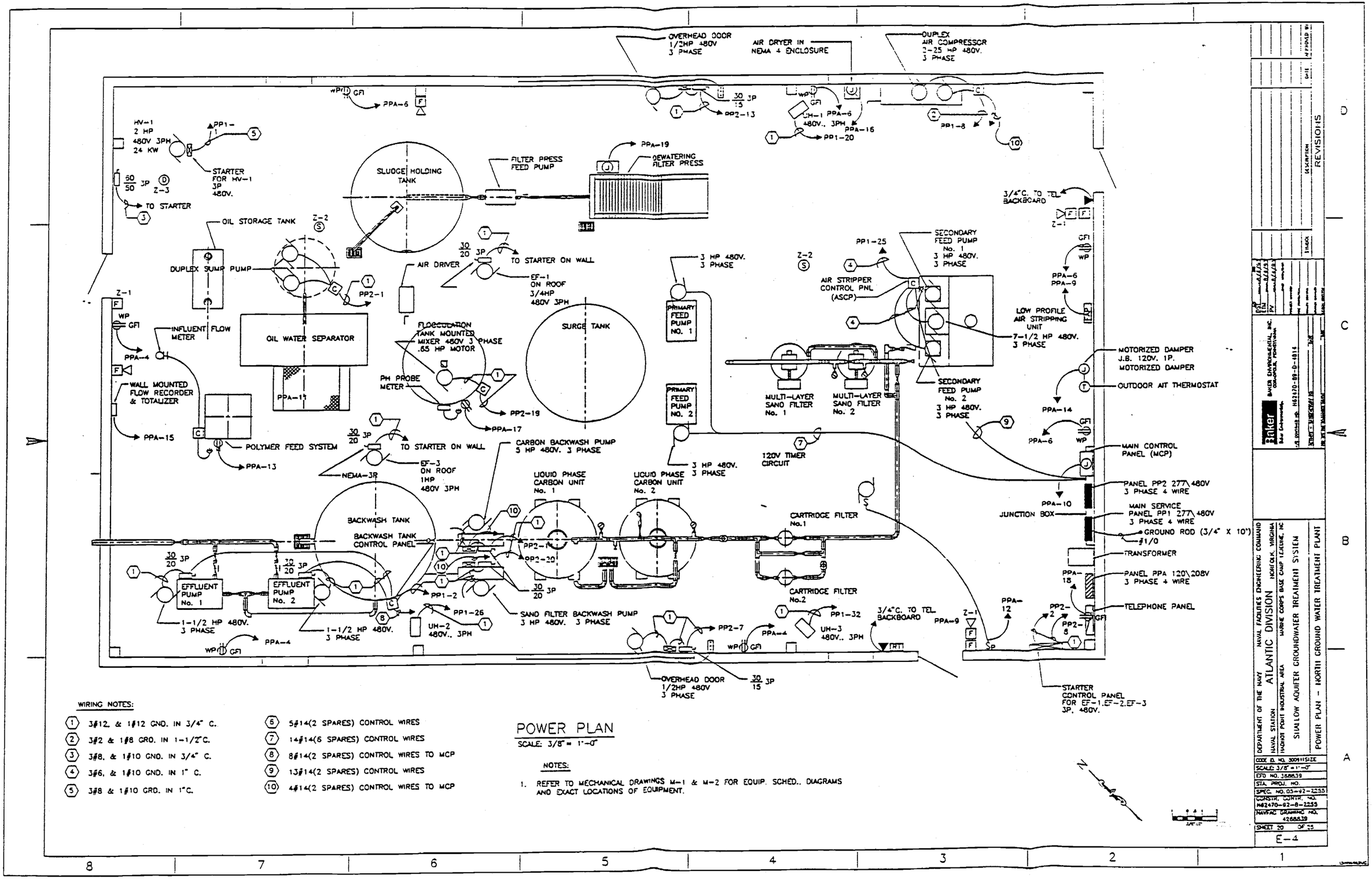
LIGHTING PLAN - NORTH GROUND WATER TREATMENT PLANT

Baker Environmental, Inc.

