

**WORK PLAN/DESIGN PLAN FOR
FREE-PRODUCT RECOVERY
AND REMOVAL SYSTEM
MOSS-AMERICAN SITE
MILWAUKEE, WISCONSIN**

Prepared for

KERR-McGEE CHEMICAL CORPORATION
Oklahoma City, Oklahoma

Prepared by

ROY F. WESTON, INC.
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April 1995

Work Order No. 02687-007-002



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3 April 1995

Mr. Russell Hart (HSRW-6J)
U.S. EPA, Region V
77 W. Jackson Blvd.
Chicago, IL 60604

Work Order No. 02687-007-002

Re: Work Plan/Design Plan for
Free-Product Recovery and Removal System
Moss-American Site, Milwaukee, Wisconsin

Dear Mr. Hart:

Roy F. Weston, Inc. (WESTON®) has prepared this transmittal on behalf of Kerr-McGee Chemical Corp. (KMCC). This transmittal includes a design and operating work plan for implementing free-product removal at the Moss-American site.

We appreciate U.S. EPA's timely review of these plans as we work together toward achieving construction and start-up of this system during 1995. We would be pleased to participate in a conference call or meeting to answer questions or provide clarification, as you conduct your review.

Very truly yours,

ROY F. WESTON, INC.

Gary J. Deigan
Principal Project Manager

Kurt S. Stimpson
Project Director

GJD:KSS/slr
Enclosure





Mr. Russell Hart
U.S. EPA

-2-

3 April 1995

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Ref. D.J. #90-11-2-590

Section Chief (3 copies)
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P.O. Box 7921
Madison, WI 53707-7921



Mr. Russell Hart
U.S. EPA

-3-

3 April 1995

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Southeast District Office
P.O. Box 12436
Milwaukee, WI 53212

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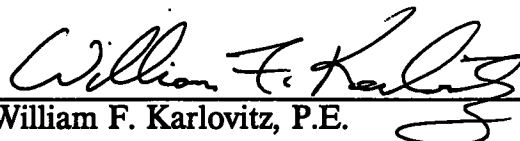
Prepared for

KERR-McGEE CORPORATION
Oklahoma City, Oklahoma 73125

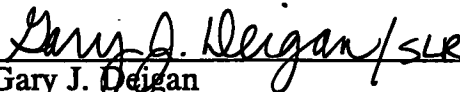
April 1995



Deepak Bhojwani
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Work Order No. 02687-007-002

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- A Additional Physical/Chemical Data on Free Product
- B Vendor Equipment Data Sheets

SECTION 1 INTRODUCTION

1.1 BACKGROUND

The United States Environmental Protection Agency (U.S. EPA), pursuant to Section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), placed the Moss-American site in Milwaukee, Wisconsin, on the National Priorities List in 1983. A Remedial Investigation/Feasibility Study (RI/FS) was conducted; the RI Report was issued on 9 January 1990 and the corresponding FS Report was issued on 24 May 1990.

A Consent Decree (CD) incorporating the Statement of Work (SOW) was signed by Kerr-McGee Chemical Corporation, Inc. (KMCC) in July of 1991. The CD, lodged by the U.S. Department of Justice in December 1991, directs KMCC to lead in the development and implementation of a remedial design and remedial action plan for the site. A predesign phase was included in the SOW to allow further evaluation of site conditions and completion of engineering evaluations before remedial design was initiated. The Predesign Phase work conducted by KMCC from April 1990 to the present is summarized in a Technical Memorandum titled *Technical Memorandum Predesign Tasks 2 (b), 3, 4, 5, 6, 7, and 19* (WESTON, November 1994). This Technical Memorandum summarizes the findings of several comprehensive predesign tasks completed during the 1994 field investigation conducted by KMCC.

One conclusion and recommendation of the November 1994 Technical Memorandum included the design, installation, and operation of a system to recover and remove free-product creosote residuals from site soils and groundwater in a localized area of the former wood-treating site. U.S. EPA concurred with this recommendation in a letter dated 8 December 1994.

This document presents the Work Plan for a free-product recovery and removal system at the Moss-American site.

1.2 FACILITY LOCATION

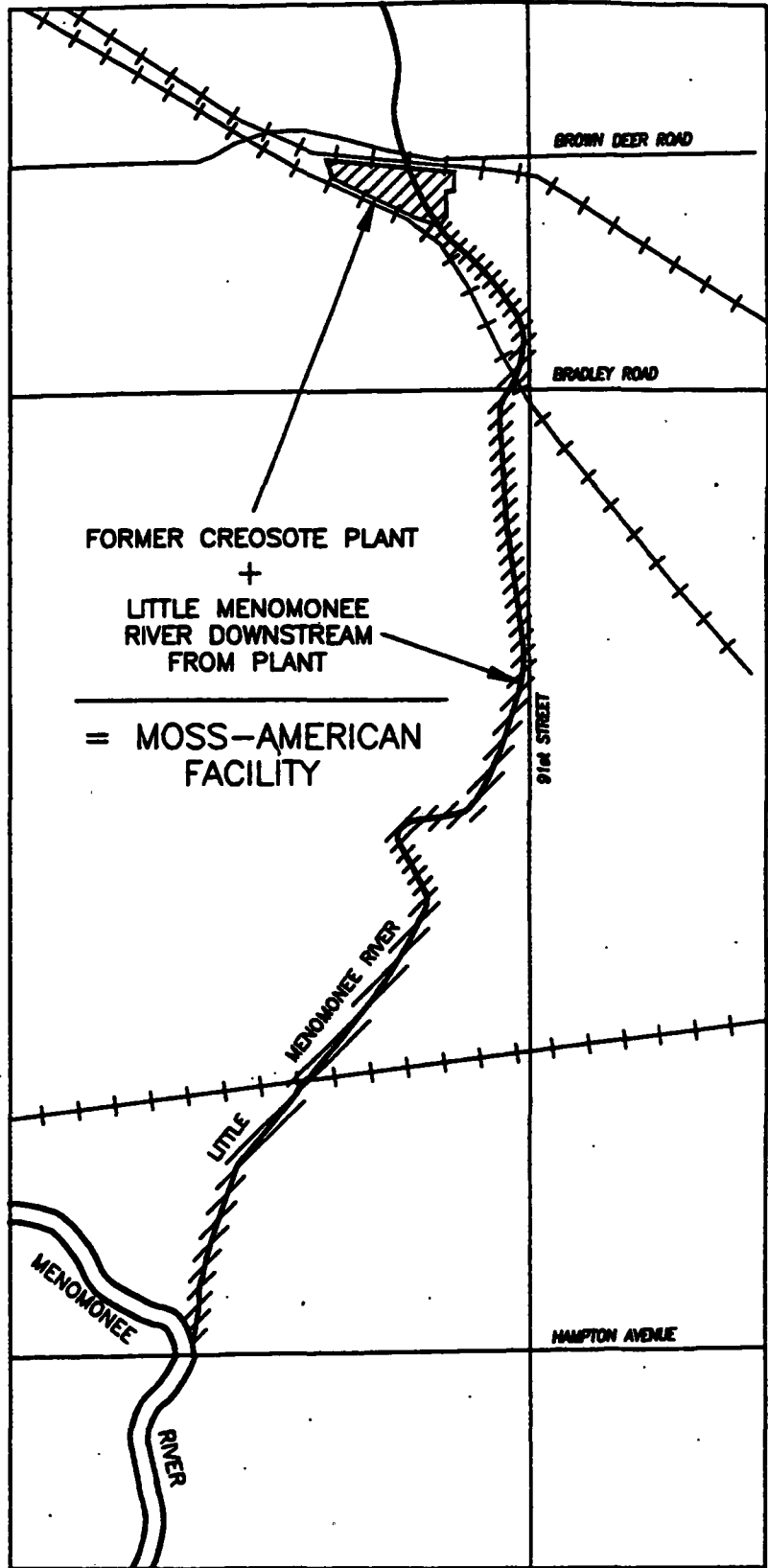
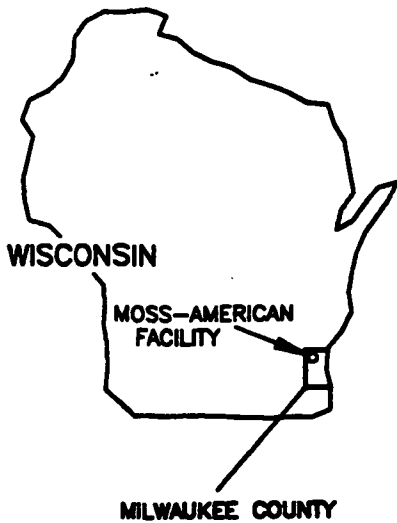
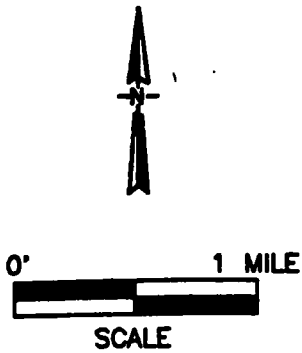
The Moss-American site is located in the northwestern section of the City of Milwaukee, County of Milwaukee, State of Wisconsin, at the southeast corner of the intersection of Brown Deer and Granville Roads, at 8716 North Granville Road. Milwaukee County owns approximately 51 acres of the former wood-preserving plant site: this parcel is currently undeveloped park land. The Chicago and Northwestern Transportation Company owns and operates 23 acres for industrial use as a loading and storage area for automobile transport. The Little Menomonee River flows through the eastern portion of the former wood-preserving plant site, and continues through the Milwaukee County Parkway to its confluence with the Menomonee River, approximately 5 miles south of the site.

The Moss-American site is located in a moderately populated suburban area of mixed light industrial, commercial, residential, and recreational uses. Population in the nearby area is an estimated 2,036 persons per square mile. Figure 1-1 presents a general site location map of the Facility.

1.3 WORK PLAN OBJECTIVES

This Work Plan for a free-product recovery and removal system at the Moss-American site has the following objectives:

- To further characterize the physical/chemical nature of the free product present on site.
- To design and specify a free-product recovery and removal system.
- To outline the construction aspects of the free-product extraction system in order for a site-specific system to be installed.



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FIGURE 1-1



Three Hawthorn Parkway
Vernon Hills, Illinois
60061

FACILITY LOCATION MAP
MOSS-AMERICAN SITE
Milwaukee, Wisconsin

- To define the operations and maintenance program.
- To present a schedule for the implementation of the system construction and operation

Sections 2, 3, and 4 of this document presents the design, construction, and operations and maintenance plan for a free-product recovery and removal system, respectively. Several engineering drawings are also enclosed in the back of the document to illustrate the design components and layout of the system. Section 5 outlines the anticipated Project Schedule.

SECTION 2

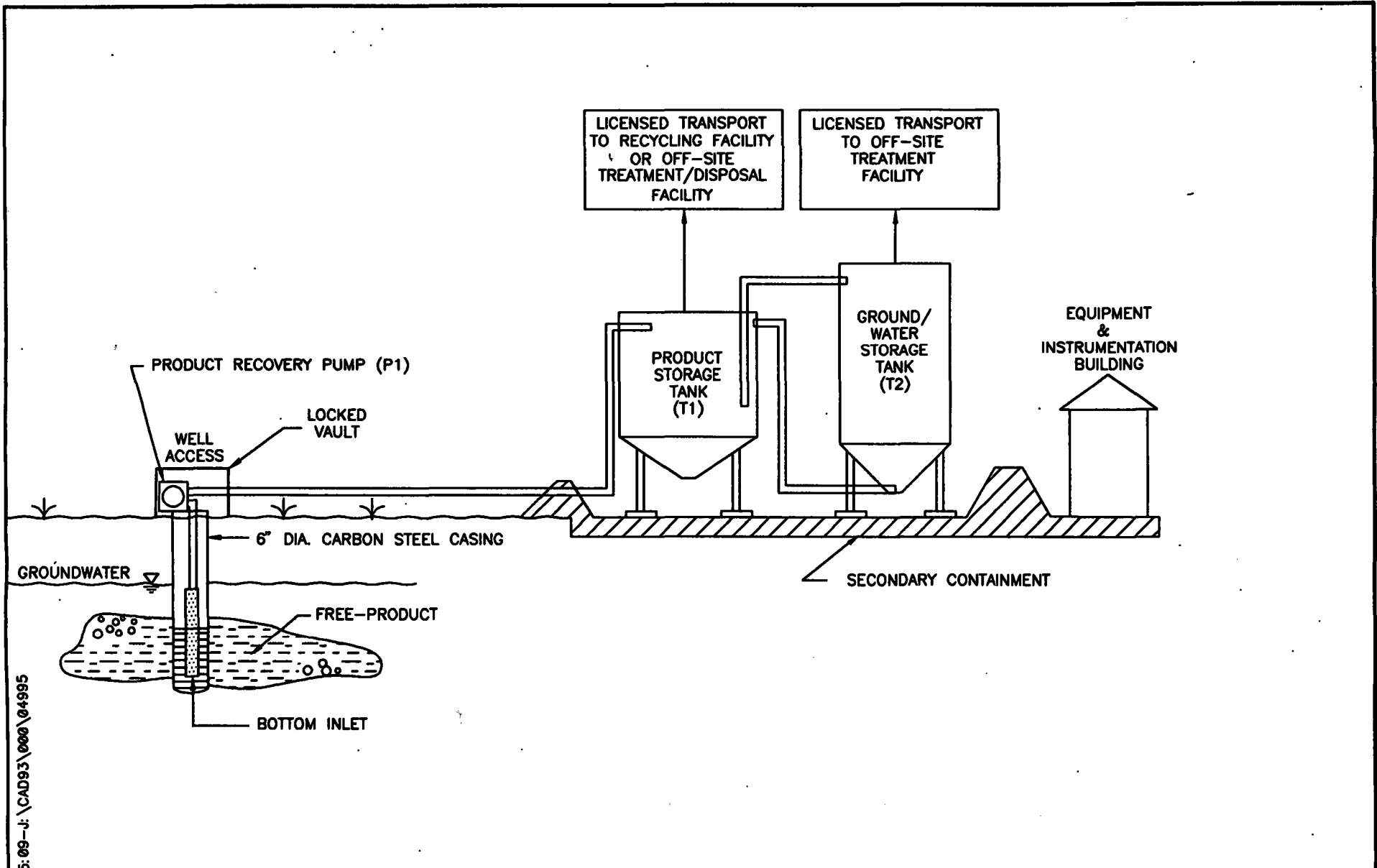
FREE-PRODUCT RECOVERY AND REMOVAL SYSTEM DESIGN

2.1 RECOVERY AREA/SUBSURFACE CONDITIONS

As noted in the Technical Memorandum (WESTON, November 1994), recoverable quantities of free product may be present in isolated locations at the site. Based on soil borings and pilot-scale mobility and free-product recovery testing accomplished during the summer and fall of 1994, free product is concentrated in the vicinity of wells TW-07 and MW-8S, in an area of approximately 1 acre. The free product is present at a depth of 6 to 12 feet below ground surface. Soil borings, geologic drill log descriptions, and results of the pilot-scale free-product mobility testing conducted in 1994 defined the extent of free product. The free product appears to be migrating very slowly toward downgradient, highly permeable units, and is present in gravel, sand, and silt layers below the groundwater table. The greatest concentration of free product in the subsurface is near Wells TW-07, TW-08, and TW-09, with varying amounts determined to be present near TW-06 and MW-8S. A separation has been observed between the dense nonaqueous phase liquid (DNAPL) creosote and the overlying water column in several of the free-product wells. The components of the free-product recovery and removal system will be installed at these locations of the former wood-treating site, as depicted on Drawing 1. Figure 2-1 provides a schematic diagram of the recovery and removal system components.

2.2 PHYSICAL/CHEMICAL PROPERTIES OF FREE PRODUCT

The free product on the Moss-American site is creosote, a complex chemical mixture of DNAPLs derived from the destructive distillation of coal. The oily DNAPL is generally translucent brown to black, and is characterized by specific gravities ranging from 1.03 to 1.20 and viscosities typically in the 10 to 70 centipoise (cp) range.



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FIGURE 2-1

WESTON
 MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
 Vernon Hills, Illinois
 60061

SCHEMATIC DIAGRAM
MOSS-AMERICAN SITE
FREE PRODUCT RECOVERY SYSTEM
 Milwaukee, Wisconsin

Creosote present at the Moss-American site consists of various coal tar distillates (primarily the 200 to 400°C fraction) that were previously blended to meet the American Wood-Preservers' Association (AWPA) product standards. The specific gravity of creosote products without petroleum oil ranges from 1.07 to 1.13. Any dilution with petroleum or fuel oil (i.e., fuel oil No. 6) typically reduces the specific gravity to approximately 1.01 to 1.05.

Creosote is a mixture containing more than 250 individual compounds: approximately 85% polycyclic aromatic hydrocarbons (PAHs), 10% phenolic compounds, and 5% heterocyclic compounds. Monocyclic aromatic hydrocarbons [such as benzene, toluene, ethylbenzene, and xylene (BTEX) constituents] are present as the light oil component in the free product at the Moss-American site, as shown in the chemical analyses conducted during the summer and fall of 1994 (WESTON, November 1994).

Appendix A presents physical/chemical analytical results from free-product sampling conducted at the Moss-American site. Noteworthy findings from this analysis include:

- The free-product sample has a BTU value of 17,400 BTU/lb.
- Dioxins are not present above detection limits.
- Lead and arsenic are not present above detection limits.

The viscosity of the free product at the Moss-American site has been considered in the design of equipment for the free-product recovery and removal system. Engineering components of the recovery system are discussed in the following subsection.

2.3 FREE-PRODUCT RECOVERY AND REMOVAL SYSTEM

The free-product recovery and removal system will consist of three major components:

- A recovery well network for recovering and collecting the free product.

- A piping system for conveying the free product to storage tanks.
- An equipment storage and instrumentation building.

The equipment and piping plan, and details of the recovery and removal system are shown in Drawings 2 and 3, respectively.

2.3.1 Recovery Wells and Pumps

The recovery and removal system will consist of six recovery wells and pumps. Six 6-inch diameter wells constructed of carbon steel casing and stainless steel screen will be installed. The borehole diameter of each well will be 12 inches to maximize the flow of free product into the well. The wells will be screened at the bottom with 5-foot-long screens. The size of the screen openings will be 0.040 inches (40-slot), with an intake area of 25.60 inches per foot of screen length. The large screen size is anticipated to maximize the potential for free-product movement into the well. The anticipated depth of installation of the recovery wells ranges between 13 and 16 feet below grade. The well screens will be surrounded with a filter pack consisting of pea gravel. The filter pack will extend to a minimum of 2 feet above the top of the well screen. The remaining annular space of the borehole will be sealed to prevent the potential downward migration of surface contaminants. The seal will consist of an additive-free bentonite slurry from the top of the filter pack to approximately 6 inches below the ground surface. A concrete cap will be installed from the top of the bentonite seal to the ground surface to anchor the well vault. The cap will slope away from the vault to divert precipitation.

Above-grade components of the recovery wells will be placed inside a 4- by 4- by 3-foot-high steel vault with locking covers. Each well vault will contain the following components:

- A seal to minimize the intrusion of water and foreign material into the well.
- A low volume peristaltic or pneumatic pump.
- One discharge piping connection.

- One conductivity probe connection.
- Connections for pump appurtenances.
- A lockable hinged access manway to permit access for maintenance.

Low-volume peristaltic or pneumatic pumps will be used to transfer free product from the recovery wells.

One pump will be installed in each recovery well; thus, a total of six pumps will be installed. Each pump would be capable of a maximum flow rate of 8 gallons per minute (gpm), although the pumps are expected to be set at a flow rate not exceeding 5 gpm to accommodate the high viscosity of the creosote. The pumps will be interfaced with a conductivity meter and sensor probe or pump cycle timer to actuate product-only pumping, with minimal groundwater removal.

2.3.2 Piping Systems

The piping connecting the recovery wells to the tank storage area will be generally installed as shown in Drawing 1. The piping will be placed on grade, as the system is currently designed to be inoperative during freezing temperatures. The piping system will consist of an inner 1-inch pipe and an outer 2-inch pipe, thereby providing secondary containment for the transfer system.

Piping from each pump will be manifolded into a single header. All joints will be fusion-welded.

