Clean Harbors Environmental Services, LLC
Lone Mountain Facility
Waynoka, Oklahoma

RCRA/HSWA Permit Renewal Application

Volume 8

October 1, 2020

VOLUME 8

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SECTION FT2

ASSESSMENT
Of
EVAPORATOR FLASH TANK NO. 2
(FT 2)
Located At The
LONE MOUNTAIN HAZARDOUS WASTE FACILITY
WAYNOKA, OKLAHOMA

PREPARED FOR

safety-kleen ®

July 2002

ENVIROTECH
ENGINEERING & CONSULTING, INC.
C.A. 1960–Expiration Date 06/30/03

2500 North Eleventh Street ■ Post Office Box 6029 ■ Enid, Oklahoma 73702 ■ (580) 234-8780 ■ Fax (580) 237-4302

02-054

ASSESSMENT
Of
EVAPORATOR FLASH TANK NO. 2 (FT 2)
Located At The
LONE MOUNTAIN HAZARDOUS WASTE FACILITY
WAYNOKA, OKLAHOMA
Prepared For
SAFETY-KLEEN, INC.

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Of
EVAPORATOR FLASH TANK NO. 2 (FT 2)
Located At The
LONE MOUNTAIN HAZARDOUS WASTE FACILITY
WAYNOKA, OKLAHOMA
Prepared For
SAFETY-KLEEN, INC.

1. TANK SYSTEM DESCRIPTION

Evaporator Flash Tank No. 2 (FT 2) is a welded, above-ground wastewater treatment and storage tank to be installed as a part of the final wastewater treatment plant at the Lone Mountain Facility in Waynoka, Oklahoma. This tank is a replacement for an existing tank which is constructed of carbon steel. The new tank, which is constructed of stainless steel, is exactly the same size as the original tank. The top of the tank is completely open to the atmosphere for evaporation purposes. Evaporator Flash Tank No. 2 (FT 2) is located within the Wastewater Final Treatment building on the first mezzanine level of the support structure. The complete tank system consists of Evaporator Flash Tank No. 2 (FT 2), Circulating Pump (P 78), Heat Exchanger (EU 1), Pump (P 80), Filter Press (FP 1), and associated piping and instruments.

2. PRIMARY TANK VESSEL

2.1 **General Description.** Evaporator Flash Tank No. 2 (FT 2) is a circular steel tank with an outside diameter of 6-ft. 4-in. and a height of 31-ft. The tank proper's skirt is anchored to the support structure, and the bottom of the tank is dished and welded to the shell. A self-supporting flue is attached to the top of the tank. Evaporator Flash Tank No. 2 (FT 2) is being assessed to determine if the unit is adequately designed with sufficient structural strength and compatibility with the waste to be stored.

2.2 **Design Standards.** The tank is designed and constructed to those sections that are applicable in the American Petroleum Institute Standard 650, 10TH Edition (API-650). The manufacturer's certification is included in *Appendix A*.

2.3 **Hazardous Characteristics of Waste Stored.** The waste stored in this tank is treated and untreated brine solutions. The following parameters are characteristics of the waste treated:

Ignitability: Flash Point > 240° F

Corrosiveness: $6 < pH < 13$
$0 < N < 7$

Reactivity: None

Temperature: < 240° F

Based on the results of the examination of the hazardous characteristics of the waste to be stored in this tank, it was determined that the pH, normality levels, and salinity (corrosiveness) of the waste are the primary areas of concern. These levels are used to determine the applicability of a corrosion allowance for the tank material type and thickness.

2.4 Welding Specifications and Inspection. The welding procedures utilized in the tank construction and the Radiographic Examination Report are included in *Appendix B*.

2.5 Corrosion Protection. The tank shell is constructed of 316L stainless steel for corrosion protection.

2.6 Documented Age of Tank. This tank was manufactured by Lide Industries of Mexia, Texas, in January 2002, and installed in July 2002.

2.7 Results of Leak Tests. The manufacturer conducted a hydrostatic leak test of the tank prior to shipping. A description of this test is included in *Appendix C* of this assessment. In addition, a visual inspection was performed of the tank's interior and exterior subsequent to installation. This inspection was conducted specifically to detect the presence, if any, of the following defects:

(a) Weld break
(b) Punctures
(c) Cracks
(d) Corrosion
(e) Other structural damage or inadequacies of construction and/or installation

The tank was again hydrostatically tested subsequent to installation. A description of this procedure is summarized in *Appendix C* of this assessment. Based on the results of these tests, it was determined that the primary tank was not leaking.

2.8 Existing Data Obtained.

Tank Diameter	6-ft. 4-in.
Nominal Height of Tank	31-ft.
Maximum Capacity	3,785-gal.*
Overflow Liquid Level	9-ft. 1-in.
Overflow Volume	1,137-gal.
Design Specific Gravity	1.5
Maximum Bottom Pressure	10.8-psi
Maximum Operating Temperature	300° F
Construction Material:	
Flue	ASTM A36
Shell	ASTM 316L
Bottom	ASTM 316L
Skirt	ASTM A36
Flanges, Blinds, Coupler and Plugs	ASTM 316L
Bolts	SA 193-B7/SA 194-2H
Wall Thickness (Shell and Bottom)	0.250-in.
Operating Pressure	Atmospheric
Seismic Zone	1

* The maximum capacity of the assessed tank is the same as the original tank, however the original tank assessment indicates otherwise. There appears to have been an error in the original assessment's volume calculations.

2.9 Calculation of Existing Foundation Loading.

Total Weight of Tank and Contents (maximum volume) .... 59,406-lb.

Detailed calculations reflecting the volume and weight of the tank are included in *Appendix D* of this assessment.

2.10 Required Structural Calculation. Calculations for the required wall thickness for this tank are presented in *Appendix D* of this assessment. Metallurgical information on the materials used is included in *Appendix E* of this assessment. The minimum required thickness in accordance with API 650 is 0.1875-in. A corrosion allowance of 0.125 is provided for. The measured wall thickness is 0.25-in.

Design calculations for the support structure are included in *Appendix F* of this assessment. These calculations were completed in accordance with the BOCA National Building Code 1990 Edition and were part of a previous tank assessment prepared by Black and Veach. The structural support was inspected and no changes have been made since the date of the Black and Veach assessment.

Structural analysis of the foundation is included in *Appendix G* of this assessment.

2.11 Comparison of Actual to Theoretical Structural Values.

(a) *Wall Thickness Comparison:*

Calculated Required Wall Thickness (includes corrosion allowance) .... 0.156-in.
Minimum Required Wall Thickness by API 650 .... 0.1875-in.
Measured Wall Thickness .... 0.250-in.

(b) *Bottom Thickness Comparison:*

Calculated Required Bottom Thickness .... 0.151-in.
Minimum Required Bottom Thickness by API 650 .... 0.250-in.
Measured Bottom Thickness .... 0.250-in.

(c) *Foundation Integrity Comparison:*

Maximum Calculated Load (6-in. Slab) .... 17.6 Kips
Calculated Foundation Support (6-in. Slab) .... 26.7 Kips

Maximum Calculated Load (17-in. Slab) .... 62.9 Kips
Calculated Foundation Support (17-in. Slab) .... 127.7 Kips

2.12 Ancillary Equipment. The ancillary equipment for the Evaporator Flash Tank No. 2 (FT 2) system includes the following:

(a) *Circulating Pump (P 78).* A centrifugal pump designed to pump 800-GPM at 150-ft. of discharge head with a suction head of 11-ft.

(b) *Heat Exchanger (EU 1).* A plate and frame unit of stainless steel construction designed to operate at a pressure of 150-PSIG and a temperature of 300° F.

(c) *Pump (P 80).* A pneumatically-operated, double-diaphragm pump designed to pump from 100- to 0-GPM at head pressures varying from 0- to 100-PSIG, pumping fluid at a temperature up to 212° F.

(d) *Filter Press (FP 1).* A gasketed unit employing glass-filled polypropylene plates designed to operate at a temperature/pressure limit of 100-psi at 212° F.

(e) *Associated Piping, Valves, and Instruments.* All piping is Schedule 40 carbon steel fitted with 150-psi flanges. All piping with an inside diameter of 2-in. or smaller is socket-welded using, at minimum, 3,000-lb. connections. All piping with an inside diameter greater than 2-in. is butt-welded. All valves, fittings, and instruments are rated for 150-psi or higher.

Note: Items (a) - (c) are part of the tank system. However, no changes were made to them during the installation of the new FT 2 tank.

3. SECONDARY CONTAINMENT SYSTEM

3.1 **General Description of Secondary Containment.** The secondary containment system is designed and operated to prevent migration of wastes or liquids out of the system. Evaporator Flash Tank Nos. 1, 2 and 3, Evaporator Blowdown Tank No. 2, and Evaporator Feed Tank No. 4 are located on a reinforced concrete base floor area with vertical concrete sidewalls. This area is inspected daily on a routine basis.

At the time of inspection, the concrete area was withstanding daily operations and routine climatic conditions. No cracks from compression or uplift were visually apparent.

Any released tank contents are removed and pumped to an appropriate storage area within the maximum time allowed as a permit condition.

3.2 **Corrosion Protection.** There is an impermeable coating applied to the entire concrete floor and curbs. Detailed information on the coatings employed is included in *Appendix H* of this assessment.

3.3 **Documented Age of the Containment Area.** The concrete secondary containment system was constructed and installed in 1987.

3.4 **Results of Leak Tests.** A visual inspection of the containment area was conducted and no cracks or breaks in the impermeable coating were observed. Therefore, it appears to be adequate to contain any leaks or spills.

3.5 **Calculation of Capacity Available (CCA).**

Area 2,739-sf
Curb Height .... 0.25-ft.
Material .... Concrete
Gross Volume 685-cf

Note: See *Appendix I* for secondary containment.

3.6 **Required Volume.**

(a) *Containment Capacity Required (CCR):*

CCR = Volume of Largest Tank (Overflow Volume) in the Secondary Containment

Volume of Largest Tank = (FT1) 506.cf

3.7 **Comparison of Available Volume to Required Volume.**

(a) *Containment Capacity Available (CCA):*

Containment Capacity Required (CCR) 506-cf
Secondary Containment Volume Available 685-cf
Excess Containment Volume 179-cf

CCA > CCR Adequate Capacity (under normal operating conditions is available.)

Note: See *Appendix I* for secondary containment calculations.

4. CONCLUSIONS

The foundation and structural support for the Evaporator Flash Tank No. 2 (FT1) system have been previously analyzed, reviewed, and deemed to be adequately designed.

The Evaporator Flash Tank No. 2 (FT 2) system has sufficient structural strength, is compatible with the waste to be stored and treated, and has adequate corrosion protection to ensure that it will not collapse, rupture, or fail.

The Evaporator Flash Tank No. 2 (FT 2) system was inspected on July 18, 2002, for weld breaks, punctures, scrapes of protective coating, cracks, leaks, corrosion, and other structural damage or inadequacies of construction/ installation.

The Evaporator Flash Tank No. 2 (FT 2) equipment was hydrostatically tested on July 18, 2002, and it was determined that the tank does not leak.

The Secondary Containment for the Evaporator Flash Tank No. 2 (FT 2) system is of sufficient structural strength and volume to meet the requirements set forth in 40 CFR 264.193.

5. RECOMMENDATIONS

Due to a previous history with interior deterioration of the Evaporator Flash Tank No. 2 (FT 2), the following recommendations are suggested:

- ☐ Visual inspections of the tank interior subsequent to the initial 6-mo. of operation.
- ☐ Annual visual inspections of the tank interior subsequent to the initial 6-mo. inspection.
- ☐ Perform an ultrasonic survey of the tank shell subsequent to 5-yr. of operation to determine the average shell thickness.

6. CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision, in accordance with a system designed to ensure that qualified personnel properly collect and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for collecting the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

8/5/02

Rob L. Stallings, P.E.
Envirotech Engineering & Consulting, Inc.

C.A. 1960 - Expiration Date 06/30/03

APPENDIX A.

MANUFACTURER'S CERTIFICATION

SECTION 400
ASSESSMENT OF ROTARY DRUM FILTER SYSTEM
LONE MOUNTAIN HAZARDOUS WASTE FACILITY
USPCI
Waynoka, Oklahoma

A. TANK SYSTEM DESCRIPTION

The Rotary Drum Filter System is a dewatering unit located in the pre-treatment building of the Lone Mountain Hazardous Waste Facility. The system consists of a skid mounted pre-engineered unit supplied by Alar Engineering, Inc. of Mokena, IL and other additional tanks, pumps, and piping. The Rotary Drum Filter and its ancillary equipment are located together on two levels and within a concrete curbed containment area. The purpose of this system is to dewater sludge and compress it into filter cakes.

The tank system actually consists of three tanks or vessels which hold hazardous waste:

- Filter Pan
- Receiver Tank
- Recycled Water Tank

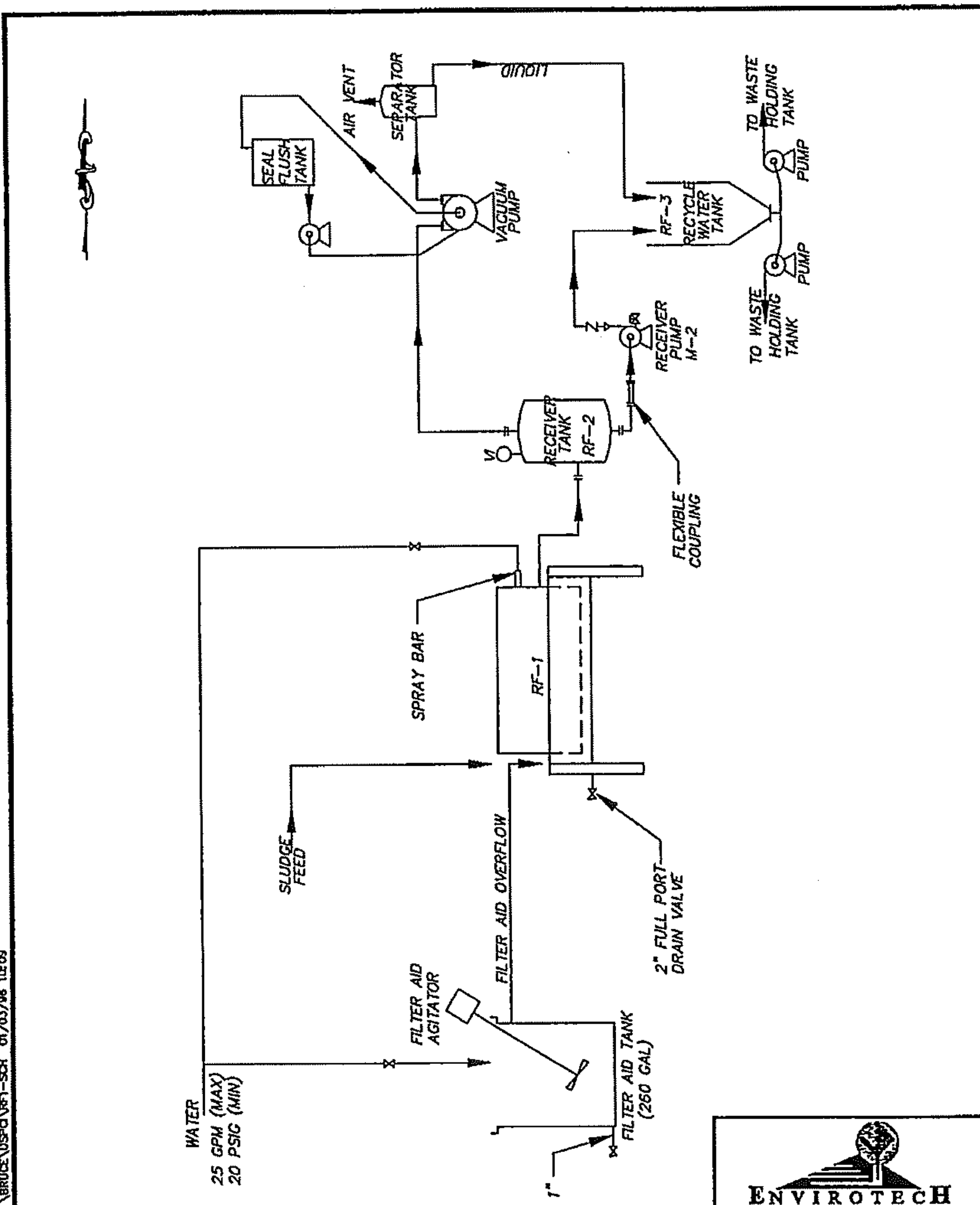
The function, design and construction of each of the three tanks will be described individually.

In addition to the three tanks mentioned, two other tanks (Seal Flush Tank and Recycled Water Tank) are part of the system; however, these tanks do not hold hazardous waste.

Filter Pan - RF-1

This is a horizontal, cylindrical tank with an open top and flat ends. The filter pan is part of the Alar system and is located on the upper level. The dimensions are 7-ft in length and 4.2-ft in width and 2-ft in depth at the deepest point. It houses the rotary drum filter. There are several pipe inlets located in this tank.

During start-up operations, a diatomaceous earth and water mixture is piped into the filter pan and the rotary drum filtration process is started. A vacuum is used to draw the diatomaceous earth mixture onto the polypropylene cloth-coated rotary drum. After a sufficient pre-coating is generated on the drum, a valve controlling the flow of the mixture is closed. Another valve is opened and hazardous waste is pumped into the filter pan. The waste is filtered through the drum in the same manner described for the diatomaceous earth and water mix. As the hazardous waste solids are built up on the drum, a knife blade is advanced and the semi-dry solids are removed and collected in a container for disposal.



ENVIROTECH

USPCI
LAIDLAW
ENVIRONMENTAL SERVICES INC.

LONE MOUNTAIN FACILITY

ROTARY DRUM FILTER SYSTEM ASSESSMENT

SCALE: N.T.S.

DWG. NO.

MANUFACTURER'S CERTIFICATION FOR A TANK BUILT TO API STANDARD 650

To Safety-Kleen Corp.(Lone Mountain Facility)
(name and address of purchaser)

Route 2 Box 170

Waynoka, TK 73860

We hereby certify that the tank constructed for you at Lide Industries, Inc.
(location)

Route 2, Box 159F

Mexia, TX 76667

and described as follows: Two 6'-4" O.D. x 20'-6" Tall Stainless Steel
(serial or contract number, diameter, height, capacity, floating or fixed roof)

Flash Tanks Serial #'s 1733 and 1734

meets all applicable requirements of API Standard 650, 10th Edition, ______ Revision, Appendix JM&S, dated ______, including the requirements for design, materials, fabrication, and erection.

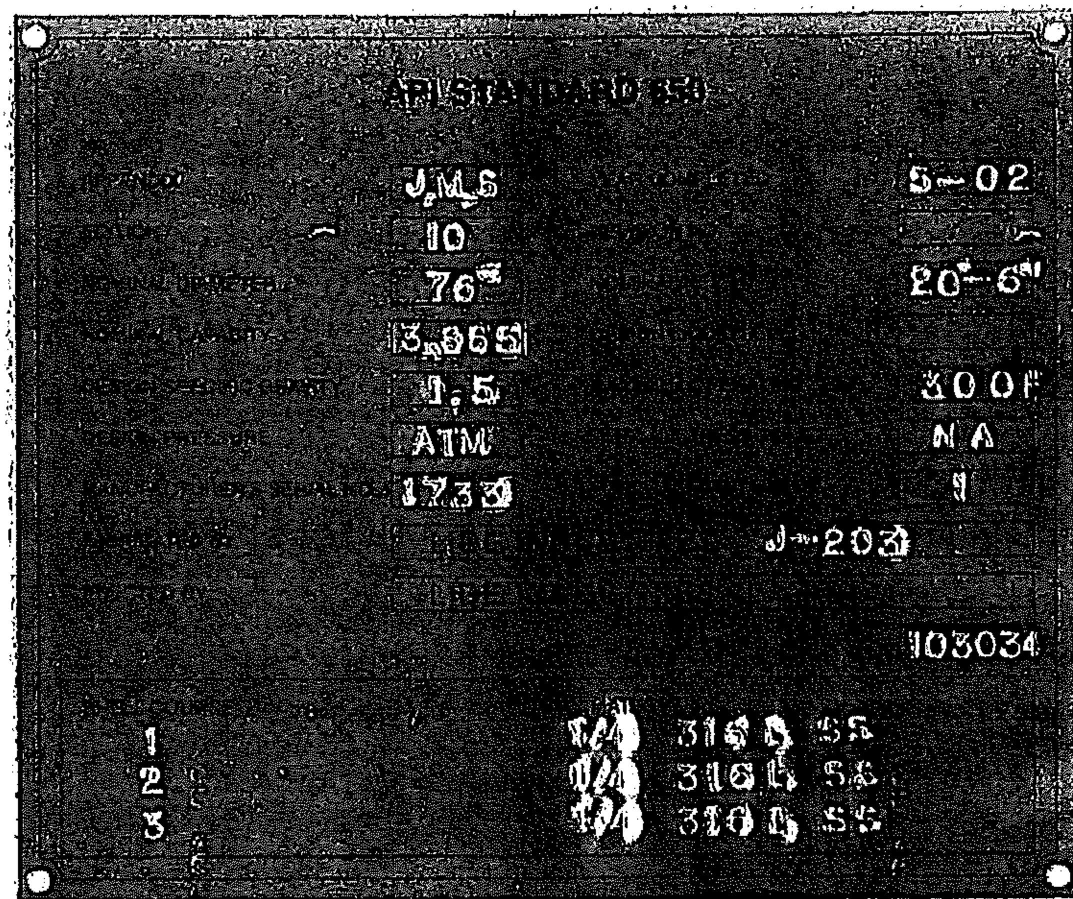
The tank is further described on the attached as-built data sheet dated 05/21/02.

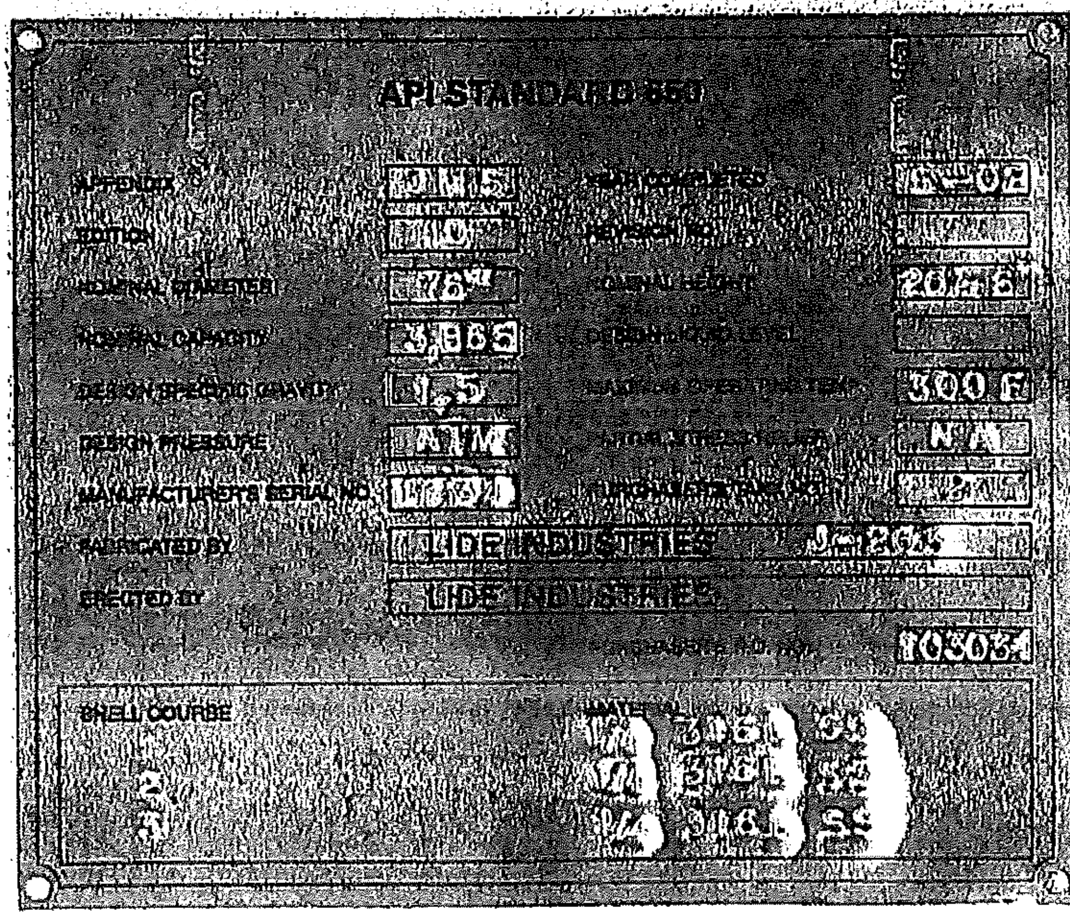
Lide Industries, Inc.
Manufacturer

Billy Lide BL
Authorized Representative

05/23/02
Date

Figure 8-2—Manufacturer's Certification Letter


API STANDARD 650
J,M,S
5-02
10
76'
20'-6"
1.5
300 F
ATM
N A
J-203
103034
1
2
3
316 L SS


API STANDARD 650
APPENDIX
J,M,S
EDITION
10
NOMINAL DIAMETER
76'
NOMINAL CAPACITY
3,865
DESIGN SPECIFIC GRAVITY
1.5
300 F
DESIGN PRESSURE
ATM
N A
MANUFACTURER'S SERIAL NO.
FABRICATED BY
LIDE INDUSTRIES
ERECTED BY
LIDE INDUSTRIES
103034
SHELL COURSE
316L SS

APPENDIX B.

WELDING PROCEDURES AND INSPECTIONS

ENVIROTECH
ENGINEERING & CONSULTING, INC.

Longview Inspection, Inc.
405 N. Eastman Road
Longview, TX 75601
903/753-2375

Longview Inspection

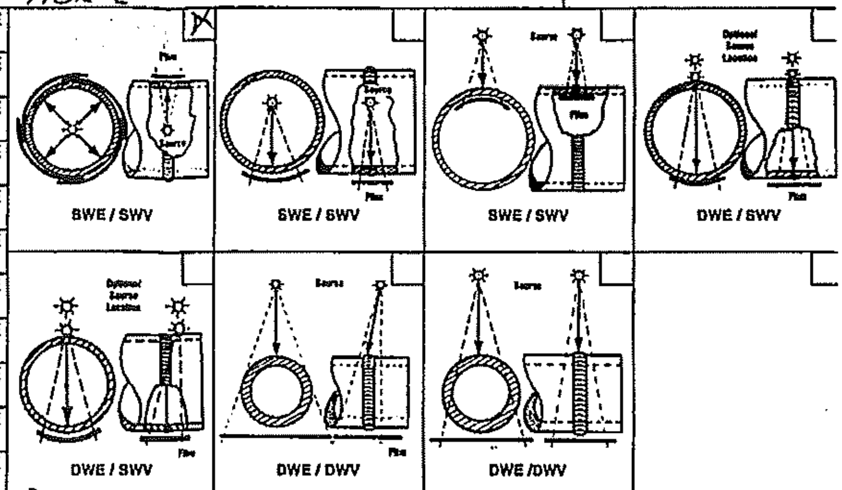
RADIOGRAPHIC EXAMINATION REPORT

Page 1 of 1

SC# 12 - 8226

CUSTOMER/CONTACT: Lide Industries	DATE: 5-9-02
LOCATION/ADDRESS: Mexia Tx.	
UNIT/SYSTEM: J-203 TNK-1 TNK-2	P.O.

	A	B	C	D	E
MATERIAL	S/S				
THICKNESS	.250				
DIAMETER	6'				
REINF. THICK.	1/16				
SFD	18				
EXP. TIME	3 MIN				
IQI SIZE/MAT'L	SP-17P				
IQI LOC. S/F	S				
SHIM THK & MAT'L	1/16				
# OF EXPOSURES	6				
MARKERS: NO. OR SPACING	6				



SOURCE	kV	Ma	FOCAL SPOT	SCREENS Pb	FILM LOADING	FILM PROCESS:		AUTO ☐
(Ir) Co X-Ray	50		.148	FRONT .010 REAR .010	(SINGLE) / DOUBLE	TIME 4/M.	TEMP 74°	MANUAL ☒

NDE PROCEDURE	ACCEPTANCE STANDARD	SURFACE CONDITION	STAGE OF MANUFACTURE:
RT-1 Rev 4	API 650	As Welded	☐ INTERMEDIATE ☒ FINAL ☐ REPAIR ☐ BEFORE PWHT ☐ AFTER PWHT

C - CRACK
SL - SLAG
T - TUNGSTEN
CP - CLUSTER POROSITY
P - POROSITY/GAS POCKET
HB - HOLLOW BEAD
IP - INSUFFICIENT PENETRATION
IF - INSUFFICIENT FUSION
EP - EXCESSIVE PENETRATION
EU - EXTERNAL UNDERCUT
IU - INTERNAL UNDERCUT
IC - INTERNAL CONCAVITY
SU - SURFACE
HL - IP DUE TO HIGH/LOW
BT - BURN THROUGH

WELD	VIEW	DENSITY PEN	DENSITY WELD	ACC	REJ	LIST INDICATIONS	WELDER ID – OTHER ID – REMARKS
TNK 1 J-1	1-X			✓		P	
J-2	1-X			✓		P	
J-3	1-X			✓			
TNK-2 J-1	1-X			✓		P	
J-2	1-X			✓			
J-3	1-X			✓			

☐ ADDITIONAL PAGES COMMENTS:

# OF FILM & SIZE: 6 - 4½ X10	FILM BRAND/TYPE: AGFA D4	TOTAL # OF WELDS:

Date	Customer Contact	Per Diem	Report No.	Unit No.	No. on Job
5-9-02	Billy Lide	☐ Yes ☒ No	1	198	2

Travel if Applicable HOURS: 6 HRS RT Miles Total	Airlines ☐ Vehicle ☒	Hours Worked 10:30 to AM and to 1:30 PM	Total Hours 9

Signature of Customer's Representative certifies time and material correct.

Rance Rich L II / B. Molloy
Name, Signature, and Level of Longview Inspection Examiner / Assistant

LII 105

SEE BACK FOR DISCLAIMER

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)
(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

Company Name LIDE TANK COMPANY By: EVAN LEMON
Welding Procedure Specification No. BB15L Date 4/24/89 Supporting PQR No.(s) BB15L
Revision No. 0 Date --
Welding Process(es) SMAW/FCAW Type(s) MANUAL/SEMI AUTOMATIC
(Automatic, Manual, Machine, or Semi-Auto.)

JOINTS (QW-402) — Details

Joint Design SEE PRODUCTION DRAWINGS
Backing (Yes) F6 (No) F5
Backing Material (Type) WELD METAL OR BASE METAL
(Refer to both backing and retainers.)

☐ Metal ☐ Nonfusing Metal RETAINERS NOT USED
☐ Nonmetallic ☐ Other

Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.

(At the option of the Mfgr., sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g. for notch toughness procedures, for multiple process procedures, etc.)

***BASE METALS (QW-403)**

P-No. 8 Group No. 1 to P-No. 8 Group No. 1
OR
Specification type and grade SA-240-316L
to Specification type and grade SA-240-316L
OR
Chem. Analysis and Mech. Prop. --
to Chem. Analysis and Mech. Prop. --
Thickness Range:
Base Metal: Groove .1875 - .4818 * Fillet ALL
Pipe Dia. Range: Groove ALL Fillet ALL
Other FCAW SHORT CIRCUIT MODE LIMITED TO 1.1 * BASE METAL THICKNESS

***FILLER METALS (QW-404)**

Spec. No. (SFA)	5.4	5.22	
AWS No. (Class)	E308L-16	E308LT-1	
F-No.	5	6	
A-No.	8	8	
Size of Filler Metals	3/32" - 1/8"	.035 - .045	
Deposited Weld Metal	.250	.188	
Thickness Range:	--	--	
Groove	.4818 *	.2068 **	
Fillet	ALL	ALL	
Electrode-Flux (Class)	--	--	
Flux Trade Name	--	--	
Consumable Insert	--	--	
Other	--	** 1.1 * WELD METAL SHORT	CIRCUIT MODE

*Each base metal-filler metal combination should be recorded individually.

FCAW - NO POWDERED OR SUPPLEMENTAL FILLER METALS WILL BE USED. FILLER METAL IS FLUX CORED

QW-482 (Back)

WPS No. BB15L Rev. 0

POSITIONS (QW-405)
Position(s) of Groove ALL
Welding Progression: Up XX Down
Position(s) of Fillet ALL

POSTWELD HEAT TREATMENT (QW-407)
Temperature Range NA
Time Range --

PREHEAT (QW-406)
Preheat Temp. Min. 50 degrees F
Interpass Temp. Max. 400 degrees F
Preheat Maintenance NA
(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

	Gas(es)	Percent Composition (Mixture)	Flow Rate
Shielding	ARG/CO2	75/25	20-35 CFM
Trailing	--	--	--
Backing	--	--	--

ELECTRICAL CHARACTERISTICS (QW-409)
Current AC or DC DC Polarity REV
Amps (Range) SEE BELOW Volts (Range) SEE BELOW
(Amps and volts range should be recorded for each electrode size, position, and thickness, etc. This information may be listed in a tabular form similar to that shown below.)

Tungsten Electrode Size and Type --
(Pure Tungsten, 2% Thoriated, etc.)

Mode of Metal Transfer for GMAW SHORT CIRCUIT ARC
(Spray arc, short circuiting arc, etc.)

Electrode Wire feed speed range --

TECHNIQUE (QW-410)
String or Weave Bead SMAW = STRING, FCAW = WEAVE
Orifice or Gas Cup Size 3/8" - 1/2"
Initial and Interpass Cleaning (Brushing, Grinding, etc.) BRUSH, GRIND, OR CHIP AS NEEDED

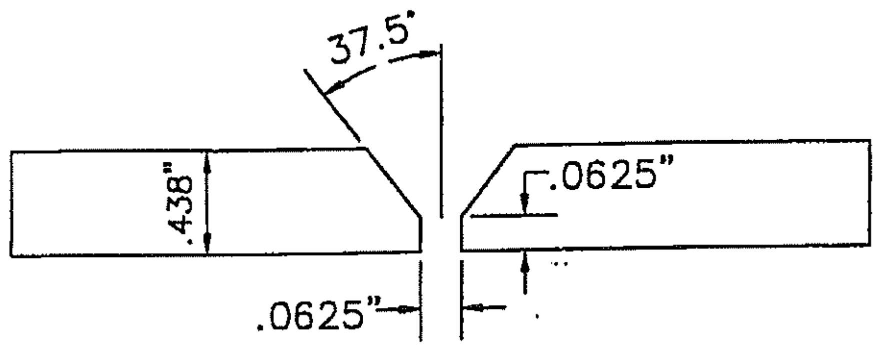
Method of Back Gouging AIR ARC OR GRIND AS NEEDED
Oscillation NONE
Contact Tube to Work Distance .750"
Multiple or Single Pass (per side) MULTIPLE
Multiple or Single Electrodes SINGLE
Travel Speed (Range) --
Peening NONE
Other NO SINGLE PASS TO EXCEED 1/2" IN THICKNESS

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	Travel Speed Range	Other (e.g., Remarks, Comments, Hot Wire Addition, Technique, Torch Angle, Etc.)
		Class	Dia.	Type Polar.	Amp. Range			
1 & 2	SMAW	EXXX X	3/32"	REV	65-130	19-26	NA	
"	"	"	1/8"	"	85-165	20-26	"	
REM	FCAW	EXXXXT1	.035	"	60-175	17-24	"	
"	"	"	.045	"	100-225	18-27	"	

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORDS (PQR)
(See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
Record Actual Conditions Used to Weld Test Coupon.

Company Name: Lide Tank Company
Procedure Qualification Record No.: BB15L   Date: 4/24/89
WPS No.: BB15L
Welding Process(es): SMAW/FCAW
Types (Manual, Automatic, Semi-Auto.): Manual/Semi-Automatic

JOINTS (QW-402)



Groove Design of Test Coupon
(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

BASE METALS (QW-403)
Material Spec.: SA-240
Type or Grade: 316L
P-No.: 8 to P-No.: 8
Thickness of Test Coupon: .438
Diameter of Test Coupon: 3-1/2" OD
Other: —

POSTWELD HEAT TREATMENT (QW-407)
Temperature: NA
Time: —
Other: —

GAS (QW-408)

	Gas(es)	Percent Composition (Mixture)	Flow Rate
Shielding	ARG/CO2	75/25	25 CFH
Trailing	—	—	—
Backing	—	—	—

FILLER METALS (QW-404)

SFA Specification	5.4	5.22
AWS Classification	E308L-16	E308LT-1
Filler Metal F-No.	5	6
Weld Metal Analysis A-No.	8	8
Size of Filler Metal	3/32"	.045"
Other	—	
Weld Metal Thickness	.250	.188

ELECTRICAL CHARACTERISTICS (QW-409)
Current: DC
Polarity: REV
Amps.: F5-110, F6-150   Volts: F5-21, F5-24
Tungsten Electrode Size: NA
Other: FCAW-SHORT CIRCUIT ARC

POSITION (QW-405)
Position of Groove: 6G
Weld Progression (Uphill, Downhill): UPHILL
Other: —

TECHNIQUE (QW-410)
Travel Speed: 8IPM
String or Weave Bead: SMAW-STRING FCAW-WEAVE
Oscillation: NONE
Multipass or Single Pass (per side): MULTIPLE
Single or Multiple Electrodes: SINGLE
Other: FCAW-NO POWDERED OR SUPPLEMENTAL FILLER METALS WERE USED. FILLER METAL IS FLUX CORED.

PREHEAT (QW-406)
Preheat Temp.: 70 DEGREES F
Interpass Temp.: 300 DEGREES F
Other: —

QW-483 (Back)

PQR No. BB151

Tensile Test (QW-150)

Specimen No.	Width	Thickness	Area	Ultimate Total Load lb	Ultimate Unit Stress psi	Type of Failure & Location
T-1	.752	.468	.352	28750	81676	BM DUCT
T-2	.749	.465	.348	28250	81178	BM DUCT

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
ROOT BEND QW-462.3 (a)	ACCEPTABLE
ROOT BEND QW-462.3 (a)	ACCEPTABLE
FACE BEND QW-462.3 (a)	ACCEPTABLE
FACE BEND QW-462.3 (a)	ACCEPTABLE

Toughness Tests (QW-170)

Specimen No.	Notch Location	Specimen Size	Test Temp.	Impact Values			Drop Weight Break (Y/N)
				Ft. lbs.	% Shear	Mils	

Comments: ________

Fillet-Weld Test (QW-180)

Result — Satisfactory: Yes ______ No ______ Penetration into Parent Metal: Yes ______ No ______

Macro — Results ________

Other Tests

Type of Test ________

Deposit Analysis ________

Other ________

Welder's Name ROBERTO CONTRERAZ Clock No. 460-47-7944 Stamp No. ______

Tests conducted by: LONGVIEW INSPECTION, INC. Laboratory Test No. 127-89

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Manufacturer LIDE TANK COMPANY

Date 4/24/89 By [signature]

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)

APPENDIX C.

HYDROSTATIC LEAK TESTS

LIDE INDUSTRIES

Route 2, Box 159F Mexia, Texas 76667 254-562-0233 Fax 254-562-0247

TEST INSPECTION REPORT

DATE: 05/22/02

CUSTOMER: Safety-Kleen

PURCHASE ORDER: 103034

ITEM NO.: 1

EQUIPMENT: Flash Tank

CODE: API 650

X-RAY: Spot

METHOD OF TEST: Filled with water and held for 24 hours

INSPECTED BY: Lide Industries, Inc.

RESULTS: Satisfactory (no leaks)

HYDROSTATIC TEST RECORD

Customer:	Safety-Kleen - Lone Mountain Facility		
Project:	Evaporator Flash Tank No. 2		
Location:	Waynoka, Oklahoma		
Test Start Date:	07/18/02	*Test Start Time:*	4:00 p.m.
Test Finish Date:	07/19/02	*Test Finish Time:*	5:00 p.m.
Test Procedure:	Fill evaporator flash tank to the overflow nozzle with water.		
Results:	All nozzles were flanged-off below the test water level. There was no change in the water level inside the flash tank. Visual inspection of the tank and tank nozzles indicated no water leaks.		

(Witness)

July 19, 2002
(Date)

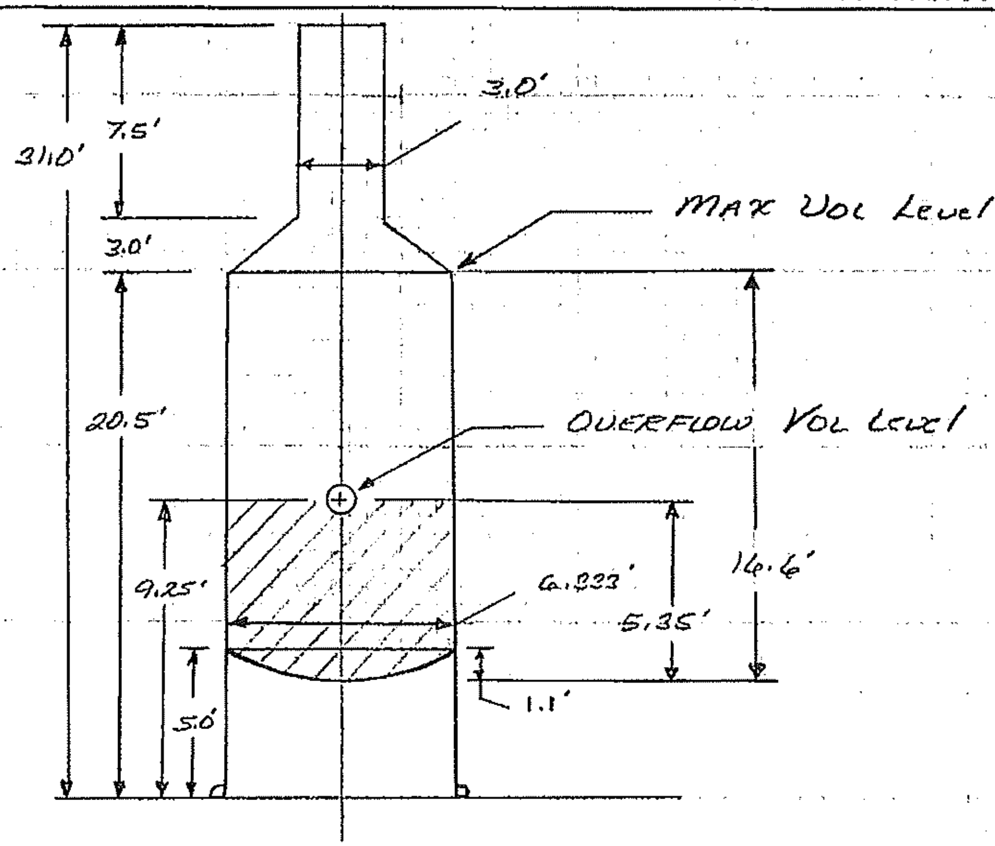
ENVIROTECH
ENGINEERING & CONSULTING, INC.

APPENDIX D.

CALCULATIONS

Project Name Safety Kleen
Project No EF 1&2 Sheet 1 of
Prepared By R. Stallings Date 7/26/02
Reviewed By Date
Scale

ENVIROTECH
ENGINEERING & CONSULTING, INC.



Shell BOTTOM

$$V = \frac{\pi D^2}{4} l + \tfrac{1}{4} \pi h (3a^2 + h^2)$$

$l = 15.5'$ $h = 1.1'$
$D = 6.33'$ $a = \frac{6.33'}{2} = 3.167'$

MAX VOL

$$V = \frac{(\pi)(6.33^2)}{4}(15.5) + \tfrac{1}{6}(\pi)(1.1)[3(3.167^2) + 1.1^2]$$

$V = 488 + 18$

$V = 504\ ft^3 = 3785$ gals (MAX VOL)*

* includes flue

Project Name Safety Kleen
Project No ET 112 Sheet 2 of
Prepared By R. Stallings Date 7/20/02
Reviewed By Date
Scale

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OVERFLOW VOL

Shell Bottom

$$V = \frac{\pi D^2 l}{4} + \frac{1}{6}\pi h (3a^2 + h^2)$$

$D = 6.333'$ $h = 1.1'$
$l = 4.25'$ $a^2 = 3.167$

$$V = \frac{\pi(6.333^2)(4.25)}{4} + \frac{1}{6}\pi(1.1)\left[3(3.167^2) + 1.1^2\right]$$

$$V = 134 + 18 = 152 \text{ ft}^3 = 1137 \text{ gals}$$

Water Weights (tank content only)

Max Vol

$$W = (3785 \text{ gals})(8.341 \text{ \#/gal})(1.5) = 47,356 \text{ \#}$$

Overflow Vol

$$W = (1137 \text{ gals})(8.341 \text{ \#/gal})(1.5) = 14,226 \text{ \#}$$

WEIGHT of TANK

7300 # Weight of New tank shell + skirt (as per Mfg DWG)
1500 # Weight of Flue
250 # insulation (estimated)
3000 # accessories (estimated)

12,050 # Total Wt Tank

2500 N. Eleventh Street ■ Enid, OK 73702 ■ (580) 234-8780 ■ Fax (580) 237-4302 ■ www.envirotech-consulting.com

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Project Name Safety Kleen
Project No ET182
Sheet 2a of
Prepared By R. Stallings Date 8/1/02
Reviewed By Date
Scale

Weight of Tank & Contents

Max Volume

Wt Tank	12,050 #
Wt Contents	47,356 #
TOTAL	59,406 #

Overflow Vol

Wt Tank	12,050 #
Wt Contents	14,226 #
TOTAL	26,276 #

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Project Name	Safety Kleen
Project No	FT I+E
Sheet	3 of
Prepared By	Stallings
Date	7/20/02
Reviewed By	
Date	
Scale	

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Max Bottom Operating Pressures

Assume tank pressure at atmospheric

@ Max Vol

$H = 15.5' + 1.1' = 16.6'$

$P = \frac{(16.6')(1.5)}{2.31} = 10.8$ PSI

@ Overflow Vol

$H = 4.25 + 1.1 = 5.35'$

$P = \frac{(5.35)(1.5)}{2.31} = 3.47$ PSI

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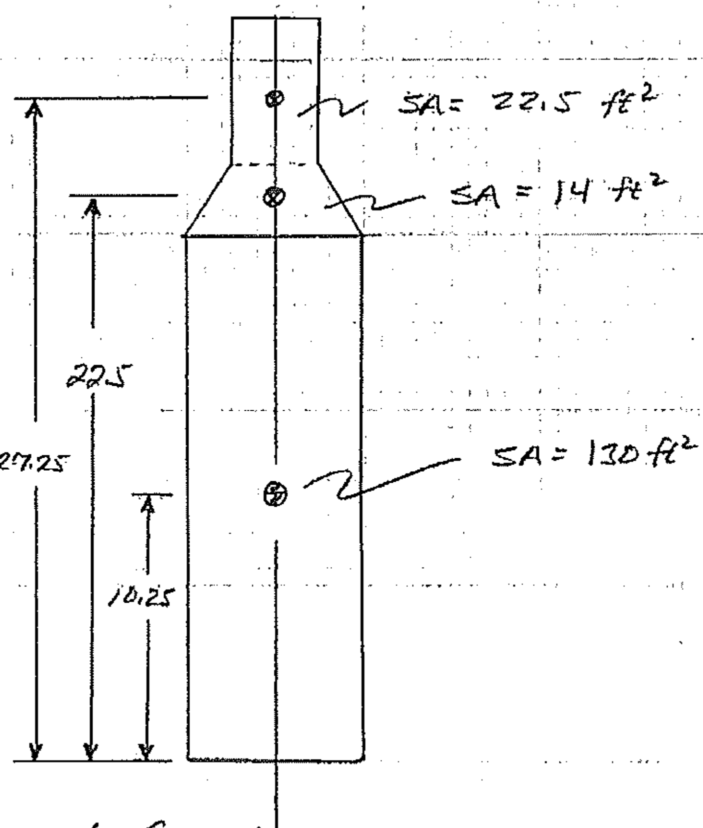
ENGINEERING & CONSULTING, INC.

Project Name Safety Kleen
Project No FT 1+2
Sheet 4 of
Prepared By R. Stallings Date 7/20/02
Reviewed By Date
Scale



Overturning Moment (WIND)

$$OTM = [(130)(10.25) + (14)(22.5) + (27.25)(22.5)](18)$$

$$OTM = 40{,}691$$

Cg Calc:

$D = 6.33$ $\quad L = 20.5'$

$r_1 = 3.165'$ $\quad r_2 = 1.5'$ $\quad h = 3'$

$D' = 3'$ $\quad L' = 7.5'$

Bottom: $W_B = \left(\frac{\pi D^2}{4}\right)\left(\frac{0.25}{12}\right)(499) = 327\#$

Shell $W_S = \pi D L \left(\frac{0.25}{12}\right)(499) = 4238\#$

$$W_f = \left(\pi D' L' + \pi(r_1 + r_2)\sqrt{(r_1 - r_2)^2 + h^2}\right)\left(\frac{0.25}{12}\right)(499)$$

$$= (70.7 + 50.3)\left(0.25/12\right)(499) = 1258\#$$

ENVIROTECH
ENGINEERING & CONSULTING, INC.

$$C_g = [(327)(5) + (4238)(10.25) + (1258)(21.5)] / 5823$$

$$C_g = 12.81'$$

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Project Name Safety Kleen
Project No FT 1:2 Sheet 6 of
Prepared By R Stallings Date 7/20/02
Reviewed By Date
Scale

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Wind Loads on Vessel API 650, 3.11

Wind Load = 18 PSF on projected frontal area

(See Sheet 4 for OTM Calcs)

OTM = 40,691 ft-#

Tank Weight (empty) = 12,050 #

$\left(\frac{2}{3}\right)\left(\frac{WD}{2}\right)$

W = Empty Tank Weight
D = tank Dia

$$\frac{2}{3}\frac{(12050)(6.33)}{2} = 25,425$$

40,691 > 25,425 ∴ Anchors are required

Anchors

$$t_B = \frac{4M}{dN} - \frac{W}{N}$$

N = 8 t_B = tension load / anchor (#)

$$t_B = \frac{4(40,691)}{(6.5)(8)} - \frac{12050}{8} = 1623\ \#$$

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Project Name Safety Kleen
Project No ET 132 Sheet 7 of
Prepared By R. Stallings Date 7/20/02
Reviewed By Date
Scale

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Assume 3/4 ϕ A-36 Anchor Bolts

Root Area = 0.309 in^2

Allowable Tension = 15,000 PSI (See API 650 F.7)

Allow 0.25" CA on the diameter "

$$\text{Eq Dia} = \sqrt{\frac{(.309)(4)}{\pi}} - 0.25 = .3772 \text{ in}$$

$$\text{Adj Root Area} = (.3772)^2 \frac{\pi}{4} = .112 \text{ in}^2$$

$$\text{Allowable Tensil Strength / Bolt} = (0.112 \text{ in}^2)\left(15{,}000 \frac{\#}{\text{in}^2}\right) = 1680\#$$

Allowable Tensile Strength / Anchor $\geq$ tension load / anchor

$$1680 > 1623$$

$\therefore$ 8 - 3/4" A-36 Bolts OK!

2500 N. Eleventh Street ▪ Enid, OK 73702 ▪ (580) 234-8780 ▪ Fax (580) 237-4302 ▪ www.envirotech-consulting.com

Project Name Safety Kleen
Project No ET182 Sheet 8 of
Prepared By R. Stallings Date 7/20/02
Reviewed By Date
Scale

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Seismic Loads Per API 650 Appendix E

Zone 1 $Z = 0.1875$ Table E-1

$I = 1.0$

$C_1 = 0.24$

Calc C_2

W_T = total wt of contents (MAX VOL) = 47356 #

$D = 6.33'$

$H = 9.0'$

$$\frac{D}{H} = \frac{6.33}{9.0} = 0.70$$

$$\frac{W_1}{W_T} = 0.87 \qquad \frac{W_2}{W_T} = 0.15$$ (See Fig E-2)

$$\frac{X_1}{H} = 0.42 \qquad \frac{X_2}{H} = 0.78$$ (See Fig E-3)

$K = 0.57$ (See Fig E-4)

$$T = K\sqrt{D}$$

$$= (0.57)\sqrt{6.33} = 1.434$$

$S = 1.5$ (Site Amp Factor Unknown - See Table E-2)

$$C_2 = \frac{0.3S}{T} = \frac{(0.3)(1.5)}{1.434} = 0.314$$

Project Name Safety Kleen
Project No ET108 Sheet 9 of
Prepared By R. Stallings Date 7/20/02
Reviewed By Date
Scale

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$W_1 = W_T(0.87) = (47356)(0.87) = 41,200$ #

$W_2 = W_T(0.15) = (47356)(0.15) = 7,103$ #

$X_1 = (0.42)(9.0) = 3.78'$

$X_2 = (0.78)(9.0) = 7.02'$

$M = ZI\,(C_1 X_s W_s + C_1 W_r H_t + C_1 W_1 X_1 + C_2 W_2 X_2)$

X_s = (Base to shell C.G.) = 12' approx

W_s = Wt Shell (#) = 12050

W_r = N/A (included in shell)

H_t = N/A

$M = (0.1875)(1)\left((0.24)(12)(12050) + (0.24)(41200)(3.78) + (.314)(7103)(7.\ldots\right.$

$M_{seismic} = 13,544$ FT-#

$M_{wind} = 40691$ FT-#

∴ Wind Dictates

Anchor Bolt Calcs are OK!

Project Name Safety Kleen
Project No ET152 Sheet 10 of
Prepared By R. Stallings Date 7/20/02
Reviewed By Date
Scale

ENVIROTECH
ENGINEERING & CONSULTING, INC.

Max Long Comp (Anchored Tanks)

$$b = \frac{Wt}{\pi D} + \frac{1.273\,M}{D^2}$$ Wt = Wt Shell

$$b = \frac{12050}{\pi(6.33)} + \frac{(1.273)(40,691)}{(6.33)^2}$$

$b = 1898$ #/ft CIRC

$$\frac{b}{12t} = \frac{1204}{(12)(.25)} = 402 \text{ PSI}$$

$$\frac{M}{D^2(Wt+W_L)} = \frac{40691}{(6.5)^2\left(\frac{12050+23032}{\pi(6.5)}\right)} = 0.56$$

$$\frac{GHD^2}{t^2} = \frac{(1.5)(9.0)(6.5)^2}{(.25)^2} = 9126$$

$$\therefore \quad Fa = \frac{10^6 t}{2.5D} + 600\sqrt{GH}$$

$$= \frac{(10^6)(0.25)}{(2.5)(6.5)(12)} + 600\sqrt{(1.5)(9)(12)}$$

$Fa = 8,918$ PSI

$.5Fy = (0.5)(42000) = 21,000$

$\frac{b}{12t} << Fa$ OK!

$Fa \leq .5Fy \therefore OK$

Project Name Safety Kleen
Project No ET 162 Sheet 11 of
Prepared By R. Stallings Date 7/20/02
Reviewed By Date
Scale

ENVIROTECH
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SHELL THICKNESS CALC

Thermal Red. Factor

RF @ 200°F = 0.81

Min Thickness as per 3.6.3.2

$$td = \frac{2.6 D (H-1) G}{E \; Sd \; RFi} + CA$$ Design Shell Thickness Method

Sy = 42 KSI
St = 81 KSI } 316L Stainless Steel

2/3 Sy = 28 KSI
2/5 St = 54 KSI ⇒ Sd = 28 KSI

E = 0.7 Assume H = 20.5 (conservative)

$$td = \frac{(2.6)(6.3)(20.5-1)(1.5)}{(0.7)(28000)(.81)} + 0.125$$

td = 0.156"

$$t_t = \frac{2.6 \, D \, (H-1)}{St}$$ Hydrostatic Test Shell Thickness Method

3/4 Sy = 31,500
2/7 ST = 23142 ⇒ St = 23142

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Project Name: Safety Kleen
Project No: ET 142
Sheet: 12 of
Prepared By: R. Stallings
Date: 7/20/02
Reviewed By:
Date:
Scale:

$$t_t = \frac{(2.6)(6.33)(20.5-1)}{23,192}$$

$$t_t = 0.0139$$

$$t_d > t_t \therefore \quad t_{min} = t_d = 0.156''$$

Min Shell Thickness (calc)

$$t = 0.156$$

Note: 1/4" plate OK!

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Project Name Safety Kleen
Project No ET 1+2 Sheet 13 of
Prepared By R. Stallings Date 2/20/02
Reviewed By Date
Scale

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Tank Bottom Calculations

$$\sigma_c = \frac{PR}{t} \Rightarrow t = \frac{PR}{\sigma_c} + CA$$

σ_c = Circumferential stress SF = safety factor

P = tank pressure (11.42 PSI - see Calcs sheet)

R = tank raidus (3.165') t = req thickness

$$\sigma_c = \frac{\sigma_y}{SF} = \frac{42{,}000 \text{ PSI (316 stainless)}}{2.5}$$

$$= 16{,}800 \text{ PSI}$$

$$t = \frac{(11.42 \text{ PSI})(3.165 \text{ ft})\left(\frac{12 \text{ in}}{\text{ft}}\right)}{16{,}800 \text{ PSI}} + 0.125 \text{ in}$$

t = 0.151-in Min Bottom Thickness (calc)

Note: 1/4" plate OK!

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APPENDIX E.

METALLURGICAL INFORMATION

ENVIROTECH
ENGINEERING & CONSULTING, INC.

Heads

AvestaPolarit STAINLESS

AvestaPolarit, Inc.
Plate Products

14290(2) 80 3/4" OD X 1/4" 316L

Certificate of Analysis and Tests

ORDER 221463 - 15 HEAD & PIECE 814488-3A 8/24/01

SOLD TO: METAL SERVICES, INC
PO BOX 550639

DALLAS TX 75355

SHIP TO: METAL SERVICES, INC.
10770 SANDHILL ROAD
1-214-348-7140
DALLAS TX 75238
649001-0004

------------------------------ YOUR ORDER & DATE ------------------------------

M 0115429 0/00/00 TAG# 10716

------------------------------ ITEM DESCRIPTION ------------------------------

Lide Industries
PO# 1476
(2) 75 1/4" OD X 1/4" 316L
Std

HEAT & PIECE 814488 - 3A
WEIGHT 2143
FINISH 1
GRADE 316L UNS-S31603
DIMENSIONS .250 X 96.000 X 288.000 EXACT

------------------------------ SPECIFICATIONS ------------------------------

*** MFG IN NEW CASTLE, IN, USA FROM SLABS IMPORTED FROM BRITAIN
ASTM A240-00 ASME SA240 98ED
ASTM A167-93, ASME SA167-92
ASTM A262-98 PRAC E
NACE MR0175-2000
NO WELD REPAIRS
ASTM A480-99 ASME SA480-98ED
ASTM A262-98 PRAC A
ASTM A262-98 PRACTICE B
NO GRIPPER MARKS

PLATES & TEST PCS SOLUTION ANNEALED @ 1950 DEGREES FARENHEIT MINIMUM.
THEN WATER COOLED OR RAPIDLY COOLED BY AIR
FREE OF MERCURY CONTAMINATION
HOT ROLLED, ANNEALED & PICKLED (HRAP)

------------------------------ MECHANICAL & OTHER TESTS ------------------------------

HARDNESS RB	87
GRAIN SIZE	6
YIELD STRENGTH (PSI)	54278
TENSILE STRENGTH (PSI)	89291
BEND	OK
INTERGRANULAR CORROSION	OK
ELONGATION % IN 2"	50.0
REDUCTION OF AREA %	71.1

MILL TEST REPORTS FURNISHED
BY TAD METALS INC. SOUTH WEST
CUSTOMER BAKER TANKHEAD
YOUR PO 14890
DATE 3-21-02
ITEM NO. 01-JOB# 53099
OUR INV. NO. 0179238

------------------------------ CHEMICAL COMPOSITION ------------------------------

CARBON	(C)	.014
MANGANESE	(MN)	1.68
PHOSPHORUS	(P)	.027
SULFUR	(S)	.001
SILICON	(SI)	.36
CHROMIUM	(CR)	16.35
NICKEL	(NI)	10.07
COBALT	(CO)	.16
COPPER	(CU)	.34
MOLY	(MO)	2.16
NITROGEN	(N)	.04
COLUMBIUM	(CB)	.008
TITANIUM	(TI)	.001
ALUMINUM	(AL)	.007
TIN	(SN)	.011

P.O. 0115429
ITEM 1/4 x 96 x 288
316L

814488

KNOWINGLY & WILLFULLY FALSIFYING OR CONCEALING A MATERIAL FACT ON THIS FORM, OR MAKING FALSE, FICTITIOUS OR FRAUDULENT STATEMENTS OR REPRESENTATIONS HEREIN COULD CONSTITUTE A FELONY PUNISHABLE UNDER FEDERAL STATUTES.

JAMES DOUBMAN, QUALITY ASSURANCE MANAGER

James Doubman

AvestaPolarit, Inc.
Plate Products
P O Box 370
New Castle, Indiana 47362

VUB
325

Shell R48499

NOTICE OF SHIPMENT/ PACKING LIST

Allegheny Ludlum An Allegheny Technologies Company

CERTIFICATE OF TEST

AL 6168A-7 400

CUST. ORDER NO. & DATE		CUST. CODE	ACCEPTING MILL	SHIPPER NO.	PRODUCT CODE	MILL ORDER NUMBER	DATE SHIPPED
816779	01/11/02	836385	MASSILLON, OH	418872	31020101060000	52-012-052	01/15/02

FORMS DISTRIBUTION: SOLD TO 1 | SHIP TO | SPEC 1

REPEAT ORDER 79736-0 | DO RATE DW | PRIORITY | GOV'T. CONTRACT | MAT'L. 1237 | SHIPPING LOCATION MASSILLON | OH | INVOICE 096046

PRIME SEC.
DSO DSO
504 504

SOLD TO
SOUTHWEST STAINLESS
2805 MARKET STREET
SUITE #150
GARLAND TX 75041

SHIP TO
SOUTHWEST STAINLESS
C/O TSA PROCESSING
1625 W SAM HOUSTON PKWY N
HOUSTON TX 77043

GRADE AND SPECIFICATIONS

CARRIER - MAVERICK TRANSP., INC. (8-9:30AM)

ALLEGHENY STAINLESS STEEL TYPE 316-L PLATE-HOT ROLLED COILS ANNEALED PICKLED 3 EDGE (ASTM-A-480/A-480M-01) (ASME-SA-240 2001 ED) (ASTM-A-240-01) (316/316L)

ITEM	PCS	DIMENSIONS W/G/L	HEAT #	COIL #	TEST #	GROSS	TARE	NET	THEO	TAG #/ CD SKID #
010A	1	48./.250/566.	895858B	09261N010	9604427	23480		23480		
LOST EDGE SCRAP LAST 1FT;CREDIT CUST 45 LBS										
C										
011	1	60./.250/287.	78511FC	11631N049A	9604699	15400		15400		
C										
	2	COILS				38880		38880		

TYPE	HEAT/TEST	--C---	--MN--	--P---	--S---	--SI--	--CR--	--NI--	--MO--	--N---
HEAT	895858B	.017	1.78	.029	.001	.48	16.37	10.20	2.10	.04
HEAT	78511FC	.023	1.82	.032	.001	.65	16.78	10.06	2.01	.03

ITEM	TEST NO	YIELD PSI *	TENSILE PSI	% ELONG IN 2"	% R/A	HARDNESS	BEND	CORROSION A 262 PR E	GRAIN SIZE	HARDENABILITY
010A	9604427	T 43800.	82500.	53.	70.	83.HRB	NR	NR	NR	NR
					67.	87.HRB				
		* Y.S. BY 0.2% OFFSET METHOD								
011	9604699	T 42900.	85500.	55.	76.	150.HB	NR	NR	NR	NR
		T 42500.	87000.	55.	72.	157.HB				
		* Y.S. BY 0.2% OFFSET METHOD								

NR = DATA NOT REQUIRED

PAGE 01 - FINAL PAGE. SHIPPING CONTROL COPY 01/14/02 14:08:47

C.M. Napoli - Manager, Technical Information

Sep 26 01 08:01a BOB PACOVSKY 17134678200 p.3

R471

Shell

NOTICE OF SHIPMENT

Allegheny Ludlum
An Allegheny Technologies Company

CERTIFICATE OF TEST

AL 9105-11 30

CUST. ORDER NO. & DATE: 816265 09/13/01
CUST. CODE: 836365
ACCEPTING MILL: MASSILLON, OH
SHIPPER NO.: 410052
PRODUCT CODE: 31020101060000
MILL ORDER NUMBER: 52-091-131
DATE SHIPPED: 09/19/01
MEMBAT ORDER: 79736-0
DD RATE: DW
MATL.: 1237
SHIPPING LOCATION: MASSILLON
OH
INVOICE: 095317
GOVT. CONTRACT

FORMS DISTRIBUTION: SOLD TO 1 | SHIP TO | SPEC 1

SOLD TO
SOUTHWEST STAINLESS
2805 MARKET STREET
SUITE #150
GARLAND
TX [illegible]

PRIME SEC.
DS9 DOG
504 304

SHIP TO
SOUTHWEST STAINLESS
C/O TSA PROCESSING
[illegible]
HOUSTON
TX 77043

GRADE AND SPECIFICATIONS
ALLEGHENY STAINLESS STEEL TYPE 316 PLATE-HOT ROLLED COILS ANNEALED PICKLED 3 EDGE (ASTM-A-480/A-480M-00)
(ASME-SA-240-A99) (ASTM-A-240-00) (316/316L)

CARRIER - JONES MOTOR CO., INC. (10AM-11:30AM)

ITEM	PCS	DIMENSIONS W/S/L		HEAT #	COIL #	TEST #	GROSS	TARE	NET	THEO	TAG #/ CD SKID #
006 C	1	60./.1875/311.LF	B-2 R-6	722112C	08621N0018	9604067	12580		12580		
007 C	1	60./.250/387.	B-2 R-6	722[illegible]	08621N0091B	9604097	20680		20680		
	2 COILS						33260		33260		

TYPE HEAT	HEAT/TEST	C	MN	P	S	SI	CR	NI	MO	N
HEAT	722112C	.022	1.87	.025	.0004	.40	16.72	10.07	2.05	.03

ITEM	TEST NO		YIELD PSI *	TENSILE PSI	% ELONG IN 2"	% R/A	HARDNESS	BEND	CORROSION A 262 PR E	GRAIN SIZE	HARDENABILITY
006	7604067	F	41500.	83000.	60.	74.	81.HRB	NR	NR	NR	NR
007	9604097	?	43500.	82000.	[illegible]	69.	81.HRB				
		T	44500.	84500.	53.	70.	149.HB	NR	NR	NR	NR

* Y.S. BY 0.2% OFFSET METHOD

NR = DATA NOT REQUIRED

PAGE 01 - FINAL PAGE.

09/19/01 08:30:46

[illegible]

Shell R41161

AL 8168A-7 400

NOTICE OF SHIPMENT/ PACKING LIST

Allegheny Ludlum — An Allegheny Technologies Company

CERTIFICATE OF TEST

CUST. ORDER NO. & DATE		CUST. CODE	ACCEPTING MILL	SHIPPER NO.	PRODUCT CODE	MILL ORDER NUMBER	DATE SHIPPED
816779	01/11/02	836385	MASSILLON, OH	418800	31020101060000	52-012-052	01/14/02

FORMS DISTRIBUTION: SOLD TO 1 | SHIP TO | SPEC 1

REPEAT ORDER 79736-0 | DO RATE DW | PRIORITY | GOV'T. CONTRACT | MAT'L. 1237 | SHIPPING LOCATION MASSILLON OH | INVOICE 096045

SOLD TO	PRIME	SEC.	SHIP TO
SOUTHWEST STAINLESS	DSO	DSO	SOUTHWEST STAINLESS
2805 MARKET STREET	504	504	C/O TSA PROCESSING
SUITE #150			1625 W SAM HOUSTON PKWY N
GARLAND TX 75041			HOUSTON TX 77043

GRADE AND SPECIFICATIONS — CARRIER - JONES MOTOR CO., INC. (NOON-1:30)

ALLEGHENY STAINLESS STEEL TYPE 316-L PLATE-HOT ROLLED COILS ANNEALED PICKLED 3 EDGE (ASTM-A-480/A-480M-01) (ASME-SA-240 2001 ED) (ASTM-A-240-01) (316/316L)

ITEM	PCS	DIMENSIONS W/G/L	HEAT #	COIL #	TEST #	GROSS	TARE	NET	THEO	TAG #/ CD SKID #
012 C	1	72./.250/362.	69421FC	05641N116A	9603901	23100		23100		
	1	COIL				23100		23100		

TYPE	HEAT/TEST	C	MN	P	S	SI	CR	NI	MO	N
HEAT	69421FC	.012	1.88	.029	.0005	.60	16.74	10.15	2.04	.02

ITEM	TEST NO		YIELD PSI *	TENSILE PSI	% ELONG IN 2"	% R/A	HARDNESS	BEND	CORROSION A 262 PR E	GRAIN SIZE	HARDENABILITY
012	9603901	T	40100.	81500.	61.	73.	149.HB	NR	NR	NR	NR
		T	38700.	81500.	60.	73.	149.HB				

* Y.S. BY 0.2% OFFSET METHOD

NR = DATA NOT REQUIRED

PAGE 01 - FINAL PAGE. SHIPPING CONTROL COPY 01/14/02 08:41:27

CM Napoli

C.M. Napoli - Manager, Technical Interv

NOTICE OF SHIPMENT/
PACKING LIST

Allegheny Ludlum
An Allegheny Technologies Company

K4-1141 Shell

CERTIFICATE OF T

AL 6166A-7 400

CUST. ORDER NO. & DATE		CUST. CODE	ACCEPTING MILL	SHIPPER NO.	PRODUCT CODE	MILL ORDER NUMBER	DATE SHIPPED
816779	01/11/02	836385	MASSILLON, OH	418800	31020101060000	52-012-052	01/14/02

FORMS DISTRIBUTION: SOLD TO 1 | SHIP TO | SPEC 1

REPEAT ORDER 79736-0 | DO RATE DW | PRIORITY

GOV'T. CONTRACT | MAT'L. 1237 | SHIPPING LOCATION MASSILLON OH | INVOICE 096045

SOLD TO	PRIME	SEC.	SHIP TO
SOUTHWEST STAINLESS	DSO	DSO	SOUTHWEST STAINLESS
2805 MARKET STREET	504	504	C/O TSA PROCESSING
SUITE #150			1625 W SAM HOUSTON PKWY N
GARLAND TX 75041			HOUSTON TX 77043

GRADE AND SPECIFICATIONS CARRIER - JONES MOTOR CO., INC. (NOON-1:30)
ALLEGHENY STAINLESS STEEL TYPE 316-L PLATE-HOT ROLLED COILS ANNEALED PICKLED 3 EDGE (ASTM-A-480/A-480M-01) (ASME-SA-240 2001 ED) (ASTM-A-240-01) (316/316L)

ITEM	PCS	DIMENSIONS W/G/L	HEAT #	COIL #	TEST #	GROSS	TARE	NET	THEO	TAG #/ CD SKID #
012 C	1	72./.250/362.	69421FC	05641N116A	9603901	23100		23100		
	1	COIL				23100		23100		

TYPE	HEAT/TEST	--C--	--MN--	--P--	--S--	--SI--	--CR--	--NI--	--MO--	--N--
HEAT	69421FC	.012	1.88	.029	.0005	.60	16.74	10.15	2.04	.02

ITEM	TEST NO		YIELD PSI *	TENSILE PSI	% ELONG IN 2"	% R/A	HARDNESS	BEND	CORROSION A 262 PR E	GRAIN SIZE	HARDENABILITY
012	9603901	T	40100.	81500.	61.	73.	149.HB	NR	NR	NR	NR
		T	38700.	81500.	60.	73.	149.HB				

* Y.S. BY 0.2% OFFSET METHOD

NR = DATA NOT REQUIRED

PAGE 01 - FINAL PAGE. SHIPPING CONTROL COPY 01/14/02 08:41:27

CM Napoli
C.M. Napoli - Manager, Technical Intern

1

AL 6168A-7 400

NOTICE OF SHIPMENT/ PACKING LIST

Allegh[illegible] Ludlum — An Allegheny Technologies Company

Shell to Skirt Rigs

CERTIFICATE OF T[illegible]

CUST. ORDER NO. & DATE		CUST. CODE	ACCEPTING MILL	SHIPPER NO.	PRODUCT CODE	MILL ORDER NUMBER	DATE SHIPPED
816934	02/05/02	836385	MASSILLON, OH	420626	31020101060000	52-022-028	02/07/02

FORMS DISTRIBUTION: SOLD TO 1 | SHIP TO | SPEC 1

REPEAT ORDER	DO RATE	PRIORITY	GOV'T. CONTRACT	MAT'L.	SHIPPING LOCATION		INVOICE
79736-0	DW			1237	MASSILLON	OH	096195

SOLD TO	PRIME	SEC.	SHIP TO
SOUTHWEST STAINLESS	DSO	DSO	SOUTHWEST STAINLESS
2805 MARKET STREET	504	504	C/O TSA PROCESSING
SUITE #150			1625 W SAM HOUSTON PKWY N
GARLAND TX 75041			HOUSTON TX 77043

GRADE AND SPECIFICATIONS

CARRIER - JONES MOTOR CO., INC. (2-3:30PM)

ALLEGHENY STAINLESS STEEL TYPE 316-L PLATE-HOT ROLLED COILS ANNEALED PICKLED 3 EDGE (ASTM-A-480/A-480M-01) (ASME-SA-240 2001 ED) (ASTM-A-240-01) (316/316L)

ITEM	PCS	DIMENSIONS W/G/L	HEAT #	COIL #	TEST #	GROSS	TARE	NET	THEO	TAG #/ CD SKID #
002	1	48./.500/218.	894356	12511N041	9604932	18380		18380		
C										
	1	COIL				18380		18380		

TYPE	HEAT/TEST	C	MN	P	S	SI	CR	NI	MO	N
HEAT	894356	.023	1.62	.028	.018	.40	16.42	10.14	2.13	.06

ITEM	TEST NO		YIELD PSI *	TENSILE PSI	% ELONG IN 2"	% R/A	HARDNESS	BEND	CORROSION A 262 PR E	GRAIN SIZE	HARDENABILITY
002	9604932	T	44700.	83500.	61.	70.	156.HB	NR	NR	NR	NR
		T	44100.	83500.	61.	69.	163.HB				

* Y.S. BY 0.2% OFFSET METHOD

NR = DATA NOT REQUIRED

THIS CERTIFICATE OF TEST SHALL NOT BE REPRODUCED EXCEPT IN FULL.

SHIPPING CONTROL COPY

02/07/02 08:39:06

The above is a true copy of data on file. The material and test results conform to the sales contract and specification(s) as set forth in Allegheny Ludlum's Order Acknowledgement.

CM Napoli

C.M. Napoli - Manager, Technical Inform[illegible]

P.11

R47161

METALFAR PRODOTTI INDUSTRIALI S.p.A.

Tel. (031) 655441
Telefax 655149
MATERIAL TEST DEPARTMENT
SALA PROVE ED ANALISI MATERIALI

INSPECTION CERTIFICATE DIN 50049/3.1B - EN 10204/3.1B ** CERTIFICATO DI COLLAUDO

GERLIN INC. TUBE LINE STAINLESS DIV
176 TUBEWAY DRIVE
USA CAROL STREAM, ILL.

30#3,149

N.: 76/ 14/01/2002
RIFERIMENTO / VS. FATT.: 55/ 07/01/2002
S.: 27928
DEL. NOTE / BOLLA: 98/ 07/01/2002

CODE COLATA	HEAT COLATA	ITEM POS.	YOUR P.O. VS. ORDINE	OUR REFERENCE NS. ORDINE	QUANTITY QUANTITÀ	DESCRIPTION DESCRIZIONE		DIM. IN ACCORDANCE TO DIM. IN ACCORDO A	VISUAL & DIMENSIONAL VISITO E DIMENSIONALE
	454134	0003	051773-0	01002712 0018	5	BLIND 150 RF 4"	F316/L	ASME/ANSI B16.5	SATISFACTORY
	381460	0009	051773-0	01002712 0024	15	S/O 150 RF 1/2"	F316/L	ASME/ANSI B16.5	SATISFACTORY
	448151	0010	051773-0	01002712 0025	50	S/O 150 RF 1"	F316/L	ASME/ANSI B16.5	SATISFACTORY
	298470	0011	051773-0	01002712 0026	65	S/O 150 RF 1.1/2"	F316/L	ASME/ANSI B16.5	SATISFACTORY
	324900	0012	051773-0	01002712 0027	50	S/O 150 RF 2"	F316/L	ASME/ANSI B16.5	SATISFACTORY
	451311	0013	051773-0	01002712 0028	15	S/O 150 RF 3"	F316/L	ASME/ANSI B16.5	SATISFACTORY

CODE COLATA	HEAT COLATA	ITEM POS.	MATERIAL MATERIALE	C%	Si%	Mn%	S%	P%	Cr%	Ni%	Mo%	Ti%	Cu%	V%	Nb%	N%	Al%	C.E.%	STEEL MILL ACCIAIERIA
	454134	0003	ASTM A182 F316/F316L	0.025	0.580	1.600	0.020	0.026	17.000	11.100	2.270	0.000	0.000	0.000	0.000	0.058	0.000	4.885	SANDVIK
	381460	0009	ASTM A182 F316/F316L	0.018	0.380	1.600	0.028	0.029	16.780	10.440	2.030	0.000	0.000	0.000	0.000	0.048	0.000	4.726	THYSSEN / KNK
	448151	0010	ASTM A182 F316/F316L	0.028	0.620	1.570	0.019	0.028	16.840	11.160	2.290	0.000	0.000	0.000	0.000	0.065	0.000	4.859	SANDVIK
	298470	0011	ASTM A182 F316/F316L	0.011	0.400	1.810	0.022	0.029	16.810	11.310	2.040	0.000	0.000	0.000	0.000	0.022	0.000	4.036	THYSSEN / KNK
	324900	0012	ASTM A182 F316/F316L	0.015	0.340	1.760	0.027	0.035	16.720	10.980	2.060	0.000	0.000	0.000	0.000	0.026	0.000	4.794	THYSSEN / KNK
	451311	0013	ASTM A182 F316/F316L	0.021	0.500	1.550	0.021	0.027	16.770	11.250	2.320	0.000	0.000	0.000	0.000	0.068	0.000	4.817	SANDVIK

CODE COLATA	HEAT COLATA	ITEM POS.	TEST SPECIMEN mm² PROVETTA: section	length	YIELD POINT N/mm² ≥ 0.2%	TENSILE STRENGTH N/mm²	ELONGATION %	REDUCTION OF AREA %	HARDNESS	BEND TEST	FLATTENING	IMPACT TEST K.V.	TYPE	°C	1	2	3	GRAIN SIZE				YIELD POINT N/mm² ≥ 1.0%	OUR.REF
	454134	0003	126.60	50.80	296.0	576	80.0	85.0	160-165	0.0	0.0			0	0	0	0	1				0.0	
	381460	0009	126.60	50.80	303.0	586	81.0	93.0	162-166	0.0	0.0			0	0	0	0	1				0.0	
	448151	0010	126.60	50.80	311.0	558	63.0	77.0	160-165	0.0	0.0			0	0	0	0	1				0.0	
	298470	0011	126.60	50.80	296.0	592	78.0	88.0	163-166	0.0	0.0			0	0	0	0	1				0.0	
	324900	0012	126.60	50.80	278.0	584	72.0	86.0	162-165	0.0	0.0			0	0	0	0	1				0.0	
	451311	0013	126.60	50.80	299.0	576	72.0	89.0	164-167	0.0	0.0			0	0	0	0	1				0.0	

CODE COLATA	HEAT COLATA	ITEM POS.	MATERIAL IN ACCORDANCE TO MATERIALE IN ACCORDO A	HEAT TREATMENT TRATTAMENTO TERMICO	FURNACE FORNO
	454134	0003	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	381460	0009	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	448151	0010	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	298470	0011	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	324900	0012	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	451311	0013	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE

QUALITY CONTROL DEPARTMENT UFFICIO CONTROLLO QUALITÀ	INSPECTION AUTHORITY ENTE UFFICIALE COLLAUDO	MANUFACTURER'S SYMBOL MARCHIO PRODUTTORE
MUTTI LORENZO		MFF

R47161

METALFAR
PRODOTTI INDUSTRIALI S.p.A.
Tel. (031) 655441
Telefax 655149
MATERIAL TEST DEPARTMENT
SALA PROVE ED ANALISI MATERIALI

INSPECTION CERTIFICATE DIN 50049/3.1B - EN 10204/3.1B ** CERTIFICATO DI COLLAUDO

GERLIN INC. TUBE LINE STAINLESS DIV
170 TUBEWAY DRIVE
USA CAROL STREAM, ILL.