N62470-89-D-4814

CODE ID. NO. 80091	SIZE D
SCALE: 3/8" = 1'-0"	
EFD NO. 368838	
STA. PROJ. NO.	
SPEC. NO. 05-92-2255	
CONSTR. CONTR. NO. N62470-92-B-2255	
NAVFAC DRAWING NO. 4268838	
SHEET 19	OF 25
E-3	

023570192



WIRING NOTES:

1. 3#12, & 1#12 GND. IN 3/4" C.
2. 3#2 & 1#8 GRD. IN 1-1/2"C.
3. 3#8, & 1#10 GND. IN 3/4" C.
4. 3#6, & 1#10 GND. IN 1" C.
5. 3#8 & 1#10 GRD. IN 1"C.
6. 5#14(2 SPARES) CONTROL WIRES
7. 14#14(6 SPARES) CONTROL WIRES
8. 8#14(2 SPARES) CONTROL WIRES TO MCP
9. 13#14(2 SPARES) CONTROL WIRES
10. 4#14(2 SPARES) CONTROL WIRES TO MCP

POWER PLAN

SCALE: 3/8" = 1'-0"

NOTES:

1. REFER TO MECHANICAL DRAWINGS M-1 & M-2 FOR EQUIP. SCHED., DIAGRAMS AND EXACT LOCATIONS OF EQUIPMENT.

REVISIONS

NO.	DESCRIPTION	DATE

Baker — BAKER ENVIRONMENTAL, INC. CORAOPOLIS, PENNSYLVANIA

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND — ATLANTIC DIVISION — NORFOLK, VIRGINIA
NAVAL STATION — MARINE CORPS BASE CAMP LEJEUNE, NC — HADNOT POINT INDUSTRIAL AREA

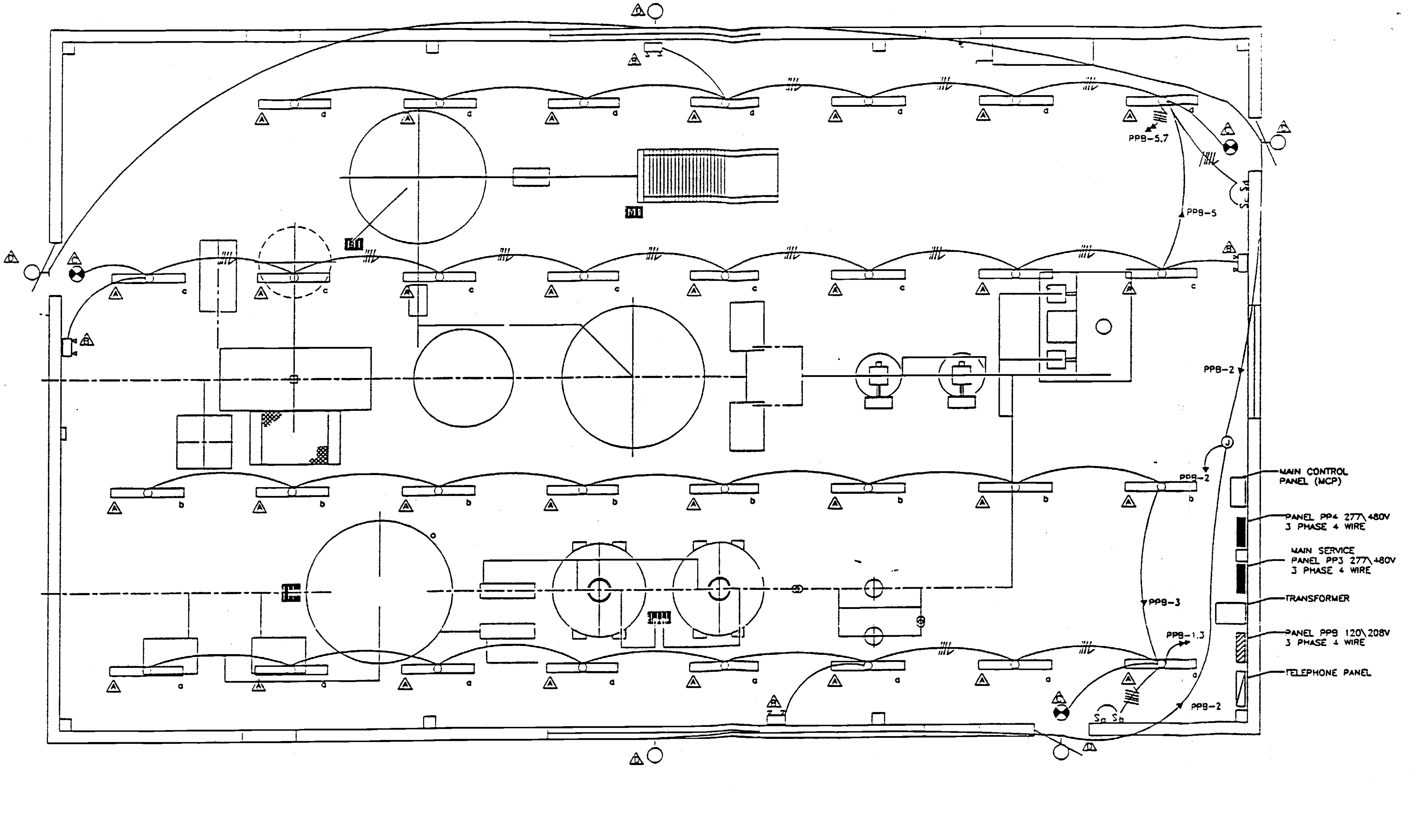
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM

POWER PLAN - NORTH GROUND WATER TREATMENT PLANT

CODE ID. NO. 30011	SIZE
SCALE: 3/8" = 1'-0"	
CTO NO. 388639	
STA. PROJ. NO.	
SPEC. NO. 05-92-2255	
CONSTR. CONTR. NO. N62470-92-B-2255	
NAVFAC DRAWING NO. 4268839	
SHEET 20 OF 25	

E-4

023570202

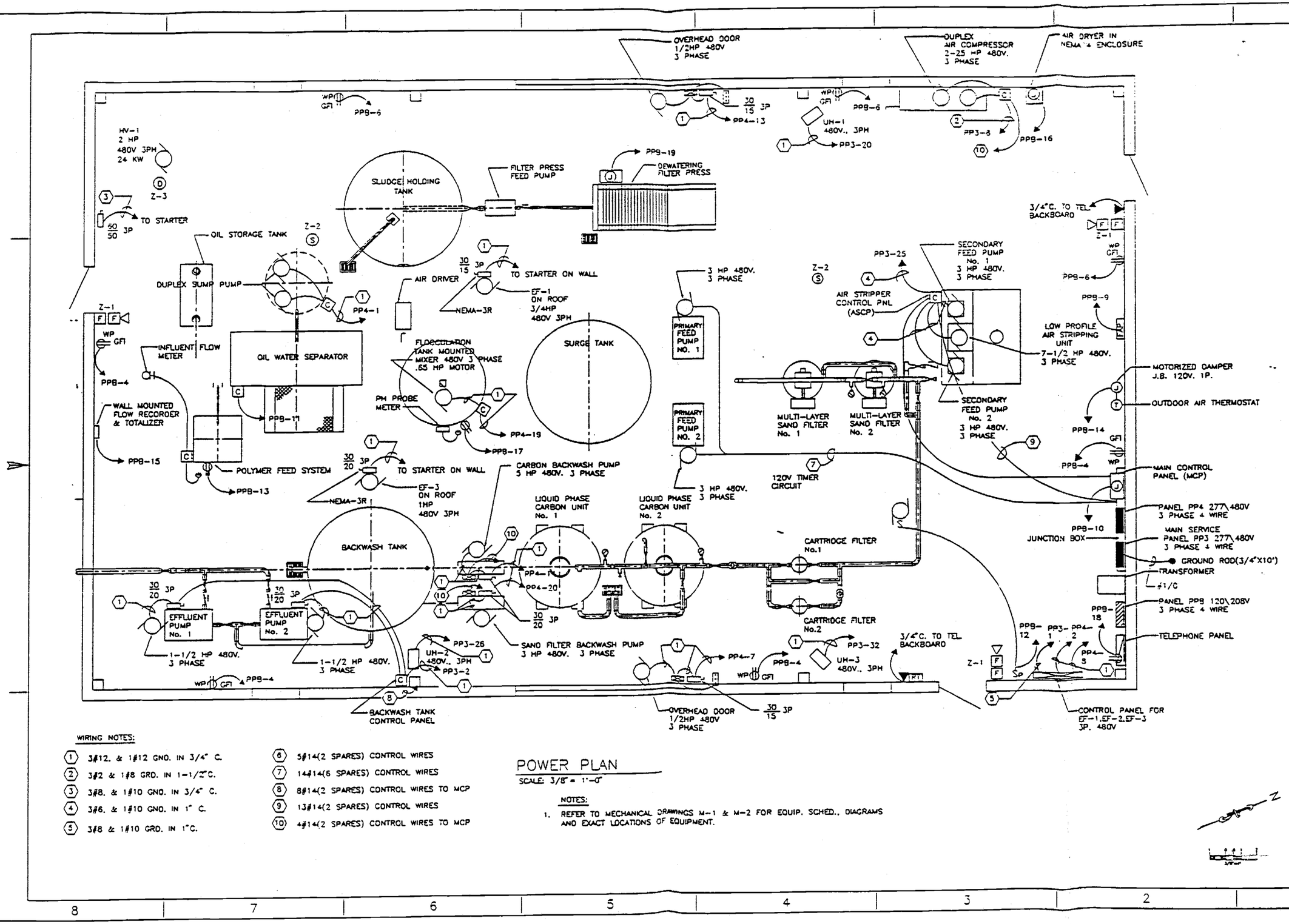


LIGHTING PLAN
SCALE: 3/8" = 1'-0"