2.3.3 Equipment Storage and Instrumentation Building

An equipment storage and instrumentation building will be installed to house miscellaneous equipment. The building will be constructed of 12-gauge ASTM-A569 steel to provide structural strength and security. The building will also be provided with ventilation and

lighting suitable for conducting operation and maintenance (O&M) activities in a safe and efficient manner. Drawing 2 shows the anticipated layout and location of the equipment storage and instrumentation building.

2.4 FREE-PRODUCT AND GROUNDWATER MANAGEMENT SYSTEM

2.4.1 Temporary Tank Storage

The temporary on-site free-product storage system will consist of two 10,000-gallon single-walled carbon steel tanks equipped with ladders and arranged within a secondary containment system. Each tank will have a 20-inch access manway with a removable cover for access. Tank materials will be in accordance with API 650 specifications. In addition, each tank will be painted with two coats of water-resistant black paint. The interior of each tank will be coated with two coats of primer.

Free product and limited groundwater from the extraction wells will be pumped to the primary 10,000-gallon tank (T1). As water separates from the product in Tank T1, it will be decanted to the second 10,000-gallon tank (T2), on a periodic basis. This oil/water separation will minimize the need for off-site treatment in rendering the free-product recyclable.

2.4.2 Transportation, Recycling or Treatment/Disposal

Recyclable free product from the product storage tank will be transported in tanker trucks to an active KMCC off-site wood-treating facility. Nonrecyclable free product and groundwater will be transported as a hazardous waste to a licensed off-site disposal facility that will be determined and contracted by KMCC prior to start-up of the system. Water from the water storage tank will also be transported in tanker trucks to a licensed off-site treatment facility. Based on the intended design and operation of the system, the quantity of water expected to be collected is minimal, as the recovery system will capture primarily

free product. Licensed waste haulers will be used to transport free product and extracted groundwater to off-site locations.

Commercial treatment facilities tentatively identified as licensed to accept the free product and/or groundwater include:

- Waste Research and Reclamation, Co. — Eau Claire, Wisconsin.
- Chemical Waste Management Inc. — Chicago, Illinois.
- Peoria Disposal Co. — Peoria, Illinois.
- EOG Environmental, Inc. — Milwaukee, Wisconsin.
- Clean Harbors Environmental Services, Inc. — Chicago, Illinois.
- Rhône-Poulenc, Inc. — Hammond, Indiana.

The KMCC Forest Products Division's active wood-treating facility in Indianapolis, Indiana will receive recyclable free product from the Moss-American site.

SECTION 3

CONSTRUCTION OF FREE-PRODUCT RECOVERY AND REMOVAL SYSTEM

This section outlines the approach to constructing the free-product recovery and removal system, including the health and safety requirements that will be addressed during construction, decontamination procedures, and the contaminated materials management plan.

3.1 CONSTRUCTION APPROACH

3.1.1 Health and Safety

A Site Health and Safety Plan (HASP) will define the requirements and designate protocols to be followed by all site personnel during construction and operation of the free-product recovery system at the Moss-American site. All work will be conducted in accordance with OSHA 1910.120 and applicable OSHA construction standards. Specifically, the HASP will serve as a guideline during the following free-product recovery and removal system construction activities:

- Conducting site reconnaissance for the purpose of planning construction tasks.
- Obtaining product level measurements in existing temporary wells.
- Construction of the free-product recovery and removal system, including drilling activities for extraction wells; well construction activities; constructing piping, tanks, and appurtenances for the system; and other construction activities associated with the installation and operation of the system.
- Operation and maintenance of the system.

The existing site HASP will be amended to serve as a guideline for conducting the construction activities and will remain applicable to all government employees, contractors, subcontractors, and visitors to the site during the work period. All operations and equipment at the Moss-American site will comply with 29 CFR 1910.120 and other

applicable portions of 29 CFR 1910 and 29 CFR 1926. Specific topics to be addressed in the HASP Addendum include the key personnel and Site Health and Safety Coordinator (SHSC) during the work, task/operation safety and health risk analysis, personnel training requirements, personal protective equipment to be used, medical surveillance requirements, frequency and types of air monitoring, site control measures, decontamination plan, emergency response/contingency plan, and community health and safety.

3.1.2 Decontamination

The HASP will specify decontamination procedures for personnel and equipment that come in contact with areas of potential contamination. The SHSC will be responsible for implementing these procedures and communicating them to site personnel prior to the start of work.

3.1.3 Contaminated Materials Management

The amount of wastes generated during drilling and free-product system construction activities is expected to be minimal. Used safety/protective clothing will be placed in 55-gallon drums in a segregated manner and managed with other RI and predesign-derived wastes. All decontamination washes, rinses, drippings; washdown water; and well development water will be managed within the fenced boundary of the former wood-preserving plant property. Drill cuttings and soils will be containerized and staged with other investigative wastes on site.

A number of waste streams will be generated during the construction activities, including the following:

- Wash and rinsate water from the decontamination of the equipment.
- Soil residue from the decontamination of the equipment.
- Personal protective equipment (coveralls, gloves, booties, etc.)

The following general procedures will be followed:

- All decontamination activities will take place in area(s) where containment is provided (i.e., liner system, container, vessel, sump).
- Any contaminated or potentially contaminated solids and liquids will be transferred from the containment system and staged in Department of Transportation (DOT)-approved (17H) containers at the Moss-American site in a secured area within the boundaries of the site fence. The containers shall be inspected periodically for leaks.
- The wastes will be managed (disposed on site as part of the final facility remedy) or they will be disposed at an appropriate off-site treatment/disposal facility. This management decision will be made following the evaluation of pertinent analytical data.

SECTION 4

PRELIMINARY OPERATION AND MAINTENANCE PLAN

This section outlines the operation and maintenance (O&M) procedures for the free-product recovery and removal system. The system has been designed with a number of features that simplify the O&M requirements and thus minimize the potential for operator error. This section presents general operational guidelines to create reviewer understanding, but does not define procedures for O&M of specific vendor/manufacturer's equipment and instrumentation. The free-product recovery system will be operated by KMCC or one of its contractors.

4.1 SYSTEM START-UP AND SHAKEDOWN

A period of system start-up, debugging, and shakedown will follow after construction is completed. During this period, equipment vendor and manufacturer representatives will provide operator training and instruction. The system will be tuned and adjusted at this time, as necessary, to accommodate post-construction conditions.

Both automated and manually operated components of the system will be tested thoroughly and checked for proper operation. Inspection and maintenance logs that correspond specifically to the installed equipment will be developed.

4.2 INSPECTION, MONITORING, AND MAINTENANCE

4.2.1 Inspection Program

An inspection program for tanks, piping, secondary containment, and security systems will be implemented by KMCC. The inspection program will meet the substantive and applicable requirements of 40 CFR Part 265.

4.2.2 Monitoring and Maintenance

System monitoring and maintenance will be performed by a KMCC representative or contractor employee. Maintenance activities will be performed to ensure the system continues to operate in accordance with its intended design plans.

Monitoring (via sampling and analysis) is not anticipated to be required, as the system has been designed to have zero discharges to the environment. Periodic sampling and analysis of recovered free product and groundwater will be conducted to maintain compliance with the receiving facility's waste analysis plan and to determine variations in product physical/chemical characteristics.

4.3 OPERATING PLAN

4.3.1 Process Overview

The free-product recovery and removal system will consist of a series of six wells, each outfitted with an extraction pump, product sensor, and transfer piping. The pumps will be operated to sense the presence of free product in the well and be activated to remove only free product. Minimal quantities of groundwater may also be removed. Free product and small quantities of groundwater will be transferred by a double-walled piping system to a tank storage system. A dual-tank storage system will be utilized to separately store groundwater and free product. The tank storage systems have been designed and will be operated to meet the performance standards of 40 CFR Part 265.

When a full tanker truck load (3,000 to 5,000 gallons) of free product or groundwater accumulates in the tank system, a licensed commercial transporter will transfer the load to a tanker truck for over-the-road transport. The loads will be documented appropriately via manifest (for waste) or a bill of lading (recyclable material). The transporter will transfer the recovered product and groundwater to a KMCC-designated location: a properly licensed

treatment, storage, disposal facility for nonrecyclable (waste) materials, or an active wood-treating facility operated by KMCC for recyclable (free product) materials.

4.3.2 Operating Period

As presently designed and specified, the free-product recovery and removal system is proposed to be operated only during periods of nonfreezing weather. The system will be shut down and purged from November through May.

KMCC does not propose that the system be winterized due to the excessive O&M costs associated with insulating and heating the transfer and storage components, and the loss of efficiency in recovering and handling a highly viscous material during cold temperatures.

4.4 DOCUMENTATION AND REPORTING

The O&M of the free-product recovery and removal system will be documented to establish a facility record.

The facility record will include:

- Inspection and maintenance logs and records.
- Transport bills of lading and waste manifests.
- Sampling and analytical data.
- Recovered material quantities and flow rate information.

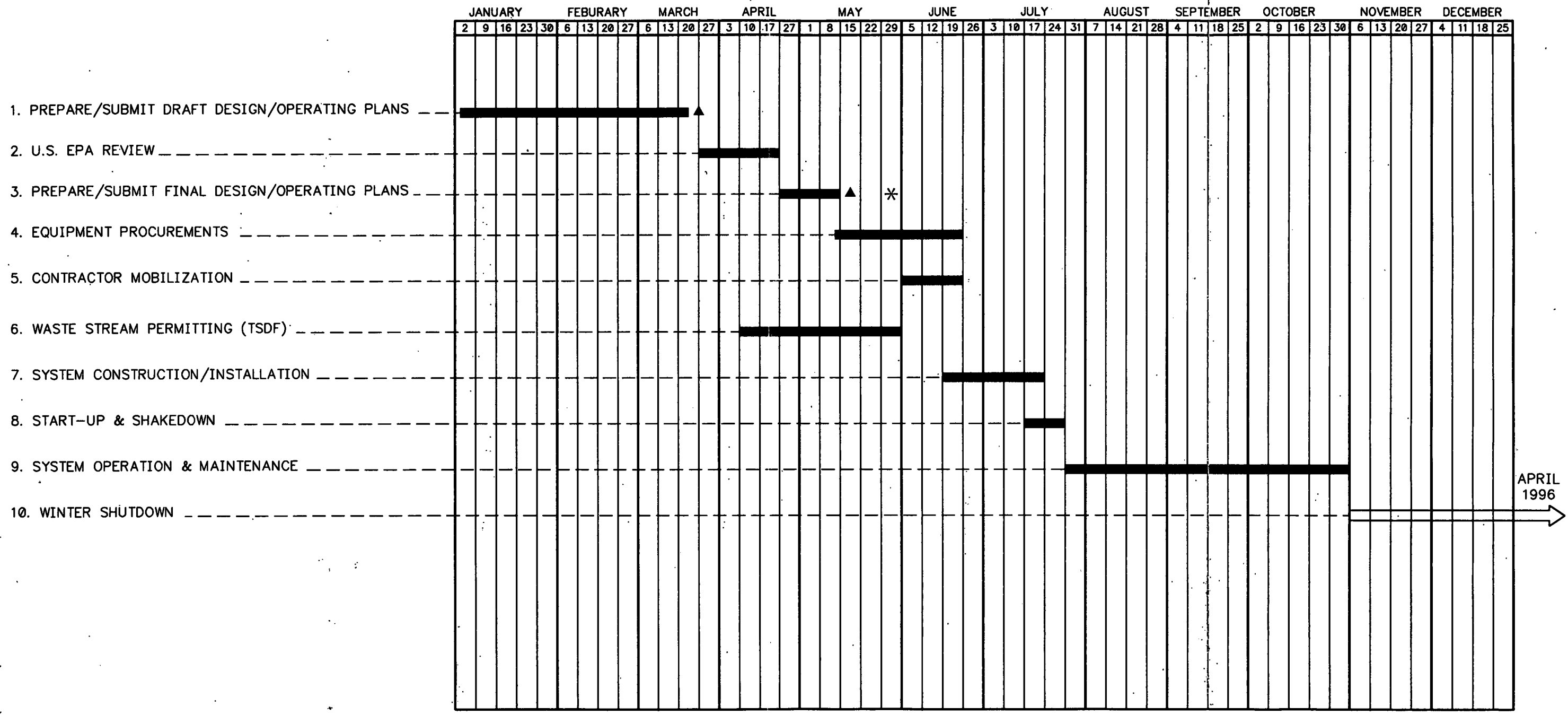
The facility record will be maintained at the KMCC offices and at KMCC's O&M contractor's location.

SECTION 5

PROJECT SCHEDULE

Figure 5-1 presents the anticipated project schedule for completing the planning, procurements, installation, and start-up of the free-product recovery and removal system. The schedule is subject to revision for unanticipated delays caused by site access restrictions, U.S. EPA/WDNR review, disposal facility permitting, and vendor's order fulfillments.

1995



▲ SUBMITTAL TO U.S. EPA
 * U.S. EPA APPROVAL

APRIL 1996

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FIGURE 5-1

WESTON
 MANAGERS DESIGNERS/CONSULTANTS
 Three Hawthorn Parkway
 Vernon Hills, Illinois
 60061

ANTICIPATED PROJECT SCHEDULE
 FREE PRODUCT RECOVERY SYSTEM
 MOSS - AMERICAN SITE
 Milwaukee, Wisconsin

REFERENCES

WESTON. 1994. Technical Memorandum: Predesign Tasks 2(b), 3, 4, 5, 6, 7, and 19 (1994 Predesign Work), Moss-American Site, Kerr-McGee Chemical Corporation, Milwaukee, Wisconsin.

WESTON. 1991. Final Interim Site Health and Safety Plan, Moss-American Site, Kerr-McGee Chemical Corporation, Milwaukee, Wisconsin.

WESTON. 1993. Predesign Phase Quality Assurance Project Plan, Moss-American Site, Kerr-McGee Chemical Corporation, Milwaukee, Wisconsin.

APPENDIX A

**ADDITIONAL PHYSICAL/CHEMICAL DATA ON FREE PRODUCT
MOSS-AMERICAN SITE
MILWAUKEE, WISCONSIN**

LANCASTER LABORATORIES, INC.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
Phone (717) 656-2300
FAX (717) 656-2681

Interim Analytical Reports
To
Mr. Rich Schultz
Weston//Kerr-McGee Corporation

From
F. Bradley Ayars

The number of pages including the cover sheet are 2

MESSAGE:

The KF Moisture will not be available until Monday 02/27/95 around 2:00pm.
Please give me a call if you have any questions. (717) 656-2300, Ext. 1331.

All analytical results should be considered preliminary and are
subject to further review until the final report is issued.

**** Lancaster Laboratories, Inc. Analytical Report ****
2425 New Holland Pike, Lancaster, PA 17601Sample Number: G4 2266855 Account: 07802 Kerr-McGee Corporation
Date Submitted: 02/22/95 Date Reported: NOT REP
Date Collected: 07/05/94TW-07 PRODUCT Sample
Moss American Site
Previous LLI# 2247352

	ANALYSIS NAME	RESULT	LIMIT OF QUANTITATION	UNITS
0518	BTU/lb	17,400.	500.	BTU/lb

LANCASTER LABORATORIES, INC.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
Phone (717) 656-2300
FAX (717) 656-2681

Interim Analytical Reports
To
Rich Schultz at Weston
Kerr-McGee Corporation

From
F. Bradley Ayars

The number of pages including the cover sheet are 2

MESSAGE:

All analytical results should be considered preliminary and are subject to further review until the final report is issued.

**** Lancaster Laboratories, Inc. Analytical Report ****
2425 New Holland Pike, Lancaster, PA 17601

Sample Number: G4 2256855 Account: 07802 Kerr-McGee Corporation
Date Submitted: 02/22/95 Date Reported: NOT REP
Date Collected: 07/05/94

TW-07 PRODUCT Sample
Moss American Site
Previous LLI# 2247352

ANALYSIS NAME	RESULT	LIMIT OF QUANTITATION	UNITS
4529 Moisture (Karl Fischer)	0.19	0.04	% by wt.



LLI Sample No. G5 2247352
Collected: 7/ 5/94 at 10:00 by RS

Submitted: 1/12/95 Reported: 1/30/95
Discard: 3/ 2/95

TW-07PRODUCT Sample
Moss American Site

Account No: 07802
Kerr-McGee Corporation
Technology & Engineering Div.
PO Box 25861
Oklahoma City OK 73125-0861

P.O. MOSS AMERICAN
Rel.

TW-07 SDG#: MOS24-01*

AS RECEIVED

CAT NO.	ANALYSIS NAME	RESULTS	LIMIT OF QUANTITATION	UNITS
3982	BTEX by GC/MS (SWB46/8240A)			See Page 2
0155	Lead	N.D.	10.	mg/kg
1145	Arsenic (furnace method)	0.47	2.0	mg/kg
1196	Dioxin Screen of Soils	N.D.	5,000.	ug/kg

This is a semi-quantitative screening procedure for 2,3,7,8-TCDD as outlined in EPA 600 Method 625. Results are reported as less than the lowest detectable concentration if no dioxin was detected. The GC/MS semivolatiles internal standard peak areas were outside of the QC limits for both the initial injection and the re-injection. The values here are from the initial injection of the sample.

1198	Acid Extractables SWB46/8270A			See Page 3
1199	Base Neutrals (SWB46/8270A)			See Page 4
1200	Base Neutral cont SWB46/8270A			See Page 5

The usual quantitation limits could not be attained due to the matrix of the sample or interferences observed in the GC/MS semivolatiles analysis.

The GC/MS semivolatiles internal standard peak areas were outside of QC limits. The matrix spike and matrix spike duplicate samples were analyzed and internal standard peak areas were again outside of QC limits, indicating a significant matrix effect.

1 COPY TO Kerr-McGee Corporation
1 COPY TO Roy F. Weston, Inc.
1 COPY TO Data Package Group

ATTN: Garet Van de Steeg, Ph D
ATTN: Mr. Gary Deigan

Questions? Contact your Client Services Representative
F. Bradley Ayars at (717) 656-2300
13:16:48 D 0003 1 117437 449941
415 75.00 00110400 SOL000

Respectfully Submitted
Jenifer E. Hess, B.S.
Group Leader Pesticides/PCBs



Lancaster Laboratories, Inc.
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2301 FAX 717-656-2681

See reverse side for explanation of symbols and abbreviations.



Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

N.D.	none detected	BMQL	Below Minimum Quantitation Level
TNTC	Too Numerous To Count	MPN	Most Probable Number
IU	International Units	CP Units	cobalt-chloroplatinate units
umhos/cm	micromhos/cm	NTU	nephelometric turbidity units
C	degrees Celsius	F	degrees Fahrenheit
Cal	(diet) calories	lb.	pound(s)
meq	milliequivalents	kg	kilogram(s)
g	gram(s)	mg	milligram(s)
ug	microgram(s)	l	liter(s)
ml	milliliter(s)	ul	microliter(s)
m3	cubic meter(s)	fib > 5 um/ml	fibers greater than 5 microns in length per ml

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> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte concentration to approximate the value present in a similar sample without moisture.

U.S. EPA data qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
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D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
J	Estimated value
N	Presumptive evidence of a compound (TIC's only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
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LLI Sample No. G5 2247352
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Submitted: 1/12/95 Reported: 1/30/95
Discard: 3/ 2/95

TW-07PRODUCT Sample
Moss American Site

TW-07 SDG#: MOS24-01*

Account No: 07802
Kerr-McGee Corporation
Technology & Engineering Div.
PO Box 25861
Oklahoma City OK 73125-0861

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CAT NO.	ANALYSIS NAME	RESULTS	LIMIT OF QUANTITATION	UNITS
1183	Toluene	41,000.	6,300.	ug/kg
3355	Xylene (total)	260,000.	6,300.	ug/kg

BTEX by GC/MS (SW846/8240A)

The GC/MS volatile analysis was performed according to the medium level soil method due to the level of target compounds. The quantitation limits were therefore raised.

Questions? Contact your Client Services Representative
F. Bradley Ayars at (717) 656-2300

Respectfully Submitted
Michele McClarin, B.A.
Group Leader, GC/MS Volatiles



Lancaster Laboratories, Inc.
2425 New Holland Pike
Lancaster, PA 17601-5994
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See reverse side for explanation of symbols and abbreviations.