3047 / 31149

N.: 76/ 10/01/2002
INVOICE / FATTURA 55/ 07/01/2002
C. 27926
DEL. NOTE / BOLLA 98/ 07/01/2002

CODE COLATA	HEAT COLATA	ITEM POS.	YOUR P.O. VS ORDINE	OUR REFERENCE NS ORDINE	QUANTITY QUANTITÀ	DESCRIPTION DESCRIZIONE		DIM. IN ACCORDANCE TO DIM. IN ACCORDO A	VISUAL & DIMENSIONAL VISIVO E DIMENSIONALE
	454134	0003	051773-0	01002712 0018	5	BLIND 150 RF 4"	F316/L	ASME/ANSI B16.5	SATISFACTORY
	381460	0009	051773-0	01002712 0024	15	S/O 150 RF 1/2"	F316/L	ASME/ANSI B16.5	SATISFACTORY
	448151	0010	051773-0	01002712 0025	50	S/O 150 RF 1"	F316/L	ASME/ANSI B16.5	SATISFACTORY
	298470	0011	051773-0	01002712 0026	65	S/O 150 RF 1.1/2"	F316/L	ASME/ANSI B16.5	SATISFACTORY
	324900	0012	051773-0	01002712 0027	50	S/O 150 RF 2"	F316/L	ASME/ANSI B16.5	SATISFACTORY
	451311	0013	051773-0	01002712 0028	15	S/O 150 RF 3"	F316/L	ASME/ANSI B16.5	SATISFACTORY

CODE COLATA	HEAT COLATA	ITEM POS.	MATERIAL MATERIALE	C%	Si%	Mn%	S%	P%	Cr%	Ni%	Mo%	Ti%	Cu%	V%	Nb%	N%	Al%	C.E.%	STEEL MILL ACCIERIA
	454134	0003	ASTM A182 F316/F316L	0.025	0.500	1.600	0.020	0.026	17.000	11.100	2.270	0.000	0.000	0.000	0.000	0.058	0.000	4.885	SANDVIK
	381460	0009	ASTM A182 F316/F316L	0.018	0.380	1.600	0.028	0.029	16.700	10.440	2.030	0.000	0.000	0.000	0.000	0.048	0.000	4.726	THYSSEN / NK
	448151	0010	ASTM A182 F316/F316L	0.028	0.620	1.570	0.019	0.028	16.840	11.160	2.290	0.000	0.000	0.000	0.000	0.065	0.000	4.855	SANDVIK
	298470	0011	ASTM A182 F316/F316L	0.011	0.400	1.810	0.022	0.029	16.810	11.310	2.040	0.000	0.000	0.000	0.000	0.022	0.000	4.836	THYSSEN / NK
	324900	0012	ASTM A182 F316/F316L	0.015	0.340	1.760	0.027	0.035	16.710	10.980	2.060	0.000	0.000	0.000	0.000	0.026	0.000	4.794	THYSSEN / NK
	451311	0013	ASTM A182 F316/F316L	0.021	0.500	1.550	0.021	0.027	16.770	11.250	2.320	0.000	0.000	0.000	0.000	0.068	0.000	4.847	SANDVIK

CODE COLATA	HEAT COLATA	ITEM POS.	TEST SPECIMEN mm² PROVETTA Section	Length	YIELD POINT N/mm² ≥ 0.2%	TENSILE STRENGTH N/mm² ≥	ELONGATION % ≥	REDUCTION OF AREA % ≥	HARDNESS	BEND TEST	FLATTENING	IMPACT TEST T.R.	TYPE	°C	1	2	3	SHAPE FORM				YIELD POINT N/mm² ≥	OUR REF.
	454134	0003	126.60	50.80	296.0	576	88.0	85.0	160-165	0.0	0.0			0	0	0	0	1				0.0	
	381460	0009	126.60	50.80	303.0	586	81.0	93.0	162-166	0.0	0.0			0	0	0	0	1				0.0	
	448151	0010	126.60	50.80	311.0	558	63.0	77.0	160-165	0.0	0.0			0	0	0	0	1				0.0	
	298470	0011	126.60	50.80	296.0	592	70.0	88.0	163-166	0.0	0.0			0	0	0	0	1				0.0	
	324900	0012	126.60	50.80	278.0	584	72.0	86.0	162-165	0.0	0.0			0	0	0	0	1				0.0	
	451311	0013	126.60	50.80	299.0	576	72.0	85.0	164-167	0.0	0.0			0	0	0	0	1				0.0	

CODE COLATA	HEAT COLATA	ITEM POS.	MATERIAL IN ACCORDANCE TO MATERIALE IN ACCORDO A	HEAT TREATMENT TRATTAMENTO TERMICO	FURNACE FORNO
	454134	0003	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	381460	0009	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	448151	0010	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	298470	0011	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	324900	0012	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	451311	0013	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE

QUALITY CONTROL DEPARTMENT UFFICIO CONTROLLO QUALITÀ	INSPECTION AUTHORITY ENTE UFFICIALE COLLAUDO	MANUFACTURER'S SYMBOL MARCHIO PRODUZIONE
HUTTI LORENZO		MFF

ITALFAR
PRODOTTI INDUSTRIALI S.p.A.
22881 CESANA BRIANZA (Lecco) ITALY
Tel. (031) 865441
Telefax 655149
MATERIAL TEST DEPARTMENT
SALA PROVE ED ANALISI MATERIALI

INSPECTION CERTIFICATE 50049/3.1B - EN 10204/3.1B ** CERTIFICATO DI COLLAUDO

SILBO INDUSTRIES
50 CHESTNUT RIDGE ROAD
07645 MONTVALE N.J.

R47161

N.: 1741/ 29/05/2001
INVOICE / FATTURA: 1491/ 24/05/2001
S 25631
DEL. NOTE / BOLLA: 2557/ 24/05/2001
PAG.

HEAT CODE COD. COLATA	HEAT COLATA	ITEM POS.	YOUR P.O. VS. ORDINE	OUR REFERENCE NS. ORDINE	QUANTITY QUANTITÀ	DESCRIPTION DESCRIZIONE	DIM. IN ACCORDANCE TO DIM. IN ACCORDO A	VISUAL & DIMENSIONAL VISIVO E DIMENSIONALE
	299540	0018	86318*HD	01001147 0037	10	S/O 150 RF 3" F316/L	ASME/ANSI B16.5	SATISFACTORY
	326380	0019	86318*HD	01001147 0038	10	S/O 150 RF 6" F316/L	ASME/ANSI B16.5	SATISFACTORY
	320720	0020	86318*HD	01001147 0039	5	S/O 150 RF 8" F316/L	ASME/ANSI B16.5	SATISFACTORY
	147212	0021	86318*HD	01001147 0040	3	S/O 150 RF 10" F316/L	ASME/ANSI B16.5	SATISFACTORY
	297160	0026	86318*HD	01001147 0045	3	THRD 150 RF 2" F316/L	ASME/ANSI B16.5	SATISFACTORY
	326390	0027	86318*HD	01001147 0046	5	THRD 150 RF 3" F316/L	ASME/ANSI B16.5	SATISFACTORY

HEAT CODE COD. COLATA	HEAT COLATA	ITEM POS.	MATERIAL MATERIALE	C %	Si %	Mn %	S %	P %	Cr %	Ni %	Mo %	Ti %	Cu %	V %	Nb %	N %	Al %	C.E. %	STEEL MILL ACCIAIERIA
	299540	0018	ASTM A182 F316/F316L	0.011	0.270	1.810	0.028	0.030	16.660	11.070	2.080	0.000	0.000	0.000	0.000	0.017	0.000	[illegible].791	THYSSEN / KWK
	326380	0019	ASTM A182 F316/F316L	0.012	0.270	1.620	0.024	0.029	16.640	11.010	2.030	0.000	0.000	0.000	0.000	[illegible]	0.000	[illegible].750	THYSSEN / KWK
	320720	0020	ASTM A182 F316/F316L	0.010	0.380	1.730	0.027	0.029	16.720	10.860	2.130	0.000	0.000	0.000	0.000	[illegible]	0.000	[illegible].792	THYSSEN / KWK
	147212	0021	ASTM A182 F316/F316L	0.016	0.520	1.470	0.024	0.030	16.770	10.500	2.010	0.000	0.000	0.000	0.000	0.043	0.000	[illegible].722	KRUPP STAHL
	297160	0026	ASTM A182 F316/F316L	0.012	0.450	1.820	0.020	0.030	16.850	11.130	2.150	0.000	0.000	0.000	0.000	0.052	0.000	[illegible].857	THYSSEN / KWK
	326390	0027	ASTM A182 F316/F316L	0.010	0.400	1.710	0.024	0.028	17.180	11.150	2.050	0.000	0.000	0.000	0.000	0.019	0.000	[illegible].884	THYSSEN / KWK

HEAT CODE COD. COLATA	HEAT COLATA	ITEM POS.	TEST SPECIMEN mm^2 PROVETTA SECTION Sezione	mm LENGHT Lunghezza	YIELD POINT Snervamento $N/mm^2 \geq 0,2\%$	TENSILE STRENGHT Rottura $N/mm^2 \geq$	ELONGATION Allungamento $\% \geq$	REDUCTION OF AREA Contrazione $\% \geq$	HARDNESS Durezza Hb	BEND TEST Piega	FLATTENING TEST Schiacciam.	IMPACT TEST - resilienza Joule/cm^2 L.H.	TYPE TIPO	°C	1	2	3	SHAPE FORMA 1 = ø 2 = □	X	Y	Z	YIELD POINT INCREMENTO $N/mm^2 \geq 1,5\%$	OUR REF.
	299540	0018	126.60	50.80	299.0	586	67.0	79.0	160-164	0.0	0.0			0	0	0	0	1				0.0	
	326380	0019	126.60	50.80	291.0	576	77.0	80.0	160-164	0.0	0.0			0	0	0	0	1				0.0	
	320720	0020	126.60	50.80	264.0	551	70.0	84.0	158-163	0.0	0.0			0	0	0	0	1				0.0	
	147212	0021	126.60	50.80	294.0	548	64.0	76.0	160-164	0.0	0.0			0	0	0	0	1				0.0	
	297160	0026	126.60	50.80	299.0	576	69.0	89.0	160-165	0.0	0.0			0	0	0	0	1				0.0	
	326390	0027	126.60	50.80	271.0	545	65.0	77.0	158-163	0.0	0.0			0	0	0	0	1				0.0	

HEAT CODE COD. COLATA	HEAT COLATA	ITEM POS.	MATERIAL IN ACCORDANCE TO MATERIALE IN ACCORDO A	HEAT TREATMENT TRATTAMENTO TERMICO	FURNACE FORNO
	299540	0018	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	326380	0019	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	320720	0020	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	147212	0021	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	297160	0026	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE
	326390	0027	ASTM A 182/A 182M - 98c ASME SA 182/SA 182M-E98	SOLUTION TREAT AT 1050 C - QUENCHED IN WATER	ELECTRIC FURNACE

NOTE

MATERIAL IN ACCORDANCE WITH NACE MR-0175/2000

QUALITY CONTROL DEPARTMENT UFFICIO CONTROLLO QUALITÀ	INSPECTION AUTHORITY ENTE UFFICIALE COLLAUDO	MANUFACTURER'S SYMBOL MARCHIO PRODUZIONE
MUTTI LORENZO		MFF

R47161

ENLIN STEEL CORPORATION

TAIPEI : TEL (02)26940222 FAX (02)26945878
NAN-KANG : TEL (049)253726 FAX (049)253729
PHILS. : TEL (046)4371023 FAX (046)4371021
U.S.A. : TEL (949)5880714 FAX (949)5881440

MILL TEST REPORT

DATE: Jan/ 4/2002

PURCHASER: SOUTHWEST STAINLESS, INC.

PURCHASE ORDER NO.: 616148

ENLIN S/O NO.: B234SW

PRODUCT : STAINLESS STEEL FORGED FLANGE

HEAT NO.	QTY	TYPE	DESIGNATION	SIZE	SPECIFICATION
GCJ9	50	316L/316	150# SLIP ON RF	6"	ANSI B16.5

CHEMICAL ANALYSIS OF MATERIAL

HEAT NO.	C	Mn	Si	P	S	Cr	Ni	Mo	N	SPECIFICATION
Maxi	0.035	2.00	1.00	0.040	0.030	16 - 18	10 - 14	2 - 3	0.100	ASME SA182-92
GCJ9	0.016	1.39	0.33	0.023	0.001	16.43	10.70	2.04	0.034	ASTM A182-95

MECHANICAL CHARACTERISTICS

HEAT NO.	T.S.-PSI	Y.S.-PSI	%-E.L.	%-R.A.	HEAT-TREAT	DIMENSION	P.M.I.
Mini	75,000	30,000	30	50	1050- 1150 ℃		
GCJ9	81,000	38,600	57	60	1060 ℃	OK	OK

MATERIAL RESISTANT TO INTERCRYSTALLINE CORROSION ACCORDING TO
ASTM A262 PRACTICE E.
FREE FROM MERCURY CONTAMINATION.
MATERIAL IN ACCORDANCE WITH NACE MR0175-94.

FACTORY INSPECTOR :

Yi Tsai Lin

YI TSAI LIN

QUALITY ASSURANCE DEPARTMENT

RU71161

艳罐鐵工股份有限公司
高雄縣仁武鄉烏林村仁心路 303 號
BOTH-WELL STEEL FITTINGS CO., LTD.
NO.303, JEN-HSIN ROAD JEN-WU HSIANG
KAOHSIUNG HSIEN,TAIWAN R.O.C.(81405)
TEL : (07) 371-0497 , 371-1536 , 372-0260 FAX: (886-7) 371-3864 . 371-3882
HOME PAGE:http://www.bothwell.com.tw E-MAIL:bothwell@www.bothwell.com.tw or box@mail.bothwell.com.tw

An ISO-9002 Registered Manufacturer

RvC Dutch Council For Accreditation

MILL TEST & INSPECTION CERTIFICATE

ACCORDING TO EN10204 / DIN50049 / 3.1.B

CUSTOMER:SELBO INDUSTRIES, INC.
CERT NO:12062 ORDER NO:87058
INVOICE NO:BW01100060
L/C NO:6I1262119
DATE:01/12/04
PAGE: 10

ITEM	RAW MATERIAL HEAT NO.	BOTH WELL HT CD.	DESCRIPTION	QUANTITY
030	9N236	T426	FULL CPLG 1/2" 3000# S/W	25 PCS
031	9P045	T445	FULL CPLG 1" 3000# S/W	25 PCS
037	P0784	T431	FULL CPLG 1/4" 3000# NPT	15 PCS
038	P0136	T404	FULL CPLG 3/8" 3000# NPT	5 PCS
039	9N241	T424	FULL CPLG 3/4" 3000# NPT	10 PCS
040	A28750	W137	FULL CPLG 1-1/2" 3000# NPT	5 PCS
041	449344	T357	FULL CPLG 2" 3000# NPT	15 PCS
046	P0136	T404	HALF CPLG 3/8" 3000# NPT	15 PCS
047	A33282	W162	HALF CPLG 1" 3000# NPT	25 PCS
059	706659	T359	TEE 2" 3000# S/W	10 PCS

Specification:
ASME SA182
F316/316L-E96
DIMENSION:
ASME B16.11 - 1996

SURFACE:
BY VISUAL...GOOD

CHEMICAL COMPOSITION (%)

ITEM	C	Si	Mn	P	S	Cu	Cr	Ni	Mo	V	Nb	N
Min	-	-	-	-	-	-	16.00	10.00	2.000	-	-	-
Max	0.035	1.000	2.000	0.045	0.030	-	18.00	15.00	3.000	-	-	0.100
030	0.018	0.360	1.650	0.027	0.024	-	17.24	11.02	2.100	-	-	0.035
031	0.018	0.450	1.640	0.019	0.025	-	17.22	11.48	2.000	-	-	0.080
037	0.019	0.450	1.560	0.034	0.025	-	16.40	10.75	2.130	-	-	0.067
038	0.030	0.420	1.810	0.036	0.026	-	16.52	10.82	2.200	-	-	0.050
039	0.015	0.310	1.620	0.026	0.025	-	17.19	11.31	2.080	-	-	0.038
040	0.023	0.340	1.660	0.032	0.012	-	16.64	11.53	2.244	-	-	0.026
041	0.009	0.450	1.610	0.025	0.021	-	17.46	12.54	2.540	-	-	0.058
046	0.030	0.420	1.810	0.036	0.026	-	16.52	10.82	2.200	-	-	0.050
047	0.020	0.410	1.230	0.030	0.003	-	16.27	11.23	2.256	-	-	0.050
059	0.018	0.290	1.300	0.035	0.024	-	16.32	12.01	2.060	-	-	0.044

MECHANICAL TEST

ITEM	Tensile Strength (Kg/mm2)	Yield Strength (Kg/mm2)	Elongation (%)	R of A (%)	Hardness (HB)
Min	52.70	21.10	30.00	60.00	-
Max	-	-	-	-	235
030	58.70	28.00	58.00	76.00	163
031	60.60	29.50	56.00	74.00	170
037	58.70	33.20	58.00	71.70	163
038	57.40	30.60	57.20	72.10	161
030	56.90	25.30	61.50	71.20	158
040	54.10	24.30	56.50	70.50	152
041	58.80	27.70	64.70	71.70	163
046	57.40	30.60	57.20	72.10	161
047	60.30	30.10	57.10	72.60	170
059	59.80	29.90	53.80	70.80	167

Remark :

SOLUTION TREATED : 1040℃,W.Q.

CONFORMS TO NACE MR01-75
STEEL MAKING PROCESS:ELECTRIC FURNACE

WE CERTIFY THE ABOVE MENTIONED FITTINGS HAVE BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH THE SPECIFICATIONS SHOWN.

S C Loo   C.C Huang

Q . C MANAGER   INSPECTOR

K50001

BRISTOL METALS L.P.
BRISTOL, TN. U.S.A.
MILL TEST REPORT

TO: SOUTHWEST STAINLESS
2005 MARKET STREET
SUITE #150
GARLAND, TX 75041

CUST NO: 63800080
JOB NO: 9098C
PO NO: 813639
DATE: 04/05/00

HEAT NO.	ITEM DESCRIPTION
927264	2" WELDED PIPE SCH 40S TP316L/TP316 ASTM A312-95A/ASME SA312 -98,99ADD,WELDED

HEAT NO.	C	MN	P	S	SI	NI	CR
927264	.020	1.760	.028	.0190	.37	10.110	16.400

HEAT NO.	MO	CU	CB	N2	TENSILE	YIELD
927264	2.03	.34	.00	.049	91,900	46,800

HEAT NO.	CO		
927264	.160		

HEAT NO.	HARDNESS	ELONGATION	TG BEND	FLATTENING	TENSION
927264	RB85	42.00 %	NA	OK	OK

REVERSE BEND	FLANGE	FLARE	REVERSE FLATTENING	EDDY CURRENT	HYDRO
NA	NA	NA	NA	NA	1900 PSI

HEAT NO.	ANNEALED AT 1900 DEG F. AND WATER QUENCHED TO BELOW 600 DEG. F. IN LESS THAN 3 MIN.	RADIOGRAPHIC EXAMINATION
927264	YES	NA

HARDNESS IN ACCORDANCE WITH NACE MR0175.
BRISTOL METALS DOES NOT ADD MERCURY DURING ANY MANUFACTURING PROCESSES.
WE CERTIFY THIS REPORT TO BE
TRUE AND ACCURATE, ACCORDING
TO OUR RECORDS ON FILE.

BRISTOL METALS L.P.

David Singleton

REPRESENTATIVE

FRED

R47161

TEST CERTIFICATE

AICHI STEEL CORPORATION

Messrs :

KARIYA PLANT:KARIYA-CITY,
AICHI-PREF.,JAPAN

Date : AUG.05.2000 No. K-8230

Material	Size (INCH)	Section Code	Charge No.	Condition Code	Bundle No.	No. of Piece	Netweight (LBS)
AISI316/316L	2 X 2 X 3/8	61	23208	DS	SB5105-SB5106	21	2,061

Ladle Analysis(%)

C. ×100	Si. ×100	Mn. ×100	P. ×1000	S. ×1000	Cu. ×100	Ni. ×100	Cr. ×100	Mo. ×100	B. ×10000	CO X 100	N X 100
MAX 3	MAX 100	MAX 200	MAX 45	MAX 30	MAX 50	1000-1400	1600-1800	200-300			MAX 10
2.0	50	139	32	1	20	1136	1687	213		16	2

Mechanical Properties

Heat Treatment (℃)			Tensile Test				Impact Test	Hardness Test	Bend Test
SOLUTION TREATMENT	2nd Quenching	Tempering	Yield Strength KSI, 1000psi	Tensile Strength KSI, 1000psi	Elongation %	Reduction of Area %	Charpy Izod	HRB	
-	-	-	MIN 30	MIN 75	MIN 40	MIN 50		78- 90	
AS DELIVERED			34	75	65	73		79	

The Quality Management System of ISO9002 in Kariya Plant and Relative Head Office have been approved by Lloyd's Resister Quality Assurance Limited

LLOYD'S REGISTER QUALITY ASSURANCE ISO9002

Hardness Test (As delivered)	Grain Size Test	Micro Structure	Macro Structure	Remark
	6.3	GOOD	GOOD	ASTM A276-98A,A484,A479/479M-97C+S2.1;ASME SA479/479M-98ED+S2.1 SAE AMS QQS 763;INTER GRANULAR CORROSION TESTED ASTM A262 A.C.E:OK.1/LOT;1976°F X 2MINUTES WATER QUENCH

Section Code: 10 : Round Bar, 20 : Square Bar, 30 : Hexgonal Bar, 50 : Flat Bar(Round edge), 51 : Flat Bar(Square edge), 54 : Flat Bar(Parabolic type), 60 : Flat Bar(Stainless steel), 61 : Equal Leg Angle Bar(Stainless steel), 62 : Unequal Leg Angle Bar(Stainless steel), 63 : Channel Bar, 66 : Sheet Bar(Stainless steel), 91 : Wire Rod

Condition Code: A : Annealed, B : Low Temperature Annealed, D : Solution Heat Treated, G : Centerless Ground, H : Quenched and Tempered, N : Normalized, P : Cold Drawn, Q : Spheroidized, R : Hot Rolled, S : Pickled, T : Bar Turned

Chief, Inspection Department
AICHI STEEL CORPORATION

APPENDIX F.

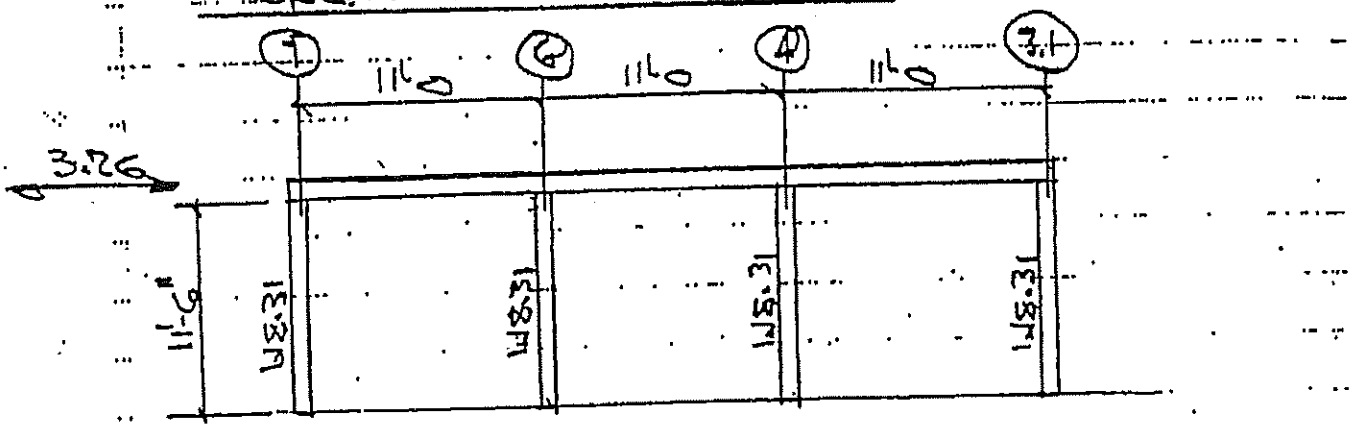
SUPPORT STRUCTURE CALCULATIONS

Structural Support Calculations

COLUMN LOADS

A-1 - 3.6 k	EXCEPT @ GRID F. ALL COLUMNS WILL BE 10 8x24
B-1 - 14.3 k	
C.9-1 - 14.1 k	WITH KL 13'-0 ALLOWABLE COL LOAD IS 93.0 K.
D.1-1 - 19.0 k	THIS SATISFIES ALL CONDITIONS
E-1 - 14.2 k	
A-2 - 4.5 k	
B-2 - 36.3 k	
D-2 - 62.9 k	
E-2 - 34.1 k	
A3 - 8.4 k	
B-3 - 27.9 k	
C.9-3 - 28.8 k	
D.1-3 - 19.9 k	
E-3 - 14.4 k	
A-5 - 9.8 k	
B-5 - 17.6 k	
A-7 - 4.8 k	
B-7 - 8.5 k	
C-7 - 11.5 k	
F-7 - 12.1 k	
C6 - 24.8 k	
F-6 - 24.2 k	
C-4 - 28.1 k	
F-4 - 24.2 k	
F-3.1 - 12.0 k	

HORZ. FORCES @ GRID "F"



$\frac{3.26}{4} = .8150$ KIPS PER COL.

$.8150 \times 11.5 = 9.37$ k' MOMENT

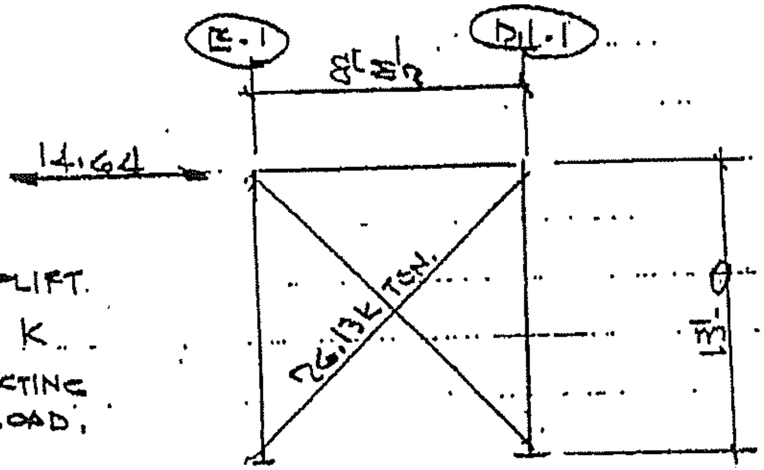
$\frac{9.37 \times 12 \times 1000}{21600} = 5.2$ REQD S3

W8x31 = 27.5 > 5.2 COLUMNS OK

REGISTERED PROFESSIONAL ENGINEER
OTIS ARVIN CLARK
14097
OKLAHOMA

HORZ. FORCES @ DIAG. BRACING.

7.26 KIPS @ C-7 TO F-7
12.23 @ E-2 TO E-3
6.10 @ A-1 TO A-2
14.64 @ D.1-1 TO E-1



COL. UPLIFT
21.65 K
NEGLECTING
DEAD LOAD.

DIAG. BRACE. PL 4 x 3/8 = 1.50 □" $\frac{26.13}{1.5}$ = 17.42 KSI < 24
BRACE O.K.

COLUMN UPLIFT 21.65 W/ 4 - ¾ Ø EPOXY ANCHORS

PULLOUT TEST ON ¾ Ø EPOXY ANC. W/ 6½" INBEDMENT IS
24.2 KIPS. WITH A SAFETY FACTOR OF 4 TO 1
= 6 KIPS PER ANCHOR
6k x 4 = 24 > 21.65 O.K.

REGISTERED PROFESSIONAL ENGINEER
OTIS ARVIN CLARK
14897
OKLAHOMA

DESIGN LOADS (1990 BOCA NATIONAL BLDG. CODE)

LIVE LOAD 100 PSF. (LIGHT MANUFACTURING - PAGE 246
DEAD LOAD 20 PSF.
TOTAL 120 PSF.

TANKS FT1, FT2, & FT3 47300 LBS. EACH (FILLED).
TANK EF4 25,300 LBS (FILLED)

LATERAL FORCES FOR EARTHQUAKE LOADS

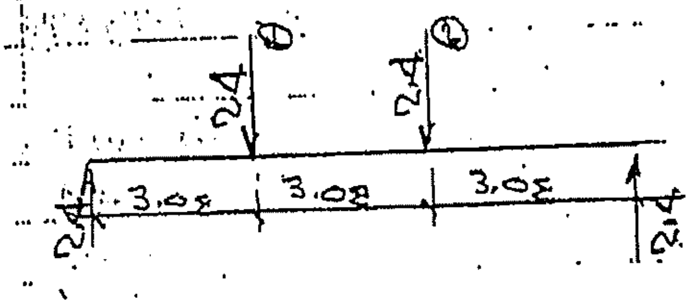
V = 2.5 Av I K C S W (PAGE 278)
Av = .1 (ZONE 1) (PAGE 273)
I = 1.0 (TABLE 1113.1, PAGE 275)
K = 1.0 (TABLE 1113.4.3., PAGE 278)
C = .12 (PAGE 279)
S = 1.5 (TABLE 1113.4.6, PAGE 281)
W = WEIGHT

V = 2.5 x .1 x 1.0 x 1.0 x .12 x 1.5 x W.
V = .045 W

REGISTERED PROFESSIONAL ENGINEER
OTIS ARVIN CLARK
14897
OKLAHOMA

BEAM @ GRID A-1 TO B-1 (W12x14)

UNBRACED LGTH. 3'-1

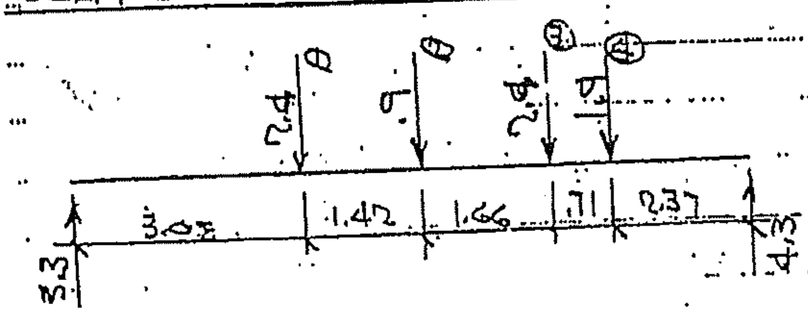


M @ ① & ② = 2.4 x 3.08 = 7.4

FROM ASD 2-174 ALLOWABLE M = 27.3 > 7.4

BEAM @ GRID A-2 TO B-2 (W12x14)

UNBRACED LGTH 3'-1



M @ ① 3.3 x 3.08 = 10.2

M @ ② 3.3 x 4.50 - 2.4 x 1.42 = 11.4

M @ ③ 4.3 x 3.08 - 1.9 x .71 = 11.9

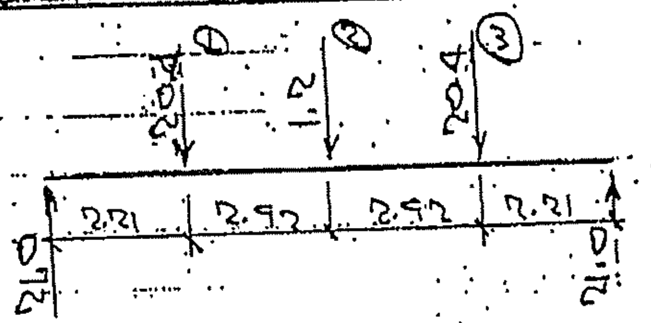
M @ ④ 4.3 x 2.37 = 10.2

FROM ASD 2-174 ALLOWABLE M = 27.3 > 11.9

BEAM @ GRID B-2 TO D-2

(W12x35)

UNBRACED LGTH 2'-11



M @ 1 21.0 x 2.21 = 46.4

M @ 2 21.0 x 5.13 - 20.4 x 2.92 = 48.2

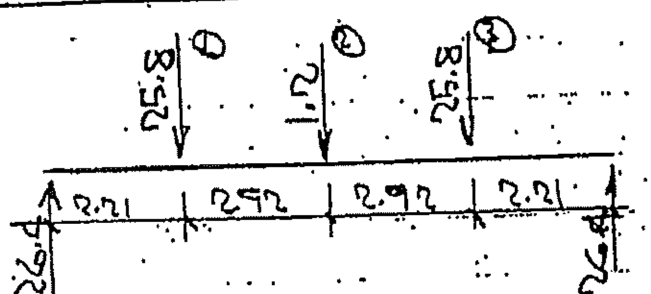
M @ 3 21.0 x 2.21 = 46.4

FROM ASD 2-172 ALLOWABLE M = 91.2 > 48.2

BEAM @ GRID D-2 TO E-2

(W12x26)

UNBRACED LGTH 2'-11



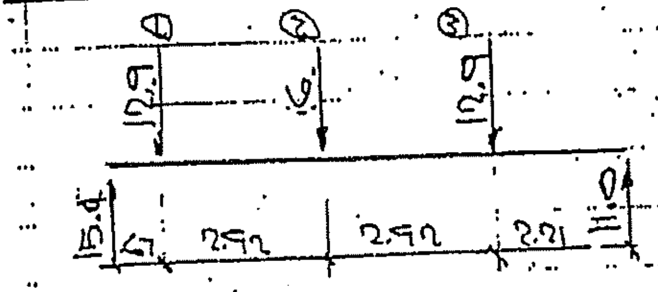
M @ 1 26.4 x 2.21 = 58.3

M @ 2 26.4 x 5.13 - 25.8 x 2.92 = 60.1

M @ 3 26.4 x 2.21 = 58.3

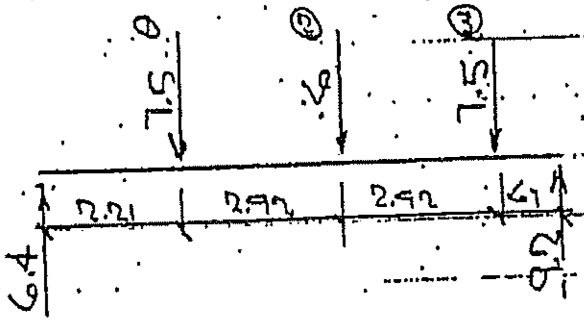
FROM ASD 2-173 ALLOWABLE M = 66.8 > 60.1

BEAM @ GRID D.1-1 TO E-1 & D.1-3 TO E-3 (W12x26)
(UNBRACED LGTH 2.11)



M @ ① 15.4 x .67 = 10.3
M @ ② 15.4 x 3.59 − 12.9 x 2.92 = 17.6
M @ ③ 11.0 x 2.21 = 24.3
FROM ASD 2-173 ALLOWABLE M = 66.6 > 24.3

BEAM @ GRID B-1 TO C9-1 (W12x19)
UNBRACED LGTH 2.11

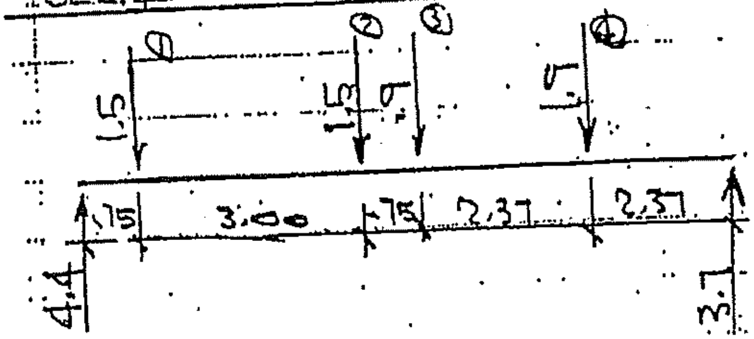


M @ ① 6.4 x 2.21 = 14.1
M @ ② 6.4 x 5.13 − 7.5 x 2.92 = 10.9
M @ ③ 9.2 x .67 = 6.2

FROM ASD 2-174 ALLOWABLE M = 42.5 > 14.1

BEAM @ GRID A-3 TO B-3

(W12x14)
UNBRACED LGTH 3'0

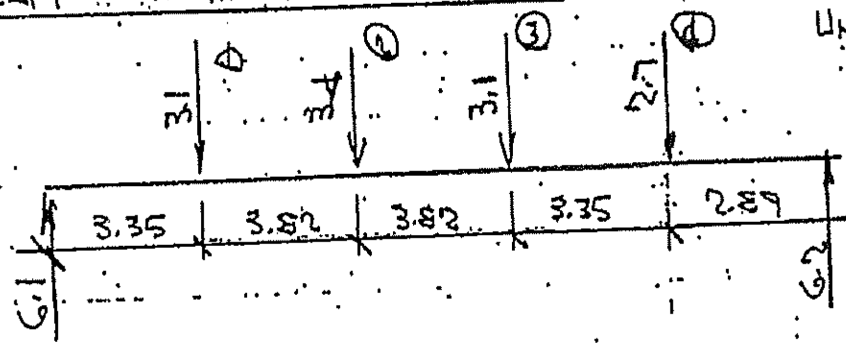


M @ B 4.4 x .75 =
M @ 2 4.4 x 3.75 - 1.5 x 3.00 =
M @ 3 3.7 x 5.14 - 1.9 x 2.37 =
M @ 4 3.7 x 2.37 =

FROM ASD 2-174 ALLOWABLE M = 27.3 >

BEAM @ GRID A-5 TO A-7

(W12x26)
UNBRACED LGTH 3'10



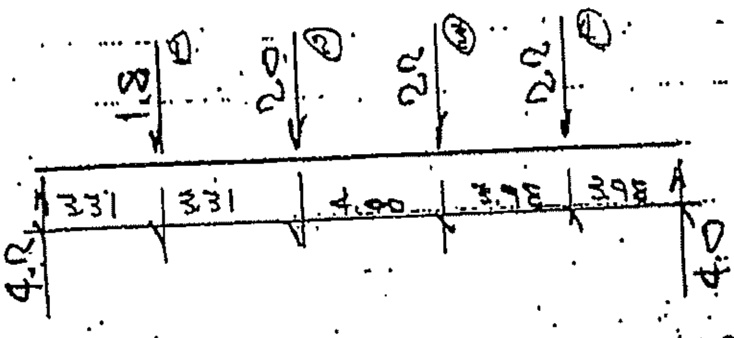
M @ 1 6.1 x 3.35 = 20.4
M @ 2 6.1 x 7.17 - 3.1 x 3.82 = 31.9
M @ 3 6.2 x 6.24 - 2.7 x 3.35 = 29.<
M @ 4 6.2 x 2.89 = 17.9

FROM ASD 2-172 ALLOWABLE M = 76.2 > 31.9

BEAM @ GRID A-3 TO A-5

W12x26

Unbraced Lgth 4.0



M @ 1 = 4.2 × 3.31 = 13.9

M @ 2 = 4.2 × 6.62 - 1.8 × 3.31 = 22.0

M @ 3 = 4.0 × 7.96 - 2.2 × 3.98 = 23.4

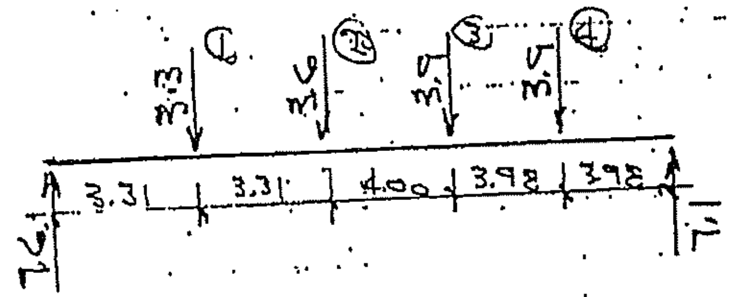
M @ 4 = 4.0 × 3.98 = 15.9

FROM ASD 2-172 ALLOWABLE M = 76.2 > 23.4

BEAM @ GRID B-3 TO B-5

(W12x26)

Unbraced Lgth 4.0



M @ 1 = 7.6 × 3.31 = 25.1

M @ 2 = 7.6 × 6.62 - 3.3 × 3.31 = 39.3

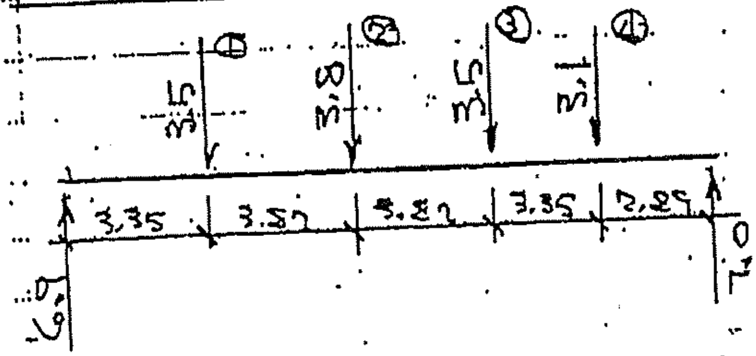
M @ 3 = 7.1 × 7.96 - 3.9 × 3.98 = 41.2

M @ 4 = 7.1 × 3.98 = 28.4

FROM ASD 2-172 ALLOWABLE M = 76.2 > 41.2

BEAM @ GRID B.5 TO B.7 (W12x26)

UNBRACED LGTH 3'9



M @ ① = 6.9 x 3.35 = 23.1

M @ ② = 6.9 x 7.17 - 3.5 x 3.82 = 36.1

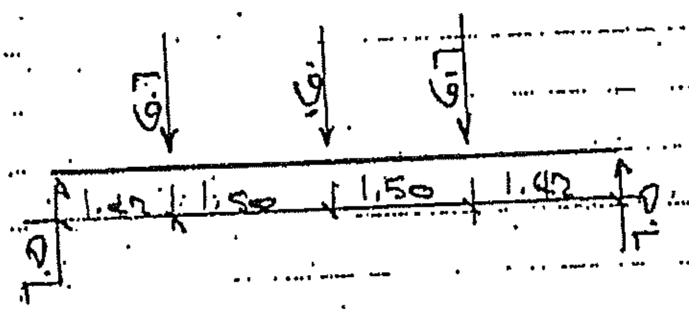
M @ ③ = 7.0 x 6.24 - 3.1 x 3.35 = 33.3

M @ ④ = 7.0 x 2.89 = 20.2

FROM ASD 2-172 ALLOWABLE M = 76.2 > 33.3

CROSS BEAM UNDER FT 1,2,&3 (5 PLACES) 5'10 SPAN (W8x18)

UNBRACED LGTH 1'6



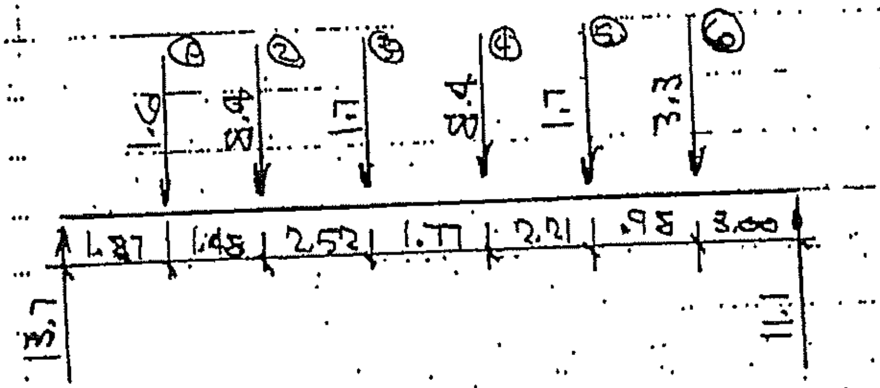
M @ ① = 7.0 x 1.42 = 9.9

M @ ② = 7.0 x 2.92 - 6.7 x 1.50 = 10.4

M @ ③ = 7.0 x 1.42 = 9.9

FROM ASD 2.174 ALLOWABLE M = 30.3 > 10.4

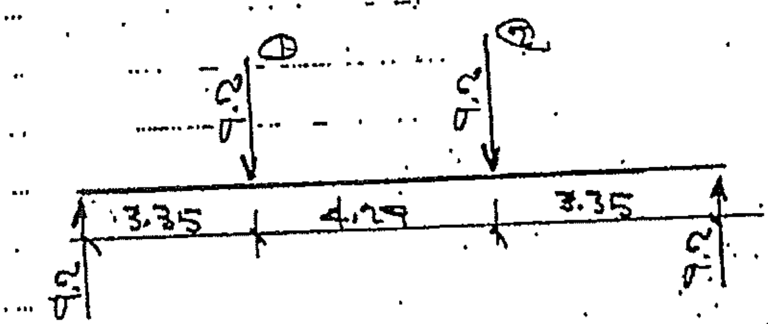
BEAM @ GRID C-3 TO C-4 (W12x35)



M @ ① = 13.7 × 1.87 = 25.6
M @ ② = 13.7 × 3.35 - 1.6 × 1.48 = 43.5
M @ ③ = 13.7 × 5.27 - 1.6 × 4.0 - 8.4 × 2.52 = 57.9
M @ ④ = 11.1 × 6.19 - 3.3 × 3.19 - 1.7 × 2.21 = 54.4
M @ ⑤ = 11.1 × 3.98 - 3.3 × .98 = 40.9
M @ ⑥ = 11.1 × 3.00 = 33.3

FROM ASD 2-172 ALLOWABLE M = 91.2 > 54.4

BEAM @ GRID F-3.1 TO F-4, F-4 TO F6
& F6 TO F-7 (W12x26)

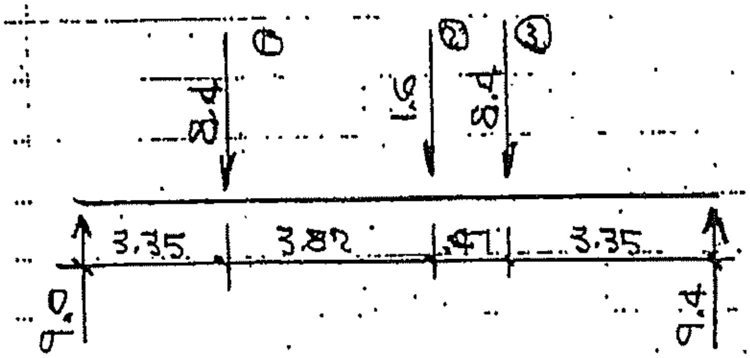


M @ ① = 9.2 × 3.35 = 30.8
M @ ② = 9.2 × 3.35 = 30.8

FROM ASD 2-172 ALLOWABLE M = 66.8 > 30.8

BEAM @ GRID C-6 TO C-7 (W12×26)

UNBRACED LGTH 3'4¼



M@① 9.0×3.35 = 30.2

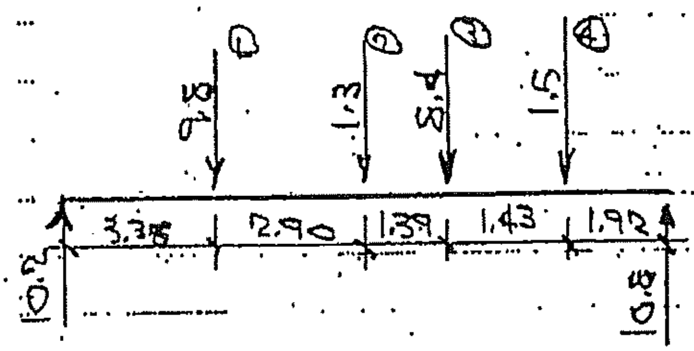
M@② 9.0×7.17 − 8.4×3.82 = 32.4

M@③ 9.4×3.35 = 31.5

FROM ASD 2-173 ALLOWABLE M = 66.8 > 32.4

BEAM @ GRID C-4 TO C-6 (W12×26)

UNBRACED LGTH 3'4¼



M@① = 10.2×3.35 = 34.2

M@② = 10.2×6.25 − 9.8×2.90 = 35.3

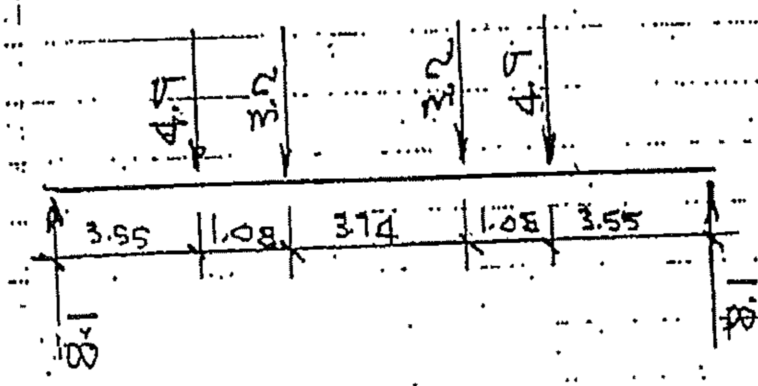
M@③ = 10.8×3.35 − 1.5×1.43 = 34.0

M@④ = 10.8×1.5 = 16.2

FROM ASD 2.173 ALLOWABLE M = 66.8 > 35.3

BEAM UNDER ER4 (2 PLACES) (W12x26)

UNBRACED LGTH 5'-10 3/4"

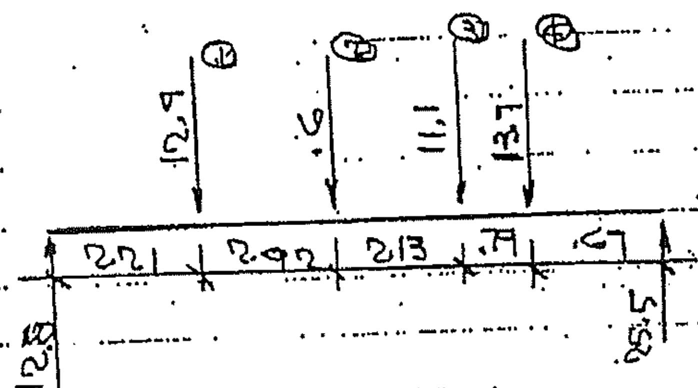


M @ ① & ④ = 8.1 × 3.55 = 28.8

M @ ② & ③ = 8.1 × 4.63 − 4.9 × 1.08 = 32.2

FROM ADS 2-173 ALLOWABLE M = 66.8 > 32.2

BEAM @ GRID B-3 TO C.9-3 (W12x35)



M @ ① 12.8 × 2.21 = 28.3

M @ ② 12.8 × 5.13 − 12.9 × 2.92 = 28.0

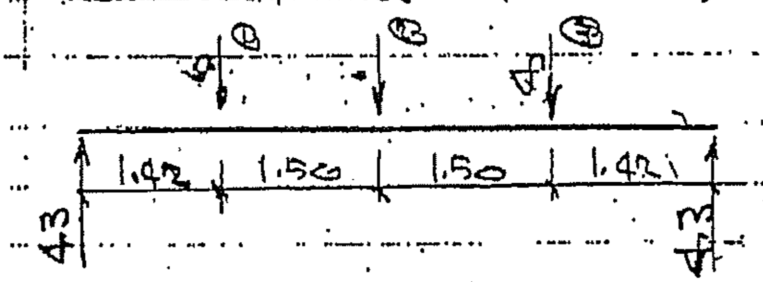
M @ ③ 25.5 × 1.46 − 13.7 × .79 = 26.4

M @ ④ 25.5 × .67 = 17.1

FROM ADS 2-172 ALLOWABLE M = 91.2 > 28.3

CROSS BEAM UNDER FF4 (2 PLACES) 5'-0 SPAN (W8x18)

UNBRACED LGTH 1'-6



M @ ① 4.3 x 1.42 = 6.1

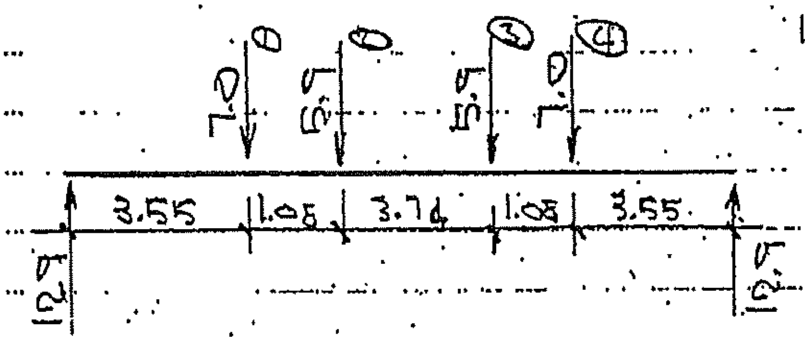
M @ ② 4.3 x 2.92 - 4.0 x 1.50 = 6.6

M @ ③ 4.3 x 1.42 = 6.1

FROM ASD 2-174 ALLOWABLE M = 30.3 > 6.6

BEAM UNDER FLASH TANKS (6 PLACES) (W12x26)

UNBRACED LGTH 5'-0¾



M @ ① & ④ = 12.9 x 3.55 = 45.8

M @ ② & ③ = 12.9 x 4.63 - 7.0 x 1.08 = 52.2

FROM ASD 2-173 ALLOWABLE M = 66.8 > 52.2

BEAM @ GRID E-2 TO E-3 (W8x24)
UNBRACED LGTH 12'4

$M = \frac{1.8 \times 12.33}{8} = 2.8\ k'$

FROM ASD 2-174 ALLOWABLE M = 38.3 > 2.8

BEAM @ GRID B-2 TO B-3 (W8x24)
UNBRACED LGTH 12'4

$M = \frac{3.6 \times 12.33}{8} = 5.5\ k'$

FROM ASD 2-174 ALLOWABLE M = 38.3 > 5.5

BEAM @ GRID B-1 TO B-2 (W8x24)
UNBRACED LGTH 12'4

$M = \frac{4.2 \times 12.33}{8} = 6.5\ k'$

FROM ASD 2-174 ALLOWABLE M = 38.3 > 6.5

BEAM @ GRID A-1 TO A-2 (W8x24)
UNBRACED LGTH 12'4

$M = \frac{2.4 \times 12.33}{8} = 3.7\ k'$

FROM ASD 2-174 ALLOWABLE M = 38.2 > 3.7

BEAM @ GRID A-5 TO B-5 (W8x24)
UNBRACED LGTH 9'3

$M = \frac{3.4 \times 9.25}{8} = 3.9$

FROM ASD 2-174 ALLOWABLE M = 38.3 > 3.9

BEAM 7'-2 1/8 SOUTH OF GRID B-7 TO C-7 W8x10

UNBRACED LGTH 7'-3

$M = \frac{3.2 \times 7.25}{8} = 2.9\ k'$

FROM ASD PAGE 2-175 ALLOWABLE M = 11.5 > 2.9

BEAM 6'-3 NORTH OF GRID B-5 TO C-5 (W8x10)

UNBRACED LGTH 7'-3

$M = \frac{3.2 \times 7.25}{8} = 2.9\ k'$

FROM ADS 2-175 ALLOWABLE M = 11.5 > 2.9

BEAM 2'-10 3/4 NORTH OF GRID B-5 TO C-5 (W8x10)

UNBRACED LGTH 7'-3

$M = \frac{2.8 \times 7.25}{8} = 2.5\ k'$

FROM ADS 2-175 ALLOWABLE M = 11.5 > 2.5

BEAM 3'-3 3/4 SOUTH OF GRID B-5 TO C-5 (W8x10)

UNBRACED LGTH 7'-3

$M = \frac{3.0 \times 7.25}{8} = 2.7\ k'$

FROM ADS 2-175 ALLOWABLE M = 11.5 > 2.7

BEAM 6'-7 1/2 SOUTH OF GRID B-5 TO C-5 (W8x10)

UNBRACED LGTH 7'-3

$M = \frac{3.2 \times 7.25}{8} = 2.9\ k'$

FROM ADS 2-175 ALLOWABLE M = 11.5 > 2.9

BEAM 2'10¾ NORTH OF GRID A-5 TO B-5 (W8x10)
UNBRACED LGTH 9'3

$M = \frac{3.4 \times 9.25}{8} = 3.9\,k'$

FROM ADS 2-175 ALLOWABLE M = 9.0 > 3.9

BEAM 6'3 NORTH OF GRID A-5 TO B-5 (W8x10)
UNBRACED LGTH 9'3

$M = \frac{4.0 \times 9.25}{8} = 4.6\,k'$

FROM ADS 2.175 ALLOWABLE M = 9.0 > 4.6

BEAM 7'2½ SOUTH OF GRID A-7 TO B-7 (W8x10)
UNBRACED LGTH 9'3

$M = \frac{4.2 \times 9.25}{8} = 4.9\,k'$

FROM ADS 2-175 ALLOWABLE M = 9.0 > 4.9

BEAM 3'4¼ SOUTH OF GRID A-7 TO B-7 (W8x10)

$M = \frac{4.0 \times 9.25}{8} = 4.6\,k'$

FROM ADS 2-175 ALLOWABLE M = 9.0 > 4.6

BEAM 3'4¼ SOUTH OF GRID B-5 TO C-5 (W8x10)
UNBRACED LGTH 7'3

$M = \frac{3.2 \times 7.25}{8} = 2.9\,k'$

FROM ADS 2.175 ALLOWABLE M = 11.5 > 2.9

BEAM @ GRID D-2 TO D-3 (W12x14): UNBRACED LGTH 11'-10

M = 3.8 x 11.83 / 8 = 4.7 K'

FROM ASD 2-175 ALLOWABLE M = 20.75 > 4.7

BEAM @ GRID D-1 TO D-2 (W12x19) UNBRACED LGTH 12'-6

M = 3.2 x 12.5 / 8 = 5.0 K'

FROM ASD 2-175 ALLOWABLE M = 17.0 > 5.0

BEAM 3'-11 3/4 ± 7'-11 1/2 NORTH OF GRID A-3 TO B-3 (W8x10) UNBRACED LGTH 9'-3)

M = 4.4 x 9.25 / 8 = 5.1 K'

FROM ASD 2-175 ALLOWABLE M = 9.0 > 5.1

BEAM 6'-7 1/2 SOUTH OF GRID A-5 TO B5 (W8x10) UNBRACED LGTH 9'-3

M = 4.0 x 9.25 / 8 = 4.6

FROM ASD 2-175 ALLOWABLE M = 9.0 > 4.6

BEAM 3'-3 3/4 SOUTH OF GRID A-5 TO B-5 (W8x10) UNBRACED LGTH 9'-3

M = 3.6 x 9.25 / 8 = 4.2

FROM ADS 2-175 ALLOWABLE M = 9.0 > 4.2

BEAM 3'-1 & 6'-2 WEST OF GRID B-1 TO B-2 (2 PLACES)
(W8x15) UNBRACED LGTH = 13'-0

$M = \frac{4.8 \times 13}{8} = 7.8\ k'$

FROM ASD 2.175 ALLOWABLE M = 12.1 > 7.8

BEAM 2'-4" W OF GRID B-2 TO B-3 (W8x15)
UNBRACED LGTH 13'-0

$M = \frac{3.8 \times 13}{8} = 6.2\ k'$

FROM ASD PAGE 2-175 ALLOWABLE M = 12.1 > 6.2

BEAM UNDER TANKS (8 PLACES) (W8x10)
UNBRACED LGTH 5'-11

$M = \frac{1.6 \times 5.9}{8} = 1.2\ k'$

FROM ASD 2-175 ALLOWABLE M = 15.6 > 1.2

BEAM @ TANKS 3'-6 5/8 SPAN (8 PLACES) (W8x10)
UNBRACED LGTH 3'-6 5/8

$M = \frac{1.2 \times 3.55}{8} = .5\ k'$

FROM ASD 2.175 ALLOWABLE M = 15.6 > .5

BEAM @ GRID A-7 TO B-7 (W8.24)
UNBRACED LGTH 9'3

$M = \frac{1.8 \times 9.25}{8} = 2.1\ k'$

FROM ASD 2-174 ALLOWABLE M = 38.3 > 2.1

BEAM @ GRID B-7 TO C-7 (W8.24)
UNBRACED LGTH 7'3

$M = \frac{1.4 \times 7.25}{8} = 1.3$

FROM ASD 2.174 ALLOWABLE M = 38.3 > 1.3

BEAM @ GRID B-5 TO C-5 (W8.24)
UNBRACED LGTH 7'3

$M = \frac{2.6 \times 7.25}{8} = 2.4\ k'$

FROM ASD 2.174 ALLOWABLE M = 38.3 > 2.4

BEAM @ GRID C-7 TO F-7 (W12.26)
UNBRACED LGTH 18'0½

$M = \frac{3.6 \times 18.04}{8} = 8.1\ k'$

M @ CONT. END $= \frac{.120 \times 5.45^2}{2} = 3.0\ k'$

FROM ASD 2.174 ALLOWABLE M = 31.4 > 8.1

BEAM @ GRID C-6 TO F-6 & C-4 TO F-4 (W 12x26)
UNBRACED LGTH 18'-0½

$M = \frac{7.2 \times 18.04}{8} = 16.2\ k'$

$M @ CONT = \frac{.40 \times 5.45^2}{2} = 5.9\ k'$

FROM ASD 2-174 ALLOWABLE $M = 31.4 > 16.2$

BEAM @ GRID C-3.1 TO F-3.1 (W12x26)
UNBRACED LGTH 18'-0½

$M = \frac{6.6 \times 18.04}{8} = 14.9\ k'$

$M @ CANT. = \frac{.20 \times 5.45^2}{2} = 3.0\ k'$

FROM ASD 2-174 ALLOWABLE $M = 31.4 > 14.9$

BEAM @ FILTER PRESSES GRID C TO F (6 PLACES) (W12x26)
UNBRACED LGTH 18'-0½

$M = \frac{3.6 \times 18.04}{8} = 8.1\ k'$

$M @ CANT. = \frac{.46 \times 5.45^2}{2} = 6.8\ k'$

FROM ADS 2-174 ALLOWABLE $M = 31.4 > 8.1$

BEAM 7'11½" 34'1¾" NORTH OF GRID. B-3 TO C-3 (W8x10)
UNBRACED LGTH 7'3

$M = \frac{3.4 \times 7.25}{8} = 3.1\ k'$

FROM ASD 2-175 ALLOWABLE M = 11.5 > 3.1

BEAM @ GRID E-1 TO E-2 (W8x10)
UNBRACED LGTH 12'4

$M = \frac{1.8 \times 11.33}{8} = 2.5$

FROM ADS PAGE 2.175 ALLOWABLE M = 5.2 > 2.5

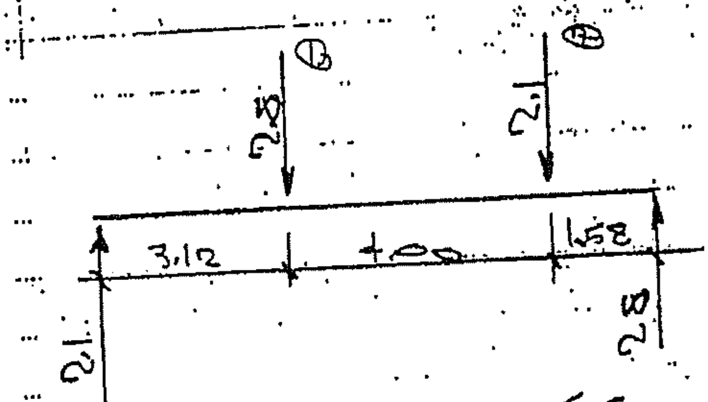
BEAM 4'6 EAST OF GRID A-3 TO A-2 (W8x10)
UNBRACED LGTH 13'0

$M = \frac{1.8 \times 13}{8} = 2.9\ k'$

FROM ASD 2-175 ALLOWABLE M = 4.8 > 2.9

MEZZ BEAM @ GRID B-1 TO C9-1 (W8x15)

UNBRACED LGTH. 4.0



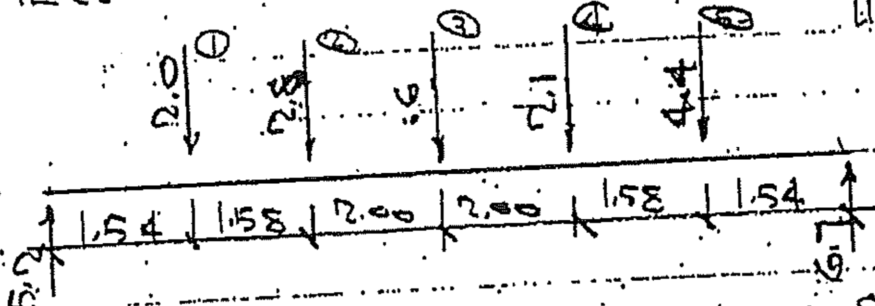
M @ (B) = 2.1 x 3.12 = 6.6

M @ (C) = 2.8 x 1.58 = 4.4

FROM ASD 2-175 ALLOWABLE M = 23.6 > 6.6

MEZZ BEAM @ GRID B-2 TO D-2 (W12x14)

UNBRACED LGTH 2.0



M @ (1) = 5.2 x 1.54 = 8.0

M @ (2) = 5.2 x 3.12 - 2.0 x 1.58 = 13.3

M @ (3) = 5.2 x 5.12 - 2.0 x 3.58 - 2.8 x 2.00 = 14.4

M @ (4) = 6.7 x 3.12 - 4.4 x 1.58 = 13.9

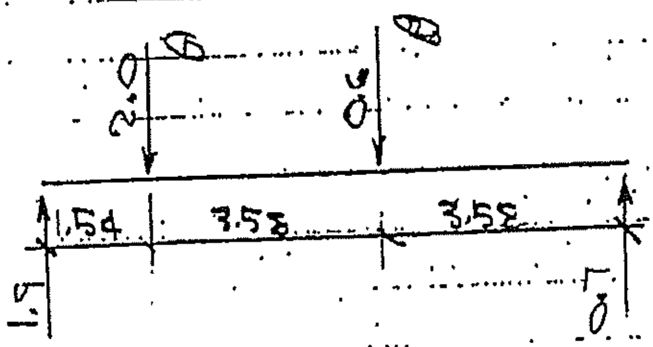
M @ (5) = 6.7 x 1.54 = 10.3

FROM ASD 2-174 ALLOWABLE M = 29.8 > 14.4

(3 PLACES)

MEZZ BEAM B-3 TO C.9-3 & D.1-3 TO E-3 (W8x15)
& E-1 TO D.1-1

UNBRACED LGTH 3.7

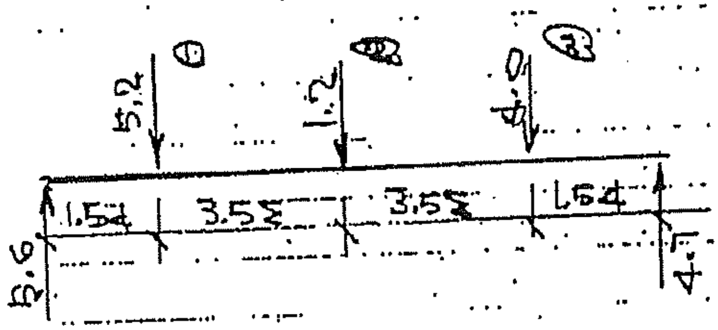


M @ 1 1.9 x 1.54 = 2.9 k'
M @ 2 0.7 x 3.58 = 2.5 k'

FROM ASD 2-175 ALLOWABLE M = 23.6 > 2.9

MEZZ BEAM @ GRID D-2 TO E-2 (W12x14)

UNBRACED LGTH 3.7



M @ 1 = 5.6 x 1.54 = 8.6
M @ 2 = 5.6 x 5.12 - 5.2 x 3.58 = 10.1
M @ 3 = 4.7 x 1.54 = 7.2

FROM ASD 2-174 ALLOWABLE M = 27.6 > 10.1

MEZZ BEAM C.9-1 TO C.9-2 (W8x15)
(UNBRACED LGTH = 10'-2)

$M = \frac{3.6 \times 12.67}{8} = 5.7\,k'$

FROM ADS 2.175 ALLOWABLE M = 14.0 > 5.7

MEZZ BEAM D.1-1 TO D.1-2 (W8x15)
(UNBRACED LGTH = 7'-2)

$M = \frac{5.2 \times 12.67}{8} = 8.2\,k'$

FROM ADS 2-175 ALLOWABLE M = 21.0 > 8.2

MEZZ BEAM 1'-7 WEST OF C9-1 TO C.9-2 (W8x15)
(UNBRACED LGTH 4'-6)

$M = \frac{4.2 \times 13}{8} = 6.8\,k'$

FROM ADS 2.175 ALLOWABLE M = 21.25 > 6.8

MEZZ BEAM 3'-1/2 EAST OF B-1 TO B-2 (W8x15)
(4'-6 UNBRACED LGTH)

$M = \frac{5.6 \times 13}{8} = 9.1$

FROM ADS 2.175 ALLOWABLE M = 21.25 > 9.1

MEZZ BEAM 1'-6 1/2 EAST OF B2 TO B3 (W8x15)
(UNBRACED LGTH 7'-2)

$M = \frac{4.0 \times 13}{8} = 6.5$

FROM ADS 2-175 ALLOWABLE M = 21.0 > 6.5

MEZZ BEAM @ GRID E-1 TO E-2, (W8x10)
B2 TO B3 & E2 TO E3

$M = \frac{1.2 \times 13}{8} = 1.95$ k' (UNBRACED LGTH 13'-0)

FROM ADS 2.175 ALLOWABLE M = 4.0 > 1.95

MEZZ BEAM @ GRID B1 TO B2 (W8x10)
(UNBRACED LGTH 6'8)

$M = \frac{2.6 \times 13}{8} = 4.2$ k'

FROM ADS PAGE 2.175 ALLOWABLE M = 12.2 >

MEZZ BEAM @ GRID C9-3 TO C9-2 & D1-3 TO D1-2
(W8x15) UNBRACED LGTH 7'2)

$M = \frac{5.2 \times 13}{8} = 8.5$ k'

FROM ADS 2.175 ALLOW. M = 21.2 > 8.5

MEZZ BEAM 1'6" WEST OF E1 TO E2 & E2 TO E3 (W8x15)
(UNBRACED LGTH 7'2)

$M = \frac{4.0 \times 13}{8} = 6.5$ k'

FROM ADS 2.175 ALLOWABLE M = 21.2 > 6.5

MEZZ BEAM 2'-11 SPAN, 6 PLACES, W8x10
(2'-11 UNBRACED LGTH)

$M = \frac{1.2 \times 2.92}{8} = .4 K'$

FROM ADS 2-175 ALLOWABLE M = 16.0 > .4

MEZZ BEAM @ TANK OPENINGS (6 PLACES) (W 8x10)
(UNBRACED LGTH 2'1/4

$M = \frac{.6 \times 7.16}{4} = 1.1 K'$

FROM ADS 2-175 ALLOWABLE M = 16.0 > 1.1

OTIS ARVIN CLARK 14897 REGISTERED PROFESSIONAL ENGINEER OKLAHOMA

(REVISED)

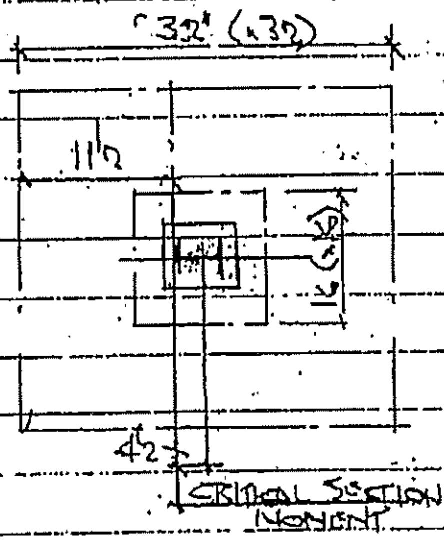
COLUMNS ON 6" SLAB

MAX COL LOAD IS AT B.5 = 17.6 KIPS

6" SLAB 4000 PSI CONC W/ #4@12 E.W. @ CTR.

ALLOWABLE M PER FT OF SLAB

$= A_s f_s j d = .20 \times 24000 \times .85 \times 3 = 12{,}240$ "LBS.



CHECK OF 2 WAY (PUNCHING) SHEAR

$4 \times 16" \times 6" \times 1.1\sqrt{4000} = 26.7\,K > 17.6\,K$ O.K.

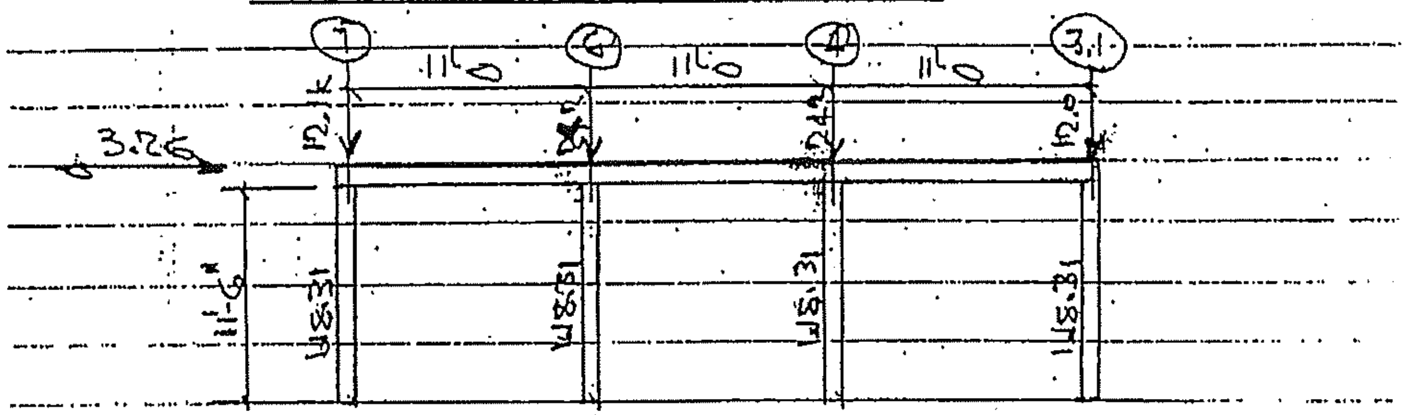
REQUIRED MOMENT PER FT OF SLAB

$\dfrac{\dfrac{2500 \times 11.5}{12}}{3} \times 11.5 = 9184$ "LBS $< 12{,}240$ "LBS. O.K.

FROM ASD PAGE 2-302 BEAM DIAG. #20

(REVISED)

HORZ FORCES @ GRID "F"



$\frac{3.26}{4} = .8150$ KIPS PER COL.

$.8150 \times 11.5 = 9.37$ k' MOMENT

$\frac{9.37 \times 12 \times 1000}{21600} = 5.2$ REQ'D S3

W8x31 = 27.5 > 5.2 ∴ COLUMNS OK

COMBINED LOADS

$\frac{5.2}{27.5} + \frac{24.2}{149} = .3515 < 1$ COLS O.K.

FROM PAGE 3.31

REGISTERED PROFESSIONAL ENGINEER
OTIS ARVIN CLARK
14897
OKLAHOMA

HORZ FORCES @ MEZZ. MAX. COL LOAD @ B2 = 7.1 k
D2 = 12.3 k
E2 = 5.9 k

HORZ FORCE @ GRID 2 = (7.1 + 12.3 + 5.9) x .045 = 1.14 k

$\frac{1.14}{3}$ = .38 k HORZ FORCE PER COL.

M k' WEAK AXIS OF COL = .38 x 12.25 = 4.66 k'

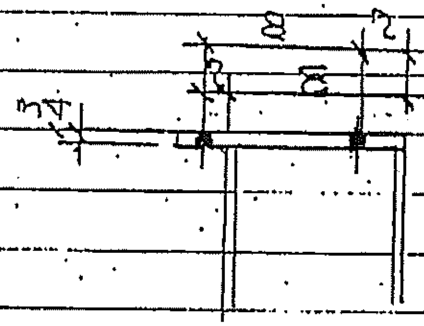
REQD S_y = $\frac{4.66 \times 12}{21.6}$ = 2.59 ≤ 5.63 OK

COMBINED LOADING

$\frac{2.59}{5.63} + \frac{12.3}{95}$ = .46 + .13 = .59 < 1

COLS. OK

MOMENT CONN @ COL CAP PLATES - COLS F3.1, F4, F6, & F7



CAP PLS @ COLS F3.1 & F7

FROM PAGE 5 MOMENT IS 9.37 k'

FORCE @ FLG = $\frac{9.37 \times 12}{(8 - .435)} = 14.86$ k

WELD @ FLANGES .70 x 4 x 8 = 22.4 > 14.86 O.K.

MAX TEN @ BOLTS = $\frac{9.37 \times 12}{6.75} = 16.66$ k

$\frac{16.66}{2} = 8.32$ PER BOLT < 9.3 O.K.

APPENDIX G.

FOUNDATION ANALYSIS

ENVIROTECH
ENGINEERING & CONSULTING, INC.

Foundation Design Analysis

USPCI
A Subsidiary of
Union Pacific Corporation

March 27, 1995

Mr. Jim Richenbaugh
Black & Veatch Waste Science
4717 Grand Avenue, Suite 500
Kansas City, MO 64112

Re: USPCI Lone Mountain Facility
Subject: Waste Water Treatment Floor Structural Design

The concrete floors in the area where the mezzanine has been erected were poured as part of two different building expansions. The first expansion was poured in the spring of 1987 and was designed to be eighteen inches thick with two layers of 3/4 inch reinforcement bars tied on one foot centers and separated by twelve inches between the top and bottom mats. All reinforcement bars were kept within three inches of the slab's surfaces and were supported by concrete brick on a two inch layer of sand. This slab underlies the area that supports the Flash Tanks and EF4 and extends to the south edge of the filter press mezzanine.

The second expansion attaches to the north side of the first slab and was poured in November of 1987. It was poured around four existing boiler foundations that were 2 feet wide, 3 feet deep, and 24 feet long. The floor slab was poured six inches thick and used a layer of 1/2 inch reinforcement bars tied on one foot centers, supported on a concrete brick and a 2 inch layer of sand. This slab underlies the area supporting the filter presses.

Both slabs were poured using a 4000 psi concrete strength mix as verified by the core sample tested by Meyers Engineering of which a report has been sent to you earlier this week.

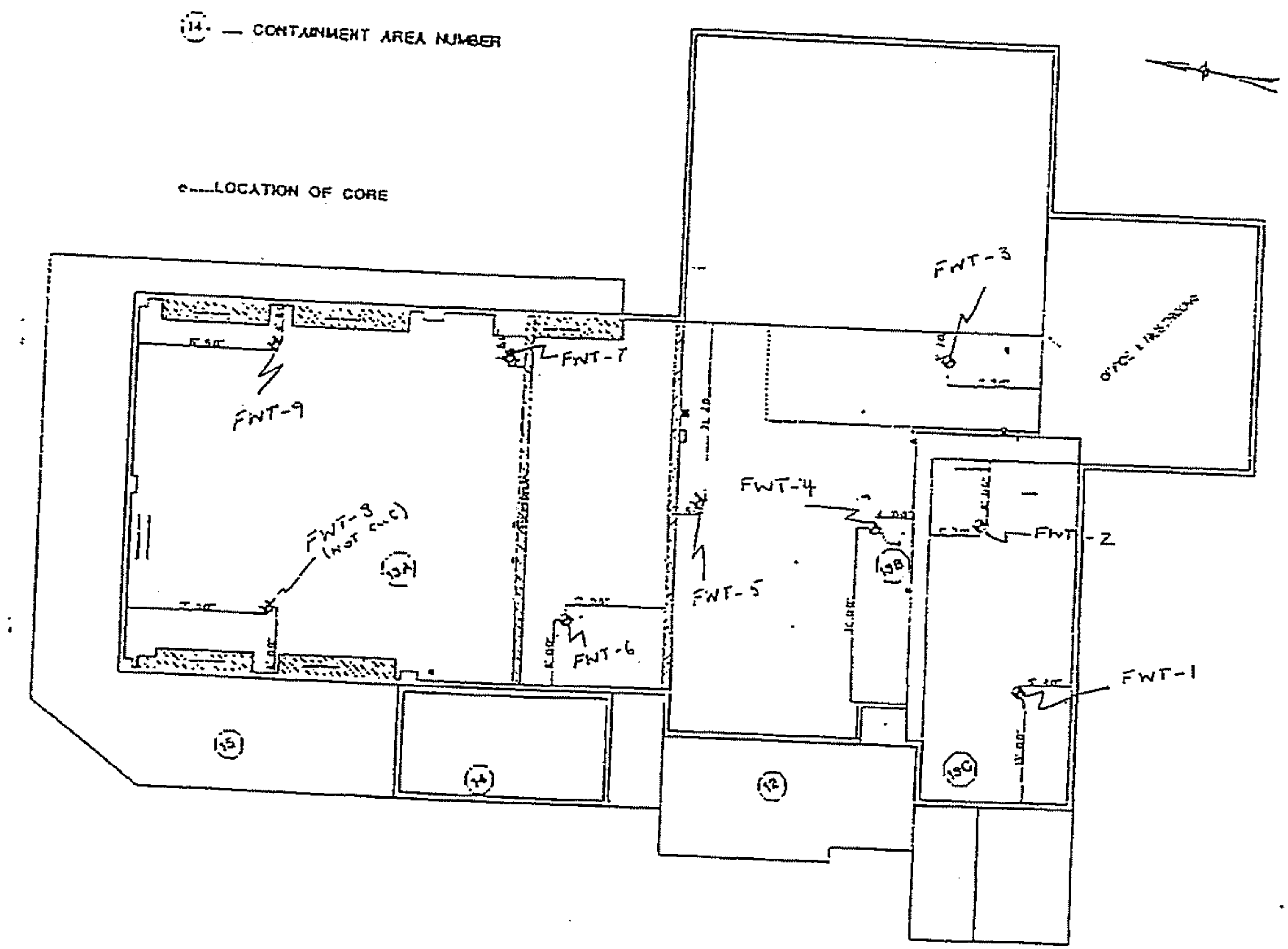
I hope this will provide the information you needed for the certification work now in progress.