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION — NORFOLK, VIRGINIA
NAVAL STATION
HADNOT POINT INDUSTRIAL AREA — MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
LIGHTING PLAN - SOUTH GROUND WATER TREATMENT PLANT

CODE ID. NO. 80091 SIZE D
SCALE: 3/8" = 1'-0"
EFD NO. 368840
STA. PROJ. NO.
SPEC. NO. 05-92-2255
CONSTR. CONTR. NO. N62470-92-B-2255
NAVFAC DRAWING NO. 4288840
SHEET 21 OF 25
E-5

0235702IZ



WIRING NOTES:

1. 3#12. & 1#12 GND. IN 3/4" C.
2. 3#2 & 1#8 GRD. IN 1-1/2"C.
3. 3#8. & 1#10 GND. IN 3/4" C.
4. 3#6. & 1#10 GND. IN 1" C.
5. 3#8 & 1#10 GRD. IN 1"C.
6. 5#14(2 SPARES) CONTROL WIRES
7. 14#14(6 SPARES) CONTROL WIRES
8. 8#14(2 SPARES) CONTROL WIRES TO MCP
9. 13#14(2 SPARES) CONTROL WIRES
10. 4#14(2 SPARES) CONTROL WIRES TO MCP

POWER PLAN

SCALE: 3/8" = 1'-0"

NOTES:

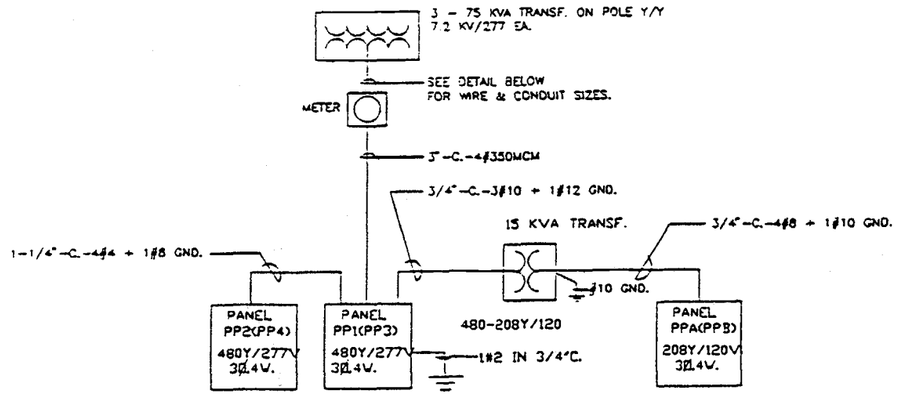
1. REFER TO MECHANICAL DRAWINGS M-1 & M-2 FOR EQUIP. SCHED., DIAGRAMS AND EXACT LOCATIONS OF EQUIPMENT.

REVISIONS

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
NAVAL STATION
MARINE CORPS BASE CAMP LEJEUNE, NC
HADNOT POINT INDUSTRIAL AREA
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
POWER PLAN - SOUTH GROUND WATER TREATMENT PLANT

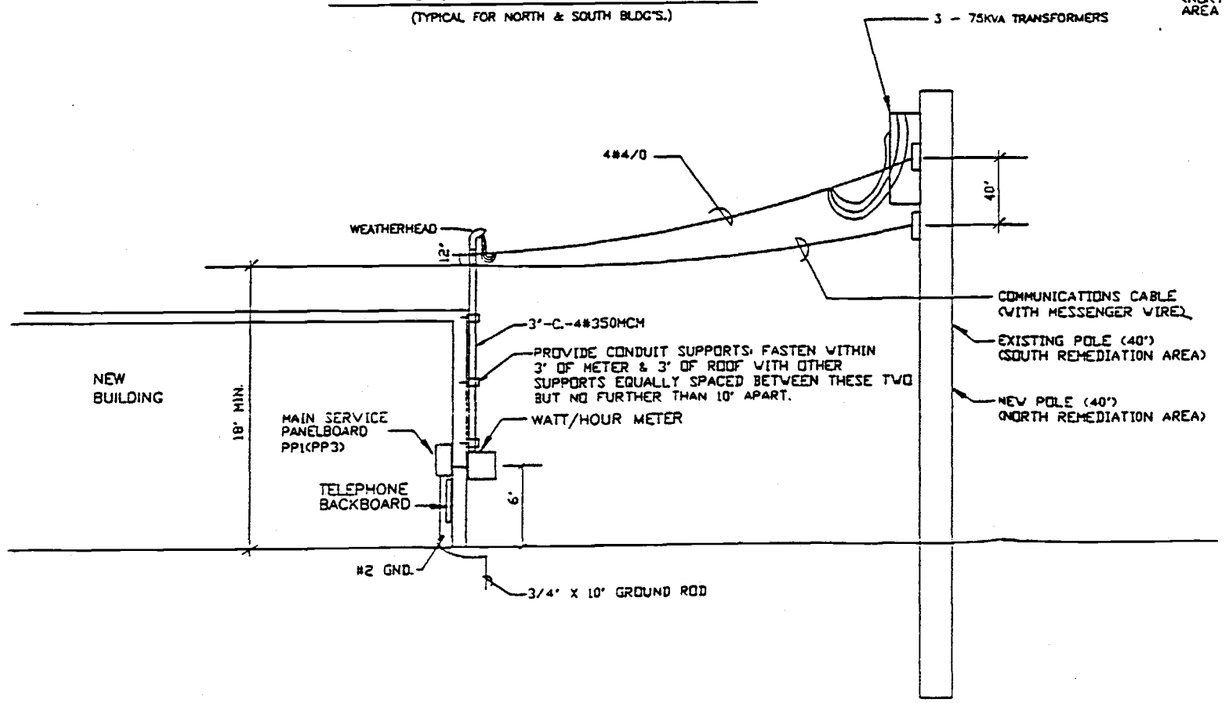
CODE ID. NO. 80091 SIZE D
SCALE: 3/8" = 1'-0"
EFD NO. 3688A1
STA. PROJ. NO.
SPEC. NO. 05-92-2253
CONSTR. CONTR. NO. N62470-92-B-2255
NAVFAC DRAWING NO. 4268841
SHEET 22 OF 25
E-3