#2216
9/13/96

Explanation of Symbols and Abbreviations

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meq	milliequivalents	kg	kilogram(s)
g	gram(s)	mg	milligram(s)
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ppb parts per billion

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TW-07 SDG#: MOS24-01*

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CAT NO.	ANALYSIS NAME	RESULTS	LIMIT OF QUANTITATION	UNITS
	Acid Extractables SW846/8270A			
1194	pentachlorophenol	N.D.	250.	mg/kg

Questions? Contact your Client Services Representative
F. Bradley Ayars at (717) 656-2300

Respectfully Submitted
Jon S. Kauffman, Ph.D.
Group Leader, GC/MS



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2425 New Holland Pike
Lancaster, PA 17601-5994
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CAT NO.	ANALYSIS NAME	AS RECEIVED		
		RESULTS	LIMIT OF QUANTITATION	UNITS
Base Neutrals (SW846/8270A)				
3761	naphthalene	70,000.	10,000.	mg/kg
3775	phenanthrene	64,000.	10,000.	mg/kg

Questions? Contact your Client Services Representative
F. Bradley Ayars at (717) 656-2300

Respectfully Submitted
Jon S. Kauffman, Ph.D.
Group Leader, GC/MS



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CAT NO.	ANALYSIS NAME	RESULTS	LIMIT OF QUANTITATION	UNITS
1195	pyrene	28,000	10,000	mg/kg

Base Neutral cont SW846/8270A

Questions? Contact your Client Services Representative
F. Bradley Ayars at (717) 656-2300

Respectfully Submitted
Jon S. Kauffman, Ph.D.
Group Leader, GC/MS



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Submitted: 01/12/95

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TW-07 . SDG#: MOS24-01*

Account No: 07802
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PO Box 25861
Oklahoma City OK 73125-0861

CAT NO	ANALYSIS NAME	METHOD	TRIAL	DATE OF ANALYSIS
3982	BTEX by GC/MS (SW846/8240A)	SW-846 8240A	1	01/18/95
0155	Lead	SW-846 7420	1	01/20/95
1015	Oil Metals Digestion for Oils	SW-846 3050A (Modified)	1	01/14/95
1145	Arsenic (furnace method)	SW-846 7060	1	01/16/95
0381	BNA Soil Extraction	SW-846 3550	1	01/13/95
1196	Dioxin Screen of Soils	EPA 625 modified	1	01/20/95
1198	Acid Extractables SW846/8270A	SW-846 8270A	1	01/25/95
1199	Base Neutrals (SW846/8270A)	SW-846 8270A	1	01/25/95
1200	Base Neutral cont SW846/8270A	SW-846 8270A	1	01/25/95



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#2216
9/13/90

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Inorganic Qualifiers

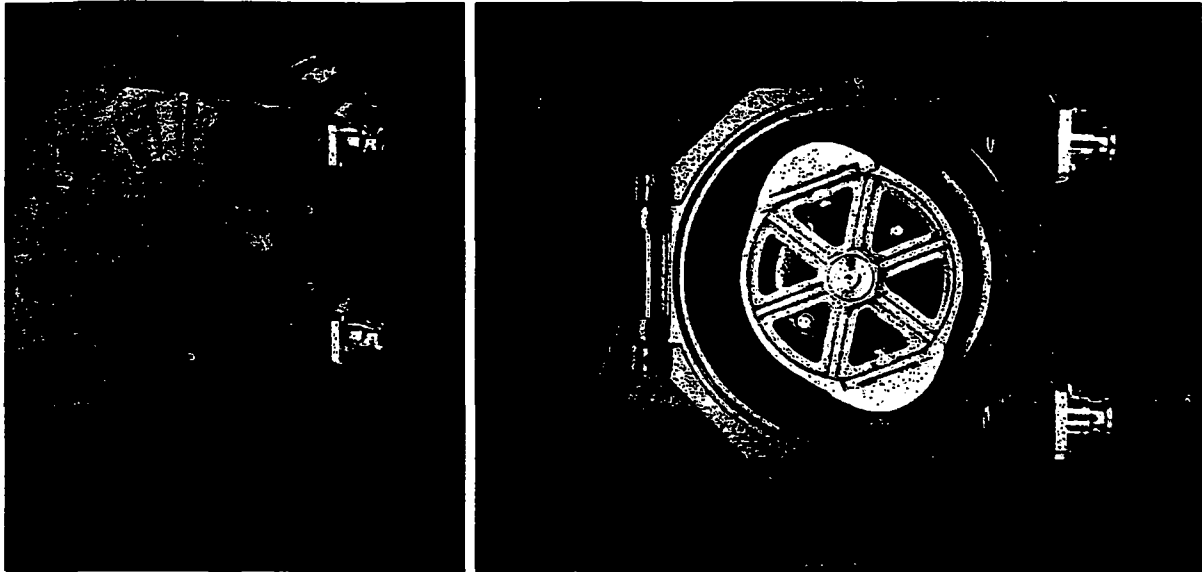
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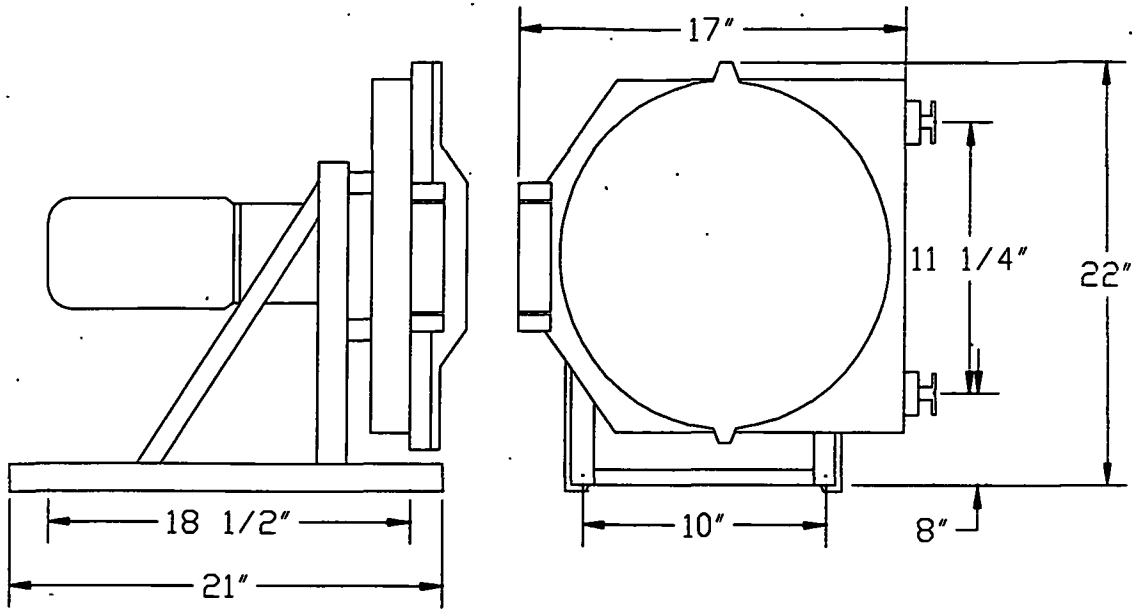
APPENDIX B

VENDOR EQUIPMENT DATA SHEETS



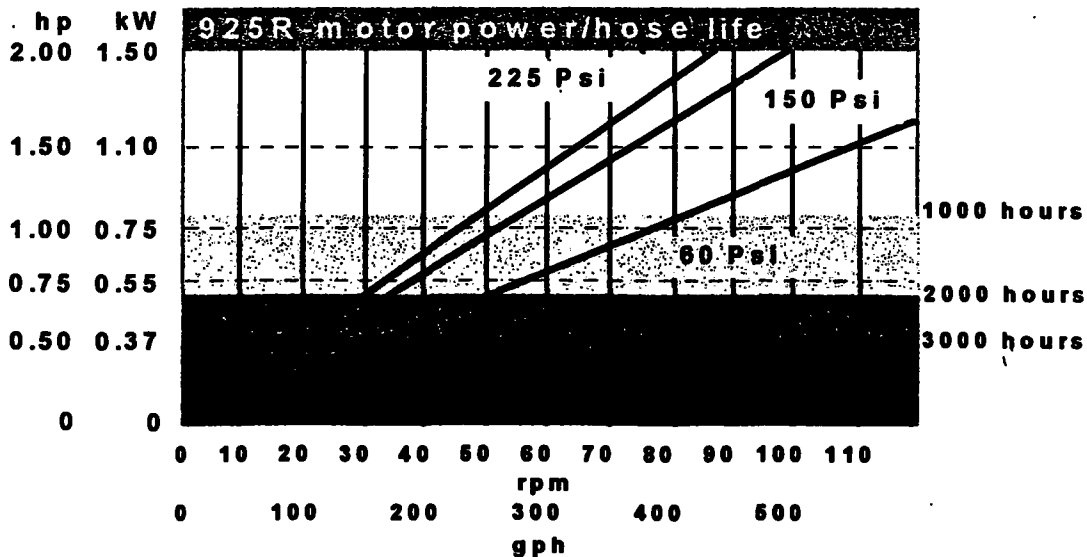
Technical Information

- Flow rates from .17 to 8.8 GPM
- Pressure to 150 Psi continuous duty
- Pressure to 225 Psi intermittent
- Suction Lift - 28 to 30 Ft.
- Temperature capabilities - 32F to 175F
- Viscosity - up to 100rpm - 7000 cPs
- up to 55rpm - 10000 cPs
- Hose materials available: Natural Rubber, Neoprene, and Food Grade Natural Rubber
- Fixed or variable speed (mechanical variator or VFD)
- Flanges available: 150#RF, 300#RF, Quick Coupling, Tri-Clamp
- 1" connections
- 2 liter lubricant bath
- Door switch - 50Watt, 240VAC max power
- Power requirements - up to 2.0 hp
 - 115, 230 or 460 VAC
 - single or 3 phase
- Speed range - up to 110rpm



Materials of Construction

- Pumphead Body and Door
 - Cast Iron
 - Gray 2 part epoxy polyester powder coat
- Pumphead Rotor
 - Cast Iron
 - Yellow 2 part epoxy polyester powder coat
- Rotor Shoes
 - Aluminum
- Frame
 - Mild Steel
 - Gray, 2 part epoxy polyester powder coat
- Flanges
 - Mild Steel
 - Stainless Steel
- Flange Studs
 - Stainless Steel
- Door, Motor and Frame Hardware
 - High Tensile Steel
- Hose Sealing Glands and Door Seal
 - Neoprene



925RG-1



HAMMERHEAD™

CLEANUP PUMPS



DATA SHEET

H2 Series (2" and Larger Wells)

H4 Series (4" and Larger Wells)

The HammerHead™ system includes controllerless air-driven pumps for extreme situations – high flow (over 11 GPM), deep wells or high discharge head (to 300'), and small diameter wells (2" and up) – in addition to more typical cleanup pumping projects.

Top and bottom inlet models are engineered to serve many applications: floating hydrocarbon recovery, drawdown pumping with or without soil vapor extraction, contaminated ground water remediation, landfill leachate and condensate control, and more.

All HammerHead pumps give you the full advantage of advanced controllerless operation. They sense liquid level internally, running when there's enough to pump, and shutting down automatically when well levels drop too low – without cycle timers, electrical equipment, downwell probes, or level controls at the wellhead. This simplicity makes installation and startup much easier. Operation is truly hands-off. There's no need to balance and re-balance the system in response to well yield or level fluctua-

tions. Each pump in a system automatically adjusts performance to its own well conditions.

HammerHead pumps are more efficient than conventional pneumatic pumps, conserving on air usage and delivering higher flow. The pump is always either refilling or discharging; because this is controlled downwell, there's no time or air lost while the entire length of air supply line vents and re-pressurizes with every cycle.

Reliable, high-clearance design is engineered to a new standard in HammerHead pumps. Critical parts are solid, investment-cast stainless steel, for superior strength and chemical resistance.

Oversized, self-cleaning ball check valves in the liquid path provide optimum flow and prevent clogging by solids or viscous substances. Even the Hammer Drive air valving uses this self-cleaning ball-and-seat mechanism, as well as positive action magnetic assist for dependable

operation in any conditions, even with substandard air quality.

And if you ever need to disassemble a HammerHead pump, it's easy to take apart and maintenance can be performed right in the field, not in a shop or at the factory.

*The Most Powerful Automatic
Cleanup Pumps For Tough
Applications Like Yours*

 **GED** Ground Water Specialists®

1-800-624-2026

SPECIFICATIONS



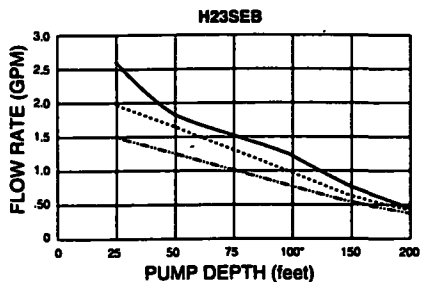
H2 SERIES BOTTOM INLET

H2 SERIES TOP INLET

H4 SERIES

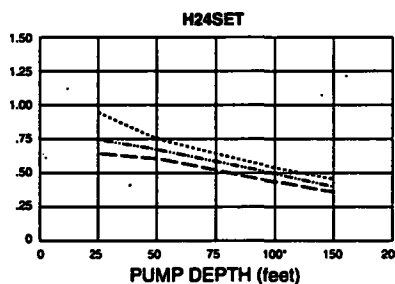
Model No.	H23SEB	H24SET	All models
Pump Type	Positive Air Displacement	Positive Air Displacement	Positive Air Displacement
Inlet	Bottom	Top	Bottom
O.D.	1.75"	1.75"	3.5"
Length	39.5"	52"	55"
Weight	5.75 lbs.	5.75 lbs.	23.5 lbs.
Materials	Stainless steel construction, with Teflon® inlet and discharge check balls, epoxy float, Viton O-rings	Stainless steel construction, with Teflon® inlet and discharge check balls, epoxy float, Viton O-rings, Q-Tal inlet housing	Stainless steel construction, with Teflon® inlet and discharge check balls, stainless steel or epoxy float, Viton O-rings
Fittings: Type	Barb	Union	Barb
Sizes: Liquid Discharge	1/2" O.D.	1/2" O.D.	3/4" O.D. (H45SSB, H45SEB) or 1-1/4" O.D. (HF45SSB, HF45SEB)
Air Supply	1/4" O.D.	1/4" O.D.	3/8" O.D.
Exhaust	3/8" O.D.	3/8" O.D.	1/2" O.D.
Pump Stroke	250 ml. (.07 gal.)	250 ml. (.07 gal.)	2850 ml. (0.8 gal.)
Operating pressure range	15-100 psi	15-100 psi	10-160 psi
Maximum lift	200 ft.	200 ft.	300 ft.
Maximum flow rate	2-1/4 GPM	1 GPM	11+ GPM (HF45SSB, HF45SEB) 8 GPM (H45SSB, H45SEB)
Minimum submergence	26" above pump bottom (in water; inquire about other liquids)	Top Inlet Port (46" above bottom of pump)	42" above pump bottom
Density of pumped liquid	0.7 g/cc up	0.7 g/cc up	1.0 g/cc (stainless float); 0.7 g/cc up (epoxy float)
Cap sizes	2" and 4" diameter (standard and vacuum seal)	2" and 4" diameter (standard and vacuum seal)	4", 6", and 8" diameter (standard and vacuum seal)

FLOW PERFORMANCE CURVES



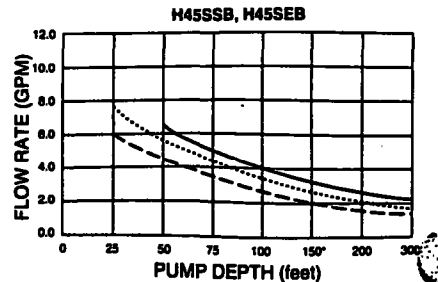
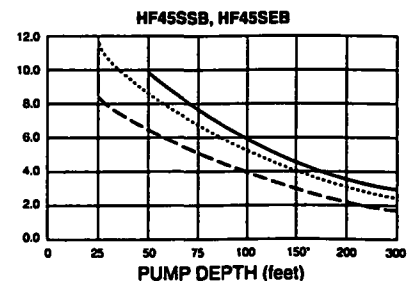
— 25 ft. Submergence
 10 ft. Submergence
 - - - 2 ft. Submergence.

*100 psi drive air pressure was supplied for all pump depths.



..... 10 ft. Submergence
 - - - 5 ft. Submergence
 — 2 ft. Submergence

*100 psi drive air pressure was supplied for all pump depths.



— 25 ft. Submergence/120 psi
 10 ft. Submergence/120 psi
 - - - 2 ft. Submergence/120 psi

*160 psi drive air pressure was supplied for pump depths greater than 150 ft.

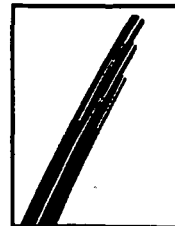
TUBING

QED's exclusive Jacketed Tubing, with a smooth, continuous nylon sheath, helps to prevent hangups and loops, makes pump installation easier (especially in narrow or obstructed well casing), and is light in weight with exceptional chemical resistance, outside and in.

Tubing sets are supplied cut to your custom length requirements. Jacketed tubing and sheath are both made of Nylon 12, which doesn't swell in water and provides excellent resistance to most commonly-encountered liquids and cleanup conditions, including hydrocarbons, fuels, and alkalis. For extremes of acidity, consult QED for alternative tubing options.

Two tubing packages are available for H4 series pumps. The standard SPTUBE provides flow rates up to 8 GPM with H45SSB and H45SEB models. The high flow MAXTUBE increases maximum flow to 11 GPM with HF45SSB and HF45SEB pumps.

The MINTUBE set serves both H2 series pumps.



Model	SPTUBE	MAXTUBE	MINTUBE
Description	Standard set contains 4 tubes—discharge, exhaust, air supply, and bubbler tubing*	High flow set contains 3 tubes—discharge, exhaust and air supply	Standard set contains 3 tubes—discharge, exhaust, and air supply
Discharge O.D.	3/4"	1-1/4"	1/2"
Exhaust O.D.	1/2"	1/2"	3/8"
Air Supply O.D.	3/8"	3/8"	1/4"
Bubbler O.D.	1/4"	—	—
Min. Bend Radius	7"	12"	6"
Max. Pressure	325 psi	165 psi	360 psi
†Max. Cont. Length 150'		100'	200'

*Bubbler tubing is used for referenced depth measurement in wells under vacuum or pressure. More information on this is supplied with custom wellhead completion packages.

† These are maximum lengths that can be shipped via UPS. For longer continuous lengths, consult QED.

CAPS AND ACCESSORIES

NOTE: each cap, flange and accessory kit comes with an illustrated instruction sheet.

STANDARD CAPS

(Regulator included)

MODEL	FOR PUMP MODEL	WELL DIAM.	DESCRIPTION	DISCHARGE TUBE O.D.
L240A	H23SEB, H24SET	2"	Cap - Standard	1/2"
L240C	H23SEB, H24SET, H45SSB, H45SEB	4"	Cap - Standard	1/2" or 3/4"
L240E	H45SSB, H45SEB	6"	Cap - Standard	3/4"
L240G	H45SSB, H45SEB	8"	Cap - Standard	3/4"

VACUUM CAPS

(Regulator not included)

MODEL	FOR PUMP MODEL	WELL DIAM.	DESCRIPTION	DISCHARGE TUBE O.D.
L250A	H23SEB, H24SET	2"	Cap - Standard - Vacuum	1/2"
L250C	H23SEB, H24SET, H45SSB, H45SEB	4"	Cap - Standard - Vacuum	1/2" or 3/4"
L250E	H45SSB, H45SEB	6"	Cap - Standard - Vacuum	3/4"
L250G	H45SSB, H45SEB	8"	Cap - Standard - Vacuum	3/4"

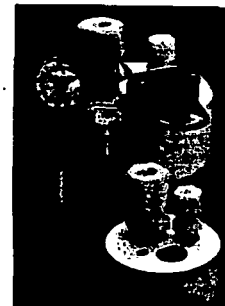
HIGH-FLOW VACUUM CAPS

(Regulator not included)

MODEL	FOR PUMP MODEL	WELL DIAM.	DESCRIPTION	DISCHARGE TUBE O.D.
L260C	HF45SSB, HF45SEB	4"	Cap - High Flow - Vacuum	1-1/4"
L260E	HF45SSB, HF45SEB	6"	Cap - High Flow - Vacuum	1-1/4"
L260G	HF45SSB, HF45SEB	8"	Cap - High Flow - Vacuum	1-1/4"

ACCESSORIES

MODEL	FOR PUMP MODEL	DESCRIPTION
37055	H23SEB, H24SET	Kit - Regulator/Gauge - HammerHead 2"
KIH2ST	H23SEB	Kit - Top Inlet Conversion
KIH2SB	H24SET	Kit - Bottom Inlet Conversion
37050	H4 SERIES	Kit - Regulator/Gauge - HammerHead 4"
37058	H4 SERIES	Kit - Cable Attachment
37060	H4 SERIES	Cable - 3/16" Stainless steel



HOW HAMMERHEAD PUMPS WORK

- Each HammerHead pump requires a certain minimum depth of liquid to operate (to raise the float high enough for actuation) – 26" for H2 models, 42" for H4.
- Pumps shut themselves down when the liquid is pumped below this level, conserving air, and will begin running again automatically when well levels recover.