Sincerely,

Lawson Fenton

Lawson Fenton
Project Manager

Box 170
aynoka, Oklahoma 73860-9622
l: 405/697-3500
x: 405/697-3596



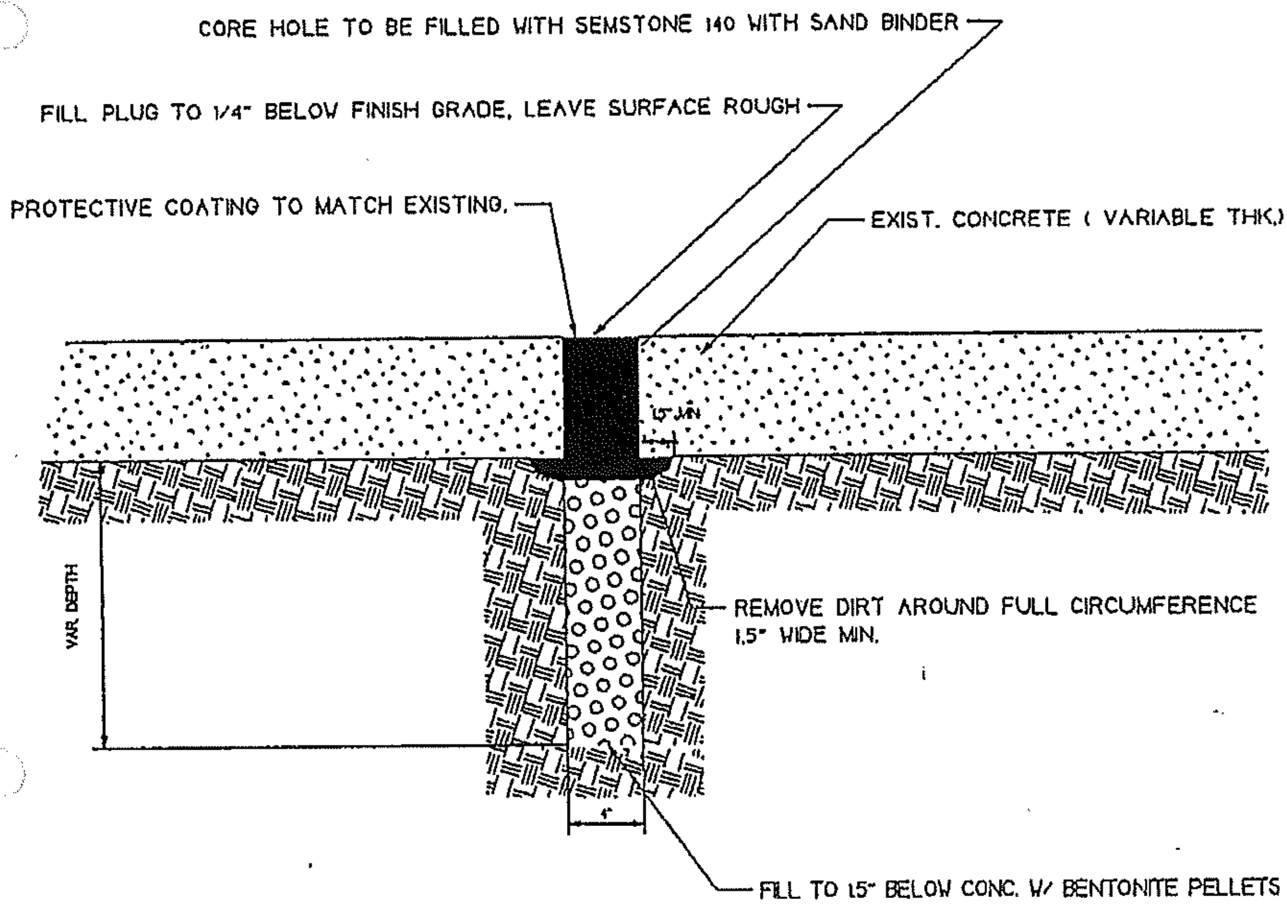
FWT: Final Water Treatment

LAYOUT OF WASTE WATER TREATMENT BUILDING USPCI LONE MOUNTAIN HAZARDOUS WASTE FACILITY WAYNOKA, OKLAHOMA

Specimen	Diameter, in.	Drilled Length, in.	Capped Length, in.	Crushing Load, lbs.	L/D Correction Factor	Compressive Strength, psi
PHT-1	3.75	5.5	5.7	32,440	0.96	2,810
PHT-2	3.75	5.5	4.9	47,200	0.93	3,980
PHT-3	3.75	6.5	4.5	41,400	0.93	3,490
PHT-4	3.75	7.5	4.6	60,700	0.93	5,110
PHT-5	3.75	7.0	7.1	43,000	0.99	3,860
PHT-6	3.75	6.5	4.1	57,100	0.88	4,550
PHT-7	3.75	7.0	5.8	43,800	0.96	3,810
PHT-8	3.75	6.0	5.8	74,800	0.96	6,480
PHT-9	3.75	5.0	5.5	33,900	0.96	2,950
PHT-10	3.75	6.0	4.7	72,500	0.93	6,100
PHT-11	3.75	6.0	5.6	55,720	0.96	4,840
PHT-12	3.75	6.0	6.6	65,600	0.98	5,800
PHT-13	3.75	5.0	5.3	68,700	0.94	5,850
PHT-14	3.75	5.0	5.3	80,200	0.95	6,900
PHT-15	3.75	6.0	5.1	60,200	0.97	5,290
FHT-1A	3.75	6.0	4.7	53,800	0.93	4,530
FHT-1B	3.75	13.0	6.0	50,800	0.97	4,460
FHT-2	3.75	22.0	7.0	30,740	0.99	2,760
*FHT-3	3.75	15.0	-	-	-	-
FHT-4	3.75	6.0	7.0	81,600	0.99	7,320
FHT-5	3.75	6.0	5.8	81,700	0.96	7,100
*FHT-6	3.75	19.0	-	-	-	-
*FHT-7	3.75	14.5	-	-	-	-
FHT-9	3.75	7.0	7.0	53,200	0.99	4,770

PHT - Pre-Water Treatment
FHT - Final Water Treatment

* Samples which we were not able to pull out of the hole.



CORE PLUG DETAIL

CORE PLUG DETAIL FOR USPCI, LONE MOUNTAIN FACILITY WAYNOKA, OKLAHOMA	Myers ENGINEERING CORPORATION Oklahoma City Oklahoma	JOB NO. 511 SCALE NTS DRAWN DWC DATE 6/23/97 1 SHEET OF 1

REV. NO1 6-23-97 CHANGE FILL N SOIL TO BENTONITE SEAL PER GENE WALKER REQUEST

OTIS A. CLARK PE.

Phone
(405) 878-0338

130 Bdwy. Bldg.
Suite 202
Shawnee, OK. 74801

To: USPCI
Lone Mountain Facility
Route 2, Box 180A
Waynoka, Okla. 73806

Attn: Lawson Fenton

March 28, 1995

The following is an investigation for the foundation support for the mezzanine platforms for the Wastewater Final Treatment Facility, and the calculations for the design of the beams, columns, and bracing for the structure. The design loads are per the 1990 BOCA National Building Code and are shown on page #7 of the following submittal.

COLUMN	LOAD, KIPS	FOUNDATION CONDITION	REMARKS
A-1	3.6	17" floor slab	OK (see page #2)
A-2	4.5		
A-3	8.4	do	do
A-5	9.8	6" floor slab	OK (see page #1)
A-7	4.8	do	do
B-1	14.3	17" floor slab	OK (see page #2)
B-2	36.3		
B-3	27.9	do	do
B-5	17.6	6" floor slab	OK (see page #1)
B-7	8.5	do	do
C-4	28.1	24" x 36" cont.ftg.	Ok (see page #3)

C-6	24.8	24" x 36" cont.ftg.	Ok (see page #3)
C-7	11.5	6" floor slab	OK (see page #1)
C.9-1	14.1	17" floor slab	OK (see page #2)
C.9-3	28.8		
D-2	62.9		
D.1-1	19.0		
D.1-3	19.9		
E-1	14.2		
E-2	34.1		
E-3	14.4	do	do
F-3.1	12.0	6" floor slab	OK (see page #1)
F-4	24.2	24" x 36" cont. ftg.	OK (see page #3)
F-6	24.2	do	do
F-7	12.1	6" floor slab	OK (see page #1)

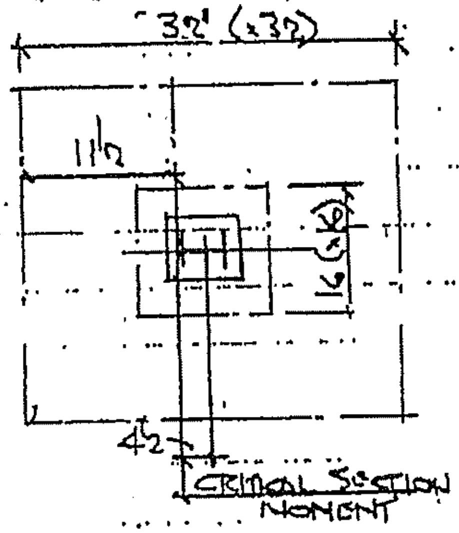
PROFESSIONAL ENGINEER
OTIS ARVIN
CLARK
14897
OKLAHOMA

COLUMNS ON 6" SLABS

MAX COL LOAD IS AT B.5 – 17.6 KIPS

6" SLAB, 4,000 PSI CONC. W/ #4 @ 12 E.W. @ CTR.

ALLOWABLE M PER FT. OF SLAB
= As fs jd = .20 x 24000 x .85 x 3 = 12,240 " LBS.



CHECK OF 2 WAY (PUNCHING) SHEAR
4 x 16" x 6" x 1.1 $\sqrt{4000}$ = 26.7 K. > 17.6 K O.K

REQUIRED MOMENT PER FT. OF SLAB

$$\frac{\frac{2500 \times 11.5}{12} \times 11.5}{4} = 6,888\text{" LBS.} < 12,240\text{" LBS.} \quad \text{O.K.}$$

COLUMNS ON 17" SLAB W/ #6 @ 12" E.W. T&B

MAX. COL. LOAD IS AT GRID D-2 - 62.9 KIPS

ALLOWABLE MOMENT IN SLAB
$.44 \times 24000 \times 12 = 126,720$ "LB. = 10.56 k'

ALLOWABLE SOIL BRG. = 2500 - SLAB WT 180 = 2320

$\frac{62.9}{2.32} = 27.11$ SQ FT REQD. AREA = 5'-3" SQUARE

2 WAY (PUNCHING) SHEAR $4 \times 27 \times 17 \times 1.1 \sqrt{4000}$
$= 127.7$ K > 62.9 K ... O.K.

REQD MOMENT IN GRADE BEAM

$\frac{2.25 \times 2.32}{4} = 1.31$ k' < 10.56 k' O.K.

COLUMNS ON 24"x36" GRADE BEAM

MAX COL LOAD IS AT COL C-4 – 28.1 KIPS.

GRADE BEAM HAS 2-#6 @ TOP, CTR & BOTT
(ACCORDING TO LAWSON FENTON)

ALLOWABLE MOMENT IN GRADE BEAM (FIGURING T&B REINF.)
$A_s f_s j d$ = .88 x 24000 x 30 x .633,600"LB. OR 52.8 K'

ALLOWABLE SOIL BRG 2500 - GB WEIGHT 360 = 2140

$\frac{28,100}{2140 \times 2}$ = 6'-8 LENGTH OF GRADE BEAM TO SUPPORT SOIL.

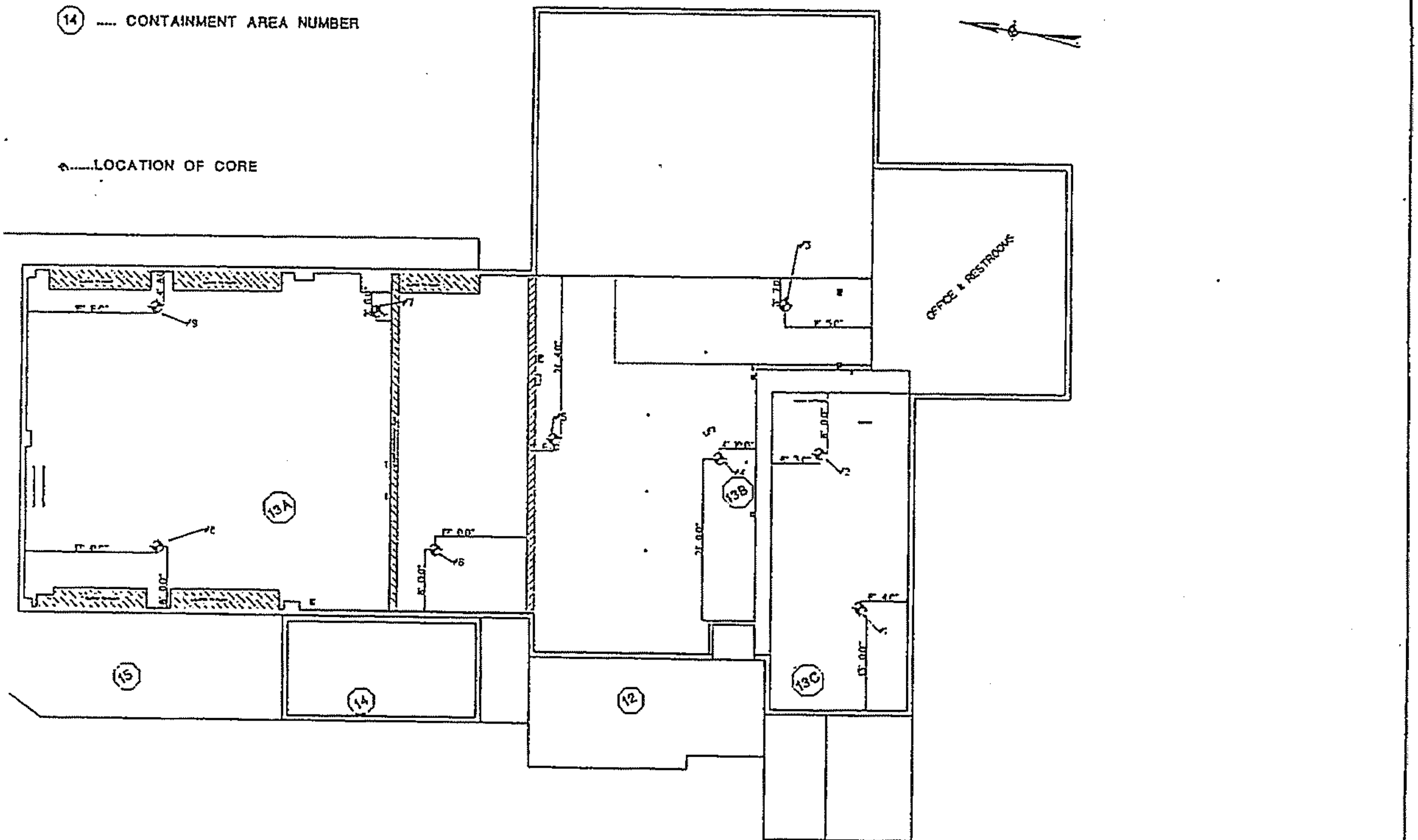
REQD MOMENT IN GRADE BEAM.

$\frac{21.8K \times 6.67}{8}$ = 18.2 K < 52.8K O.K.

REGISTERED PROFESSIONAL ENGINEER
OTIS ARVIN CLARK
14897
OKLAHOMA

(14) ..... CONTAINMENT AREA NUMBER

......LOCATION OF CORE



LAYOUT OF WASTE WATER TREATMENT BUILDING USPCI LONE MOUNTAIN HAZARDOUS WASTE FACILITY WAYNOKA, OKLAHOMA

Myers

APPENDIX H.

CONCRETE COATING INFORMATION FOR SECONDARY CONTAINMENT

ENVIROTECH
ENGINEERING & CONSULTING, INC.

Dudick Inc.

1818 Miller Parkway
Streetsboro, Ohio 44241

(216) 562-1970
(216) 562-7638 FAX

Primer 67/67C

100 % SOLIDS, MOISTURE-TOLERANT EPOXY PRIMER FOR STEEL AND CONCRETE 3-4 MILS (0.1 mm)

RECOMMENDED APPLICATIONS

Concrete Substrates
Steel Substrates
Primer for Epoxy and Urethane
Floor Toppings, Linings, Coatings and Grout

PHYSICAL PROPERTIES

Tensile Strength ASTM C-307	2,000 - 2,500 PSI
Tensile Elongation ASTM C-307	12-25 %
Adhesion to Concrete ASTM D-4541	Cohesive Failure of concrete
Adhesion to Steel ASTM D-4541	2,200-2,500 PSI
Electrical Properties NFPA #99, ASTM F-150	< 25,000 ohms

SPECIFICATIONS

Primer shall be 3-4 mils thick, 100% solids bisphenol A epoxy cured with an amine adduct as manufactured by Dudick Inc. Primer 67 shall be brush, roller or spray applied in accordance with the manufacturer's recommended practices. Primer 67C must be spray or roller applied.

PRIMER 67

Primer 67 is designed to prevent abrasive-blasted steel from developing rust bloom prior to the application of a Dudick coating or lining system. For maximum performance all steel surfaces should be primed, but primer may not be needed for mild, non-immersion service. Concrete, however, must always be primed to aid in the "wetting out" required for good adhesion.

PRIMER 67C - CONDUCTIVE PRIMER

Primer 67C is a 100% solids, two component epoxy primer designed to be used over concrete whenever the coating or lining system must be spark tested.

ESTIMATING QUANTITIES AND ORDER BILL OF MATERIAL

SQUARE FEET PER GALLON		
	CONCRETE	STEEL
Primer 67	150-200	250-300
Primer 67C	100-150	———

Quantities shown are for estimating purposes only. Actual field usage may vary. Primer 67/67C are available in 1 and 2 gallon units.

APPLICATION INSTRUCTIONS

SURFACE PREPARATION

Metal: Surfaces must be abrasive blasted to an appropriate finish.

Immersion and heavy spillage service: White Metal SSPC SP-5 or NACE #1, 3.0 mil minimum profile.

Heavy, non-immersion service (i.e. fumes and spillage): Near white SSPC SP-10 or NACE #2, 2.0 mil minimum profile.

Atmospheric service: Commercial SSPC SP-6 or NACE #3, 2.0 mil minimum profile.

Concrete: Concrete must be abrasive blasted or etched with muriatic acid (Solution of 1 part 20° Be HCl and 1 part water) to remove surface laitance and other contaminants. Concrete must be free of curing compounds and form release agents. Surface texture should be similar to 40-60 grit sandpaper. The prepared surface should have a minimum tensile strength of 250 PSI per ASTM D-4541.

All concrete substrates must be checked for moisture prior to product application using the Plastic Sheet Test, ASTM D-4263.

Additional surface preparation will be required if a 40-60 grit texture is not achieved and the surface laitance not completely removed after a single application of acid or with the first mechanical preparation procedure.

Abrasive blasting removes laitance, exposing honeycombs or voids beneath the surface which must be filled with Scratch Coat 100. (Refer to separate product bulletin)

APPLICATION SPECIFICATIONS

Substrate temperature for both concrete and metal must be between 50°F and 110°F.

Relative humidity must not exceed 90%.

Substrate temperature must be 5°F above the Dew Point.

PRIMER 67/67C MIX RATIOS:

<u>Primer 67</u>	
Component A	1 gal.
Component B	1 gal.
<u>Primer 67C</u>	
Component A	1 gal.
Component B	95 fl. oz.

*Pre-mix primer 67C Component A for 1-2 minutes to disperse the conductive fillers prior to adding the correct amount of Component B.

Primer 67C must be spray or roller applied. Use brush application for small touch-up or repair work only.

The pot life of the mixed Primer 67/67C will depend on the temperature. To prevent material waste and avoid damage to equipment, do not open and mix more material than can be used according to the following table:

PRIMER 67/ 67C POT LIFE

TEMPERATURE	POT LIFE
50°F	90 min.
75°F	60 min.
90°F	30 min.

At 75° F the pot life and thin film cure of Primer 67 can be decreased by the addition of Accelerator #1 as follows:

Ozs./Accelerator #1 per mixed gal. Primer 67	Pot Life	Thin Film Cure
3-4	36 min.	4 hrs.
6-7	15 min.	2 hrs.

Using 7 ounces of accelerator #1 per mixed gallon of Primer 67, the thin film cure @ 40° F is reduced to 8 hours.

PRIMING

Metal: Mix the pre-measured units of Component A with Component B. Prime all metal surfaces to be coated with Primer 67 at 3-4 mils WFT.

Concrete: Mix the pre-measured units of Component A with Component B. Prime all concrete surfaces to be coated with either Primer 67 or 67C at 3-4 mils WFT. The basecoat may be applied over primer that is "tacky". Do not allow the primer to puddle.

Important - With all epoxies after priming and before each additional coat, examine the surface for amine blush (oily film). If present, remove by washing with warm water and detergent.

Cure Cycle for Primer 67/67C:

Temperature	Minimum Recoat Time	Maximum Recoat Time
50°F	12 hrs.	8 Days
75°F	6-8 hrs.	5 Days
90°F	4-5 hrs.	3 Days

To optimize intercoat adhesion, we recommend application of the basecoat while the primer is tacky. If this is not possible, the above recoat times must be observed. Exposure of the primer to direct sunlight will considerably shorten the recoat times. If recommended recoat times are exceeded, consult a Dudick Representative; sanding or abrasive blasting may be required before the coating, lining or floor topping can be applied.

CLEANING

Use S-10 Cleaning Solvent to clean tools and equipment. **DO NOT USE ACETONE.**

SHIPPING

Primer 67/67C Component A's are non-regulated plastic liquids. Primer 67/67C Component B's are flammable corrosives with a flash point of 106°F (Setaflash) and carry both a red warning label and a black and white warning label. S-10 Cleaning Solvent is a flammable liquid with a flash point of 52°F (PMCC) and carries a red warning label.

STORAGE

Warning: All Dudick products classified by DOT labels as either white, yellow or red labels, must not be mixed or stored together as an explosive reaction can occur. All products should be stored in a cool, dry area away from open flames, sparks or other hazards.

When properly stored in their original, unopened containers, Primer 67/67C components have a one year shelf life.

SAFETY

M.S.D.S - Sheets must always be read before using products. Primer 67/67C are intended for application by experienced, professional personnel. Dudick Inc. can supply supervision to help determine that the surface has been properly prepared, the ingredients correctly mixed, and the materials properly and safely applied.

If materials are to be applied by your own personnel or by a third party contractor, please be sure that they are aware of the following safety precautions:

- Exposure to resins and hardeners through direct skin contact and/or inhalation may cause severe dermatitis reactions in some people. Cleanliness of the skin and clothing is critical and must be of paramount concern.

- Fumes are flammable and heavier than air. Proper ventilation should be maintained to minimize breathing of concentrated fumes.

- Suitable respirators should be used during application.

- Safety glasses, gloves, and suitable protective clothing must be worn at all times during application.

- If contact with hardeners occurs, remove any clothing involved and flush the skin with flowing water. Discard the clothing. Do not attempt to wash and reuse it. Primer liquids can be removed with S-10 Cleaning Solvent, MEK, or lacquer thinner. **DO NOT USE ACETONE.**

- Keep open flames and sparks away from the area where materials are being mixed and applied.

- If a rash occurs, remove the individual from the work area and seek a physician's care for dermatitis.

- In case of eye contact, flush with water for at least 15 minutes and consult a physician.

- If swallowed, do not induce vomiting; call a physician immediately.

Note:
Dudick Inc. ("Dudick") warrants all goods of its manufacture to be as represented in its catalogs and that the application of its products by its employees or sub-contractors shall be performed in a workmanlike manner. Dudick's obligation under this warranty shall be the repair to and replacement of any applications which its examination shall disclose to be defective. Dudick makes no warranty concerning the suitability of its product for application to any surface, it being understood that the goods have been selected and the application ordered by the purchaser. DUDICK INC. MAKES NO WARRANTY, EXPRESS OR IMPLIED, THAT THE GOODS SHALL BE MERCHANTABLE OR THAT THE GOODS ARE FIT FOR ANY PARTICULAR PURPOSE. THE WARRANTY OF REPAIR OR REPLACEMENT SET FORTH HEREIN IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES ARISING BY LAW OR OTHERWISE; AND DUDICK INC. SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DOWN TIME, DAMAGES TO PROPERTY OF THE PURCHASER OR OTHER PERSONS, OR DAMAGES FOR WHICH THE PURCHASER MAY BE LIABLE TO OTHER PERSONS, WHETHER OR NOT OCCASIONED BY DUDICK'S NEGLIGENCE. This warranty shall not be extended, altered or varied except by written instrument signed by Dudick and Purchaser.

Dudick Inc.

Dudick Incorporated
Corrosion-Proof Products
1818 South Wason Drive
Streetsboro, Ohio 44241
216-562-1970
FAX No. 216-562-7638

Protecto-Coat 200

ELASTOMERIC, SPRAY APPLIED, ENVIRONMENTALLY SAFE, URETHANE COATING. 40-60 MILS (1-1 1/2 mm)

Protecto-Coat 200 is a high solids aromatic polyurethane coating with superior elongation. It is especially suited to bridge cracks in concrete.

RECOMMENDED APPLICATIONS

- Secondary Containment Areas
- Process Floors
- Railroad Tank Cars
- Underground Pipes & Tanks - Exterior
- Thickener Tanks & Mechanisms
- Spent Liquor Storage Tanks
- Food Processing
- Pharmaceutical
- Breweries
- Structural Steel

CHEMICAL RESISTANCE

Protecto-Coat 200 provides a tough, durable surface and will withstand splash and spills of many inorganic and organic acids as well as alkalies. Also resistant to aliphatic solvents.

PHYSICAL PROPERTIES

Protecto-Coat 200	40 Mil Basecoat	20 Mil Topcoat
Tensile Strength (PSI) ASTM C307	2,400-2,600	2,200-2,500
Elongation*	225% to 250%	50 to 60%
Shore D Hardness	40-45	65-70
Abrasion Resistance CS 17 wheels/1000 cycles x 1000 gm load	10 mg weight loss	32 mg weight loss
Solids by Volume	80%	100%

*At 60% elongation the chemical resistant topcoat begins to surface crack while the basecoat will continue to elongate to 250% extension.

SPECIFICATIONS

Coating shall be 40-60 mils thick, 80-100% solids aromatic urethane resin, consisting of 2 basecoats and a topcoat of 20 mils each, manufactured by Dudick, Inc. Materials shall be brush-, roller- or spray- applied in accordance with manufacturer's recommended practices.

THE PROTECTO-COAT 200 SYSTEM

The Protecto-Coat 200 system uses a moisture tolerant primer and two or three coats of elastomeric thermosetting urethane resins to protect concrete and steel.

Primer 67 is designed to prevent abrasive-blasted steel from developing rust bloom prior to the application of a Protecto-Coat System. For maximum performance, all steel surfaces should be primed, but primer may not be needed for mild, non-immersion service. Concrete, however, must always be primed to aid in the "wetting out" required for good bonding.

Protecto-Coat 200 is applied in three coats by brush, roller or spray. The elastomeric basecoat is applied in two 25 mil applications to achieve a nominal 40 mils DFT. The chemical resistant topcoat is applied in a single 20 mil application. Total thickness shall be a nominal 60 mils.

Post-it™ brand fax transmittal memo 7671	# of pages ▸
To Dominic Owens	From Rolf
Co.	Co.
Dept.	Phone # Mid-America
Fax # 697-3572	Fax #

ESTIMATING QUANTITIES AND ORDER BILL OF MATERIAL

SQUARE FEET PER GALLON		
	CONCRETE	STEEL
Primer 67	150-200	250-300
Protecto-Coat 200		
2 Base Coats Actual 35-40 mil DFT	25	25
Top Coat Actual 15-20 mil DFT	60	60
S-10 Solvent	500	500

Quantities shown are for estimating purposes only. Actual field usage may vary.

APPLICATION INSTRUCTIONS

SURFACE PREPARATION

Metal: For immersion service, abrasive blast to a white metal finish and a 2-4 mils minimum profile according to SSPC 5 or NACE No. 1. For fume or splash service, abrasive blast to a near-white metal finish according to SSPC 10 or NACE No. 2. Atmospheric service: Commercial SSPC 6 or NACE No. 3.

Concrete: Concrete must be abrasive-blasted or etched with muriatic acid (solution of 1 part 20° Be HCl and 1 part water) to remove surface laitance and other contaminants. Concrete must be free of curing compounds and form release agents. Surface texture should be similar to 40-60 grit sandpaper. The prepared surface should have a tensile strength of between 250 and 300 PSI per ASTM D4541.

Additional surface preparation will be required if a 40-60 grit texture is not achieved and the surface laitance not completely removed after a single application of acid or with the first mechanical preparation procedure.

If, after abrasive blasting, honeycombs/voids appear on the concrete, these have to be filled with a suitable material. Contact a Dudick representative for this information.

Recommended application temperatures should be between 40°F and 90°F substrate temperature. **Do not apply Protecto-Coat 200 over concrete exposed to direct sunlight during the warming trend of the concrete as measured by surface temperature.** To do so may lead to blistering, pinholes, or wrinkling in the coating due to outgassing of air in the concrete and high substrate temperatures. Wait for a definite downturn or cooling trend within the concrete as again measured by surface temperature. If this is not possible consult a Dudick representative for alternatives such as double priming.

PRIMING

Metal: For maximum performance, prime all steel surfaces with Primer 67, mixed with appropriate amount of hardener to 3-4 mils. For mild non-immersion service, priming of steel may be omitted.

Concrete: Concrete must be primed to aid in the "wetting out" required for good bonding. Mix Component A with Component B in the premeasured units for 2-3 minutes and apply by brush, roller, or spray. We recommend the basecoat be applied over slightly tacky or tack-free primer. Do not allow the primer to puddle.

Protecto-Coat 200 Mix Ratio:

Protecto-Coat 200 Basecoat

Component A*	1 Gallon
Component B*	54 fl. ozs.

*Premeasured units by weight

Protecto-Coat 200 Topcoat

Protecto-Coat 200 Top Coat Comp. A*	1 Gal.
Component B*	54 fl. oz.

*Premeasured quantities by weight

BASECOAT

Add appropriate amount of hardener for each gallon of Protecto-Coat Liquid and mix thoroughly until uniform color is achieved. Apply a 25 mil wet (20 mil DFT) basecoat using spray, brush or roller. Allow basecoat application to cure to at least a "firm" or slightly "tacky" feel before applying the second 25 mil wet (20 mil DFT) basecoat. Brush or roller may require several coats to achieve desired thickness.

Horizontal surfaces may be basecoated in one application by applying 50 mils wet (40 mil DFT) in a single coat.

TOPCOAT

Add appropriate amount of hardener for each gallon of Protecto-Coat Liquid and mix thoroughly until a uniform color is achieved. Apply a 20-mil-thick topcoat using spray, brush or roller.

Cure Cycle for Protecto-Coat 200

TEMPERATURE	RECOAT TIME	CURE TIME
50°	48 Hrs.	96 Hrs.
70°	24 Hrs.	48 Hrs.
90°	16 Hrs.	36 Hrs.

If these recoat times are exceeded, consult a Dudick representative: sanding or abrasive blasting may be required before the next coat. Recoat times are dramatically reduced when the coating is exposed to direct sunlight.

Single Component Airless Spray Equipment — Graco King 45-to-1 spray pump or equivalent. Use Graco Golden Mastic Gun or Graco No. 207945 Gun with airless adapter equipped with a Reverse-A-Clean tip and a tip size between .035-.041. Spray hose should be 1/2" or 3/8" ID. Available inlet pressure must be a minimum of 100 psi.

Brush or roller application may require additional coats to meet specified dry film thickness.

Pot life of the opened and mixed Protecto-Coat 200 will depend on the temperature at the work site. To prevent material waste and avoid damage to equipment, do not open and mix more material than can be used according to the following table:

TEMPERATURE	POT LIFE
50°F	120 Min.
75°F	60 Min.
90°F	45 Min.

Do not attempt to store mixed material. Residual material should be properly disposed of at the end of each work period.

Where immersion service is required, spark test the coating with a 5,000 to 7,000 volt AC spark tester. Mark and repair all pinholes. Use Protecto-Coat liquid mixed with the appropriate amount of hardener. Retest only the repairs.

CLEANING

Use S-10 Solvent to clean tools and equipment.

SHIPPING

Protecto-Coat 200 Topcoat A and B and Protecto-Coat 200 Basecoat A are classified as plastic liquids and are non-regulated.

Protecto-Coat 200 Basecoat B is combustible. Primer 67 Component B is corrosive and carries a black and white warning label. Primer 67 Component A is classified as a plastic liquid and is nonregulated, while S-10 Cleaning Solvent is red label liquid with a flash point of 52°F (PMCC).

STORAGE

Warning: All Dudick products classified by DOT labels as either white, yellow or red labels must not be mixed or stored together as an explosive reaction may occur.

When stored in a cool and dry location, Protecto-Coat 200 ingredients have a one-year shelf life. Exposure to excessive heat may cause premature gelling and reduce working time.

SAFETY

M.S.D.S. - **Sheets must always be read before using products.** Protecto-Coat Systems are intended for application by experienced, professional personnel. Dudick Inc. can supply Protecto-Coat systems supervision to help determine that the surface has been properly prepared, the ingredients correctly mixed, and the materials properly and safely applied.

If Protecto-Coat materials are to be applied by your own personnel or by a third-party contractor, please be sure that they are aware of the following safety precautions:

• Exposure to resins and hardeners may cause severe dermatitis reactions in some people. Cleanliness of the skin and clothing is critical and must be of paramount concern.

• Safety glasses, gloves and suitable protective clothing must be worn at all times during application.

• Suitable respirators should be used.

• If contact with hardeners occurs, remove any clothing involved and wash the skin with large amounts of water. Discard the clothing. Do not attempt to wash and reuse it. Protecto-Coat liquid may be washed off with S-10 Cleaning Solvent, MEK liquid, or laquer thinner.

• Fumes are flammable and heavier than air. Proper ventilation should be maintained to minimize breathing of concentrated fumes.

• If a rash or dermatitis occurs, remove the individual from the work area and seek a physician's care for dermatitis.

• Keep open flames and sparks away from the area where toppings are being mixed and applied.

• In case of eye contact, wash with water for at least 15 minutes and consult a physician. If swallowed, do not induce vomiting: call a physician immediately.

Note:

Dudick Inc. ("Dudick") warrants all goods of its manufacture to be as represented in its catalogs and that the application of its products by its employees or sub-contractors shall be performed in a workmanlike manner. Dudick's obligation under this warranty shall be the repair to and replacement of any applications which its examination shall disclose to be defective. Dudick makes no warranty concerning the suitability of its product for application to any surface, it being the understood that the goods have been selected and the application ordered by the purchaser. DUDICK INC. MAKES NO WARRANTY, EXPRESS OR IMPLIED, THAT THE GOODS SHALL BE MERCHANTABLE OR THAT THE GOODS ARE FIT FOR ANY PARTICULAR PURPOSE. THE WARRANTY OF REPAIR OR REPLACEMENT SET FORTH HEREIN IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES ARISING BY LAW OR OTHERWISE; AND DUDICK INC. SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DOWN TIME, DAMAGES TO PROPERTY OF THE PURCHASER OR OTHER PERSONS, OR DAMAGES FOR WHICH THE PURCHASER MAY BE LIABLE TO OTHER PERSONS, WHETHER OR NOT OCCASIONED BY DUDICK'S NEGLIGENCE. This warranty shall not be extended, altered or varied except by written instrument signed by Dudick and Purchaser.

APPENDIX I.

SECONDARY CONTAINMENT

ENVIROTECH
ENGINEERING & CONSULTING, INC.

SAFETY KLEEN
LONE MOUNTAIN FACILITY
FT 1 & 2 TANK ASSESSMENT
SECONDARY CONTAINMENT
VOLUME CALCULATIONS

A. DIMENSIONS

1.	Length	64' 9"
2.	Width	44' 0"
3.	Height	3" min

B. VOLUME (Before encroachments) 64.75' x 44' x .25' = 712.25 ft^3

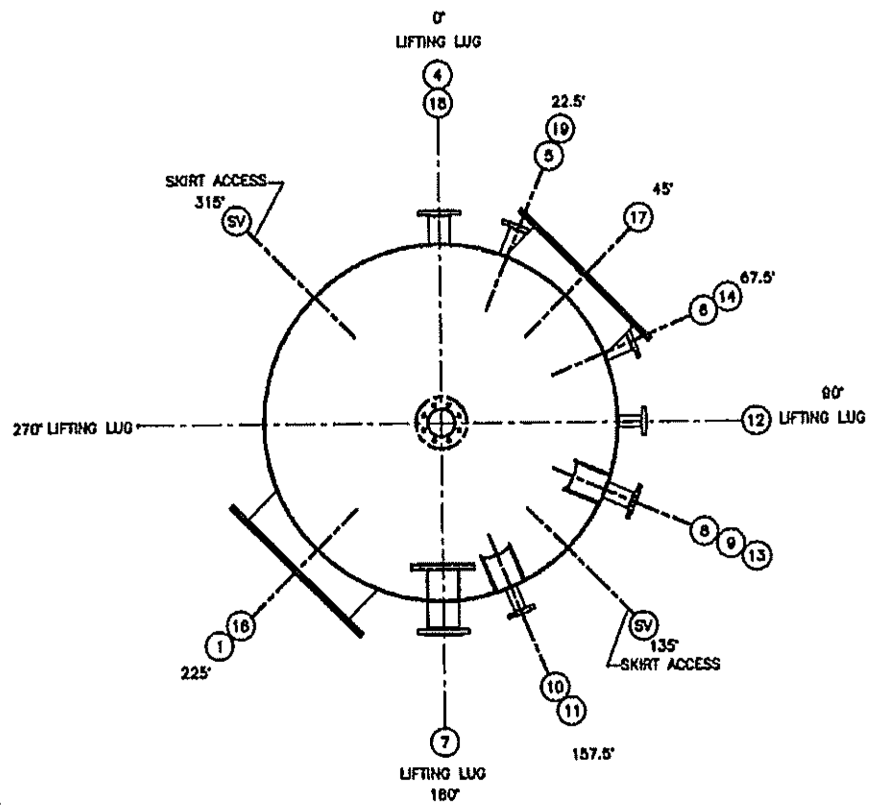
C. ENROACHMENTS

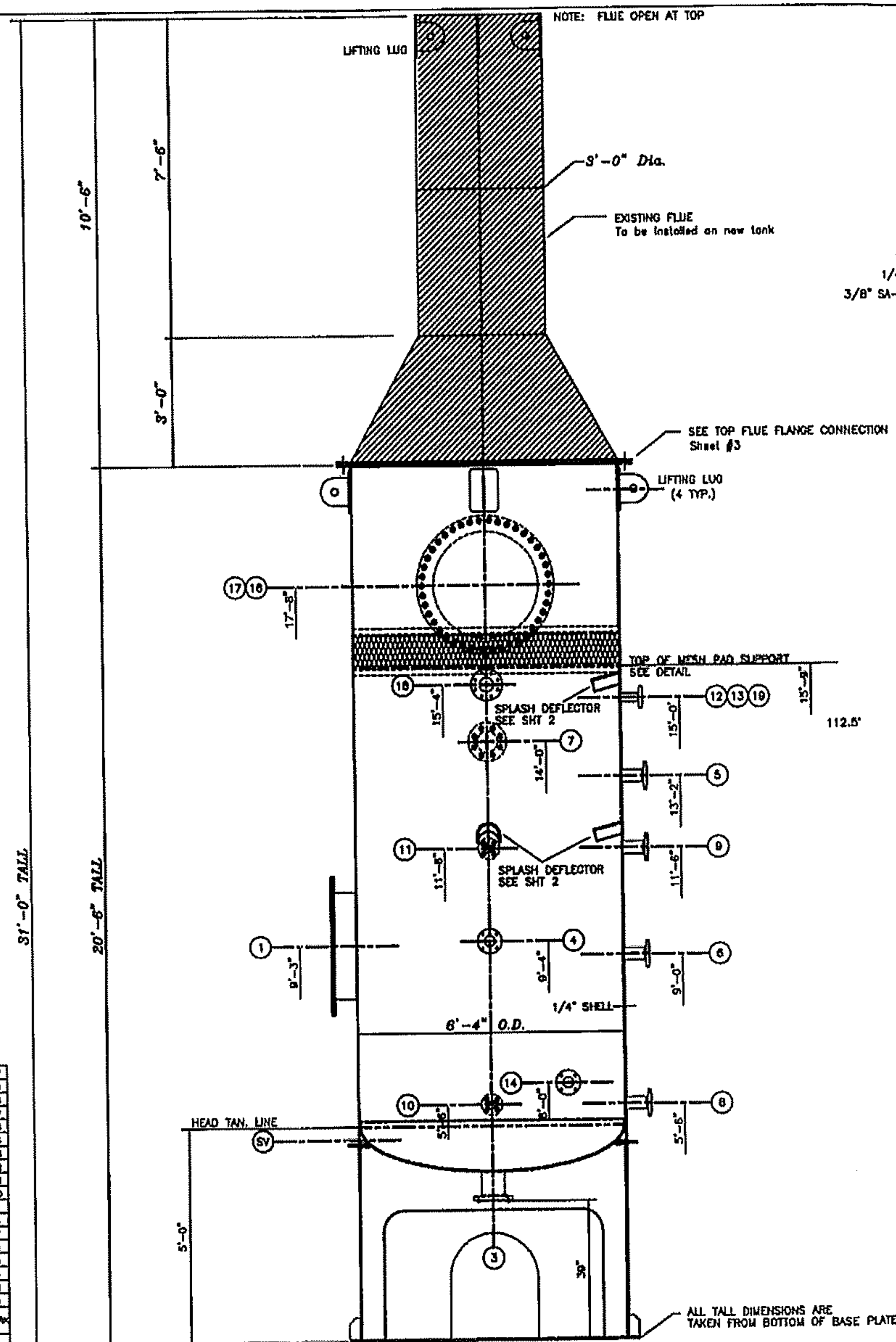
1.	Posts	16 @ 10" x 10" x 3"
2.	Posts	9 @ 12" x 10" x 3"
3.	Posts	1 @ 14" x 15" x 3"
4.	Posts	1 @ 24" x 8" x 3"
5.	Posts	2 @ 12" x 12" x 3"
6.	Posts	2 @ 32" x 12" x 3"
7.	Posts	1 @ 24 "x 24" x 3"
8.	Ramps	4 @ 14' x 30" x 3"
9.	Ramps	1 @ 16' x 32" x 3"
10.	Heat Exchangers	2 @ 2' x 51" x 3"
11.	Pumps	4 @ 5' x 20" x 3"
12.	Pumps	4 @ 3' x 1' x 3"

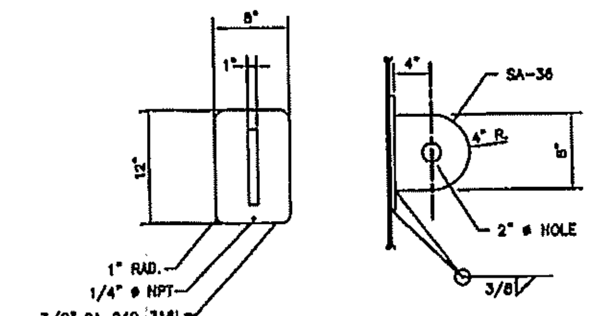
D. ENCROACHMENT VOLUME CALCULATIONS

1.	16 x 0.83 ft x 0.83 ft x 0.25 ft =	2.75 ft^3
2.	9 x 1 ft x 0.83 ft x 0.25 ft =	1.87 ft^3
3.	1 x 1.17 ft x 1.25 ft x 0.25 ft =	0.37 ft^3
4.	1 x 2 ft x 0.67 ft x 0.25 ft =	0.34 ft^3
5.	2 x 1 ft x 1 ft x 0.25 ft =	0.5 ft^3
6.	2 x 2.67 ft x 1 ft x 0.25 ft =	1.34 ft^3
7.	1 x 2 ft x 2 ft x 0.25 ft =	1.0 ft^3
8.	4 x 1.17 ft x 2.5 ft x 0.25 ft =	2.93 ft^3
9.	1 x 1.33 ft x 2.67 ft x 0.25 ft =	0.89 ft^3
10.	2 x 2 ft x 4.25 ft x 0.25 ft =	4.25 ft^3
11.	4 x 5 ft x 1.67 ft x 0.25 ft =	8.35 ft^3
12.	4 x 3 ft x 1 ft x 0.25 ft =	3 ft^3

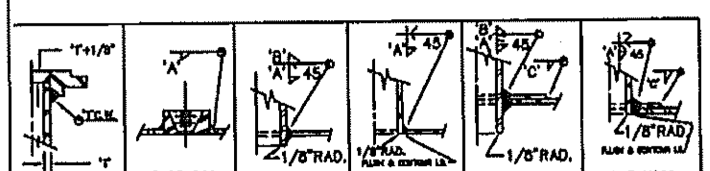
TOTAL ENCROACHMENT VOLUME	27.59 FT^3
AVAILABLE CONTAINMENT VOLUME	<u>685 FT^3</u>
LARGEST TANK VOLUME (FT 1)	506 FT^3
EXCESS CONTAINMENT	<u>179 FT^3</u>







LIFTING LUG DETAIL
(4 TYP.)



MARK	NO. REQ'D	SIZE	RATING	FACING	NECK	O.S. PROJ	I.S. PROJ	TYPE	'A'	'B'	REINFORCEMENT PAD	'C'	BLIND	NO STUDS	STUD SIZE	SERVICE	MARK
SV	2	1/4"	3000#	NPT	CPLG	—	—	III	1/4"	—	—	—	—	—	—	SKIRT VENTS	SV
19	1	3"	150#	RFSO	SCH STD	7"	1/4"	I, V	1/4"	1/4"	—	—	—	—	—	FUTURE	19
18	1	4"	150#	RFSO	SCH STD	7"	1/4"	I, V	1/4"	1/4"	—	—	—	—	—	OVERFLOW	18
17	1	30"	API	FF	1/4" PLT.	6"	1/4"	I, VII	1/4"	0"	1/4" X 63"	1/4"	YES	42	7/8"	MANWAY	17
16	1	30"	API	FF	1/4" PLT.	6"	1/4"	I, VII	1/4"	0"	1/4" X 63"	1/4"	YES	42	7/8"	MANWAY	16
14	1	3"	150#	RFSO	SCH STD	7"	1/4"	I, V	1/4"	1/4"	—	—	—	—	—	LOW LEVEL ALARM	14
13	1	3"	150#	RFSO	SCH STD	7"	1/4"	I, V	1/4"	1/4"	—	—	—	—	—	PRESSURE GAUGE	13
12	1	2"	150#	RFSO	SCH STD	6"	1/4"	I, V	1/4"	1/4"	—	—	—	—	—	FUTURE	12
11	1	2"	150#	RFSO	SCH STD	6"	1/4"	I, V	1/4"	1/4"	—	—	—	—	—	SIGHT GLASS	11
10	1	2"	150#	RFSO	SCH STD	6"	1/4"	I, V	1/4"	1/4"	—	—	—	—	—	SIGHT GLASS	10
9	1	3"	150#	RFSO	SCH STD	7"	1/4"	I, V	1/4"	1/4"	—	—	—	—	—	LEVEL GAUGE	9
8	1	3"	150#	RFSO	SCH STD	7"	1/4"	I, V	1/4"	1/4"	—	—	—	—	—	LEVEL GAUGE	8
7	1	6"	150#	RFSO	SCH STD	8"	[illegible]	I, VIII	1/4"	0"	1/4" X 19"	1/4"	YES	8	7/8"	INFLUENT	7
6	1	3"	150#	RFSO	SCH STD	7"	1/4"	I, V	1/4"	1/4"	—	—	—	—	—	HIGH LEVEL ALARM	6
5	1	3"	150#	RFSO	SCH STD	7"	1/4"	I, V	1/4"	1/4"	—	—	—	—	—	LEVEL GAUGE (FOAM DETECTOR)	5
4	1	4"	150#	RFSO	SCH STD	7"	1/4"	I, V	1/4"	1/4"	—	—	—	—	—	OVERFLOW	4
3	1	6"	150#	RFSO	SCH STD	8"	FLUSH	I, VI	1/4"	0"	—	—	—	—	—	EFFLUENT	3
1	1	30"	API	FF	1/4" PLT.	6"	1/4"	I, VII	1/4"	0"	1/4" X 63"	1/4"	YES	42	7/8"	MANWAY	1

SCHEDULE OF OPENINGS

GENERAL NOTES

1) ALL BOLT HOLES TO STRADDLE NORMAL TANK CENTERLINES UNLESS SHOWN OTHERWISE
2) ALL BLINDS TO BE FURNISHED BY CUSTOMER.
3) BEFORE DRILLING HOLES FOR 30" FLANGES CUSTOMER MUST HAVE SUPPLIED EXISTING BLINDS OR TEMPLATES.
4) DAVIT ARMS SUPPLIED BY CUSTOMER. LIDE TO FURNISH DAVIT CLIPS.
5) MANWAY FLANGE RINGS, & TOP FLANGE CONNECTION TO BE SA-36 MATERIAL

DESIGN CRITERIA

CODE: API - 650
DESIGN PRESSURE: ATM.
DESIGN VACUUM: N/A
DESIGN TEMPERATURE: 300°F
OPERATING PRESSURE: ATM.
OPERATING VACUUM: N/A
OPERATING TEMPERATURE: 300°F
SPECIFIC GRAVITY: 1.0
JOINT EFFICIENCY: 85%
RADIOGRAPHY: SPOT
CORROSION ALLOWANCE: .0"
TEST: FILL w/ WATER & HOLD FOR 24 HOURS

MATERIAL

ROOF, SHELL & BOTTOM: SA-240-316L
REINFORCEMENT PADS: SA-240-316L
STRUCTURAL SUPPORTS: SA-36
PIPE: 316
FLANGES, BLINDS, COUPLINGS & PLUGS: 316L
BOLTING: SA-193-B7 / SA-194-2H
SERVICE GASKETS: 1/8" BUNA NITRILE RUBBER
ESTIMATED WEIGHT EMPTY: 7,300 lbs
SKIRT & CARBON BLINDS: SSPC-SP6

PAINT: Sherwin Williams #B65W401 Macro HS PU White.

2	8/21/02	CERTIFIED — AS BUILT
1	1/23/02	REVISED PER CUSTOMER COMMENTS
0	1/04/02	ISSUED FOR APPROVAL

REVISIONS

DRAWN BY: JED
CHECKED BY: BOL
JOB NO.: 203
DATE: 1/04/02

PURCHASE ORDER NO. 103034 PROG.No. CAPITAL DRAWING NAME: SK-001

SAFETY — KLEEN

CAPITAL PROJECT / LONE MOUNTAIN FACILITY

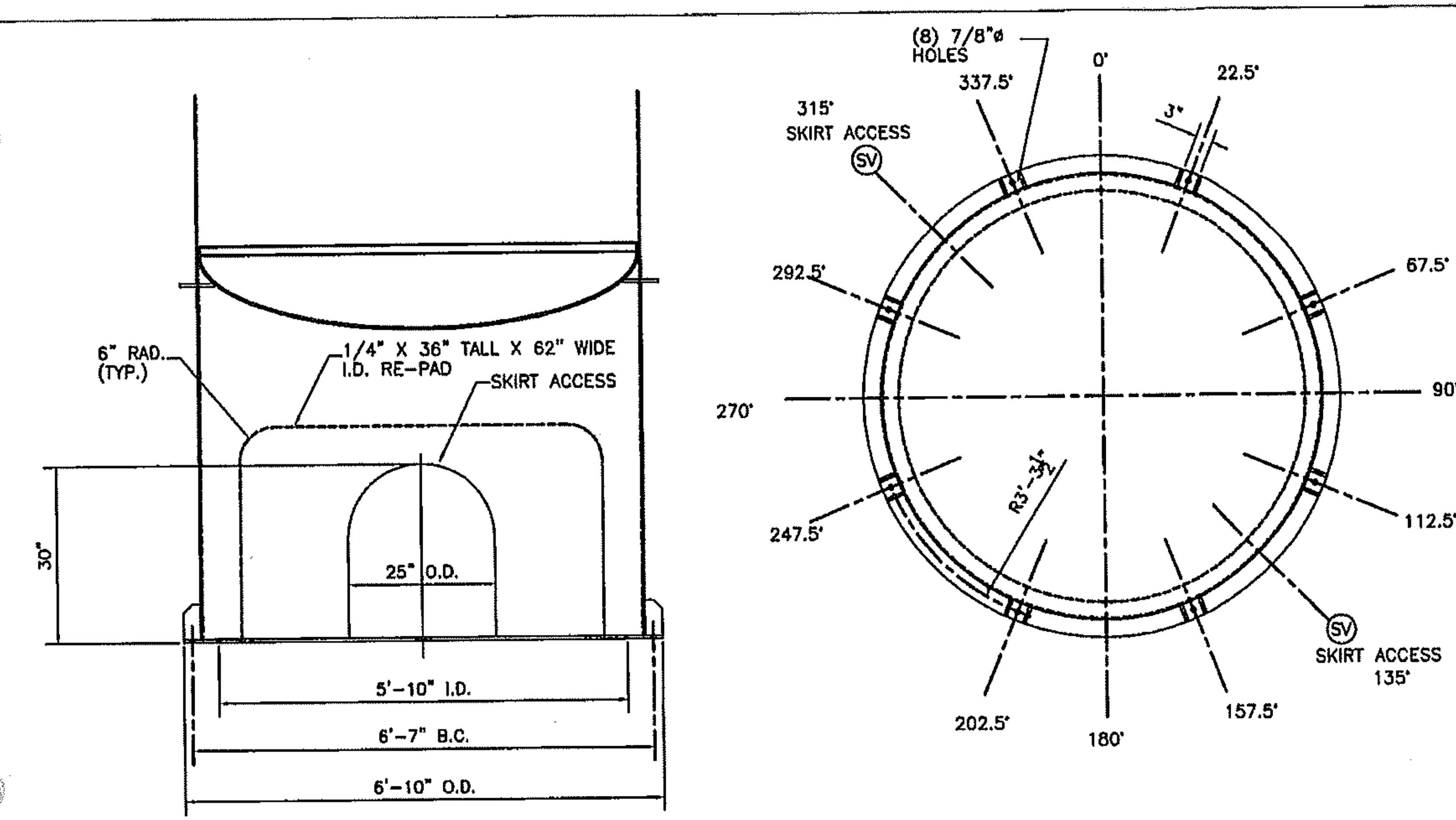
TWO 6'-4" O.D. X 20'-6" TALL STAINLESS STEEL FLASH TANK

LIDE INDUSTRIES

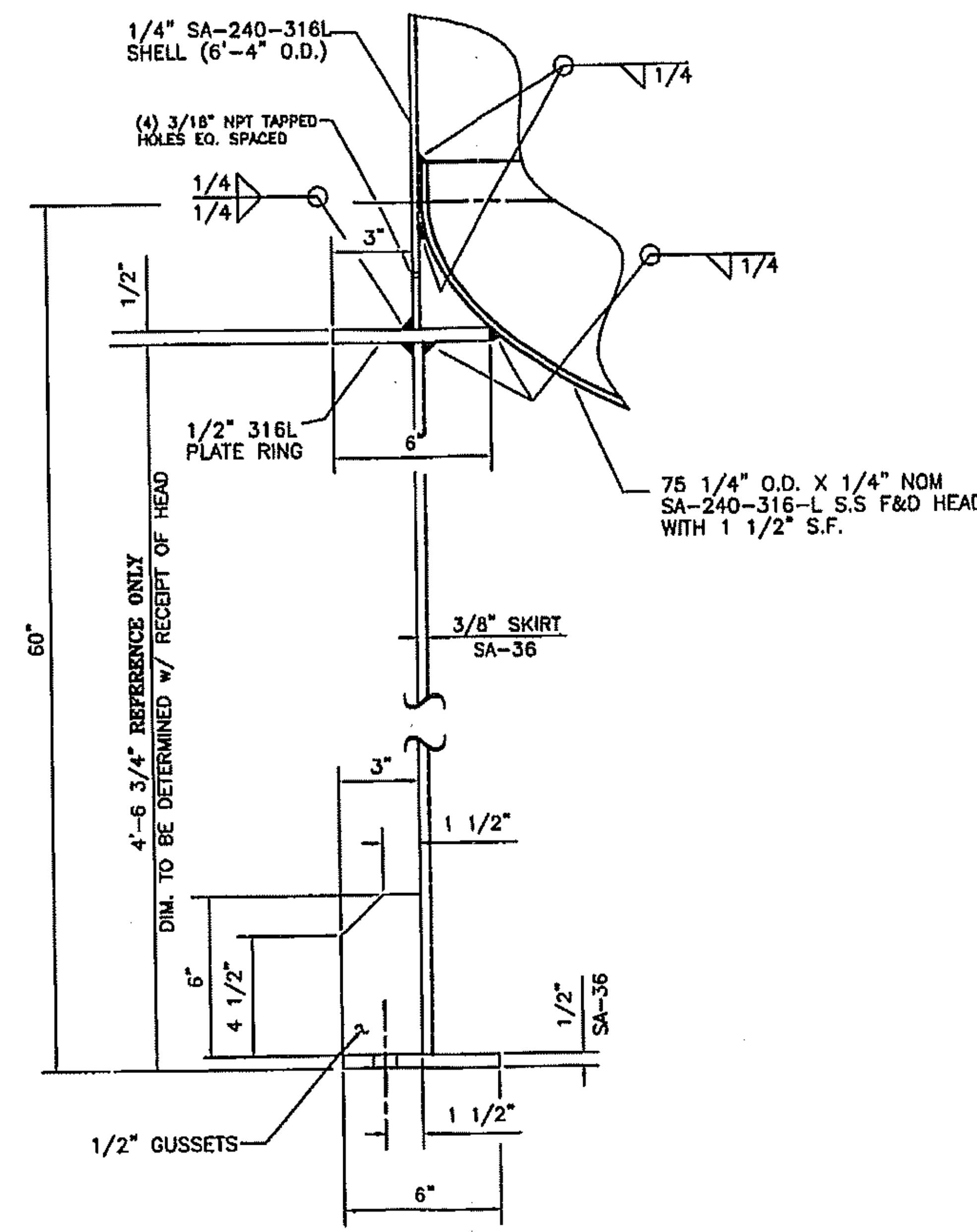
6 MILES E. HWY 84
MEXIA, TEXAS 76667

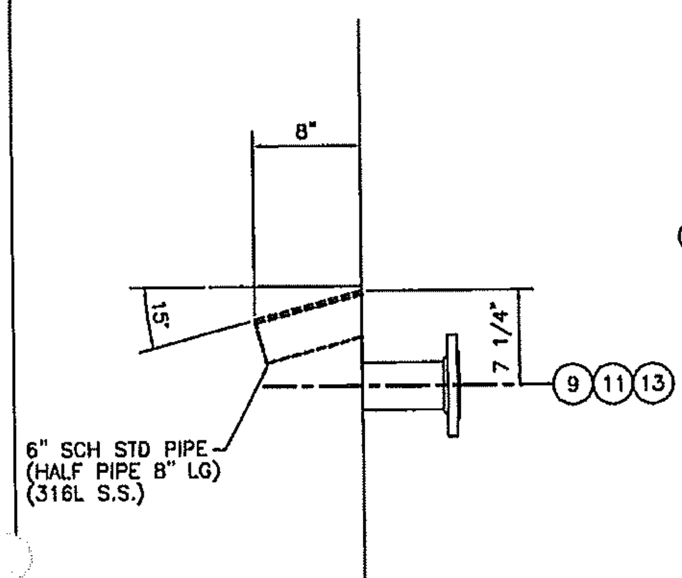
ENVIRO TECH
ENGINEERING & CONSULTING, INC.

SHEET 1 OF 3

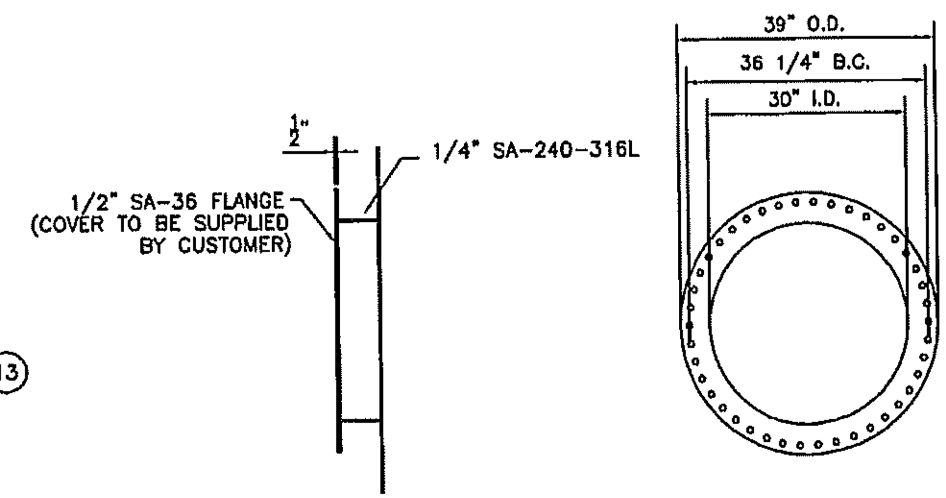


SKIRT & BASE PLATE DETAIL





SPLASH DEFLECTOR
(3 TYP.)



DO NOT FABRICATE FLANGE RING UNTIL RECEIPT OF CUSTOMER FURNISHED BLINDS OR TEMPLATE.

MANWAY DETAIL
(3 TYP.)

3	5/21/02	CERTIFIED - AS BUILT
2	2/26/02	REVISED PER CUSTOMER COMMENTS
1	1/23/02	REVISED PER CUSTOMER COMMENTS
0	1/04/02	ISSUED FOR APPROVAL

REVISIONS

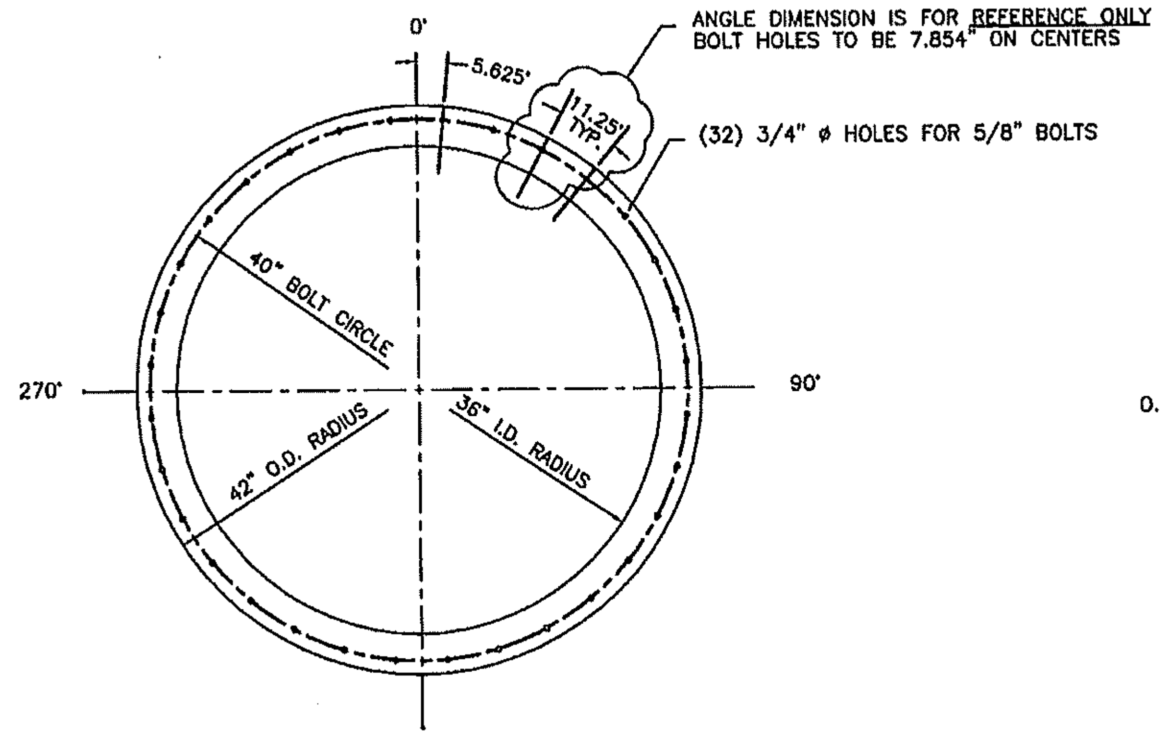
DRAWN BY: JED
CHECKED BY: BDL
JOB NO.: 203
DATE: 1/04/02
PURCHASE ORDER NO. 103034 PROG.No. CAPITAL DRAWING NAME: SK-001

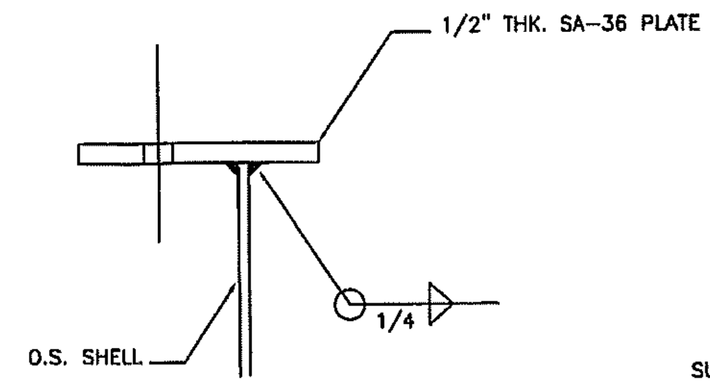
ENVIROTECH ENGINEERING & CONSULTING, INC.

SAFETY - KLEEN
CAPITAL PROJECT / LONE MOUNTAIN FACILITY
TWO 6'-4" O.D. X 20'-6" TALL STAINLESS STEEL FLASH TANK

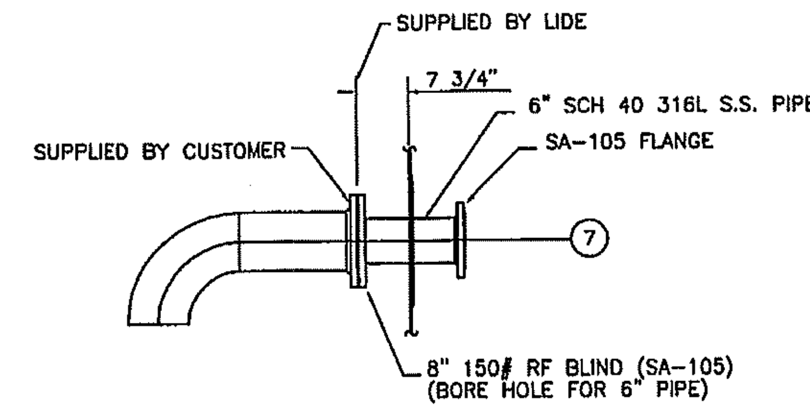
LIDE INDUSTRIES
8 MILES E. HWY 84
MEXIA, TEXAS 76667

SHEET 2 OF 3

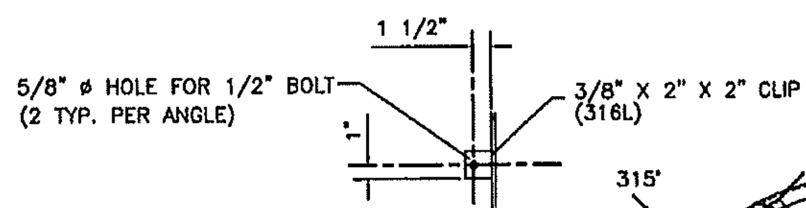




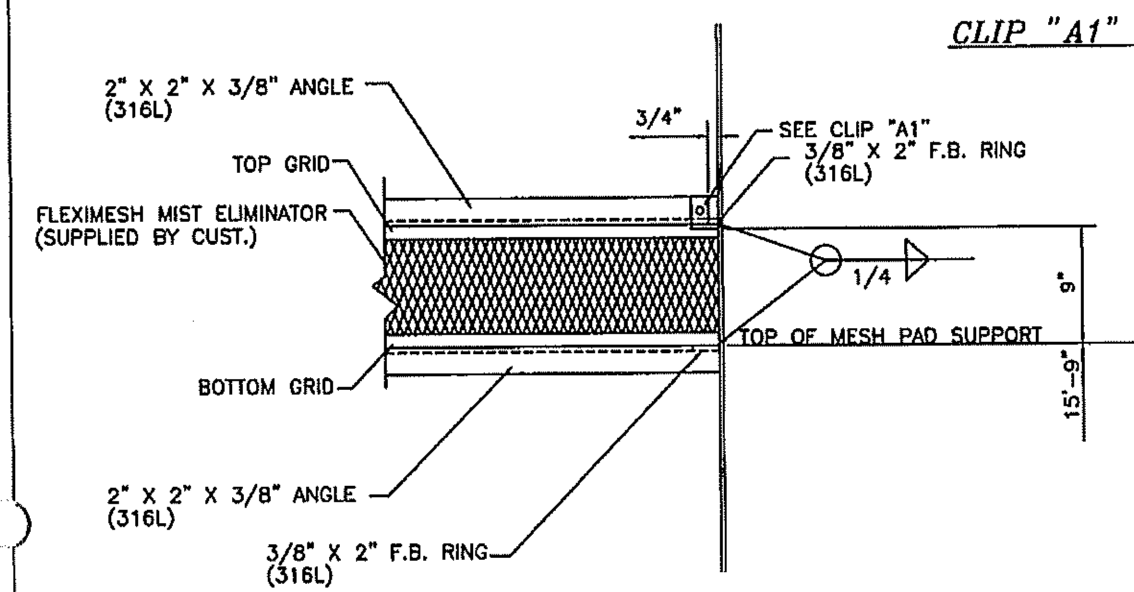
TOP FLUE FLANGE CONNECTION

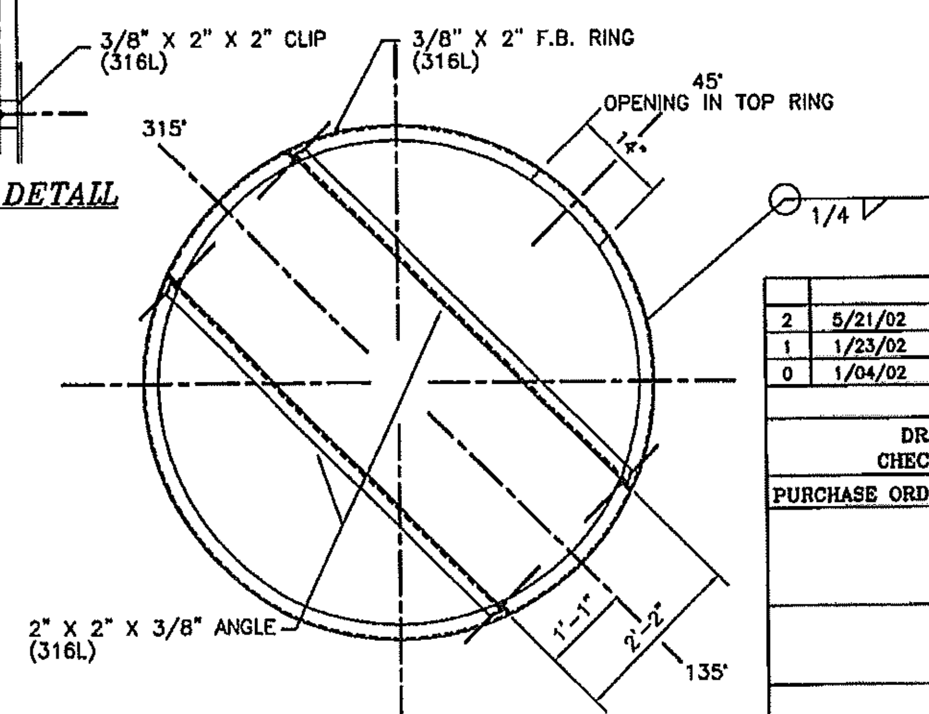


INFLUENT CONNECTION (NOZZLE "7") DETAIL



CLIP "A1" DETAIL





MIST PAD DETAIL

2	5/21/02	CERTIFIED – AS BUILT
1	1/23/02	REVISED PER CUSTOMER COMMENTS
0	1/04/02	ISSUED FOR APPROVAL

REVISIONS

DRAWN BY: JED
CHECKED BY: BDL

JOB NO.: 203
DATE: 1/04/02

PURCHASE ORDER NO. 103034 PROG.No. CAPITAL DRAWING NAME: SK-001

SAFETY – KLEEN

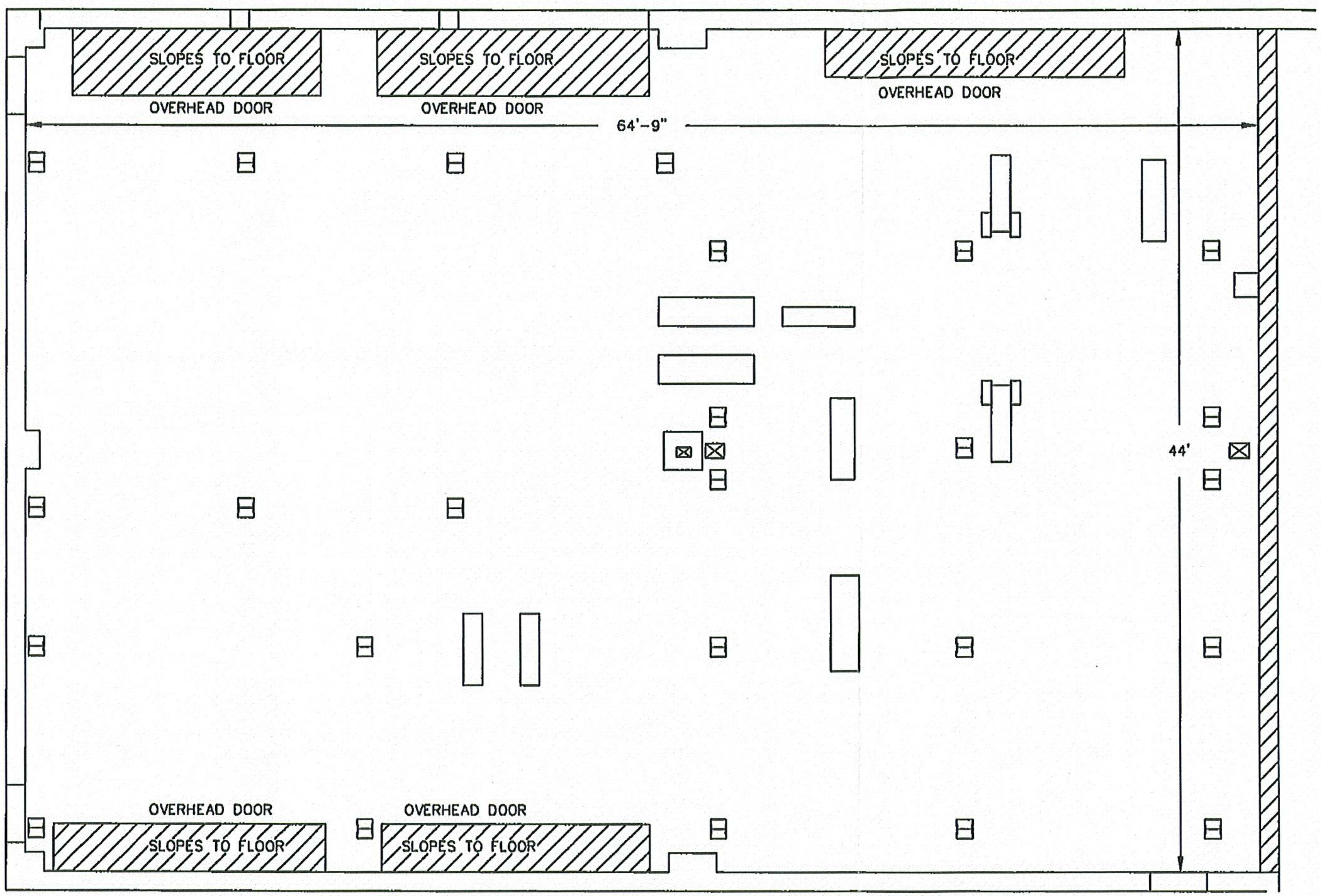
CAPITAL PROJECT / LONE MOUNTAIN FACILITY
TWO 6'-4" O.D. X 20'-6" TALL STAINLESS STEEL FLASH TANK

LIDE INDUSTRIES

6 MILES E. HWY 84
MEXIA, TEXAS 76667

ENVIROTECH
ENGINEERING & CONSULTING, INC.

SHEET 3 OF 3



FLOOR PLAN

SCALE: 1"=6'

NO.	DATE	REVISION	DRAWN BY	CHECKED BY

FT-1 & FT-2 FLASH TANK ASSESSMENT

Secondary Containment

Lone Mountain Facility, Oklahoma

ENVIROTECH

Date: August 5, 2002
Scale: 1"=6'
Designed by: R. Stallings
Drawn by: C. Grieve
Checked By: R. Stallings
Project No. 02 084
Sheet No. 1 of

SECTION FT3

(OUT OF SERVICE)

ASSESSMENT OF EVAPORATOR FLASH TANK NO.3 (FT3)
LONE MOUNTAIN HAZARDOUS WASTE FACILITY
U.S.P.C.I./LAIDLAW
WAYNOKA, OKLAHOMA

A TANK SYSTEM DESCRIPTION

Evaporator Flash Tank No.3 (FT3) is a new welded above-ground waste-water treatment and storage tank to be installed as a part of the final waste-water treatment plant at the Lone Mountain Facility. The top of the tank is completely open to the atmosphere for evaporation purposes. Evaporator Flash Tank #3 (FT3) is located within the Waste-water Final Treatment building on the first mezzanine level of the support structure. The tank system consists of Evaporator Flash Tank #3 (FT3), Circulating Pump (P5), Heat Exchanger (EU3), Pump (P83), Filter press (FP3), and associated piping and instruments.

B PRIMARY TANK VESSEL

1. General Description

Evaporator Flash Tank No.3 (FT3) is a circular steel tank with an outside diameter of 6'4" and a height of 31'0". The tank proper has a skirt that is anchored to the support structure. The bottom of the tank is dished and welded to the shell. A self-supporting Flue is attached to the top of the tank. Flash Tank No. 3 is being assessed to determine if the unit is adequately designed with sufficient structural strength and compatibility with the waste to be stored.

2. Design Standards

The tank is designed and constructed to those sections that are applicable in the American Petroleum Institute Standard 650-1993 edition (API-650).

3. Hazardous Characteristics of Wastes Stored

The wastes which are stored in this tank are treated and untreated brine solutions. Representative samples of both the treated and the untreated wastes were sent for analysis. The results of those analyses are included in Appendix G of this assessment. In addition, the following characteristics of the wastes were verified:

Ignitability - Flash Point > 240° F

Corrosiveness
$7 < pH < 12$
$2 < N < 7$

Reactivity - None

Temp < 300° F

From the examination of the hazardous characteristics of the waste to be stored in this tank, it was determined that the pH and normality levels (Corrosiveness) of the waste are the primary areas of concern. This is to determine the applicability of a corrosion allowance for the tank material type and thickness.