023570222



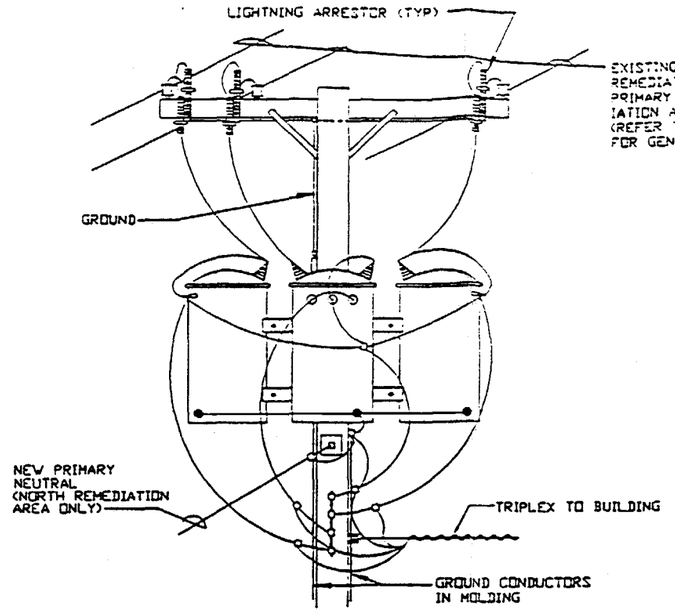
MAIN DISTRIBUTION SCHEMATIC

(TYPICAL FOR NORTH & SOUTH BLDG'S.)

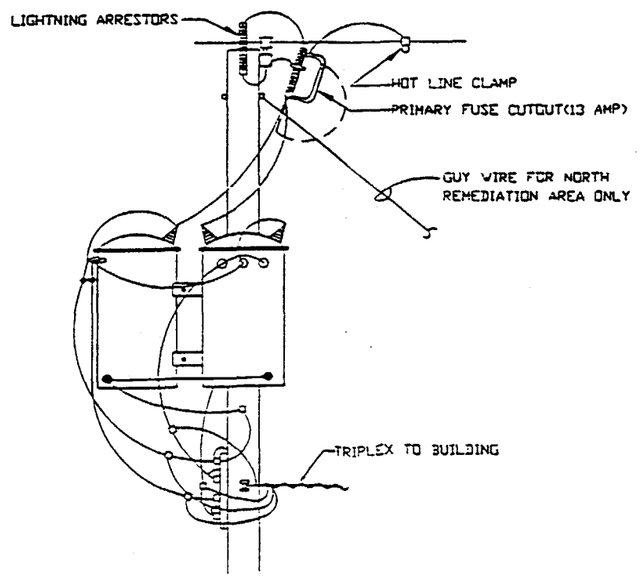


MAIN DISTRIBUTION PLAN

(TYPICAL FOR NORTH & SOUTH BLDG'S.)