PUMP FULL — FLOAT UP — PUMP ON

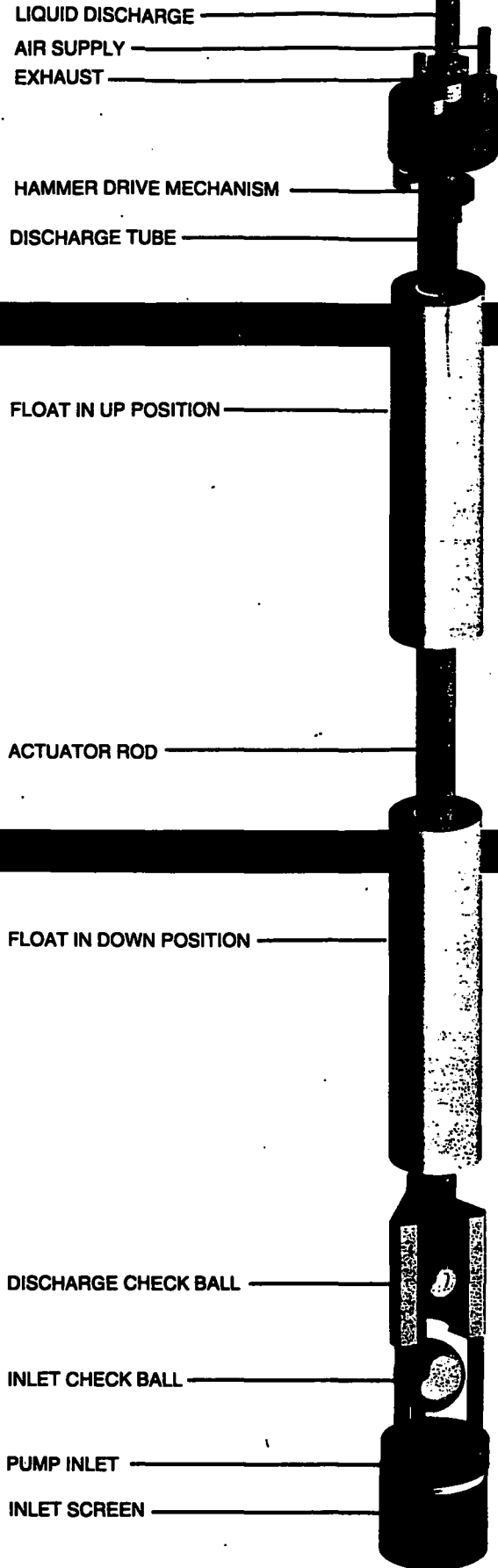
Float in this position slides the actuator rod upward, triggering Hammer Drive mechanism and causing air to enter the pump. The magnetic Hammer Drive provides positive-action air valve operation for consistent performance, no matter how rapidly or slowly the pump fills.

Incoming air pressure seats the inlet check ball, keeping liquid from leaving through the inlet. Liquid in the pump body is forced past the discharge check valve and up into the discharge tube to the surface.

PUMP EMPTY — FLOAT DOWN — PUMP OFF

Float in this position slides actuator rod downward, shutting off the air supply and allowing the compressed air in the pump to vent. The inlet check ball unseats (no longer having any pressure holding it down), which allows the next fill of liquid from the well into the pump. The discharge check ball is seated by the weight of liquid in the discharge tube above it, preventing that liquid from falling back into the pump body.

As the pump refills, the float rises back to the top position and the cycle is repeated.



Easy Treatment System Control

Treatment site system components can quickly become complicated. Ground water pumps... transfer pumps... air compressors...oil/water separators...air strippers...vacuum extractors...carbon adsorption systems...the list goes on and on.

If each component had a separate control panel, you could waste valuable hours running from panel to panel. What you need is a "command post" to centralize the status and control options for these components. QED control panels give you just that.

QED makes monitoring the treatment system at your site easier with one central control panel, customized to meet your site specifications. For nearly all combinations of remediation equipment, QED can make the layout accessible and controllable from a single panel.

QUALITY CONSTRUCTION FOR SAFE, TROUBLE-FREE USE

All of the control panels supplied by QED are built to strict quality standards. Standard panel enclosures are of NEMA 4 construction and have a padlock hasp. Explosion-proof and other specialized enclosures are also available. (Consult factory for pricing and lead time).

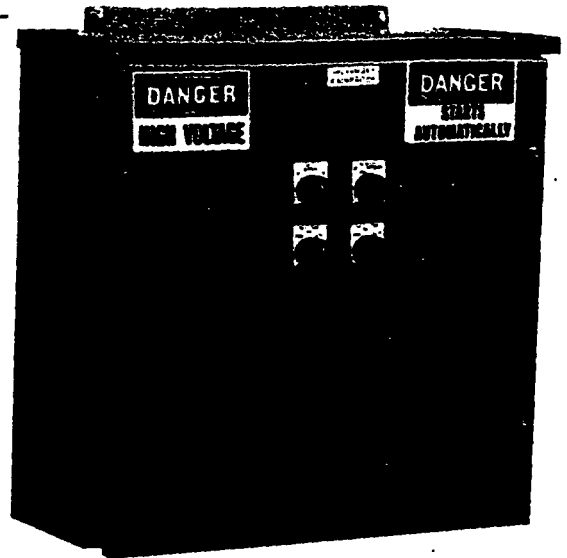
QED-designed control systems are made with safety in mind—fail-safe automatic controls with non-locking manual overrides provide safe operation with ease of system startup. Terminal strips make installation of external components and sensors simple.

A WIDE RANGE OF CUSTOM CONTROL CAPABILITIES

QED designs each control panel using intrinsically safe barriers and amplifiers to insure safe operation in hazardous locations. Intrinsically safe circuits, when properly installed in the field, give the highest degree of protection against ignition of vapors in a hazardous environment—proven safer than equivalent explosion-proof systems.

Based on the status reported from the sensors, remediation components can be turned on/off automatically for continuous, unattended operation. A sampling of the different controllers illustrates their almost endless capabilities:

- Turn off pneumatic pumps and electric submersibles, under alarm conditions.
- Turn on/off an SVE system (with adjustable timers) to control extractor on/off cycles and condensate separator draining.
- Turn on/off transfer pumps (using level sensors) if a high liquid level occurs in an oil/water separator.
- Turn on/off a transfer pump if high pressure is reached in a carbon treatment system.



CURTIS

ChallengeAIR™

1/2 to 15 HP
ELECTRIC DRIVEN
COMPRESSORS

PRODUCT FEATURES

- **CAST-IRON Construction.** Minimizes vibration during operation.
- **Drive Arrangement:** Slow speed V-belt.
- **Air Discharge Line and Pressure Switch.** Pre-piped and tested to assure proper operational pressure range.
- **Intake Filter/Silencers.** Large metal canister style minimizes running noise.
- **Motor.** Rugged NEMA design.
- **Discharge Air Line Check Valve.** Prevents pressurized air from re-entering compressor.
- **Crankcase Lubrication Level Indicator.** Easy to see the amount and condition of oil.
- **Discharge Air Service Valve.** ASME approved.
- **Manual Condensate Drain Valve.**
- **Pressure Gauge.**
- **ASME Air Receiver.** Built for 200 PSI working pressure.
- **Totally Enclosed, OSHA Approved Belt Guard.**
- **Safety Pressure Relief Valve.** ASME approved.

Plus optional factory-mounted and wired motor starter with motor overload protection and manual reset.

The Symbol of Quality

ChallengeAIR™

CHECK THESE MAJOR QUALITY FEATURES

- **Deep Radial Finned Cylinders** provide 360° heat dissipation.
- **Large Linear Finned Cylinder Heads** with pulsation dampening and cooling pockets which allows air to freely exit and enter the compression chambers.
- **Crankshaft** is dynamically balanced, precision-machined and ground. Assures extended running life for the internal bearings and wearing surfaces.
- **Main Roller or Ball Bearings** are precision installed to hold the alignment of the rotating elements to the crankcase.
- **Connecting Rods** are high tensile strength. Machined to close tolerances for years of service. Oil entrance ports are machined at the crankshaft journal and at the piston pin to allow the flow of fresh oil throughout the connecting rod. Units 5 HP and larger utilize a steel-backed babbitt bearing on the crankshaft journal.
- **Flywheel Supplies High Volume Air Flow** to cool cylinders and heads.

ChallengeAIR™ Two Stage Tank Mounted—Electric Motor Driven

1HT6	1	2.9	2.7	60	2	748	423
2HT6	2	6.8	6.3	60	3	781	449
3HT6	3	8.0	7.7	60	3	947	479
3VT6	3	8.0	7.7	60	3	947	479
5HT6	5	16.9	16.1	60	3	968	580
5VT6	5	16.9	16.1	60	3	968	612
5HT8	5	16.9	16.1	80	3	968	616
5VT8	5	16.9	16.1	80	3	968	636
7HT8	7½	24.0	23.7	80	3	764	830
10HT8	10	31.2	30.4	80	3	977	890
10HT12	10	31.2	30.4	120	3	977	1225
10VT12	10	31.2	30.4	120	3	977	1248
15HT12	15	45.5	42.8	120	3	855	1379

ChallengeAIR™ Single Stage Tank Mounted—Electric Motor Driven

05HS3	½	2.6	2.0	30	1	700	250
07HS6	¾	3.1	2.5	60	1	750	250
1HS6	1	4.8	3.8	60	2	632	425
2HS6	2	6.2	5.5	60	2	945	450
3HS6	3	11.1	8.7	60	3	945	450
3VS6	3	11.1	8.7	60	3	945	450
3HS8	3	11.1	8.7	80	3	945	500
3VS8	3	11.1	8.7	80	3	945	500
5HS6	5	16.5	13.2	60	2	945	550
5VS6	5	16.5	13.2	60	2	945	550
5HS8	5	16.5	13.2	80	2	945	550
5VS8	5	16.5	13.2	80	2	945	570
7HS8	7½	24.8	20.3	80	3	945	1100
7VS8	7½	24.8	20.3	80	3	945	1125
10HS8	10	41.5	34.5	80	3	866	1225
10HS12	10	41.5	34.5	120	3	866	1267
10VS12	10	41.5	34.5	120	3	866	1280
15HS12	15	62.6	53.6	120	3	855	1448

Distributed by

Form CA-7890-RV1
5-1-91

The Symbol of Quality

AIR COMPRESSOR SPECIFICATION

CURTIS TOLEDO HORIZONTAL TANK MOUNTED, TWO STAGE, ELECTRIC DRIVEN
AIR COMPRESSOR - MODEL NUMBER: 5HT120D

PERFORMANCE FEATURES AND SPECIFICATIONS:

- MOTOR: 5 HORSEPOWER OPEN DRIP PROOF WITH 1.15 S.F.
- VOLTAGE: 115/230 SINGLE PHASE.
- RATED FULL LOAD AMPERAGE: 56.0/28.0 Amps.
- ACTUAL DELIVERED AIR FLOW @ 100 PSI: 16.9 SCFM.
- SHIPPING WEIGHT (WITHOUT OPTIONAL EQUIPMENT): 616 LBS.

STANDARD FEATURES AND SPECIFICATIONS:

- 120 GALLON HORIZONTAL RECEIVER TANK.
- FACTORY SET PRESSURE SWITCH AT 90 PSI CUT-IN, 120 PSI CUT-OUT.
- COMBINATION HANKISON OIL COALESCING FILTER & PRESSURE REGULATOR WITH GAUGE.
- ELECTRONIC TANK DRAIN.
- LOW OIL SHUTOFF SAFETY SWITCH.
- OSHA APPROVED BELT GUARD.
- DUAL CONTROL OPERATION.

BASE PRICE WITH ABOVE FEATURES: \$2,045.00

OPTIONAL FEATURES AND EQUIPMENT:

- MOUNTED AND WIRED MOTOR STARTER WITH OVERLOAD PROTECTION (INCLUDES HEATER ELEMENTS) \$ 130.00
- 230/460 VOLT THREE PHASE MOTOR. (DEDUCT) \$ (115.00)
- BELT GUARD MOUNTED AIR COOLED AFTERCOOLER (REQUIRED WITH AIR DRYER OPTIONS). \$ 335.00
- HANKISON REFRIGERATED AIR DRYER WITH APPROPRIATE FILTRATION MOUNTED AND PLUMBED ON EXTENDED TABLE. INCLUDES MANUAL BY-PASS VALVES. \$ 735.00
- HANKISON DESICCANT AIR DRYER WITH APPROPRIATE FILTRATION MOUNTED AND PLUMBED ON EXTENDED TABLE. INCLUDES MANUAL BY-PASS VALVES. (See Note 2.) \$ 1,975.00

COMPRESSOR SYSTEM PRICE AS SELECTED (): \$ _____

NOTES:

1. PRICES SUBJECT TO CHANGE WITHOUT NOTICE.
2. TOTALLY ENCLOSED FAN COOLED (TEFC) AND EXPLOSION PROOF MOTOR OPTIONS WILL BE QUOTED ON AN AS NEEDED BASIS.
3. WHEN USING DESICCANT AIR DRYER ACTUAL DELIVERED AIR FLOW (SCFM) MUST BE REDUCED BY 15%.
4. STANDARD TRUCK FREIGHT INCLUDED TO FIRST DESTINATION (CONTINENTAL USA).
5. SHIPPING LEAD TIME 2-3 WEEKS A.R.O.
6. COMPRESSORS ARE LARGE AND SHIPPED VIA TRUCK. CUSTOMER IS RESPONSIBLE FOR PROVIDING FORKLIFT TO UNLOAD COMPRESSOR FROM TRUCK.

Tank-Full Shutoff

Prevent recovery tank overflow with automatic pump shutoff.

POSITIVE PROTECTION FROM SPILLS

The last thing you'd want to happen on a remediation pumping project is to go to tremendous trouble and expense to pump hydrocarbon or contaminated ground water up from the aquifer, only to have it spill all over again because the holding tank filled faster than expected and the pumps kept running.

Unfortunately, recovery rates from many wells are subject to fluctuations, making it difficult to predict how long it will take for a tank to fill. At remote or unstaffed sites, this may require frequent unnecessary visits for inspection, or increase the danger of accidents and further environmental damage.

The solution to the problem is the Pulse Pump Model L374 Tank Full Shutoff. The L374 senses when the recovery tank is full and automatically shuts off the pneumatic pump air supply, avoiding overflow and preventing the system from turning on again until the pump discharge and L374 level sensing tube are hooked up to an empty container.

FAIL-SAFE AND SIMPLE TO OPERATE

The L374 is connected between the air source and the pump(s) or pump controller(s). The sensing tube assembly threads into a standard 2" NPT fitting on the recovery tank or barrel.

Increased pressure caused by the liquid rising in the sensing tube is transmitted by 1/4" nylon tubing to a diaphragm in the control module. When pressure reaches a high enough threshold to indicate that the container is nearly full, the control diaphragm activates an air pilot valve which shuts off the pump air supply. This conserves air, assuming the compressor is set up to run only when the system is drawing air.

The startup/reset procedure is fail-safe. The on/reset button must be depressed for initial startup and after each shutoff cycle to activate pumping. However, the system will immediately shut off again unless the sensing tube is connected to an empty tank.

Unlike other shutoff devices, the L374 is inherently reliable with no floats that would hang up or bubblers that could clog. Heavy-duty construction and all-poppet valve operation deliver dependable performance in the field, with the capability to control as many as 10 pumps discharging into the same container.

SPECIFICATIONS:

Model No.: L374

Dimensions: Control module 8.25" H x 10.5" W x 6.5" D; sensing tube 1.88" O.D. x 37" L

Weight: Control module 6 lbs; sensing tube 1 lb.

Temperature Range: 35° - 180° F

Connection Thread Size: Air tubing 1/4" NPT; sensing tube 2" NPT.

Maximum Air Tube Length: 250'



Shutoff Control Module



Sensing Tube Assembly

AIR FLOW CHARACTERISTICS:

Pressure Range: 40 - 100 psi

Maximum Flow: 40 SCFM @ 100 psi (runs up to 10 pumps)

CONNECTIONS INCLUDED:

1/2" O.D. tubing x 1/4" NPT - 2 ea.

3/4" I.D. hose (3/8" O.D. nylon tubing) x 1/4" NPT - 2 ea.

SS hose clamps - 2 ea.

1/4" Phillips-head mounting screws - 2 ea.

Flow Control Accessories

SIMPLE, FAIL-SAFE TANK-FULL SHUTOFF PROVIDES POSITIVE PROTECTION FROM SPILLS

Recovery rates from many wells fluctuate, making it difficult to predict how long it will take for a storage tank to fill. At remote or unstaffed sites, this may require frequent unnecessary visits for inspection, or increase the danger of accidental overflow.

The solution is the Model L374 Tank Full Shutoff. The L374 senses when the recovery tank is full and automatically shuts off the pump air supply, avoiding overflow, conserving air and preventing the system from turning on again until an empty container is connected.

The L374 is connected between the air source and the pump(s) or controller(s). The sensing tube assembly threads into a standard 2" NPT fitting on the recovery tank or barrel.

The startup/reset procedure is fail-safe. The on/reset button must be depressed for initial startup and after each shutoff cycle to activate pumping. The system shuts off again unless the sensing tube is connected to an empty tank.

The L374 is inherently reliable with no floats to hang up or bubblers that could clog. It can control as many as 10 pumps discharging into the same container.



L374 Sensing Tube



L374 Controller Module

EASY, ACCURATE FLOW TOTALIZATION WITH PROVEN PUMP CYCLE COUNTER

Conventional fluid meters are not reliable for measuring the pulsing type of flow produced by pneumatic displacement pumps. In the past, this made it difficult to totalize flow for site management, reporting or regulatory requirements.

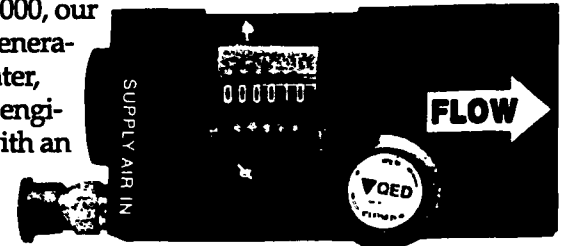
Now with the Model 37000 Pump Cycle Counter, accurate flow measurement is easy for users of QED's controllerless Hammerhead and Solo II pumps. These pumps deliver a consistent volume of liquid with each stroke. Counting the pump cycles and multiplying by the stroke volume gives the flow total.

In addition, dividing the pump cycles by the time intervals tells you how fast the pump is cycling. The model 37000, our second-generation counter,

has been engineered with an adjustable air flow

valve appropriate for a wider range of site conditions. Because it works on the compressed air line, the counter is ideal for cold weather applications where typical water flow meters have potential freezing problems. Remote display capability is also available; please inquire.

QED cycle counters have been widely accepted and proven in use on a large variety of cleanup and landfill sites. In fact, our initial innovation was such a success the competition was buying counters for its customers.