4. Corrosion Protection

The interior of the tank is coated with two layers of Plasite 7156 Hi-Resistant Heavy Build Protective coating. Each layer is applied at a dry film thickness of not less than 5.0 mils. The corrosion protection system was installed according to the application instructions in Appendix F of this assessment. The exterior coating consists of one layer of Glid-Guard corrosion resistant HS Epoxy No. 5466 series at a dry film thickness of not less then 3.0 mils.

5. Documented Age of Tank

This tank was manufactured by Scott Manufacturing, Inc. of Lubbock, Texas in August 1995 and installed in October 1995.

6. Result of Leak Tests

The manufacturer conducted a hydrostatic leak test of the tank before shipping. A description of that test is included in Appendix D of this assessment. In addition, a visual inspection was performed of the interior and exterior of the tank after installation. This inspection was conducted specifically to detect the presence of any of the following defects:

a) Weld break
b) Punctures
c) Scrapes of protective coatings
d) Cracks
e) Corrosion
f) Other structural damage or inadequacies of construction and/or installation

The tank hydrostatic test after installation is included in Appendix D of this Assessment. A description of that procedure is also included in Appendix D of this assessment. From these tests it was determined that the primary tank was not leaking.

7. Existing Data Obtained

a. Diameter of Tank	6'4"
b. Nominal Height of Tank	31'0"
c. Maximum Capacity	2981 gal.
d. Overflow Liquid level	9'1"
e. Overflow Volume	2234 gal.
f. Design Specific Gravity	1.5
g. Maximum Bottom Pressure	4.7 psi
h. Maximum Operating Temperature	300° F
i. Material of Construction	
i) Shell	ASTM A36
ii) Bottom	ASTM A516 F&D Head
iii) Roof	ASTM A36
iv) Steel Pipe	ASTM A53, Grade B
v) Bolts	ASTM A307, Grade B
j. Wall Thickness	0.375"
k. Operating Pressure	Atmospheric
l. Seismic Zone	1

8. Calculation of Existing Foundation Loading

Total Weight of Tank and Contents 48,162 lbs.

Detailed calculations reflecting the volume and weight of the tank are included in Appendix A of this assessment.

9. Required Structural Calculation

Calculations for the required wall thickness for this tank are shown in Appendix B. Metallurgical information on the materials used is included in Appendix E of this assessment. The minimum required thickness in accordance with API 650, is 0.148 inches. A corrosion allowance of 0.125 is provided for. The measured wall thickness is 0.375 inches.

Design calculations for the support structure are included in Appendix C of this assessment. These calculations were done in accordance with BOCA National Building Code 1990 Edition.

Structural analysis of the foundation is included in Appendix C of this assessment.

10. Comparison of Actual to Theoretical Structural Values

<u>Wall Thickness Comparison</u>

Calculated Required Wall Thickness	0.1875"
Minimum Required Wall Thickness By API 650	0.148"

Measured Wall Thickness	0.375"

Bottom Thickness Comparison

Calculated Required Bottom Thickness	0.150"
Minimum required Bottom Thickness by API 650	0.250"
Measured Bottom Thickness	0.375"

Support Structure Comparison

See Appendix C of this assessment for complete comparison of the loads and support information for vertical columns, horizontal beams and diagonal bracing.

Foundation Integrity Comparison

Maximum Calculated Load (6" Slab)	17.6 Kips
Calculated Foundation Support (6" Slab)	26.7 Kips
Maximum Calculated Load (17" Slab)	62.9 Kips
Calculated Foundation Support (17" Slab)	127.7 Kips

C ANCILLARY EQUIPMENT

1. General Description

The ancillary equipment for the Evaporator Flash Tank No. 3 (FT3) system includes the following:

a) Circulating Pump (P5) - a centrifugal pump designed to pump 800 GPM at 150 feet of discharge head with a suction head of 11 feet.

b) Heat exchanger (EU3) -- a plate and frame unit of stainless steel construction designed to operate at a pressure of 150 PSIG and a temperature of 300°F. Manufacturer's design information is included in Appendix B of this assessment.

c) Pump (P83) - a pneumatically operated double diaphragm pump designed to pump from 100 to 0 GPM at head pressures varying from 0 to 100 PSIG, pumping fluid at a temperature up to 212°F.

d. Filter press (FP3) - a gasketed unit employing glass filled polypropylene plates designed to operate at a temperature/pressure limit of 100 psi at 212°F. Manufacturer information and special operating instructions are included in Appendix B of this assessment.

e. Associated piping, valves and instruments - all piping is Schedule 40 carbon steel fitted with 150 psi flanges except the Low pressure blow down line from Pump P5 to EB-2 shall be heater hose rated at -40°F to 350°F and 175 to 250 psi respectively. All piping with an inside diameter of 2" or smaller is socket-welded using, at a minimum, 3000# connections. All piping with an inside diameter greater than 2" is butt-welded. All valves, fittings & instruments are rated for 150 psi or higher.

2. Design Standards

All piping was installed according to ASME/ANSI Code section B31.3. Metallurgical information on the materials used is included in Appendix E of this assessment.

3. Corrosion Protection

The exterior of all waste piping is coated with two layers of Kem-Kromik Universal Metal Primer - B50Z Series. Each layer is applied at a dry film thickness of not less than 3 mils. Detailed information on the coating is included in Appendix F of this assessment.

4. Documented Age of Piping System

The piping and other ancillary equipment was purchased during a period of time between December 1994 and January 1995. It was installed in June 1995.

5. Result of Leak Tests

A Hydrostatic leak test was performed in accordance with ASME/ANSI. B31.3 Chapter VI paragraph 345.5 using paragraph 345.4.2 to determine the pressure requirements of the test. A description of this testing procedure along with the results of that test are included in Appendix D of this assessment.

6. Data Obtained

Included in Appendix H of this assessment is a Piping and Flow Diagram of the treatment process. This Piping and Flow Diagram reflects data such as valves, blowoffs, vents, level controls and the overall flow pattern of the treatment process.

7. Pipe Support System

A visual inspection of the pipe support system was conducted. This inspection included a look at such things as materials of construction, welds, and construction methods. From this inspection a determination was made that the pipe support system is adequate.

D SECONDARY CONTAINMENT SYSTEM

1. General Description of Secondary Containment

The secondary containment system is designed and operated to prevent any migration of wastes or liquids out of the system. Evaporator Flash Tank No. 1, Evaporator Flash Tank No. 2, Evaporator Flash Tank No 3, Evaporator Blowdown Tank No. 2, and Evaporator Feed Tank No. 4 are located on a reinforced concrete base floor area with vertical concrete sidewalls. All associated piping is above ground and located within the secondary containment system. The area is inspected daily on a routine basis.

At the time of inspection the concrete area was withstanding daily operations, and routine climatic conditions. No cracks from compression or uplift were visually apparent.

Any released tank contents are removed and pumped to an appropriate storage area within the maximum time allowed as a permit condition.

2. Design Standards

Corings of the concrete in the existing containment area were taken and tested for compressive strength. A copy of the report generated from those tests is included in Appendix C of this assessment. The structural capacity of the foundation was compared to those sections that are applicable in the API-650 and the ACI-318, and these calculations were used as a guide in verifying the ability of the system to contain hazardous waste.

3. Corrosion Protection

There is an impermeable coating applied to the entire concrete floor and curbs. Appendix F of this assessment contains detailed information on the coating(s) employed.

4. Documented Age of the Containment Area

The secondary containment system was constructed and installed in 1987.

5. Result of Leak Tests

A visual inspection of the containment area was performed and from this inspection there were no cracks or breaks in the impermeable coating, therefore it appears to be adequate to contain any leaks or spills.

6. Calculation of Capacity Available (CCA)

Area	2739 s.f.
Curb Height	0.25 ft.

Material	Concrete
Gross Volume	685 c.f.

See Appendix H for detailed drawings of this containment area. Appendix A of this assessment contains detailed calculations of the available containment volume. The containment capacity available = 685 c.f.

7. Required Volume

<u>Containment Capacity Required (CCR)</u>

CCR=Volume of Largest Tank in the secondary containment

Volume of Largest Tank = (FT1) = 401 c.f.

8. Comparison of Available Volume to Required Volume

<u>Containment Capacity</u>

Containment Capacity Required =	401 c.f.
Secondary Containment Volume Available=	685 c.f
Excess Containment Volume =	284 c.f.

E CONCLUSIONS

1. The foundation, structural support, seams, connections, and controls for the Evaporator Flash Tank No. 3 (FT3) System have been adequately designed.

2. The Evaporator Flash Tank No. 3 (FT3) system has sufficient structural strength, is compatible with the wastes to be stored and treated, and has adequate corrosion protection to ensure that it will not collapse, rupture or fail.

3. The Evaporator Flash Tank No. 3 (FT3) system was inspected after installation for weld breaks, punctures scrapes of protective coating, cracks, leaks, corrosion, and other structural damage or inadequacies of construction/installation.

4. The Evaporator Flash Tank No. 3 (FT3) was tightness tested after installation and it was found that the tank tested positive for tightness.

5. The Secondary Containment for the Evaporator Flash Tank No. 3 (FT3) system is of sufficient structural strength and of sufficient volume to meet the requirements set forth in 40 CFR 264.193.

6. All ancillary equipment associated with the Evaporator Flash Tank No.3 (FT3) system is properly supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.

7. The Evaporator Flash Tank No. 3 (FT3) system associated ancillary equipment was tightness tested after equipment installation in accordance with ASME/ANSI B31 and it was found that the ancillary equipment tested positive for tightness.

8. All instruments and heat exchanger plates shall be installed, calibrated, and tested before operating personnel starts FT-3 process cycle.

F CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to be the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

James C. Reichenbach, P. E.

REGISTERED PROFESSIONAL ENGINEER
JAMES CLARK
REICHENBACH
11326
OKLAHOMA

Date

Primary Tank Volume Calculations

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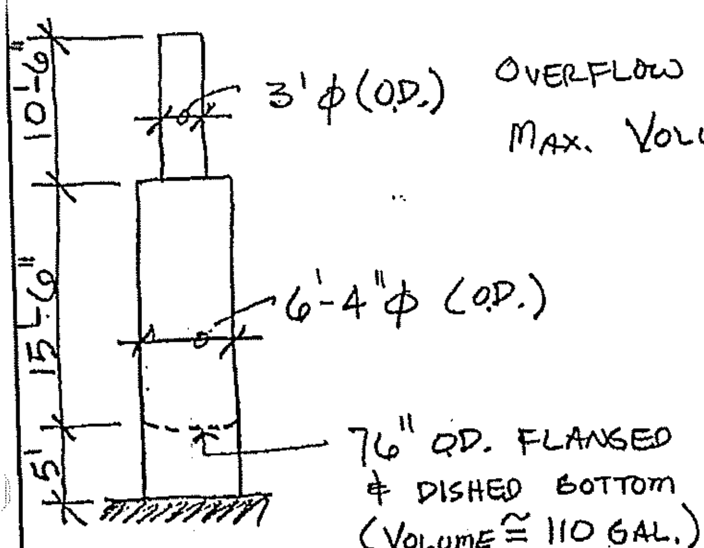

OVERFLOW VOLUME = 2234 GAL.
MAX. VOLUME = 2981 GAL.

$$\text{MAX. WATER HT.} = \frac{(2981 - 110)}{7.48052 \frac{GAL}{FT.^3}}\left(\frac{1}{\pi \frac{(6.33')^2}{4}}\right) = 12.2'$$

OVERFLOW WATER HT. = 9.1'

MAX. WATER WT. = 2981 GAL. (8.3454)(1.5) = 37,317#

OVERFLOW WATER WT. = 2234 (8.3454)(1.5) = 27,966#

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- WIND LOAD ON TANK – PER API 650, 3.11

WIND LOAD = 18 PSF

$$O.T.M. = 18\,PSF\left(3'(10.5')\left(\frac{10.5'}{2}+20.5'\right)+6.33'\frac{(20.5')^2}{2}\right)$$

$$O.T.M._{WIND} = 38542\ FT\text{-}\#$$

– DETERMINE SHELL WT.

ELEMENT		
FLUE	$10.21\,PSF(\pi)(3')(10.5')$	$= 1010.\#$
INSULATION	$2\,PSF(\pi)(3')(10.5')$	$= 192\#$
ROOF PL	$12.76\,PSF(\pi)(6.33')^2(\frac{1}{2})$	$= 402\#$
3/8" SHELL PL	$15.31\,PSF(\pi)(6.33')(20.5')$	$= 6241\#$
ACCESSORIES		$= 3000\#$
TOTAL TANK WT.		$10{,}845\#$
CONTENTS	2981 GAL	$= 37{,}317\#$
TOTAL TANK + CONTENTS		$48{,}162\#$

$$C = \frac{2M}{D(P)} = \frac{2(38542)}{6.33'(.9(10845))}$$

$$C = 1.25 > 0.66$$

$\therefore$ ANCHOR BOLTS ARE REQ'D.

Secondary Containment Volume Calculations

SECONDARY CONTAINMENT VOLUME CALCULATIONS

A. DIMENSIONS

1.	Length	64' 9"
2.	Width	44' 0"
3.	Height	3" min

B. VOLUME (Before encroachments) 64.75'x 44'x .25' = 712.25ft^3

C. ENCROACHMENTS

1.	Posts	16 @ 10"x 10"x 3"
2.	Posts	9 @ 12"x 10"x 3"
3.	Posts	1 @ 14"x 15"x 3"
4.	Posts	1 @ 24"x 8"x 3"
5.	Posts	2 @ 12"x 12"x 3"
6.	Posts	2 @ 32"x 12"x 3"
7.	Posts	1 @ 24"x 24"x 3"
8.	Ramps	4 @ 14'x 30"x 3"
9.	Ramps	1 @ 16'x 32"x 3"
10.	Heat Exchangers	2 @ 2'x 51"x 3"
11.	Pumps	4 @ 5'x 20"x 3"
12.	Pumps	4 @ 3'x 1'x 3"

D. ENCROACHMENT VOLUME CALCULATIONS

1.	16 x 0.83 ft x 0.83 ft x 0.25 ft =	2.75 ft^3
2.	9 x 1 ft x 0.83 ft x 0.25 ft =	1.87 ft^3
3.	1 x 1.17 ft x 1.25 ft x 0.25 ft =	0.37 ft^3
4.	1 x 2 ft x 0.67 ft x 0.25 ft =	0.34 ft^3
5.	2 x 1 ft x 1 ft x 0.25 ft =	0.5 ft^3
6.	2 x 2.67 ft x 1 ft x 0.25 ft =	1.34 ft^3
7.	1 x 2 ft x 2 ft x 0.25 ft =	1.0 ft^3
8.	4 x 1.17 ft x 2.5 ft x 0.25 ft =	2.93 ft^3
9.	1 x 1.33 ft x 2.67 ft x 0.25 ft =	0.89 ft^3
10.	2 x 2 ft x 4.25 ft x 0.25 ft =	4.25 ft^3
11.	4 x 5 ft x 1.67 ft x 0.25 ft =	8.35 ft^3
12.	4 x 3 ft x 1 ft x 0.25 ft =	3 ft^3

TOTAL ENCROACHMENT VOLUME	27.59 FT^3
AVAILABLE CONTAINMENT VOLUME	684.66 FT^3
LARGEST TANK VOLUME (FT 1)	401 FT^3
EXCESS CONTAINMENT	283.66 FT^3

Manufacturers Design Information

Primary Tank

MANUFACTURER'S CERTIFICATION FOR
TANK BUILT TO API STANDARD 650

TO USPCI/LAIDLAW
(Name and address of purchaser)

ROUTE 2, BOX 170

WAYNOKA, OKLAHOMA 73860-9622

We hereby certify that the tank constructed for you at

USPCI - LONE MOUNTAIN FACILITY
(Location)

WAYNOKA, OKLAHOMA

and described as follows: (1) SMI 499-3, 6'-4" O.D., 31'H
(Serial or contract number, diameter, height, capacity, floating or fixed roof)

2981 GAL, WITH FIXED FLUE OPEN TOP ROOF

meets all applicable requirements of API Standard 650, NINTH Edition, JULY 1993 Revision, Appendix A, J, & M dated NOVEMBER 30, 1994, including design, materials, fabrication, and testing.

The tank is further described on the attached as-built data sheet dated

8-1-95 (LAST REVISION DATE).

SCOTT MANUFACTURING, INC.
Manufacturer

William A. Bacon MGR/HC
Authorized representative

8-24-95
Date

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- DESIGN DATA

OPERATING PRESSURE	ATMOSPHERE
DESIGN TEMPERATURE	300° F.
SEISMIC ZONE	1
WIND VELOCITY	100 MPH
CORROSION ALLOWANCE	1/8"
MIN. PLATE THICKNESS	3/8"
SPECIFIC GRAVITY	1.5
DESIGN STANDARD*	API 650 WITH APPENDIX A, J, & M

* THE DESIGN OF THIS TANK IS "BASED" ON API 650, ALTHOUGH API 650 IS MEANT TO COVER ONLY TANKS WHOSE ENTIRE BOTTOM IS UNIFORMLY SUPPORTED ON THE GROUND. THE BOTTOM FOR THIS TANK IS NOT UNIFORMLY SUPPORTED. HOWEVER, THE DESIGN WILL COMPLY WHEREVER POSSIBLE TO API 650.

REGISTERED PROFESSIONAL ENGINEER
RUSSELL JAMES THOMA, JR.
15610
OKLAHOMA

Russell James Thoma, Jr.
8-1-95
WATER STORAGE TANK DESIGN CALCULATIONS, P. 1 TO 12.

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TRY USING (8) - 3/4" φ A36 ANCHOR BOLTS

ROOT AREA = 0.309 IN^2

ALLOW. TENSILE STRESS = 15,000 PSI

DESIGN ANCHOR BOLTS PER API 650, F.7

PROVIDE 1/4" CORROSION ALLOWANCE ON THE DIAMETER

$$\text{EQUIV. DIAMETER} = \sqrt{\frac{.309(4)}{\pi}} - .25'' = .3772 \text{ IN.}^2$$

$$\text{ADJUSTED ROOT AREA} = \frac{\pi(.3772)^2}{4} = .112 \text{ IN}^2$$

$$\text{ALLOW. BOLT TENSION} = .112 \text{ IN}^2 (15000 \text{ PSI})\left(\frac{4}{3}\right)$$

$$\text{ALLOW. BOLT TENSION} = 2235.4^{\#}$$

$$\text{BOLT CIRCLE} = 6'\text{-}4'' + 2(1\tfrac{1}{2}'') = 6'\text{-}7''$$

BOLT CIRCLE; d = 6.583 FT.

$$\text{NUMBER OF ANCHOR BOLTS} = \frac{4(38542)}{6.583'(2235.4)} - \frac{.9(10{,}845^{\#})}{2235.4^{\#}}$$

REQ'D. NUMBER OF A.B. = 6.11 BOLTS < 8 ✓OK

USE (8) - 3/4" φ A36 ANCHOR BOLTS

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- CHECK SEISMIC LOADS PER API 650, APPEN. E.

ZONE 1 — $Z = 0.1875$ (TABLE E-1)

$I = 1.0$

$C_1 = 0.24$

$W_{FLUE} = 1202^{\#}$ $X_{FLUE} = \frac{1}{2}(10.5') + 20.5' = 25.75'$

$W_{SHELL} = 9241^{\#}$ $X_S = \frac{1}{2}(20.5') = 10.25'$

$W_R = 402^{\#}$ $X_R = 20.5'$

$W_T = 37{,}317^{\#}$

$\frac{D}{H} \cong \frac{6.33'}{12.66'} = .5$

$\frac{W_1}{W_T} = .91$ $W_1 = .91(37317^{\#}) = 33959^{\#}$

$\frac{W_2}{W_T} = .13$ $W_2 = .13(37317^{\#}) = 4852^{\#}$

$\frac{X_1}{H} = .45$ $X_1 = .45(12.66') + 5' = 10.7'$

$\frac{X_2}{H} = .833$ $X_2 = .833(12.66') + 5' = 15.6'$

$k = .57$ $T = .57(6.33')^{1/2} = 1.434$ $S = 1.5$

$C_2 = \frac{0.30(1.5)}{1.434} = .314$

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SEISMIC CONT. –

$C_1 W_{FLUE} X_{FLUE} = .24(1202^{\#})(25.75') = 7428.4$

$C_1 W_S X_S = .24(9241^{\#})(10.25') = 22732.9$

$C_1 W_R H_R = .24(402^{\#})(20.5') = 1977.8$

$C_1 W_1 X_1 = .24(33959^{\#})(10.7') = 87206.7$

$C_2 W_2 X_2 = .314(4852^{\#})(15.6') = 23767.0$

$143,112.8$

SEISMIC O.T.M. = .1875(1.0)(143,112.8)

SEISMIC O.T.M. = 26834 FT-# < WIND O.T.M. = 38542'#

∴ WIND O.T.M. GOVERNS DESIGN OF ANCHOR BOLTS

PER API 650- E.5.2

$$b = w_t + \frac{1.273\,M}{D^2}$$

$$b = \frac{10845^{\#}}{\pi(6.33')} + \frac{1.273(38542)}{(6.33')^2} = 1770\ ^{\#}/\text{FT.}$$

$$\frac{b}{12t} = \frac{1770^{\#}/_1}{12(.375'')} = 393.3\ \text{PSI}$$

$$\frac{GHD^2}{t^2} = \frac{1.5(13')(6.33')^2}{.375''} = 2083.6\ \text{PSI} < 10^6$$

$$F_a = \frac{10^6(.375)}{2.5(6.33')(12)} + 600\sqrt{1.5(13')(12)} = 11,153\ \text{PSI}$$

$$F_a = 11,153\ \text{PSI} > \frac{b}{12t} = 393\ \text{PSI}$$ ✓OK

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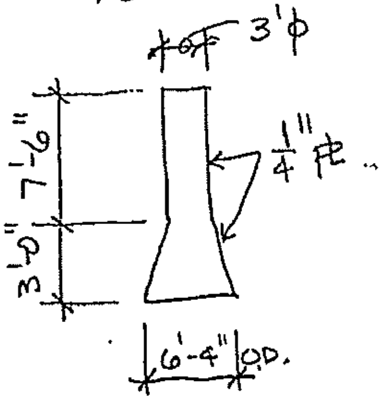
• DESIGN SELF-SUPPORTED FLUE

REFER TO "DESIGN OF PLATE STRUCTURES, VOLUME 2", p. 25



$$F_L = \frac{C_L D_o q_{cr}}{2\beta}$$

$C_L = 0.2$ $\quad D_o = 3'$ $\quad \beta = 1\% = .01$

$$f_t = \frac{3.52 \cdot D}{4\pi H_1^2}\left[\frac{E\,g}{2\,W_s}\right]^{\frac{1}{2}}$$

$$f_t = \frac{3.52(36'')}{4\pi(10.5'(12))^2}\left[\frac{28{,}300{,}000(386)}{2(.2836\,\#/\text{in}^3)}\right]^{\frac{1}{2}}$$

$f_t = 88.2$ cps

$V_{cr1} = 3.41\, D_o\, f_t$

$= 3.41(3\text{ FT.})(88.2\text{ cps})$

$V_{cr1} = 901.8$ mph $= 1322.6$ fps

$V_{cr2} = \dfrac{f_t D_o}{S}$ $\qquad S = .2$

$= \dfrac{88.2(3')}{0.2}$

$V_{cr2} = 1322.6$ fps

$q_{cr} = .00119\, V_{cr}^2$

$= .00119(1322.6)^2$

$q_{cr} = 2082$ PSF > 18 PSF

∴ DYNAMIC WIND IS NOT CRITICAL

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$$f_o = \frac{678.5\, t}{D_o^2}$$

$$= \frac{678.5(.25)}{(3')^2}$$

$$f_o = 18.85$$

$$V_o = \frac{f_o D_o}{2S}$$

$$= \frac{18.85(3')}{2(.2)}$$

$$V_o = 141.4 \text{ FT/SEC.} = 96.4 \text{ MPH}$$

$$\frac{D}{250} = \frac{36''}{250} = .144''$$

∴ OVALING VIBRATIONS ARE NOT CRITICAL

$$\frac{t}{R_o} = \frac{.25}{18''} = .01389$$

$$F_{cr} = F_y \left[.8 + \frac{5t}{R_o} \right]$$

$$= 36{,}000 \text{ PSI} \left[.8 + \frac{5(.25)}{18} \right]$$

$$F_{cr} = 31{,}300 \text{ PSI}$$

$$C'_c = \sqrt{\frac{2\pi^2 E}{F_{cr}}}$$

$$= \sqrt{\frac{2\pi^2 (28{,}300{,}000)}{31{,}300}}$$

$$C'_c = 133.6$$

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$\frac{KL}{r}$, $K = 2.0$ $L = 10.5'$

$$r = \frac{\sqrt{(36'')^2 + (35.5'')^2}}{4}$$

$$r = 12.64 \text{ IN}^2$$

$$\frac{KL}{r} = \frac{2.0(10.5')(12)}{12.64}$$

$$\frac{KL}{r} = 19.94 < C'_c = 133.6$$

$$K\phi = 1 - .5\left[\frac{KL/r}{C'_c}\right]^2$$

$$= 1 - .5\left(\frac{19.94}{133.6}\right)^2$$

$$K\phi = .989$$

$$F_c = \frac{K\phi \ F_{cr}}{FS} \qquad FS = 2.0$$

$$= \frac{.989(31,300)}{2.0}$$

$$F_c = 15,476 \text{ PSI}$$

$$S = \frac{\pi((36'')^4 - (35.5'')^4)}{32(36'')} = 249.22 \text{ IN}^3$$

$$\text{WIND OTM.} = 18\text{PSF}(3')\left(\frac{(10.5')^2}{2}\right) = 2977 \text{ FT-\#}$$

$$f_c = \frac{3 \text{ FT-K}(12)}{249.22} = .144 \text{ KSI} < F_c = 15.4 \text{ KSI} \checkmark \text{OK}$$

Tank Wall Thickness

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- CALCULATE SHELL THICKNESS PER API 650, M.3

FROM TABLE M-1;
FOR 300°F, REDUCTION FACTOR (RF.) = 0.88

$$t_{REQ'D.} = \frac{2.6\,D(H-1)\,G}{E\,(21000)(R.F.)} + C.A.$$

D = 6.33' H = 12.2' (SAY 13') G = 1.5
USE E = 0.70 C.A. = 1/8" (.125") R.F. = .88

$$t_{REQ'D.} = \frac{2.6(6.33')(13'-1)(1.5)}{.70(21000)(.88)} + .125$$

$t_{REQ'D.}$ = .148 IN. X 2 = .296 IN.

USE MIN. 3/8" STEEL PLATE FOR SHELL

REINFORCEMENT PLATES AROUND SHELL OPENINGS ARE NOT REQUIRED BECAUSE t = 3/8" (.375") > .296".

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- DESIGN SHELL MANWAY & BOTTOM MANWAY – 30" ϕ

$$P = 13'(62.4\ \#/FT.^3)(1.5) = 1216.8\ PSF = 8.45\ PSI$$

$$S = \frac{Pr^2}{t^2} \qquad S = 21{,}000\ PSI$$

$$t_{REQ'D.} = \sqrt{\frac{Pr^2}{S}}$$

$$= \sqrt{\frac{8.45(15'')^2}{21{,}000}}$$

C.A.

$$t_{REQ'D.} = .30'' + .125'' = .425''$$

USE $\underline{1/2''\ PL}$

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- DESIGN FLANGED & DISHED BOTTOM

$t_{REQ'D.} = .0000757272\ PR + C.A.$

$= .0000757272\,(8.45\text{ PSI})\left(\frac{6.33'(12)}{2}\right) + .125''$

$t_{REQD.} = .15\text{ IN.}$

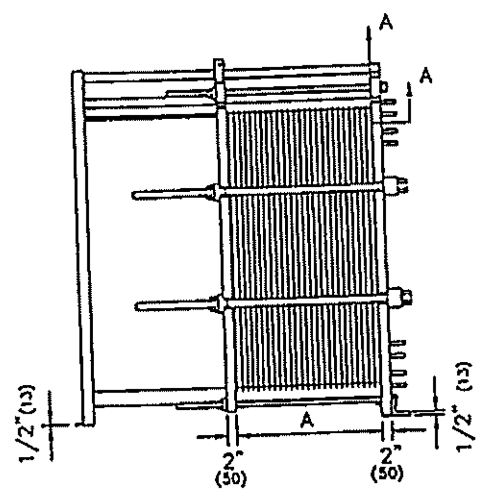
USE 3/8" THICK PL

Heat Exchanger

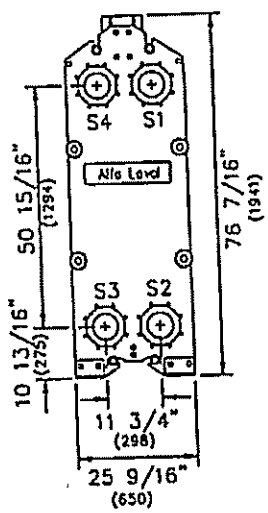
Designed, Constructed and National Board Stamped in Accordance with latest 1992 A.S.M.E. Code and Addendum.

Alfa Laval

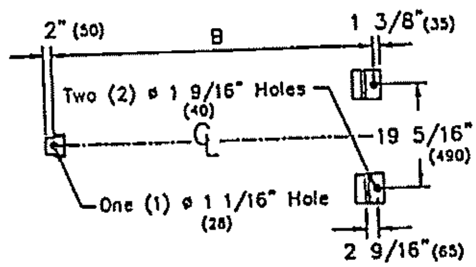
Side



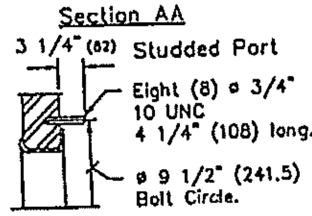
Front



Footing



Section AA



B= 42 5/16"(1075) A= See Plate Spec Documentation Dimensions in () are millimeters(mm)

Connections

LOC	Function	Fluid	Material	Size	Rating	Type
S1	Hotside Inlet	30.7 psig Steam	SS	6"	150#	STUD
S2	Hotside Outlet	30.7 psig Steam	SS	6"	150#	STUD
S3	Coldside Inlet	Solution	SS	6"	150#	STUD
S4	Coldside Outlet	Solution	SS	6"	150#	STUD

Notes: Carboline 134 1.5 mils DFT (Alfa Laval Blue)

CERTIFIED
APPROVED FOR FABRICATION
BY ________ DATE 6/27/94

Customer Name	: USPCI
P.O. Number	: 20572
Item	: # 2 Heat Exchangers
Order Number	: 942005
A/L Serial#(s)	: 30101-96638 thru 96639

Design Press/Temp.: 150 PSI / 300 °F
Plate/Gasket Mat'l: AISI 316 / EPDM
Plates Actual/Max.: 39 / 64 (0.5mm)
Weight Dry/Flooded: 2350 lb / 2607 lb
Length CBar/TBolt.: 900 mm / 750 mm

rev.	description	by	ck	date
A	Revised Stud Bolt, Foot Dimension & Foot Print			

by	date	check	date	approval	date
MG	11/91	AV	11/91	TC	11/91

M15-FFG

Alfa Laval Thermal Inc.
Manufactured in Richmond, Virginia

Alfa Laval Thermal Inc.
400 International Trade Drive
Richmond, VA 23231

Plate Heat Exchanger
Bill of Materials

Implementation Date: 2/28/94
Revision: 1

QA03138

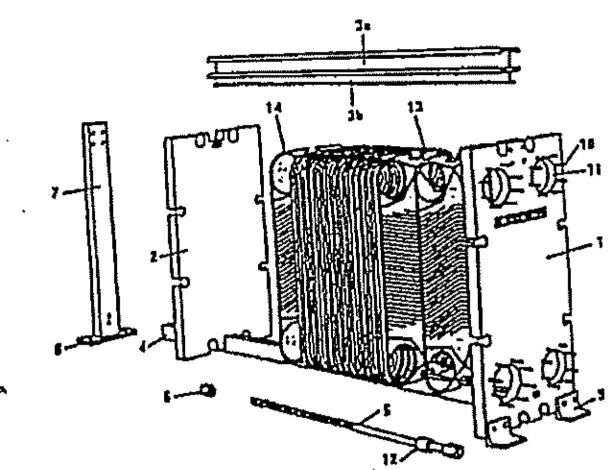
Subject: M15-FFD

BACKGROUND
Given are standard ASME/ASTM materials of construction.

No.	Item	Quantity	Material	Notes	Dimensions
1.	Frame Plate	1	SA516-70	1	
2.	Pressure Plate	1	SA516-70	1	
3a.	Carrying Bar	1	Aluminum		900 mm
3b.	T-Profile Cladding	2	SA240,304SS		900 mm
4.	Guide Bar	1	SA479,304SS		750 mm
5.	Tightening Bolt	8	SA193,B7		2" - 4 1/2 UNC
6.	Tightening Nut	8	SA194,2H2		2" - 4 1/2 UNC
7.	Support Column	1	Aluminum		
8.	Support Foot	1	SA36	1	
9.	Frame Foot	2	SA36	1	
10.	Stud Bolt	48	SA193,B7	2	
11.	Connection Liner	4	SA240,316SS		
12.	N/A				
13.	Channel Plate Gasket	40	EPDM		Electropolished
	Channel Plate	39	SA240,316SS		
Not Shown	OSHA Shroud	1	Aluminum	3	

Notes: (1)Painted. (2)Zinc Plated. (3)Not Shown

Drawing is not an accurate depiction, see certified print.



USPCI
P.O. #: 20572
TAG: #2 HEAT EXCHANGERS
A/L ORDER #: 942005
A/L SERIAL #: 30101-96638
30101-96639

CERTIFIED
APPROVED FOR FABRICATION
BY ________ DATE 6/23/94

A L F A - L A V A L   T H E R M A L

PLATE HEAT EXCHANGER
Specification Sheet

P.O.#: 20572
Order#: 942005
Tag#: # 2 Heat Exchangers

CUSTOMER: USPCI
Supplier: Alfa Laval Thermal Inc.
Agent: Charles Martin, Thermal Engineering Co

Quantity: 2
Serial#: 30101-96638 thru 96639

PHE Model Type: M15-FFG

		HOT SIDE -1-	COLD SIDE =2=
Fluids	:	30.7 psig Steam	Solution
Flow rates	lb/hr	10349	312000
Inlet temperature	F	275.0	180.0
Outlet temperature	F	272.2	230.0
Pressure drops	psi	2.0	8.9
Total Surface Area	:	260 sq ft	
Flow regimen fluids	:	counterflow	
Connection locations in	:	S1	S3
out	:	S2	S4
Material in connections	:	SS	SS
Total number of plates	:	39	
Plates material	:	AISI 316	
thickness	:	0.5mm	
Gasket material	:	EPDM Clip-on	
Design pressure	:	150 PSI	
Design temperature	:	300 F	
Liquid volumes	US gallon	13	13
Total unit dry weight	:	2300 lb	

CERTIFIED
APPROVED FOR FABRICATION
BY ______ DATE 4/21/94

942005\1

06/22/94

```
2*M15-F CH__ AISI_316 0.5mm EPDM_Clip-on

1*19 L  S1->S2  30.7 psig Steam
1*19 L  S4<=S3  Solution

                           ------------------------
                                          ---<----     0.6mm
39  End Plt1 16B   H
38  Chan Plt.03A   L    U==<===U          O      O
37  Chan Plt.03B   L    O      O          U      U
36  Chan Plt.03A   L    U      U          O      O
35  Chan Plt.03B   L    O      O          U      U
                        )      )          )      )
                        (      (          (      (
 6  Chan Plt.03A   L    U      U          O      O
 5  Chan Plt.03B   L    O      O          U      U
 4  Chan Plt.03A   L    U      U          O      O
 3  Chan Plt.03B   L    O      O          U--<---U
 2  Chan Plt.03A   L    U==<===U          O      O
 1  End Plt2 83B   H    O      O          O      O
                       -S4----S3-------S2----S1-
```

Date 06/22/94

P.O.#: 20572

~ent

CUSTOMER: USPCI

```
================================================================
        ALFA-LAVAL THERMAL     PLATE HEAT EXCHANGER
================================================================
```

Model Type M15-FFG
Quantity 2
Serial#: 30101-96638 thru 96639
Supplier: Alfa Laval Thermal Inc.
Agent: Charles Martin, Thermal Engineering Co

Order#: 942005
Tag#: # 2 Heat Exchangers

Gasket sides of the plates are facing the frame plate.
Plates with parallel flow.

Plates material	AISI 316
thickness	0.5mm
Gasket material	EPDM Clip-on
A - Dimension (See Drawing)	174 mm
Total number of plates	39
Total unit dry weight	2300 lb
Extra/Inspection port location	Side 1: Side 2:

```
-----------------------SAMPLE FLOW DIAGRAMS-------------------------
               Sample SINGLEPASS Flow Diagram
                     ------------------------

121  End Plt1 76A  H   ===<==========
120  Chan Plt 03B  L   O     U--<---O------U
119  Chan Plt 03A  L   O     U      O      U        S
                       )     )      )      )
                       (     (      (      (
                                                    A    D
3    Chan Plt 03A  H   U==<===O======U     O
2    Chan Plt 03B  H   O     U--<---O------U        M    I
1    End Plt2 83A  H   O     O      O      O
                      -S4----S3------S2----S1-      P    A

               Sample MULTIPASS Flow Diagram        L    G
                     -------T3------T2-------
121  Tran Plt 43A  H   O     O      O     O         E    R
120  Turn Plt 04B  H         O      U--<----
119  Chan Plt 03A  L   U==<===U     O     O              A
                       )      )     )     )
                       (      (     (     (         F    M
71   Chan Plt 03B  H   O      O     U--<---U
70   Chan Plt 03A  L   U==<===U     O     O         L    S
69   Turn Plt 11B  H   O            ---->--U
68   Chan Plt 03A  L   U===>==U     O     O         O
                       )      )     )     )
                       (      (     (     (         W
4    Chan Plt 03A  L   O      O     O     O
3    Chan Plt 03B  H   O      O     U--->--U
2    Chan Plt 03A  L   U===>==U     O     O
1    End Plt2 84B  H          O     O
                      -------S3------S2-------
```

See following page for Flow Diagram Discriptions.
*** SEE PAGE 1 FOR YOUR FLOW DIAGRAM. ***

ment

=================FLOW DIAGRAM DESCRIPTIONS=====================

glepass....Plate heat exchanger with connections on frame plate
(stationary cover) only.
:ipass.....Plate heat exchanger with both frame plate and pressure
plate (movable cover) connections.
S2,S3,S4...Frame plate connection designations.
T2,T3,T4...Pressure plate connection designations.
(See drawing for locations of T and S ports.)

--------------------PLATE DESCRIPTIONS---------------------------

o 121...Plate position starting from frame plate.
n Plt...Channel Plate. Standard 4-port channel plate. Gasketed so
that flow from two ports opens to the channel plate center.
. Plt2...End Plate 2. Channel plate adjacent to frame plate. With
port holes fully gasketed so that flow does not go between
this plate and the frame plate.
l Plt1...End Plate 1. Channel plate adjacent to pressure plate
on single pass unit.
:n Plt...Turning Plate. Redirects flow with port locations which are
not punched (no U or O) on multipass units.
Plt...Transition Plate. Channel plate adjacent to both pressure
plate and partition plates on multipass unit.
rt Plt...Partition Plate. Thicker steel plate required on some
multipass units.
in Plt...Twin plate. Channel plate type used on welded units only.
,03,83...Plate hole punching description. A-L internal use only.

----------------------PORT PUNCHING-----------------------------

.........Port surrounded by ring gasket. Fluid in this port
.........Flow opening port. Fluid flows into this channel.
O or U..If no U or O is shown then this port location is not punched
and fluid does not flow through this port.

----------------------PLATE ORIENTATION-------------------------

B........Plate orientation, as seen from gasketed side of plates:

```
                 -------                              -------
             ||U \ O||                              ||O / U||
A Plate =>   ||   \ <-------gasket diagonal------>/       ||   <= B Plate
             || \ / ||                              || / \  ||
             ||  \ / <-----chevron direction---->/   \  ||
```
(Channel plate arrangements alternate between A and B plates)

..........High Theata channel plate. Chevrons at angle greater than
90 degrees.
.........Low Theata channel plate. Chevrons at angle less than 90
degrees.
(Channel plate arrangements can have all Highs, all Lows or
a mixture of Highs and Lows.)

Plates: M15-F CH__ AISI_316 0.5mm EPDM_Clip-on

74	37	Chan Plt.03	L	Channel plate	
2	1	End Plt1 16B	H	End plate 1	0.6mm
2	1	End Plt2 83B	H	End plate 2	

Gaskets: EPDM Clip-on

74	37	32330-1804-3	Channel plate gasket
2	1	32330-1804-3	Channel plate gasket
2	1		End plate gasket II consists of:
4	2	32330-1804-3	2 Channel plate gaskets

Structural Support Calculations

COLUMN LOADS

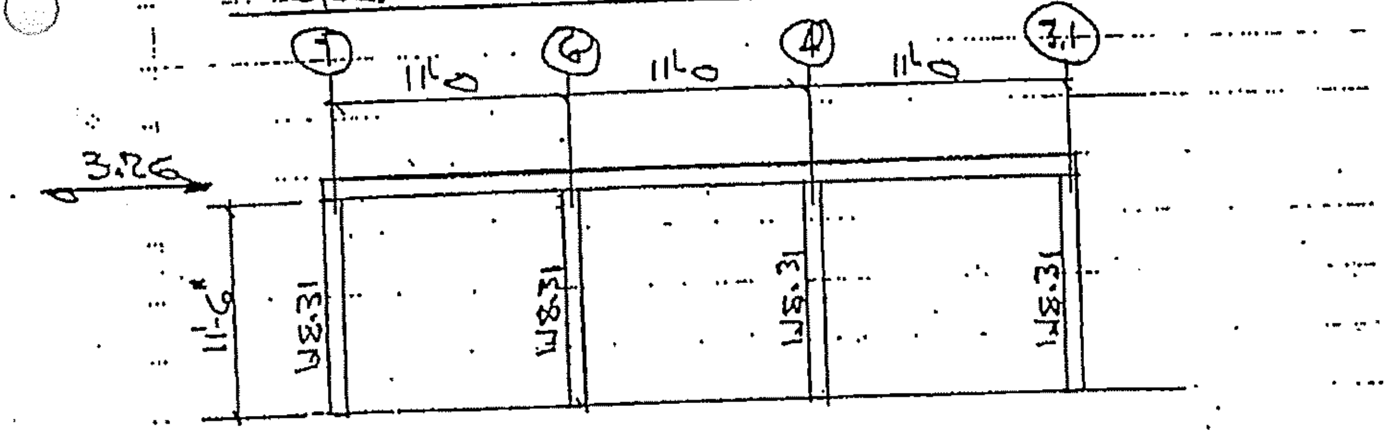
A-1 - 3.6 K
B-1 - 14.3 K
C.9-1 - 14.1 K
D.1-1 - 19.0 K
E-1 - 14.2 K
A-2 - 4.5 K
B-2 - 36.3 K
D-2 - 62.9 K
E-2 - 34.1 K
A3 - 8.4 K
B.3 - 27.9 K
C.9-3 - 28.8 K
D.1-3 - 19.9 K
E-3 - 14.4 K
A-5 - 9.8 K
B-5 - 17.6 K
A-7 - 4.8 K
B-7 - 8.5 K
C-7 - 11.5 K
F-7 - 12.1 K
C6 - 24.8 K
F-6 - 24.2 K
C-4 - 28.1 K
F-4 - 24.2 K
F-3.1 - 12.0 K

EXCEPT @ GRID F ALL COLUMNS WILL BE 14 x 24.

WITH KL 13'-0 ALLOWABLE COL LOAD IS 93.0 K.
THIS SATISFIES ALL CONDITIONS

OTIS ARLIN CLARK 14397 PROFESSIONAL ENGINEER OKLAHOMA

HORZ. FORCES @ GRID "F"



$\frac{3.26}{4}$ = .8150 KIPS PER COL.

.8150 x 11.5 = 9.37 K' MOMENT

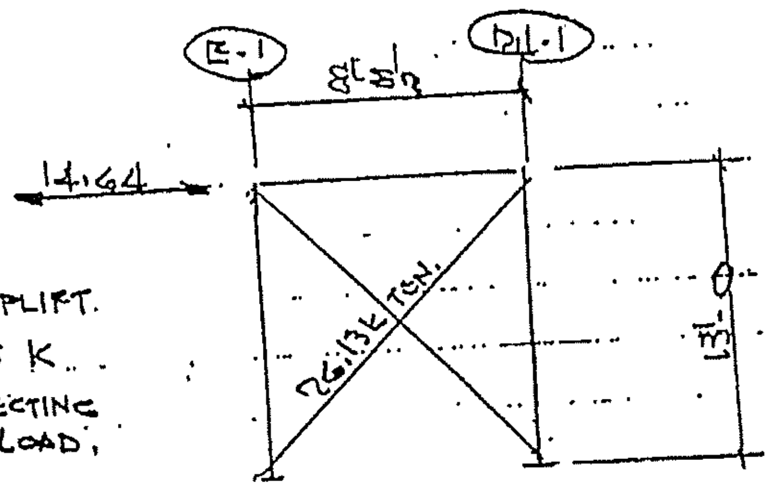
$\frac{9.37 \times 12 \times 1000}{21600}$ = 5.2 REQD Sx

W8x31 = 27.5 > 5.2 COLUMNS OK

REGISTERED PROFESSIONAL ENGINEER
OTIS ARVIN CLARK
14897
OKLAHOMA

HORZ. FORCES @ DIAG. BRACING

7.26 KIPS @ C-7 TO F-7
12.23 @ E-2 TO E-3
6.10 @ A-1 TO A-2
14.64 @ D.1-1 TO E-1



COL. UPLIFT
21.65 K
NEGLECTING
DEAD LOAD.

DIAG. BRACE. PL 4 x 3/8 = 1.5 □" $\frac{26.13}{1.5}$ = 17.42 KSI < 24
BRACE OK.

COLUMN UPLIFT 21.65 W/ 4 - 3/4 Ø EPOXY ANCHORS

PULLOUT TEST ON 3/4 Ø EPOXY ANC. W/ 6½" INBEDDMENT IS
24.2 KIPS. WITH A SAFETY FACTOR OF 4 TO 1
= 6 KIPS PER ANCHOR

6 K x 4 = 24 > 21.65 O.K.

REGISTERED PROFESSIONAL ENGINEER
OTIS ARVIN CLARK
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OKLAHOMA

DESIGN LOADS (1990 BOCA NATIONAL BLDG CODE)

LIVE LOAD ... 100 PSF. (LIGHT MANUFACTURING - PAGE 246)
DEAD LOAD . . 20 PSF.
TOTAL . . . 120 PSF.

TANKS FT1, FT2, & FT3 47,300 LBS. EACH (FILLED).
TANK FT4 25,300 LBS (FILLED)

LATERIAL FORCES FOR EARTHQUAKE LOADS

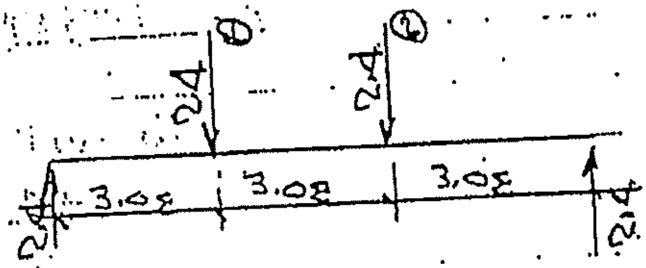
$V = 2.5 A_v I K C S W$ (PAGE 272)
$A_v = .1$ (ZONE 1) (PAGE 273)
$I = 1.0$ (TABLE 1113.1, PAGE 275)
$K = 1.0$ (TABLE 1113.4.3., PAGE 278)
$C = .12$ (PAGE 279)
$S = 1.5$ (TABLE 1113.4.6, PAGE 281)
W = WEIGHT

$V = 2.5 \times .1 \times 1.0 \times 1.0 \times .12 \times 1.5 \times W$
$V = .045\ W$

REGISTERED PROFESSIONAL ENGINEER
OTIS ALVIN CLARK
14897
OKLAHOMA

BEAM @ GRID A-1 TO B-1 (W12.14)

UNBRACED LGTH. 3'-1

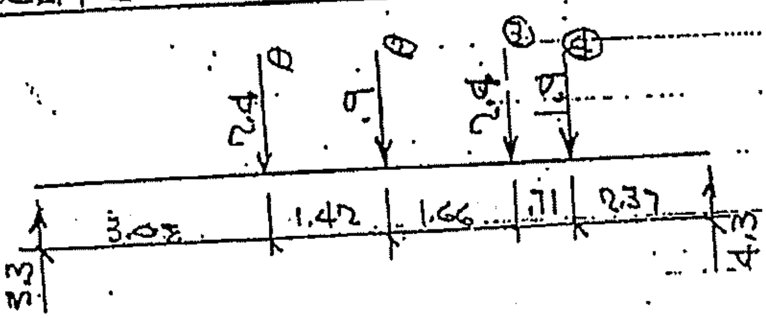


M @ ① & ② = 2.4 x 3.08 = 7.4

FROM ASD 2-174 ALLOWABLE M = 27.3 > 7.4

BEAM @ GRID A-2 TO B-2 (W12.14)

UNBRACED LGTH 3'-1

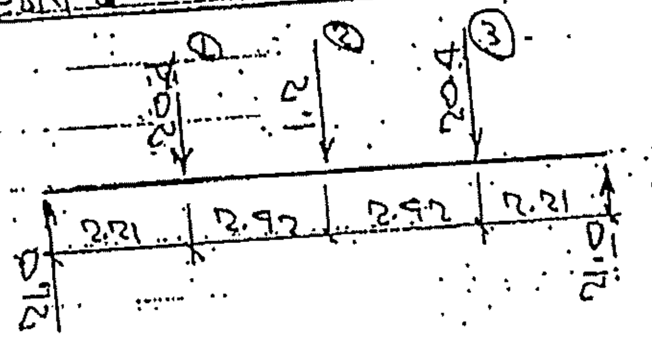


M @ ① 3.3 x 3.08 = 10.2
M @ ② 3.3 x 4.50 - 2.4 x 1.42 = 11.4
M @ ③ 4.3 x 3.08 - 1.9 x .71 = 11.9
M @ ④ 4.3 x 2.37 = 10.2

FROM ASD 2-174 ALLOWABLE M = 27.3 > 11.9

BEAM @ GRID B-2 TO D-2 (W12x35)

UNBRACED LGTH 2'-11



M @ 1 21.0 x 2.21 = 46.4

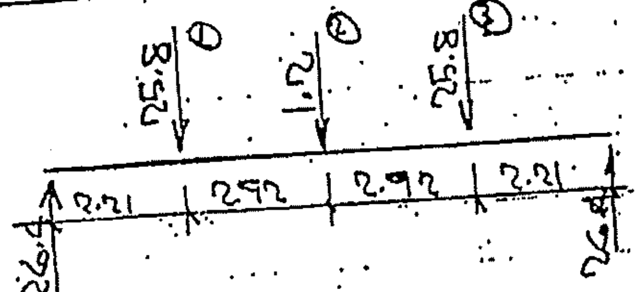
M @ 2 21.0 x 5.13 - 20.4 x 2.92 = 48.2

M @ 3 21.0 x 2.21 = 46.4

FROM ASD 2-172 ALLOWABLE M = 91.2 > 48.2

BEAM @ GRID D-2 TO E-2 (W12x26)

UNBRACED LGTH 2'-11



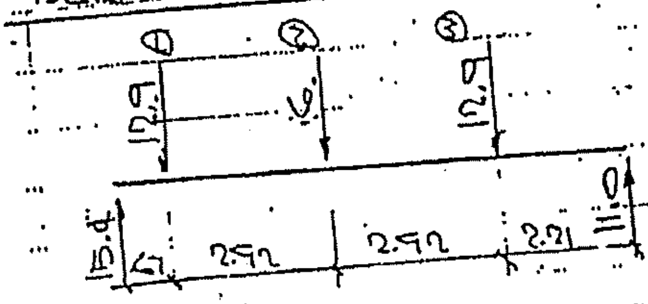
M @ 1 26.4 x 2.21 = 58.3

M @ 2 26.4 x 5.13 - 25.8 x 2.92 = 60.1

M @ 3 26.4 x 2.21 = 58.3

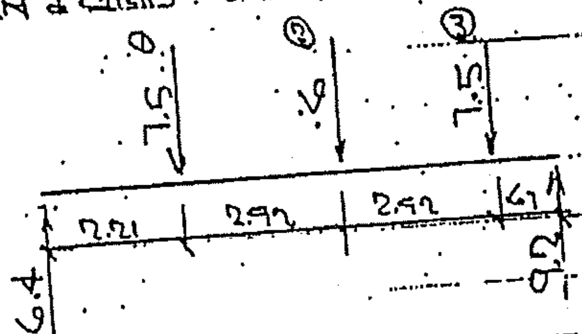
FROM ASD 2-173 ALLOWABLE M = 66.8 > 60.1

BEAM @ GRID D.1-1 TO E-1 & D.1-3 TO E-3 (W12x26)
(UNBRACED LGTH 2'11)



M @ ① 15.4 x .67 = 10.3
M @ ② 15.4 x 3.59 - 12.9 x 2.92 = 17.6
M @ ③ 11.0 x 2.21 = 24.3
FROM ASD 2.173 ALLOWABLE M = 66.4 > 24.3

BEAM @ GRID B-1 TO C-1 (W12x19)
UNBRACED LGTH 2'11

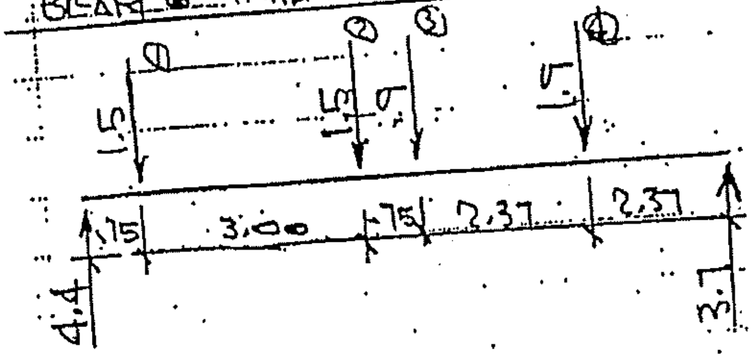


M @ ① 6.4 x 2.21 = 14.1
M @ ② 6.4 x 5.13 - 7.5 x 2.92 = 10.9
M @ ③ 9.2 x .67 = 6.2

FROM ASD 2-174 ALLOWABLE M = 42.5 > 14.1

(W12x14)
UNBRACED LGTH 3'0

BEAM @ GRID A-3 TO B-3



M @ 1 4.4 x .75

M @ 2 4.4 x 3.75 - 1.5 x 3.00 =

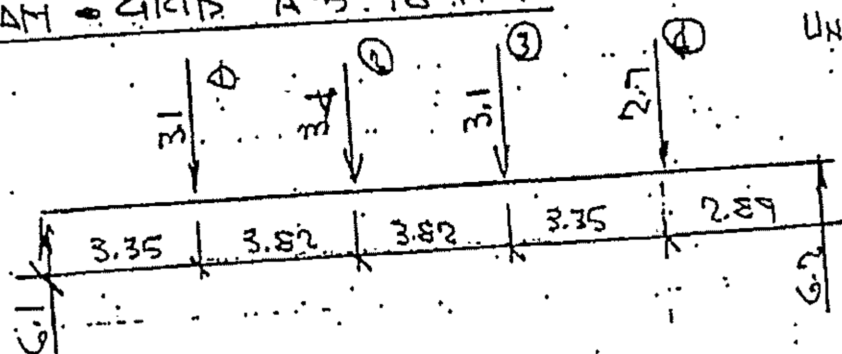
M @ 3 3.7 x 5.14 - 1.9 x 2.37 =

M @ 4 3.7 x 2.37

FROM ASD 2-174 ALLOWABLE M = 77.3 >

(W12x26)
UNBRACED LGTH 3'10

BEAM @ GRID A-5 TO A-7



M @ 1 6.1 x 3.35 = 20.4

M @ 2 6.1 x 7.17 - 3.1 x 3.82 = 31.9

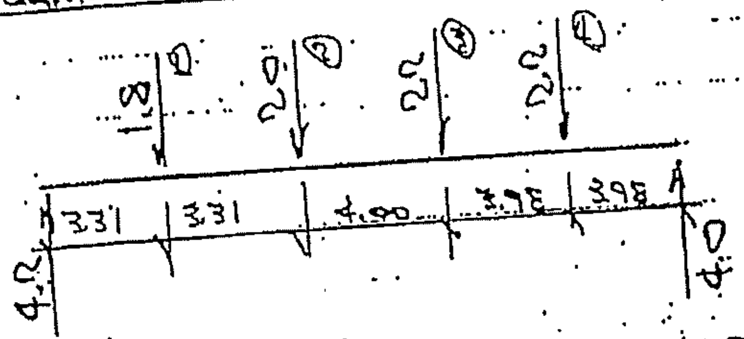
M @ 3 6.2 x 6.24 - 2.7 x 3.35 = 29.6

M @ 4 6.2 x 2.89 = 17.9

FROM ASD 2-172 ALLOWABLE M = 76.2 > 31.9

BEAM @ GRID A-3 TO A-5 W12x26

UNBRACED LGTH 4.0



M @ 1 = 4.2 × 3.31 = 13.9

M @ 2 = 4.2 × 6.62 − 1.8 × 3.31 = 22.0

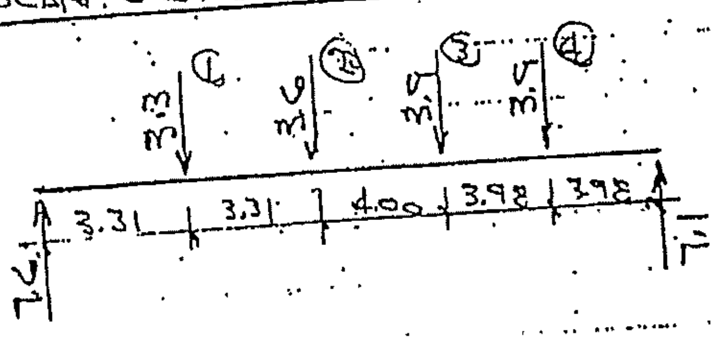
M @ 3 = 4.0 × 7.96 − 2.2 × 3.98 = 23.4

M @ 4 = 4.0 × 3.98 = 15.9

FROM ASD 2.172 ALLOWABLE M = 76.2 > 23.4

BEAM @ GRID B-3 TO B-5 (W12x26)

UNBRACED LGTH 4.0



M @ 1 = 7.6 × 3.31 = 25.1

M @ 2 = 7.6 × 6.62 − 3.3 × 3.31 = 39.3

M @ 3 = 7.1 × 7.96 − 3.9 × 3.98 = 41.2

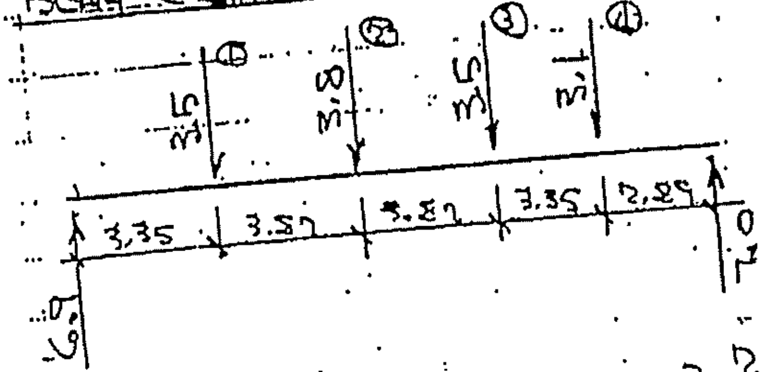
M @ 4 = 7.1 × 3.98 = 28.4

FROM ASD 2-172 ALLOWABLE M = 76.2 > 41.2

Jt.IS H Clark

(1/12/86)

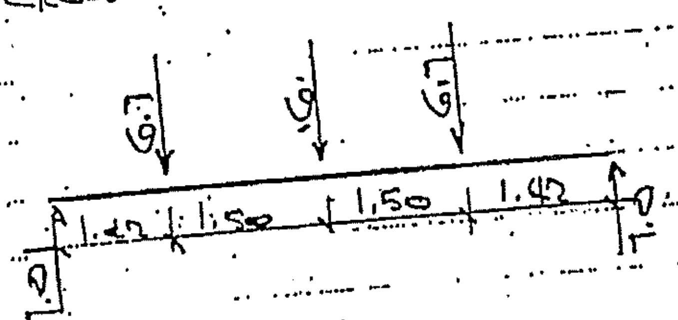
BEAM @ GRID B.5 TO B.7. UNBRACED LGTH 3'9½"



M @ ① = 6.9 × 3.35 = 23.1
M @ ② = 6.9 × 7.17 − 3.5 × 3.82 = 36.1
M @ ③ = 7.0 × 6.24 − 3.1 × 3.35 = 33.3
M @ ④ = 7.0 × 2.89 = 20.2

FROM ASD 2-172 ALLOWABLE M = 76.2 > 33.3

CROSS BEAM UNDER FT 1, 2, & 3 (G FLOOR) 5'-0 SPAN (W8×18)
UNBRACED LGTH 1'6

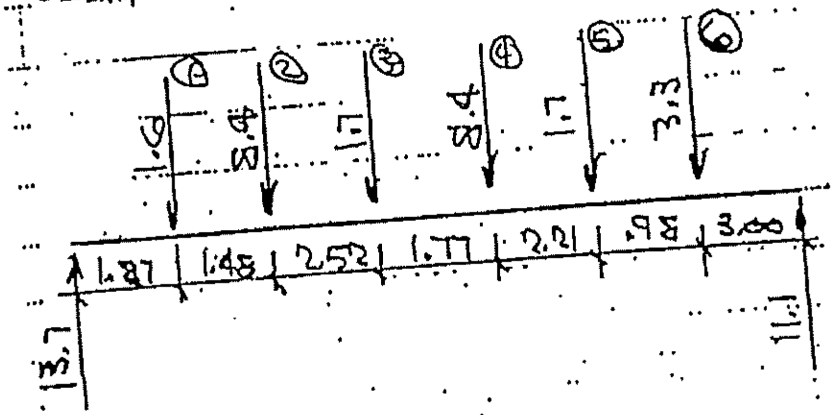


M @ ① = 7.0 × 1.42 = 9.9
M @ ② = 7.0 × 2.92 − 6.7 × 1.50 = 10.4
M @ ③ = 7.0 × 1.42 = 9.9

FROM ASD 2.174 ALLOWABLE M = 30.3 > 10.4

(W 12x35)

BEAM @ GRID C-3 TO C-4

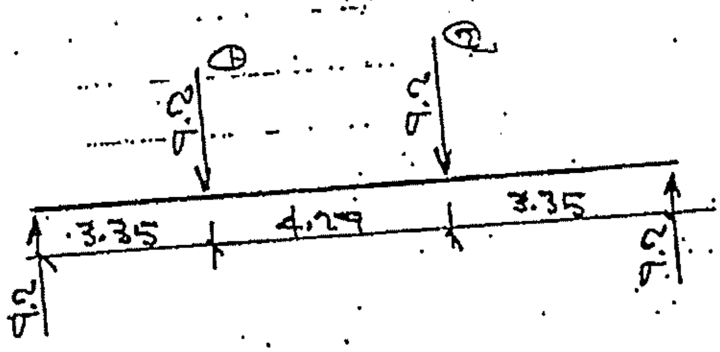


M @ 1 = 13.7 × 1.87 = 25.6
M @ 2 = 13.7 × 3.35 - 1.6 × 1.48 = 43.5
M @ 3 = 13.7 × 5.27 - 1.6 × 4.0 - 8.4 × 2.52 = 52.9
M @ 4 = 11.1 × 6.19 - 3.3 × 3.19 - 1.7 × 2.21 = 54.4
M @ 5 = 11.1 × 3.98 - 3.3 × .98 = 40.9
M @ 6 = 11.1 × 3.00 = 33.3

FROM ASD Z = 172 ALLOWABLE M = 91.2 > 54.4

(W 12x26)

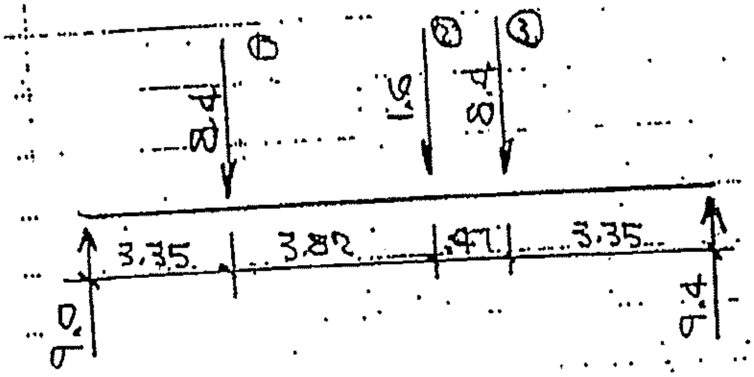
BEAM @ GRID F-3.1 TO F-4, F-4 TO F6
& F6 TO F-7



M @ 1 = 9.2 × 3.35 = 30.8
M @ 2 = 9.2 × 3.35 = 30.8

... Z = 172 ALLOWABLE M = 66.8 > 30.8

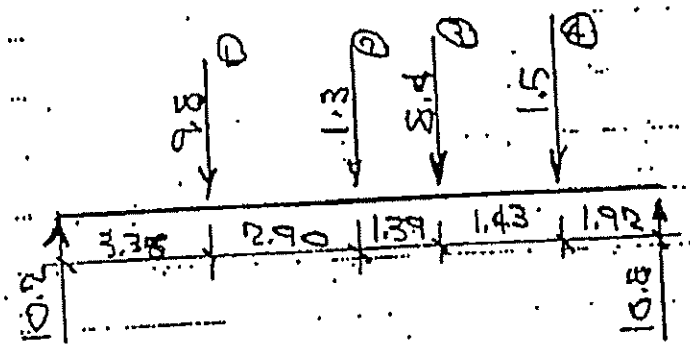
BEAM @ GRID C-6 TO C-7 (W12×26)
UNBRACED LGTH 3'4¼



M @ ① 9.0 × 3.35 = 30.2
M @ ② 9.0 × 7.17 − 8.4 × 3.82 = 32.4
M @ ③ 9.4 × 3.35 = 31.5

FROM ASD 2-173 ALLOWABLE M = 66.8 > 32.4

BEAM @ GRID C-4 TO C-6 (W12×26)
UNBRACED LGTH 3'4¼

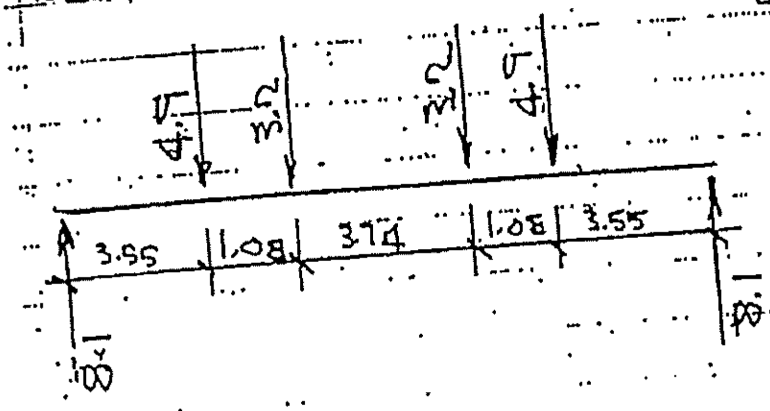


M @ ① = 10.2 × 3.35 = 34.2
M @ ② = 10.2 × 6.25 − 9.8 × 2.90 = 35.3
M @ ③ = 10.8 × 3.35 − 1.5 × 1.43 = 34.0
M @ ④ = 10.8 × 1.5 = 16.2

FROM ASD 2-173 ALLOWABLE M = 66.8 > 35.3

(W12x26)

BEAM UNDER EF-4 (2 PLACES) UNBRACED LGTH 5'-10 3/4"



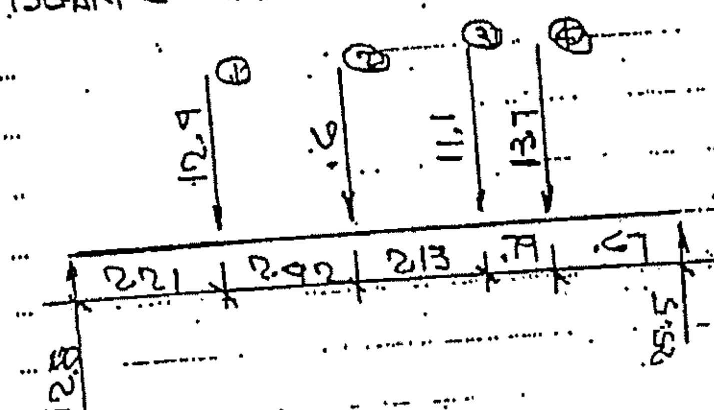
M @ ① & ④ = 8.1 × 3.55 = 28.8

M @ ② & ③ = 8.1 × 4.63 − 4.9 × 1.08 = 32.2

FROM ADS 2-173 ALLOWABLE M = 66.8 > 32.2

(W12x35)

BEAM @ GRID B-3 TO C.9-3



M @ ① 12.8 × 2.21 = 28.3

M @ ② 12.8 × 5.13 − 12.9 × 2.92 = 28.0

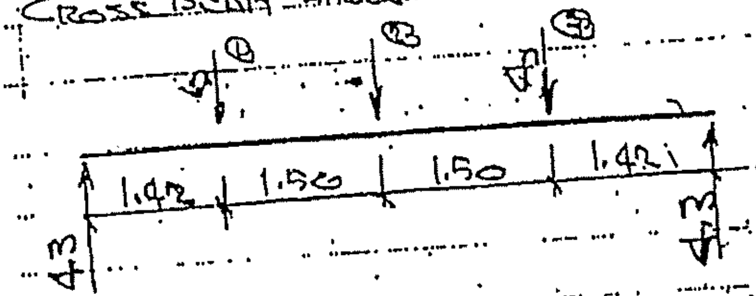
M @ ③ 25.5 × 1.46 − 13.7 × .79 = 26.4

M @ ④ 25.5 × .67 = 17.1

FROM ADS 2-172 ALLOWABLE M = 91.2 > 28.3

CROSS BEAM UNDER FF4 (2 PLACES) 5'10 SPAN (W8x18)

UNBRACED LGTH 1'6



M @ ① 4.3 x 1.42 = 6.1

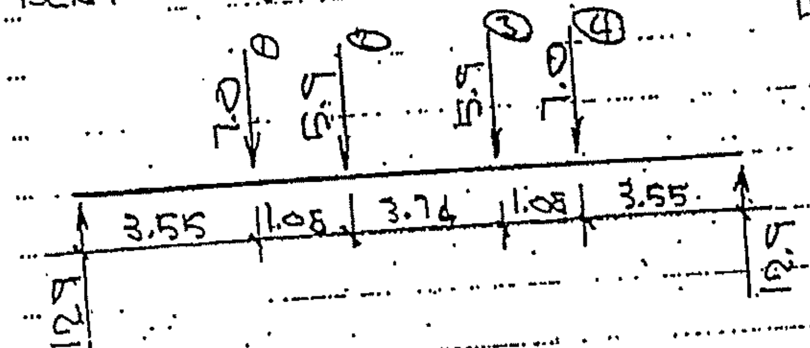
M @ ② 4.3 x 2.92 - 4.0 x 1.50 = 6.6

M @ ③ 4.3 x 1.42 = 6.1

FROM ASD 2-174 ALLOWABLE M = 30.3 > 6.6

BEAM UNDER FLASH TANKS (6 PLACES) (W12x26)

UNBRACED LGTH 5'10¾



M @ ① & ④ = 12.9 x 3.55 = 45.8

M @ ② & ③ = 12.9 x 4.63 - 7.0 x 1.08 = 52.2

FROM ASD 2-173 ALLOWABLE M = 66.8 > 52.2

BEAM @ GRID E-2 TO E-3 (W8x24)
UNBRACED LGTH 12'4

$M = \frac{1.8 \times 12.33}{8} = 2.8\ k'$

FROM ASD 2-174 ALLOWABLE M = 38.3 > 2.8

BEAM @ GRID B-2 TO B-3 (W8x24)
UNBRACED LGTH 12'4

$M = \frac{3.6 \times 12.33}{8} = 5.5\ k'$

FROM ASD 2-174 ALLOWABLE M = 38.3 > 5.5

BEAM @ GRID B-1 TO B-2 (W8x24)
UNBRACED LGTH 12'4

$M = \frac{4.2 \times 12.33}{8} = 6.5\ k'$

FROM ASD 2-174 ALLOWABLE M = 38.3 > 6.5

BEAM @ GRID A-1 TO A-2 (W8x24)
UNBRACED LGTH 12'4

$M = \frac{2.4 \times 12.33}{8} = 3.7\ k'$

FROM ASD 2-174 ALLOWABLE M = 38.2 > 3.7

BEAM @ GRID A-5 TO B-5 (W8x24)
UNBRACED LGTH 9'3

$M = \frac{3.4 \times 9.25}{8} = 3.9$

FROM ASD 2-174 ALLOWABLE M = 38.3 > 3.9

BEAM 7'7/8 SOUTH OF GRID B-7 TO C-7 W8x10

UNBRACED LGTH 7'-3

$$M = \frac{3.2 \times 7.25}{8} = 2.9 k'$$

FROM ASD PAGE 2-175 ALLOWABLE M = 11.5 > 2.9

BEAM 6'3 NORTH OF GRID B-5 TO C-5 (W8x10)

UNBRACED LGTH 7'3

$$M = \frac{3.2 \times 7.25}{8} = 2.9 k'$$

FROM ADS 2-175 ALLOWABLE M = 11.5 > 2.9

BEAM 2'10 3/4 NORTH OF GRID B-5 TO C-5 (W8x10)

UNBRACED LGTH 7'3

$$M = \frac{2.8 \times 7.25}{8} = 2.5 k'$$

FROM ADS 2-175 ALLOWABLE M = 11.5 > 2.5

BEAM 3'3 3/4 SOUTH OF GRID B-5 TO C-5 (W8x10)

UNBRACED LGTH 7'3

$$M = \frac{3.0 \times 7.25}{8} = 2.7 k'$$

FROM ADS 2-175 ALLOWABLE M = 11.5 > 2.7

BEAM 6'7 1/2 SOUTH OF GRID B-5 TO C-5 (W8x10)

UNBRACED LGTH 7'3

$$M = \frac{3.2 \times 7.25}{8} = 2.9 k'$$

FROM ADS 2-175 ALLOWABLE M = 11.5 > 2.9

BEAM 2'10¾" NORTH OF GRID A-5 TO B-5 (W8x10)
UNBRACED LGTH 9'3

$M = \frac{3.4 \times 9.25}{8} = 3.9\,k'$

FROM ADS 2-175 ALLOWABLE M = 9.0 > 3.9

BEAM 6'3 NORTH OF GRID A-5 TO B-5 (W8x10)
UNBRACED LGTH 9'3

$M = \frac{4.0 \times 9.25}{8} = 4.6\,k'$

FROM ADS 2-175 ALLOWABLE M = 9.0 > 4.6

BEAM 7'2½" SOUTH OF GRID A-7 TO B-7 (W8x10)
UNBRACED LGTH 9'3

$M = \frac{4.2 \times 9.25}{8} = 4.9\,k'$

FROM: ADS 2-175 ALLOWABLE M = 9.0 > 4.9

BEAM 3'4¼ SOUTH OF GRID A-7 TO B-7 (W8x10)

$M = \frac{4.0 \times 9.25}{8} = 4.6\,k'$

FROM ADS 2-175 ALLOWABLE M = 9.0 > 4.6

BEAM 3'4¼ SOUTH OF GRID B-5 TO C-5 (W8x10)
UNBRACED LGTH 7'3

$M = \frac{3.2 \times 7.25}{8} = 2.9\,k'$

FROM ADS 2-175 ALLOWABLE M = 11.5 > 2.9

BEAM @ GRID D-2 TO D-3 (W12x14)
UNBRACED LGTH 11'-10

$M = \frac{3.2 \times 11.83}{8} = 4.7\ K'$

FROM ASD 2-175 ALLOWABLE M = 20.75 > 4.7

BEAM @ GRID D-1 TO D-2 (W12x19)
UNBRACED LGTH 12'-6

$M = \frac{3.2 \times 12.5}{8} = 5.0\ K'$

FROM ASD 2-175 ALLOWABLE M = 17.0 > 5.0

BEAM 3'-11 3/4 & 7'-11 1/2 NORTH OF GRID A-3 TO B-3 (W8x10)
UNBRACED LGTH 9'-3

$M = \frac{4.4 \times 9.25}{8} = 5.1\ K'$

FROM ASD 2-175 ALLOWABLE M = 9.0 > 5.1

BEAM 6'-7 1/2 SOUTH OF GRID A-5 TO B5 (W8x10)
UNBRACED LGTH 9'-3

$M = \frac{4.0 \times 9.25}{8} = 4.6$

FROM ASD 2.175 ALLOWABLE M = 9.0 > 4.6

BEAM 3'-3 3/4 SOUTH OF GRID A-5 TO B-5 (W8x10)
UNBRACED LGTH 9'-3

$M = \frac{3.6 \times 9.25}{8} = 4.2$

FROM ASD 2-175 ALLOWABLE M = 9.0 > 4.2

BEAM 3'-1 ± 6'-2 WEST OF GRID B-1 TO B-2 (2 PLACES)
(W8x15) UNBRACED LGTH = 13'-0

$M = \frac{4.8 \times 13}{8} = 7.8\ k'$

FROM ASD 2.175 ALLOWABLE M = 12.1 > 7.8

BEAM 2'-4" WEST OF GRID B-2 TO B-3 (W8x15)
UNBRACED LGTH 13'-0

$M = \frac{3.8 \times 13}{8} = 6.2\ k'$

FROM ASD PAGE 2-175 ALLOWABLE M = 12.1 > 6.2

BEAM UNDER TANKS (8 PLACES) (W8x10)
UNBRACED LGTH 8'-11

$M = \frac{1.6 \times 5.9}{8} = 1.2\ k'$

FROM ASD 2.175 ALLOWABLE M = 15.6 > 1.2

BEAM @ TANKS 3'-6 5/8 SPAN (8 PLACES) (W8x10)
UNBRACED LGTH 3'-6 5/8

$M = \frac{1.2 \times 3.55}{8} = .5\ k'$

FROM ASD 2.175 ALLOWABLE M = 15.6 > .5

BEAM @ GRID A-7 TO B-7 (W8x24) UNBRACED LGTH 9'3

$M = \frac{1.8 \times 9.25}{8} = 2.1\ k'$

FROM ASD 2.174 ALLOWABLE M = 38.3 > 2.1

BEAM @ GRID B-7 TO C-7 (W8x24) UNBRACED LGTH 7'3

$M = \frac{1.4 \times 7.25}{8} = 1.3$

FROM ASD 2.174 ALLOWABLE M = 38.3 > 1.3

BEAM @ GRID B-5 TO C-5 (W8x24) UNBRACED LGTH 7'3

$M = \frac{2.6 \times 7.25}{8} = 2.4\ k'$

FROM ASD 2.174 ALLOWABLE M = 38.3 > 2.4

BEAM @ GRID C-7 TO F-7 (W12x26) UNBRACED LGTH 18'0½

$M = \frac{3.6 \times 18.04}{8} = 8.1\ k'$

$M = \text{CANT. END} = \frac{.120 \times 5.45^2}{2} = 3.0\ k'$

FROM ASD 2.174 ALLOWABLE M = 31.4 > 8.1

BEAM @ GRID C-6 TO F-6 & C-4 TO F-4 (W 12x26)
UNBRACED LGTH 18'-0"

$M = \frac{7.2 \times 18.04}{8} = 16.2\ k'$

$M @ CONT = \frac{.40 \times 5.45^2}{2} = 5.9\ k'$

FROM ASD 2-174 ALLOWABLE M = 31.4 > 16.2

BEAM @ GRID C-3.1 TO F-3.1 (W12x26)
UNBRACED LGTH 18'-0"

$M = \frac{6.6 \times 18.04}{8} = 14.9\ k'$

$M @ CANT. = \frac{.20 \times 5.45^2}{2} = 3.0\ k'$

FROM ASD 2-174 ALLOWABLE M = 31.4 > 14.9

BEAM @ FILTER PRESSES GRID C TO F (6 PLACES) (W12x26)
UNBRACED LGTH 18'-6"

$M = \frac{3.6 \times 18.04}{8} = 8.1\ k'$

$M @ CANT. = \frac{.46 \times 5.45^2}{2} = 6.8\ k'$

FROM ADS 2-174 ALLOWABLE M = 31.4 > 8.1

BEAM 7'1 1/2" 34 1/4 NORTH OF GRID. B-3 TO C-3 (W8x10)

UNBRACED LGTH 7'3

$M = \frac{3.4 \times 7.25}{8} = 3.1 \text{ k}'$

FROM ASD 2.175 ALLOWABLE M = 11.5 > 3.1

BEAM @ GRID E-1 TO E-2 (W8x10)

UNBRACED LGTH 12'4

$M = \frac{1.8 \times 11.33}{8} = 2.5$

FROM ADS PAGE 2.175 ALLOWABLE M = 5.2 > 2.5

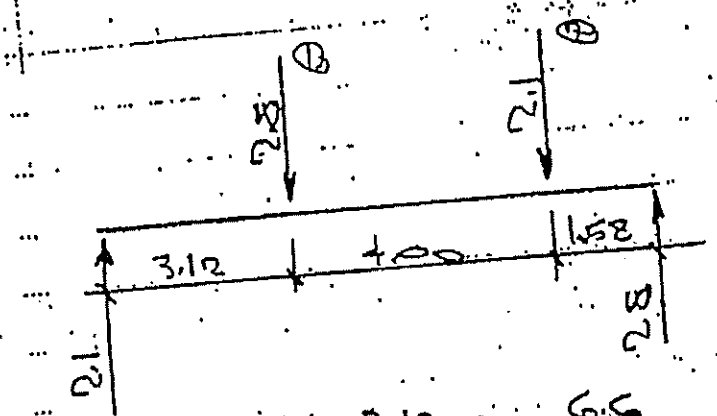
BEAM 4'6 EAST OF GRID A-3 TO A-2 (W8x10)

UNBRACED LGTH 13'0

$M = \frac{1.8 \times 13}{8} = 2.9 \text{ k}'$

FROM ASD 2.175 ALLOWABLE M = 4.8 > 2.9

MEZZ BEAM @ GRID B-1 TO C9-1 (W8x15) UNBRACED LGTH 4'0

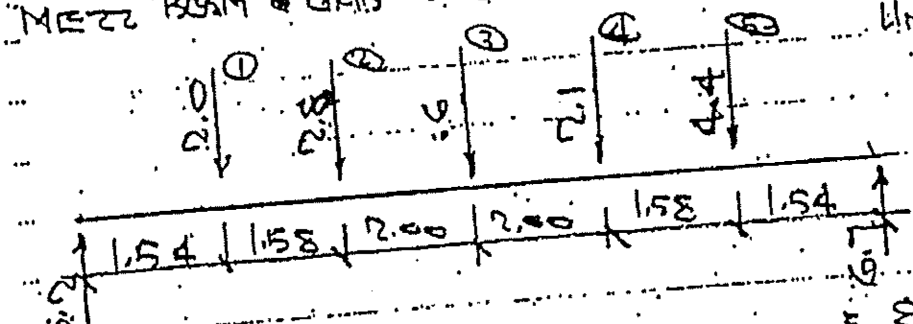


M @ B = 2.1 x 3.12 = 6.6

M @ C = 2.8 x 1.58 = 4.4

FROM ASD 2-175 ALLOWABLE M = 23.6 > 6.6

MEZZ BEAM @ GRID B-2 TO D-2 (W12x14) UNBRACED LGTH 2'0



M @ 1 = 5.2 x 1.54 = 8.0

M @ 2 = 5.2 x 3.12 - 2.0 x 1.58 = 13.3

M @ 3 = 5.2 x 5.12 - 2.0 x 3.58 - 2.8 x 2.00 = 14.4

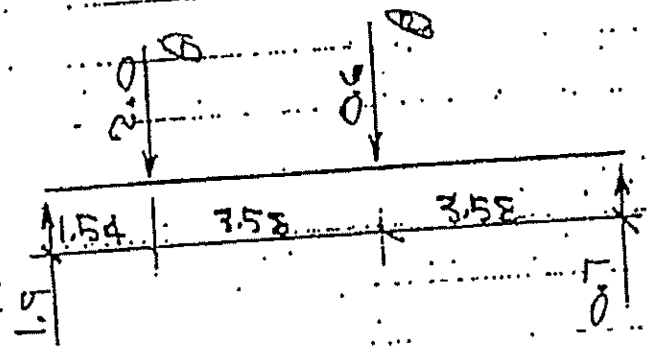
M @ 4 = 6.7 x 3.12 - 4.4 x 1.58 = 13.9

M @ 5 = 6.7 x 1.54 = 10.3

FROM ASD 2-174 ALLOWABLE M = 29.8 > 14.4

(3 PLACES) (W8x15)

MEZZ BEAM B-3 TO C.9-3 & D.1-3 TO E-3 & E-1 TO D.1-1 UNBRACED LGTH 3'-7

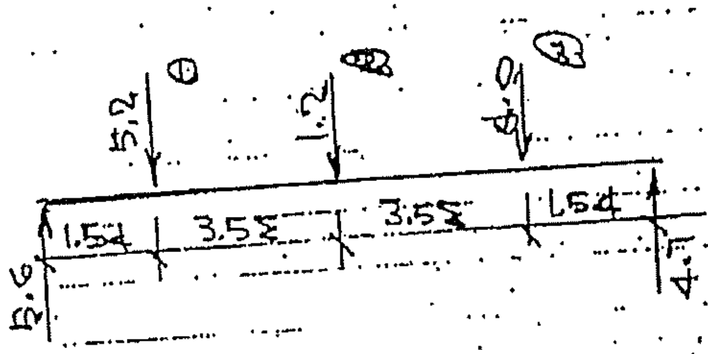


M @ ① 1.9 x 1.54 = 2.9 k'
M @ ② 0.7 x 3.58 = 2.5 k'

FROM ASD 2-175 ALLOWABLE M = 23.6 > 2.9

(W12x14)

MEZZ BEAM @ GRID D-2 TO E-2 UNBRACED LGTH 3'-7



M @ ① = 5.6 x 1.54 = 8.6
M @ ② = 5.6 x 5.12 - 5.2 x 3.58 = 10.1
M @ ③ = 4.7 x 1.54 = 7.2

FROM ASD 2-174 ALLOWABLE M = 27.6 > 10.1

MEZZ BEAM C9-1 TO C9-2 (W8x15)
(UNBRACED LGTH = 10'-1½)

$M = \frac{3.6 \times 12.67}{8} = 5.7\,k'$

FROM ADS 2-175 ALLOWABLE M = 14.0 > 5.7

MEZZ BEAM D.1-1 TO D.1-2 (W8x15)
(UNBRACED LGTH = 7'-2)

$M = \frac{5.2 \times 12.67}{8} = 8.2\,k'$

FROM ADS 2-175 ALLOWABLE M = 21.0 > 8.2

MEZZ BEAM 1'-7 WEST OF C9-1 TO C9-2 (W8x15)
(UNBRACED LGTH 4'-6)

$M = \frac{4.2 \times 13}{8} = 6.8\,k'$

FROM ADS 2-175 ALLOWABLE M = 21.25 > 6.8

MEZZ BEAM 3'-1½ EAST OF B-1 TO B-2 (W8x15)
(4'-6 UNBRACED LGTH)

$M = \frac{5.6 \times 13}{8} = 9.1$

FROM ADS 2-175 ALLOWABLE M = 21.25 > 9.1

MEZZ BEAM 1'-6½ EAST OF B2 TO B3 (W8x15)
(UNBRACED LGTH 7'-2)

$M = \frac{4.0 \times 13}{8} = 6.5$

FROM ADS 2-175 ALLOWABLE M = 21.0 > 6.5

MEZZ BEAM @ GRID E-1 TO E-2, (W8x10)
B2 TO B3 & E2 TO E3

M = $\frac{1.2 \times 13}{8}$ = 1.95 k' (UNBRACED LGTH 13'0)

FROM ADS 2.175 ALLOWABLE M = 4.0 > 1.95

MEZZ BEAM @ GRID B1 TO B2 (W8x10)
(UNBRACED LGTH 6'8)

M = $\frac{2.6 \times 13}{8}$ = 4.2 k'

FROM ADS PAGE 2.175 ALLOWABLE M = 12.2 >

MEZZ BEAM @ GRID C9-3 TO C9-2 & D.1-3 TO D.1-2
(W8x15) UNBRACED LGTH 7'2)

M = $\frac{5.2 \times 13}{8}$ = 8.5 k'

FROM ADS 2.175 ALLOW. M = 21.2 > 8.5

MEZZ BEAM 1'6" WEST OF E1 TO E2 & E2 TO E3 (W8x15)
(UNBRACED LGTH 7'2)

M = $\frac{4.0 \times 13}{8}$ = 6.5 k'

FROM ADS 2.175 ALLOWABLE M = 21.2 > 6.5

MEZZ BEAM 2'-11 SPAN, 6 PLACES, W8x10
(2'-11 UNBRACED LGTH)

$M = \frac{1.2 \times 2.92}{8} = .4\,K'$

FROM AISC 2-175 ALLOWABLE M = 16.0 > .4

MEZZ. BEAM @ TANK OPENINGS (6 PLACES) (W8x10)
(UNBRACED LGTH 2'-1 1/4)

$M = \frac{.6 \times 7.16}{4} = 1.1\,K'$

FROM AISC 2-175 ALLOWABLE M = 16.0 > 1.1

OTIS ARVIN CLARK
14897
PROFESSIONAL ENGINEER
OKLAHOMA

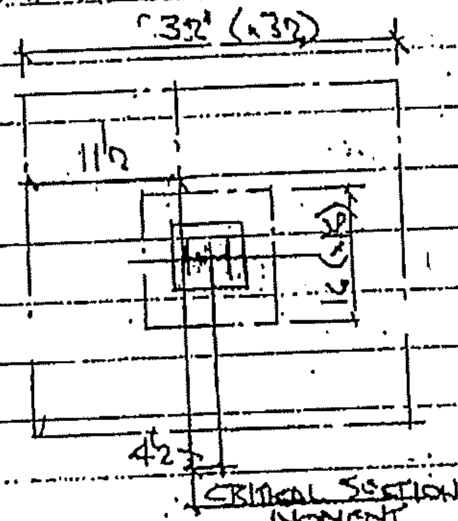
(REVISED)

COLUMNS ON 6" SLABS

MAX COL LOAD IS AT B.5 = 17.6 KIPS

6" SLAB 4000 PSI CONC W/ #4@12 E.W. @ CTR.