ELEVATION



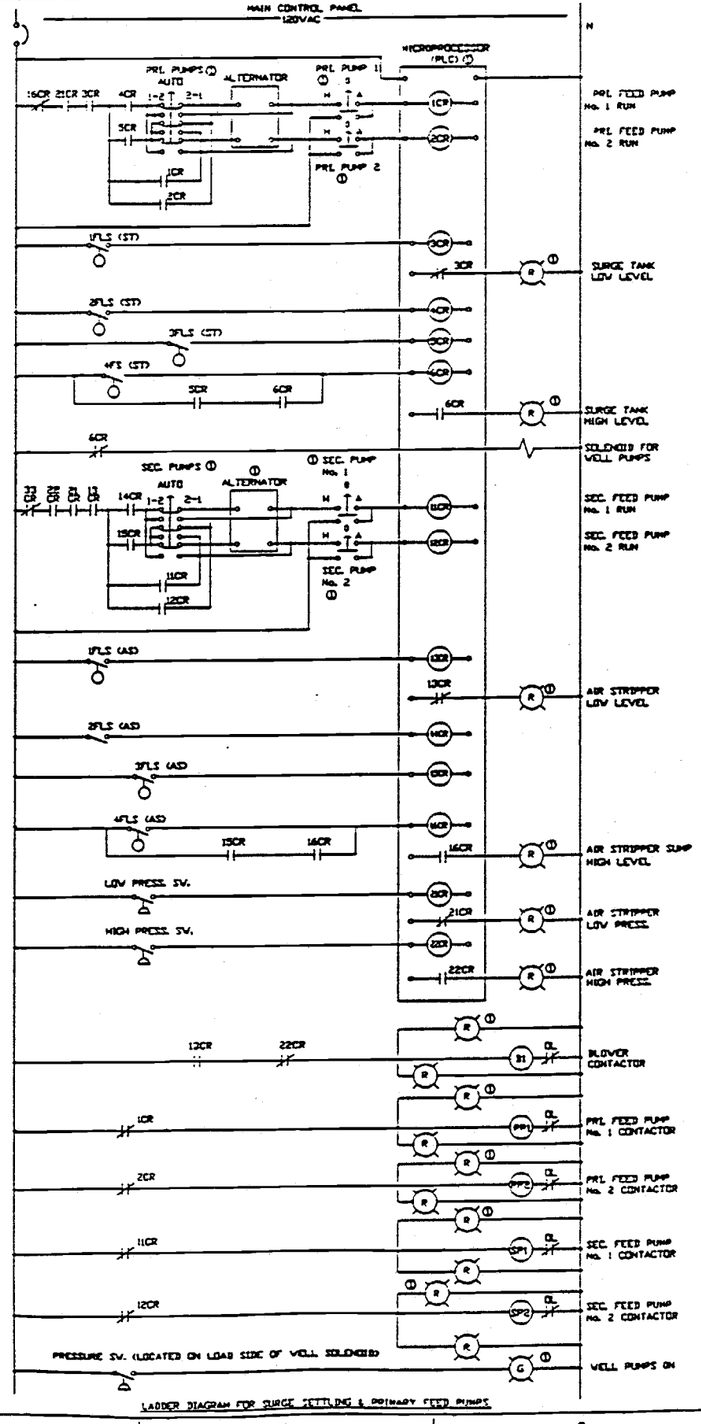
SIDE ELEVATION

REVISIONS

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION — ATLANTIC DIVISION — NORFOLK, VIRGINIA
HAMPTON ROADS INDUSTRIAL AREA — MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
ELECTRICAL MAIN DISTRIBUTION & DETAILS

CODE ID. NO. 80091 SIZE D
SCALE: NONE
CTO NO. 368942
STA. PROJ. NO.
SPEC. NO. 05-92-2253
CONSTR. CONTR. NO. N62470-92-B-2255
NAVFAC DRAWING NO. 426842
SHEET 23 OF 25
E-7

8 7 6 5 4 3 2 1



023570232

LADDER DIAGRAM FOR SURGE, SETTLING & PRIMARY FEED PUMPS

① LOCATE ON MAIN CONTROL PANEL (MCP)

TANK LEVEL SENSOR OPERATION
TYPICAL FOR SURGE TANK (ST),
AIR STRIPPER SUMP (AS), AND
BACKWASH TANK (BT)

REVISIONS
DESCRIPTION
SYMBOL
DATE
APPROVED BY

Baker
Baker Environmental
BAKER ENVIRONMENTAL, INC.
CORAOPOLIS, PENNSYLVANIA
N62470-89-D-4814
DST
EIN
PY

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
NAVAL STATION
MARINE CORPS BASE CAMP LEJEUNE, NC
HADNOT POINT INDUSTRIAL AREA
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
ELECTRICAL LADDER DIAGRAMS

CODE ID. NO. 80091 SIZE D
SCALE: NONE
EFD NO. 368843
STA. PROJ. NO.
SPEC. NO. 05-92-2255
CONSTR. CONTR. NO. N62470-92-B-2255
NAVFAC DRAWING NO. 4268843
SHEET 24 OF 25
E-8

8 7 6 5 4 3 2 1
D C B A

02357024Z

PANELBOARD PP1 & PP3

400A. BUS W/300A. M.B. 480/277V., 3 PHASE 4W. 25 KAIC MIN. SURFACE MOUNT.