TANK-FULL SHUTOFF SPECIFICATIONS:

- Model No.: L374
 Dimensions: Control module 8.25" H x 10.5" W x 6.5" D (21 x 27 x 16.5 cm); sensing tube 1.88" O.D. x 37" (94 cm) L
 Weight: Control module 6 lbs. (2.7 kg), sensing tube 1 lb. (.45 kg)
 Temperature Range: 35° - 180° F (2°-82°C)
 Pressure Range: 40-100 psi (275-700 kPa)
 Maximum Flow: 40 SCFM @ 100 psi (68 m³/h @ 700 kPa)
 (runs up to 10 pumps)
 Connection Thread Size: Air tubing 1/4" NPT; sensing tube 2" NPT
 Maximum Air Tube Length: 250' (75 m)
 Connections Included:
 1/2" O.D. tubing x 1/4" NPT - 2 ea.
 1/4" I.D. hose (3/8" O.D. nylon tubing) x 1/4" NPT - 2 ea.
 SS hose clamps - 2 ea.
 1/4" Phillips-head mounting screws - 2 ea.

CYCLE COUNTER SPECIFICATIONS:

- Model No.: 37000
 Dimensions: 2.25" H x 4.5" W x 2.13" D (5.7 x 11.4 x 5.4 cm)
 Materials: anodized aluminum, brass, plastic
 Weight: 1 lb. (.45 kg) shipping weight
 Temperature Range: 0° - 140° F (-18°, 60°C)
 Maximum Pressure: 200 psi (1380 kPa)
 Flow Capacity: Normal flow 5 SCFM (8.5 m³/h);
 maximum flow 20 SCFM (34 m³/h)
 Number of Counts: 0 - 999,999
 Connections Included:
 1/8" male NPT air "in" connection.
 1/8" female NPT air "out" connection.
 1/8" brass street elbow - 2 ea.

Jacketed, Bonded, and Single Tubing

QED JACKETED TUBING SETS MAKE HOSES AND CABLE-TIED TUBING OBSOLETE FOR MANY JOBS

There's a new choice for liquid or gas transfer in pollution control and other demanding applications — light-weight, chemical-resistant multi-tube bundles from QED. They provide easier handling and more reliable service than hoses or cable-tied tubing.

Hoses are over twice as heavy, and their large O.D. can bind in tight quarters. Hoses can also kink or double over and jam, and their limpness makes it hard to push equipment past snags.

Cable-tied tubing can loop or kink, and sharp ties can even cut fingers during handling.

QED's Jacketed Tubing, developed for tough cleanup pumping jobs, changes everything. A snug, continuous sheath keeps tubing together and makes it more manageable. The compact bundle is much easier to use, especially in narrow or obstructed casings or spaces — with no loops, snags, kinks, hangups, or bandages.

TOUGH MATERIALS TAME HARSH ENVIRONMENTS

QED Jacketed Tubing is made entirely of UV-protected black Nylon 12 — the same polymer used for automobile fuel lines. This high-strength material doesn't swell in water, and offers excellent chemical resistance to cleanup and landfill liquids, far superior to ordinary nylon 6 carried by most suppliers.

You may be able to specify hose lining of resistant materials, but exposure of the outer surface to harsh chemicals and conditions can cause hose casings to degrade. With QED Jacketed Tubing, the inner and outer surface and sheath are all Nylon 12, for maximum toughness throughout.

MANY SIZES AVAILABLE IN JACKETED SETS

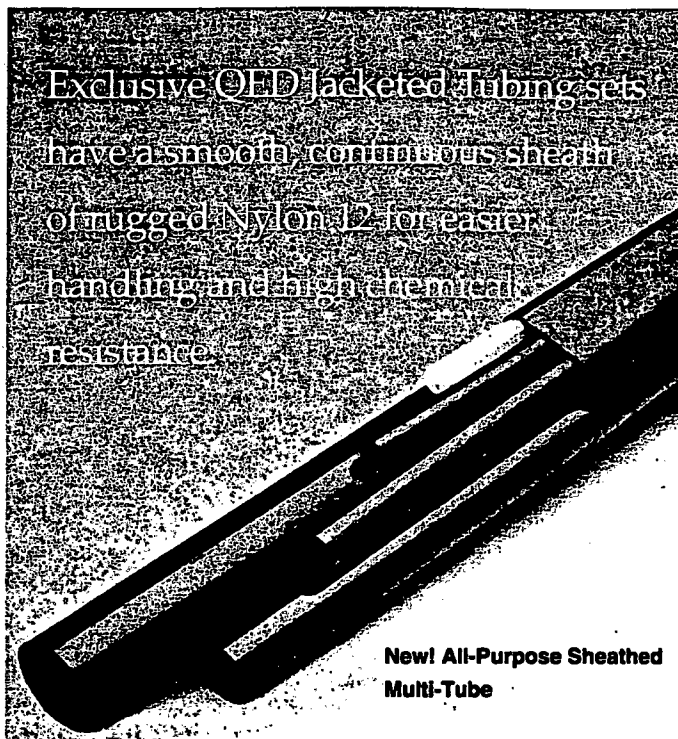
Jacketed tubing is supplied in 3 to 5-tube combinations in a variety of sizes, custom-cut to any length so there's no waste. Available sets fit all QED HammerHead™, Solo® II, Eliminator, and Pulse Pump® models.

STRIPPABLE BONDED TWIN TUBING SETS

Continuous heat-bonded twin tube sets, developed for ground water sampling pumps, come in Teflon, Teflon-lined polyethylene, and polyethylene. When stripped, tubing has a clean O.D. suitable for leak-tight connections.

A WIDE SELECTION OF SINGLE TUBING

QED supplies a large assortment of single tubing, in bulk and cut to length. Sizes range from 1/4" to 1-1/4" (6mm to 32mm) O.D. Materials include Nylon 12 (for hydrocarbons and bases, not for acids), polyethylene (for corrosives and solvents, not fuels), Teflon® (maximum inertness and chemical resistance), and Teflon-lined polyethylene (economical Teflon alternative).



New! All-Purpose Sheathed Multi-Tube

JACKETED TUBING SPECIFICATIONS (Used mostly for cleanup pumping)

MODEL NO.	USED w/QED CLEANUP PUMPS	DISCHARGE	EXHAUST	AIR SUPPLY	BRAIN VENT* OR BUBBLER	BUBBLER	BEND RADIUS	MAX. OPER. PRESSURE	MAX. CONT. LENGTH #
SPTUBE	H4 SERIES, SP2000, SP4000, LP1001, LP1201, LP1702, LP1705, LP4600, LP4700	3/4" (19 mm)	1/2" (13 mm)	3/8" (9 mm)	1/4" (6 mm)	—	7" (18 cm)	325 psi (2,250 kPa)	200' (60 m)
LPTUBE†	SP2000, SP4000	3/4" (19 mm)	1/2" (13 mm)	3/8" (9 mm)	1/4" (6 mm)	1/4" (6 mm)	7" (18 cm)	325 psi (2,250 kPa)	150' (45 m)
MAXTUBE	HF4 SERIES	1-1/4" (32 mm)	1/2" (13 mm)	3/8" (9 mm)	—	—	12" (30 cm)	165 psi (1,150 kPa)	150' (45 m)
MINTUBE	H2 SERIES, LP1301, LP1401, LP1602, LP1610, LP1650	1/2" (13 mm)	3/8" (9 mm)	1/4" (6 mm)	—	—	6" (15 cm)	360 psi (2,500 kPa)	250' (75 m)

* SP2000 & SP4000 only

† Used with SP2000 and SP4000 Solo II pumps for level measurement.

NOTE: Tubing sizes all nominal O.D. Tubing connections may change and all tubes may not be connected in some tubing/pump combinations. See individual tubing chart for actual OD/ID.

BONDED TWIN TUBE SPECIFICATIONS (Used mostly for purging and sampling)

MODEL NO.	MATERIAL	USED w/QED SAMPLING PUMPS	AIR SUPPLY	DISCHARGE	BEND RADIUS	MAX. OPER. PRESSURE	MAX. CONT. LENGTH #
P5200	Polyethylene	1100 & 1200 series	1/4" (6 mm)	1/4" (6 mm)	1" (2.5 cm)	300 psi (2,050 kPa)	250' (75 m)
P5000	Polyethylene	T1300	1/4" (6 mm)	3/8" (9 mm)	1.25" (3.2 cm)	300 psi (2,050 kPa)	250' (75 m)
P5100	Polyethylene	1100 & 1200 series	1/4" (6 mm)	1/2" (13 mm)	2.50" (6.4 cm)	200 psi (1,400 kPa)	250' (75 m)
P5610	Polyethylene	HR4000 series	1/2" (13 mm)	3/4" (19 mm)	4" (10 cm)	150 psi (1,050 kPa)	250' (75 m)
T5200	Teflon	1100 & 1200 series	1/4" (6 mm)	1/4" (6 mm)	1.50" (3.8 cm)	320 psi (2,200 kPa)	250' (75 m)
T5010	Teflon	T1300	1/4" (6 mm)	3/8" (9 mm)	2.50" (6.4 cm)	300 psi (2,050 kPa)	250' (75 m)
T5110	Teflon	1100 & 1200 series	1/4" (6 mm)	1/2" (13 mm)	3" (7.6 cm)	240 psi (1,650 kPa)	250' (75 m)
T5610	Teflon	1500 series	1/2" (13 mm)	3/4" (19 mm)	9" (23 cm)	150 psi (1,050 kPa)	250' (75 m)
PT5200	Teflon-Lined PE	1100 & 1200 series	1/4" (6 mm)	1/4" (6 mm)	1" (2.5 cm)	300 psi (2,050 kPa)	250' (75 m)
PT5000	Teflon-Lined PE	T1300	1/4" (6 mm)	3/8" (9 mm)	1.25" (3.2 cm)	300 psi (2,050 kPa)	250' (75 m)
PT5100	Teflon-Lined PE	1100 & 1200 series	1/4" (6 mm)	1/2" (13 mm)	2.50" (6.4 cm)	200 psi (1,400 kPa)	250' (75 m)
PT5610	Teflon-Lined PE	1500 series	1/2" (13 mm)	3/4" (19 mm)	4" (10 cm)	150 psi (1,050 kPa)	250' (75 m)

INDIVIDUAL TUBING SPECIFICATIONS

MODEL NO.	MATERIAL	USE CLAMP MODEL NO.‡	NOMINAL SIZE	ACTUAL O.D. / I.D.	BEND RADIUS	MAX. OPER. PRESSURE	MAX. CONT. LENGTH #
35715	Nylon 12	35186	1/4" (6 mm)	.25 / .17" (6/4 mm)	7/8" (2.2 cm)	500 psi (3,450 kPa)	1500' (450 m)
35716	Nylon 12	35187	3/8" (9 mm)	.38 / .28" (9/7 mm)	1-1/8" (2.9 cm)	360 psi (2,500 kPa)	800' (240 m)
35097	Nylon 12	35209	1/2" (13 mm)	.50 / .38" (13/9 mm)	1-1/4" (3.2 cm)	385 psi (2,650 kPa)	400' (120 m)
35364	Nylon 12	36217	3/4" (19 mm)	.75 / .60" (19/15 mm)	4" (10 cm)	325 psi (2,250 kPa)	200' (60 m)
37014	Nylon 12	37032	1-1/4" (32 mm)	1.25 / 1.00" (32/25 mm)	10" (25 cm)	165 psi (1,150 kPa)	125' (38 m)
6200	Polyethylene	35186	1/4" (6 mm)	.25 / .17" (6/4 mm)	1" (2.5 cm)	300 psi (2,050 kPa)	1500' (450 m)
34115	Polyethylene	35187	3/8" (9 mm)	.38 / .25" (9/6 mm)	1-1/4" (3.2 cm)	300 psi (2,050 kPa)	500' (150 m)
34629	Polyethylene	35209	1/2" (13 mm)	.50 / .39" (13/10 mm)	2-1/2" (6.4 cm)	200 psi (1,400 kPa)	400' (120 m)
34819	Polyethylene	36217	3/4" (19 mm)	.75 / .63" (19/16 mm)	4" (10 cm)	150 psi (1,050 kPa)	200' (60 m)
6220	Teflon	35186	1/4" (6 mm)	.25 / .17" (6/4 mm)	1-1/2" (3.8 cm)	300 psi (2,050 kPa)	1500' (450 m)
34156	Teflon	35187	3/8" (9 mm)	.38 / .25" (9/6 mm)	2-1/2" (6.4 cm)	300 psi (2,050 kPa)	500' (150 m)
34159	Teflon	35209	1/2" (13 mm)	.50 / .39" (13/10 mm)	3" (7.6 cm)	200 psi (1,400 kPa)	400' (120 m)
35091	Teflon	36217	3/4" (19 mm)	.75 / .63" (19/16 mm)	9" (23 cm)	150 psi (1,050 kPa)	200' (60 m)
35409	Teflon-Lined PE	35186	1/4" (6 mm)	.25 / .17" (6/4 mm)	1" (2.5 cm)	300 psi (2,050 kPa)	250' (75 m)
35374	Teflon-Lined PE	35187	3/8" (9 mm)	.38 / .25" (9/6 mm)	1-1/4" (3.2 cm)	300 psi (2,050 kPa)	250' (75 m)
34501	Teflon-Lined PE	35209	1/2" (13 mm)	.50 / .38" (13/9 mm)	2-1/2" (6.4 cm)	200 psi (1,400 kPa)	250' (75 m)
35966	Teflon-Lined PE	36217	3/4" (19 mm)	.75 / .63" (19/16 mm)	4" (10 cm)	150 psi (1,050 kPa)	250' (75 m)

‡Clamp Tool, Model No. 35188 — tightens and removes all sizes of stainless steel crimp-type clamps.

#For longer continuous lengths in Jacketed, Twin, and Single tubing, consult QED.

NOTES: All sizes O.D. unless otherwise indicated. Couplers, elbows, tees, and other fittings available in a variety of sizes and materials; please inquire.

Wide Range, Small-Bore Electrodeless Conductivity Sensors

**ELECTRODELESS
CONDUCTIVITY**

Data Sheet 3600E/892
Supersedes 3600E/891

FEATURES

- Small size sensors, in four styles, simplify mounting and reduce costs
- Design eliminates electrode coating problems
- Inherent isolation prevents ground loops
- Polypropylene or PVDF wetted material provides excellent chemical resistance
- Measures from 0-200 to 0-1,000,000 $\mu\text{S}/\text{cm}$
- Automatic, 0-125°C temperature compensation



(from left to right) Convertible, Flange-Mount, Sanitary and Perlick Style Sensors

Introduction

GLI's wide range, small-bore electrodeless conductivity sensors eliminate polarization and coating problems — and the associated maintenance — common with conventional contacting electrode conductivity sensors. The measuring range of these electrodeless conductivity sensors extends from 0-200 microSiemens/cm up to 0-1,000,000 microSiemens/cm. Their small size makes mounting in small line sizes easy and economical.

All GLI electrodeless conductivity sensors have an integral temperature compensator to allow adjustment of the conductivity reading to a 25°C reference.

Single Wetted Material

To simplify chemical resistance problems, these sensors are constructed such that only one material is wetted by the process media. Polypropylene or PVDF material is offered for compatibility with a broad range of solutions. Because these wetted materials are non-conductive, the sensor is electrically isolated from the process fluid, eliminating ground loops which can affect measurement accuracy.

Sensor Styles and Mountings

The "convertible" style sensor may be attached to the end of a pipe for submersion mounting, threaded into a special bushing for pipe tee mounting or used with

special union-mount hardware. Flange or insertion mounting, via a tank fitting or ball valve assembly, is also possible.

The flange-mount style sensor features metal 5/8-11 UNC threads for fastening into any metal flange. A Viton O-ring provides a leakproof seal between the sensor and flange.

For dairy, food and beverage industry applications, the sanitary and Perlick clean-in-place style sensors are offered. The sanitary style sensor has an integral flange for mating to GLI's sanitary tee mounting hardware which includes a gasket (EPDM compound) and special cap. The gasket is also available separately for mounting to a 2-inch sanitary clamp-type ferrule or butt-weld tee. The Perlick style sensor is designed to mount into a Perlick sight-glass fitting. A steel backing plate behind the 3-1/2 inch diameter sensor flange provides an exceptionally strong mounting. Perlick style sensors are also available with smaller diameter flanges to fit smaller Perlick sight-glass fittings. Call for details.

Optional mounting hardware assemblies are offered in selected materials and include a junction box. Interconnect cable (p/n 99X1W1103) must be used for wire runs between the junction box and instrument. Any other type of cable will degrade measurement performance.



**GREAT LAKES
INSTRUMENTS**

Temperature/Pressure Considerations

The sensor and mounting hardware components used to install the sensor have independent ratings for temperature and pressure. However, the sensor and hardware combination acts as an integrated system and must be

considered as such when evaluating the application. The mounting hardware material typically limits the temperature and pressure rating of this unified system. Refer to the temperature versus pressure charts below to determine the appropriate sensor/hardware combination.

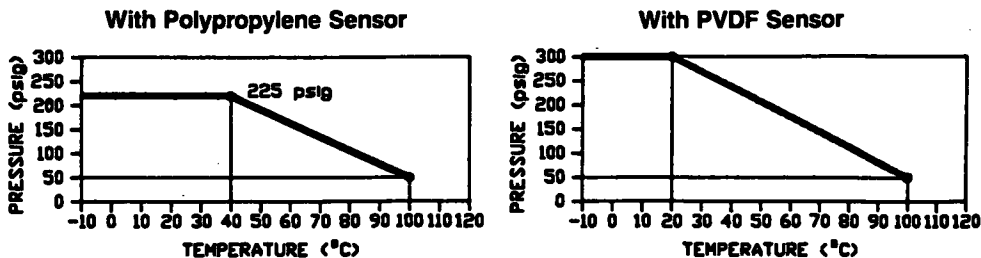
SPECIFICATIONS* (all sensor styles)

Wetted Materials	Polypropylene or PVDF
Measuring Range	From 0-200 up to 0-1,000,000 microSiemens/cm
Integral Cable	5 conductor (plus shield) with Teflon jacket - rated to 200°C; 4-1/2 ft. (1.4 m) standard length
Maximum Flow Rate	10 feet per second
Temperature Compensation	Automatic, 0-125°C (32-257°F)

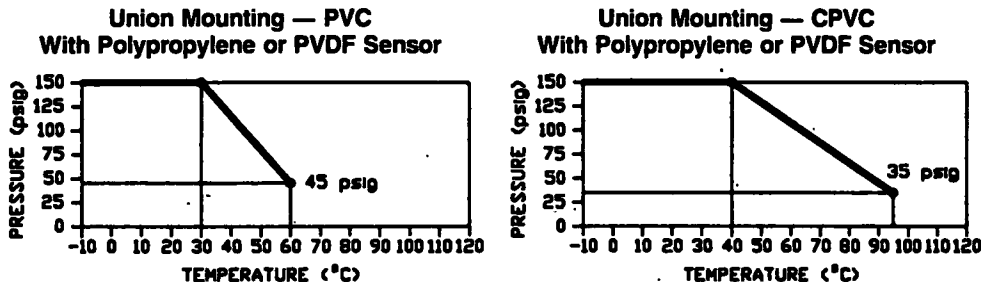
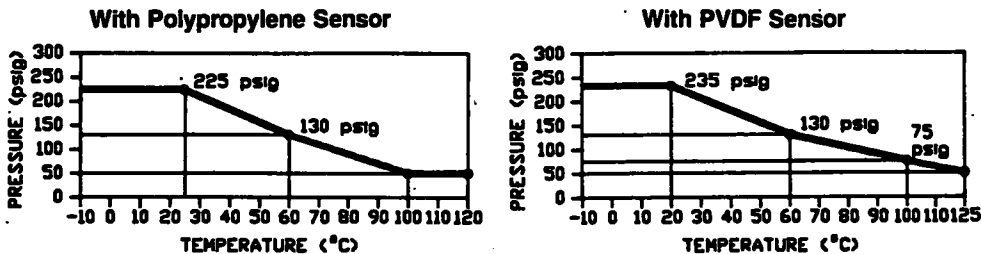
Temperature/Pressure Limits for GLI Sensor/Mounting Hardware Combinations:

NOTE: Ratings for these hardware materials are based upon water service. More severe service may require a correction factor.