ALLOWABLE M PER FT OF SLAB
$= A_s f_s j d = .20 \times 24000 \times .85 \times 3 = 12{,}240$ "LBS.



CHECK OF 2 WAY (PUNCHING) SHEAR
$4 \times 16" \times 6" \times 1.1\sqrt{4000} = 26.7\,K > 17.6\,K$ O.K.

REQUIRED MOMENT PER FT OF SLAB

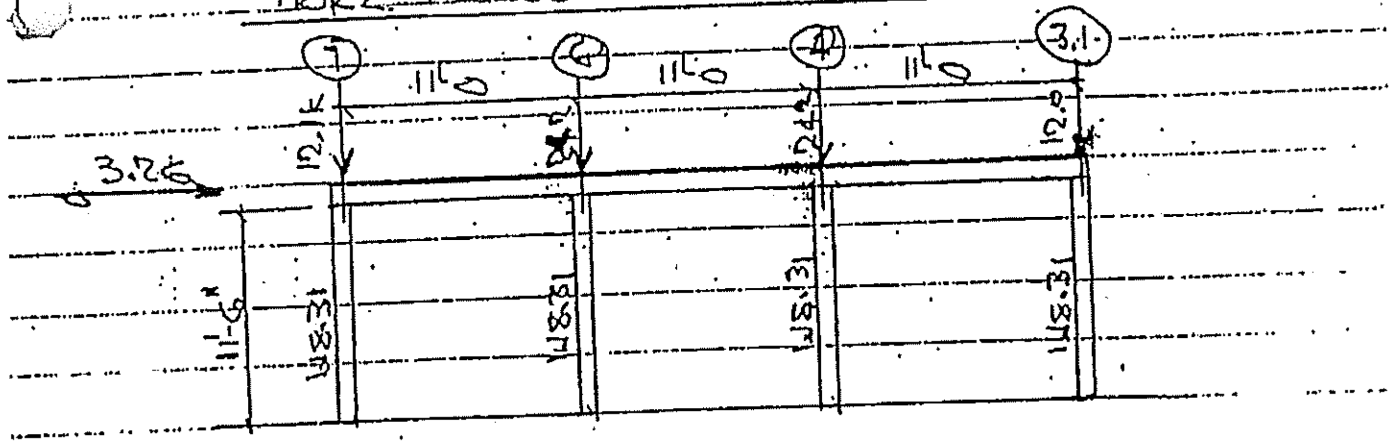
$\dfrac{\dfrac{2500 \times 11.5}{12}}{3} \times 11.5 = 9184$"LBS < 12,240"LBS. O.K.

FROM ASD PAGE 2-302 BEAM DIAG. #20

Otis A Clark PE. TEL NO.405 878-0338 Apr 03,95 13:36 P.03

(REVISED)

HORZ FORCES @ GRID "F"



$\frac{3.26}{4}$ = .8150 KIPS PER COL

.8150 x 11.5 = 9.37 k' MOMENT

$\frac{9.37 \times 12 \times 1000}{21600}$ = 5.2 REQD S_x.

W8x31 = 27.5 > 5.2 ∴ COLUMNS OK

COMBINED LOADS.

$\frac{5.2}{27.5} + \frac{24.2}{149} = .3515 < 1$ COLS O.K.

FROM ADS-3.31

REGISTERED PROFESSIONAL ENGINEER
OTIS ARVIN CLARK
14897
OKLAHOMA

HORZ FORCES @ MEZZ. NON COL LOAD @ B2 = 7.1 k
D2 = 12.3 k
E2 = 5.9 k

HORZ FORCE @ GRID 2 = (7.1 + 12.3 + 5.9) x .045 = 1.14 k

$\frac{1.14}{3}$ = .38 k HORZ FORCE PER COL.

M k' WEAK AXIS OF COL = .38 x 12.25 = 4.66 k'

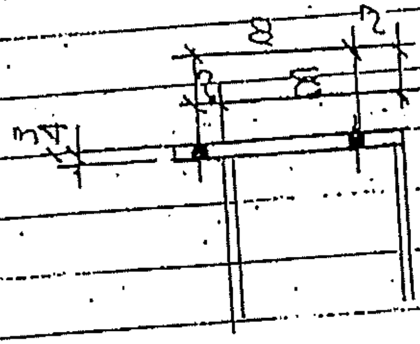
REQD S_Z = $\frac{4.66 \times 12}{21.6}$ = 2.59 ≤ 5.63 OK

COMBINED LOADING

$\frac{2.59}{5.63} + \frac{12.3}{95}$ = .46 + .13 = .59 < 1

COLS. OK

MOMENT CONN @ COL CAP PLATES - COLS F3.1, F4, F6, & F



CAP PLS @ COLS F3.1 & F7

FROM PAGE 5 MOMENT IS 9.37 k'

FORCE @ FLGS $\frac{9.37 \times 12}{(8 - .435)} = 14.86$ k

WELD @ FLANGES $70.4 \times 8 = 72.4 > 14.86$ o.k.

MAX TEN @ BOLTS $\frac{9.37 \times 12}{6.75} = 16.66$ k

$\frac{16.66}{2} = 8.32$ PER BOLT < 9.3 o.k.

Foundation Design Analysis

USPCI
A Subsidiary of
Union Pacific Corporation

March 27, 1995

Mr. Jim Richenbaugh
Black & Veatch Waste Science
4717 Grand Avenue, Suite 500
Kansas City, MO 64112

Re: USPCI Lone Mountain Facility
Subject: Waste Water Treatment Floor Structural Design

The concrete floors in the area where the mezzanine has been erected were poured as part of two different building expansions. The first expansion was poured in the spring of 1987 and was designed to be eighteen inches thick with two layers of 3/4 inch reinforcement bars tied on one foot centers and separated by twelve inches between the top and bottom mats. All reinforcement bars were kept within three inches of the slab's surfaces and were supported by concrete brick on a two inch layer of sand. This slab underlies the area that supports the Flash Tanks and EF4 and extends to the south edge of the filter press mezzanine.

The second expansion attaches to the north side of the first slab and was poured in November of 1987. It was poured around four existing boiler foundations that were 2 feet wide, 3 feet deep, and 24 feet long. The floor slab was poured six inches thick and used a layer of 1/2 inch reinforcement bars tied on one foot centers, supported on a concrete brick and a 2 inch layer of sand. This slab underlies the area supporting the filter presses.

Both slabs were poured using a 4000 psi concrete strength mix as verified by the core sample tested by Meyers Engineering of which a report has been sent to you earlier this week.

I hope this will provide the information you needed for the certification work now in progress.

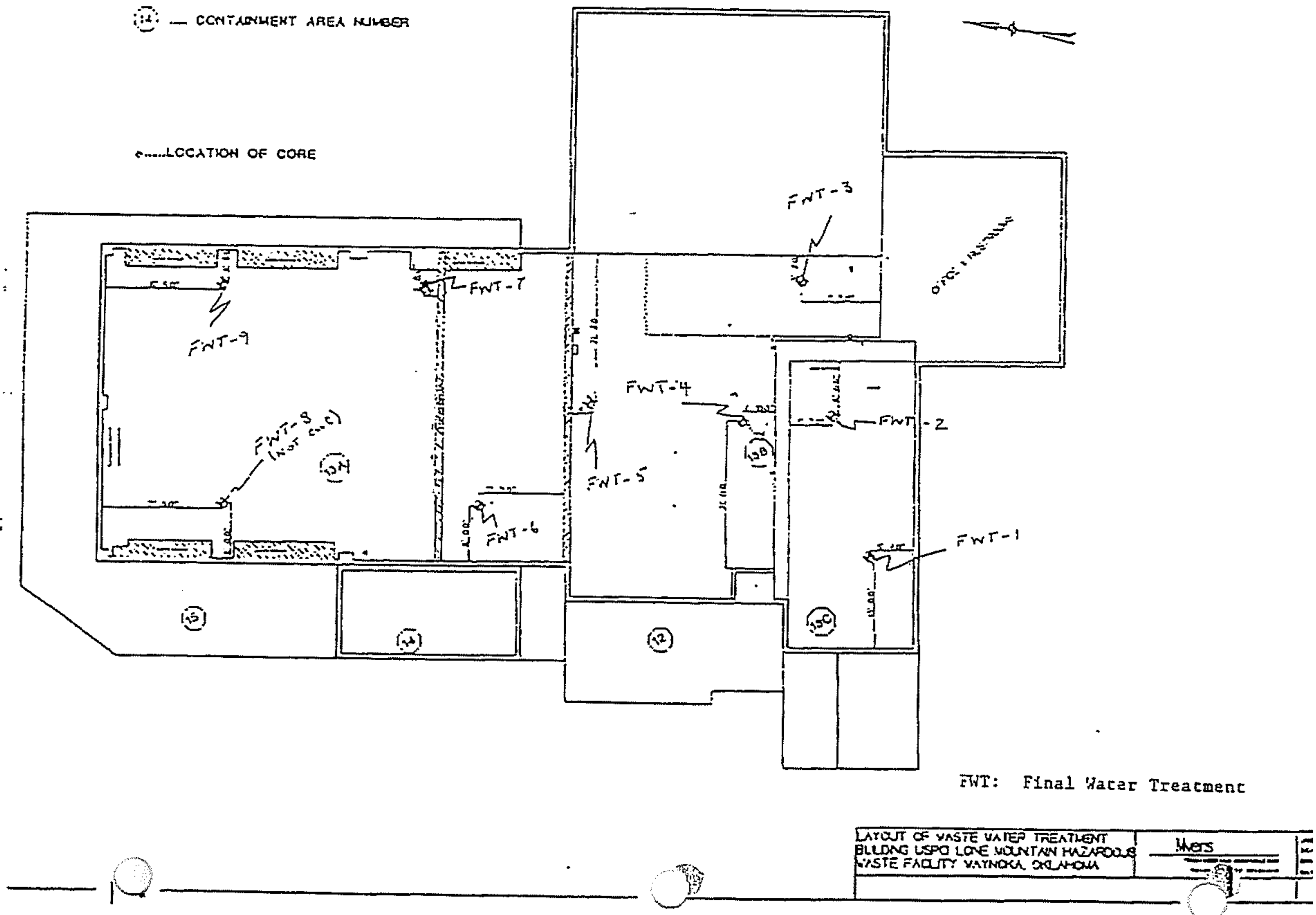
Sincerely,

Lawson Fenton

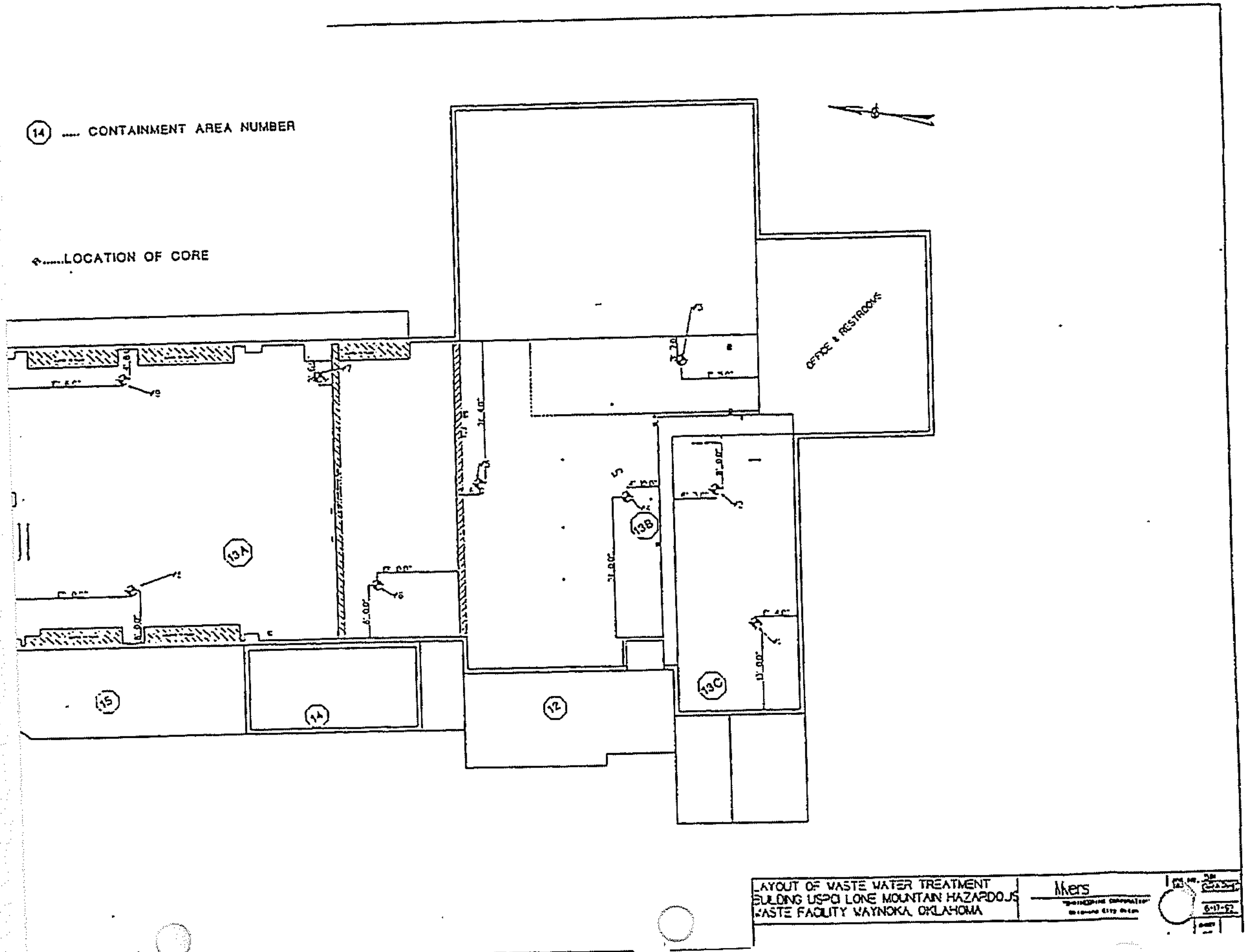
Lawson Fenton
Project Manager

R. [illegible]ox 170
Wayn[illegible], Oklahoma 73860-9622

Tel: 405/697-3500
Fax: 405/697-3596



FWT: Final Water Treatment



LAYOUT OF WASTE WATER TREATMENT
BUILDING USPCI LONE MOUNTAIN HAZARDOUS
WASTE FACILITY WAYNOKA, OKLAHOMA

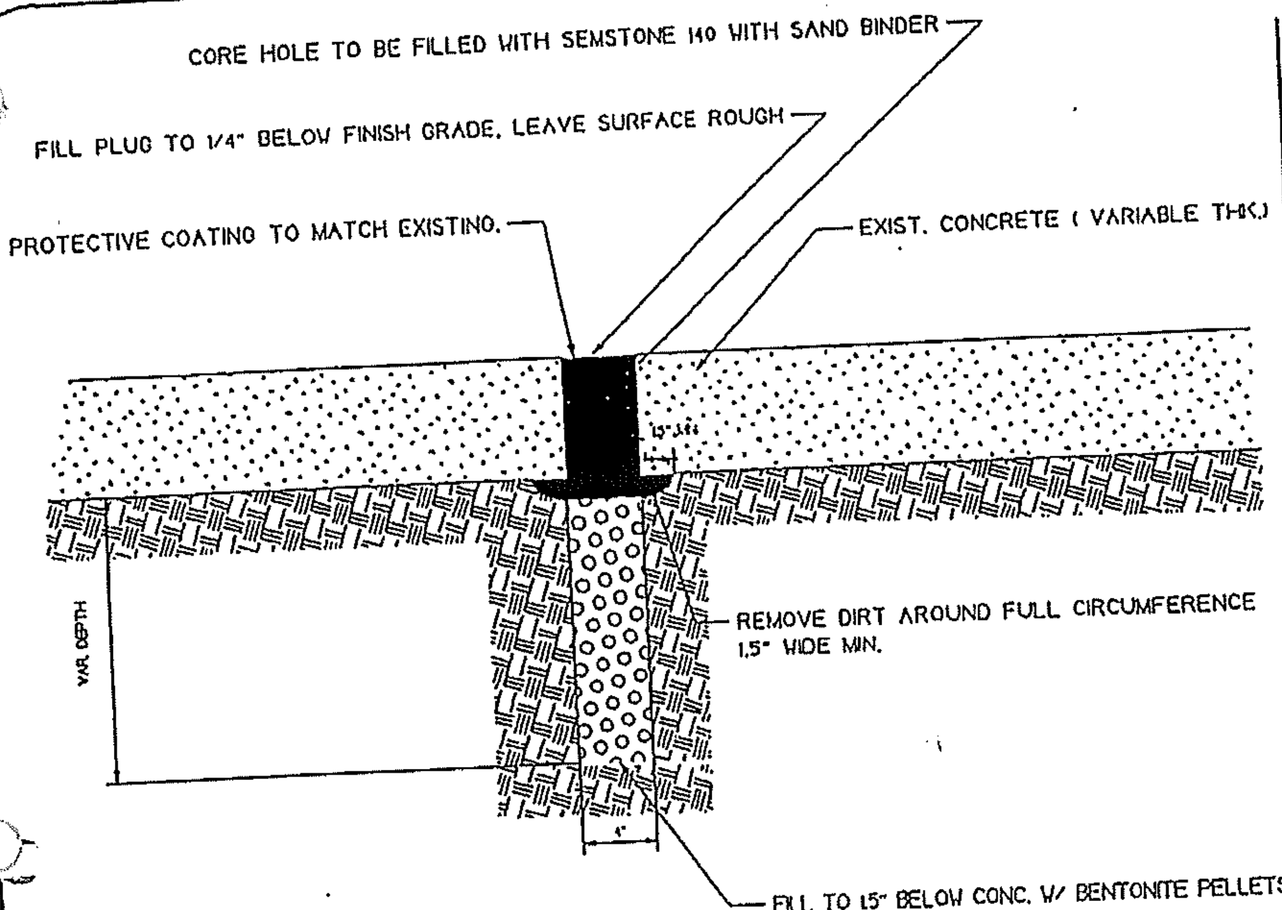
Myers

6-17-92

Specimen	Diameter, In.	Drilled Length, In.	Capped Length, In.	Crushing Load, lbs.	L/D Correction Factor	Compressive Strength, psi
PWT-1	3.75	5.5	5.7	32,440	0.96	2,810
PWT-2	3.75	5.5	4.9	47,200	0.93	3,980
PWT-3	3.75	6.5	4.5	41,400	0.93	3,490
PWT-4	3.75	7.5	4.6	60,700	0.93	5,110
PWT-5	3.75	7.0	7.1	43,000	0.99	3,860
PWT-6	3.75	6.5	4.1	67,100	0.88	4,550
PWT-7	3.75	7.0	5.8	43,800	0.96	3,810
PWT-8	3.75	6.0	5.8	74,800	0.96	6,480
PWT-9	3.75	5.0	5.5	33,900	0.96	2,950
PWT-10	3.75	6.0	4.7	72,500	0.93	6,100
PWT-11	3.75	6.0	5.6	55,720	0.96	4,840
PWT-12	3.75	6.0	6.6	65,600	0.98	5,800
PWT-13	3.75	5.0	5.3	68,700	0.94	5,850
PWT-14	3.75	5.0	5.3	80,200	0.95	6,900
PWT-15	3.75	6.0	5.1	60,200	0.97	5,290
FWT-1A	3.75	6.0	4.7	53,800	0.93	4,530
FWT-1B	3.75	11.0	6.0	50,800	0.97	4,460
FWT-2	3.75	22.0	7.0	30,740	0.99	2,760
*FWT-3	3.75	15.0	-	-	-	-
FWT-4	3.75	6.0	7.0	81,600	0.99	7,320
FWT-5	3.75	6.0	5.8	81,700	0.96	7,100
*FWT-6	3.75	19.0	-	-	-	-
*FWT-7	3.75	14.5	-	-	-	-
FWT-9	3.75	7.0	7.0	53,200	0.99	4,770

PWT - Pre-Water Treatment
FWT - Final Water Treatment

* Samples which we were not able to pull out of the hole.



CORE PLUG DETAIL

CORE PLUG DETAIL FOR
USPCI, LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

Myers
ENGINEERING CORPORATION
Oklahoma City Oklahoma

JOB NO.	511
SCALE	NTS
DRAWN	DMC
DATE	6/23/92
SHEET 1 OF 1	

REV. NO 1 6-23-92 CHANGE FILL N SOL. TO BENTONITE SEAL PER GENE WALKER REQUEST.

Otis A Clark PE. TEL NO.405 [illegible]

OTIS A. CLARK PE.

Phone
(405) 878-0338

130 Bdwy. Bldg.
Suite 202
Shawnee, OK. 74801

To: USPCI
Lone Mountain Facility
Route 2, Box 180A
Waynoka, Okla. 73806

Attn: Lawson Fenton

March 28, 1995

The following is an investigation for the foundation support for the mezzanine platforms for the Wastewater Final Treatment Facility, and the calculations for the design of the beams, columns, and bracing for the structure. The design loads are per the 1990 BOCA National Building Code and are shown on page #7 of the following submittal.

COLUMN	LOAD, KIPS	FOUNDATION CONDITION	REMARKS
A-1	3.6	17" floor slab	OK (see page #2)
A-2	4.5		
A-3	8.4	do	do
A-5	9.8	6" floor slab	OK (see page #1)
A-7	4.8	do	do
B-1	14.3	17" floor slab	OK (see page #2)
B-2	36.3		
B-3	27.9	do	do
B-5	17.6	6" floor slab	OK (see page #1)
B-7	8.5	do	do
C-4	28.1	24" x 36" cont.ftg.	OK (see page #3)

C-6	24.8	24" x 36" cont.ftg.	Ok (see page #3)
C-7	11.5	6" floor slab	OK (see page #1)
C.9-1	14.1	17" floor slab	OK (see page #2)
C.9-3	28.8		
D-2	62.9		
D.1-1	19.0		
D.1-3	19.9		
E-1	14.2		
E-2	34.1		
E-3	14.4	do	do
F-3.1	12.0	6" floor slab	OK (see page #1)
F-4	24.2	24" x 36" cont. ftg.	OK (see page #3)
F-6	24.2	do	do
F-7	12.1	6" floor slab	OK (see page #1)

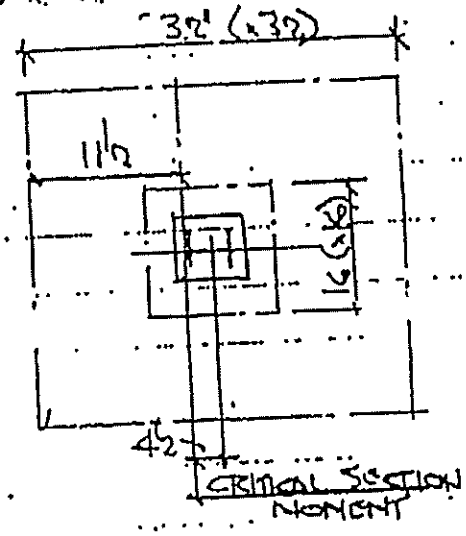
PROFESSIONAL ENGINEER
OTIS ARVIN
CLARK
14887
OKLAHOMA

COLUMNS ON 6" SLABS

MAX COL LOAD IS AT B.5 – 17.6 KIPS.

6" SLAB, 4,000 PSI CONC. W/ #4 @ 12 E.W. @ CTR.

ALLOWABLE M PER FT. OF SLABS
$= A_s f_s jd = .20 \times 24000 \times .85 \times 3 = 12{,}240$ " LBS.



CHECK OF 2 WAY (PUNCHING) SHEAR
$4 \times 16" \times 6" \times 1.1\sqrt{4000} = 26.7\text{K.} > 17.6\text{K}$ O.K.

REQUIRED MOMENT PER FT. OF SLABS

$$\frac{\frac{2500 \times 11.5}{12} \times 11.5}{4} = 6{,}888\text{" LBS.} < 12{,}240\text{" LBS.}$$ O.K.

COLUMNS ON 17" SLAB W/ #6 @ 12 E.W. T&B

MAX. COL. LOAD IS AT GRID D-2 = 62.9 KIPS.

ALLOWABLE MOMENT IN SLAB

$.44 \times 24000 \times 12 = 126{,}720$ "LB. $= 10.56$ k'

ALLOWABLE SOIL BRG. = 2500 − SLAB WT 180 = 2320

$\frac{62.9}{2.32} = 27.11$ SQ FT REQD. AREA = $5^{.}23$ SQUARE

2 WAY (PUNCHING) SHEAR $4 \times 27 \times 17 \times 1.1 \sqrt{4000}$
$= 127.7$ K > 62.9 K O.K.

REQD MOMENT IN GRADE BEAM

$\frac{2.25 \times 2.32}{4} = 1.31$ k' < 10.56 k' O.K.

COLUMNS ON 24" x 36" GRADE BEAM

MAX COL LOAD IS AT COL C-4 – 28.1 KIPS.

GRADE BEAM HAS 2 #6 @ TOP, CTR & BOTT
(ACCORDING TO LAWSON FENTON)

ALLOWABLE MOMENT IN GRADE BEAM (FIGURING T&B REINF.)
$A_s f_s j d$ = .88 x 24000 x 30 = 633,600"LB. OR 52.8 K'

ALLOWABLE SOIL BRG 2500 – GB WEIGHT 360 = 2140
$\frac{28,100}{2140 \times 2}$ = 6'-8 LENGTH OF GRADE BEAM TO SUPPORT COL.

REQD MOMENT IN GRADE BEAM

$\frac{21.8K \times 6.67}{2}$ = 18.2 K < 52.8K O.K.

REGISTERED PROFESSIONAL ENGINEER
OTIS ARVIN CLARK
14897
OKLAHOMA

Tank Leak Tests

HYDROSTATIC TEST RECORD

RECORD DATE: 8-8-95

CUSTOMER: USPCI-LONE MT. FACILITY

PROJECT: EVAPROATOR FLASH TANK NO. 3

LOCATION: WAYNOKA, OK.

VENDOR: SCOTT MANUFACTURING, INC.

CUSTOMER: P.O. NO. 132

W.O. NO.: 48709,10, & 11

JOB NO.: 499

TESTING PROCEDURE: WELDED STEEL TANKS FOR OIL STORAGE, API STANDARD 650, NINTH EDITION, JULY 1993, SECTION 5 - ERECTION, PARAGRAPH 5.3.6 TESTING OF THE SHELL, METHOD a.(1).

RESULTS: PRIOR TO SANDBLASTING AND PAINTING, EVAPORATOR FLASH TANK NO. 3 WAS FILLED WITH WATER UP TO THE SHELL AND FLUE CONNECTION. THE TANK WAS INSPECTED FREQUENTLY DURING THE FILLING OPERATION. WATER WAS HELD IN THE TANK FOR A PERIOD OF TWENTY FOUR HOURS. AFTER CAREFUL VISUAL INSPECTION NO LEAKS WERE VISIBLE IN ANY WELDED SHELL OR PIPE JOINTS.

REPORT NO 1

VENDOR INSPECTOR'S SIGNATURE

Hydrostatic Test Record

Customer: USPCI - Lone Mt. Facility

Project: Evaporation Flash Tank No.3

Location: Waynoka, OK

Test Start Date: 8/13/96 Test Start Time: 4:55 p.m.

Test Finish Date: 8/14/96 Test Finish Time: 8:30 a.m.

Test Procedure:

Fill evaporator feed tank to the manway with water.

Results:

There was no change in water level inside the feed tank. Visual inspection of tank indicated no water leaks.

SEAL REGISTERED PROFESSIONAL ENGINEER
GEOFFREY E. BRUEGGEMANN
11079
OKLAHOMA

Signature Geoffrey E. Brueggemann
Geoffery E. Brueggemann, P.E.
Envirotech Services, Inc.

Date: 8/20/96

Piping Leak Tests

Piping Pressure Test

Customer: USPCI - Lone Mt. Facility

Project: Discharge piping from Filter Press Pump P83 to Filter Press 3.

Location: Waynoke, OK

Test Start Date 5/2/95 Test Start Time 1:20 p.m.

Test Finish Date 5/2/95 Test Finish Time 3:20 p.m.

Test Procedure:

Fill piping section between filter press pump P83 discharge to inlet of filter press FP3. Apply water pressure to system up to 150 psig by hydro pump and hold this pressure for minimum 2 hours.

Results:

Piping section was isolated from P83 by flange and FP3 by valve. System was pressured up to 150 psig and held this pressure for 2 hours. No change in pressure gauge reading was observed.

Witness Gary Price Date: 5/2/95

Hydrostatic Test Record

Customer: USPCI - Lone Mt. Facility

Project: Suction pipe from Evaporator Flash Tank No. 3 to Pump P-5.

Location: Waynoka, OK

Test Start Date: 8/13/96 Test Start Time: 4:55 p.m.

Test Finish Date: 8/14/96 Test Finish Time: 8:30 a.m.

Test Procedure:

Prior to hydrostatic test on FT3, open bottom valve and flood suction piping to Pump P-5.

Results:

There was no change in water level inside the flash tank. Visual inspection of the suction piping between FT3 and Pump P-5 indicated no water leaks.

REGISTERED PROFESSIONAL ENGINEER
GEOFFREY E. BRUEGGEMANN
11079
OKLAHOMA
SEAL

Signature Geoffrey E. Brueggemann
Geoffery E. Brueggemann, P.E.
Envirotech Services, Inc.

Date: 8/20/96

Piping Pressure Test

Customer: USPCI - Lone Mt. Facility

Project: Discharge piping from Filter Press FP3 to suction side of Evaporation Feed Pump P-5.

Location: Waynoka, OK

Test Start Date: 8/13/96 Test Start Time: 11:15 a.m.

Test Finish Date: 8/13/96 Test Finish Time: 1:15 p.m.

Test Procedure:

Fill piping section between Filter Press FP3 discharge to suction side of Pump P-5. Apply water pressure to system up to 155 psig by hydro pump and hold this pressure for minimum 2 hours.

Results:

Piping section was isolated from Filter Press FP3 by flange and P-5 by valve. System was pressured up to 155 psig and held this pressure for 2 hours. No change in pressure gauge reading was observed.

SEAL
REGISTERED PROFESSIONAL ENGINEER
GEOFFREY E. BRUEGGEMANN
11079
OKLAHOMA

Signature Geoffry E Bruegg
Geoffery E. Brueggemann, P.E.
Envirotech Services, Inc.

Date: 8/20/96

Piping Pressure Test

Customer: USPCI - Lone Mt. Facility

Project: Discharge piping from Evaporation Feed Pump P-5 to suction side of Evaporation Heat Exchanger EU3.

Location: Waynoka, OK

Test Start Date: 8/14/96 Test Start Time: 9:20 a.m.

Test Finish Date: 8/14/96 Test Finish Time: 11:20 a.m.

Test Procedure:

Fill piping section between Pump P-5 discharge to suction side of EU3. Apply water pressure to system up to 235 psig by hydro pump and hold this pressure for minimum 2 hours.

Results:

Piping section was isolated from Pump P-5 by flange and EU3 by valve. System was pressured up to 235 psig and held this pressure for 2 hours. No change in pressure gauge reading was observed.

SEAL

REGISTERED PROFESSIONAL ENGINEER
GEOFFREY E. BRUEGGEMANN
11079
OKLAHOMA

Signature Geoffrey E. Brueggemann
Geoffery E. Brueggemann, P.E.
Envirotech Services, Inc.

Date: 8/20/96

Piping Pressure Test

Customer: USPCI - Lone Mt. Facility

Project: Discharge piping from Evaporator Heat Exchanger EU3 to suction side of Flash Tank FT3.

Location: Waynoka, OK

Test Start Date: 8/14/96 Test Start Time: 8:30 a.m.

Test Finish Date: 8/14/96 Test Finish Time: 10:30 a.m.

Test Procedure:

Fill piping section between EU3 discharge to suction side of FT3. Apply water pressure to system up to 225 psig by hydro pump and hold this pressure for minimum 2 hours.

Results:

Piping section was isolated from EU3 by flange and FT3 by valve. System was pressured up to 225 psig and held this pressure for 2 hours. No change in pressure gauge reading was observed.

SEAL REGISTERED PROFESSIONAL ENGINEER GEOFFREY E. BRUEGGEMANN 11079 OKLAHOMA

Signature Geoffrey E. Brueggemann

Geoffery E. Brueggemann, P.E.
Envirotech Services, Inc.

Date: 8/20/96

Piping Pressure Test

Customer: USPCI - Lone Mt. Facility

Project: Suction piping of Evaporator Flash Tank FT3 to suction side of Filter Press Pump P83.

Location: Waynoka, OK

Test Start Date: 8/29/96 Test Start Time: 8:30 a.m.

Test Finish Date: 8/29/96 Test Finish Time: 10:30 a.m.

Test Procedure:

Fill piping section between discharge side of FT3 and Pump P83. Apply water pressure to system of 50 psig by hydro pump and hold this pressure for minimum 2 hours.

Results:

Piping section was isolated from FT3 by valve and P83 by flange. System was pressured up to 50 psig and held this pressure for 2 hours. Visual inspection of all piping indicated no leaks.

SEAL REGISTERED PROFESSIONAL ENGINEER GEOFFREY E. BRUEGGEMANN 10729 OKLAHOMA

Signature Geoffrey E. Brueggemann
Geoffery E. Brueggemann, P.E.
Envirotech Services, Inc.

Date: Aug. 29, 1996

Tank Metallurgy

SMI JOB INSPECTION FORM

W/O #: 48710 DATE: 8-8-95 INSPECTED BY: M. JORDAN

CUSTOMER: USPCI EVAPORATOR FLASH TANK NO. 3
LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

INSPECTION CRITERIA PER: CUSTOMER: ______ SMI: ✓

INSPECTION: TANK AND PERTINENT PARTS TYPE INSPECTION: VISUAL, DIMENSIONAL, X-RAY

DRAWING #: 499-1 THRU 10 LOCATION: IN SHOP AND PAINT AREA

BRIEF DESCRIPTION OF INSPECTION: ALL WELDS, DIMENSIONS AND ORIENTATIONS CHECKED. 8-8-95 TANK WAS RAISED UPRIGHT AND HYDRO TESTED. NO LEAKS FOUND. SEE X-RAY LOCATION MAP: THREE SPOTS SHOT.
PAINT: 11 MILS (TOTAL) INSIDE
4 MILS (TOTAL) OUTSIDE
INSULATION, CLADDING, ASSEMBLY PER SPECIFICATIONS. WASHERS WERE USED (BOTH SIDES) ON CONE BOLT UP. MINOR PAINT TOUCH-UP WAS NEEDED (AFTER LOADED FOR SHIPPING) WAS NOT DONE BECAUSE PAINTER DID NOT HAVE LEFT-OVER PAINT.

INSPECTION RESULTS:

CONFORMING: ✓ NON CONFORMING: ______

IF NON CONFORMING - CORRECTIONS IMPLEMENTED: ______

CORRECTIONS APPROVED YES ______ NO ______

COPIES TO: DATE:
BILL BASOM 8-22-95

NAME Mimmy Jordan
DATE: 8-22-95

14214 West Hwy. 80 East
Odessa, Texas 79765
(915) 563-4465

ASME
API
ANSI
AWS

MIDLAND INSPECTION & ENGINEERING, INC.
a DPM Subsidiary

Ultrasonics
Dye Penetrant
Magnetic Particle
Heat Treat
Radiography
Visual Inspection

Pg. 1 of 2

No. 23670

Customer: Scott Mfg. Date: 7-13-95 Technician: Carthel Level: II Asst: D. Null Level: I
Work Order: 48709 Serial No.: 499-3 Code: API 650 %: Spot Rig #: 1400

ULTRASONIC	MAGNETIC PARTICLE	DYE PENETRANT	RADIOGRAPHIC
Equipment:	Equipment:	Type Cleaner:	Curies: 12 Screens: .01
Transducer Type:	Material Type: Thickness:	Type Penet.:	Exposure Arrangement: B
Size: Freq.:	Amp.:	Type Devel.:	Material Thickness: .375
Calibration	Prodspacing:	Surface Prep:	Penetrameter: S 17 F
Material: Ampl.:	AC/DC:	Dwell Time:	Film Type: AGFA D7
Hole Size: Dist.:	Surface Prep:	Material Type: Thickness:	Film Qty: 3 pieces 4½x17"
	Type Used:		Film Qty:
	Particle Used (lbs.):		Film Qty:

	Piece No.	By No.	Location	Piece Size	MEI Within Code Yes	MEI Within Code No	CUST Within Code Yes	CUST Within Code No	Defect/Discontinuity Location	REMARKS
1	SPOT 1		0-1	60"	✓					
2	SPOT 2		0-1	60"	✓					
3	SPOT 3		0-1	60"	✓					
4										
5										
6										
7										
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40										

Test(s) Interpreted By: Nelson Carthel Level: II P.O. #: 37860

Number of Personnel: 2 Inspection Testing Misc. Info.: #Parts: 3 #Welds: Per Diem: NO Miles: 133

Travel Time: 6 Site Time: 4 Total Hrs.: 10 Job Location: Wolfforth Day Start: 4:30 AM Day End: 2:30 PM

NOTICE: THE ABOVE REPORT AND ANY CONSULTATION WITH THE CUSTOMER REPRESENTATIVE OR CUSTOMER'S CONTRACTOR REGARDING THE RESULTS OF THE EXAMINATION REPRESENTS THE GOOD FAITH OPINION OF THE MEI TECHNICIAN ASSIGNED TO THE PROJECT UNLESS SPECIFICALLY WRITTEN ON THIS REPORT TO THE CONTRARY. THE CUSTOMER REPRESENTATIVE ACCEPTING THE EXAMINATION RESULTS AND/OR REPORT IS IN AGREEMENT WITH THE RESULTS AND CONFIRMS THAT THE PERSONNEL OF MEI ABOVE HAVE PERFORMED THEIR SERVICES IN ACCORDANCE WITH THE CUSTOMER'S SPECIFICATIONS. MEI SHALL ASSUME NO FURTHER RESPONSIBILITY FOR THE EXAMINATION RESULTS AND/OR REPORTS FOLLOWING ACCEPTANCE BY THE CUSTOMER REPRESENTATIVE. THE CUSTOMER'S REPRESENTATIVE'S SIGNATURE VERIFIES TIME AND MATERIALS IN WHOLE, AND THE PROJECT LOCATION WAS NOT DAMAGED BY PERSONNEL OR EQUIPMENT AND WAS LEFT IN SATISFACTORY CONDITION UNLESS OTHERWISE SPECIFICALLY NOTED.
UNDER NO CIRCUMSTANCES DOES MEI GUARANTEE THE QUALITY OR USABILITY OF ANY ITEM, MATERIAL, OR PRODUCT, EXAMINATED OR TESTED. NO WARRANTIES ARE EXPRESSED OR IMPLIED, AND IN NO EVENT SHALL THE LIABILITY OF MEI WITH RESPECT TO ITEMS EXAMINATED (INCLUDING ANY LIABILITY PERTAINING TO SELECTION AND/OR RESULTS OF THESE SAME TEST) EXCEED THE CHARGE OF MEI FOR THE EXAMINATION OF SUCH ITEMS.

Agreed and Accepted: [signature] Date:

TERMS AND ABBREVIATIONS

I.P.	INADEQUATE PENETRATION	S.P.	SPHERICAL POROSITY
I.P.D.	INADEQUATE PENETRATION DUE TO HIGH-LOW	C.P.	CLUSTER POROSITY
I.C.	INTERNAL CONCAVITY	P.P.	PIPING POROSITY
I.F.	INCOMPLETE FUSION	H.B.	HOLLOW BEAD
C.L.	COLD LAP	C.R.	CRACKS
B.T.	BURN THROUGH	A.D.	ACCUMULATION OF DISCONTINUITIES
E.S.I.	ELONGATED SLAG INCLUSIONS	I.U.	INTERNAL UNDERCUT
I.S.I.	ISOLATED SLAG INCLUSIONS	O.U.	OUTSIDE UNDERCUT
		C.E.I.	CORROSION EROSION INSIDE
		C.E.O.	CORROSION EROSION OUTSIDE

LUBBOCK LABS, INC.

SCOTT MANUFACTURING, INC.
P.O. BOX 10232
LUBBOCK, TEXAS 79408

DATE: 6-9-90

PHONE (806) 747-3303
210 PARIS
LUBBOCK, TEXAS 79401

WELDER AND WELDING OPERATOR QUALIFICATION TEST RECORD

Welder or welding operator's name BILL FISHER Identification no. SS#457-82-4797

Welding process GMAW Manual YES Semiautomatic -- Machine --

Position 6 GR - T,K,Y CONNECTIONS UPHILL

(Flat, horizontal, overhead or vertical — if vertical, state whether upward or downward)

In accordance with procedure specification no SMI - 022

Material specification ASTM A 53 GRADE B

Diameter and wall thickness (if pipe) — otherwise, joint thickness

Thickness range this qualifies 2T = 1.012"

FILLER METAL

Specification no. SFA 5.20 Classification AWS E 71T-1 F no.

Describe filler metal (if not covered by AWS specification)

Is backing strip used? NO

Filler metal diameter and trade name 0.045" FRONT 1 ARC

Flux for submerged arc or gas for gas metal arc or flux cored arc welding CO^2 - 100%

VISUAL INSPECTION (9.25.1)

Appearance GOOD Undercut NONE Piping porosity NONE

Guided Bend Test Results N/A - SEE, AWS D1.1-90 5.3.2

Type	Result	Type	Result

Test conducted by Laboratory test no.
per Test date

Fillet Test Results N/A

Appearance Fillet size

Fracture test root penetration Macroetch

(Describe the location, nature, and size of any crack or tearing of the specimen.)

Test conducted by Laboratory test no.
per Test date

RADIOGRAPHIC TEST RESULTS

Film Identification	Results	Remarks	Film Identification	Results	Remarks
#8 BILL FISHER					
0-1	PASS		2-0	PASS	
1-2	PASS		PERMIAN N.D.T. #5945		

Test witnessed by RON WIMBERLEY Test no. 06990-7
per Ron Wimberley

We, the undersigned, certify that the statements in this record are correct and that the welds were prepared and tested in accordance with the requirements of 5C or D of AWS D1.1, (1990 year) Structural Welding Code.

Manufacturer or contractor SCOTT MFG. INC.
Authorized by RICK SCOTT
Date 6-9-90

Form E-4
ANSI/AWS D1.1-86

LUBBOCK LABS, INC.

PHONE (806) 747-3393
210 PARIS
LUBBOCK, TEXAS 79401

Customer: SCOTT MANFACTURING, INC.
P.O. BOX 10282
LUBBOCK, TEXAS 79408

Date 10-16-93

Report of: WELDER AND WELDING OPERATOR QUALIFICATION TEST RECORD

Social Security no. 461-78-1423

Welder or welding operator's name WYNN CADEL Identification no. 275

Welding process FCAW Manual ***** Semiautomatic Machine

Position 3G VERTICLE : ALSO QUALIFIES FOR 1G FLAT, & 2G HORIZONTAL ---- DOWNWARD

(Flat, horizontal, overhead or vertical — If vertical, state whether upward or downward)

In accordance with procedure specification no S.M.I. CORTEN

Material specification ASTM A 242

Diameter and wall thickness (if pipe) — otherwise, joint thickness 0.375"

Thickess range this qualifies 0.125" to 0.75"---- ALSO QUALIFIES FILLET WELDS OF UNLIMITED

FILLER METAL

Specification no. AWS 5.29 Classification E 81T1-W F no.

Describe filler metal (if not covered by AWS specification)

Is backing strip used? YES

Filler metal diameter and trade name 0.045" ALLOY RODS--DUAL SHIELD

Flux for submerged arc or gas for gas metal arc or flux cored arc welding

VISUAL INSPECTION (9.25.1)

Appearance GOOD Undercut NONE Piping porosity NONE

Guided Bent Test Results

Type	Result	Type	Result
FACE 1	ACCEPTED		
ROOT 1	ACCEPTED		

Test conducted by RON WIMBERLEY Laboratory test no. 0101693-A
per Ron Wimberley Test date 10-16-93

Fillet Test Results

N/A

Appearance Fillet size
Fracture test root penetration Marcoetch
(Describe the location, nature, and size of any crack or tearing of the specimen.)
Test conducted by Laboratory test no.
per Test date

RADIOGRAPHIC TEST RESULTS

N/A

Film Identification	Results	Remarks	Film Identification	Results	Remarks

Test witnessed by Test no.
per

We, the undersigned, certify that the statements in this record are correct and that the welds were prepared and tested in accordance with the requirements of 5C or D of AWS D1.1, (1992 year) Structural Welding Code.

Manufacturer or contractor SCOTT MANFACTURING, INC.

Authorized by

Date 10-16-93

Form E-4

LUBBOCK LABS, INC.

PHONE (806) 747-3393
210 PARIS
LUBBOCK, TEXAS 79401

Customer: SCOTT MANUFACTURING, INC.
P.O. BOX 10232
LBUBOCK, TEXAS 79408

Date 6-9-90

Report of: WELDING PROCEDURE QUALIFICATION TEST RECORD

PROCEDURE SPECIFICATION

Material specification ASTM A-53, GRADE B, 8"Dia. Pipe
Welding process GMAW
Manual or machine MANUAL
Position of welding 6GR-T, K, Y CONNECTIONS
Filler metal specification SFA 5.20
Filler metal classification AWS E 71T-1
Weld metal grade* ASTM A 53, GRADE B
Shielding gas CO^2 Flow rate 35-40 CFH
Single or multiple pass MULTIPLE
Single or multiple arc SINGLE
Welding current DIRECT/REVERSE
Welding progression UP HILL
Preheat temperature N/A
Postheat treatment N/A
Welder's name BILL FISHER
SS#457-82-4797

*Applicable when filler metal has no AWS classification.

VISUAL INSPECTION (9.25.1)

Appearance GOOD
Undercut NONE
Piping porosity NONE

Test date 6-9-90
Witnessed by RON WIMBERLEY
Ron Wimberley

GROOVE WELD TEST RESULTS

Tensile strength, psi
1. 92,800 - SWL FILE #2839901
2. 84,200 - SWL FILE #2839901

Guided-bend tests (2 root-, 2 face-, or 4 side-bend)

SIDE	SIDE
S 1. SATISFACTORY	1. SATISFACTORY
S 2. SATISFACTORY	2. SATISFACTORY

Radiographic-ultrasonic examination
RT report no PASS-PERMIAN N.D.T. #5945
UT report no. N/A

FILLET WELD TEST RESULTS N/A

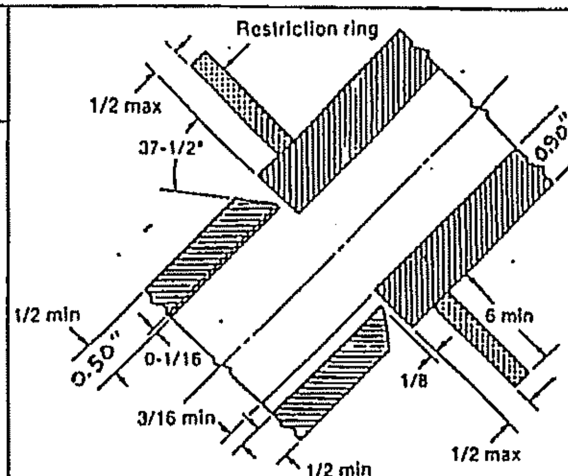
Minimum size multiple pass Macroetch
1. ______ 3. ______
2. ______

Maximum size single pass Macroetch
1. ______ 3. ______
2. ______

All-weld-metal tension test
Tensile strength, psi ______
Yield point/strength, psi ______
Elongation in 2 in., % ______
Laboratory test no. 06990-7A

WELDING PROCEDURE

Pass no.	Electrode size	Welding current: Amperes	Welding current: Volts	Speed of travel
1-6	0.045"	220	26	12-14



We, the undersigned, certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of 5B of AWS D1.1, (1990 year) Stuctural Welding Code.

Procedure no. SMI-022
Revision no. 6-09-90
Manufacturer or contractor SCOTT MFG. INC.
Authorized by RICK SCOTT
Date 6-9-90

Form E-2

SCOTT MANUFACTURING INC.

Procedure Qualification Test Record (PQR)

PQR Number #015
WPS Number #015A AND #015B

Variables

Base metal ASTM 500, GR:B / ASTM 500 GR:B
Metal thickness .188 / .188
Coating NONE
Joint preparation GRIND
Backing SEE - JOINT DETAIL
Position of welding FLAT AND HORZ. (1F & 2F)
Welding process FLUX-CORED (FCAW)
Manual, semiautomatic, or automatic SEMIAUTOMATIC

*Filler metal spec. AWS 5.20
*Filler metal class SFA 5.20 (E71T-1)
*Weld metal grade MILD STEEL (A-1)
Electrical characteristics D.C.R.P
Mode of transfer SPRAY
Shielding gas/combination 75% A + 25% Co2
Gas flow (CFH) 25 CFH
Welder's name C. CADDEL
Welder's ID no. 275

*See Definitions

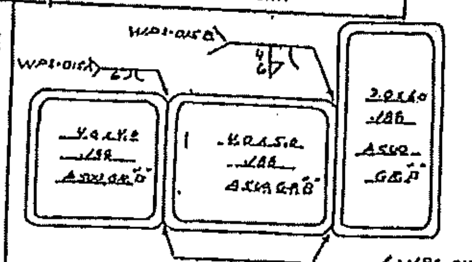
Weld in butt joint visual exam results (see 3.4.1 or 8.4.1)	A	B
Fusion	Accept	Accept
Penetration	Accept	Accept
Reinforcement	Accept	Accept
Porosity	Accept	Accept
Undercut	Accept	Accept
Cracks	Accept	Accept

Fillet weld visual exam results (see 3.4.2 or 8.4.2)	
Fusion	Accept
Effective throat	Accept
Convexity	Accept
Porosity	Accept
Undercut	Accept
Cracks	Accept

AWS QC 1
DAVID M. LOVETT
82060601
CWI

by: David Lovett

Joining Procedure

Filler Metal Size	Welding Power		Speed of Travel	Joint Detail
	Current Range	Voltage Range		
FLUX-CORED .045	150 (I)	25 (V)	244 IPM (WIRE)	

NOTES: 1) FLARE-VEE WELDS-ONE PASS
2) FLARE-BEVEL WELDS-THREE PASSES.

We, the undersigned, certify that the statements in this record are correct and that the test specimens were prepared, joined, and examined in accordance with the requirements of ANSI/AWS D9.1, Sheet Metal Welding Code.
PER MIL STD 1261-C

Manufacturer or Contractor SCOTT MANUFACTURING INC.
Authorized by F.A. Pernell
Date 7/20/94

WIR NO.	QUALITY DEPARTMENT-WELDING INSPECTION RECORD (WIR).			
NA				
PRINT * NA	PART NAME: WELDER'S QUALIFICATION TEST SPECIMEN I.D. # 275		weld description: PQR 015 & WELDER'S QUALIFICATION	
WPS-015A WPS* PER QAP-1 & WPS 015B	WELDER: C. Caddel	work station: W.O.*	date 7-20-94	welding code MIL-STD-1261C

WELDING CHARACTERISTICS

CHARACTERISTIC	ACCEPT	REJECT	DISCREPANCIES	NO OF WELDS INSPECT NO ACCEPT/REJ'T
POROSITY	X			
OVERLAP	X			
UNDERCUT	X			
USION	X			
AG INCLUS'S	NA			
	X			
☒ ACCEPTED	☐ REJECTED	☐ HOLD	☐ OTHER	INSPECTED BY/DATE Hemtil 7/20/94

VISUAL INSPECTION CRITERIA FOR PRODUCTION WELDS: QAM 14.3.4	☐ reinspected ☐ accepted ☐ rejectd
COMMENTS/ OBSERVATIONS	FCAW MILD STEEL FLAT & HORIZONTAL (1F & 2F)

REINSPECTED BY: DATE:

Scott Manufacturing, Inc.
Custom Metal Fabrication
P.O. Box 10232
Lubbock, Texas 79408-3232
(806) 747-3395
FAX (806) 866-4930

SCOTT MANUFACTURING, INC. LUBBOCK, TX.

SHIP TO:
F.M. 1585, 3/4 Mile East of Hwy 62/82
Wolfforth, TX 79382

MAIL TO:
P.O. Box 10232
Lubbock, TX 79408-3232

INSTRUCTIONS:
Send invoice & Bill of Lading to
Scott Manufacturing, Inc.
P.O. Box 10232
Lubbock, TX 79408-3232

Date 6-26-95

JE.. TO
NA.. KOCH ENGINEERING CO. INC
..DRESS
..NE 918-742-0005 CONTACT GARY KUCK

..UANTITY	U/M	DESCRIPTION	PRICE PER U/M	TOTAL
2		75 1/4" O.D. X6" STAINLESS STEEL		
		FLEXMESH MIST ELIMINATOR		
		FRT.		
		TAX		

~~Instkp 7/21~~ / 7-25-95
Shipping 7/26/95

..IVERY DATE
P..
..B SMI

..PAY & ADD ☐ COD ☐
..PAID ☑ COLLECT ☐

USPCI

White — Purchasing

TAX EXEMPT YES ☐ NO ☐
COST CODE ~~6086~~ ~~E086070~~
WORK ORDER # T-48709
PURCHASE ORDER # 37625

KOCH

JOB NO.: 46794 <<<
Rep:

KOCH ENGINEERING COMPANY INC
DIVMET® DIVISION

*** PACKING LIST ***

old To:
COTT MANUFACTURING INC
) BOX 10232
JBBOCK TX 79408
CCOUNTS PAYABLE

Ship To:
SCOTT MANUFACTURING INC
FM 1585, 3/4 MILE EAST
HWY 62/82, WOLFORTH TX 79382

Date: 06/28/95

Customer Order No.: 37625

heduled-Ship-Date: 7-21-94

Terms: NET 30

Ship Via: CENTRAL
Remarks:

<<<< Collect
XXX <<<< Prepaid & Add
<<<<Freight Allowed

F.O.B. HOUSTON

	Item 1	Item 2	Item 3	Item 4	Item 5
JANTITY	2				
IAMETER	75.25				
SH THICKNESS	6.00				
S[illegible]TERIAL	304				
SH STYLE	4310				
ID MATERIAL	304				
& BOTTOM GRIDS	TB-S				
WAY SIZE	-				
TIONS	6				
RK NUMBER					

of Crate(s):
e of Crate(s):
oss Wt. of Crate(s):

W.O.# JT-48709

9630 Clarewood ▪ Suite C-2 ▪ Houston, Texas 77036 ▪ 713/777-4114 ▪ FAX 713/776-9541

PURCHASE ORDER

Scott Manufacturing, Inc.
Custom Metal Fabrication
P.O. Box 10232
Lubbock, Texas 79408-3232
(806) 747-3395
FAX (806) 866-4930

SMI SCOTT MANUFACTURING, INC. LUBBOCK, TX.

SHIP TO:
F.M. 1585, 3/4 Mile East of Hwy 82/82
Wolfforth, TX 79382

MAIL TO:
P.O. Box 10232
Lubbock, TX 79408-3232

INSTRUCTIONS:
Send Invoice & Bill of Lading to
Scott Manufacturing, Inc.
P.O. Box 10232
Lubbock, TX 79408-3232

S TO
COMPANY FORT WORTH F&D
ADDRESS
PHONE 817-236-8773 CONTACT WESLEY WEBB
Date 6-26-95

QUANTITY	U/M	DESCRIPTION	PRICE PER U/M	TOTAL
1		3/8" X 75 1/4" O.D. X A516 MATERIAL		
		DISHED & FLANGED HEAD W/ MTR'S ✓		
		FRT.		

DELIVERY DATE 7/5/95 (SHIP OUT)
SHIP VIA
FOB DESTINATION SMI
PREPAY & ADD ☐ COD ☐
PREPAID ☐ COLLECT ☑

TAX EXEMPT YES ☐ NO ☐
COST CODE 6070
WORK ORDER # T-48709
PURCHASE ORDER # 37626

White — Purchasing

T48709
37626

FORT WORTH F&D HEAD COMPANY

P. O. BOX 16477 — FORT WORTH, TEXAS 76162–0477

MILL TEST REPORT

CUSTOMER	CUSTOMER ORDER NO.	DATE
Scott Manufacturing, Inc.	PO# 37626	07-05-95

CODE	QTY.	SIZE–OD	THK.	PLATE MFG.	HEAT NO.	SLAB NO.	MAT'L	HOT FORMED	COLD FORMED
JWG	1	75 1/4"OD. x 3/8"NOM. Flanged & Dished Head, 69 1/4"DR., 4 3/4"ICR., 2"SF.		Geneva Steel	1A1009	26-01	SA-516-70		X

FORT WORTH F & D HEAD COMPANY CERTIFIES THAT HEADS MANUFACTURED FROM MATERIAL REPRESENTED BY THIS REPORT COMPLY WITH ASME CODE SECTION II & SECTION VIII, DIVISION I. ALL HEADS COMPLY WITH UCS-79(d) & UG-81(a). NO SUBSEQUENT HEAT TREATMENT WAS PERFORMED.

WE CERTIFY THAT THIS IS A TRUE COPY OF THE ORIGINAL METALLURGICAL TEST CERTIFICATE NOW IN OUR FILES.

FORT WORTH F & D HEAD COMPANY

MAY 18 '95 07:06AM

PG-4645

Metallurgical Test Report

GENEVA STEEL

GENEVA STEEL COMPANY CERTIFIES ALL SMELTING, MELTING AND MANUFACTURING PROCESSES OCCURRED IN THE U.S.A.

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.

Edward F. Bradley

CORPORATE DIRECTOR, QUALITY

DATE 04-22-95

REQ., JOB, CONTRACT NO.	P.O. DATE	PURCHASE ORDER NO.		
	10/21/94	60-3670/DFW202598		
	SHIPPERS NO.		MILL ORDER NO.	TALLY NO.
	GP251998 04-22-95		EA82380	GP251998
	VENDOR IDENTITY	TTPX08014		

VENDOR: GENEVA STEEL, P.O. BOX 2500, PROVO, UTAH 84603

SOLD TO: MANNESMANN PIPE&STEEL CORP, 1990 POST OAK BLVD, HOUSTON TX 77056-3811

SHIP TO: DELTA STEEL, INC., 9217 SOUTH FREEWAY, FORT WORTH, TEXAS

SPEC. & DESP.: PLATE ASTM A516-90 GRADE 70 AND ASME SA516 1992 EDITION 1993 ADDENDA GRADE 70 PRESSURE VESSEL QUALITY WAIVE DIE STAMP - STENCIL ONLY

01 MILL CERTIFIED T/R

88057

ITEM NO.	THICKNESS OF SECTION	WIDTH, DIA. OR FT. WT.	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	YIELD PT. *KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED. OF AREA	BEND
03	.3750"	84.0000"	480.0000"	5	21440#	1A1009	26-01	54.5	79.2	22.0			
	JWG						26-01	45.6	73.5	22.0			
							26-01	44.4	73.4	24.0			
							END OF DATA						

*YIELD STRENGTH-TOTAL EXTENSION UNDER LOAD 0.5%

HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO	
1A1009	HEAT	25	110	007	007	29	01	01	02	004		040		025			004		FINE GRAIN

'GENEVA STEEL COMPANY CERTIFIES ALL SMELTING, MELTING AND MANUFACTURING PROCESSES OCCURRED IN THE USA.'

END OF DATA

5-25-95

... VERTICAL DOTTED LINE OR DECIMAL POINTS ...

SMI
SCOTT MANUFACTURING, INC.
LUBBOCK, TX.

Scott Manufacturing, Inc.
Custom Metal Fabrication
P.O. Box 10232
Lubbock, Texas 79408-3232
(806) 747-3395
FAX (806) 866-4930

SHIP TO:
F.M. 1585, 3/4 Mile East of Hwy 62/82
Wolfforth, TX 79382

MAIL TO:
P.O. Box 10232
Lubbock, TX 79408-3232

INSTRUCTIONS:
Send Invoice & Bill of Lading to
Scott Manufacturing, Inc.
P.O. Box 10232
Lubbock, TX 79408-3232

Date 6-29-95

ISSUED TO
COMPANY Instel
ADDRESS
PHONE
CONTACT Gordon

QUANTITY	U/M	DESCRIPTION MTR'S	PRICE PER U/M	TOTAL
1		3/8 PL 60 X 240 X A-36		
2		3/8 PL 96 X 240 X "		
1		1/4 PL 60 X 240 X "		

DELIVERY DATE 7-5-95
SHIP VIA Instel
OLD SMT
PREPAY & ADD ☐
PREPAID ☐
COD ☐
COLLECT ☐

TAX EXEMPT YES ☑ NO ☐
COST CODE 6094
WORK ORDER # JT 48709
PURCHASE ORDER # 37692

White — Purchasing

MAR 21 '95 05:35PM ASOMA MALSTEEL TX

Экспорт Export 2451 · 1003003

Продавец (Экспортер)
Seller (Exporter)

AO
NLMK
398040 LIPETSK 33760
PL. METALLURGOV,2

Грузополучатель, адрес, страна:
Customer, Address, Country:

INTERMETAL GROUP LTD
LOT 1
HOUSTON
export in USA

Железнодорожная накладная №
Railway Bill No

Вагон №
Freight Car No 42534081

ТОВАРОСОПРОВОДИТЕЛЬНЫЙ ДОКУМЕНТ №
Shipping document No
(СЕРТИФИКАТ КАЧЕСТВА)
Quality certificate
(ОТГРУЗОЧНАЯ СПЕЦИФИКАЦИЯ)
Shipping specification 94748

Контракт №
Contract No 98-29/92-4-157-32
от
from 000

Заказ-наряд №
Order-Naryad No 98-29/92-4-157-32
от
from 000

Разрешение на вывоз №
Export licence No 000
от
from 000

Лист № 1
Sheet No 1
Листов: 1
Sheets: 1

Заказ №
Order No 341381 94

Наименование и код товара Description and code of goods	720822990	НТД (NTD)	Вид груза, место, код	Колич. товара Quantity
PL 3/8 X 60 Coil hot-rolled carbon steel strip in coils		ГОСТ—GOST ТУ—TU ASTM A-36		3

№ п. п. Item No	№ поз. Pos. No	Номера плавок Nos. of Heats	Группа (кл.) прочности Group (class) of strength	Марка стали Grade of Steel	толщина thickness	ширина width	длина length	Ед. изм. Код Unit Code	Номера мест Package Nos.	брутто gross	нетто net
1	8	2412710			9.14	1524			657	14.91	14.90
2	8	2412710			9.14	1524		шт.	658	15.01	15.00
3	8	2412710			9.14	1524		Рул	659	14.81	14.80
										44.73	44.70

Показатели качества товара / Quality Characteristic of Goods
Химический состав, % / Composition, %

№ п. п. Item No	№ поз. Pos. No	Номера плавок Nos. of Heats	C x100	Mn x100	Si x100	P x1000	S x1000	Cr x100	Ni x100	Cu x100	Al x100
1	8	2412710	17	46	22	15	18	3	3	2	4.4

Механические свойства / Mechanical Properties; Технологические пробы / Technological tests; Твердость / Hardness

№ п. п. Item No	№ поз. Pos. No	Номера партий Nos. of Lots	Предел прочности Ultimate strength	Предел текучести Yield limit	Удлинен. Elongation	Ударная вязкость Impact viscosity	Холодн. загиб Cold bend tests	Ударная вязкость после мехстарения Impact toughness after Mechanical ageing	Характ. кромки Brim
1	8	29759	488.0	353.0	40.0				0

ЛИПЕЦКАЯ ТАМОЖНЯ
ГТК РОССИИ 022
ВЫПУСК РАЗРЕШЕН
Инспектор

Примечание:
Note: прокатки:760-800 смотки:570-610

Маркировка (marking) LOT 2

Указанный в настоящем сертификате товар соответствует по качеству действующим в России стандартам, техническим условиям и может быть отгружен на экспорт.

It is hereby certified that the quality of goods mentioned in this certificate is in conformity with the Russia standards, specification and the goods may be exported.

Подпись
Signature
Работник ОТК
Representative of QCD
Работник цеха
Representative of the shop
М. П. 15/12 1994
19 г.

STEEL AUTHORITY OF INDIA LTD

BHILAI STEEL PLANT

BHILAI, INDIA

№ 5470

MILL TEST CERTIFICATE

CERTIFICATE NO.3VTZ000269 DATE : 09-03-1993

1. BUYER'S NAME AND ADDRESS : METALL UND ROHSTOFF A.G. BAHNHOFSTRASSE 10 CH-6300 ZUG, SWITZERLAND
2. MATERIAL : PRIME HOT ROLLED MILD STEEL PLATES
3. PROCESS OF MANUFACTURE OF STEEL : BASIC OXYGEN CONVERTER CONTINUOUS CAST KILLED STEEL
4. QUALITY : ASTM A-36
5. TOLERANCES : ASTM A-6 WITH S-14 BEND TEST
6. BILL OF LADING NUMBER : 3VTZ000269 DATED 09-03-1993
7. NAME OF VESSEL : M.V. STATE OF GUJARAT
8. LOADING PORT : VISAKHAPATNAM/INDIA
9. DISCHARGE PORT : HOUSTON PIER/U.S.A.

ITEM NUMBER : 1

DIMENSION IN INCHES : 3/8 X 96 X 240

THEORETICAL WEIGHT PER PIECE IN KG. : 1111

LOT 303

M AND R REFERENCE NO. : 2.1225

TEST RESULTS

HEAT NUMBER	NUMBER OF PIECES	CHEMICAL ANALYSIS (AS PER LADLE SAMPLE ANALYSIS) C %	S %	P %	Mn %	Si %	MECHANICAL PROPERTIES YIELD POINT IN N/sq.mm	TENSILE STRENGTH IN N/sq.mm	% ELONGATION ON GL = 200 mm	BEND TEST 1/2 T
73000	42	0.12	0.024	0.018	0.60	0.18	309	432	27	OK
							297	426	28	OK
73008	28	0.11	0.023	0.019	0.87	0.21	335	460	26	OK
							331	452	24	OK
73011	59	0.09	0.023	0.013	0.81	0.20	309	411	24	OK
							315	428	27	OK
73034	58	0.11	0.026	0.014	0.81	0.14	323	444	25	OK
							329	458	24	OK

Contd Page 02

"STEEL AUTHORITY OF INDIA LIMITED"

: 2 :

TEST RESULTS

HEAT NUMBER	NUMBER OF PIECES	CHEMICAL ANALYSIS (AS PER LADLE SAMPLE ANALYSIS) C %	S %	P %	Mn %	Si %	MECHANICAL PROPERTIES YIELD POINT IN N/sq.mm	TENSILE STRENGTH IN N/sq.mm	% ELONGATION ON GL. = 200 mm	BEND TEST 1/2 T
73075	59	0.10	0.024	0.015	0.80	0.21	303	424	25	OK
							324	454	24	OK
73078	43	0.11	0.021	0.011	0.84	0.22	314	437	26	OK
							335	456	25	OK
73244	50	0.11	0.020	0.017	0.85	0.23	324	434	24	OK
							354	473	24	OK
73284	39	0.10	0.023	0.021	0.86	0.21	325	439	25	OK
							327	436	25	OK
73472	6	0.10	0.021	0.017	0.86	0.20	316	448	24	OK
							331	471	24	OK
73474	52	0.09	0.021	0.014	0.80	0.21	332	447	26	OK
							335	449	27	OK
73475	57	0.08	0.018	0.012	0.84	0.22	336	454	30	OK
							359	469	27	OK
73477	1	0.11	0.024	0.016	0.90	0.22	326	441	24	OK
							335	459	28	OK
73481	6	0.09	0.018	0.011	0.80	0.22	342	452	23	OK
							336	456	26	OK
73468	1	0.10	0.019	0.019	0.88	0.18	355	472	27	OK
							340	460	25	OK

NUMBER OF PIECES : 301

TOTAL WEIGHT (METRIC TON) : 556.611

CERTIFIED THAT THE MATERIAL IS IN ACCORDANCE WITH ASTM A-36, 1989 EDITION AND ROLLING TOLERANCE ON THICKNESS, WIDTH, LENGTH AND FLATNESS ACCORDING TO ASTM A-6 MATERIAL HAVE SHEARED EDGES ON ALL FOUR SIDES.

FOR CHIEF METALLURGIST
BHILAI STEEL PLANT
"STEEL AUTHORITY OF INDIA LIMITED"

7030

FILE COPY

Date: 10.31 1995 CERTIFICATE NO. __

PRODUCER: DONETSK IRON AND STEEL WORKS

MATERIAL: PRIME QUALITY, NEWLY PRODUCED, HOT ROLLED STEEL PLATES TO A 36.