LOAD SERVED	LOAD (AMPS) A	LOAD (AMPS) B	LOAD (AMPS) C	BKR TRIP	WIRE SIZE	CKT. NO.	CKT. NO.	WIRE SIZE	BKR. TRIP	LOAD (AMPS) A	LOAD (AMPS) B	LOAD (AMPS) C	LOAD SERVED
HV-1 24 KV & 2HP	33.2	33.2	33.2	50	#8	[illegible]	2	#12	20	5.9	5.9	5.9	BACKWASH TANK CONTROL PANEL 2-1-1/2HP
SPARE				20		7	8	#2	100	76.5	76.5	76.5	AIR COMPRESSOR 2-25 HP
PRIMARY FEED PUMP #1 3HP	4.8	4.8	4.8	20	#12	13	14		20				SPARE
PRIMARY FEED PUMP #2 3HP	4.8	4.8	4.8	20	#12	19	20	#12	20	4.0	4.0	4.0	ELECTRIC HEATER UH #1
AIR STRIPPER 1-7-1/2HP & 2-3HP	23.4	23.4	23.4	40	#6	25	26	#12	20	4.0	4.0	4.0	ELECTRIC HEATER UH #2
SPARE				20		31	32	#12	20	4.0	4.0	4.0	ELECTRIC HEATER UH #3
PANEL PP2 OR PP4	21.6	21.6	21.6	70	#4	37	38	#10	25	18.0	18.0	18.0	TRANSF. 15KVA PANEL PPA OR PPB
TOTAL	87.8	87.8	87.8							112.4	112.4	112.4	TOTAL

TOTAL CONNECTED AMPS A: 200.2 B: 200.2 C: 200.2

PANELBOARD PP2 & PP4

225A. MLO 480/277V. 3 PHASE 4 WIRE 25 KAIC MINIMUM. SURFACE MOUNT.

LOAD SERVED	LOAD (AMPS) A	LOAD (AMPS) B	LOAD (AMPS) C	BKR TRIP	WIRE SIZE	CKT. NO.	CKT. NO.	WIRE SIZE	BKR. TRIP	LOAD (AMPS) A	LOAD (AMPS) B	LOAD (AMPS) C	LOAD SERVED
SUMP PUMP 2-1/2HP	2.0	2.0	2.0	20	#12	1	2	#12	20	1.4	1.4	1.4	EXHAUST FAN EF-1 3/4HP
OVERHEAD DOOR #1 1/2HP	1.0	1.0	1.0	20	#12	7	8	#12	20	1.8	1.8	1.8	EXHAUST FAN EF-3 1HP
OVERHEAD DOOR #2 1/2HP	1.0	1.0	1.0	20	#12	13	14	#12	20	7.6	7.6	7.6	CARBON FILTER BACKWASH PUMP 5HP
FLOCCULATION TANK	2.0	2.0	2.0	20	#12	19	20	#12	20	4.8	4.8	4.8	SAND FILTER BACKWASH PUMP 3HP
SPARE				20		25	26		20				SPARE
SPARE				20		31	32		20				SPARE
SPACE						37	38						SPACE
TOTAL	6.0	6.0	6.0							15.6	15.6	15.6	TOTAL