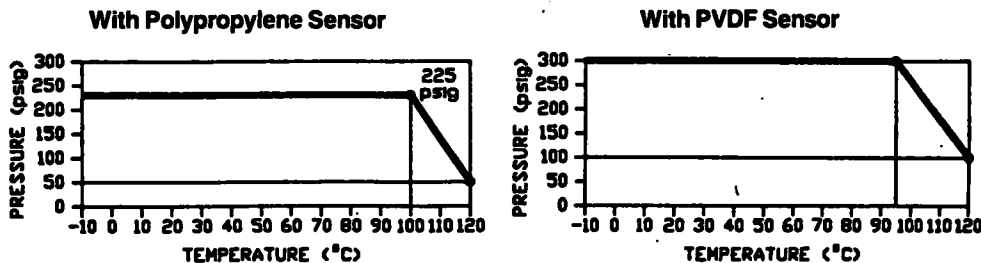
Submersion Mounting — CPVC



Submersion Mounting — PVDF



▲ Sanitary Mounting — 304 SS

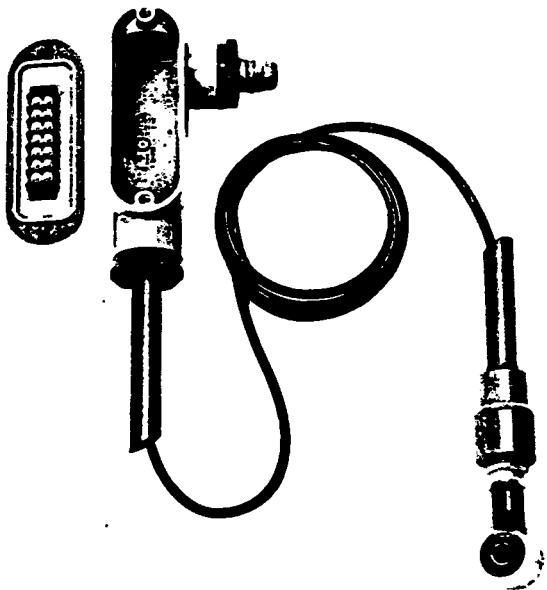


* Subject to change without notice.

▲ Ratings listed for sanitary mounting are based on MH048S8S hardware with 99X9H1132 sanitary clamp. Other hardware and clamp combinations may reduce the ratings shown.

MOUNTING HARDWARE ASSEMBLIES

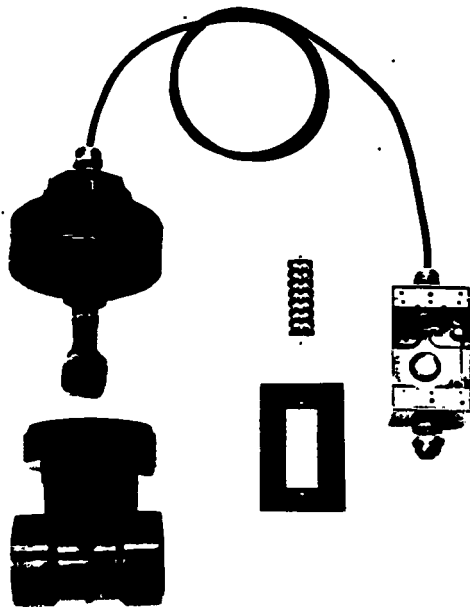
**Figure 1 — Submersion Mounting
w/Convertible Sensor**



Part No.	Description
MH432G	1/2" x 4' CPVC pipe and coupling with PVC pipe-mount junction box.
MH462G	1/2" x 4' PVDF pipe and coupling with PVC pipe-mount junction box.

NOTE: Sensor and interconnect cable are not included and must be ordered separately.

**Figure 2 — Union Mounting
w/Convertible Sensor**



Part No.	Description
MH578N3N	2" PVC tee w/union and aluminum junction box.
MH538N3N	2" CPVC tee w/union and aluminum junction box.

NOTE: Union-mount hardware includes Viton O-ring. Sensor and interconnect cable are not included and must be ordered separately.

ORDERING INFORMATION

— Sensors —

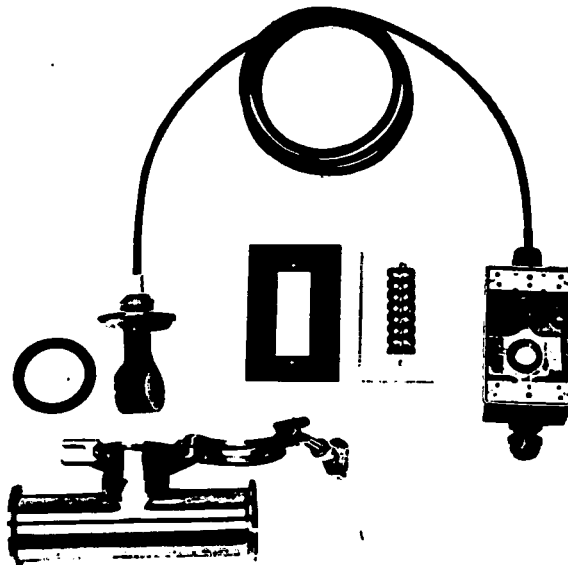
Product No.	Mounting Style	Wetted Material
3605E2T	Sanitary	Polypropylene
3606E2T	Sanitary	PVDF
3625E2T	Convertible	Polypropylene
3626E2T	Convertible	PVDF
3635E2T	Flange-mount	Polypropylene
3636E2T	Flange-mount	PVDF
3665E2T	Perlick	Polypropylene

NOTE: Standard cable length is 4-1/2 ft. To order sensors with 10 ft. cable, add "K" prefix to Product No. and specify K=10 ft. cable. For 20 ft. cable, specify "K" prefix to be 20 ft. cable.

— Accessories (ordered separately) —

- **99X1W1103 Interconnect Cable**
6 conductor (plus shield) cable must be used for wire runs between junction box and instrument. **NOTE** — Any other type of cable will degrade measurement performance. Typically, 50 ft. is recommended for each installation. Cable has PVC jacket rated to 105°C.
- **99X9H1132 Sanitary Clamp**
2-inch wing nut heavy duty clamp for use with MH048S8S sanitary mounting hardware.
- **70A3F1037-002 Spare Special Cap**
For use with sanitary sensor and MH048S8S hardware.
- **99X9H1327 Spare Sanitary Gasket**
EPDM compound gasket for sanitary installation.

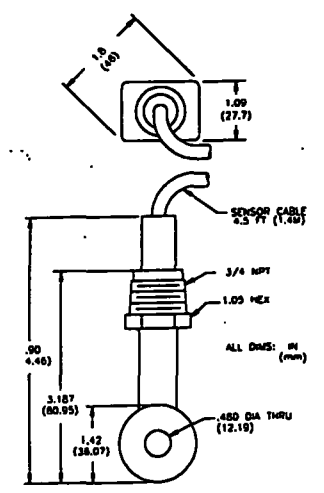
Figure 3 — Sanitary Mounting



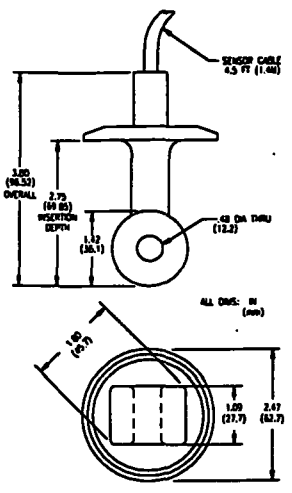
Part No.	Description
MH048S8S	2" sanitary tee (304 SS), special cap, gasket (EPDM compound) and aluminum junction box.

NOTE: Sensor, clamp and interconnect cable are not included and must be ordered separately.

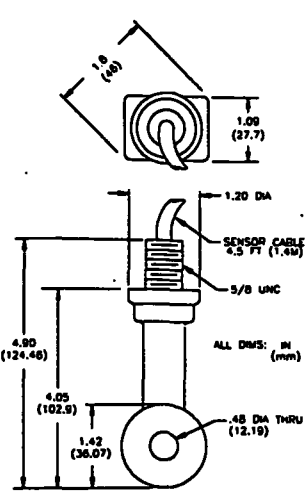
DIMENSIONS AND MOUNTING



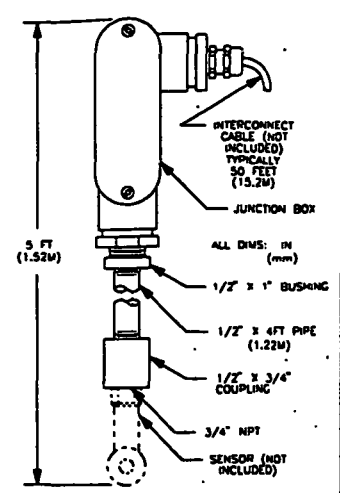
Convertible Style Sensor



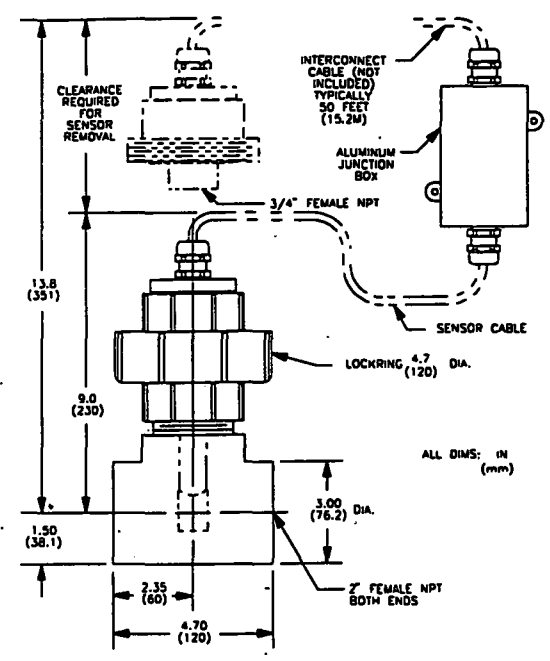
Sanitary Style Sensor



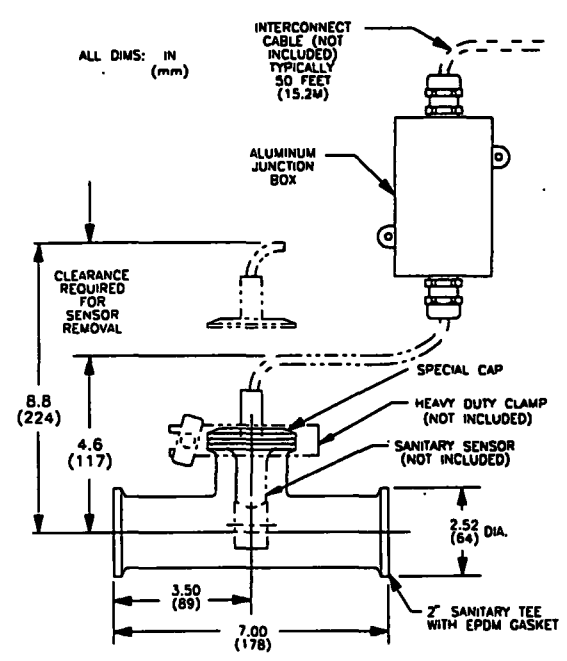
Flange Mount Style Sensor



Submersion Mounting Hardware



Union Mounting Hardware



Sanitary Mounting Hardware

Represented By:

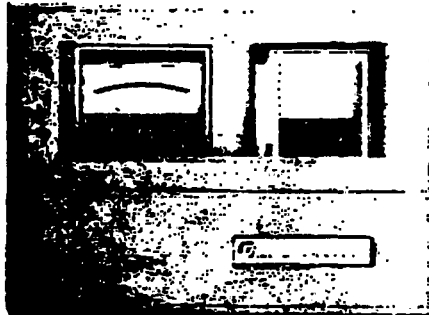
Great Lakes Instruments, Inc. Telephone (414) 355-3601
 8855 N. 55th Street Telefax (414) 355-8346
 Milwaukee, WI 53223



A Schott Group Company



MODEL 674 EFFLUENT MONITOR



FEATURES

- Packaged system for waste effluent and sewer discharge compliance
- Choice of pH, ORP or conductivity analyzer for measurement and control
- Compact, corrosion-resistant styrene case with weatherproof door
- Integral recorder for permanent strip chart records

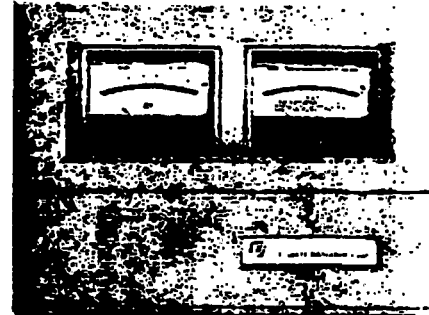
Description:

The Model 674 is a packaged system which combines a Model 671 pH, ORP or conductivity analyzer and a 2-1/4 inch. strip chart recorder in a NEMA 4X styrene enclosure. The recorder has an ON/OFF mode switch and is prewired to the analyzer. The 1671J dual system is similar to the 674 system except that a second Model 671 analyzer replaces the recorder. Any combination of pH, ORP and conductivity analyzers are available. Standard or special measuring scales can be ordered for each analyzer. The economical 674 system is ideal for waste effluent and sewer discharge compliance applications where a permanent record must be kept. Typical applications for Model 1671J systems include pH neutralization with downstream pH monitoring, ORP control with downstream conductivity control, chromium waste treatment (pH and ORP), and two-stage cyanide destruction (requires two 1671J systems of pH and ORP).

Model 671 pH and ORP analyzers may be used with a GLI 5-wire Differential Technique* sensor or a conventional combination electrode. The Model 671 conductivity analyzer accepts an additional sensor input so that a secondary or "back-up" sensor can be switched into operation should the primary sensor need servicing or replacement. Both conductivity sensors must have the same cell constant.

Each 671 analyzer has non-isolated 0-1 mA, 0-5 VDC and 4-20 mA outputs. Isolation for the 4-20

MODEL 1671J DUAL ANALYZERS



FEATURES

- Ideal for ON/OFF control neutralization followed by an effluent monitor
- Mix or match pH, ORP and conductivity analyzers to suit application needs
- Independent outputs for control and recording
- Universal mounting

mA output is optional. Each analyzer has a range expand feature to allow the 4-20 mA output to represent a segment of the measuring scale span. The pH and ORP analyzers are equipped to use the 4-20 mA output as a proportional controller for simple proportional control applications. A DIRECT/REVERSE jumper selects the direction of controller action to regulate a proportioning control valve or pump. In addition, the pH and ORP analyzers may be ordered with a pulsed, contact closure output instead of the 4-20 mA output for variable speed, pulse-driven pumps. A maximum of between 80 and 120 pulses per minute can be provided.

All of the analyzers have two relays. The control relay can be selected to operate in response to increasing or decreasing reading. An AUTO/OFF/MANUAL operating mode switch provides added control flexibility. The "dual alarm" relay has independent high and low alarm setpoint controls with fixed deadbands.

The 674 and 1671J systems are housed in a compact, corrosion-resistant styrene case. Its rugged construction provides substantial environmental protection for most mounting locations. The windowed access door is gasketed to provide a weatherproof seal. Two stainless steel brackets are included for panel, surface or pipe mounting.

*U.S. Patents 3709796 and 3962895

MODEL NUMBER
674 Analyzer and 2 1/2" strip chart recorder in NEMA 4X styrene enclosure with stainless steel mounting brackets

TYPE OF MEASUREMENT
P1 pH
R1 ORP (mV)
C1 Conductivity (microSiemens/cm)

ANALOG OUTPUT (Non-isolated 0-1 mA; 0-5 VDC plus):
C Non-isolated 4-20 mA
F Isolated 4-20 mA
P Pulsed, contact closure (specify maximum pulses per minute; 80 to 120) (Note A)

LINE VOLTAGE
1 115 volts, 60 Hz
2 230 volts, 50 Hz
3 115 volts, 50 Hz
4 230 volts, 60 Hz

RESERVED CATEGORIES

674 [] [] [] [] [] [] [] [] [] []

STANDARD MEASURING SCALES

pH	
0-10, 0-14, 2-12, 4-10 and 4-14	
ORP (mV)	
0-250, 0-500, 0-1000, (-)500 to (+)500 and (-)1000 to (+)1000	
CONDUCTIVITY (microSiemens/cm)	Sensor Cell Constant
0-10, 0-50, 0-100 and 0-200	0.05
0-500, 0-1000, 0-2000 and 0-5000	0.5
0-10,000, 0-20,000 and 0-50,000	10 G

Choose one from each category.

NOTE A: The pulse option "P" is available for pH and ORP only.

Product Number (Specify measuring scale from above)

MODEL NUMBER
1671J Dual 671 analyzers in NEMA 4X styrene enclosure with stainless steel mounting brackets.

LINE VOLTAGE
1 115 volts, 50/60 Hz
2 230 volts, 50/60 Hz.

FIRST ANALYZER TYPE OF MEASUREMENT
P pH R ORP (mV) C Conductivity (microSiemens/cm)

FIRST ANALYZER ANALOG OUTPUT (Non-isolated 0-1 mA and 0-5 VDC plus):
1 Non-isolated 4-20 mA
2 Isolated 4-20 mA
3 Pulsed, contact closure (specify maximum pulses/minute; 80 to 120) (Note A)

SECOND ANALYZER TYPE OF MEASUREMENT
P pH R ORP (mV) C Conductivity (microSiemens/cm)

SECOND ANALYZER ANALOG OUTPUT (Non-isolated 0-1 mA and 0-5 VDC plus):
1 Non-isolated 4-20 mA
2 Isolated 4-20 mA
3 Pulsed, contact closure (specify maximum pulses/minute; 80 to 120) (Note A)

RESERVED CATEGORY

1671J [] [] [] [] [] [] [] [] [] []

Choose one from each category.

NOTE A: The pulse option "3" is available for pH and ORP only.

Product Number (Specify measuring scale for each analyzer from above)

Accessories (ordered separately):

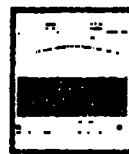
— For pH/ORP —

- 671-055 Interconnect Cable (spec. to data sheet S60PR, 6000PO, 6000OR, RTA SS, 6314 and 6323)
- 671-055 Interconnect Cable (spec. to data sheet S60PR, 6000PO, 6000OR, RTA SS, 6314 and 6323)

— For Conductivity —

- 671-055 Interconnect Cable (spec. to data sheet 30000)
- 671-055 Interconnect Cable (spec. to data sheet 30000)

INSTRUMENT CONFIGURATIONS



Model 674

Model 1671J

	pH/ORP	CONDUCTIVITY
OPERATIONAL:		
Display	3-1/2 inch analog meter	3-1/2 inch analog meter
Measuring Range	pH: 0-14, ORP: (-)1000 to (+)1000 mV	0-10 to 0-50,000 microSiemens/cm
Temperature Compensation	Automatic 0-100°C (32-212°F) or fixed	Automatic 0-100°C (32-212°F), Fixed at 2% per °C
Sensor-to-Analyzer Distance	3000 feet max. for GLI 5-wire Differential Technique sensor; 10 feet max. for direct connection of conventional combination electrode (Model 714 preamp is required for distances greater than 10 feet).	300 feet maximum
Ambient Conditions	-30 to 50°C (-22 to 122°F), 0 to 100% R.H. non-condensing	
Relay Function:		
Control Setpoint	Continuously adjustable, 0-100% of full scale	
Control Deadband	Continuously adjustable, 0-15% of full scale	
Alarm Relay, Dual Setpoints	High and low, individually adjustable 0-100% of full scale	
Alarm Deadband	Fixed at 2% of measuring scale span	
Indicators	LED lights when respective relay turns on	
Contact Rating	SPDT, 5A 115/250 VAC, 5A @ 30 VDC resistive	

NOTE: Control relay turns on in response to increasing or decreasing reading, switch selectable.

Proportional Controller (For pH only):

Setpoint	Anywhere on scale
Proportional Gain	1 to 10
Controller Output (uses analog output)	Current: 4-20 mA, 825 ohms max. load (575 ohms when isolated)
	-or-
	Pulsed: Dry contact closure, 80 to 120 pulses/minute maximum (set to 100 unless specified), 50 milli-second contact closure, pulse frequency is proportional to 0-100% of the controller output. Contact rating is 200 VDC, 1/2 amp. DC, 10 W max.

Power Requirements 98-132 VAC, 50/60 Hz (less than 5 VA), optional 195-265 VAC, 50/60 Hz, connections via terminal strip

Analog Outputs: Standard Non-expandable and non-isolated*: 0-1 mA, 100 ohms maximum load
 -or-
 0-5 VDC, 500K ohms minimum load

Optional Expandable and non-isolated*: 4-20 mA, 825 ohms maximum load.
 Isolation* for expandable 4-20 mA output only, 575 ohms maximum load

Range Expand - The 4-20 mA output can be made to represent a selected segment of the display scale. This segment cannot be smaller than 10% of the measuring scale span, but may be positioned anywhere within that span.