SIZE: 1/4 x 60 x 240

TO WHOM IT MAY CONCERN

THEORETICAL WEIGHT : 0,463 MT

No.	Heat number	C x100	Mn x100	Si x100	S x1000	P x1000	Cr x100	Ni x100	Cu x100	Tensile MPA	Yeild MPA	Elongation % 50 / 250 mm	No of pieces	No of bundles
1	8304 - 356	15	57	26	36	28	14	7	6	465 470 470 470	325 305 330 320	34 22 22,5 34	3	1
2	8305 - 353	18	55	28	27	21	11	7	12	490 500 500 500	315 320 330 320	32 27 26 32	51	6
3	8329 - 455	15	55	26	39	20	13	8	8	445 450 450 455	305 305 315 305	34 28 27 33	45	5
4	8342 - 452	17	46	18	35	14	16	11	8	450 450 445 460	285 300 285 295	30 27 34 26	41	5
5	8343 - 471	16	46	21	46	14	16	9	9	440 440 430 440	280 300 285 290	34 29 29,5 35	24	3
6	7379 - 541	19	54	29	30	29	15	6	7	485 480 475 485	315 320 315 320	32 25,5 26,5 34	47	6
7	7380 - 539	19	54	22	28	27	20	6	6	485 495 490 490	315 330 315 320	26 30 29 34	35	4
8	3010 - 638	20	72	28	30	26	14	6	12	480 475 475 480	315 305 315 320	33 28 27 30	11	2

FILE COPY

18	7341 - 467	23	62	25	27	19		7	6	520 510 510 530	325 330 330 330	34 24.5 24 24	48	
19	7338 - 462	15	49	22	30	15	10	12	11	440 440 430 440	290 280 285 280	26.5 32 25.5 32	49	6
20	7343 - 451	14	58	25	38	25	13	9	9	465 465 455 470	300 305 305 310	34 25 27 34	57	7
21	7342 - 450	13	47	20	35	17	10	8	8	440 440 435 435	305 290 300 300	34 32 27 28	63	7
22	7339 - 468	16	54	20	33	18	15	8	10	460 465 465 460	310 305 315 310	27 35 34 27	39	5
23	8330 - 456	17	49	19	34	16	14	7	8	450 445 450 450	295 305 315 310	27 35 34 27	36	4
24	7384 - 544	18	57	29	30	20	11	6	10	490 490 490 480	320 335 335 325	36 25 29 36	45	5
25	7351 - 536	19	59	22	38	24	21	9	9	465 475 480 465	315 320 320 310	29 34 34 27.5	47	6
26	7363 - 537	17	57	22	43	24	13	10	9	475 470 465 470	320 310 310 325	34 26 27 34	9	1

FILE COPY

										445 475 465	295 320 315	30 30 29		
28	7383 - 543	18	62	25	28	19	11	7	8	500 455 450 510	325 300 295 335	32 26 26 30	47	6
29	7386 - 547	18	59	23	32	19	14	8	8	490 490 490 500	325 320 340 335	28 23 23 26	36	4
30	8368 - 548	15	49	18	35	14	12	6	8	465 485 500 485	310 315 320 310	32 26 25 26	53	6

Quality control department

Scott Manufacturing, Inc.
Custom Metal Fabrication
P.O. Box 10232
Lubbock, Texas 79408-3232
(806) 747-3395
FAX (806) 866-4930

SCOTT MANUFACTURING, INC. LUBBOCK, TX

SHIP TO:
F.M. 1585, 3/4 Mile East of Hwy 62/82
Wolfforth, TX 79382

MAIL TO:
P.O. Box 10232
Lubbock, TX 79408-3232

INSTRUCTIONS:
Send Invoice & Bill of Lading to
Scott Manufacturing, Inc.
P.O. Box 10232
Lubbock, TX 79408-3232

SUED TO
COMPANY Instel

ADDRESS

PHONE CONTACT Gordon

Date 6-29-95

QUANTITY	U/M	DESCRIPTION	PRICE PER U/M	TOTAL
2		3/8 X 2 FB X 20 x A-36		
1		2 X 2 X 3/8 X 40 x "		

DELIVERY DATE 7-5-95
SHIP VIA Instel
FOB SMI

PREPAY & ADD ☐ COD ☐
PREPAID ☐ COLLECT ☐

TAX EXEMPT YES ☑ NO ☐
COST CODE 6070
WORK ORDER # JT 48710
PURCHASE ORDER # 37693

White — Purchasing

ACEROS CORSA, S.A. DE C.V.

Apartado Postal 75-269 54180 México, D. F.
Tels.: 586-16-00 y 586-87-22
Telex 01776550 COSAME FAX 586-81-38

P.O.# 1-3997

Date: 25/01/95

P.O. R.C. GONX.310789

Sold to: COMMERCIAL METALS CO.
P.O.BOX 1046
DALLAS,TX.75221-1046

Shipped to: A.A.MEJIA Y GOMEZ SANUDO,S.
Y/O ALFREDO RAMIREZ.
NVO.LAREDO,LAREDO.

MILL TEST REPORT

TESTED ASTM A6

ASTM A36

Item	Size Material	Kgs.	No. of Lifts	No. of Pieces	Total Pcs.	Heat No.	C	Mn	Si	S	P	Tensile PSI	Yield PSI	Elong. % (8")
							Chemical					Mechanical Properties		
1	FB 2"X3/8"X20'	15.754	8	85	680	9850	0.17	0.72	0.20	.029	.022	66,600	49,300	20.50
2	FB 2 1/2"X3/8"X20'	16.683	8	72	576	9816	0.23	0.60	0.25	.027	.015	68,300	50,600	22.60
3	FB 3"X3/8"X20'	29.197	14	60	840	9876	0.16	0.68	0.24	.050	.024	75,000	55,600	24.40
4	FB 2 1/2"X1/2"X20'	16.066	8	52	416	9990	0.20	0.74	0.20	.031	.020	70,300	52,100	22.90
5														
6														
7														
8														
9														
10														
11														
12														
13														

MELTED AND MANUFACTURED IN MEXICO

A - Equals Legs Angles
FB - Flat Bars
R - Rounds

1-5

Authorized Signature
ACEROS CORSA, S.A. DE C.V.

JUL 10 '95 09:43

P.2/3

STRUCTURAL METALS, INC.
BOX 911, SEGUIN, TEXAS 78156-0911
210-372-8200

CERTIFIED TEST REPORT

The following tests conform to the requirements of the specifications listed.

WE HEREBY CERTIFY THAT THE FOLLOWING DATA IS A TRUE COPY FROM TESTS PERFORMED IN OUR LABORATORY.

QUALITY CONTROL MANAGER 2/21/95

SIN# 5140355
BOL NO B9544244

S 170000
O INTSEL SOUTHWEST
L P O BOX 41041
D HOUSTON TX 77241
T
O

S 8000
H INTSEL SOUTHWEST
I MILL
P SEGUIN TX
T

HEAT NO	SECTION		SPECIFICATION	T #	YIELD PSI	TENSILE PSI	ELONG %	ELONG IN	R.A. %	BEND TEST DIAM	BEND TEST RSL	DATE ROLLED	LB/FT
19359	2X2X3/8	20	ASTM A36-93a	1	50300	74000	32.0	8				010694	4.48
19359	L 2X2X3/8	40	ASTM A36-93a	1	50300	74000	32.0	8				010694	4.48
19809	L 3X2X1/4	40	ASTM A36-93a	1	54600	78400	31.0	8				020195	4.06

HEAT NO	C	MN	P	S	SI	CU	CR	NI	MO	CB	V	AL	CE		BHN	
19359	.19	0.70	.007	.037	.22	.59	0.10	0.17	.050	.000	.0020	.003	.00			1-42040
19359	.19	0.70	.007	.037	.22	.59	0.10	0.17	.050	.000	.0020	.003	.00			1-42040
19809	.19	0.68	.007	.026	.21	.41	0.16	0.16	.046	.000	.0020	.002	.00			1-42040

REMARKS: 100% MELTED AND MANUFACTURED IN THE USA AND FREE FROM MERCURY CONTAMINATION IN THE PROCESS

FOR ADDITIONAL COPIES CALL ACCOUNTING (210) 372-8225.

SCOTT MANUFACTURING, INC.
LUBBOCK, TX.

Scott Manufacturing, Inc.
Custom Metal Fabrication
P.O. Box 10232
Lubbock, Texas 79408-3232
(806) 747-3395
FAX (806) 866-4930

SHIP TO:
F.M. 1585, 3/4 Mile East of Hwy 62/82
Wolfforth, TX 79382

MAIL TO:
P.O. Box 10232
Lubbock, TX 79408-3232

ISSUED TO
COMPANY General Steel
ADDRESS
PHONE CONTACT Randy

INSTRUCTIONS:
Send Invoice & Bill of Lading to
Scott Manufacturing, Inc.
P.O. Box 10232
Lubbock, TX 79408-3232

Date 7-5-95

	QUANTITY	U/M	DESCRIPTION	PRICE PER U/M	TOTAL
1	1	✓	2"⌀ Std Pipe x 21' R/L A536RB ✓		
2	1		2½"⌀ Std Pipe x 21' R/L A536RB ✓		
3	1		8"⌀ Sch 40 Pipe x 5' A536RB ✓		
4	1		4"⌀ Sch 80 Pipe x 2' A536RB ✓		
5	1	✓	3"⌀ Sch 80 Pipe x 6' A536RB ✓		
6	1		2"⌀ Sch 160 Pipe x ~~2'6"~~ A536RB 1'6" ✓		
7	1		10"⌀ Sch 40 Pipe x 2'6" A536RB ✓		
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					

DELIVERY DATE
SHIP VIA Gen SMI

PREPAY & ADD ☐ COD ☐
PREPAID ☐ COLLECT ☐

Vspc'l

White — Purchasing

TAX EXEMPT YES ☒ NO ☐
COST CODE 6070
WORK ORDER # JT 48710
PURCHASE ORDER # 37748

Jul-20 Thu 11:58 1995 Job 344 Page 2/11 GEN STEEL WHSE INC GEN. STEEL WHSE. INC.

検査証明書 INSPECTION CERTIFICATE

住友金属工業株式会社 和歌山製鉄所 (海南)
SUMITOMO METAL INDUSTRIES, LTD.
WAKAYAMA STEEL WORKS (KAINAN)
250-180 Funoo, Kainan, Wakayama, Japan

Certificate No.: BYYJ1623 Page: 1 Date: 1993- 2-26
009 449 393500+4 2P1XC1072
Shipper: ITOCHU CORPORATION
Customer: VAN LEEUWEN PIPE AND TUBE CORP.
Commodity: SEAMLESS HOT FINISHED CARBON STEEL PIPE WITH BEVELED ENDS
Standard: API 5L GR.X42 / API 5L GR.B / ASTM A106-91 / ASME SA-106 GR.B / ASTM A53 / ASME SA-53 GR.B
Order No.: CLP/92/1-62581-01
Specification:

Mill Work No.	O.D.	I.D.	W.T.	Length	No. of pcs.	Total Length	Mass
BYYJ1623	2.375"		0.154"	20'	600		19920

Chemical Composition % (1=×10, 2=×100, 3=×1000, 4=×10000, 5=×100000)

Heat No.		C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	*U4	*QL	Spec.	Y.S	T.S	EL %	Hardness HV
		2	2	2	3	3	2	2	2	2	2	2	2					
MIN.		-	10	29	-	-	-	-	-	-	-	-	-	LBR	420	600	30	B -
MAX.		22	-	106	25	25	40	40	40	15	8	100	40	UBR	-	-	-	B248
MILL TEST																		
J311047	L	16	18	82	19	6	1	2	4	1	0	8	31	LBR	575	717	58	
	P	17	17	82	22	7	1	2	4	1	0	8	32					
J311164	L	15	22	83	19	6	2	2	5	0	0	9	30	LBR	522	736	60	
	P	15	22	81	21	7	2	2	5	0	0	9	30					
J312007	L	15	17	86	17	5	1	2	4	0	0	7	30	LBR	571	726	61	
	P	15	19	89	16	6	1	2	4	0	0	7	31					
LOT TEST																		
J311047	P	17	17	82	22	7	1	2	4	1	0	8	32	LBR	575	717	58	B149
	P	17	18	81	22	7	1	2	4	1	0	8	32	LBR	549	727	66	B151
	P	16	17	80	20	6	1	2	4	1	0	8	31					
	P	16	17	80	20	7	1	2	4	1	0	8	31					
	P	17	17	80	22	7	1	2	4	1	0	8	32					
	P	16	17	80	20	7	1	2	4	1	0	8	31					

Tensile Test: Gauge Length 2.0"

Visual & Dimensions	Hydrostatic	N.D.E.	Flattening	Bending	Flaring	Flange	Weld Ductility	Crush	Reverse Flattening	Reverse Bend	Ring Expansion	Ring Tensile	Ring Gauge	Drift	Metal	Coating & Lining
GOOD	3000 GOOD	-	-	GOOD	-	-	-	-	-	-	-	-	GOOD	-	-	-

HEAT TREATMENT : AS ROLLED
*QL=C+MN/6+(CR+MO+V)/5+(CU+NI)/15
*U4=CU+NI+CR+MO+V
NACE MR-01-75

上記の製品は所定の規格及び仕様に従って製造され、その要求事項を満足していることを証明します。

WE HEREBY CERTIFY THAT THE MATERIAL HEREIN DESCRIBED HAS BEEN MANUFACTURED, SAMPLED, TESTED, AND INSPECTED IN ACCORDANCE WITH ABOVE STANDARD AND SPECIFICATION AND SATISFIES THE REQUIREMENTS.

MANAGER OF QUALITY ASSURANCE
QUALITY CONTROL DEPT.

SEP 10 1993

BYYJ1623

2" Sch 40 Seamless

Contract No. : BYYJ1625 Page : 2

検査証明書
INSPECTION CERTIFICATE
(別紙 ATTACHED SHEET)

住友金属工業株式会社 和歌山製鉄所（海南）
SUMITOMO METAL INDUSTRIES, LTD.
WAKAYAMA STEEL WORKS (KAINAN)
260-100 Funoo, Kainan, Wakayama, Japan

化学成分 Chemical Composition %
(1=×10, 2=×100, 3=×1000, 4=×10000, 5=×100000)

出鋼番号 Heat No.		C	Si	Mn	P	S	CU	NI	CR	MO	V	AL	OL
		2	2	2	3	3	2	2	2	2	2	2	2
MIN.		-	10	29	-	-	-	-	-	-	-	-	-
MAX.		22	-	106	25	25	40	40	40	15	8	100	40
J311164	P	15	22	81	21	7	2	2	5	0	0	9	30
	P	15	22	81	20	6	2	2	6	0	0	10	30
J312007	P	15	19	89	16	6	1	2	4	0	0	7	31
	P	15	19	89	16	6	1	2	4	0	0	7	31

引張試験 Tensile Test (GL = 2.0") / 硬さ Hardness / 衝撃試験 Impact Test

出鋼番号 Heat No.	Lot or Test No.		Y.S. 0.5	T.S.	EL %	Hardness HV	(1)	(2)	(3)	AVG.
MIN.		LBR	420	60030		0				
MAX.		LBR				8246				
J311164		LBR	582	73860		8153				
J312007		LBR	571	72863		8149				

SEP 10 1993

品質保証部長 MANAGER OF QUALITY SYSTEMS / QUALITY CONTROL DEPARTMENT

BYYJ1625 END

U.S. STEEL GROUP
a division of USX Corporation

TUBULAR PRODUCTS INSPECTION CERTIFICATE

2" Sch 160 Seamless

(TYPE B - IN ACCORDANCE WITH ISO 10474/EN10204/DIN50049)

TIME: 10:08

USS, USX, USX are trademarks of USX Corporation

MILL ORDER/ITEM NO.	SHIPPERS NO.	P.O. NUMBER	VEHICLE I.D.
DS17725 03	R18819	CLP/94/I96096-01	LT8220

SOLD TO ADDRESS	MAIL TO ADDRESS	VENDOR
VAN LEEUWEN PIPE & TUBE CORP P O BOX 40896 HOUSTON TX 77240-0896	VAN LEEUWEN PIPE & TUBE CORP P O BOX 40896 HOUSTON TX 77240-0896	USS TUBULAR PRODUCTS 1807 EAST 28TH ST. LORAIN, OH 44055

SPECIFICATION AND GRADE

PIPE CARBON SMLS STD PIPE API 5L-*40TH EDITION DTD 11/1/92 GRADE B AND GRADE X42 ASTM A53-*93A ASTM A106-*93 GRADE B QUAD STENCIL ASME SA53-*1992 EDITION 1993 ADDENDUM ASME SA106-*1992 EDITION 1993 ADDENDUM GRADE B CARBON EQUIVALENT ON HEAT ANALYSIS .40 MAX BASED ON C+MN OVER 6 + (CR+MO+V) OVER 5 + (CU+NI) OVER 15 BLK REG MILL COAT PE BEV 30 DEG MEETING ALL THE APPLICABLE REQUIREMENTS OF NACE STANDAR MR-01-75

MATERIAL COND: AS ROLLED O.D.: 2.375(60.325) in (mm) WALL: 0.344 (8.737) in (mm)

TENSILE

PRODUCT IDENTIFICATION	TEST TYPE/ ORIENTATION	TEST COND.	GAUGE WIDTH IN	YIELD PSI	EXT % .50	TENSILE PSI	Y/T	ELONG % (IN 2")	HARDNESS SCALE: HRB	MIN HYDRO PSI
				MIN 42000		MIN 60000	MAX	MIN 24.0	MAX 99.0	3000
L83846	STRIP/L/B	AR	0.750	47100	.50	73700	0.64	39.0	B 83.3	3000
N89348	STRIP/L/B	AR	0.750	49100	.50	75500	0.65	39.0	B 82.7	3000

** END OF DATA THIS SHEET **

LEGEND: L - LONGITUDINAL, U - UPSET, T - TRANSVERSE, N - NORMALIZED, QT - QUENCHED & TEMPERED, SR - STRESS RELIEVED, AR - AS ROLLED, AQ - AS QUENCHED, B - BODY, W - WELD

PRODUCT IDENTIFICATION	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	AL	N	V	B	TI	CB	CO	CE*
L83846	HEAT	.17	1.05	006	004	.24	.01	.01	.05	.00			.001					
L83846	PROD	.15	1.09	007	005	.26	.01	.01	.04	.01			.002					
L83846	PROD	.16	1.07	007	004	.27	.01	.01	.04	.01			.002					
N89348	HEAT	.17	1.07	008	008	.24	.01	.01	.05	.00			.001					
N89348	PROD	.15	1.10	008	008	.23	.01	.01	.06	.01			.002					
N89348	PROD	.15	1.13	009	009	.23	.01	.01	.06	.01			.003					

** END OF DATA THIS SHEET **

RECEIVED FEB 13 1995

*C.E. IS BASED ON THE FOLLOWING EQUATION(S): CE=C+(MN/6)+(CR+MO+V)/5+ (NI+CU)/15

...vision of USX Corporation

INSPECTION CERTIFICATE

[TYPE II - III ACCORDA... ...TH ISO 10474/EN10204/DIN50049]

USS, USX, USS ... trademarks of USX Corpora...

MILL ORDER/ITEM NO.	SHIPPERS NO.	P.O. NUMBER	INVOICE NUMBER
DS17725 03	R18819	CLP/94/I96096-01	

MATERIAL COND: AS ROLLED — O.D.: 2.375(60.325) in (mm) — WALL: 0.344 (8.737) in (mm)

PRODUCT IDENTIFICATION	FLAT	BEND	GRAIN SIZE	MIN COLLAPSE	CHARPY V-NOTCH IMPACT TESTING: DIR	TEST LOC.	TEMP	SIZE	TEST COND.	FT-LBS 1	2	3	AVG	% SHEAR 1	2	3	AVG
L53348		OK															
N89348		OK															

** END OF DATA THIS SHEET **

LEGEND: L - LONGITUDINAL T - TRANSVERSE B - BODY W - WELD HAZ - HEAT AFFECTED ZONE

TESTING / INSPECTION INFORMATION

TEST / INSPECTION	YES	RESULTS / COMMENTS
FULL LENGTH VISUAL	X	
FULL LENGTH EMI		OD ____ OD/ID ____ L ____ L/T ____
FULL LENGTH MPI		
FULL LENGTH UT		OD ____ OD/ID ____ L ____ L/T ____
END AREA INSPECTION (PLAIN END)		MPI ____ UT ____
SPECIAL END AREA (SEA) INSP.		MPI ____ UT ____
FULL LENGTH DRIFT		DRIFT MANDREL SIZE:

ADDITIONAL NOTES/COMMENTS

ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA. NO REPAIRS BY WELDING. NO MERCURY OR MERCURY COMPOUNDS ARE ADDED TO THE STEEL AND ALL MERCURY BEARING EQUIPMENT IS PROTECTED BY A DOUBLE BOUNDARY OF CONTAINMENT.

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS THE REQUIREMENTS IN SUCH RESPECTS.

PREPARED BY THE OFFICE OF: D.B. DABKOWSKI MGR. MET. & Q.A. USS TUBULAR PRODUCTS

DATE 12/05/94

U.S. STEEL GROUP
A unit of USX Corporation

TUBULAR PRODUCTS
METALLURGICAL TEST REPORT

PAGE OF 2

WHS 09.16.02

REQ., JOB, CONTRACT NO.	P.O. DATE	PURCHASE ORDER NO.		
		CLP/93/168848-01		
	SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.	
	R14566	DS95850 03		/ /
	VEHICLE IDENTITY	CR587983'		

VENDOR: USS TUBULAR PRODUCTS

SOLD TO:
VAN LEEUWEN PIPE & TUBE CORP
ACCOUNTS PAYABLE
15333 HEMPSTEAD RD
HOUSTON TX 77040

MAIL TO:
VAN LEEUWEN PIPE & TUBE CORP
ACCOUNTS PAYABLE
15333 HEMPSTEAD RD
HOUSTON TX 77040

THIS IS TO CERTIFY THAT TH
PRODUCT DESCRIBED HEREIN W
MFG., SAMPLED, TESTED, AND
OR INSPD. IN ACCORDANCE WI
THE SPECIFICATION AND
FULFILLS REQUIREMENTS IN
SUCH RESPECTS.
APPROVED BY OFFICE OF:
D.S. DABKOWSKI MGR. MET. &
Q.A. USS TUBULAR PRODUCTS

DATE 06/02/93

SEP 10 1993

SPEC. & INSP.: MEETING ALL THE APPLICABLE REQUIREMENTS OF NACE STANDARD MR-01-75

ITEM NO.	SIZE	WALL	SPECIFICATION & GRADE	MATL.	HEAT/LOT NO.	MIN. HYDRO PSI	YIELD STR. PSI	TENSILE STR. PSI	ELONG. % IN 2"	GAGE WIDTH IN.	FLAT
03	2 7/8	.203	ASTM A53-90B/A106-91 GR. B ASME SA53/SA106 89ED 91ADD API 5L GR. B/X42 40TH ED. DTD 11/92	SML	N67242	3000	48600	73800	37.0	3/4	OK
03	2 7/8	.203	ASTM A53-90B/A106-91 GR. B ASME SA53/SA106 89ED 91ADD API 5L GR. B/X42 40TH ED. DTD 11/92	SML	N67244	3000	48900	73200	36.0	3/4	OK

ITEM NO.	HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO	
03	N67242	HEAT	18	104	011	010	24	02	02	04	01				001					CE=.37
03	N67242	PROD	19	107	009	013	24	02	01	04	01				002					HRB=78.0
03	N67244	HEAT	17	104	011	011	23	02	02	04	01				001					CE=.36
03	N67244	PROD	16	105	008	013	22	02	02	04	01				001					HRB=78.0

ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.

** END OF DATA THIS SHEET ***

[illegible] ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

530

350354

VALLOUREC INDUSTRIES

TUBERIE DE SAINT SAULVE
[illegible]

MATERIAL TEST REPORT

PAGE 1

REF. [illegible]

PURCHASER : HARMON KEYSTONE CORP.
ORDER NO : H-14438/ PO. 60-8-06510 08.04.92

[illegible]

SEAMLESS STEEL PIPE,HOT FINISHED (MILL. STEEL) [illegible] ,ANTI-RUST COATING DRY VARNISH,ENDS BEVELLED [illegible]

SPECIFICATION: GRADE B . API 5 L 39 ED. ASTM A 106.91 / A 53 [illegible] ASME SA 106 89 / SA 53 89 + LP 87.801 REV. 0

STENCIL.MARKS: ON PIPE: VALLOUREC BV 5L 0061- [illegible] DATE OF MARKING A53/SA53 A106/SA106 B
DIMENSION 10.25 S HYDROSTATIC PRESSURE LENGTH IN FOOT HEAT NUMBER
CUSTOMER'S REFERENCE

DIE STAMPING: ON PIPE : FRANCE
ON METAL TAG: PHILADELPHIA CUSTOMER'S REFERENCE MADE IN FRANCE DOUBLE
NR ONE AND FOLLOWING ONES NUMBER OF PIPES NET WEIGHT LBS FOOTAGE

ITEM Y/R	O/R	O.D. X W.T.		QUANTITY	TOTAL LENGTH	TOTAL WEIGHT
06	03	88,900 X 7,620	MM	30	1150FT 0 IN (350,72 M)	12074 LB (5477 KG)

3 1/2 X 0.300
RANDOM LENGTHS OF 10.97 TO 12.80 METERS (R/L 36 / 42 FT)

LADLE ANALYSIS (%)

PROCESS	HEAT	C	SI	MN	P	S	CR	MO	NI	CU	V
[illegible]	[illegible]	0,14	0,23	0,67	0,011	0,004	0,04	0,01	0,03	0,020	0,005

.../... 2 -

[illegible] 11-23-92

3" sch 80 [illegible]

Vallourec Industries

TUBERIE DE SAINT SAULVE
TEL.
TELEX

MATERIAL TEST REPORT

PAGE 2

REF. 26-92-29049

PURCHASER : MARMON KEYSTONE CORP.
ORDER NO : H-14438/ PO. 60-8-06510 05.04.92

(NO VLR: C30252/93)

– TENSILE TEST   DIR.: LONGIT.   ROOM TEMPER.   TYPE: RECT. 3/4 "

HEAT	Y.S. PSI	T.S. PSI	ELONGATION % (LO = 2")
350354	41000	63300	41.5

– PRODUCT ANALYSIS (%)

HEAT	C	SI	MN	P	S	CR	MO	NI	CU	V
350354	0.15	0.21	0.64	0.013	0.006	0.02	0.01	0.03	0.025	0.000
350354	0.15	0.21	0.65	0.013	0.004	0.05	0.01	0.03	0.024	0.000

– OTHER TESTS : SATISFACTORY

		RESULTS
HYDRAULIC TEST	1662LOT P= 2500 PSI / 5SEC	O.K
SURFACE & DIMENSIONS	1807LOT	O.K
FLATTENING TEST		O.K

– NO REPAIR BY WELDING HAS BEEN CARRIED OUT

..../... 3

3 Sch 80 Seamless

40404 PAGE 1 OF 1 N8084

U.S. STEEL GROUP
A unit of USX Corporation

TUBULAR PRODUCTS
METALLURGICAL TEST REPORT

WHS 10.00.13

O. JOB. CONTRACT NO.	P.O. DATE	PURCHASE ORDER NO.		INVOICE NO.
		60-S-29699		
	SHIPPING NO. T47435	MILL ORDER NO. DR47190 02		
	VEHICLE IDENTITY P2568K OR			

VENDOR: USS TUBULAR PRODUCTS

SOLD TO:
MARMON KEYSTONE CORP
P O BOX 791
BUTLER PA 16003-0791

MAIL TO:
MARMON KEYSTONE CORP
P O BOX 791
BUTLER PA 16003-0791

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN HAS MFG., SAMPLED, TESTED, AND/ OR INSPD. IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.
APPROVED BY OFFICE OF:
D.S. DASKOWSKI MGR. MET. & Q.A. USS TUBULAR PRODUCTS

DATE 06/03/94

ITEM NO.	SIZE	WALL	SPECIFICATION & GRADE	MAR.	HEAT/ LOT NO.	MIN. HYDRO PSI	YIELD STR. PSI	TENSILE STR. PSI	ELONG. % IN 2"	GAGE LENGTH IN.	FLAT	
02	4 1/2	.337	API 5L GR. B/X42 40TH ED. DTD 11/92. ASTM A53-90B/ A106-91 GR. B. ASME SA53/ SA106 GR. B 1992 EDITION 1992 ADDENDUM	SML	N86284	3000	46700	74200	42.0	1 1/2	OK	

ITEM NO.	HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CA	
02	N86284	HEAT	18	99	009	009	21	01	03	04	01				001					CE=.34
02	N86284	PROD	16	104	008	009	23	02	02	04	01				002					

*** ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.
** END OF DATA THIS SHEET ***

6 10 94

Jul-20 Thu 12:03 1995 P.05/05 Page 10/11 Job 344 303 295 7818 TO GENERAL STEEL GEN STEEL WHSE INC JUL 20 '95 07:26 FR MK DENVER-40 EN. STEEL WHSE. INC

R 550 B87908 U82176 B87908 U82175 8.625 X .322 105456 SSC 01444

USS
A division of USX Corporation

TUBULAR PRODUCTS

SHIPPER NO.	MILL ORDER NO.	INVOICE NO.
F25433	1E65690	488-0429680
NS192882		06/22/94

FAIRFIELD WORKS
P.O. BOX 599
FAIRFIELD, ALABAMA 35064

MARMON/KEYSTONE CORP
P O BOX 791

BUTLER PA 16003-0791

MAIL TO

MARMON/KEYSTONE CORP
109 GOODRICH DR
PINSON VALLEY AL 35217

PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.
PREPARED BY THE OFFICE OF:
L.M. ZEONC - MANAGER, Q.A.
FAIRFIELD PIPE MILL

DATE AUGUST 23, 1994

PIPE CARBON SMLS STD PIPE API 5L-#40TH EDITION DTD 11/1/92 GRADE B AND GRADE X42 ASTM A53-#90B ASTM A106-#1991 GRADE B QUAD STENCIL CARBON EQUIVALENT ON HEAT ANALYSIS .40 MAX BASED ON C+MN OVER 6 + (CR+MO+V) OVER 5 + (CU+NI) OVER 15 BLK REG MILL COAT PE BEV 30 DEG
ISP:01 MILL CERTIFY TO ASME SA 2 T/R TO SHIP TO ATTN LISA

SIZE	WALL	SPECIFICATION & GRADE	MFG.	HEAT LOT NO.	MIN. HYDRO PSI	YIELD PSI	TENSILE PSI	ELONG. % IN 2"	BEND WORK	FLAT
8.625C	0.322D	ROCKWELL B = 76.3	SMLS	B87908	2,380 DESED	47,200	73,100	38.8	1.5	OK
						AS ROLLED TENSILE.				
8.625C	0.322D	ROCKWELL B = 74.5	SMLS	U82175	2,380 DESED	49,500	73,700	37.3	1.6	OK
						AS ROLLED TENSILE.				

YIELD STRENGTH @ .5% EXT.
LONGITUDINAL STRIP TENSILE SPECIMENS USED UNLESS NOTED OTHERWISE.
ALSO MEETS THE REQUIREMENTS OF ASME SA53 1992 EDITION, & SA106 1992

HOT FINISHED — NO HEAT TREATMENT
EDITION GRADE B

ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.

HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CA	C.E.
B87908	HEAT	.18	1.08	.010	.008	.24	.02	.01	.04	.00				.00					.37
	PROD	.18	1.08	.011	.008	.23	.01	.01	.03	.01				.00					.36
U82175	HEAT	.18	1.05	.012	.010	.23	.02	.01	.02	.01				.00					.36
	PROD	.19	1.04	.012	.010	.23	.02	.01	.02	.01				.00					.37

** END OF DATA **

030

N 86865

PAGE 1 1.

U.S. STEEL GROUP
A unit of USX Corporation

TUBULAR PRODUCTS
METALLURGICAL TEST REPORT

902 \ 14.06.14

CS. CONTRACT NO.	P.O. DATE	PURCHASE ORDER NO.		
		60-B-36462		
	SHIPPER NO.	MILL ORDER NO.	INVOICE NO.	
USS TUBULAR PRODUCTS	T49066	DK49895 10		
	VEHICLE IDENTITY	P2848K		

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MFG., SAMPLED, TESTED, AND/OR INSPD. IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS.
APPROVED BY OFFICE OF:
D.B. DASKOWSKI MGR. MET. &
Q.A. USS TUBULAR PRODUCTS

DATE 07/11/94

MARMON KEYSTONE CORP
P O BOX 791
BUTLER PA 16003-0791

MAIL TO
MARMON KEYSTONE CORP
P O BOX 791
BUTLER PA 16003-0791

Post-it® Fax Note 7671	Date 7-20-95 / # of pages ▸ 5
To Colcg	From Denise
Co./Dept. P/O 41675	Co.
Phone #	Phone #
Fax #	Fax #

ITEM	SIZE	WALL	SPECIFICATION & GRADE	MATL	SHIFT LOT NO.	HYDRO PSI	YIELD STR. PSI	TENSILE STR. PSI	ELONG. % IN 2"	GAGE WIDTH	FLAT	BEND
0	10 3/4	.365	API 5L SR. B/X42 40TH ED. DTD 11/92, ASTM A53-90B/ A106-91 GR. B. ASME SA53/ SA106 GR. B 1992 EDITION 1992 ADDENDUM	SML	N86865	2420	53300	75000	39.5	1 1/2	OK	

NO.	HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO	
J	N86365	HEAT	16	106	012	006	25	02	03	06	02				001					CE=.36
J	N86365	PROD	18	101	010	008	26	02	02	05	01				002					

*** END OF DATA THIS SHEET *** ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.

DA 7.26.94

Piping Metallurgy

06/16/1993 10:12 FROM TEXASPIPE & SUPPLY TO

Quanex

QUANEX CORPORATION
HOUSTON, TEXAS
GULF STATES TUBE DIVISION ROSENBERG, TEXAS 77471

CUST NUMBER	CUSTOMER ORDER NUMBER	DATE	OFO	COM		DI			ACCOUNT NUMBER		
766768	75736	06/25/93	23	00		16	20	01	05712000000	FP	JHH

TEXAS PIPE & SUPPLY CO INC
2330 HOLMES ROAD
HOUSTON TX 77051

SHIP TO: TEXAS PIPE & SUPPLY CO INC
2330 HOLMES ROAD
HOUSTON TX 77051

ROUTING
OL CUST TRK - TR WITH SHIPMENT

ER SPEC	ROUND	HOT FINISH		PER SPEC	AUGUST 1993
EAMLESS	ASTM/ASME A/SA 106 B 90		HF CARBON PIPE		08/31/93

SPECIAL INSTRUCTIONS:
LAIN ENDS - LACQUER COAT
CCEPTABLE PER NACE MRO 175 TABLE 3
IM FOR 20' MIN LENGTHS

ITEM	QUANTITY	O.D.	I.D.	WALL	LENGTH	WT/FT	WEIGHT	
1	5,460'	1.900 1-1/2" SCH 40		.145 AVG	RAND 17' 24'	2.718	14,840	Comp. 259 pcs. 5763'

MILL TEST REPORTS FURNISHED BY
TEXAS PIPE & SUPPLY CO., INC.
CUSTOMER
CUSTOMER PO #

HEAT NO.	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	Pb	REMARKS
08173	.19	.73	.006	.011	.23	.10	.06	.02	.23		V .001
	.20	.76	.005	.013	.23	.10	.06	.02	.24		V .001
07598	.19	.77	.006	.014	.20	.09	.06	.02	.24		V .001
	.19	.76	.006	.015	.20	.09	.06	.02	.24		V .001

FLATTEN	FLARE	FLANGE	REV. FLATTEN	HYDRO TEST	BEND	EDDY CURRENT
				2500 psi OK	OK	

HEAT NO.	ULT. STR. PSI	YIELD PSI	ELONG 2"	HARDNESS	HEAT NO.	ULT. STR. PSI	YIELD PSI	ELONG 2"	HARDNESS
08173	77900	50900	48.0						
07598	72900	48400	48.0						

SWORN TO AND SUBSCRIBED BEFORE ME THIS

I CERTIFY THAT THE MATERIAL HEREIN DESCRIBED HAS BEEN MANUFACTURED

HACKNEY, INC.

A DIVISION OF TRINITY INDUSTRIES
P.O. Box 568887 • 2525 Stemmons Freeway
Dallas, Texas 75356-8887 • (214) 634-2850

YOUR ORDER NUMBER	REFERENCE	CUSTOMER NO.	INVOICE NO.	INVOICE DATE	DATE SHIPPED
0099-002979	C139654	454634	819873	12/02/94	12/02/94

SOLD TO: M & M SUPPLY CO
PO BOX 548
DUNCAN OK 75533

SHIP TO: M & M SUPPLY
3923 OKLAHOMA AVE
WOODWARD, OK 73801

CERTIFIED TEST REPORT

R1414 (R 12/93)

ITEM	QUANTITY	DESCRIPTION/SPECIFICATION	HEAT CODE
36	6	8X6 STD CONC A106B 48 / 88768 A234-92A/SA234 WPB	XMP
37.	2	4X2 STD ECC A106B 09 / X83447 A234-92A/SA234 WPB	XLR
38:	3	6X4 STD ECC. A106B 09 / X83188 A234-92A/SA234 WPB	XLK
39	6	2 STD LR 45 A106B 09 / N86242 A234-92A/SA234 WPB STRESS RELIEVED AT 1200 F	LYH1

CHEMICAL ANALYSIS

HEAT CODE	C	Mn	P	S	Si	Cr	Mo	Cu	Ni	V	Nb	C.E.=
XMP	.19	.75	.010	.006	.34	.07	.02	.15	.08	.00	.00	.35
XLR	.18	.80	.012	.006	.24	.03	.01	.04	.01	.00	.00	.33
XLK	.18	.78	.012	.012	.25	.02	.01	.02	.01	.00	.00	.32
LYH1	.17	.81	.008	.007	.24	.04	.01	.01	.01	.00	.00	.32

HEAT CODE	PHYSICAL PROPERTIES: TENSILE * KSI	YIELD KSI	% Elong. IN 2"	Hardness HB	CHARPY RESULTS: Size MM x 10 mm	Temp. °F	FOOT POUNDS	LATERAL EXPANSION	% SHEAR
XMP	78.2 L	49.6	38.0	197 MAX					
XLR	71.3 L	45.1	42.3	197 MAX					
XLK	70.0 L	45.2	43.8	197 MAX					
LYH1	80.1 L	57.2	30.0	132					

*L = LONGITUDINAL, T = TRANSVERSE, R = ROUND, S = STRIP

HACKNEY is a domestic manufacturer, and these items conform to the following specifications as they apply:
FITTINGS: ASTM A234 WPB, ASME SA234 WPB, ANSI B16.9, B16.28, AND NACE MR01-75.
FLANGES: ASTM A105 AND A516-70, ASME SA105, ANSI B16.5, and NACE MR01-75.
... were heat treated as required by the applicable specification. They also conform to the requirements of Parts 192 and 195, Title 49, Code of Federal ...ns. All welded fittings are welded by certified welders to ASME Section IX, and 100% radiographically examined per Article 2, ASME Section V. All are in ...ance with the requirements of Paragraph UG-11, Section VIII, Division 1 of the ASME code. Hackney weld caps meet ASME Division 1, Section VIII Pressu... Vessel Code Requirements, Paragraph UCS-79d. We certify these flanges and fittings capable of passing a hydrostatic test compatible with their rating, and that ... above figures are correct as contained in the records of the Company. Hardness testing and stamping are per NACE MR01-75.

P.O.#81380

THE TUBE GROUP

Quanex

GULF STATES TUBE DIVISION ROSENBERG, TEXAS 77471

P.O. BOX 952
ROSENBERG, TEXAS
(713) 342-5401
800-231-5954

ORDER NUMBER	CUSTOMER ORDER NUMBER	DATE	OFO	COM	DIVI	MI SLS	GR SLS	ACCOUNT NUMBER	US
073539	81380	09/28/94	23	00	16	20	01	0571200000	FP

SOLD TO: TEXAS PIPE & SUPPLY CO INC, 2330 HOLMES ROAD, HOUSTON TX 77051

SHIP TO: TEXAS PIPE & SUPPLY CO INC, 2330 HOLMES ROAD, HOUSTON TX 77051

ROUTING: COL-CUST TRK-TR W/SHPT

ANALYSIS	SHAPE	PRODUCT	HEAT TREATMENT	
PER SPEC	ROUND	HOT FINISH	PER SPEC	OCTOBER
SEAMLESS	SPECIFICATION: ASTM/ASME A/SA 106 B 90		HF CARBON PIPE	10/31/94

SPECIAL INSTRUCTIONS:
PLAIN ENDS - U.V.C. COAT
ACCEPTABLE PER NACE MRO 175 TABLE 3
AIM FOR 20' MIN. LENGTHS

ITEM	QUANTITY	O.D.	I.D.	WALL	LENGTH	WT/FT	WEIGHT	
1	12,800'	1.315 1" SCH 40		.133 AVG	RAND 17' 24'	1.679	21,491	Comp. 589 pcs 12,942

MILL TEST REPORTS FURNISHED BY
TEXAS PIPE & SUPPLY, CO. INC.
CUSTOMER ____________
CUSTOMER PO# ____________

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	Fe	REMARKS
601244	.17	.67	.014	.012	.25	.07	.04	.01	.16		V .002
	.17	.67	.014	.012	.26	.07	.04	.02	.16		V .002
601174	.17	.71	.014	.016	.23	.08	.03	.02	.20		V .002
	.17	.70	.014	.017	.23	.09	.03	.02	.20		V .002

FLATTEN	FLARE	FLANGE	REV. FLATTEN	HYDRO TEST	BEND	EDDY CURRENT
				2500 psi OK	OK	

MECHANICAL PROPERTIES

HEAT NO.	ULT. STR. PSI	YIELD PSI	ELONG 2"	HARDNESS	HEAT NO.	ULT. STR. PSI	YIELD PSI	ELONG 2"
601244	67900	45900	48.0					
601174	70400	47900	50.0					

OTHER TESTS

I CERTIFY THAT THE MATERIAL HEREIN DESCRIBED HAS BEEN MANUFACTURED IN ACCORDANCE WITH THE ORDERED SPECIFICATION AND THAT THIS TEST INFORMATION IS CORRECT AS CONTAINED IN THE RECORDS OF THE COMPANY.

AL ZBRANEK
TECHNICAL ANALYST

SWORN TO AND SUBSCRIBED BEFORE ME THIS 4th DAY OF October

NOTARY

HACKNEY, INC.

A DIVISION OF TRINITY INDUSTRIES
P.O. Box 568887 • 2525 Stemmons Freeway
Dallas, Texas 75356-8887 • (214) 634-2850

YOUR ORDER NUMBER	REFERENCE	CUSTOMER NO.	INVOICE NO.	INVOICE DATE	DATE SHIPPED
0099-002979	C139654	454634	819873	12/02/94	12/02/94

SOLD TO: M & M SUPPLY CO
PO BOX 548
DUNCAN OK 75533

SHIP TO: M & M SUPPLY
3923 OKLAHOMA AVE
WOODWARD, OK 73801

CERTIFIED TEST REPORT

3414 (R 12/93)

ITEM	QUANTITY	DESCRIPTION/SPECIFICATION		HEAT CODE
1	24	2 150 RF WN STD A105 26 / 494-3258	A105-93B/SA105 AS FORGED	0994EH
4	20	6 150 RF WN STD A105 32 / 62367	A105-93B/SA105 AS FORGED	0894CS
6	14	3 150 RF BLD A105 32 / 60633	A105-93B/SA105 AS FORGED	0694AM
8	8	6 150# RF BLIND A105 A105 32 / 62311	A105-93B/SA105 AS FORGED	0894BV

CHEMICAL ANALYSIS

HEAT CODE	C	Mn	P	S	Si	Cr	Mo	[illegible]	[illegible]	V	Nb		C.E. =
0994EH	.20	.83	.024	.027	.27	.11	.02	[illegible]	[illegible]	.00	.00		.40
0894CS	.21	.94	.009	.017	.23	.09	.02	[illegible]	[illegible]	.00	.00		.41
0694AM	.20	.87	.008	.016	.22	.08	.02	[illegible]	.08	.00	.00		.39
0894BV	.20	.89	.014	.013	.21	.10	.02	.22	.08	.00	.00		.39

PHYSICAL PROPERTIES					CHARPY RESULTS				
HEAT CODE	TENSILE * KSI	YIELD KSI	% Elong. IN 2"	Hardness HB	Size MM x 10 mm	Temp. °F	FOOT POUNDS	LATERAL EXPANSION	% SHEAR
0994EH	78.4 % R.A.	46.7 =65.0	29.0	135					
0894CS	78.4 % R.A.	44.5 =66.0	28.0	147					
0694AM	75.6 % R.A.	41.8 =60.0	33.0	141					
0894BV	76.0 % R.A.	44.4 =63.0	30.0	139					

*L = LONGITUDINAL, T = TRANSVERSE, R = ROUND, S = STRIP

HACKNEY is a domestic manufacturer, and these items conform to the following specifications as they apply:
FITTINGS: ASTM A234 WPB, ASME SA234 WPB, ANSI B16.9, B16.28 AND NACE MR01-75.
FLANGES: ASTM A105 AND A516-70, ASME SA105, ANSI B16.5, and NACE MR01-75. They also conform to the requirements of Parts 192 and 195, Title 49, Code of Federal
All [illegible] were heat treated as required by the applicable specification. [illegible] and 100% radiographically examined per Article 2, ASME Section V. All are in
[illegible]ions. All welded fittings are welded by certified welders to ASME Section [illegible] ASME code. Hackney weld caps meet ASME Division 1, Section VIII Pressure
[illegible] with the requirements of Paragraph UG-11, Section VIII Division [illegible] capable of passing a hydrostatic test compatible with their rating, and that the
Vessel Code Requirements, Paragraph UCS-79d. We certify these flanges and fittings [illegible] Hardness testing and stamping are per NACE MR01-75.
above figures are correct as contained in the records of the Company.

HACKNEY, INC.

A DIVISION OF TRINITY INDUSTRIES
P.O. Box 568887 • 2525 Stemmons Freeway
Dallas, Texas 75356-8887 • (214) 634-2850

YOUR ORDER NUMBER	REFERENCE	CUSTOMER NO.	INVOICE NO.	INVOICE DATE	DATE SHIPPED
0099-002979	C139654	454634	821782	12/16/94	12/16/94

D TO: M & M SUPPLY CO
PO BOX 548
DUNCAN OK 75533

SHIP TO: M & M SUPPLY
3923 OKLAHOMA AVE
WOODWARD, OK 73801

CERTIFIED TEST REPORT

114 (R 12/93)

EM	QUANTITY	DESCRIPTION/SPECIFICATION		HEAT CODE
2	30	3 150 RF WN STD A105 26 / 494-3217	A105-93B/SA105 AS FORGED	0994EX
3	8	4 150 RF WN STD A105 04 / 8495H2021	A105-93B/SA105 AS FORGED	1194BD
5	14	8 150 RF WN STD A105 32 / 63195	A105-93B/SA105 AS FORGED	1094BT
7	6	4 150 RF BLIND A105 26 / 494-3250	A105-93B/SA105 AS FORGED	1194DA

CHEMICAL ANALYSIS

CODE	C	Mn	P	S	Si	Cr	Mo	Cu	Ni	V	Nb		C.E.
0994EX	.19	.90	.018	.023	.26	.07	.01	.34	.09	.00	.00		.39
1194BD	.24	.98	.014	.025	.25	.09	.02	.27	.07	.00	.00		.45
1094BT	.19	.86	.007	.014	.23	.06	.02	.18	.08	.00	.00		.37
1194DA	.21	.91	.024	.024	.22	.14	.01	.28	.08	.00	.00		.42

PHYSICAL PROPERTIES / CHARPY RESULTS

HEAT CODE	TENSILE * KSI	YIELD KSI	% Elong. IN 2"	Hardness HB	Size MM x 10 mm	Temp. °F	FOOT POUNDS	LATERAL EXPANSION	% SHEAR
0994EX	73.5	41.0	32.0	141					
	% R.A.	=64.0							
1194BD	83.4	46.6	30.0	150					
	% R.A.	=60.0							
1094BT	75.4	42.8	34.0	132					
	% R.A.	=67.0							
1194DA	79.9	46.5	28.0	153					
	% R.A.	=65.0							

* = LONGITUDINAL, T = TRANSVERSE, R = ROUND, S = STRIP

HACKNEY is a domestic manufacturer, and these items conform to the following specifications as they apply:
FITTINGS: ASTM A234 WPB, ASME SA234 WPB, ANSI B16.9, B16.28, AND NACE MR01-75.
FLANGES: ASTM A105 AND A516-70, ASME SA105, ANSI B16.5, and NACE MR01-75.
All items were heat treated as required by the applicable specification. They also conform to the requirements of Parts 192 and 195, Title 49, Code of Federal e...ns. All welded fittings are welded by certified welders to ASME Section X, and 100% radiographically examined per Article 2, ASME Section V. All are in ... with the requirements of Paragraph UG-11, Section VII, Division 1 of the ASME code. Hackney weld caps meet ASME Division 1, Section VIII Pressure Code Requirements, Paragraph UCS-79d. We certify these flanges and fittings capable of passing a hydrostatic test compatible with their rating, and that the above figures are correct as contained in the records of the Company. Hardness testing and stamping are per NACE MR01-75.

HACKNEY, INC.

A DIVISION OF TRINITY INDUSTRIES
P.O. Box 568887 • 2525 Stemmons Freeway
Dallas, Texas 75356-8887 • (214) 634-2850

YOUR ORDER NUMBER	REFERENCE	CUSTOMER NO.	INVOICE NO.	INVOICE DATE	DATE SHIPPED
0099-002979	C139654	454634	824237	01/12/95	01/12/95

SOLD TO: M & M SUPPLY CO
PO BOX 548
DUNCAN OK 75533

SHIP TO: M & M SUPPLY
3923 OKLAHOMA AVE
WOODWARD, OK 73801

CERTIFIED TEST REPORT

3I 414 (R 12/93)

ITEM	QUANTITY	DESCRIPTION/SPECIFICATION		HEAT CODE
12	6	4 150 RF SO A105 26 / 494-1178	A105-93B/SA105 AS FORGED	0794BM
14	6	2 150 RF THRD A105 26 / 494-3254	A105-93B/SA105 AS FORGED	0994DX
15	12	1 150 RF SW STD A105 LS 25545	A105-90A/SA105 AS FORGED	1192DE
19	8	2 300 RF BLIND A105 26 / 494-3205	A105-93B/SA105 AS FORGED	0994DH

CHEMICAL ANALYSIS

CODE	C	Mn	P	S	Si	Cr	Mo	Cu	Ni	V	Nb		C.E.
0794BM	.25	.97	.016	.028	.22	.07	.02	.37	.09	.00	.00		.46
0994DX	.20	.87	.017	.026	.28	.08	.02	.29	.09	.00	.00		.39
1192DE	.18	.98	.011	.021	.23	.09	.01	.20	.08	.02	.02		.39
0994DH	.22	.86	.015	.024	.19	.06	.02	.23	.09	.00	.00		.40

PHYSICAL PROPERTIES / CHARPY RESULTS

HEAT CODE	TENSILE * KSI	YIELD KSI	% Elong. IN 2"	Hardness HB	Size MM x 10 mm	Temp. °F	FOOT POUNDS	LATERAL EXPANSION	% SHEAR
0794BM	88.2	54.8	27.0	165					
	% R.A.	=59.0							
0994DX	86.2	49.4	30.0	144					
	% R.A.	=61.0							
1192DE	86.2	55.6	26.0	156					
	% R.A.	=64.0							
0994DH	81.8	60.8	33.0	141					
	% R.A.	=64.0							

*L = LONGITUDINAL, T = TRANSVERSE, R = ROUND, S = STRIP

HACKNEY is a domestic manufacturer, and these items conform to the following specifications as they apply:
FITTINGS: ASTM A234 WPB, ASME SA234 WPB, ANSI B16.9, B16.28, AND NACE MR01-75.
FLANGES: ASTM A105 AND A516-70, ASME SA105, ANSI B16.5, and NACE MR01-75.
All items were heat treated as required by the applicable specification. They also conform to the requirements of Parts 192 and 195, Title 49, Code of Federal Regulations. All welded fittings are welded by certified welders to ASME Section X, and 100% radiographically examined per Article 2, ASME Section V. All are in accordance with the requirements of Paragraph UG-11, Section VII, Division 1 of the ASME code. Hackney weld caps meet ASME Division 1, Section VIII Pressure Vessel Code Requirements, Paragraph UCS-79d. We certify these flanges and fittings capable of passing a hydrostatic test compatible with their rating, and that the above figures are correct as contained in the records of the Company. Hardness testing and stamping are per NACE MR01-75.

HACKNEY, INC.

A DIVISION OF TRINITY INDUSTRIES
P.O. Box 568887 • 2525 Stemmons Freeway
Dallas, Texas 75356-8887 • (214) 634-2850

YOUR ORDER NUMBER	REFERENCE	CUSTOMER NO.	INVOICE NO.	INVOICE DATE	DATE [illegible]
0005-000190	C105278	454634	944862	04/15/93	04/15/[illegible]

SOLD TO: M & M SUPPLY,CO
PO BOX 548
DUNCAN,OK.75533

SHIP TO: M & M SUPPLY
2512 N. 4TH
ENID, OK 73701

CERTIFIED TEST REPORT

TRI 414 (R 8/91)

ITEM	QUANTITY	DESCRIPTION/SPECIFICATION		HEAT [illegible]
			A234-92A/SA234 WPB	AZAZ
6	2	10 STD WC A516-70 TUSCL 421C088	A234-92A/SA234 WPB	KWS1
7	4	3X2-1/2 STD CONC A106B USS L40421	STRESS RELIEVED AT 1200 F A234-92A/SA234 WPB	LAT1
8	8	4X2 STD CONC A106B USS X46453	STRESS RELIEVED AT 1200 F A234-92A/SA234 WPB	LA01
9	2	6X4 STD CONC A106B NSS FX0054	STRESS RELIEVED AT 1200 F	

CHEMICAL [illegible]

CODE	C	Mn	P	S	Si	Cr	Mo	Cu	Ni	V	[illegible]		CE
AZAZ	.26	1.12	.020	.010	.22	.03	.00	.01	.02	.00	.00		.46
KWS1	.18	1.02	.011	.004	.25	.05	.01	.15	.01	.00	.00		.37
LAT1	.17	.78	.010	.005	.23	.03	.01	.01	.01	.00	.00		.31
LA01	.15	.65	.008	.004	.22	.07	.02	.17	.08	.00	.00		.29

PHYSICAL PROPERTIES / CHARPY RESULTS

HEAT CODE	TENSILE * KSI	YIELD KSI	% Elong. IN 2"	Hard-ness HB	Size MM x 10 mm	Temp. °F	FOOT POUNDS	LATERAL EXPANSION	% SHEAR
AZAZ	85.0 T	58.8	33.0	197 MAX					
KWS1	72.8 L	47.2	31.0	130					
LAT1	76.9 L	49.1	31.0	115					
LA01	68.5 L	47.9	30.0	117					

*L = LONGITUDINAL, T = TRANSVERSE

AZAZ KWS1 LAT1 LA01 CONFORM TO THE REQUIREMENTS OF NACE MR0175-92

[illegible] were manufactured.

[illegible] items were heat treated in accordance with the requirements of the specification to which they were manufactured.

We certify that the products covered by this report comply with the applicable requirements of ASTM and/or ASME specifications, as noted for each item.

We hereby certify that the above figures are correct, as contained in the records of the Company.

[illegible signature]

HACKNEY, INC.
A DIVISION OF TRINITY INDUSTRIES
P.O. Box 568887 • 2525 Stemmons Freeway
Dallas, Texas 75356-8887 • (214) 634-2850

YOUR ORDER NUMBER	REFERENCE #	CUSTOMER NO.	INVOICE NO.	INVOICE DATE	DATE SHIPPED
0099-000662	C114322	454634	966462	09/22/93	09/22/93

SOLD TO: M & M SUPPLY.CO
PO.BOX 548
DUNCAN, OK 75533

SHIP TO: M & M SUPPLY
201 SE 3RD.
LINDSAY, OK 73052

CERTIFIED TEST REPORT

414 (R8/91)

ITEM	QUANTITY	DESCRIPTION/SPECIFICATION	HEAT CODE
9	12	8 STD WC A234-92A/SA234 WPB A516-70 TUSCL 5B72530	AZDF
10	8	3X2 STD CONC. A234-92A/SA234 WPB A106B 09 / L60626 STRESS RELIEVED AT 1200 F	LKE1
11	6	6X4 STD CONC. A234-92A/SA234 WPB A106B USS U42761 STRESS RELIEVED AT 1200 F	C59D
13	12	3 STD LR 90 A234-92A/SA234 WPB A106B 09 / L60626 STRESS RELIEVED AT 1200 F	LKE1

HEAT CODE	C	Mn	P	S	Si	Cr	Mo	Cu	Ni	V	Nb		C.E.
AZDF	.25	1.02	.019	.013	.21	.03	.00	.05	.03	.00	.00		.43
LKE1	.18	.80	.011	.006	.26	.04	.01	.02	.02	.00	.00		.33
C59D	.17	.77	.010	.008	.23	.03	.01	.01	.01	.00	.00		.31
LKE1	.18	.80	.011	.006	.26	.04	.01	.02	.02	.00	.00		.33

IMPACT RESULTS

HEAT CODE	TENSILE * KSI	[redacted]		Hardness HB	Size MM x 10 mm	Temp. °F	FOOT POUNDS	LATERAL EXPANSION	% SHEAR
AZDF	[redacted]			197 MAX					
LKE1	[redacted]			123					
C59D	[redacted]			118					
LKE1	[redacted]			123					

L = LONGITUDINAL, T = TRANSVERSE

LKE1 C59D LKE1 CONFORM TO THE REQUIREMENTS OF NACE MR0175-92

We certify that the products covered by this report comply with the requirements of the specification to which they were manufactured.
The items were heat treated in accordance with the applicable requirements of ASTM and/or ASME specifications, as noted for each item.
We certify that the products covered by this report comply with the applicable requirements ... the Company.
We hereby certify that the above figures are correct, as contained in the records of the Company.

[signature]

Secondary Containment Corrosion Protection

Tank Corrosion Protection

INTERIOR COATING SYSTEM

SURFACE PREPARATION

SSPC-SP 5 "WHITE METAL BLAST CLEANING," 2.0-3.0 MILS SURFACE PROFILE.

PRIME COAT

APPLY BY SPRAY TO ALL INTERIOR SURFACES, ONE COAT OF PLASITE 7156 HI-RESTANT HEAVY BUILD PROTECTIVE COATING, IVORY, AT A DRY FILM THICKNESS OF NOT LESS THAN 5.0 MILS. A MINIMUM DRYING TIME OF 12 HOURS AT 70° SHALL BE ALLOWED BEFORE APPLICATION OF THE FINISH COAT.

WELD AND SEAM STRIPE COAT

APPLY BY HIGH QUALITY BRUSH, ONE COAT OF PLASITE 7156 HI-RESISTANT HEAVY BUILD PROTECTIVE COATING, IVORY, TO ALL WELDS AND SEAMS.

FINISH COAT

APPLY BY SPRAY, TO ALL INTERIOR SURFACES, ONE FINISH COAT OF PLASITE 7156 HI-RESISTANT HEAVY BUILD PROTECTIVE COATING, LIGHT GRAY, AT A DRY FILM THICKNESS OF NOT LESS THAN 5.0 MILS. A MINIMUM DRYING TIME OF 7 DAYS AT 70° F SHALL ELAPSE AFTER COMPLETION OF THE INTERIOR PAINT SYSTEM BEFORE THE TANK CAN BE PLACED IN SERVICE.

TOTAL DRY FILM THICKNESS

THE TOTAL DRY FILM THICKNESS SHALL NOT BE LESS THAN 10.0 MILS. PER SSPC DRY FILM THICKNESS MEASURING STANDARD. ADDITIONAL FINISH COATS WILL BE APPLIED IN AREAS OF DEFICIENT THICKNESS.

EXTERIOR COATING SYSTEM

SURFACE PREPARATION

SSPC-SP10 "NEAR WHITE METAL BLAST CLEANING," 2.0-3.0 MILS SURFACE PROFILE.

PRIME COAT

APPLY BY SPRAY TO ALL EXTERIOR SURFACES. ONE COAT OF GLID-GUARD CORROSION RESISTANT H S EPOXY NO. 5466 SERIES, GRAY, AT A DRY FILM THICKNESS OF NOT LESS THAN 3.0 MILS.

PLASITE ®

TECHNICAL BULLETIN

7156
March 1993
(Replaces May 1985)

PLASITE 7156 HI-RESISTANT HEAVY BUILD PROTECTIVE COATING

TYPE: A water-resistant epoxy coating polymerized with an amine adduct-type curing agent.
INTENDED USE: Primarily as a tank lining for water, including low conductivity deionized or distilled water at elevated temperatures, as well as use with brines and petroleum processes. Designed and laboratory confirmed for immersion in demineralized water at 250°F.

FOR INDUSTRIAL USE ONLY!

GOVERNMENT AGENCY ACCEPTANCE: Meets the requirements of the U.S. Food and Drug Administration, 21 CFR 175.300.
Accepted by the U.S. Department of Agriculture for surfaces which contact potable water and for incidental food contact.
Accepted by the U.S. Environmental Protection Agency for surfaces which contact potable water.
NSF REQUIREMENT GUIDE - PLASITE 7156 is certified by the National Sanitation Foundation (NSF) to Standard 61 for potable water up to 180°F when the following requirements are met. PLASITE 71 Thinner, up to a maximum of 15%, must be used for thinning purposes. Prior to placing the lining in service it must be force cured at 200°F metal temperature for four hours.
CHEMICAL RESISTANCE: Excellent resistance to waters and brines at elevated temperatures. Refer to CHEMICAL RESISTANCE on Page 2.
TEMPERATURE RESISTANCE: Dry film basis is 400°F for short periods. Continuous immersion temperatures depend on particular reagent and temperatures.
SURFACE PREPARATION: Steel surfaces shall be prepared by blasting to white metal since this coating is intended for use in immersion service. Refer to Page 3 for details on SURFACE PREPARATION.
APPLICATION: PLASITE 7156 is formulated for use as a spray applied coating. Refer to SPRAY EQUIPMENT on Page 4.
COLORS: Ivory; Light gray. Special colors are available but may not be suitable for food service. Consult PLASITE Technical Service Department.
FILM THICKNESS PER COAT: A 5 to 6 mil film is produced in one multi-pass spray coat. A total film thickness of 10 to 12 mils is required for immersion service.
COVERAGE: 850 mil ft²/gallon ±2% (theoretical). For estimating purposes, 57 ft²/gallon will produce a 10 to 12 mil DFT film (20% loss included). Two multi-pass spray coats will produce the 10 to 12 mil DFT film recommended for immersion service.
DRYING TIME: Surface will normally be tack free in 2 hours at 70°F.
CURING TIME: 7 days at 70°F to 90°F; 20 days at 30°F to 50°F. Consult laboratory for possible difference in resistance of coating when curing at the lower temperatures. Refer to Page 2 for force curing.

PHYSICAL SPECIFICATIONS

PIGMENTS: Titanium dioxide, inerts and tinting colors.

SOLIDS: 74% ±2% by weight; 53% ±2% by volume.

POT LIFE: Approximately 8 to 10 hours at 70°F.

SHELF LIFE: 24 months at 70°F. Material in stock should be turned upside down every 3 months.

SPRAY VISCOSITY: At 70°F, 17 ±5 seconds Ford Cup #4.

SHIPPING WT.: Approximately 13.5 lbs./gallon.

***ABRASIVE RESISTANCE:** 75.3 milligrams loss average, 1000 cycles, Taber CS-17 Wheel, 1000 Gr. Wt. Ivory Color.

***SURFACE HARDNESS:** Konig Pendulum Hardness of 113 seconds; (Glass Standard = 250 seconds) ASTM Method D4366-84.

THERMAL SHOCK: Unaffected in 5 cycles, minus 70°F to plus 212°F.

GLOSS: 7.0 at 60°.

***NOTE:** Above tests were conducted on film cured at 150°F.

VOLATILE ORGANIC COMPOUNDS CONTENT

COLOR	COATING AS SUPPLIED (ASTM METHOD D2369) Lbs./Gal.	Grams/Liter	THINNED 10% BY VOLUME WITH PLASITE 71 THINNER *Lbs./Gal	*Grams/Liter
Ivory	3.06 ±2%	368 ±2%	3.39 ±2%	406 ±2%
Lt. Gray	3.12 ±2%	374 ±2%	3.45 ±2%	413 ±2%

*Determined theoretically by using ASTM Method test results.

WISCONSIN PROTECTIVE COATINGS CORP.
614 Elizabeth Street
P.O. Box 8147
Green Bay, WI 54308-8147
414-437-6561

Represented by:

ZONE OF USAGE

A ZONE: This would include immersion service for process and storage vessels. A film thickness of 10 to 12 mils required.

CHEMICAL RESISTANCE

The following list of laboratory tests is an indication of the range of chemical resistance. These tests consist of 1" × 5" mild steel test panels coated to a film thickness of 12 mils. The panels are one-half immersed in the solution at noted temperatures for a period of six months with no effect on the coating.

WATERS		ALKALIES		MISCELLANEOUS	
Demineralized	250°F	50% Sodium Hydroxide	150°F	50% Sodium Chlorate	150°F
Sea Water	212°F	50% Magnesium Hydroxide	100°F	Crude Oil	210°F
		25% Sodium Hydroxide	150°F	Ethylene Glycol	100°F
		10% Calcium Hydroxide	150°F		

NOTE: Although the chemical tests indicated show that PLASITE 7156 is unaffected by immersion as listed, it is not meant to imply an express guarantee in actual service. The service is dependent upon proper application and actual operating conditions and it is recommended that users confirm adaptability of the product for a specific use by their own tests. PLASITE 7156 is not suitable for service in corrosive acids or oxidizing service for continuous immersion.

THINNERS

The following thinners are recommended:

PLASITE 71 Thinner — a medium-fast thinner to be used under most conditions (above 50°F).

PLASITE 20 Thinner — a fast thinner to be used when applying at lower temperatures (below 50°F).

The amounts of thinner required will vary depending on air and surface temperatures and application equipment. Normal application temperatures and conditions will require addition of approximately 10% by volume with approximately 5% additional thinner added for each 5° of increased temperature. Airless spray equipment and above normal temperatures require additional thinning.

It is recommended that the amount of thinner included on each order amount to approximately 20% of the coating order.

PRIMERS

PLASITE 7104 inhibitive primer is available for use in special applications such as pre-priming of blasted steel surfaces prior to final fabrication or erection and prior to application of final topcoats. The propriety of such a system should be determined by consulting plant laboratory or by prior experience or testing.

PLASITE 7104 Primer is applied at a spreading rate of 206 ft²/gallon for a 3 mil DFT (20% loss included). The PLASITE 7156 Coating, for ZONE A Service, is normally intended for use as a self-priming system with a separate primer not required.

PLASITE 7104 Primer is NOT recommended for potable water service.

CURING

1. For immersion service, complete curing will normally take place in 7 days at 70°F, 14 days at 50°F, or 20 days at 30°F to 50°F. As ventilation and other factors affect the time/cure of coatings, additional time allowance is recommended at any temperature if cure time is questioned. When exposure is severe, force curing is recommended to obtain maximum resistance.

2. With adequate ventilation, when applying at temperatures between 30°F and 50°F, coating surfaces will normally be tack free in 16 to 24 hours; between 50°F and 70°F, 2 to 16 hours.

3. Force curing at elevated temperature is desirable for certain exposures. Where coating is to be subjected to immersion in taste sensitive solutions, it is recommended that the curing temperature be at 200°F for 4 hours. In order to ensure the complete removal of solvent and odor, force curing is recommended when coating is to be used in potable water and food material service.

4. Listed below are a few force curing schedules that may be used for time and work planning. When applying at temperatures of 30°F to 60°F, allow 16 to 24 hours air dry time prior to raising the metal temperature to the force curing temperature. When applying at temperatures above 60°F to 70°F, allow 2 to 5 hours air dry time. After the appropriate air dry period, raise metal temperature approximately 30°F each 30 minutes until the desired force curing metal temperature is reached.

METAL TEMPERATURE °F	CURING TIME	METAL TEMPERATURE °F	CURING TIME
130	18 Hours	170	3½ Hours
140	10 Hours	180	2½ Hours
150	6 Hours	190	2 Hours
160	4½ Hours	200	1¾ Hours

Final cure may be checked by exposing coated surface to ethyl alcohol for ten minutes. If no dissolving and only minor softening of film occurs, the curing can be considered complete. The film will reharden after exposure if cured.

SURFACE PREPARATION

STEEL

Immersion Service (Zone A as described under ZONE OF USAGE).

1. All sharp edges shall be ground to produce a radius and all imperfections, such as, skip welds, delaminations, scabs, slivers and slag, shall be corrected prior to abrasive blasting. Skip welds shall be welded solid.
2. Degrease surface prior to sandblasting. Organic solvents, alkaline solutions, steam, hot water with detergents or other systems that will completely remove dirt, oil, grease, etc. may be used. Used tanks may require additional decontamination.
3. The surface shall be blasted to an SSPC-SP5 or NACE No. 1 white metal surface using a Venturi blast nozzle supplied with 80 to 100 psi. An anchor pattern or "tooth" in the metal shall correspond to approximately 20 to 25% of the total film thickness of the coating.
4. Contaminated grit shall not be used for the finish work.
5. The blasting media used shall be a natural abrasive, or steel grit, or slag grit (similar or equal to BLACK BEAUTY®). These abrasives shall be sharp with a hard-cutting surface, properly graded, dry, and of best quality. The media shall be of proper size to obtain the specified anchor pattern and shall be free of objectionable contaminants.
6. The anchor pattern shall be sharp and no evidence of a polished surface is allowed.
7. Remove all traces of grit and dust with a vacuum cleaner or by brushing. Care must be taken to avoid contaminating the surface with fingerprints or from detrimental material on the workers' clothes.
8. The surface temperature shall be maintained at a minimum of 5° above the dew point to prevent oxidation of the surface. The coating shall be applied within the same day that the surface has been prepared.

nen utilized, inhibitive primer should be applied as soon as possible after surface preparation.

NOTE: The above specification numbers are from Steel Structure Painting Council Surface Preparation Specifications, 4516 Henry Street, Suite 301, Pittsburgh, PA 15213-3728 and National Association of Corrosion Engineers, P.O. Box 218340, Houston, TX 77218.

CONCRETE

Immersion Service (Zone A as described under ZONE OF USAGE).

All concrete surfaces require whip blasting with No. 50 grit for immersion service. Fully cured concrete must be blasted to provide a hard, firm, clean and neutral surface for coating. All concrete surfaces must be filled and sealed with PLASITE 9028M1 or PLASITE 9028M2, applied in accordance with appropriate PLASITE bulletin. All surface imperfections, "bug holes," etc. must be completely repaired before application of PLASITE 7156. PLASITE 9028M1 or PLASITE 9028M2 are not recommended for food or potable water service. Ref. Force Curing recommendation for taste sensitive solutions.

ALUMINUM

Surface shall be clean and grease free with a blast produced anchor pattern or "tooth" as described earlier under "STEEL." In addition, the blasted surface shall be given a chemical treatment such as:

ALODINE® 1200S available from
Parker & Amchem
32100 Stephenson Highway
Madison Heights, MI 48071
(800) 521-1355

IRIDITE® 14-2 produced by
Allied-Kelite Division of
Witco Corporation
2701 Lake Street
Melrose Park, IL 60160
(800) 323-9784

OAKITE® CRYSCOAT 747LTS Plus
OAKITE® CRYSCOAT ULTRASEAL
Produced by Oakite Products
50 Valley Road
Berkeley Heights, NJ 07922
(908) 464-6900
Canada: (416) 791-1628

EQUIPMENT

SPRAY APPLICATION

1. All spray equipment should be thoroughly cleaned and the hose, in particular, should be free of old paint film and other contaminants.
2. Use standard production type spray guns:

GUN	FLUID	AIR
DeVilbiss JGA-503	E	797
Binks #18	66-SS	63-PB
Graco P800	04	02

3. When airless spray equipment is used, the recommended liquid pressure is 1500 to 1800 psi with tip size from .015" to .021". Thinning requirements are more than for conventional spray.

BRUSH APPLICATION

A high quality brush should be used.

READ THIS NOTICE!!

SAFETY AND MISCELLANEOUS EQUIPMENT

1. For tank lining work, it is recommended that the operator provide himself with clean coveralls and rubber soled shoes and observe good personal hygiene. Certain personnel may be sensitive to various types of resins which may cause dermatitis.
2. THE SOLVENT IN THIS COATING IS FLAMMABLE AND CARE AS DEMANDED BY GOOD PRACTICE, OSHA, STATE AND LOCAL SAFETY CODES, ETC. MUST BE FOLLOWED CLOSELY. Keep away from heat, sparks and open flame and use necessary safety equipment, such as, air mask, explosion-proof electrical equipment, non-sparking tools and ladders, etc. Avoid contact with skin and breathing of vapor or spray mist. When working in tanks, rooms and other enclosed spaces, adequate ventilation must be provided. Refer to PLASITE Bulletin PA-3. Keep out of the reach of children.
3. CAUTION - Read and follow all caution statements on this product technical bulletin, material safety data sheet and container label for this product.

MIXING

The catalyst is in a separate container and measured for the coating unit supplied. Thoroughly mix the pigments. After the pigment and liquid is thoroughly mixed, add the measured liquid catalyst slowly and mix completely with the coating. The coating should stand approximately 30 minutes after the catalyst has been thoroughly mixed.

APPLICATION PROCEDURE

SPRAY GUN

1. Air supply shall be uncontaminated. Adjust air pressure to approximately 50 lbs. at the gun and provide 5 to 10 lbs. of pot pressure. Adjust spray gun by first opening liquid valve and then adjusting air valve to give an 8" to 12" wide spray pattern with best possible atomization.
2. Apply a "mist" bonding pass.
3. Allow to dry approximately one minute but not long enough to allow film to completely dry.
4. Apply crisscross multi-passes maintaining an even continuous wet appearing film. This technique will enable a 10 to 12 mil wet film (approximately 5 to 6 mils DFT) to be applied per multi-pass coat.
5. OVERCOAT TIME will vary both with temperature and ventilation. Will normally require 8 to 12 hours at 70°F for enclosed spaces with additional time needed if coating is being applied at lower temperatures. Remove all overspray by dry brushing or scraping if required.
6. By repeating Step No. 4 a homogeneous film of 10 to 12 mils is obtained.
7. Equipment must be thoroughly cleaned immediately after use with PLASITE thinner to prevent the setting of the coating.

NOTE: All welds, pits and rough metal areas should be coated by brush prior to spray application.

BRUSH APPLICATION

(Recommended for small areas and repairs only)

1. Apply a very light crisscross brush coat.
2. Allow to dry for approximately 5 minutes.
3. Apply a heavy coat using crisscross brush pattern. "Flow" the coating on rather than try to "brush out."
4. Allow to dry tack-free.
5. Repeat Steps 3 and 4 until sufficient film thickness is obtained. Normally a film thickness of 2½ to 3 mils can be obtained per coat by this method.

INSPECTION

Degree of surface preparation shall conform to appropriate specifications as outlined in SURFACE PREPARATION section. Film thickness of each coat and total dry film thickness of coating system shall be determined with a non-destructive magnetic gauge properly calibrated.

Refer to PLASITE Bulletin PA-3, Section 3, for inspection requirements.

This bulletin provides standard information on the coating and application procedure. Since varying conditions may not be covered, consult your local sales representative or PLASITE Technical Service Department for further information.

METRIC COMPARISONS

1 mil = .001" = 25.4 microns

1 U.S. gallon = 3.785 liters

1 sq. ft. × 0.0929 = sq. meters

$$°C = \frac{5\,(°F - 32)}{9}$$

Glidden

For Industrial Use and Professional Application Only
Rust Inhibitive Polyamide Epoxy Coating

GLID-GUARD® Corrosion Resistant HS Epoxy No. 5465 Series

For Interior-Exterior Metal

Read Label and Material Safety Data Sheet Prior to Use. DSF1-0690
See other cautions on last page.

PRODUCT DESCRIPTION

GLID-GUARD Corrosion Resistant HS Epoxy is a low VOC, high solids, two package polyamide epoxy coating intended for direct application to interior and exterior metal. It is rust inhibitive and resistant to moisture and many chemicals. The product's excellent penetrating properties result in superior adhesion.

This product is an excellent choice for application to metal when surface preparation is limited to Hand Tool or Power Tool Cleaning. It is also suitable for use as a high build intermediate coat in heavy-duty industrial systems and may be used as a topcoat when the color and sheen are acceptable.

Like most epoxy coatings, GLID-GUARD Corrosion Resistant HS Epoxy will chalk and lose gloss on exposure to direct sunlight but will maintain excellent film integrity and continue to provide excellent protection to the substrate.

PRODUCTS AVAILABLE

GLID-GUARD Corrosion Resistant HS Epoxy Red No. 5465 (Component A)
GLID-GUARD Corrosion Resistant HS Epoxy Gray No. 5466 (Component A)
GLID-GUARD Corrosion Resistant HS Epoxy White No. 5467 (Component A)
GLID-GUARD Corrosion Resistant HS Epoxy Aluminum Mastic No. 5468 (Component A)
GLID-GUARD Corrosion Resistant HS Epoxy Curing Agent No. 5469 (Component B)

NOTE: Refer to Protective Maintenance Coatings Data sheet Section 8 No. 29 for detailed information on Aluminum Mastic No. 5468.

TYPICAL USES

Ideal for use as a primer and intermediate build coat on storage tanks, structural steel, machinery and equipment in the food processing industries, chemical industries, petroleum refineries, paper mills, marine structures, mining industries, waste water treatment facilities, and general industrial buildings.

PRODUCT ADVANTAGES

- Low VOC
- Rust inhibitive
- Tolerates surface moisture during application
- Long term flexibility—does not become brittle with age
- Hard, tough film
- Free of toxic amine curing agents
- Excellent alkali and solvent resistance
- High film build
- Protection in fresh or salt water immersion
- Lead and chromate free
- Simple 1 to 1 mixing ratio

SERVICE CONDITIONS

Do not use for potable water or direct food contact service. Do not use on unprimed wood or unprimed gypsum wallboard. Do not use on surfaces that may be subjected to severe abrasion.

Will withstand 250°F. continuous and 300°F. intermittent dry heat. The color may change as these limits are approached, but the film will remain intact.

REGULATORY RESTRICTIONS

The application VOC of this product may be restricted by law in some locations. Application VOC is increased by thinning with solvent. If the application VOC is restricted to 420 gm/liter (3.5 lbs/gal.), thinning must not exceed 7% by volume (9 fl.oz./gal.) with GLID-GUARD Epoxy Solvent No. 5568. If the application VOC is restricted to 450 gm/liter (3.75 lbs./gal.) or higher or is not restricted, thinning with up to 10% (12 fl.oz./gal.) is permissible.

TECHNICAL DATA

All data shown is for a mixed (converted) gallon unless otherwise noted

*Product No.—5467/5469
Generic Type—Polyamide epoxy
Color—White
Gloss—Approximately 30 @ 60°
Percent Solids by Weight—71% ± 1%
Percent Solids by Volume—54% ± 1%
Theoretical Coverage per 1.0 dry mil (1.9 mils wet)—866 sq.ft./gallon
**Recommended Film Build/Coverage (theoretical, unreduced)
Minimum—3.0 mils dry (5.5 mils wet) 289 sq.ft./gallon
Typical—5.0 mils dry (9.5 mils wet) 173 sq.ft./gallon
Maximum—8.0 mils dry (15.0 mils wet) 108 sq.ft./gallon
(wet mil figures rounded to the nearest 0.5 mil)
When computing working coverage, allow for application losses, surface irregularities, any solvent addition, etc.
Percent Vehicle (Solids) by Weight—28% ± 1%
Percent Pigment by Weight—43% ± 1%
Percent Solvent by Weight—29% ± 1%
Viscosity—95-100 KU
Weight per Gallon—11.1 lbs.
Flash Point (Closed Cup)—Base No. 5467—46°F. Curing Agent No. 5469—43°F.
VOC—3.24 lbs/gallon (388 gm/liter) unreduced
3.48 lbs/gallon (417 gm/liter) reduced 7% by volume with No. 5568
3.56 lbs/gallon (427 gm/liter) reduced 10% by volume with No. 5568
Drying Time (70°F., 50% Relative Humidity)
Touch—1-2 hours
Handle—7 hours
Recoat—7 hours
Full Cure—7 days
Reduction Solvent—GLID-GUARD Epoxy Solvent No. 5568 (10% maximum)
Clean-Up Solvent—GLID-GUARD Epoxy Solvent No. 5568 or MEK
Type of Cure—Converted
Mixing Ratio (Base/Curing Agent) by Volume—1 to 1
Induction Before Use—30 minutes @ material temperatures >70°F.
60 minutes @ material temperatures 60°-70°F.
Pot Life—4 hours @ 70°F.
Tinting—DO NOT TINT

*Compositional data for other products in this series may differ slightly.
**As measured over the peaks of any surface projections or blast profile.

GLID-GUARD Corrosion Resistant HS Epoxy (Continued)

MATERIAL PREPARATION

Do not add unspecified curing agents or solvents or mix with other paints. Do not tint.

Thoroughly mix the selected GLID-GUARD Corrosion Resistant HS Epoxy (Component A) and Corrosion Resistant HS Epoxy Curing Agent No. 5469 (Component B) separately, then combine the two components in equal parts by volume using power agitation. If agitation equipment is not explosion proof, provide good ventilation to prevent build up of vapors. Allow the combined material to stand 30 minutes before use. Extend this induction (standing) time to 60 minutes if the surface or material temperature is 60°–70°F. After the induction period has elapsed, add up to 10% by volume GLID-GUARD Epoxy Solvent No. 5568 (12 fluid ounces per gallon of combined material) if necessary for application and mix thoroughly (see "Regulatory Restrictions" above). Pot life is 4 hours at 70°F., less at higher temperatures.