TOTAL CONNECTED AMPS A: 21.6 B: 21.6 C: 21.6

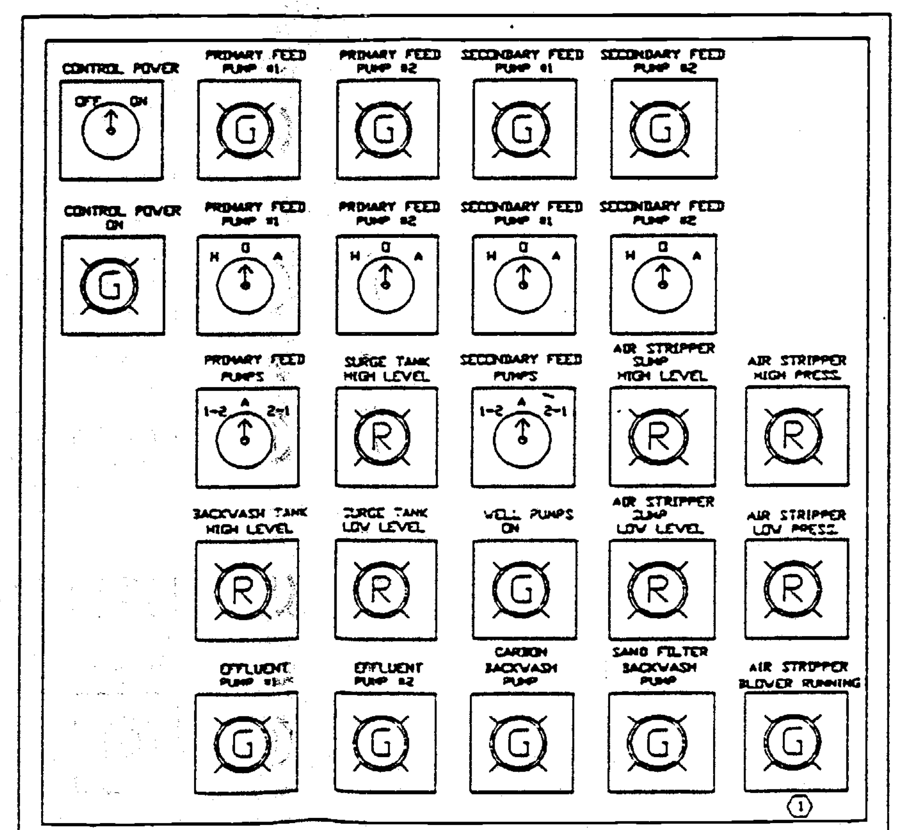
PANELBOARD PPA & PPB

100A BUS W/50A M.B. 208/120V. 3 PHASE 4 WIRE 10 KAIC MIN. SURFACE MOUNT.

LOAD SERVED	LOAD (AMPS) A	LOAD (AMPS) B	LOAD (AMPS) C	BKR TRIP	WIRE SIZE	CKT. No.	CKT. No.	WIRE SIZE	BKR. TRIP	LOAD (AMPS) A	LOAD (AMPS) B	LOAD (AMPS) C	LOAD SERVED
ROOM LTG.	8.3			20	#12	1	2	#12	20	2.5			EXTERIOR LTG.
ROOM LTG.		8.3		20	#12	3	4	#12	20		8.3		CONV. OUTLETS
ROOM LTG.			8.3	20	#12	5	6	#12	20			8.3	CONV. OUTLETS
ROOM LTG.	8.3			20	#12	7	8		20				SPARE
① FACP		.5		20	#12	9	10	#12	20		1.0		MCP
OIL SEP. CONT. PNL.			1.0	20	#12	11	12	#12	20			7.2	EF-2
POLYMER FEED SYS.	1.0			20	#12	13	14	#12	20	.5			MOTOR. DAMPER
FLOW RECORDER		1.0		20	#12	15	16	#12	20		7.2		AIR DRYER
PH FLOW METER			1.0	20	#12	17	18	#12	20			2.0	TEL. BD. C.S.
DEWATER FILTER	7.2			20	#12	19	20		20				SPARE
SPARE				20		21	22		20				SPARE
SPARE				20		23	24		20				SPARE
SPARE				20		25	26		20				SPARE
SPACE						27	28						SPACE
SPACE						29	30						SPACE
TOTAL	24.8	9.8	10.3							2.8	16.5	17.5	TOTAL

TOTAL CONNECTED AMPS A: 27.6 B: 26.3 C: 27.8

① PROVIDE RED LOCK-ON BREAKER



MAIN CONTROL PANEL (MCP)

FRONT VIEW

NOTE:
REFER TO SHEET E-8 FOR LADDER DIAGRAM

① SEE MECHANICAL DRAWING M-1 FOR WIRING

REVISIONS

SYMBOL | DESCRIPTION | DATE | APPROVED

BST 8/27/93
ETH 8/4/93
PV 8/4/93

Baker
Baker Environmental, Inc.
BAKER ENVIRONMENTAL, INC. CORAOPOLIS, PENNSYLVANIA
A/E CONTRACT NO. N62470-89-D-4814

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION NORFOLK, VIRGINIA
NAVAL STATION
HADNOT POINT INDUSTRIAL AREA MARINE CORPS BASE CAMP LEJEUNE, NC
SHALLOW AQUIFER GROUNDWATER TREATMENT SYSTEM
ELECTRICAL PANEL DIAGRAMS

CODE ID. NO. 80091 SIZE D
SCALE: NONE
EFD NO. 368844
STA. PROJ. NO.
SPEC. NO. 05-92-2255
CONSTR. CONTR. NO. N62470-92-B-2255
NAVFAC DRAWING NO. 4268844
SHEET 25 OF 25
E-9