* Non-isolated outputs are isolated from ground and line power, but not from the input or each other. The isolated output is isolated from the input, ground, line power and all other outputs.

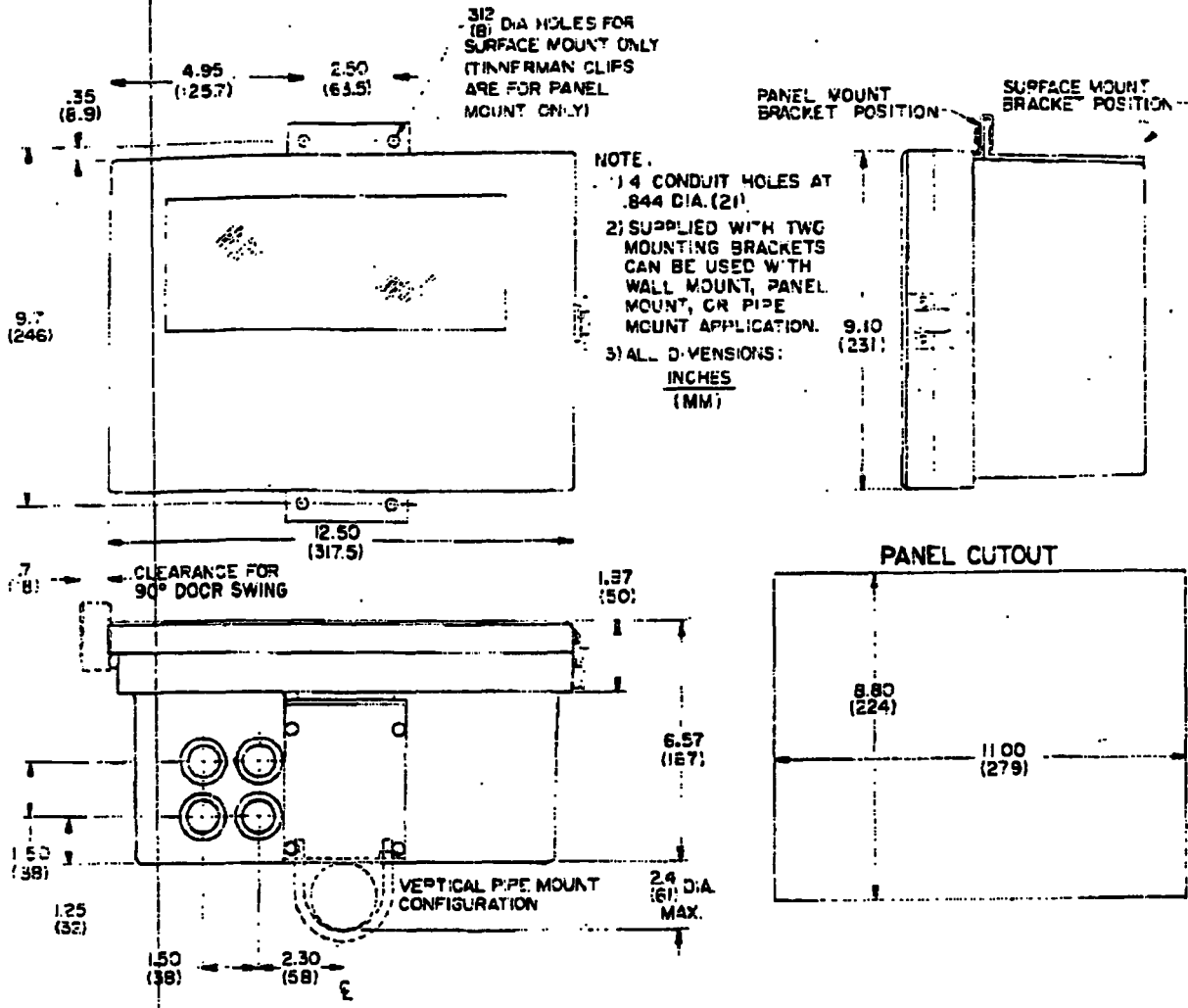
ANALYZER PERFORMANCE (Electrical, Analog Outputs):

Sensitivity	0.1% of span
Stability	0.1% of span per 24 hrs., non-cumulative
Repeatability	0.1% of span
Response Time	3 seconds to 90% of value upon step change
Non-Linearity	0.05% of span
Temperature Drift	Zero: 0.01% of span per °C Span: 0.015% of span per °C
	0.5% of span Zero: 0.02% of span per °C Span: 0.02% of span per °C

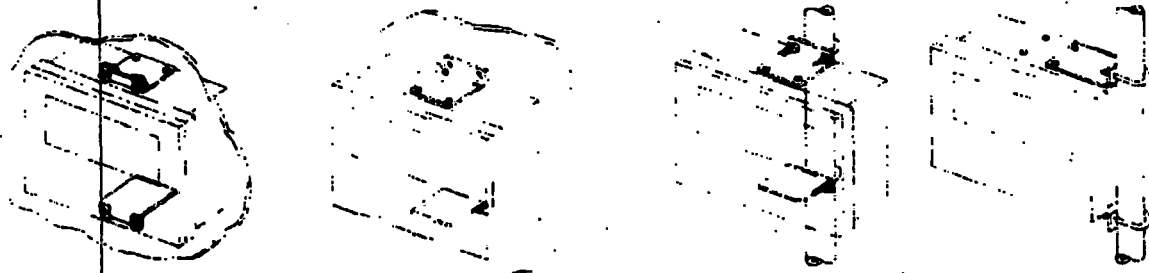
MECHANICAL:

Enclosure	NEMA 4X, styrene structural foam (with flame retardant additive) and two stainless steel mounting brackets
Mounting Configurations	Surface, panel and pipe mount
Net Weight	12 lbs. (5.5 kg)

DIMENSIONS AND MOUNTING



Mounting Configurations



Panel-Mount
(tinnerman nuts included)

Surface-Mount

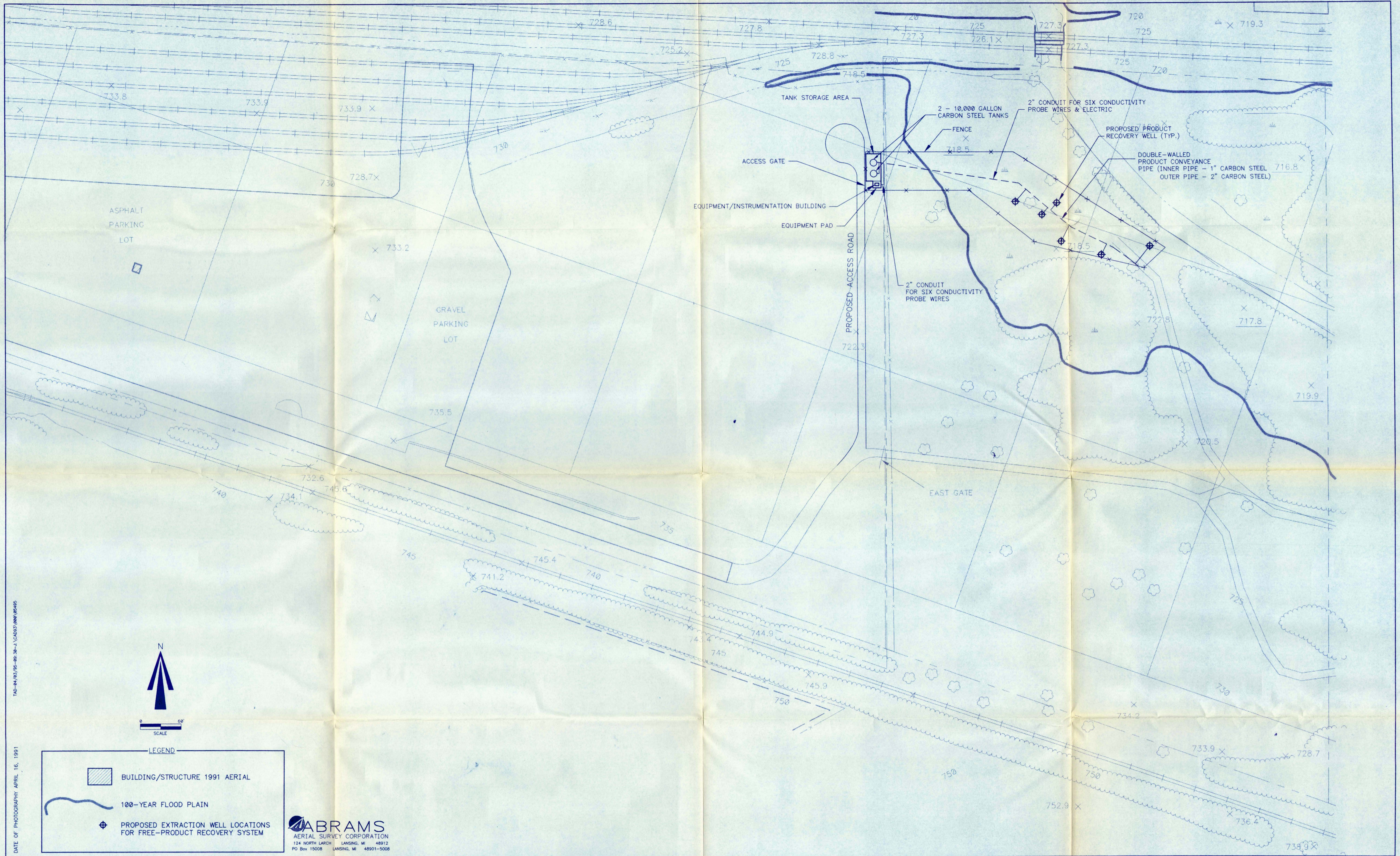
Pipe-Mount
(U-bolts not included)

GREAT LAKES INSTRUMENTS, INC.

8855 NORTH 55TH STREET P.O. BOX 23058
 MILWAUKEE, WISCONSIN 53223
 (414) 355-3801 • Telex 26-9885 • Telefax (414) 355-8346

Represented by:

DRAWINGS



LEGEND

	BUILDING/STRUCTURE 1991 AERIAL
	100-YEAR FLOOD PLAIN
	PROPOSED EXTRACTION WELL LOCATIONS FOR FREE-PRODUCT RECOVERY SYSTEM

ABRAMS
 AERIAL SURVEY CORPORATION
 124 NORTH LARCH LANSING, MI 48912
 PO Box 15008 LANSING, MI 48901-5008

TAD-04/03/95-02-30-3 \CAD03\000\06495
 DATE OF PHOTOGRAPHY APRIL 16, 1991

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION

MOSS - AMERICAN SITE
 Milwaukee, Wisconsin

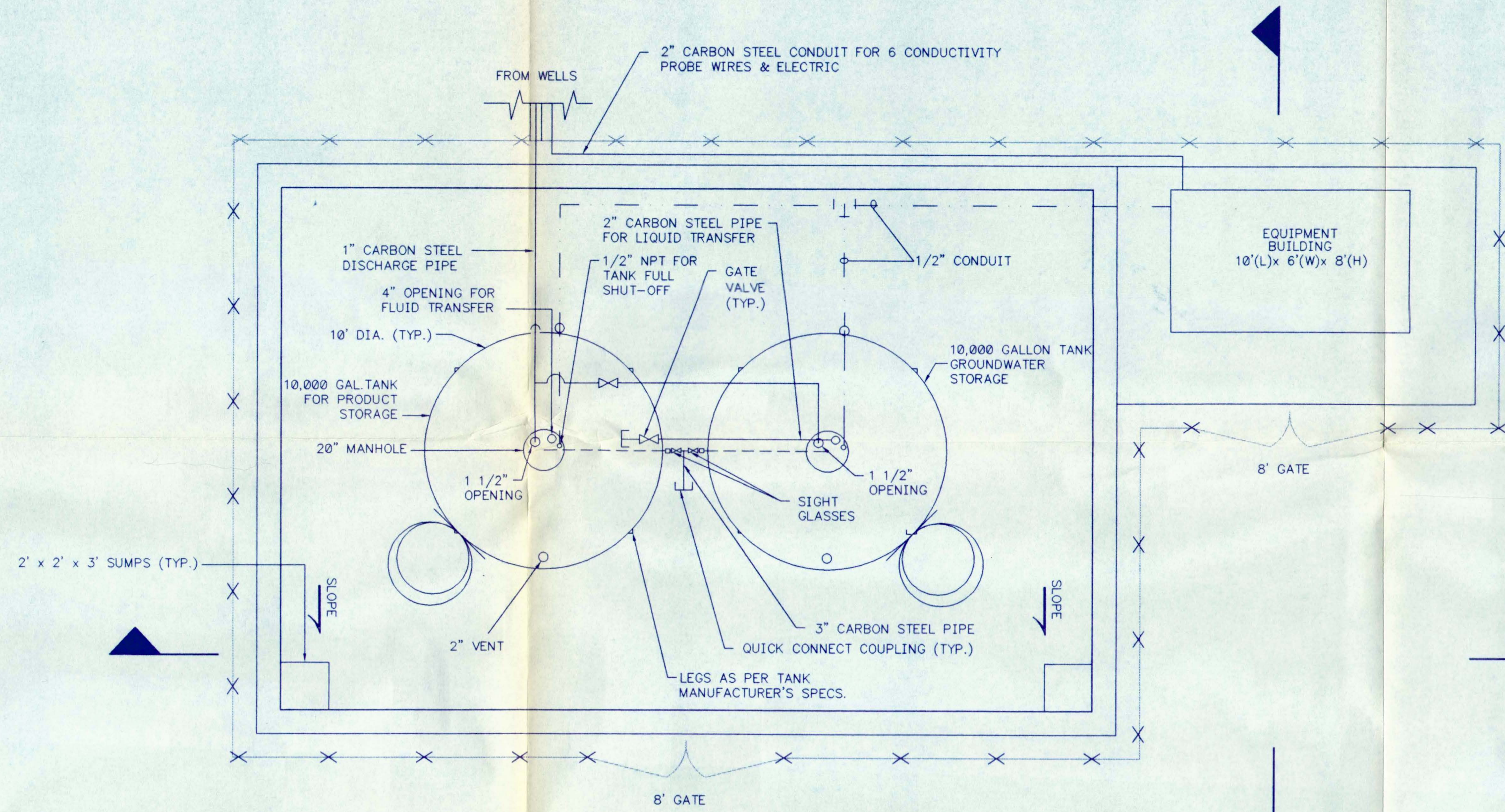


CHECKED	DATE	CLIENT APPROVALS	DATE
DES. ENG.			
PRGM. ENG.			
PROJ. MGR.			
APPROVED			
APPROVED		ISSUED FOR	DATE

SITE LAYOUT			
FREE PRODUCT RECOVERY AND REMOVAL SYSTEM			
DRAWN	R.J.B.	DATE	01 APR 95
DWG. NO.	1		REV. NO.
SCALE	1" = 60'	W.O. NO.	02687007002008000
SHT.	1	OF	3

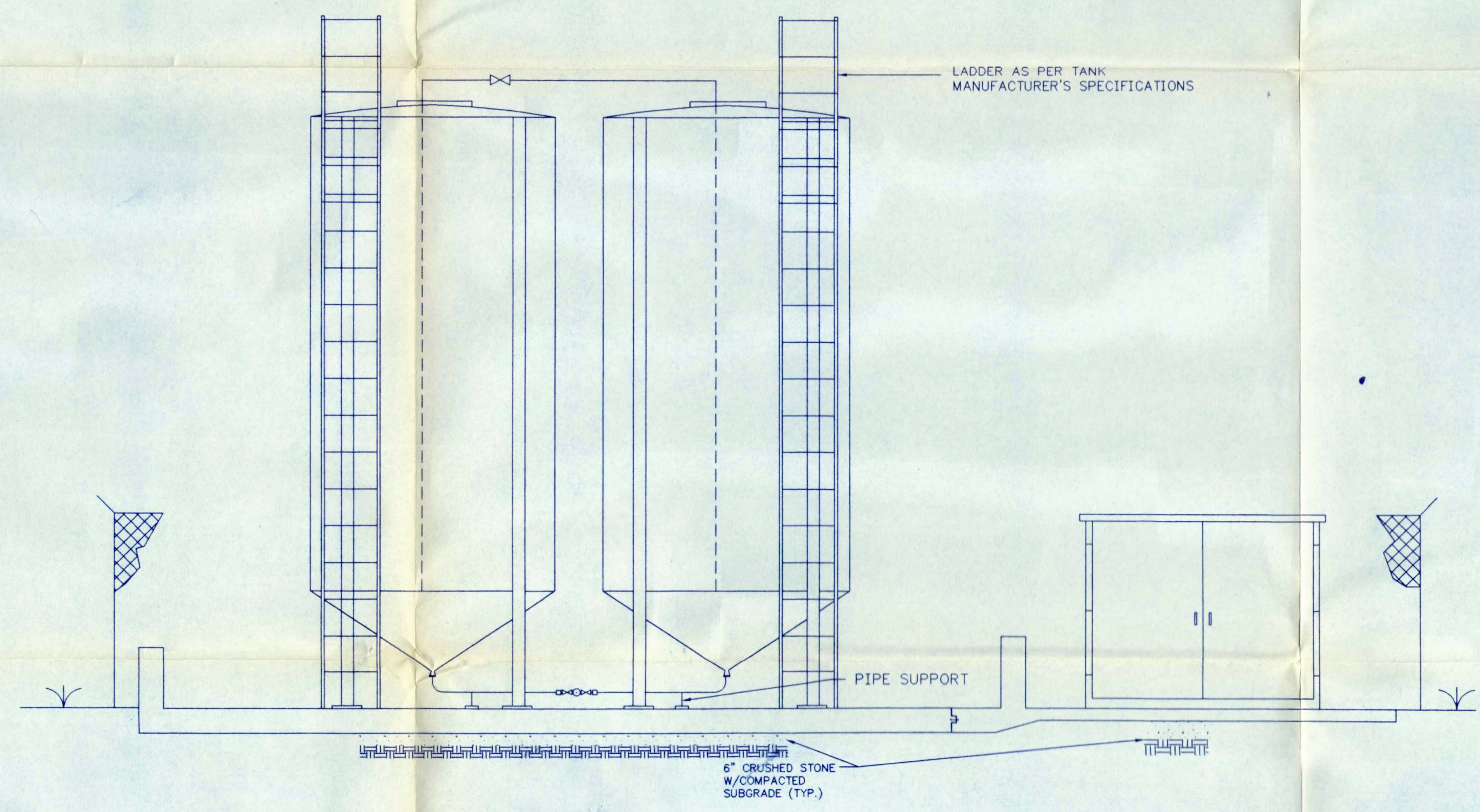
WEST CHESTER

PENNSYLVANIA

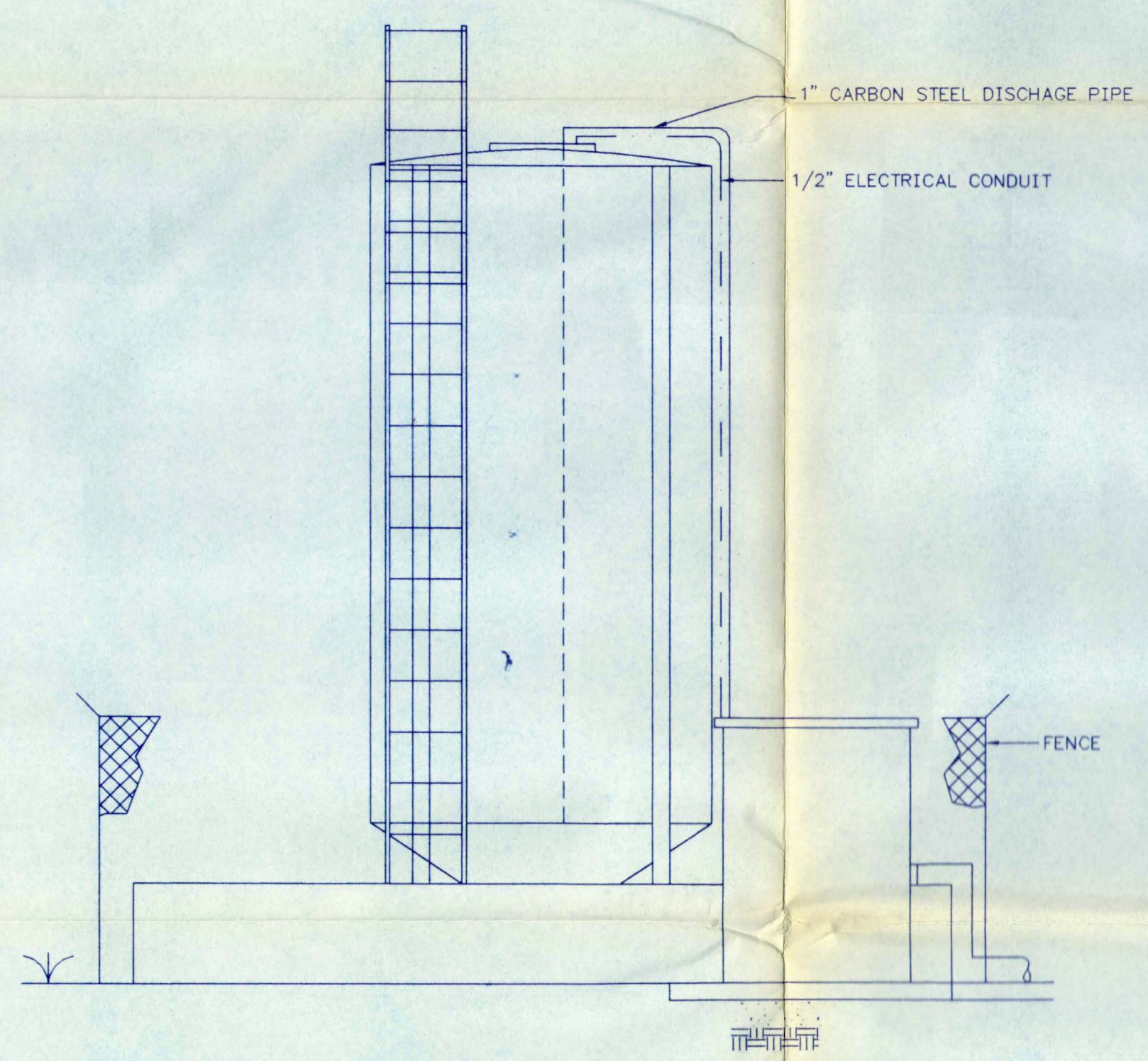


STORAGE TANK AND EQUIPMENT - PLAN VIEW

1/4" = 1'-0"
NOTE: SEE SHEET 3 FOR STRUCTURAL DETAILS OF CONCRETE SLAB



SECTION A
1/4" = 1'-0"