SURFACE PREPARATION

All surfaces should be clean, dry and free of all contaminants.

Metal Surfaces

Ferrous Metal

Surface preparation is dependent upon service conditions as follows:

TYPE A—AGGRESSIVELY CORROSIVE
This exposure is an area characterized by aggressive chemical fumes, mists or dusts or other chemical contaminants that combine with high humidity and condensed moisture to corrode zinc at rates greater than one mil per year. The need to limit air pollution and protect personnel generally confines chemical concentrations of such an aggressive nature to within a radius of about 50 yards from the source of contamination. For Type A environments and all immersion exposures, White Metal Blast Cleaning (SSPC-SP5-82 and SSPC-SP-COM) is recommended. For splash and spillage, Near-White Blast Cleaning (SSPC–SP10-82 and SSPC-SP-COM) is satisfactory.

TYPE C—CORROSIVE
This exposure is less destructive than Type A exposure and is characterized by moderately aggressive chemical fumes, mists, or dusts that combine with moisture and high humidity to corrode zinc at rates less than one mil per year. Type A exposure may, in many instances, become Type C exposure outside of a radius of about 50 yards from the source of contamination (or a limited further distance. For Type C environments, Near-White Blast Cleaning (SSPC-SP10-82 and SSPC-SP-COM) is recommended.

TYPE M—MODERATE
This exposure is generally outdoors and is characterized by normal atmospheric weathering and/or light or moderate concentrations of chemical fumes that combine with humidity and condensed moisture to corrode carbon steel at rates less than three mils per year. Zinc in this exposure is virtually free of corrosion. Light to moderate chemical fume concentrations in indoor areas without excessive humidity may produce similar conditions. For Type M environments, Commercial Blast Cleaning (SSPC-SP6-82 and SSPC-SP-COM) is recommended. Where exposure is normal weathering only, Brush-Off Blast Cleaning (SSPC-SP7-82 and SSPC-SP-COM), Power Tool Cleaning (SSPC-SP3-82 and SSPC-SP-COM), or Hand Tool Cleaning (SSPC-SP2-82 and SSPC-SP-COM) will provide excellent service.

TYPE P—PROTECTED (ARCHITECTURAL)
In this category, surfaces are generally indoors and are not subjected to high humidity or chemical contaminants that will attack paint or steel. For Type P environments, Brush-Off Blast Cleaning (SSPC-SP7-82 and SSPC-SP-COM), Power Tool Cleaning (SSPC-SP3-82 and SSPC-SP-COM), or Hand Tool Cleaning (SSPC-SP2-82 and SSPC-SP-COM) will provide the sound substrate needed for proper adhesion.

Galvanized and Aluminum

Sandblasting is unnecessary. Remove oil, grease, dirt, dust and chemical contaminants using the prescribed cleaning methods.

Poured Concrete

Verify that all surface projections have been leveled. Remove all oils, grease, dust, dirt and chemical contaminants with the prescribed cleaning methods. Remove weak or powdery surfaces by acid etching or brush abrasive blasting. Dull very smooth concrete by similar means. Prime with this product thinned 10% by volume with GLID-GUARD Epoxy Solvent No. 5568 (see "Regulatory Restrictions" above).

Previously Painted Surfaces

The performance of this coating over previously painted surfaces is directly influenced by the type, age and condition of the old finish. For best results in immersion situations, completely remove any old coating and prepare as for new surfaces. For non-immersion service, remove all blistered, loose or peeling old coating. Hard or glossy finishes should be dulled by sanding or other abrasive means. Apply to a test area; if wrinkling or lifting occurs after overnight drying, remove the old coating.

APPLICATION

Do not apply when air or substrate temperature is below 60°F.

For best appearance, primary application should be by airless or conventional spray. Use brush or roller application for small areas only—flow and leveling will be limited. Spray application is required to obtain 5.0 mils dry in a single coat. Application by brush or roller will limit the film thickness to 3.0-4.0 mils dry per coat.

SPRAY APPLICATION

Airless Spray

Glidden equipment is specified.
Gun: ASM 400 Fluid Tip: 315-619
Pump: GLIDDEN 500™, GLIDDEN 750™, GLIDDEN 750GE™, GLIDDEN FORMULA ONE™
Pressure: 2000-2500 psi
NOTE: All pumps must be kept well away from areas where vapors from this product may collect.

Conventional Spray

Gun: Binks Model 18, Binks 2001, or equivalent
Needle: Binks Model 63A or equivalent
Fluid Nozzle: Binks Modes 63PB or equivalent
Air Cap: Binks Model 63B or equivalent

COVERAGE

Typical coverage (calculated, unreduced) is 173 sq.ft./gallon at 5.0 mils dry (9.5 mils wet). Minimum film thickness is 3.0 mils dry (5.5 mils wet) 289 sq.ft./gallon, maximum is 8.0 mils dry (15.0 mils wet) 108 sq.ft./gallon. All wet mil figures are rounded to the nearest 0.5 mil. When computing working coverage, allow for application losses, surface irregularities, any solvent addition, etc.

DRYING

Dries to touch in 1-2 hours, to handle in 7 hours, to recoat in 7 hours, to full cure in 7 days at 70°F., 50% relative humidity. Allow longer drying times under cooler or more humid conditions.

CLEAN-UP

Clean all equipment immediately after use with GLID-GUARD Epoxy Solvent No. 5568 or methyl ethyl ketone.

TOPCOATS

SOLVENT EPOXY FINISHES
GLID-GUARD Corrosion Resistant HS Epoxy No. 5465/5469 series
GLID-GUARD Chemical Resistant Epoxy No. 5240/5242 series
GLID-GUARD High Solids Epoxy No. 5430/5434 series
GLID-GUARD® DURAMASTER™ High Solids Epoxy No. 5295/5299 series
GLID-GUARD® METALLITE™ High Build Epoxy No. 5475/5476
GLID-GUARD Cold Cure Epoxy No. 5281/5265
GLID-GUARD Coal Tar Epoxy No. 5270/5271
GLID-GUARD Hi-Build Coal Tar Epoxy No. 5273/5274
GLID-GUARD® GLID-TILE™ Epoxide No. 5550/5552 series
NU-PON® COTE Color Coat No. 7240/7200 series

WATER-BORNE EPOXY FINISHES
GLID-GUARD Acrylic Epoxy No. 5277/5278
GLID-GUARD Amine-Adduct Epoxy No. 5585/5586 series

POLYURETHANE FINISHES
GLID-THANE™ ONE Moisture Cured Polyurethane No. 6100 series
GLID-THANE II Acrylic Polyurethane No. 6200/6252 series
GLID-GUARD High Solids Acrylic/Polyester Urethane No. 5410/5414 series

SOLVENT VINYL FINISHES
GLID-GUARD Double Build Vinyl No. 5514
GLID-GUARD® VINYL-COTE™ High Build No. 5522

WATER-BORNE ACRYLIC FINISHES
LIFEMASTER™ PRO Hi Performance Acrylic No. 6900 series
LIFEMASTER PRO HB Acrylic No. 5440 series

Piping Corrosion Protection

The Sherwin-Williams Company
Cleveland, OH 44115

Kem Kromik Universal Metal Primer—B50Z Series

Description

Kem Kromik Universal Metal Primer is a low VOC, modified alkyd resin primer designed for use over iron and steel substrates. Can be used as a "universal" primer under high performance topcoats and is also suitable as a "barrier" coat over conventional coatings which would normally be attacked by strong solvents in high performance coatings.

Characteristics

Color: Brown, Off White, and Buff

Coverage:

Recommended: 204-273 sq. ft./gal. 6-8 mils wet; 3-4 mils dry

Theoretical, no loss: 818 sq. ft./ gal. @ 1.0 mil dry

Curing Mechanism: Oxidation

Drying Schedule: (temperature & humidity dependent)

@ 6 mils wet, 50% R. H. and:

	@ 40°F	@77°F	@110° F
To Touch:	2 hours	30 minutes	15 minutes
Tack Free:	2½ hours	1 hour	20 minutes
To Recoat with:			
alkyds	2½ hours	1 hour	45 minutes
epoxy	36 hours	16 hours	16 hours
urethane	36 hours	16 hours	16 hours

Finish: 0-10 units @ 85°

Flash Point: 80°F (Pensky-Martens Closed Cup)

Solvent: Xylene

Vehicle Type: Phenolic Alkyd

VOC: 415 grams/liter; 3.45 lbs./gal.

Volume Solids: 51 ± 2%

Weight Solids: 72 ± 2%

Weight per Gallon: 12.5 ± .35 lbs

Meets the performance requirements, not necessarily composition, of Federal Specification: TT-P-664D

Application

Application Conditions

Temperature (air, surface, material): ...... 40-120°F

(surface temp. at least 5°F above dew point)

Relative humidity: ...... 85% maximum.

Brush: No reduction required. Use a natural bristle brush.

Roller: No reduction required. Use a 3/8" woven nap with phenolic core.

Airless spray:

Pressure ...... 1800-3000 psi

Tip ...... .015" - .019"

Hose ...... 1/4" I.D.

Filter ...... 60 mesh

Reduction ...... normally no reduction required

Conventional spray:

Specifications

Substrate	Surface Preparation (See pages 2 through 5)
Steel	SSPC SP2/ SW-14

2 topcoats are recommended over all primers/substrates.

Suggested topcoats	Page
A-100 Exterior Latex Finishes	24-26
Corothane II Satin Polyurethane	32
DTM Acrylic Coatings	34
Heavy Duty Epoxy	49
Hi-Bild Aliphatic Polyurethane	50
Hi-Solids Polyurethane	53
Industrial Enamel	54
Industrial Enamel HS	55
Metalatex Semi-Gloss Coating	64
ProMar Interior & Exterior Alkyd & Latex Topcoats	73-95
Sher-Tile Epoxy	100
Silver-Brite Aluminum	102
Tile-Clad High Solids Epoxy	108
Water Based Catalyzed Epoxy	111

Performance Specifications

Physical Properties:

Abrasion Resistance (ASTM D4060, 1000 cycles) ...... 250 mg

Direct Impact (ASTM G14) ...... 70 inch lbs.

Dry Heat Resistance (ASTM D2485) ...... 200° F

Elcometer Adhesion (ASTM D4541) ...... 260 psi

Exterior Durability (with chalk) ...... Good

Flexibility (ASTM D522, 180° bend) ...... 1/4" mandrel

Moisture Condensation Resistance (ASTM D4585) ...... 500 hrs.

Pencil Hardness (ASTM D3363) ...... H

Salt Fog Resistance (ASTM B117) ...... 500 hours

Thermal Shock (ASTM D2246) ...... 5 cycles

Resistance Guide:

(Resistance to fumes, splash and spillage - not immersion-ASTM D3912).

Acid Salt Solutions ...... Moderate

Aliphatic Hydrocarbons ...... Moderate

Alkalies ...... Not recommended

Aromatic Hydrocarbon Solvents ...... Light

Chlorinated Solvents ...... Not recommended

Fresh Water ...... Moderate

Salt Water ...... Moderate

Glycol ethers, alcohols, formaldehyde ...... Moderate

Oils (cutting, vegetable, lubricating) ...... Severe

Organic Acids ...... Light

Oxygenated Solvents ...... Not recommended

STORAGE

Warning: All Dudick products classified by DOT labels as either white, yellow or red labels, must not be mixed or stored together as an explosive reaction can occur. All products should be stored in a cool, dry area away from open flames, sparks or other hazards.

When properly stored in their original, unopened containers, Primer 67/67C components have a one year shelf life.

SAFETY

M.S.D.S - Sheets must always be read before using products. Primer 67/67C are intended for application by experienced, professional personnel. Dudick Inc. can supply supervision to help determine that the surface has been properly prepared, the ingredients correctly mixed, and the materials properly and safely applied.

If materials are to be applied by your own personnel or by a third party contractor, please be sure that they are aware of the following safety precautions:

- Exposure to resins and hardeners through direct skin contact and/or inhalation may cause severe dermatitis reactions in some people. Cleanliness of the skin and clothing is critical and must be of paramount concern.

- Fumes are flammable and heavier than air. Proper ventilation should be maintained to minimize breathing of concentrated fumes.

- Suitable respirators should be used during application.

- Safety glasses, gloves, and suitable protective clothing must be worn at all times during application.

- If contact with hardeners occurs, remove any clothing involved and flush the skin with flowing water. Discard the clothing. Do not attempt to wash and reuse it. Primer liquids can be removed with S-10 Cleaning Solvent, MEK, or lacquer thinner. **DO NOT USE ACETONE.**

- Keep open flames and sparks away from the area where materials are being mixed and applied.

- If a rash occurs, remove the individual from the work area and seek a physician's care for dermatitis.

- In case of eye contact, flush with water for at least 15 minutes and consult a physician.

- If swallowed, do not induce vomiting; call a physician immediately.

Note:
Dudick Inc. ("Dudick") warrants all goods of its manufacture to be as represented in its catalogs and that the application of its products by its employees or sub-contractors shall be performed in a workmanlike manner. Dudick's obligation under this warranty shall be the repair to and replacement of any applications which its examination shall disclose to be defective. Dudick makes no warranty concerning the suitability of its product for application to any surface, it being understood that the goods have been selected and the application ordered by the purchaser. DUDICK INC. MAKES NO WARRANTY, EXPRESS OR IMPLIED, THAT THE GOODS SHALL BE MERCHANTABLE OR THAT THE GOODS ARE FIT FOR ANY PARTICULAR PURPOSE. THE WARRANTY OF REPAIR OR REPLACEMENT SET FORTH HEREIN IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES ARISING BY LAW OR OTHERWISE; AND DUDICK INC. SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DOWN TIME, DAMAGES TO PROPERTY OF THE PURCHASER OR OTHER PERSONS, OR DAMAGES FOR WHICH THE PURCHASER MAY BE LIABLE TO OTHER PERSONS, WHETHER OR NOT OCCASIONED BY DUDICK'S NEGLIGENCE. This warranty shall not be extended, altered or varied except by written instrument signed by Dudick and Purchaser.

Dudick Inc.

1818 Miller Parkway
Streetsboro, Ohio 44241

(216) 562-1970
(216) 562-7638 FAX

Primer 67/67C

100 % SOLIDS, MOISTURE-TOLERANT EPOXY PRIMER FOR STEEL AND CONCRETE 3-4 MILS (0.1 mm)

RECOMMENDED APPLICATIONS

Concrete Substrates
Steel Substrates
Primer for Epoxy and Urethane
Floor Toppings, Linings, Coatings and Grout

PHYSICAL PROPERTIES

Tensile Strength ASTM C-307	2,000 - 2,500 PSI
Tensile Elongation ASTM C-307	12-25 %
Adhesion to Concrete ASTM D-4541	Cohesive Failure of concrete
Adhesion to Steel ASTM D-4541	2,200-2,500 PSI
Electrical Properties NFPA #99, ASTM F-150	< 25,000 ohms

SPECIFICATIONS

Primer shall be 3-4 mils thick, 100% solids bisphenol A epoxy cured with an amine adduct as manufactured by Dudick Inc. Primer 67 shall be brush, roller or spray applied in accordance with the manufacturer's recommended practices. Primer 67C must be spray or roller applied.

PRIMER 67

Primer 67 is designed to prevent abrasive-blasted steel from developing rust bloom prior to the application of a Dudick coating or lining system. For maximum performance all steel surfaces should be primed, but primer may not be needed for mild, non-immersion service. Concrete, however, must always be primed to aid in the "wetting out" required for good adhesion.

PRIMER 67C - CONDUCTIVE PRIMER

Primer 67C is a 100% solids, two component epoxy primer designed to be used over concrete whenever the coating or lining system must be spark tested.

ESTIMATING QUANTITIES AND ORDER BILL OF MATERIAL

SQUARE FEET PER GALLON		
	CONCRETE	STEEL
Primer 67	150-200	250-300
Primer 67C	100-150	———

Quantities shown are for estimating purposes only. Actual field usage may vary. Primer 67/67C are available in 1 and 2 gallon units.

APPLICATION INSTRUCTIONS

SURFACE PREPARATION

Metal: Surfaces must be abrasive blasted to an appropriate finish.

Immersion and heavy spillage service: White Metal SSPC SP-5 or NACE #1, 3.0 mil minimum profile.

Heavy, non-immersion service (i.e. fumes and spillage): Near white SSPC SP-10 or NACE #2, 2.0 mil minimum profile.

Atmospheric service: Commercial SSPC SP-6 or NACE #3, 2.0 mil minimum profile.

Concrete: Concrete must be abrasive blasted or etched with muriatic acid (Solution of 1 part 20° Be HCl and 1 part water) to remove surface laitance and other contaminants. Concrete must be free of curing compounds and form release agents. Surface texture should be similar to 40-60 grit sandpaper. The prepared surface should have a minimum tensile strength of 250 PSI per ASTM D-4541.

All concrete substrates must be checked for moisture prior to product application using the Plastic Sheet Test, ASTM D-4263.

Additional surface preparation will be required if a 40-60 grit texture is not achieved and the surface laitance not completely removed after a single application of acid or with the first mechanical preparation procedure.

Abrasive blasting removes laitance, exposing honeycombs or voids beneath the surface which must be filled with Scratch Coat 100. (Refer to separate product bulletin)

APPLICATION SPECIFICATIONS

Substrate temperature for both concrete and metal must be between 50°F and 110°F.

Relative humidity must not exceed 90%.

Substrate temperature must be 5°F above the Dew Point.

PRIMER 67/67C MIX RATIOS:

<u>Primer 67</u>	
Component A	1 gal.
Component B	1 gal.
<u>Primer 67C</u>	
Component A	1 gal.
Component B	95 fl. oz.

*Pre-mix primer 67C Component A for 1-2 minutes to disperse the conductive fillers prior to adding the correct amount of Component B.

Primer 67C must be spray or roller applied. Use brush application for small touch-up or repair work only.

The pot life of the mixed Primer 67/67C will depend on the temperature. To prevent material waste and avoid damage to equipment, do not open and mix more material than can be used according to the following table:

PRIMER 67/ 67C POT LIFE

TEMPERATURE	POT LIFE
50°F	90 min.
75°F	60 min.
90°F	30 min.

At 75° F the pot life and thin film cure of Primer 67 can be decreased by the addition of Accelerator #1 as follows:

Ozs./Accelerator #1 per mixed gal. Primer 67	Pot Life	Thin Film Cure
3-4	36 min.	4 hrs.
6-7	15 min.	2 hrs.

Using 7 ounces of accelerator #1 per mixed gallon of Primer 67, the thin film cure @ 40° F is reduced to 8 hours.

PRIMING

Metal: Mix the pre-measured units of Component A with Component B. Prime all metal surfaces to be coated with Primer 67 at 3-4 mils WFT.

Concrete: Mix the pre-measured units of Component A with Component B. Prime all concrete surfaces to be coated with either Primer 67 or 67C at 3-4 mils WFT. The basecoat may be applied over primer that is "tacky". Do not allow the primer to puddle.

Important - With all epoxies after priming and before each additional coat, examine the surface for amine blush (oily film). If present, remove by washing with warm water and detergent.

Cure Cycle for Primer 67/67C:

Temperature	Minimum Recoat Time	Maximum Recoat Time
50°F	12 hrs.	8 Days
75°F	6-8 hrs.	5 Days
90°F	4-5 hrs.	3 Days

To optimize intercoat adhesion, we recommend application of the basecoat while the primer is tacky. If this is not possible, the above recoat times must be observed. Exposure of the primer to direct sunlight will considerably shorten the recoat times. If recommended recoat times are exceeded, consult a Dudick Representative; sanding or abrasive blasting may be required before the coating, lining or floor topping can be applied.

CLEANING

Use S-10 Cleaning Solvent to clean tools and equipment. **DO NOT USE ACETONE.**

SHIPPING

Primer 67/67C Component A's are non-regulated plastic liquids. Primer 67/67C Component B's are flammable corrosives with a flash point of 106°F (Setaflash) and carry both a red warning label and a black and white warning label. S-10 Cleaning Solvent is a flammable liquid with a flash point of 52°F (PMCC) and carries a red warning label.

Dudick Inc.

Dudick Incorporated
Corrosion-Proof Products
1818 South Wason Drive
Streetsboro, Ohio 44241
216-562-1970
FAX No. 216-562-7638

Protecto-Coat 200

ELASTOMERIC, SPRAY APPLIED, ENVIRONMENTALLY SAFE, URETHANE COATING. 40-60 MILS (1-1 1/2 mm)

Protecto-Coat 200 is a high solids aromatic polyurethane coating with superior elongation. It is especially suited to bridge cracks in concrete.

RECOMMENDED APPLICATIONS

- Secondary Containment Areas
- Process Floors
- Railroad Tank Cars
- Underground Pipes & Tanks - Exterior
- Thickener Tanks & Mechanisms
- Spent Liquor Storage Tanks
- Food Processing
- Pharmaceutical
- Breweries
- Structural Steel

CHEMICAL RESISTANCE

Protecto-Coat 200 provides a tough, durable surface and will withstand splash and spills of many inorganic and organic acids as well as alkalies. Also resistant to aliphatic solvents.

PHYSICAL PROPERTIES

Protecto-Coat 200	40 Mil Basecoat	20 Mil Topcoat
Tensile Strength (PSI) ASTM C307	2,400-2,600	2,200-2,500
Elongation*	225% to 250%	50 to 60%
Shore D Hardness	40-45	65-70
Abrasion Resistance CS 17 wheels/1000 cycles x 1000 gm load	10 mg weight loss	32 mg weight loss
Solids by Volume	80%	100%

*At 60% elongation the chemical resistant topcoat begins to surface crack while the basecoat will continue to elongate to 250% extension.

SPECIFICATIONS

Coating shall be 40-60 mils thick, 80-100% solids aromatic urethane resin, consisting of 2 basecoats and a topcoat of 20 mils each, manufactured by Dudick, Inc. Materials shall be brush-, roller- or spray- applied in accordance with manufacturer's recommended practices.

THE PROTECTO-COAT 200 SYSTEM

The Protecto-Coat 200 system uses a moisture tolerant primer and two or three coats of elastomeric thermosetting urethane resins to protect concrete and steel.

Primer 67 is designed to prevent abrasive-blasted steel from developing rust bloom prior to the application of a Protecto-Coat System. For maximum performance, all steel surfaces should be primed, but primer may not be needed for mild, non-immersion service. Concrete, however, must always be primed to aid in the "wetting out" required for good bonding.

Protecto-Coat 200 is applied in three coats by brush, roller or spray. The elastomeric basecoat is applied in two 25 mil applications to achieve a nominal 40 mils DFT. The chemical resistant topcoat is applied in a single 20 mil application. Total thickness shall be a nominal 60 mils.

Post-it™ brand fax transmittal memo 7671 | # of pages ▸

To Dominic Quivers	From Rolf
Co.	Co.
Dept.	Phone # Mid-America
Fax # 692-3592	Fax #

ESTIMATING QUANTITIES AND ORDER BILL OF MATERIAL

SQUARE FEET PER GALLON		
	CONCRETE	STEEL
Primer 67	150-200	250-300
Protecto-Coat 200		
2 Base Coats Actual 35-40 mil DFT	25	25
Top Coat Actual 15-20 mil DFT	60	60
S-10 Solvent	500	500

Quantities shown are for estimating purposes only. Actual field usage may vary.

APPLICATION INSTRUCTIONS

SURFACE PREPARATION

Metal: For immersion service, abrasive blast to a white metal finish and a 2-4 mils minimum profile according to SSPC 5 or NACE No. 1. For fume or splash service, abrasive blast to a near-white metal finish according to SSPC 10 or NACE No. 2. Atmospheric service: Commercial SSPC 6 or NACE No. 3.

Concrete: Concrete must be abrasive-blasted or etched with muriatic acid (solution of 1 part 20° Be HCl and 1 part water) to remove surface laitance and other contaminants. Concrete must be free of curing compounds and form release agents. Surface texture should be similar to 40-60 grit sandpaper. The prepared surface should have a tensile strength of between 250 and 300 PSI per ASTM D4541.

Additional surface preparation will be required if a 40-60 grit texture is not achieved and the surface laitance not completely removed after a single application of acid or with the first mechanical preparation procedure.

If, after abrasive blasting, honeycombs/voids appear on the concrete, these have to be filled with a suitable material. Contact a Dudick representative for this information.

Recommended application temperatures should be between 40°F and 90°F substrate temperature. Do not apply Protecto-Coat 200 over concrete exposed to direct sunlight during the warming trend of the concrete as measured by surface temperature. To do so may lead to blistering, pinholes, or wrinkling in the coating due to outgassing of air in the concrete and high substrate temperatures. Wait for a definite downturn or cooling trend within the concrete as again measured by surface temperature. If this is not possible consult a Dudick representative for alternatives such as double priming.

PRIMING

Metal: For maximum performance, prime all steel surfaces with Primer 67, mixed with appropriate amount of hardener to 3-4 mils. For mild non-immersion service, priming of steel may be omitted.

Concrete: Concrete must be primed to aid in the "wetting out" required for good bonding. Mix Component A with Component B in the premeasured units for 2-3 minutes and apply by brush, roller, or spray. We recommend the basecoat be applied over slightly tacky or tack-free primer. Do not allow the primer to puddle.

Protecto-Coat 200 <u>Mix Ratio:</u>

<u>Protecto-Coat 200 Basecoat</u>

Component A*	1 Gallon
Component B*	54 fl. ozs.

*Premeasured units by weight

<u>Protecto-Coat 200 Topcoat</u>

Protecto-Coat 200 Top Coat Comp. A*	1 Gal.
Component B*	54 fl. oz.

*Premeasured quantities by weight

BASECOAT

Add appropriate amount of hardener for each gallon of Protecto-Coat Liquid and mix thoroughly until uniform color is achieved. Apply a 25 mil wet (20 mil DFT) basecoat using spray, brush or roller. Allow basecoat application to cure to at least a "firm" or slightly "tacky" feel before applying the second 25 mil wet (20 mil DFT) basecoat. Brush or roller may require several coats to achieve desired thickness.

Horizontal surfaces may be basecoated in one application by applying 50 mils wet (40 mil DFT) in a single coat.

TOPCOAT

Add appropriate amount of hardener for each gallon of Protecto-Coat Liquid and mix thoroughly until a uniform color is achieved. Apply a 20-mil-thick topcoat using spray, brush or roller.

Cure Cycle for Protecto-Coat 200

TEMPERATURE	RECOAT TIME	CURE TIME
50°	48 Hrs.	96 Hrs.
70°	24 Hrs.	48 Hrs.
90°	16 Hrs.	36 Hrs.

If these recoat times are exceeded, consult a Dudick representative: sanding or abrasive blasting may be required before the next coat. Recoat times are dramatically reduced when the coating is exposed to direct sunlight.

Single Component Airless Spray Equipment — Graco King 45-to-1 spray pump or equivalent. Use Graco Golden Mastic Gun or Graco No. 207945 Gun with airless adapter equipped with a Reverse-A-Clean tip and a tip size between .035-.041. Spray hose should be 1/2" or 3/8" ID. Available inlet pressure must be a minimum of 100 psi.

Brush or roller application may require additional coats to meet specified dry film thickness.

Pot life of the opened and mixed Protecto-Coat 200 will depend on the temperature at the work site. To prevent material waste and avoid damage to equipment, do not open and mix more material than can be used according to the following table:

TEMPERATURE	POT LIFE
50°F	120 Min.
75°F	60 Min.
90°F	45 Min.

Do not attempt to store mixed material. Residual material should be properly disposed of at the end of each work period.

Where immersion service is required, spark test the coating with a 5,000 to 7,000 volt AC spark tester. Mark and repair all pinholes. Use Protecto-Coat liquid mixed with the appropriate amount of hardener. Retest only the repairs.

CLEANING

Use S-10 Solvent to clean tools and equipment.

SHIPPING

Protecto-Coat 200 Topcoat A and B and Protecto-Coat 200 Basecoat A are classified as plastic liquids and are non-regulated.

Protecto-Coat 200 Basecoat B is combustible. Primer 67 Component B is corrosive and carries a black and white warning label. Primer 67 Component A is classified as a plastic liquid and is nonregulated, while S-10 Cleaning Solvent is red label liquid with a flash point of 52°F (PMCC).

STORAGE

Warning: All Dudick products classified by DOT labels as either white, yellow or red labels must not be mixed or stored together as an explosive reaction may occur.

When stored in a cool and dry location, Protecto-Coat 200 ingredients have a one-year shelf life. Exposure to excessive heat may cause premature gelling and reduce working time.

SAFETY

M.S.D.S. - Sheets must always be read before using products. Protecto-Coat Systems are intended for application by experienced, professional personnel. Dudick Inc. can supply Protecto-Coat systems supervision to help determine that the surface has been properly prepared, the ingredients correctly mixed, and the materials properly and safely applied.

If Protecto-Coat materials are to be applied by your own personnel or by a third-party contractor, please be sure that they are aware of the following safety precautions:

• Exposure to resins and hardeners may cause severe dermatitis reactions in some people. Cleanliness of the skin and clothing is critical and must be of paramount concern.

• Safety glasses, gloves and suitable protective clothing must be worn at all times during application.

• Suitable respirators should be used.

• If contact with hardeners occurs, remove any clothing involved and wash the skin with large amounts of water. Discard the clothing. Do not attempt to wash and reuse it. Protecto-Coat liquid may be washed off with S-10 Cleaning Solvent, MEK liquid, or laquer thinner.

• Fumes are flammable and heavier than air. Proper ventilation should be maintained to minimize breathing of concentrated fumes.

• If a rash or dermatitis occurs, remove the individual from the work area and seek a physician's care for dermatitis.

• Keep open flames and sparks away from the area where toppings are being mixed and applied.

• In case of eye contact, wash with water for at least 15 minutes and consult a physician. If swallowed, do not induce vomiting: call a physician immediately.

Note:

Dudick Inc. ("Dudick") warrants all goods of its manufacture to be as represented in its catalogs and that the application of its products by its employees or sub-contractors shall be performed in a workmanlike manner. Dudick's obligation under this warranty shall be the repair to and replacement of any applications which its examination shall disclose to be defective. Dudick makes no warranty concerning the suitability of its product for application to any surface, it being the understood that the goods have been selected and the application ordered by the purchaser. DUDICK INC. MAKES NO WARRANTY, EXPRESS OR IMPLIED, THAT THE GOODS SHALL BE MERCHANTABLE OR THAT THE GOODS ARE FIT FOR ANY PARTICULAR PURPOSE. THE WARRANTY OF REPAIR OR REPLACEMENT SET FORTH HEREIN IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES ARISING BY LAW OR OTHERWISE; AND DUDICK INC. SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DOWN TIME, DAMAGES TO PROPERTY OF THE PURCHASER OR OTHER PERSONS, OR DAMAGES FOR WHICH THE PURCHASER MAY BE LIABLE TO OTHER PERSONS, WHETHER OR NOT OCCASIONED BY DUDICK'S NEGLIGENCE. This warranty shall not be extended, altered or varied except by written instrument signed by Dudick and Purchaser.

Waste Analysis

Treated Blowdown

ANACHEM INC.

8 Prestige Circle, Suite 104 • Allen, Texas 75002
214/727-9003 • FAX # 214/727-9686 • 1-800-966-1186

Customer Name: USPCI
Date Received: August 17, 1994 at 11:10:45
Date Reported: August 26, 1994
Submission #: 9408000203
Project: HEAT EXCHANGERS

SAMPLES The submission consisted of 1 sample with sample I.D. shown in the attached data table.

TESTS The sample listed in the attached result pages was analyzed for:

* ALKALINITY, TOTAL (EPA 310.1)
* ANION/CATION RATIO (CALCULATION)
* CALCIUM/Ca (EPA 215.1)
* CHLORIDE (EPA 300.6)
* CYANIDE, TOTAL (EPA 335.2)
* HARDNESS, TOTAL (BASED ON AAS/ICP)
* ICP SCAN (EPA 200.7)
* IRON/Fe (EPA 236.1)
* MAGNESIUM/Mg (EPA 242.1)
* MICROWAVE DIGESTION (EPA 3015)
* pH (EPA 150.1)
* POTASSIUM/K (EPA 200.7)
* SILICA (EPA 370.1)l
* SODIUM/Na (EPA 273.1)
* SPECIFIC CONDUCTANCE (EPA 120.1)
* SULFATE (EPA 375.4)
* TDS-TOTAL DISSOLVED SOLIDS (EPA 160.1)
* TSS-TOTAL SUSPENDED SOLIDS (EPA 160.2)

<u>Distribution Of Reports</u>
2-Bruce Patterson of USPCI
Ph. (405) 697-3500 Fax (405) 697-3592

Respectfully Submitted,
Anachem,Inc.

C E Newton

C.E. Newton, Ph.D.
Chemist

Submission #: 9408000203 lims

NOTE: Submitted material will be retained for 60 days unless notified or consumed in analysis. Material determined to be hazardous will be returned or a $20 disposal fee will be assessed. Our letters and reports are for the exclusive use of the client to whom they are addressed. The use of our name and reports must receive our prior written approval. Our letters and reports apply to the sample tested and/or inspected, and are not necessarily indicative of the qualitites of apparently identical or similar materials.

35372 to 35372

Client Name: USPCI
Submission #: 9408000203
Project Name: HEAT EXCHANGERS
Report Date: 08/26/94

Client Sample #: TREATED EXHAUST BLOWOFF
Laboratory ID #: 35372 Matrix: Liquid
Sample Container: 3xGallon Plastic
Sampling Location: Not listed on the chain of custody.
Sampling Date : Not listed on the chain of custody.
Temperature (Celcius):21

ALKALINITY, TOTAL (EPA 310.1)

Analyte	Results(mg/l)	Det.Limit
Total Alkalinity	7600	1

ANION/CATION RATIO (CALCULATION)

Analyte	Results(%)	Det.Limit
Anion/Cation Ratio	1.00	0

CALCIUM/Ca (EPA 215.1)

Analyte	Results(mg/l)	Det.Limit
Calcium	30.2	0.01

CHLORIDE (EPA 300.6)

Analyte	Results(mg/l)	Det.Limit
Chloride	145000	0.1

CYANIDE, TOTAL (EPA 335.2)

Analyte	Results(mg/l)	Det.Limit
Total Cyanide	23.9	0.20

NESS, TOTAL (BASED ON AAS/ICP)

uyte	Results(mg/l)	Det.Limit
rdness, Calculated	1500	

ICP SCAN (EPA 200.7)

Analyte	Results(mg/l)	Det.Limit
Silver	<0.0120	0.0120
Cadmium	0.072	0.0014
Chromium	0.112	0.0146
Copper	0.286	0.0046
Cobalt	1.38	0.0028
Lead	0.362	0.042
Manganese	0.034	0.0004
Nickel	0.925	0.0049
Antimony	<0.0246	0.0246
Thallium	0.286	0.056
Zinc	0.031	0.0031
Arsenic	32.6	0.044
Selenium	2.61	0.026
Aluminum	2.96	0.107
Barium	0.152	0.045
Beryllium	<0.0011	0.0011
Molybdenum	31.2	0.0069
Tin	<0.023	0.023
Titanium	<0.017	0.017
Vandium	0.139	0.0037
Silicon	4.09	0.015
Strontium	1.33	0.0013
Lithium	12	0.001

IRON/Fe (EPA 236.1)

	Results(mg/l)	Det.Limit
	5.09	0.03

MAGNESIUM/Mg (EPA 242.1)

Analyte	Results(mg/l)	Det.Limit
Magnesium	31.7	0.01

Client Name: USPCI
Submission #: 9408000203
Project Name: HEAT EXCHANGERS
Report Date: 08/26/94

pH (EPA 150.1)	Results(---)	Det.Limit
Analyte		
pH For Liquid	7.5	0

POTASSIUM/K (EPA 200.7)	Results(mg/l)	Det.Limit
Analyte		
Potassium	12300	0.010

SILICA (EPA 370.1)l	Results(mg/l)	Det.Limit
Analyte		
Silicon Dioxide/Silica	100	2

SODIUM/Na (EPA 273.1)	Results(mg/l)	Det.Limit
Analyte		
Sodium	105000	0.01

SPECIFIC CONDUCTANCE (EPA 120.1)	Results(umhos/cm	Det.Limit
Analyte		
Specific Conductance	78900	1

SULFATE (EPA 375.4)	Results(mg/l)	Det.Limit
Analyte		
Sulfate	30200	1

TDS-TOTAL DISSOLVED SOLIDS (EPA 160.1)	Results(mg/l)	Det.Limit
Analyte		
Total Dissolved Solids	299000	1

TOTAL SUSPENDED SOLIDS (EPA 160.2)	Results(mg/l)	Det.Limit
Analyte		
Total Suspended Solids	1440	1

Project: Heat Exchangers

Report to: USPCI
Lab Number: 9408000203
Page 4 of 4

QUALITY CONTROL DATA

ANALYTE	DATE ANALYZED	SPIKE VOL	STAND. DEV.	COEFF. OF VAR %	REC1/%	REC2/%
Hardness, Calc.	8/19/94	----	0	0	96	----
Total Alkalinity	8/19/94	----	5.7	0.7	100	----
Silica	8/25/94	----	0	0	100	----
Sulfate	8/19/94	----	0.31	1.2	100	----
Chloride	8/25.04	----	178	8	100	----
T.S.S.	8/18/94	----	181	10	99	98
Total Cyanide	8/25/94	----	0	0	109	----

Standard Deviation = (x1-x2)/1.414
Coefficient of Variability % = (S.D./Avg.) X 100
Recovery % = [(spiked-unspiked)/expected] X 100

ICP SCAN INFORMATION

Note: *ICP scans are very general in nature and do not include precise calibration or quality control. The process is intended as a screening procedure to identify very high metal concentrations.*

Report to: USPCI
Lab Number: 9407000227
Page 4 of 4

Project: Heat Exchangers

QUALITY CONTROL DATA

ANALYTE	DATE ANALYZED	SPIKE VOL	STAND. DEV.	COEFF. OF VAR %	REC1/%	REC2/%
Mercury	7/20/94	---	0.141	2.0	102	99
Total Alkalinity	7/26/94	---	0	0	100	---
T.D.S.	7/28/94	995	304	0.1	96	96
Silicon Dioxide/ Silica	8/1/94	---	0	0	100	---
Sulfate	8/1/94	---	5	2.4	99	---
Chloride	7/26/94	500	2.1	1.1	100	99
Hardness, Calcium	8/1/94	---	±4.2	1.1	110	100
T.S.S.	7/21/94	298	0.7	0	98	95

Standard Deviation = (x1-x2)/1.414
Coefficient of Variability % = (S.D./Avg.) X 100
Recovery % = [(spiked-unspiked)/expected] X 100

ICP SCAN INFORMATION

Note: *ICP scans are very general in nature and do not include precise calibration or quality control. The process is intended as a screening procedure to identify very high metal concentrations.*

Evaporator Blowdown

ient Name: USPCI
·bmission# : 9407000227
: ·t Name: HEAT EXCHANGERS
: Date: 08/04/94

ient Sample #: EV #1

iboratory ID #:	33964 *Matrix:* Liquid
imple Container:	2 Liter Plastic Bottle
impling Location:	Not listed on the chain of custody.
impling Date :	Not listed on the chain of custody.

:P SCAN (EPA 6010)

nalyte	Results(mg/l)	Det.Limit
ilver	333	
alcium	2.4 –	
admium	0.166	
hromium	0.514	
opper	1.76	
obalt	97.6	
:on	12600	
otassium	0.242	
ead	41.7	
fagnesium	0.264	
fanganese	136000	
odium	36.4	
lickel	0.336	
ntimony	0.198	
'hallium	0.264	
inc	52.2	
rsenic	4.5	
elenium		
luminum		
Barium		
··llium	67.2	
·enum		
Titanium	3.1	
Vandium		
Silicon	1	
Strontium	22.4	
Lithium		

MERCURY DIGESTION (EPA 7470)
Date of Mercury Digestion:07/20/94

MERCURY / Hg BY COLD VAPOR (EPA 245.1)

Analyte	Results(mg/l)	Det.Limit
Mercury	0.002	

Client Sample #: EV #2

Laboratory ID #:	33965 *Matrix:* Liquid
Sample Container:	2x2Liter Plastic Bottle
Sampling Location:	Not listed on the chain of custody.
Sampling Date :	Not listed on the chain of custody.

ALKALINITY, TOTAL (EPA 310.1)

Analyte	Results(mg/l)	Det.Limit
Total Alkalinity	18900	1

ANION / CATION RATIO (CALCULATION)

Analyte	Results()	Det.Limit
Anion/Cation Ratio	1.08	0

BICARBONATE ALKALINITY (EPA 310.1)

Analyte	Results(mg/l)	Det.Limit
··onate Alkalinity	23100	1

CALCIUM / Ca (EPA 200.7)

Analyte	Results(mg/l)	Det.Limit
Calcium	735 –	0.001

Name: USPCI
ission# : 9407000227
Name: HEAT EXCHANGERS
Date: 08/04/94

	Results	Det.Limit
ATE ALKALINITY (EPA 310.1)	Results(mg/l)	Det.Limit
lyte		
bonate Alkalinity	<1	1
LORIDE (EPA 300.6)	Results(mg/l)	Det.Limit
alyte		
loride	176000	0.1
ANIDE, TOTAL (EPA 335.2)	Results(mg/l)	Det.Limit
alyte		
al Cyanide	<0.02	0.02
ON/Fe (EPA 200.7)	Results(mg/l)	Det.Limit
alyte		
n	112	0.013
AGNESIUM/Mg (EPA 200.7)	Results(mg/l)	Det.Limit
alyte		
agnesium	222	0.030
I (EPA 150.1)	Results(----)	Det.Limit
alyte		
I For Liquid	13	0
OTASSIUM/K (EPA 200.7)	Results(mg/l)	Det.Limit
alyte		
tassium	17400	0.010
EPA 370.1)	Results(mg/l)	Det.Limit
ioxide/Silica	400	2
ODIUM/Na (EPA 200.7)	Results(mg/l)	Det.Limit
nalyte		
odium	150000	0.001
PECIFIC CONDUCTANCE (EPA 120.1)	Results(umhos/cm	Det.Limit
nalyte		
pecific Conductance	840000	1

THIS IS A CALCULATED VALUE; THE MATRIX OF THE SAMPLE PRECLUDED THE USE OF A CONDUCTIVITY PROBE DUE TO OILY COATING; THE CALCULATED VALUE ASSUMES INFINITE DILUTION OF THE SAMPLE.)

	Results	Det.Limit
SPECIFIC GRAVITY (USP 841)	Results()	Det.Limit
Analyte		
Specific Gravity	1.31	1
SULFATE (EPA 375.4)	Results(mg/l)	Det.Limit
Analyte		
Sulfate	55300	1
TDS-TOTAL DISSOLVED SOLIDS (EPA 160.1)	Results(mg/l)	Det.Limit
Analyte		
Total Dissolved Solids	417000	1
TSS-TOTAL SUSPENDED SOLIDS (EPA 160.2)	Results(mg/l)	Det.Limit
Analyte		
pended Solids	6780	1

port to: USPCI
Number: 9407000227
Page 4 of 4

Project: Heat Exchangers

QUALITY CONTROL DATA

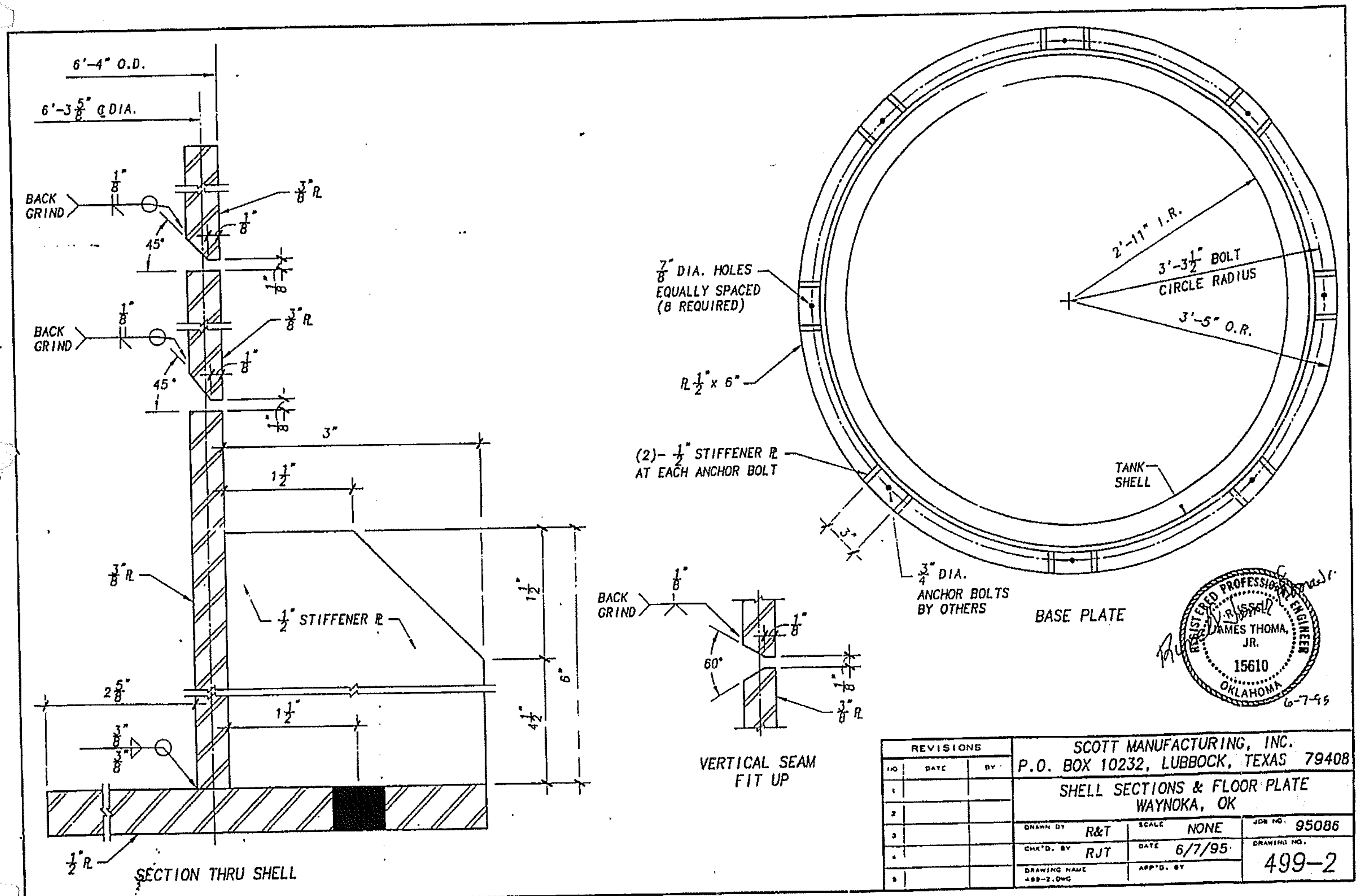
ANALYTE	DATE ANALYZED	SPIKE VOL	STAND. DEV.	COEFF. OF VAR %	REC1/%	REC2/%
Mercury	7/20/94	---	0.141	2.0	102	99
Total Alkalinity	7/26/94	---	0	0	100	---
T.D.S.	7/28/94	995	304	0.1	96	96
Silicon Dioxide/ Silica	8/1/94	---	0	0	100	---
Sulfate	8/1/94	---	5	2.4	99	---
Chloride	7/26/94	500	2.1	1.1	100	99
Hardness, Calcium	8/1/94	---	±4.2	1.1	110	100
T.S.S.	7/21/94	298	0.7	0	98	95

Standard Deviation = (x1-x2)/1.414
Coefficient of Variability % = (S.D./Avg.) X 100
overy % = [(spiked-unspiked)/expected] X 100

ICP SCAN INFORMATION

Note: *ICP scans are very general in nature and do not include precise calibration or quality control. The process is intended as a screening procedure to identify very high metal concentrations.*

Tank Drawings



REVISIONS		
NO	DATE	BY
1		
2		
3		
4		
5		

SCOTT MANUFACTURING, INC.
P.O. BOX 10232, LUBBOCK, TEXAS 79408

SHELL SECTIONS & FLOOR PLATE
WAYNOKA, OK

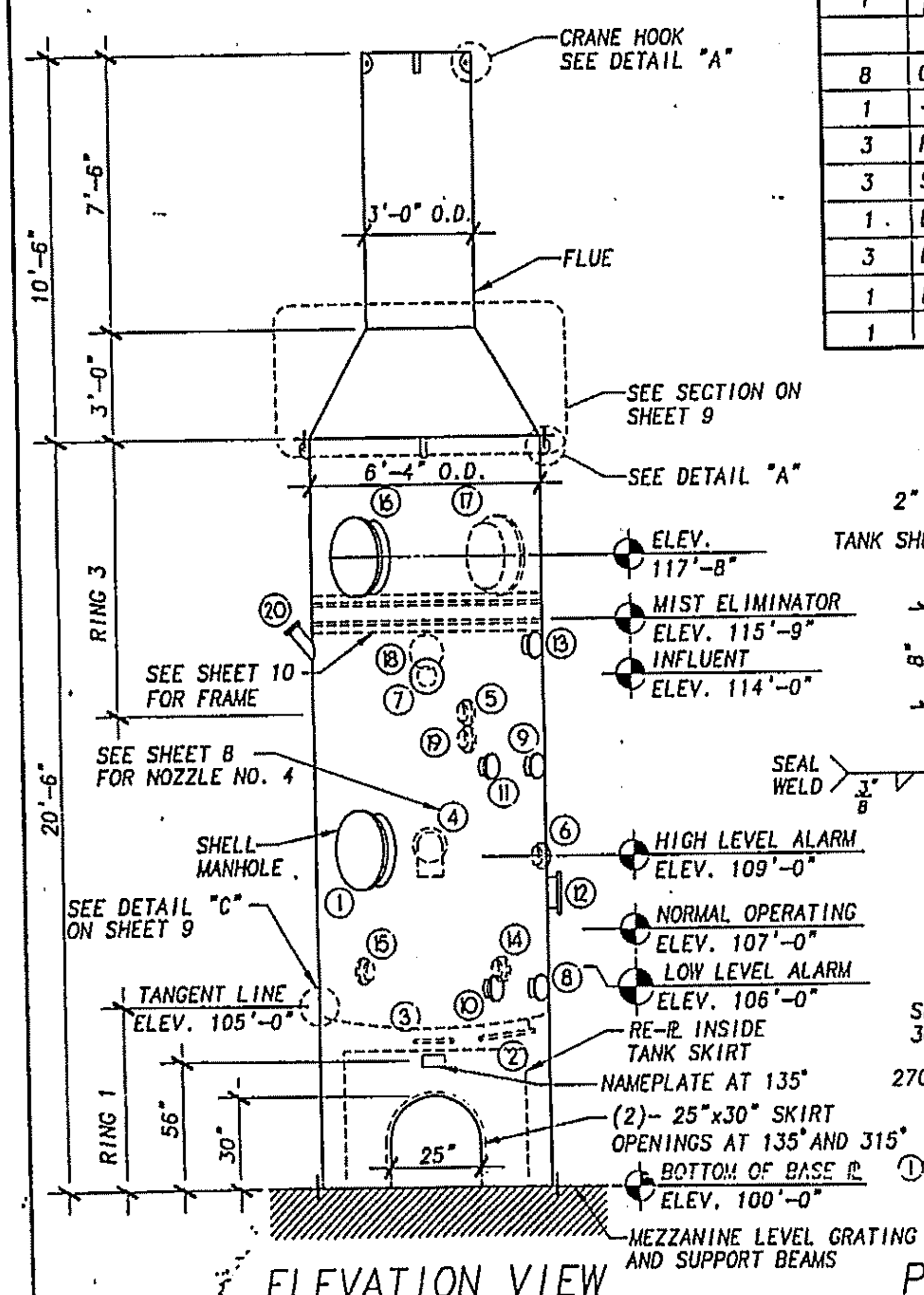
DRAWN BY R&T	SCALE NONE	JOB NO. 95086	
CHK'D. BY RJT	DATE 6/7/95	DRAWING NO. 499-2	
DRAWING NAME 499-2.DWG	APP'D. BY		

NOTE: SEE SHEET 2 FOR HORIZONTAL AND VERTICAL SHELL SEAM FIT UP AND WELDING

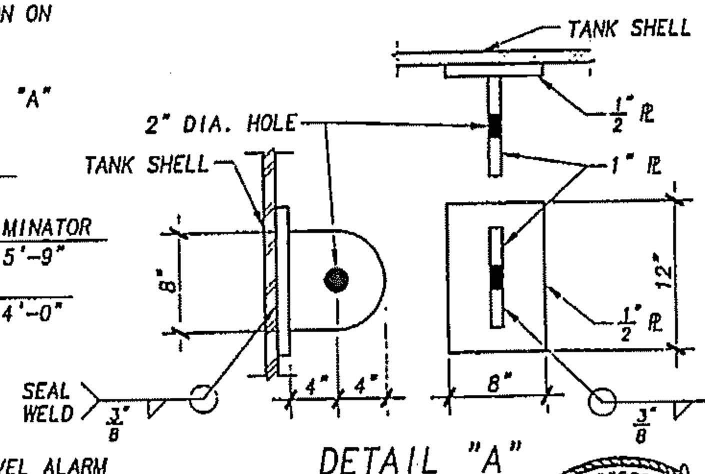
QTY.	ITEM	DWG. NO.
3	SHELL PL	1
1	1/4" THICK FLUE W/ 2" INSUL.	1
1	3/8 x75 1/4 O.D. FLANGED & DISHED HEAD, STANDARD TYPE, A516 STEEL	1
8	CRANE HOOKS	1
1	1/2" BASE PLATE	2
3	REINFORCING PL (RE-PL)	3
3	SHELL MANHOLE – 30"ø	4
1	BOTTOM MANHOLE – 20"ø	5
3	DAVIT	6
1	NAME PLATE & BRACKET	7
1	INFLUENT INTERNAL DETAIL	8

NOZZLE NO.	SIZE	LOCATION	ORIENTATION TO NORTH	DIST. FROM CENTER OF TANK OR ABOVE FLOOR ELEVATION	DESCRIPTION
1	30"	SIDEWALL	225°	9'-3"	MANWAY
2 +	20"	BOTTOM	135°	1'-9"	MANWAY
3	8"	BOTTOM	180°	CENTER	EFFLUENT
4	4"	SIDEWALL	0°	9'-4"	OVERFLOW
5	3"	SIDEWALL	22.5°	15'-6"	LEVEL GAUGE (FOAM DETECTOR)
6	3"	SIDEWALL	67.5°	9'-0"	HIGH LEVEL ALARM
7	8"	SIDEWALL	180°	14'-0"	INFLUENT
8	3"	SIDEWALL	112.5°	5'-6"	LEVEL GAUGE
9 **	3"	SIDEWALL	112.5°	11'-6"	LEVEL GAUGE
10	2"	SIDEWALL	157.5°	5'-6"	SIGHT GLASS
11 **	2"	SIDEWALL	157.5°	11'-6"	SIGHT GLASS
12	3"	SIDEWALL	90°	8'-0"	FUTURE
13 **	3"	SIDEWALL	112.5°	15'-6"	PRESS. GAUGE
14	3"	SIDEWALL	67.5°	6'-0"	LOW LEVEL ALARM
15	3"	SIDEWALL	315°	6'-0"	FUTURE
16 *	30"	SIDEWALL	225°	17'-8"	MANWAY
17 *	30"	SIDEWALL	45°	17'-8"	MANWAY
18 **	4"	SIDEWALL	0°	15'-4"	OVERFLOW
19	3"	SIDEWALL	22.5°	13'-6"	FUTURE
20	10"	SIDEWALL	270°	15'-0"	VIEWPORT

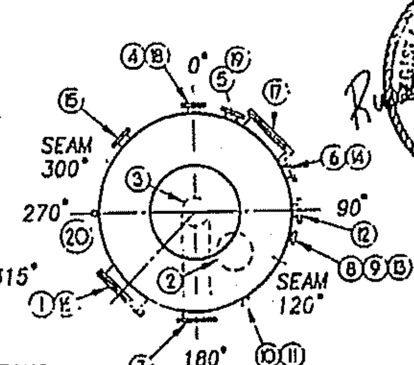
* FABRICATOR TO VERIFY LOCATION WITH USPCI TO AVOID PIPING INTERFERENCE.
+ HINGE BOTTOM MANWAY TO ALLOW COVER PLATE TO SWING OPEN TOWARD THE TANK SHELL AWAY FROM THE TANK CENTER.
** PROVIDE A SPLASH DEFLECTOR PER SHEET 8



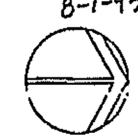
ELEVATION VIEW



DETAIL "A"



PLAN ORIENTATION



NORTH

8-1-95

SHELL PL SCHEDULE

RING NO.	THICK.*	HEIGHT	NO. OF SHEETS PER RING AT LENGTH
1	3/8"	60"	1 AT 237 1/2"
2	3/8"	96"	1 AT 237 1/2"
3	3/8"	90"	1 AT 237 1/2"

* 1/8" CORROSION ALLOWANCE ADDED

REVISIONS		
NO	DATE	BY
1	6/23/95	RJT
2	8/1/95	RJT
3		
4		
5		

SCOTT MANUFACTURING, INC.
P.O. BOX 10232, LUBBOCK, TEXAS 79408

EVAPORATOR FLASH TANK NO. 3
USPCI, WAYNOKA, OK

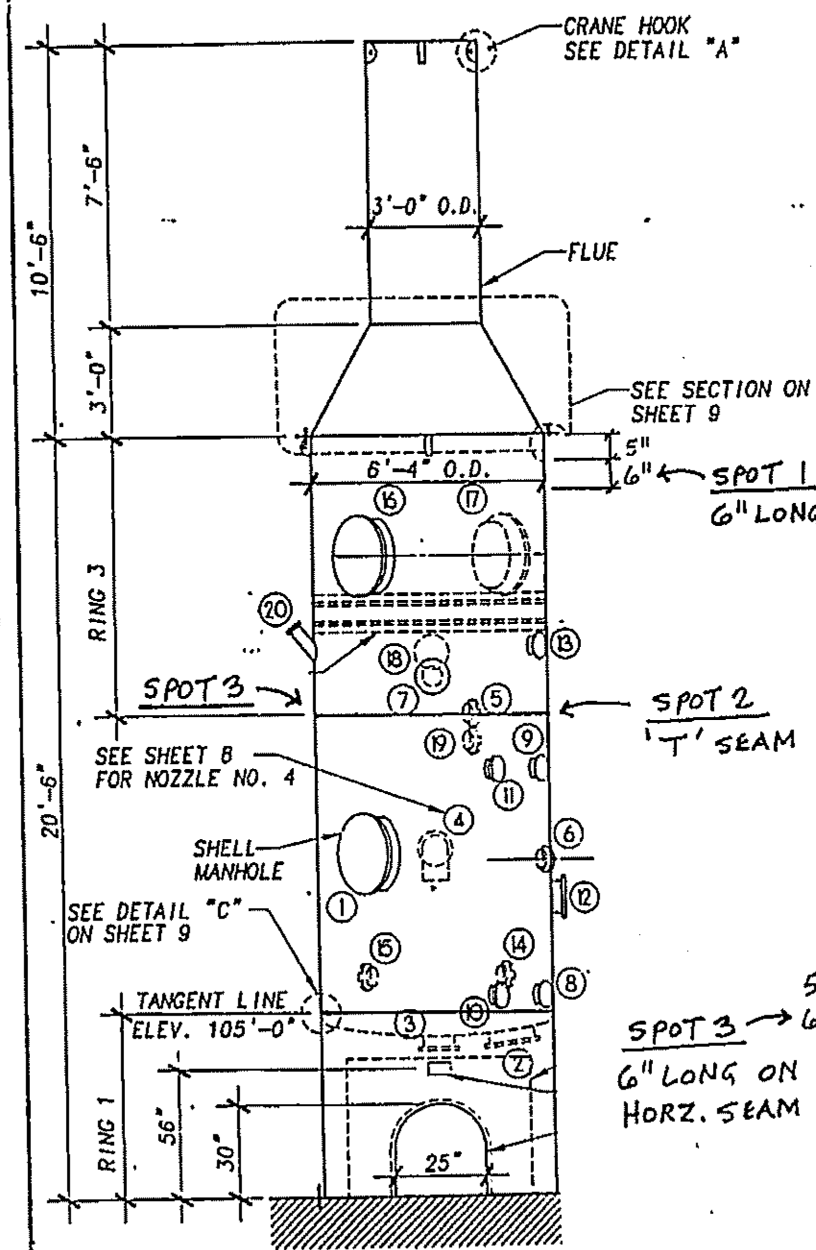
DRAWN BY R&T	SCALE NONE	JOB NO. 95026	
CHK'D. BY RJT	DATE 6/7/95	DRAWING NO. 499-1	
DRAWING NAME 499-1.DWG	APP'D. BY		

NOTE: SEE SHEET 2 FOR HORIZONTAL AND VERTICAL SHELL SEAM FIT UP AND WELDING

QTY.	ITEM	DWG. NO.
3	SHELL PL	1
1	$\frac{1}{4}$ THICK FLUE W/ 2" INSUL.	1
1	$\frac{3}{8}$ x75 $\frac{1}{2}$ O.D. FLANGED & DISHED HEAD, STANDARD TYPE, A516 STEEL	1
8	CRANE HOOKS	1
1	$\frac{1}{2}$ BASE PLATE	2
3	REINFORCING PL (RE-PL)	3
3	SHELL MANHOLE - 30"ø	4
1	BOTTOM MANHOLE - 20"ø	5
3	DAVIT	6
1	NAME PLATE & BRACKET	7
1	INFLUENT INTERNAL DETAIL	8

NOZZLE NO.	SIZE	LOCATION	ORIENTATION TO NORTH	DIST. FROM CENTER OF TANK OR ABOVE FLOOR ELEVATION	DESCRIPTION
1	30"	SIDEWALL	225°	9'-3"	MANWAY
2 +	20"	BOTTOM	135°	1'-9"	MANWAY
3	8"	BOTTOM	180°	CENTER	EFFLUENT
4	4"	SIDEWALL	0°	9'-4"	OVERFLOW
5	3"	SIDEWALL	22.5°	15'-6"	LEVEL GAUGE (FOAM DETECTOR)
6	3"	SIDEWALL	67.5°	9'-0"	HIGH LEVEL ALARM
7	8"	SIDEWALL	180°	14'-0"	INFLUENT
8	3"	SIDEWALL	112.5°	5'-6"	LEVEL GAUGE
9 **	3"	SIDEWALL	112.5°	11'-6"	LEVEL GAUGE
10	2"	SIDEWALL	157.5°	5'-6"	SIGHT GLASS
11**	2"	SIDEWALL	157.5°	11'-6"	SIGHT GLASS
12	3"	SIDEWALL	90°	8'-0"	FUTURE
13**	3"	SIDEWALL	112.5°	15'-6"	PRESS. GAUGE
14	3"	SIDEWALL	67.5°	6'-0"	LOW LEVEL ALARM
15	3"	SIDEWALL	315°	6'-0"	FUTURE
16 *	30"	SIDEWALL	225°	17'-8"	MANWAY
17 *	30"	SIDEWALL	45°	17'-8"	MANWAY
18**	4"	SIDEWALL	0°	15'-4"	OVERFLOW
19	3"	SIDEWALL	22.5°	13'-6"	FUTURE
20	10"	SIDEWALL	270°	15'-0"	VIEWPORT

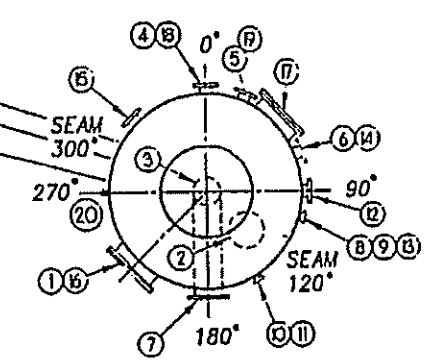
* FABRICATOR TO VERIFY LOCATION WITH USPCI TO AVOID PIPING INTERFERENCE.
+ HINGE BOTTOM MANWAY TO ALLOW COVER PLATE TO SWING OPEN TOWARD THE TANK SHELL AWAY FROM THE TANK CENTER.
** PROVIDE A SPLASH DEFLECTOR PER SHEET 8



ELEVATION VIEW

X-RAY LOCATION MAP

7-13-95



PLAN ORIENTATION

SHELL PL SCHEDULE

RING NO.	THICK.*	HEIGHT	NO. OF SHEETS PER RING	AT LENGTH
1	$\frac{3}{8}$"	60"	1 AT 237$\frac{1}{2}$"	
2	$\frac{3}{8}$"	96"	1 AT 237$\frac{1}{2}$"	
3	$\frac{3}{8}$"	90"	1 AT 237$\frac{1}{2}$"	

* $\frac{1}{8}$" CORROSION ALLOWANCE ADDED

REVISIONS			
NO	DATE	BY	
1	6/23/95	RJT	
2			
3			
4			
5			

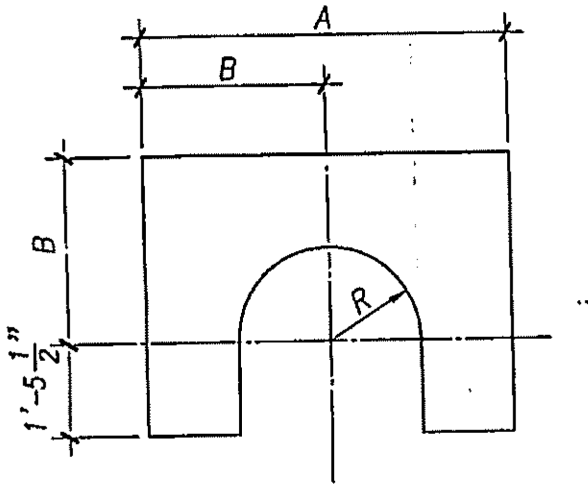
SCOTT MANUFACTURING, INC.
P.O. BOX 10232, LUBBOCK, TEXAS 79408

EVAPORATOR FLASH TANK NO. 3
USPCI, WAYNOKA, OK

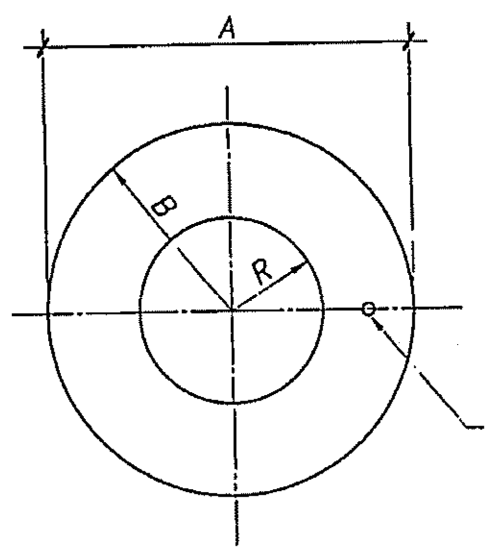
DRAWN BY	SCALE	JOB NO.
R&T	NONE	95085
RJT	DATE 6/7/95	DRAWING NO. 499-1
DRAWING NAME 499-1.DWG	APP'D. BY	

USE	NOMINAL DIAMETER D	T	ROLL RADIUS	A	B	R	A'	B'	QUANTITY
SHELL MANHOLE	30"	$\frac{3}{8}$"	SHELL RADIUS	62"	31"	$13\frac{1}{2}$"			2
VIEWPORT	$21\frac{1}{2}$" x $10\frac{7}{8}$"	$\frac{3}{8}$"	SHELL RADIUS	46"	36"		$10\frac{3}{4}$"	$5\frac{7}{16}$"	1
INFLUENT	8"	$\frac{3}{8}$"	SHELL RADIUS	19"	$8\frac{3}{4}$"	$4\frac{3}{8}$"			1

FOR SHELL MANHOLE

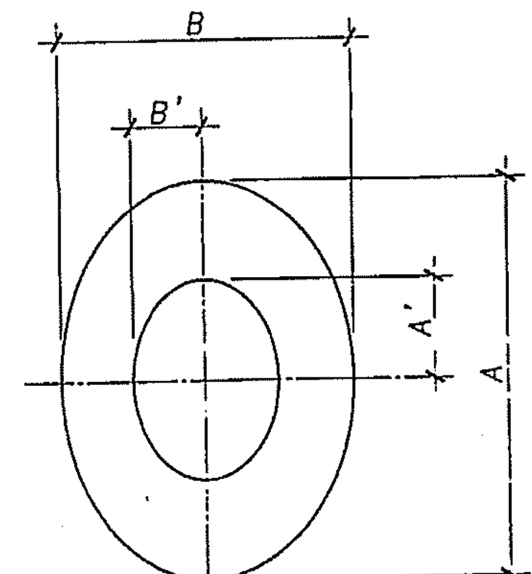


FOR OTHER FITTINGS



ONE $\frac{1}{4}$" TELLTALE HOLE IN REINFORCING PLATE. HOLE SHALL BE LOCATED ON HORIZONTAL CENTERLINE AND HAVE STD. PIPE THREADS.