SECTION B
1/4" = 1'-0"

T:\04-03\75-09-11-1\CAD\3\DWG\0275

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION

MOSS - AMERICAN SITE
Milwaukee, Wisconsin

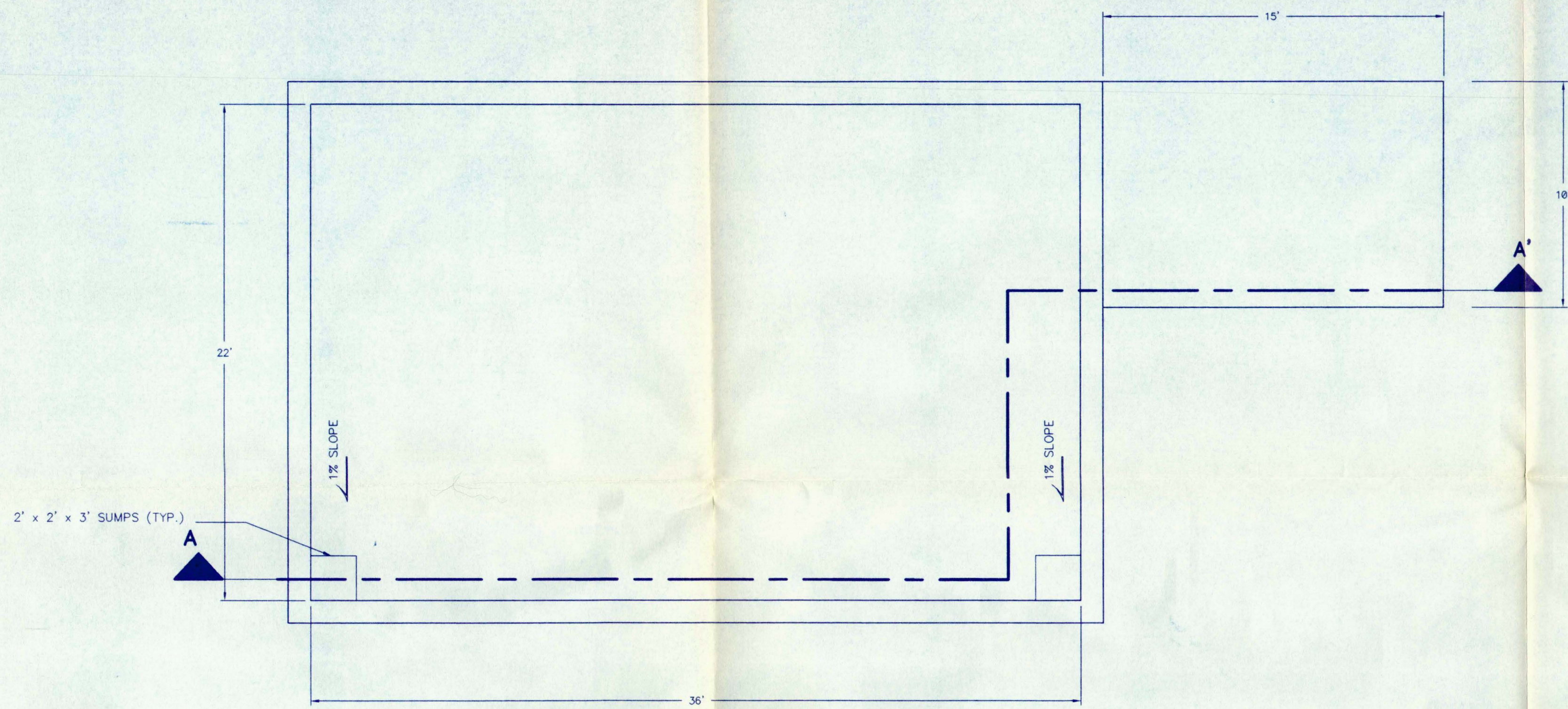
WESTON
MANAGERS DESIGNERS/CONSULTANTS

ILLINOIS

CHECKED	DATE	CLIENT APPROVALS	DATE
DES. ENG.			
PROJ. ENG.			
PROJ. MGR.			
APPROVED			
APPROVED		ISSUED FOR	DATE

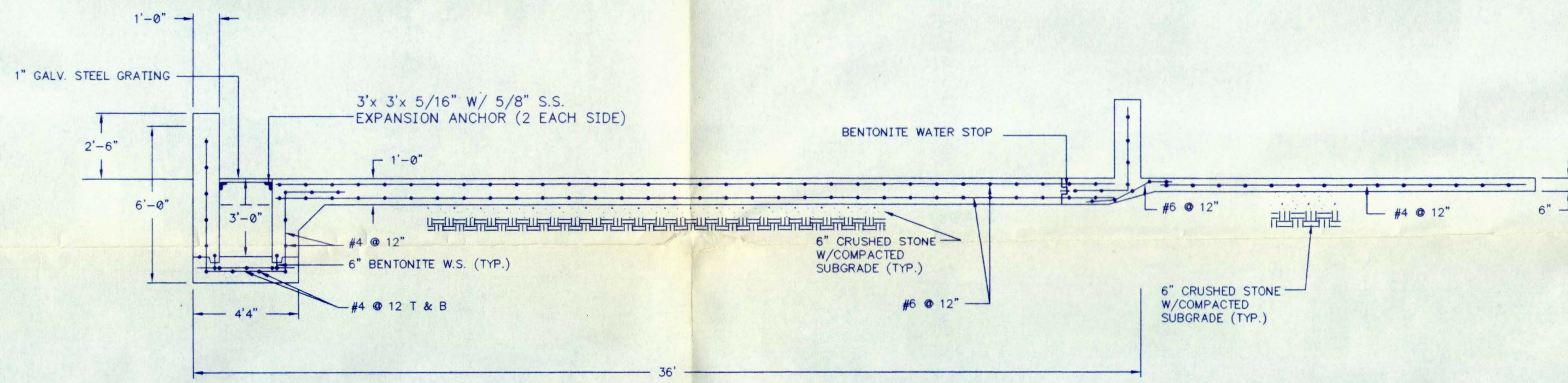
EQUIPMENT AND PIPING PLAN AND SECTION
FREE PRODUCT RECOVERY SYSTEM AND REMOVAL SYSTEM

DRAWN R.J.B.	DATE 01 APR 95	DWG. NO. 2	REV. NO.
SCALE 1/4" = 1'-0"	W.O. NO. 02687007002008000	SHT. 2	OF 3



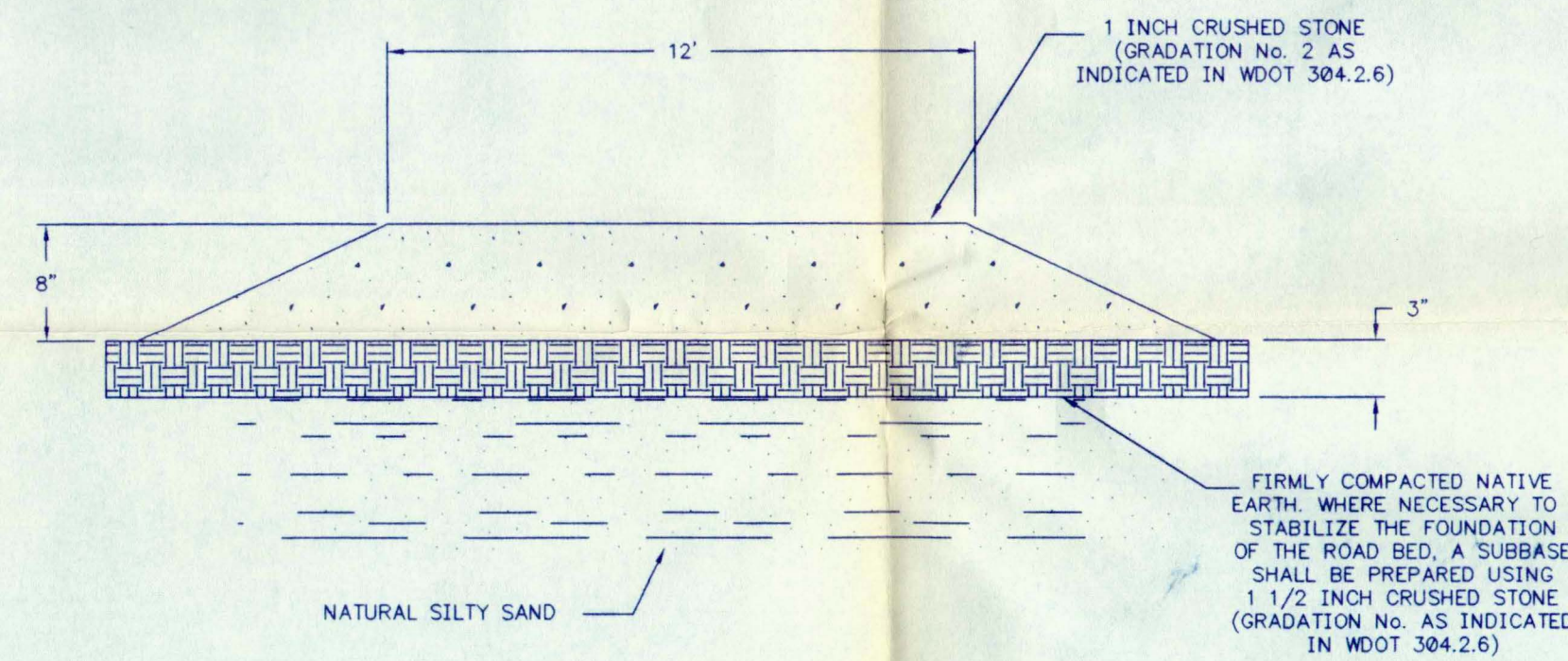
STORAGE TANK AND EQUIPMENT PAD - PLAN VIEW

1/4" = 1'-0"



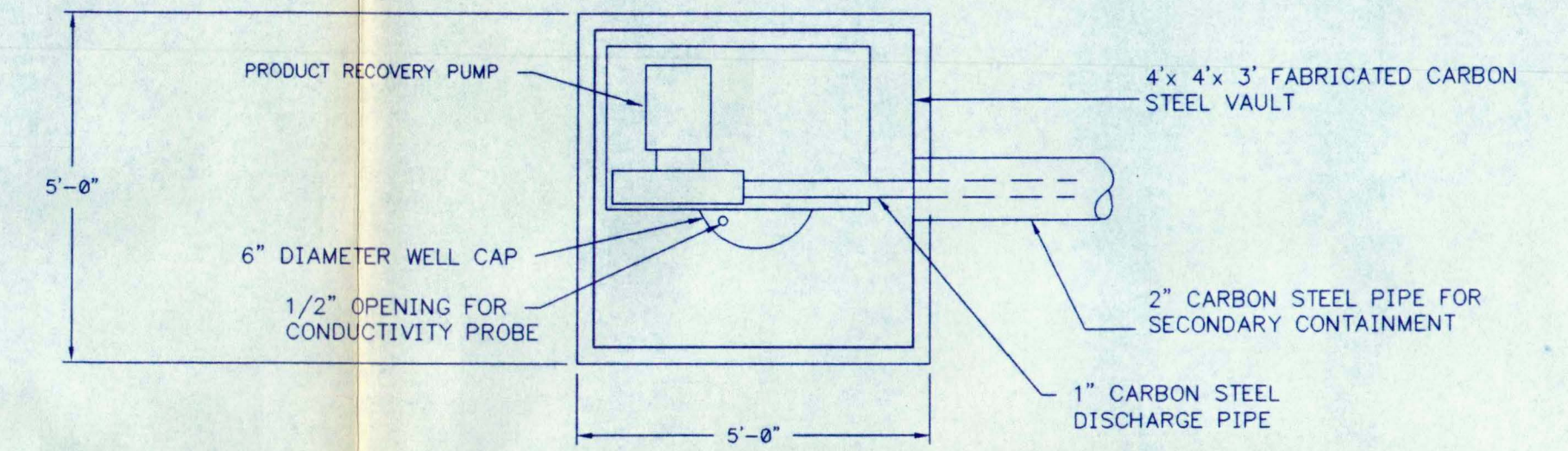
SECTION A - A'
TANK COMPRESSOR BUILDING AND
SECONDARY CONTAINMENT/FOUNDATION DETAIL

1/4" = 1'-0"



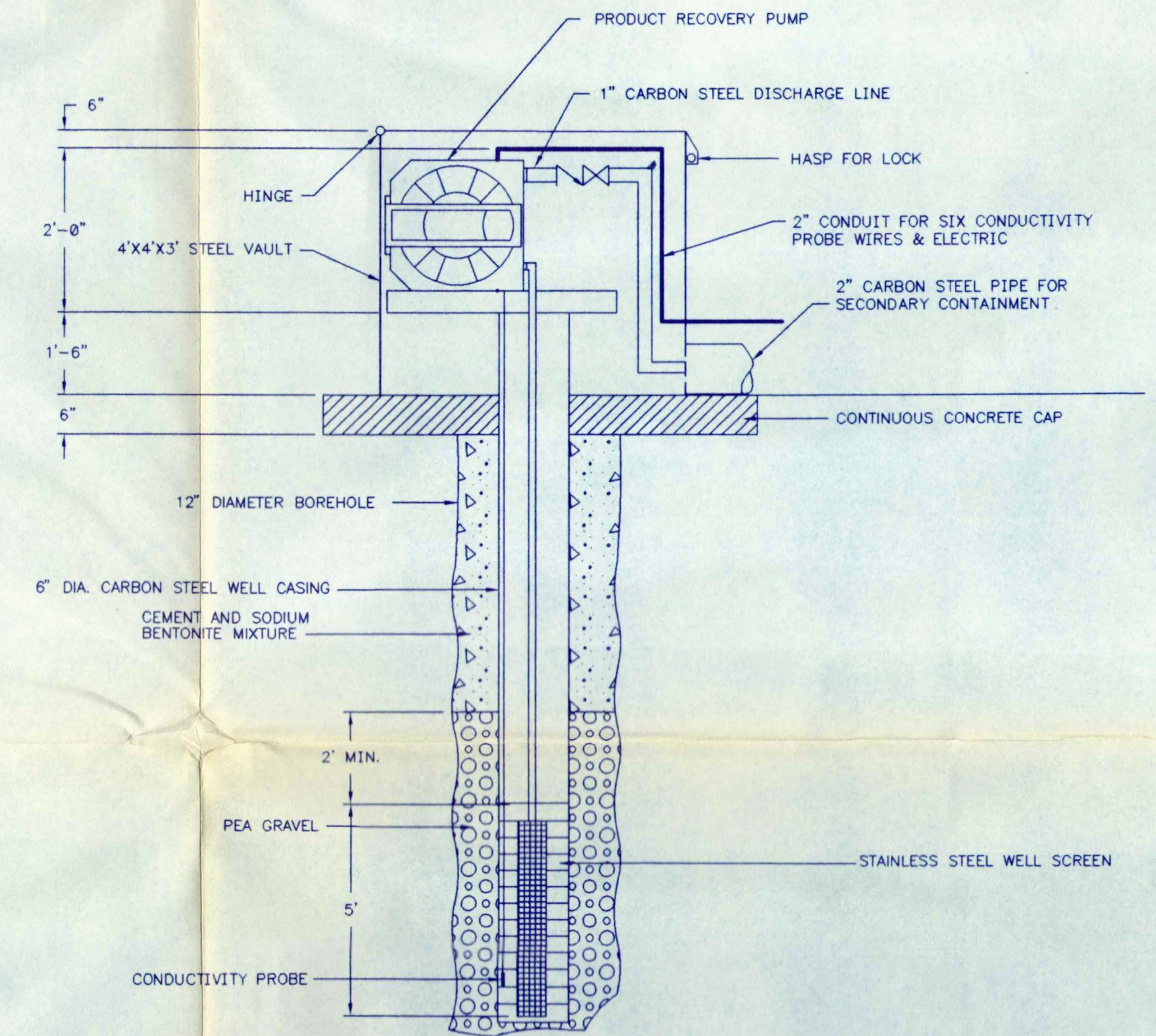
ACCESS ROAD DETAIL

N.T.S.



WELL HEAD PROTECTION - PLAN VIEW

N.T.S.



PRODUCT RECOVERY WELL CROSS-SECTION

N.T.S.

NOTES:

CONCRETE:

1. CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3,000 PSI.
2. ALL REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM A-615, GRADE 60.
3. ALL REINFORCING STEEL SHALL BE DOWELED INTO SLABS AND WALLS, AND SHALL HAVE A MINIMUM EMBEDMENT OF 36 DIAMETERS.
4. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4" X 3/4" WITH MILLED CHAMFER STRIPS.
5. WATERSTOPS SHALL BE 6" BENTONITE.
6. ALL EXPOSED CONCRETE SHALL BE PAINTED WITH ACID RESISTANT EPOXY COATING.
7. MINIMUM REINFORCING COVER SHALL BE 2" FOR FORMED SURFACES UNLESS OTHERWISE SPECIFIED.
8. REINFORCING AT SURFACES POURED AGAINST SOIL AS A FORM, SHALL HAVE 3" COVER.

TAD-04/03/95-09-28-1-CAD03 (REV) 04/95

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION

MOSS - AMERICAN SITE
Milwaukee, Wisconsin

WESTON
MANAGERS DESIGNERS/CONSULTANTS

ILLINOIS

CHECKED	DATE	CLIENT APPROVALS	DATE
DES. ENG.			
PROJ. ENG.			
PROJ. MGR.			
APPROVED			
APPROVED		ISSUED FOR	DATE

DETAILS
FREE PRODUCT RECOVERY
AND REMOVAL SYSTEM

DRAWN	R.J.B.	DATE	01 APR 95	DWG. NO.	3	REV. NO.	
SCALE	AS NOTED	W.O. NO.	02687007002008000	SHT	3	OF	3