FRONT VIEW



FOR VIEWPORT

REINFORCING PLATE THICKNESS, T

ROLL RADIUS

EDGE VIEW, ROLLED

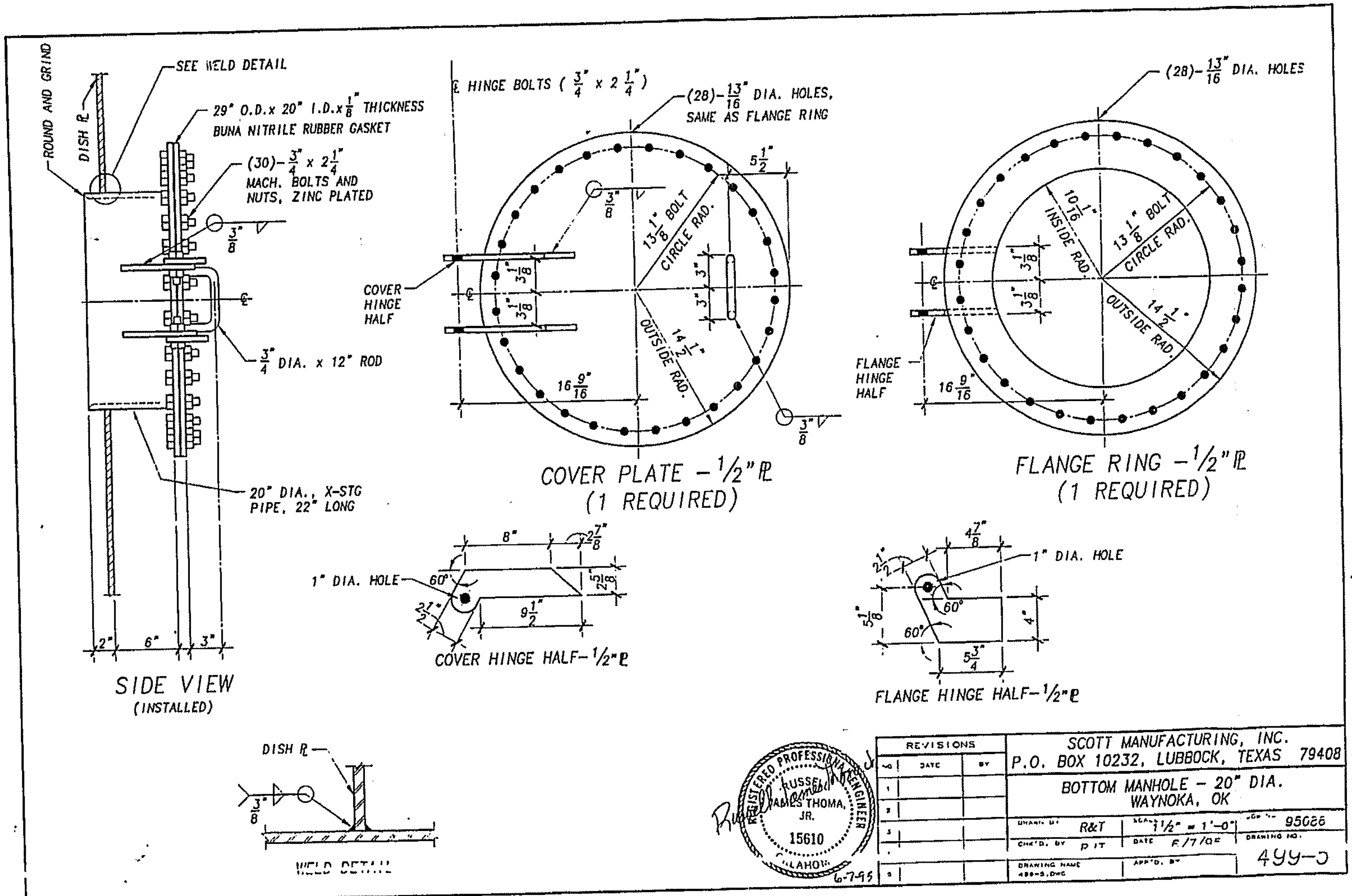
REGISTERED PROFESSIONAL ENGINEER
JAMES THOMA, JR.
15610
OKLAHOMA
8-1-95

REVISIONS		
NO	DATE	BY
1	6/23/95	RJT
2	8/1/95	RJT
3		
4		
5		

SCOTT MANUFACTURING, INC.
P.O. BOX 10232, LUBBOCK, TEXAS 79408

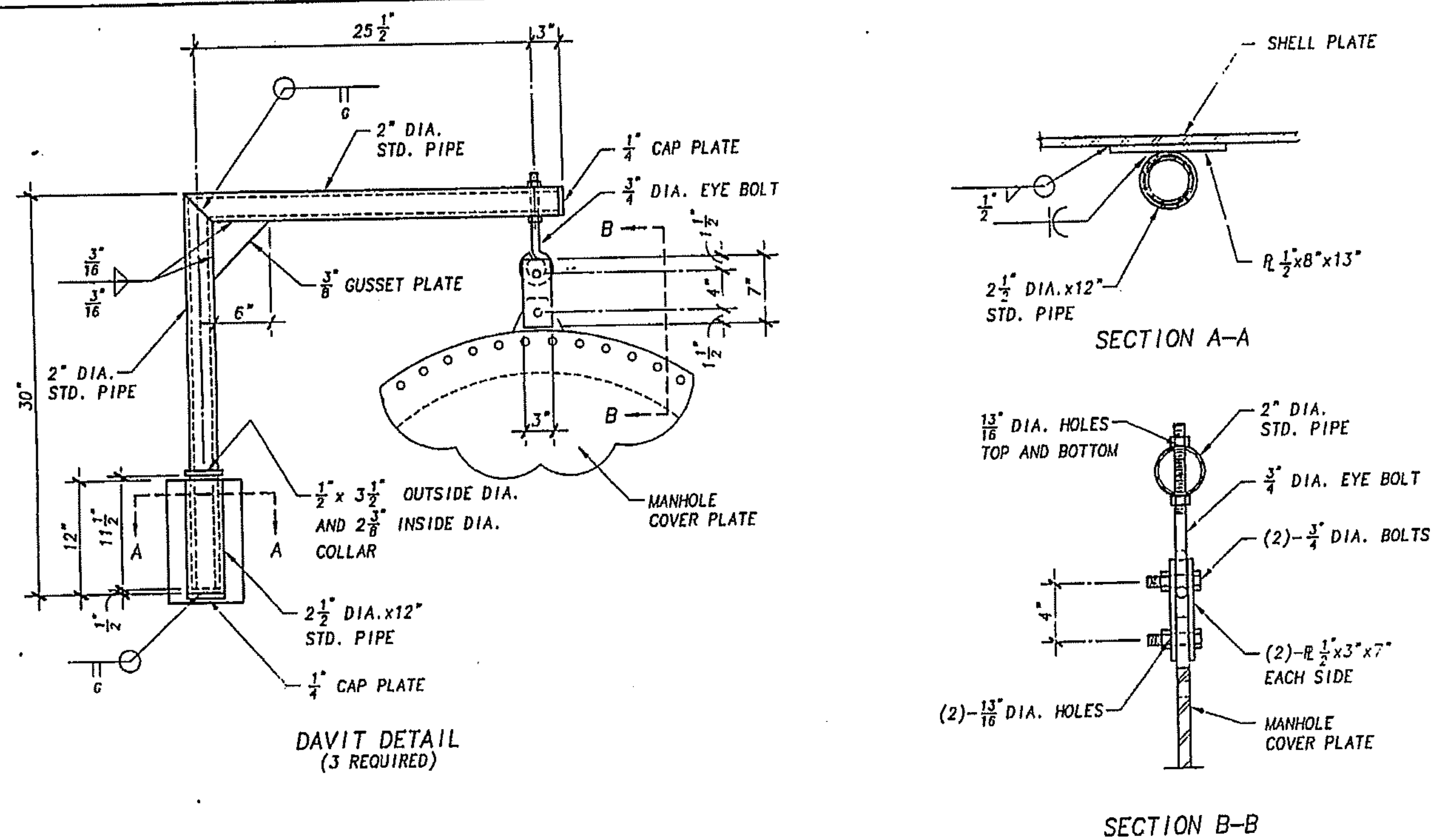
REINFORCING PLATE DETAILS
WAYNOKA, OK

DRAWN BY R&T	SCALE NONE	JOB NO. 95086	
CHK'D. BY RJT	DATE 6/7/95	DRAWING NO. 499-3	
DRAWING NAME 499-3.DWG	APP'D. BY		



SEE WELD DETAIL
ROUND AND GRIND
DISH PL
29" O.D. x 20" I.D. x 1/8" THICKNESS BUNA NITRILE RUBBER GASKET
(30)-3/4" x 2 1/4" MACH. BOLTS AND NUTS, ZINC PLATED
3/4" DIA. x 12" ROD
20" DIA., X-STG PIPE, 22" LONG
2" 6" 3"
SIDE VIEW
(INSTALLED)
℄ HINGE BOLTS (3/4" x 2 1/4")
(28)-13/16" DIA. HOLES, SAME AS FLANGE RING
5 1/2"
13 1/8" BOLT CIRCLE RAD.
14 1/2" OUTSIDE RAD.
16 9/16
COVER HINGE HALF
COVER PLATE - 1/2" PL
(1 REQUIRED)
(28)-13/16" DIA. HOLES
10 1/16" INSIDE RAD.
13 1/8" BOLT CIRCLE RAD.
14 1/2" OUTSIDE RAD.
FLANGE HINGE HALF
FLANGE RING - 1/2" PL
(1 REQUIRED)
1" DIA. HOLE
8"
9 1/2"
COVER HINGE HALF-1/2" PL
1" DIA. HOLE
4 7/8"
5 3/4"
FLANGE HINGE HALF-1/2" PL
DISH PL
WELD DETAIL
REVISIONS
SCOTT MANUFACTURING, INC.
P.O. BOX 10232, LUBBOCK, TEXAS 79408
BOTTOM MANHOLE - 20" DIA.
WAYNOKA, OK
R&T
1 1/2" = 1'-0"
95086
6/7/95
499-5
RUSSELL JAMES THOMA, JR.
15610
REGISTERED PROFESSIONAL ENGINEER
6-7-95

Ancillary Equipment Drawings



REGISTERED PROFESSIONAL ENGINEER
RUSSELL JAMES THOMA, JR.
15610
OKLAHOMA

Russell James Thoma
6-7-95

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NO	DATE	BY	DAVIT DETAIL WAYNOKA, OK		
1			DRAWN BY R&T	SCALE NONE	JOB NO. 95085
2			CHK'D. BY RJT	DATE 6/7/95	DRAWING NO. 499-6
3			DRAWING NAME 499-6.DWG	APP'D. BY	
4					
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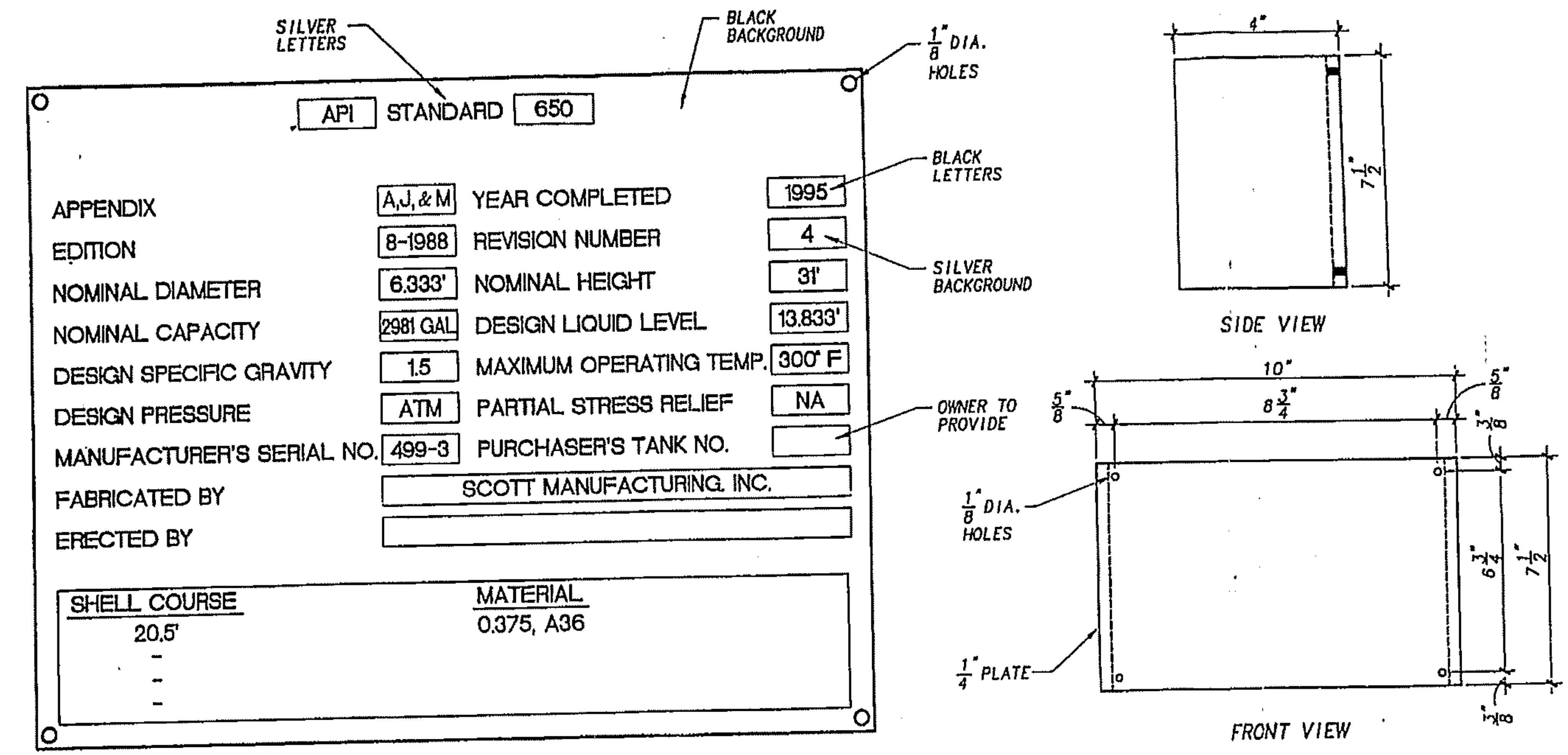

NAME PLATE BRACKET
(1 REQUIRED)
(4) – 1/8" DIA. DRIVE SCREW RIVETS REQUIRED

NAME PLATE
(1 REQUIRED)

REGISTERED PROFESSIONAL ENGINEER
RUSSELL JAMES THOMA, JR.
15610
OKLAHOMA
6-28-95

REVISIONS		
NO	DATE	BY
1	6/23/95	RJT
2		
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P.O. BOX 10232, LUBBOCK, TEXAS 79408

NAME PLATE AND BRACKET
WAYNOKA, OK

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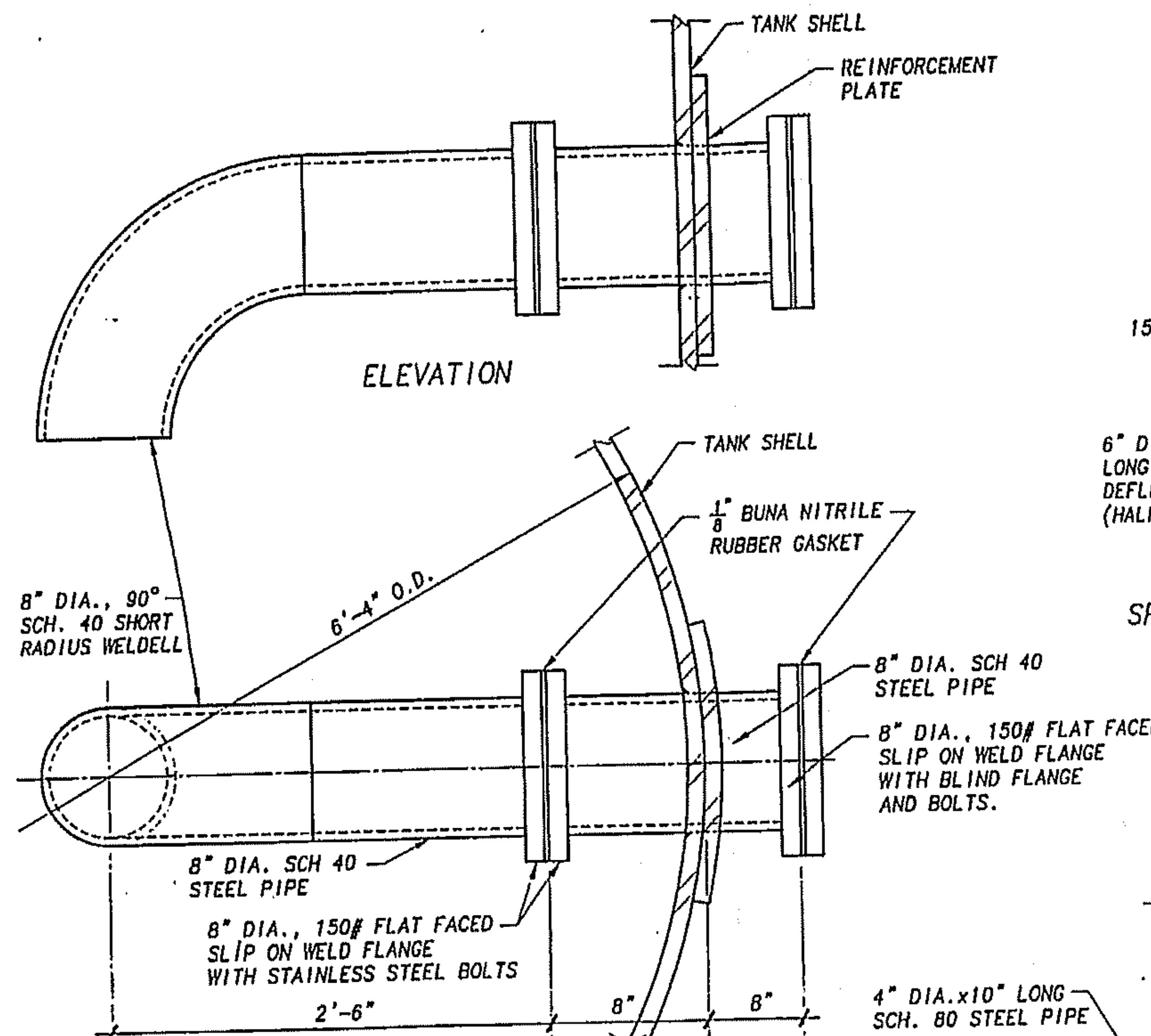
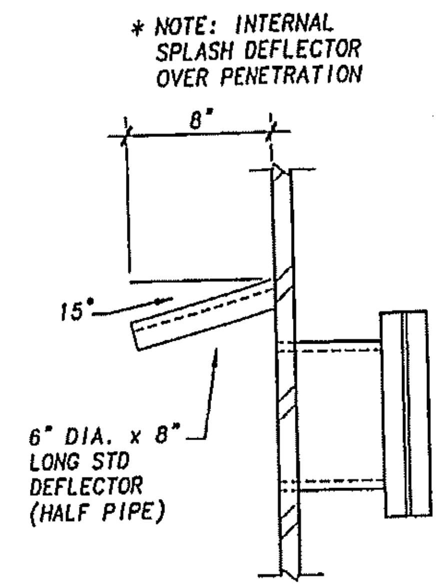
CHK'D. BY RJT	DATE 6/7/95	DRAWING NO. 499-7
DRAWING NAME 499-7.DWG	APP'D. BY	

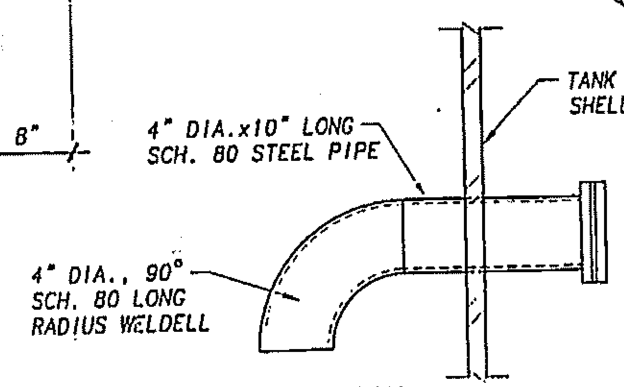


PLAN

INFLUENT CONNECTION DETAIL



SPLASH DEFLECTOR

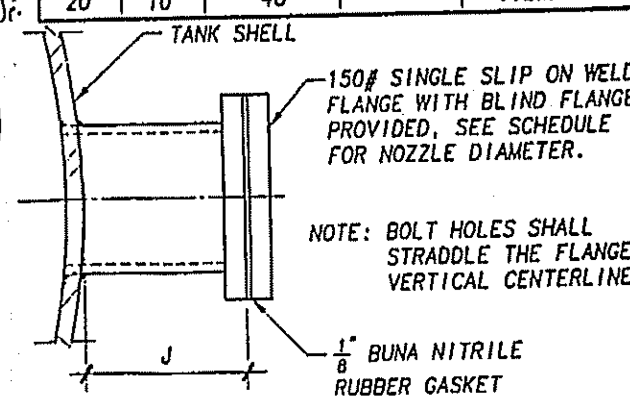


ELEVATION

NOZZLE NO. 4 DETAIL

NOZZLE NO.	SIZE	WALL THICK. SCHEDULE	J	DESCRIPTION
1	–	–	–	MANWAY
2	–	–	–	MANWAY
3	8"	40	8"	EFFLUENT
4	4"	80	7"	OVERFLOW
5	3"	80	7"	LEVEL GAUGE (FOAM DETECTOR)
6	3"	80	7"	HIGH LEVEL ALARM
7	8"	40	8"	INFLUENT
8	3"	80	7"	LEVEL GAUGE
9*	3"	80	7"	LEVEL GAUGE
10	2"	160	6"	SIGHT GLASS
11*	2"	160	6"	SIGHT GLASS
12	3"	80	7"	FUTURE
13*	3"	80	7"	PRESS. GAUGE
14	3"	80	7"	LOW LEVEL ALARM
15	3"	80	7"	FUTURE
16	–	–	–	MANWAY
17	–	–	–	MANWAY
18*	4"	80	7"	OVERFLOW
19	3"	80	7"	FUTURE
20	10"	40	–	VIEWPORT

REGISTERED PROFESSIONAL ENGINEER
JAMES THOMA, JR.
15610
OKLAHOMA
8-1-95



TYPICAL NOZZLE CONNECTION

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2	8/1/95	RJT
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4		
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INFLUENT CONNECTION DETAIL
WAYNOKA, OK

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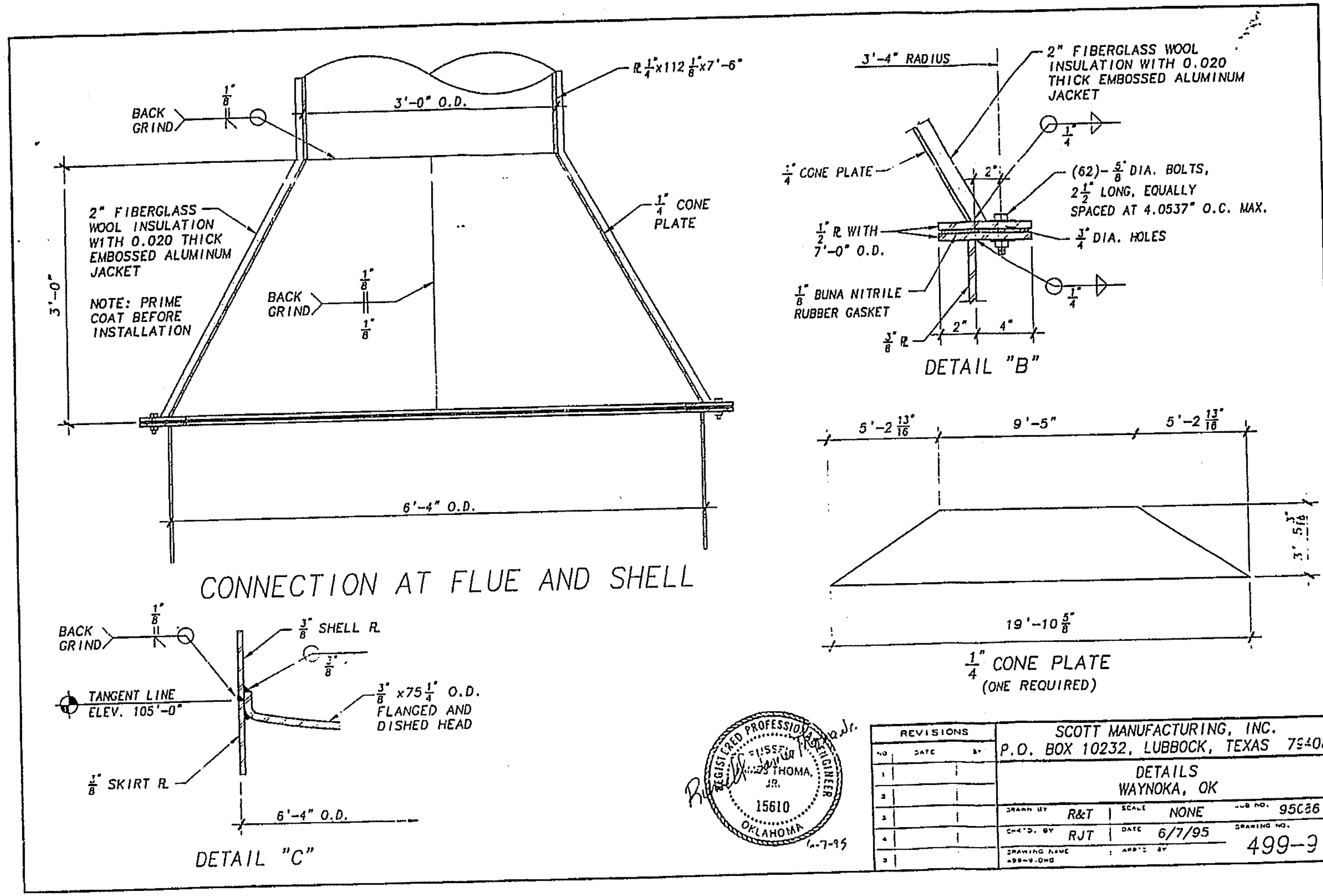
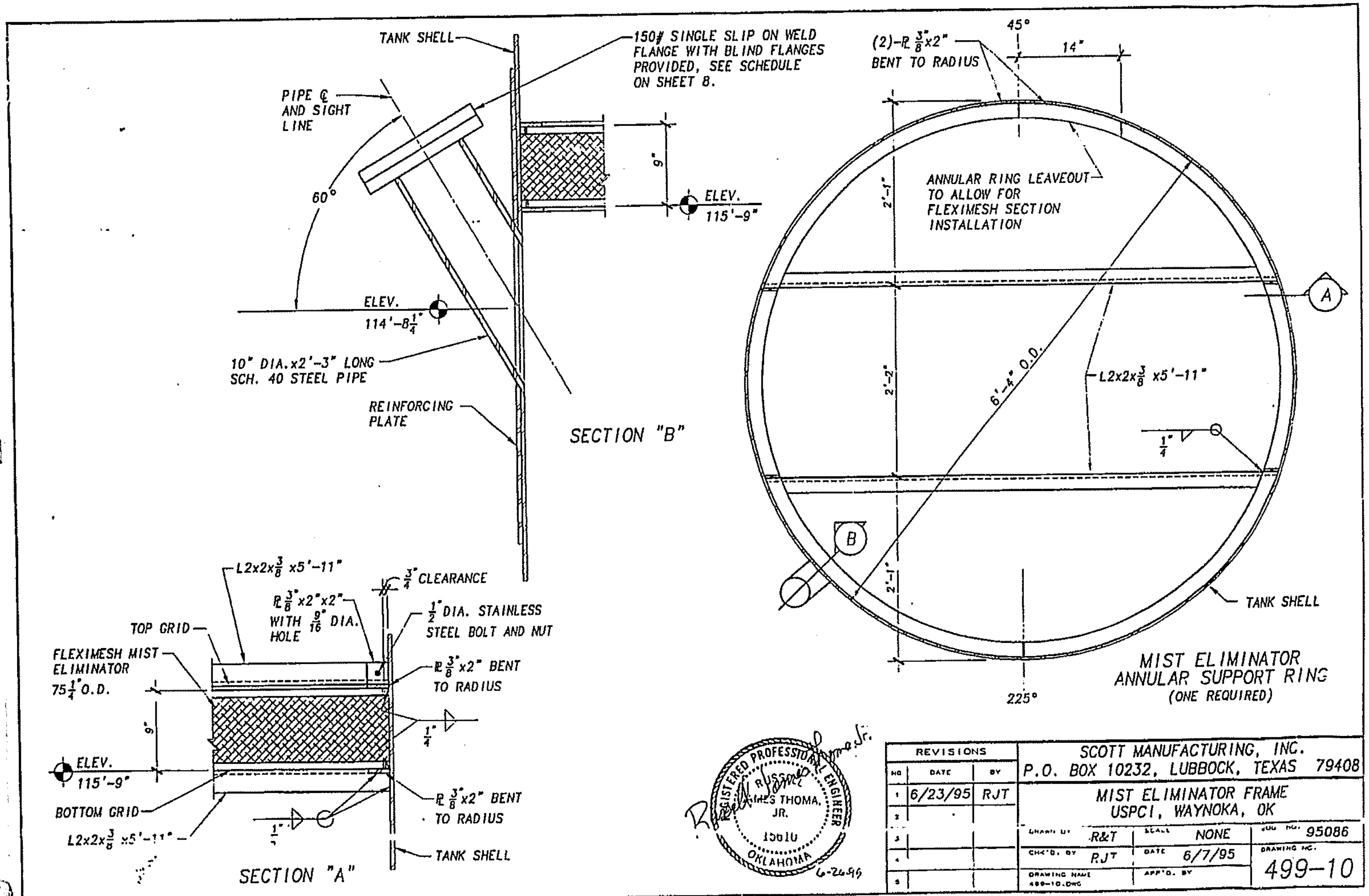
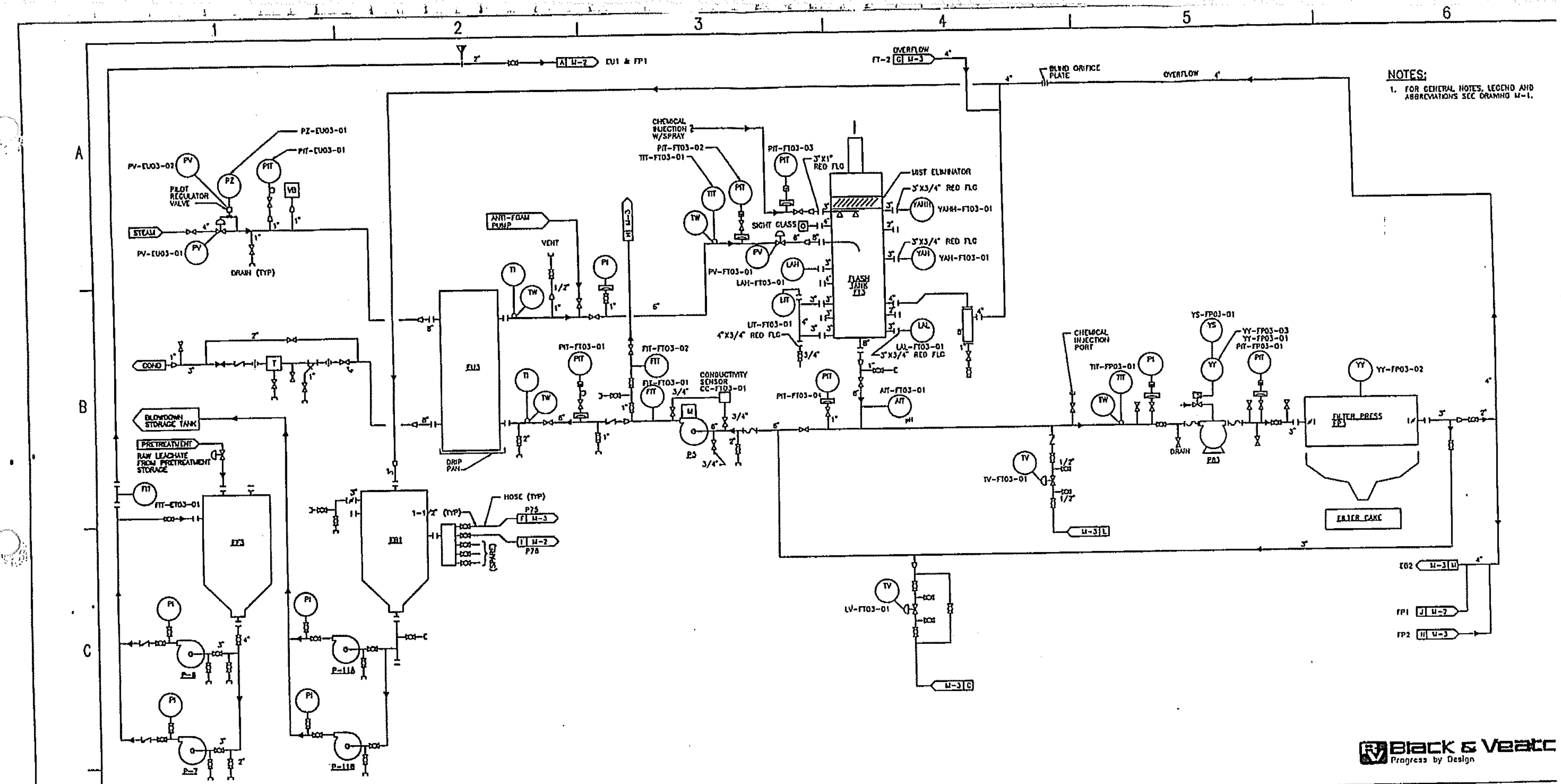
CHK'D. BY	RJT	DATE	6/7/95	DRAWING NO.	499-8
DRAWING NAME 499-8.DWG		APP'D. BY			


CONNECTION AT FLUE AND SHELL
BACK GRIND
1/8"
3'-0" O.D.
R 1/4"x112 1/8"x7'-6"
2" FIBERGLASS WOOL INSULATION WITH 0.020 THICK EMBOSSED ALUMINUM JACKET
NOTE: PRIME COAT BEFORE INSTALLATION
3'-0"
1/4" CONE PLATE
6'-4" O.D.
DETAIL "B"
3'-4" RADIUS
1/4" CONE PLATE
(62)-5/8" DIA. BOLTS, 2 1/2" LONG, EQUALLY SPACED AT 4.0537" O.C. MAX.
1/2" R WITH 7'-0" O.D.
3/4" DIA. HOLES
1/8" BUNA NITRILE RUBBER GASKET
3/8" R
2"
4"
1/4"
1/4" CONE PLATE
(ONE REQUIRED)
5'-2 13/16"
9'-5"
5'-2 13/16"
19'-10 5/8"
DETAIL "C"
3/8" SHELL R
3/8" x75 1/4" O.D. FLANGED AND DISHED HEAD
TANGENT LINE ELEV. 105'-0"
3/8" SKIRT R
6'-4" O.D.
REVISIONS
SCOTT MANUFACTURING, INC.
P.O. BOX 10232, LUBBOCK, TEXAS 79408
DETAILS
WAYNOKA, OK
R&T
NONE
95036
RJT
6/7/95
499-9
REGISTERED PROFESSIONAL ENGINEER
RUSSELL THOMA, JR.
15610
OKLAHOMA
6-7-95


TANK SHELL
150# SINGLE SLIP ON WELD FLANGE WITH BLIND FLANGES PROVIDED, SEE SCHEDULE ON SHEET 8.
PIPE ℄ AND SIGHT LINE
60°
9"
ELEV. 115'-9"
ELEV. 114'-8 1/4"
10" DIA.x2'-3" LONG SCH. 40 STEEL PIPE
REINFORCING PLATE
SECTION "B"
(2)-PL 3/8"x2" BENT TO RADIUS
45°
14"
ANNULAR RING LEAVEOUT TO ALLOW FOR FLEXIMESH SECTION INSTALLATION
2'-1"
2'-2"
2'-1"
6'-4" O.D.
L2x2x3/8 x5'-11"
1/4"
A
B
TANK SHELL
225°
MIST ELIMINATOR ANNULAR SUPPORT RING
(ONE REQUIRED)
L2x2x3/8 x5'-11"
3/4" CLEARANCE
PL 3/8"x2"x2" WITH 9/16" DIA. HOLE
1/2" DIA. STAINLESS STEEL BOLT AND NUT
TOP GRID
FLEXIMESH MIST ELIMINATOR 75 1/4" O.D.
PL 3/8"x2" BENT TO RADIUS
9"
1/4"
ELEV. 115'-9"
BOTTOM GRID
PL 3/8"x2" BENT TO RADIUS
L2x2x3/8 x5'-11"
1/4"
TANK SHELL
SECTION "A"
REGISTERED PROFESSIONAL ENGINEER
RUSSELL JAMES THOMA, JR.
15610
OKLAHOMA
6-26-95
REVISIONS
NO DATE BY
1 6/23/95 RJT
SCOTT MANUFACTURING, INC.
P.O. BOX 10232, LUBBOCK, TEXAS 79408
MIST ELIMINATOR FRAME
USPCI, WAYNOKA, OK
DRAWN BY R&T
SCALE NONE
JOB NO. 95086
CHK'D. BY RJT
DATE 6/7/95
DRAWING NO. 499-10
DRAWING NAME 499-10.DWG
APP'D. BY



Black & Veatch
Progress by Design

PRETREATMENT PRETREATMENT STORAGE RAW LEACHATE FLOW RATE: VARIABLE SPECIFIC GRAVITY: 1.03 TOTAL SOLIDS: 2-4%	**FF3** EVAPORATION FEED TANK ATMS DESIGN TANK SIZE: 6'-4" DIA X 10' HIGH MATERIAL: CARBON STEEL VOLUME: 1825 GAL± MAKE UP: LEVEL CONTROLLED INSULATION: NONE	**P-6 & P-7** RAW LEACHATE FEED PUMP DESIGN: END SUCTION GPM: 80 HEAD: 50 FT(PRELIMINARY) HP: 2 SPECIFIC GRAVITY: 1.03 LB/HR: 20412±(PER FT) TEMP: 40 TO 60 F		**P-5** EVAPORATION FT PUMP DESIGN: END SUCTION GPM: 800 HEAD: 100(PRELIMINARY) HP: 60 SPECIFIC GRAVITY: 1.2 LB/HR: 451,600 TEMP: 200 TO 210 F	**EU-3** EVAPORATION HEAT EXCHANGER DESIGN: PLATE & FRAME MATERIAL: STAINLESS STEEL HEAT TRANSFER: 13,300,000± BTUH	**FT3** FLASH TANK ATMS DESIGN TANK SIZE: 8'-4" DIA X 12' HIGH MATERIAL: CARBON STEEL VOLUME: 2200± GAL MAKE UP: LEVEL CONTROL INSULATION: 2" MINIMUM	**PA3** BLOWDOWN PUMP DESIGN: DIAPHRAM TYPE GPM: 100 TO 0 HEAD: SPECIFIC GRAVITY: 1.2± LB/HR: 58,000± TEMP: 170 F	**FP3** FILTER PRESS DESIGN: VOLUME: 40 CU FT TEMP: 170 F MAX.	**FB1** BLOWDOWN TANK ATMS DESIGN SIZE: 5'-0" DIA X 10' HIGH VOLUME: 1000± GAL MATERIAL: CARBON STEEL INSULATION: NONE	**11A & 11B** BLOWDOWN RECIRCULATION PUMP GPM: 30 HEAD: 50 FT HP: 1

REVISIONS

NO	DESCRIPTION	DATE	BY	CHK	APP

REVISIONS

NO	DESCRIPTION	DATE	BY	CHK	APP

REFERENCE DRAWINGS

DRAWING NO.	TITLE

ISSUE RECORD

DATE	ISS	REV	TO	FOR
9/18/06	1	0	PERMIT	CONFORMED DWG

ENGR RECORD

	BY	DATE
DRAWN		
CHECKED		
PROJECT ENG		
PROJECT MANAGER		
CONSULTANT	B&V	8/8/04
APPROVED		
APPROVED		

CURRENT DRAWING STATUS

	BY	DATE
PRELIMINARY OR PLANNING	B&V	10/24/04
APPROVED FOR FINAL DESIGN		
IN FINAL DESIGN		
APPROVED FOR QUOTE/PURCH		
APPROVED FOR CONSTRUCTION		

USPCI
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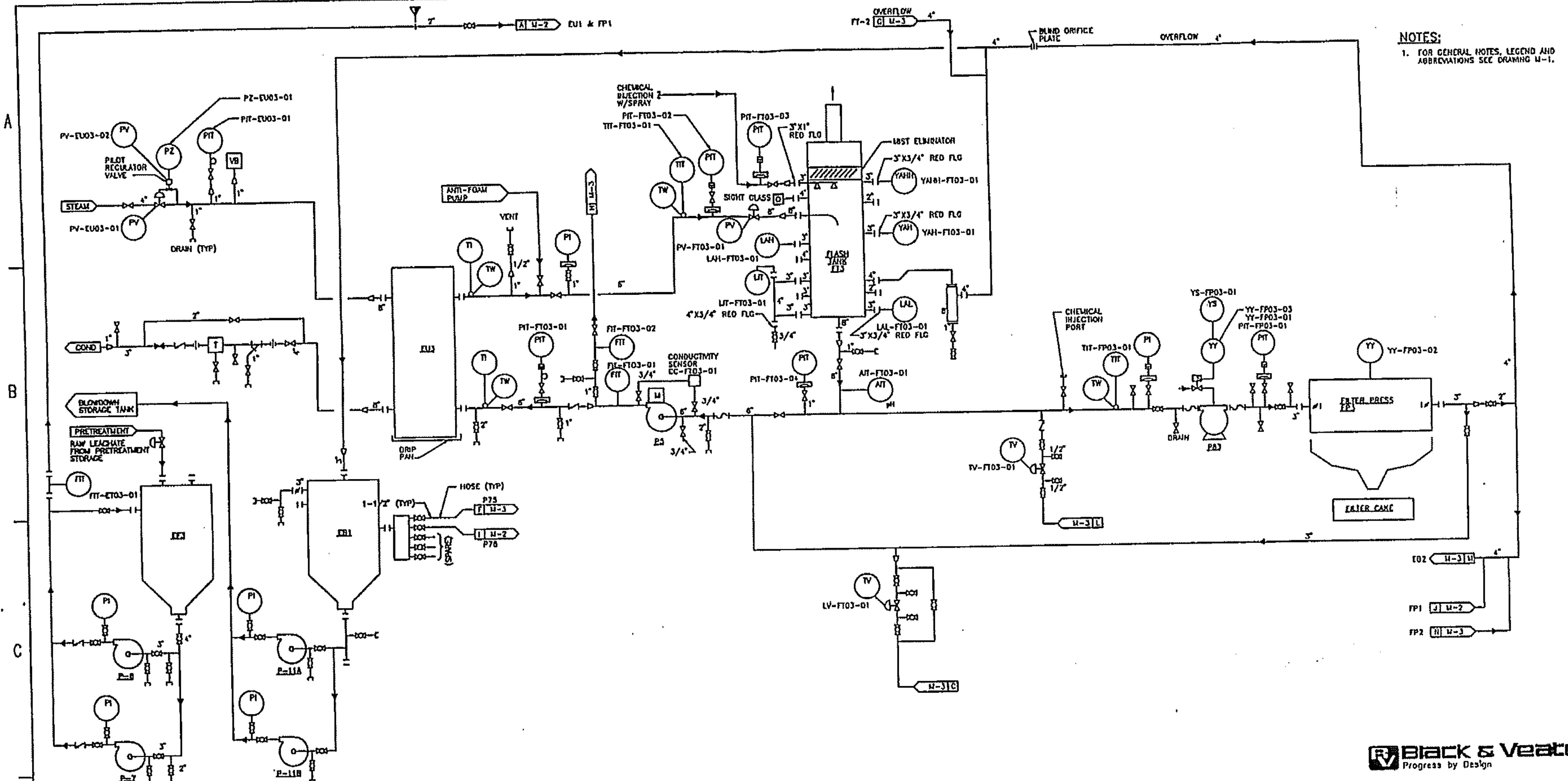
LONE MOUNTAIN FACILITY

TITLE
WASTEWATER FINAL TREATMENT FACILITY
EVAPORATOR SYSTEM NO.3
PROCESS DIAGRAM

FOR

SCALE	JOB NO	DRAWING NUMBER	CAD NUMBER
NONE		M-4	M-4.DWG



PRETREATMENT PRETREATMENT STORAGE RAW LEACHATE FLOW RATE: VARIABLE SPECIFIC GRAVITY: 1.03 TOTAL SOLIDS: 2-4%	**EF3** EVAPORATION FEED TANK ATMS DESIGN TANK SIZE: 6'-4" DIA. X 10' HIGH MATERIAL: CARBON STEEL VOLUME: 1625 GAL± MAKE UP: LEVEL CONTROLLED INSULATION: NONE	**P-6 & P-7** RAW LEACHATE FEED PUMP DESIGN: END SUCTION GPM: 80 HEAD: 50 FT(PRELIMINARY) HP: 2 SPECIFIC GRAVITY: 1.03 LB/HR: 20112±(PER FT) TEMP: 40 TO 80 F		**P-5** EVAPORATION FT PUMP DESIGN: END SUCTION GPM: 600 HEAD: 100(PRELIMINARY) HP: 60 SPECIFIC GRAVITY: 1.2 LB/HR: 451,800 TEMP: 200 TO 210 F	**EU-3** EVAPORATION HEAT EXCHANGER DESIGN: PLATE & FRAME MATERIAL: STAINLESS STEEL HEAT TRANSFER: 13,300,000± BTUH	**FT3** FLASH TANK ATMS DESIGN TANK SIZE: 6'-4" DIA X 12' HIGH MATERIAL: CARBON STEEL VOLUME: 2200± GAL MAKE UP: LEVEL CONTROL INSULATION: 2" MINIMUM	**PB3** BLOWDOWN PUMP DESIGN: DIAPHRAM TYPE GPM: 100 TO 0 HEAD: SPECIFIC GRAVITY: 1.2± LB/HR: 58,000± TEMP: 170 F	**FP3** FILTER PRESS DESIGN: VOLUME: 40 CU FT TEMP: 170 F MAX.	**EB1** BLOWDOWN TANK ATMS DESIGN SIZE: 5'-0" DIA X 10' HIGH VOLUME: 1000± GAL MATERIAL: CARBON STEEL INSULATION: NONE

11A & 11B
BLOWDOWN RECIRCULATION PUMP
GPM: 30
HEAD: 50 FT
HP: 1

Black & Veatch
Progress by Design

REVISIONS

NO	DESCRIPTION	DATE	BY	CHK	APP

REVISIONS

NO	DESCRIPTION	DATE	BY	CHK	APP

REFERENCE DRAWINGS

DRAWING NO.	TITLE

ISSUE RECORD

DATE	ISS	REV	TO	FOR
9/18/06	1	0	PERMIT	CONFORMED DWG

ENGR RECORD

	BY	DATE
DRAWN		
CHECKED		
PROJECT ENG		
PROJECT MANAGER		
CONSULTANT	B&V	8/8/04
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APPROVED		

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IN FINAL DESIGN		
APPROVED FOR QUOTE/PURCH		
APPROVED FOR CONSTRUCTION		

USPCI
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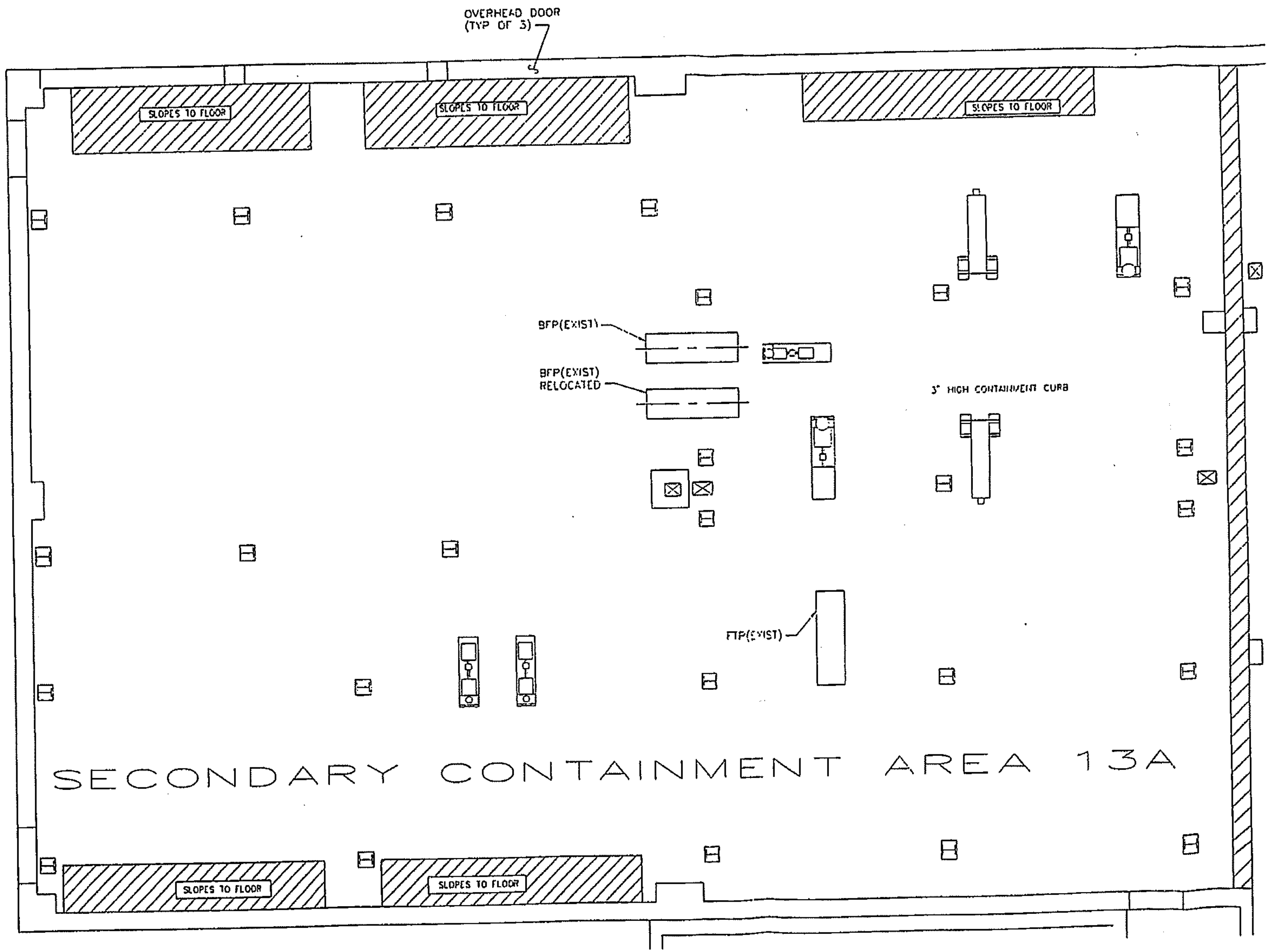
LONE MOUNTAIN FACILITY

TITLE
WASTEWATER FINAL TREATMENT FACILITY
EVAPORATOR SYSTEM NO.3
PROCESS DIAGRAM

FOR

SCALE	JOB NO	DRAWING NUMBER	CAD NUMBER
NONE		M-4	M-4.DWG

Secondary Containment Drawings


OVERHEAD DOOR
(TYP OF 3)
SLOPES TO FLOOR
SLOPES TO FLOOR
SLOPES TO FLOOR
BFP(EXIST)
BFP(EXIST)
RELOCATED
3" HIGH CONTAINMENT CURB
FTP(EXIST)
SECONDARY CONTAINMENT AREA 13A
SLOPES TO FLOOR
SLOPES TO FLOOR

SECTION T-6

ASSESSMENT OF WASTERWATER STORAGE TANK T-6
CLEAN HARBORS' WAYNOKA FACILITY

For:

CleanHarbors®
ENVIRONMENTAL SERVICES, INC.

Prepared by:

ENVIROTECH
ENGINEERING & CONSULTING, INC.

REGISTERED PROFESSIONAL ENGINEER
RONALD RAY ERDMAN
12502
OKLAHOMA

Aug 28, 2018

CA 1960
6-30-2020

August 2018

18176.00

Contents

LIST OF FIGURES:

LIST OF APPENDICES:

1. INTRODUCTION

Envirotech Engineering and Consulting, Inc. performed professional engineering services for producing the following inspection and assessment of the T-6 Wastewater Storage Tank at the Lone Mountain Facility at Waynoka, Oklahoma and which is operated by Clean Harbors Environmental Services, Inc. Inspections were performed by Envirotech on May 21st, June 5th and August 23, 2018. The inspections and assessments were performed for the purpose of fulfilling the recommended update of the previous reported assessment by Envirotech in September of 2013.

The inspections included visual and sonic measurement of steel plate thicknesses of the walls and floors of the tank. Data and calculations from the previous assessment are included in this report and its appendices since Tank T-6 has demonstrated insignificant changes such that remains consistent with that data.

2. TANK SYSTEM DESCRIPTION

Wastewater Storage Tank (T6) is an on-ground wastewater storage tank installed in 1987. This tank has stored both raw leachate and treated wastewater (concentrate and sludge) in the past. The tank is vertical in position and cylindrical in shape. The tank is completely open to the atmosphere for evaporation purposes. Wastewater Storage Tank T6 is located in the central portion of the Lone Mountain Facility. A stairway, platform and walkway are located on the east side of the tank. The tank employs a tape float gage for liquid level measurement.

Wastewater Storage Tank (T6) is enveloped by a larger steel tank. The second steel tank is for the purpose of secondary containment. The annular tank space between the sides of the inner and outer tank is large enough for persons to enter and perform inspections. The distance between the bottoms of the inner and outer tank is only approximately 12-in. and is filled with pea gravel; therefore entry for direct inspection is impossible directly underneath the primary tank. Therefore, inspection of the secondary floor was evaluated under the gravel between the walls of the two tanks. This was considered adequate representation of the secondary floor.

3. PRIMARY TANK VESSEL

3.1 General Description of Wastewater Storage Tank (T6).

Wastewater Storage Tank (T6) consists of circular steel tank with an inside wall diameter of 100-ft. The tank has a maximum operating volume of 1,409,994.96-gal. (see *Appendix A* – Tank System Volume and Weight Calculations). The tank walls were initially constructed with three courses of steel plates. The first or bottom course was constructed of 5/16-in. A-36 steel. The second and third courses were constructed of ¼ in. A-36 steel. This is shown in Figure 1. The bottom the tank was

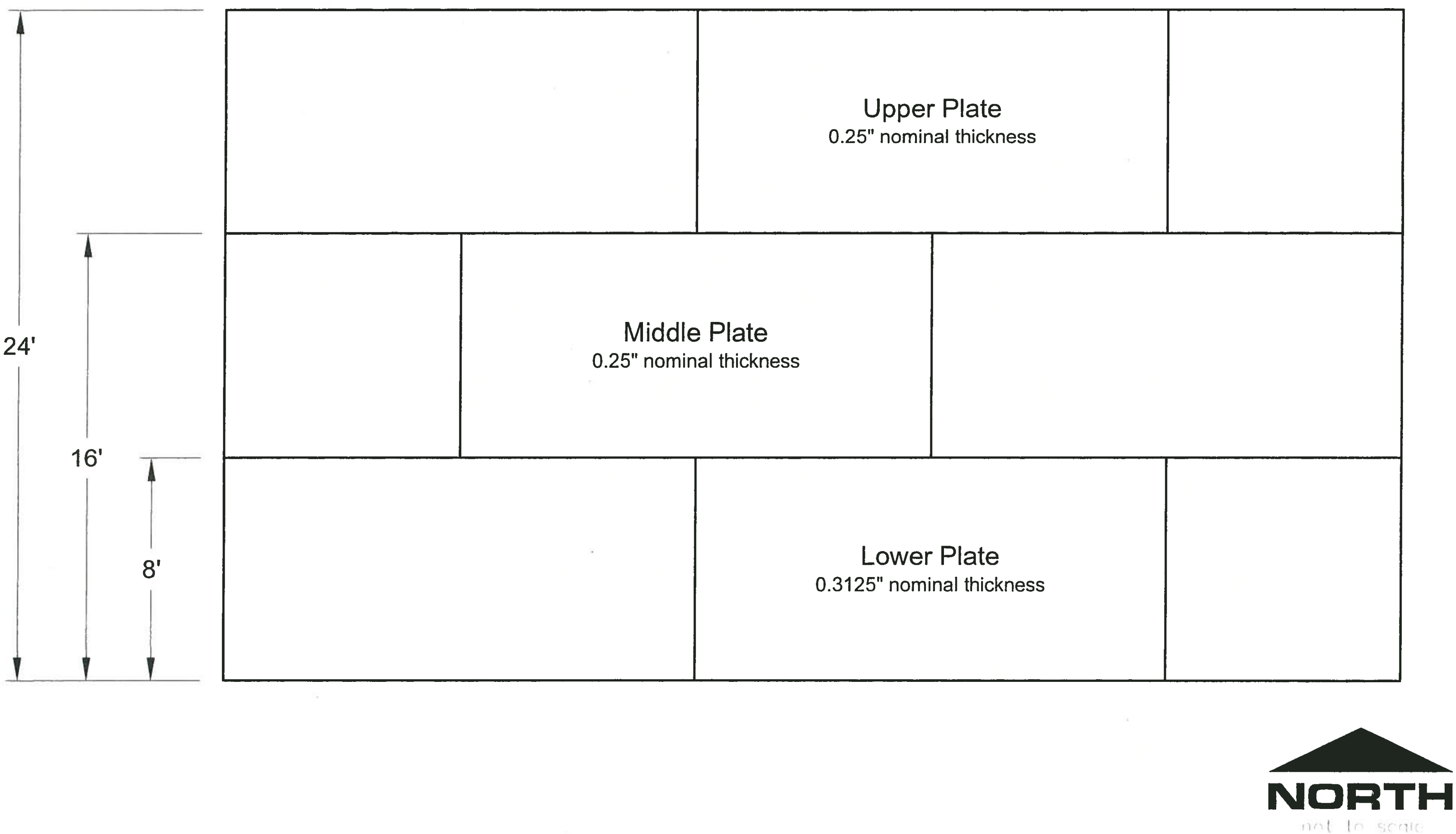


Figure 1

Interior Wall Schematic

Clean Harbors Tank T-6 Inspection

013266–00

SE/NE Section 33, Township 23 North, Range 15 West
Indian Meridian, Waynoka, Major County

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2500 North 11th Street -, Enid, Oklahoma 73701
Phone (580) 234-8780, Fax (580) 237-4302
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www.envirotechconsulting.com

constructed of ¼-in. A-36 steel. A pea gravel base filter detection system is located directly under the tank.

Wastewater Storage Tank (T6) was assessed to determine if the unit remained adequately designed with sufficient structural strength and compatibility with the waste to be stored. To conduct the assessment, the contents of the tank were removed and the tank was thoroughly washed and cleaned.

The Tank T-6 was opened for inspection by Clean Harbors personnel who managed the confined entry requirements. The principal inspection was performed on May 21, 2018 by Envirotech personnel. Follow-up inspections were performed on June 5th and August 23rd, 2018 to obtain additional thickness information needed to complete this report.

The inspection included inspecting regular locations inside the lower wall levels between the tank walls. Inspection of the interior walls and floor as well as the exterior wall surfaces were also measured for metal thickness. Note that the secondary wall is constructed the same except the middle plate has a design thickness of 0.3125 inches. Envirotech performed a visual inspection and ultrasonic thickness measurement survey of the entire tank bottom as well as the first course and bottom section of the second course of the tank shell. The upper section of the tank was not tested because storage had not and would not occur at that height. The black tank coating was visually observed to be in tact without noticeable damage to its surface. Steel thickness readings are shown on Figure 2 regarding the interior wall surface of the primary tank, the exterior wall of the secondary tank, and floor thickness measurements of the primary and secondary tank floors.

It will be mentioned at this time that the secondary walls and floor section were also inspected at the same time. The results of that inspection are reported in section 4 of this report. The wall section thickness of the outer wall is similar to the primary tank except the middle section is constructed with 0.3125-inch steel plate. The secondary tank floor thickness was measured at the area between the tank walls and results indicated adequate thickness of steel exists at those locations. No history or other information suggests the secondary floor has experienced measureable degradation.

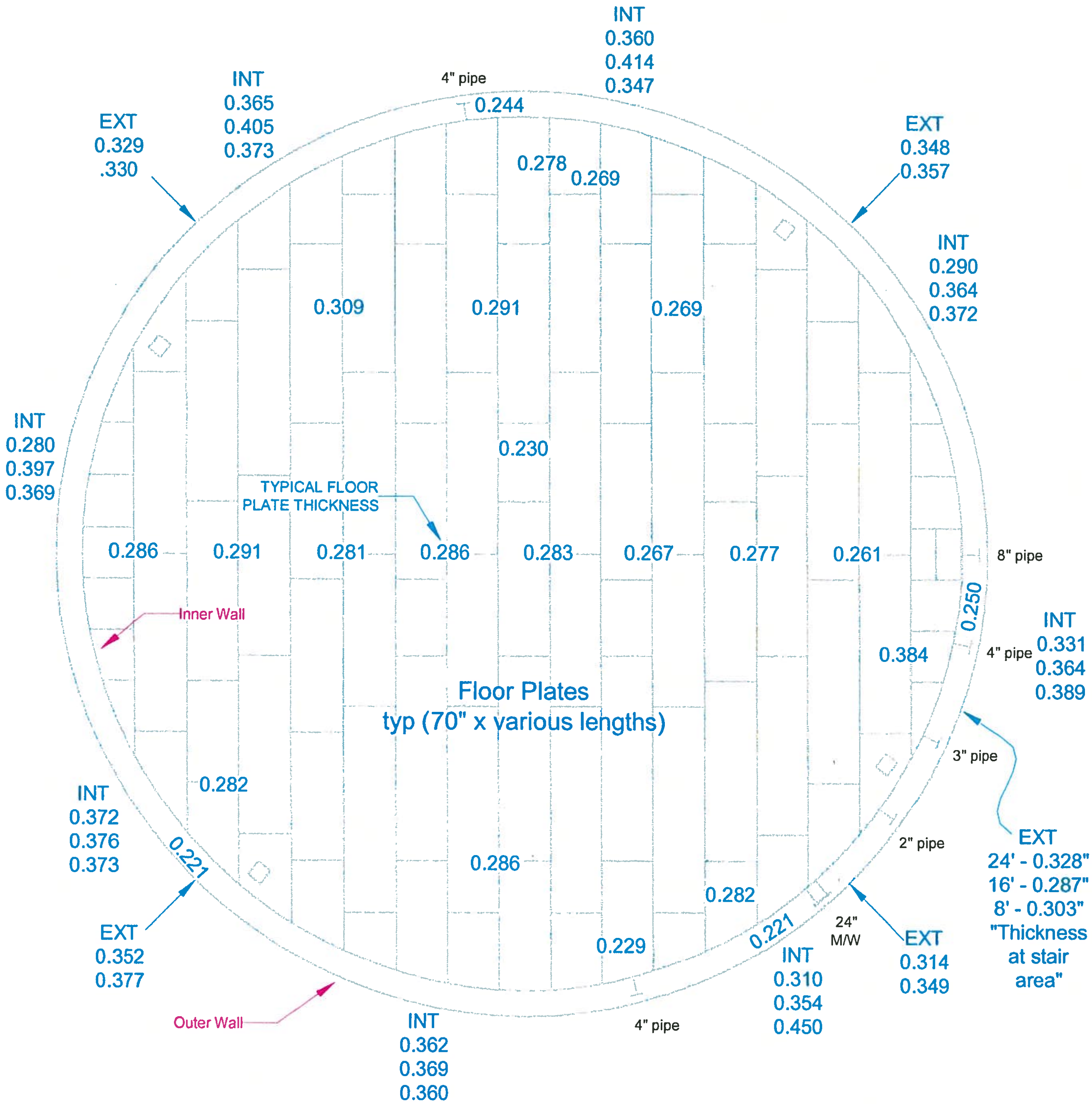
3.2 Design Standards.

Original tank structure calculations located in *Appendix B* were performed to compare the existing tank to those sections that were applicable in the American Petroleum Institute Standard 650 – 1988 Edition API-650 – (New Tank Standards) and API 653-1992 (Tank Inspection, Repair, Alteration and Reconstruction) where applicable. Those calculations can be found in *Appendix B* of this report. The tank was earlier reported to have been constructed by Maloney Crawford of Tulsa, Oklahoma and the design drawings indicated that the tank was fabricated and erected in accordance with API Standard 650.

3.3 Hazardous Characteristics of Wastes Stored.

The wastes which are treated in this tank have the following characteristics:

Wastewater, Wastewater Concentrate and Leachate



LEGEND	INTERIOR & EXTERIOR TANKS	
INT	0.000	Bottom of Middle Plate
	0.000	Center of Lower Plate
	0.000	Bottom of Lower Plate
EXT	0.000	Bottom of Middle Plate
	0.000	Center of Lower Plate

NOTE: All thickness measurements are after coating

NORTH

Tank Thickness Measurements

Clean Harbors TankT-6 Inspection

013266–00

Figure 2

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pH (4-13)
N > 6
Temperature = Ambient to 210° F

The hazardous characteristics of the waste treated in this tank were previously examined and it was determined that the pH and normality levels of the waste were the primary areas of concern. This was to determine the applicability of a corrosion allowance for the tank material type and thickness.

3.4 Existing Corrosion Protection.

Visual inspection of the primary tank revealed that the inside of the tank had been previously coated with coal tar epoxy coating. It was reported by Clean Harbors that the tank interior was recently sandblasted to prepare the surface for re-coating with a new layer of coal tar epoxy.

The exterior of the tank (between the outer secondary and inner primary wall) was inspected during the confined space entry. There is no coating on the interior surface, however the steel wall material appeared rust-coated but in good condition.

3.5 Documented Age of Tank.

This tank was erected and installed in 1987. The tank is 31-years old.

3.6 Result of Leak Tests.

A leak test has not been performed upon this vessel and is not required since the interior of the primary tank was inspected.

3.7 Existing Data Available.

Diameter of Tank	100-ft.
Height	24-ft.
(Maximum Operating Level)	19-ft.
Material	A36 (Design)
Wall Thickness First Course	.3125-in.
Wall Thickness Second Course	.25-in.
Wall Thickness Third Course	.25-in.
Specific Gravity	1.3
Operating Temperature	Ambient
Maximum Volume	188,502-c.f.
Seismic Zone	1

3.8 Structural Calculation.

The required thickness of the primary tank first course tank wall (as per API 653 – 1992) was calculated to be 0.3771-in., if the tank were filled to capacity (24-ft.) with material having a specific gravity of 1.3. This required thickness is greater than the original measured average thickness of 0.3154-in and therefore would not over stress the tank. The table below presents allowable tank fluids heights for specific gravities ranging from 1.0 – 1.3. *Appendix B* (Primary Tank Wall Thickness Calculations) presents detailed calculations for the three courses of primary tank based on specific gravity of 1.3 and a 19-ft. maximum fluid level. Also see section 3.9 regarding maximum liquid level.

ALLOWABLE FLUID HEIGHTS	
Sp. Gr.	Fluid Height (ft)
1.0	24
1.1	22
1.2	21
1.3	19

3.9 Comparison to Actual Structure to Theoretical Values.

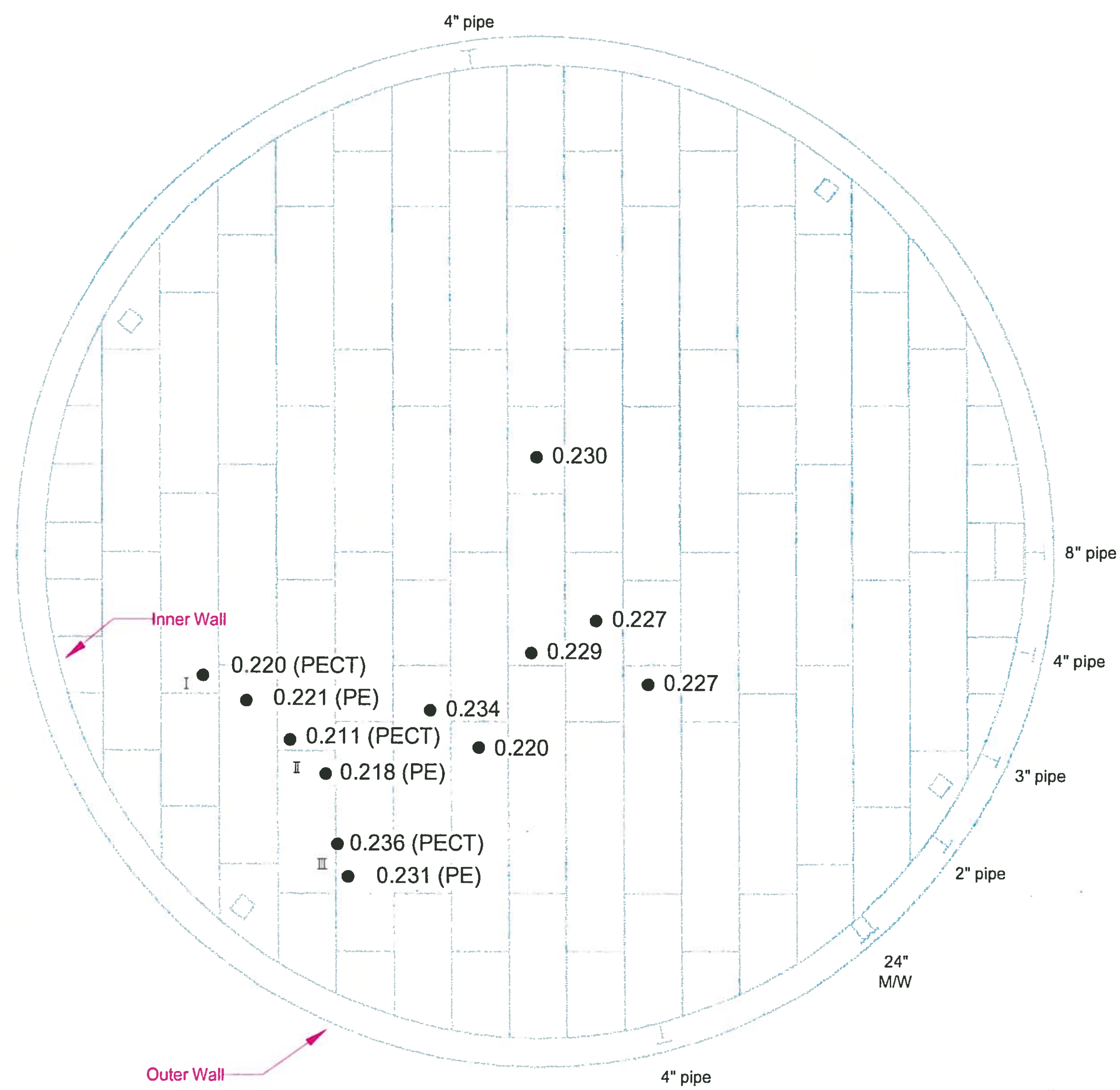
WALL THICKNESS COMPARISON			
	Calculated Minimum Thickness	Measured Thickness (Note 1)	Thickness Meets Standard
1st Course	0.3087-in.*	0.3600-in.	Yes
2nd Course	0.2130-in.*	0.2800-in.	Yes
3rd Course	0.2130-in.*	See Note 2	See Note 2

*Based on a specific gravity of 1.3 of a fluid height of 19-ft.

Notes:
1. Evaluated combined metal and coating.
2. 3rd course not measured since liquid level not planned to extend high enough to impact the surface as reported by Clean Harbors and visually observed by Envirotech.

BOTTOM THICKNESS COMPARISON		
	Measured Thickness	Minimum Thickness (per API 650)
Bottom	0.190 – 0.250	0.2360-in.

During the initial tank inspection on May 21, 2018, Envirotech noted that significant corrosion had occurred primarily in the south end of the tank. During their second inspection on June 5, 2018, Envirotech observed several spot locations of corrosion which were ground to a flat surface to accommodate measurements that revealed the net remaining floor thickness was about 0.220 inches (see figure 2a). Since the cause and period of time could not be determined, it was recommended to replace the affected metal flooring. This was also based on APR 653 which states that minimum floor thickness is 0.010 inches for a tank without secondary containment. Even though this tank has such containment, use of the 0.010 inch criteria was considered an appropriate engineering factor of safety. Clean Harbors elected to continue with sandblasting the floor and the Envirotech engineer



NOTE:

Roman Numerals denote calibration points

Floor thickness measurements are before coating

NORTH

Tank Thickness Measurements

Clean Harbors TankT-6 Inspection

013266–00

Figure 2a

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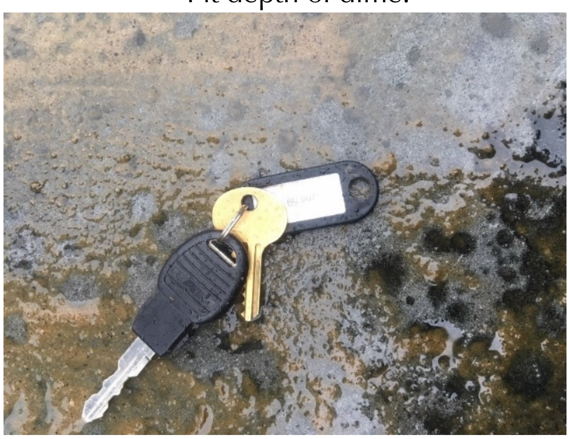
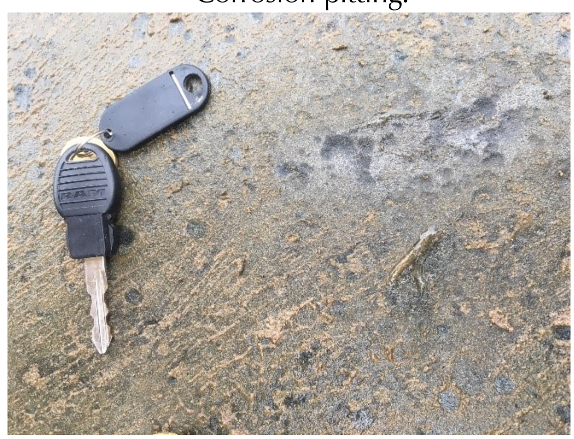
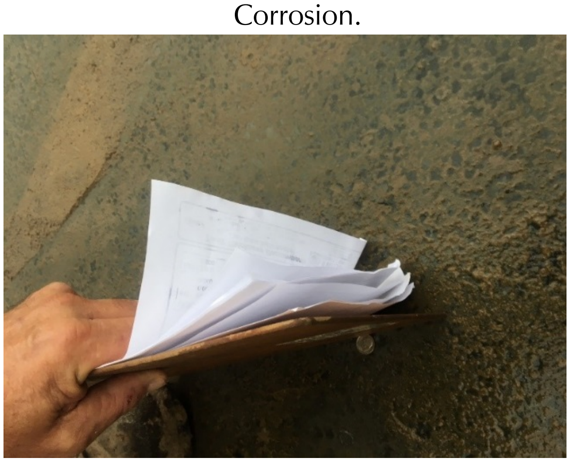
provided additional floor thickness data. It was demonstrated that the original floor is 0.250 inches thick (see Figure 2b). It was also demonstrated that corrosion was about 0.060 inches deep resulting in a floor thickness of about of 0.190 inches due to corrosion. Envirotech then reported to Clean Harbors that coating may progress since the tank bottom had adequate thickness. See photos below.


Pit depth of dime.

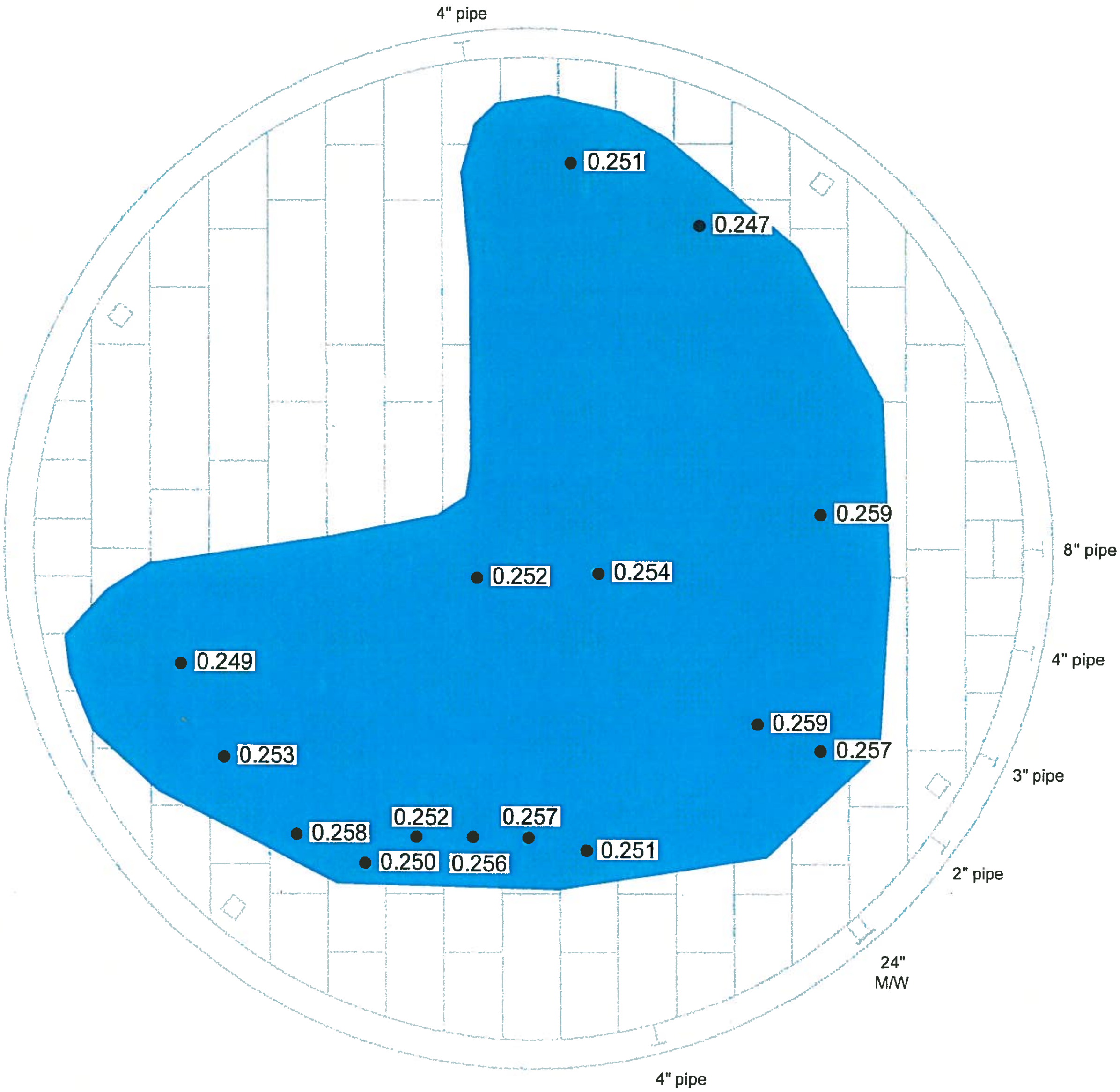

Corrosion pitting.


Corrosion.


Corrosion.


Corrosive pit depth of dime.


Corrosive pit depth of dime.



Area of Corrosion

NORTH

Tank Thickness Measurements

Clean Harbors TankT-6 Inspection

013266–00

Figure 2b

ENVIROTECH

2500 North 11th Street -, Enid, Oklahoma 73701
Phone (580) 234-8780, Fax (580) 237-4302
C.A. #1960 - Expiration Data: 6-30-2020
www.envirotechconsulting.com

4. SECONDARY CONTAINMENT SYSTEM

4.1 General Description of Secondary Containment

(The following information is provided by 1997 tank inspection report).

The secondary containment system consists of an outer tank shell 108-ft. in diameter. The outer shell height is 24-ft. The tank walls were constructed using three course of steel plates which were welded together. The first and second courses were constructed of 5/16-in. A-36 steel while the third course was constructed of ¼-in. A-36 steel. The tank bottom was constructed of ¼-in. A-36 steel.

Initially, the tank was built on a native soil pad with a crushed rock layer of approximately 6-in. The tank pad was elevated and surface drainage moved away from the tank. Over time, the area around the tank had filled in to the point that surface water stood around the tank after rainfall events. The impact is that standing water under the tank may enhance bottom corrosion. This has been minimized through ongoing maintenance to create drainage away from the base of the tank as visually observed by Envirotech in the current inspection. A 12-in. layer of pea gravel was installed between the secondary containment tank floor and the primary tank floor and acts as a leak detection and collection system. This is demonstrated in the as-built plans in *Appendix C*.

4.2 Design Standards.

The tank was earlier reported as constructed by Maloney Crawford of Tulsa, Oklahoma. The design drawings indicated that the tank was fabricated and erected in accordance with API Standard 650 at that time.

4.3 Hazardous Characteristics of Wastes Stored.

The wastes which are treated in the primary tank have the following characteristics:

Wastewater, Wastewater Concentrate and Leachate
pH (4-13)
N > 6
Temperature = Ambient to 210° F

The hazardous characteristics of the waste treated in the primary tank were previously examined and it was determined that the pH and normality levels of the waste were primary areas of concern. This was to determine the applicability of a corrosion allowance for the containment system material type and thickness.

4.4 Existing Corrosion Protection.

The interior of the tank was inspected during the confined space entry. There is no coating on the interior surface, however the material appeared in good condition. The exterior of the tank is painted with an epoxy paint as corrosion protection.

4.5 Documented Age of the Containment Area.

The secondary containment vessel was erected in 1987 thus making the containment system 31-years old.

4.6 Result of Leak Tests.

No leak tests have been performed.

4.7 Existing Available Data.

Diameter of Tank	108-ft.
Height	24-ft.
(Maximum Operating Level)	19-ft.
Material	A36 (Design)
Wall Thickness First Course	.3125-in.
Wall Thickness Second Course	.3125-in.
Wall Thickness Third Course	.25-in.
Specific Gravity	1.3
Operating Temperature	Ambient
Seismic Zone	1

4.8 Structural Calculations.

The required thickness of the secondary containment was previously determined to be a function of the specific gravity of the fluid and the corresponding fluid height in the primary vessel. Based on the Allowable Fluid Heights presented in Section 3-8, the maximum fluid heights that would be experienced in the secondary containment, range from 16-ft. to 20-ft. (see *Appendix D* – Secondary Containment Volume Calculations). The calculated minimum thicknesses associated with these fluid heights and specific gravities are presented below:

Maximum Fluid Height (ft)	Specific Gravity of Fluid	Calculated Minimum Thickness – 1st Course (inches)
16.0	1.3	0.2841
20.0	1.0	0.2784

Appendix B (Secondary Tank wall Thickness Calculations) presents detailed calculations based on a maximum fluid height of 16-ft. and a fluid specific gravity of 1.3. Note that under these conditions, fluid would never reach the third course of the secondary containment. *Appendix B* does however present a thickness calculation for the third course based on the 20-ft. maximum fluid height and specific gravity of 1.0.

A seismic design check was performed pursuant to API 650. Both the overturning moment and shell compression calculations indicate the tank being stable (see *Exhibit E* – Structural Support Calculations.)

A wind loading check was performed pursuant to API 650. These calculations indicate the tank is stable. (see *Exhibit E* – Structural Support Calculations).

4.9 Comparison of Actual Structure Theoretical Values.

WALL THICKNESS COMPARISON			
	Calculated Minimum Thickness	Measured Thickness	Thickness Meets Standard
1st & 2nd Course	0.2841-in.	0.3300-in.	Yes
3rd Course	0.108-in.	0.2870-in.	Yes

BOTTOM THICKNESS COMPARISON		
	Measured Thickness	Minimum Thickness (per API 650)
Bottom	0.221	0.2500-in.

4.10 Calculation of Existing Capacity.

The secondary containment vessel envelopes the primary tank. If the primary tank leaks, the contents would flow into the secondary vessel and the hydraulic grade lines between the two tanks would equalize thus containing the contents of the primary tank.

5. FOUNDATION AND SHELL SETTLEMENT ANALYSIS

The total weight of tank systems was previously calculated to be 8,372-tons. (see *Appendix A* – Tank System Volume and Weight Calculations). The weight of the tank system is distributed equally over the entire area of the secondary containment tank bottom. This yields a foundation loading of 1827.79-psf. Although no foundation investigation was performed prior to the construction of the T6 tank system, other work and investigation on the Lone Mountain site have resulted in allowable soil loading in excess of 2500-psf.

The foundation loading attributable to resistance of an overturning moment as a result of seismic forces, was calculated to be 601.00-psf, again well below the 2500-psf limit (see *Appendix E* – Structural Support Calculations Shell Compression).

During the tank inspection, elevation measurements were taken at eight (8) points around the circumference of the tank to determine if settlement was occurring. The maximum out-of-plane settlement was computed pursuant to API 653 *Appendix B* and compared with the settlement found from the elevation measurements. The maximum allowable settlement was computed to be 0.42-ft. and the maximum measured settlement was found to be 0.23-ft (see *Appendix F* – Tank System Measurements and Settlement Calculations).

6. ANCILLARY EQUIPMENT

6.1 Manways.

Located in both the primary and secondary tanks are manways with a neck diameter of 24-in. The center of the manways are located approximately 30-in. from the bottom of the tanks. The manways are secured with flange plates 2-ft. 8-in. in diameter which are held in place with 8 7/8-in. dia. Bolts. Both manways were visually inspected by Envirotech Services, Inc. and found in good condition.

6.2 Stairway and Platform.

Affixed to the exterior of secondary containment tank is a metal access stairway that leads from the ground to a platform located at the top of the tank. The stairway and platform are bolted to brackets which are welded to the tank.

Located on the interior of the primary tank is a vertical steel ladder which connects to welded brackets on the side of the tank. The condition of the stairway, platform, ladder and attachment bracket all appear good.

6.3 Nozzle Flanges.

Six (6) nozzle flanges are located around the perimeter walls of both the primary and secondary tanks (see *Diagrams T-6 In* and *T-6 Out* in *Appendix B*). The sizes of the nozzles range from 2-in. to 8-in. in diameter. Nozzles designs are such that piping may be connected to the interior and exterior sections resulting in a piping linkage from the interior of the primary tank to the exterior of the secondary tank. Currently all nozzles are blanked off, and no piping connects the interior and exterior tanks. All of the nozzles were visually inspected by Envirotech Services, Inc. and found in good condition.

6.4 Load Lines.

Load lines were not in place during the inspection and therefore are not included in this assessment.

6.5 Leak Detection System.

Leak detection for the tank system is provided by a network of four (4) collection boxes located equidistant around the perimeter of the secondary containment tank. If a leak occurs in either the bottom or sides of the primary tank, the fluid should travel through the gravel pack and end up at one of the four (4) collection boxes. The fluid then passes under the lip of the gravel stop section of the collection box, found in the interior of the secondary containment tank, and enters the leak detection piping which transports it to the exterior of the tank. The exterior piping is blanked with a gate valve and contains a sight glass for inspection purposes. The exterior piping, the gate valve and the sight glass are all contained within a secondary containment vault which is located on the exterior of the tank.

7. CONCLUSIONS

7.1 Primary and Secondary Tank Use.

The primary and secondary tanks were assessed in this document pursuant to API 650-88 and API 653-2009 where applicable. The tank vessels, at the time of the inspection, were determined appropriate for use with the present waste stream at given densities, chemical, and physical characteristics as verified by Clean Harbors Environmental Services, Inc. It was noted that the primary tanks operating height should be restricted based on the apparent and reported maximum height as visually observed and regarding specific gravity of the fluid and its associated height restriction in Section-3.8.

7.2 Life Expectancy.

Based on the information presented and fluid height restriction noted, the useful life of the tanks is estimated to be an additional 15-yrs. However, corrosion of the interior tank shall be carefully observed to preempt internal steel lining failure do to corrosion. Repair of the floor plates may be required if corrosion continues as noted in this report.

8. RECOMMENDATIONS

8.1 Compatible Storage.

Clean Harbors should continually insure compatibility with the waste and densities stored in the tank.

8.2 Control Liquid Height.

Maintain a management system or alarm to ensure that the fluid height does not exceed that specified in Section-3.8 of the report.

8.3 Drainage Control.

Maintain site work around the perimeter of the tank to direct storm water away from the tank.

8.4 Routine Inspections.

Monthly visual inspections of the tank exterior should be conducted. This inspection should include each of the four (4) sight glasses associated with the leak detection system. If routine and preventative measures results in the tank being empty, consideration should be given to making periodic interior inspection.

8.5 Corrosion protection.

Continue routine painting of the tank exterior.

9. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who mange the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including possibility of fine and imprisonment for known violations.

REGISTERED PROFESSIONAL ENGINEER
RONALD RAY ERDMAN
12502
OKLAHOMA

Ron Erdman, P.E.
License No. OK12502

8-28-2018
Date

CA1960
6-30-2020

Appendix A

T6, Wastewater Storage Tank

TANK SYSTEM VOLUME AND WEIGHT CALCULATIONS

DIMENSIONS:		
Geometry:	Cylindrical	
Diameter (Primary Tank):	100.00	Feet
Diameter (Secondary Tank):	108.00	Feet
Height:	24.00	Feet
Operating Height:	19.00	Feet
Bottom:	Flat	

PRIMARY TANK VOLUME

Maximume Volume =	188,502.00	C.F.
Operating Volume =	149,230.75	C.F.
Total Primary Tank Volume =	188502.00	C.F.
	1,409,994.96	Gal.

TANK SYSTEM WEIGHTS

CONTENTS S.G.	1.30	
DENSITY	81.12	LB/C.F.
WEIGHT OF PRIMARY TANK CONTENTS	7,645.64	TONS

TANK WEIGHT - PRIMARY TANK

SURFACE AREA CALCULATIONS

Tank Bottom =	7,854.25	S.F.
Tank Wall = Cir*h	7,540.08	S.F.
Total Surface Area:	15,394.33	S.F.

TANK WEIGHT CALCULATIONS

Steel Thickness:		
Bottom =	0.2500	inches
Tank Wall (1st. course) =	0.3125	inches
Tank Wall (2nd. & 3rd. Courses) =	0.2500	inches
Volume of Steel:		
Bottom =	163.63	C.F.
Tank Wall =	170.16	C.F.
Density of Steel =	490.00	LB/C.F.
TOTAL PRIMARY TANK WEIGHT	81.78	TONS

T6, Wastewater Storage Tank

TANK SYSTEM VOLUME AND WEIGHT CALCULATIONS

TANK WEIGHT - SECONDARY TANK

SURFACE AREA CALCULATION:

Tank Bottom =	9,161.20	S.F.
Tank Wall =	8,144.29	S.F.
Total Surface Area	17,305.48	S.F.

TANK WEIGHT CALCULATION:

Steel Thickness:		
Bottom =	0.2500	inches
Tank Wall (1st & 2nd Courses)	0.3125	inches
Tank Wall (3rd. Course)	0.2500	inches
Volume of Steel:		
Bottom =	190.86	C.F.
Tank Wall =	197.97	C.F.
Density of Steel =	490.00	LB/C.F.
TOTAL SECONDARY TANK WEIGHT	95.26	TONS
Volume of pea gravel bed	9,161.20	C.F.
Density of pea gravel	120.00	LB/C.F.
TOTAL PEA GRAVEL WEIGHT	549.67	TONS
TOTAL TANK SYSTEM WEIGHT	8,372.35	TONS
Foundation Loading	1827.79	psf

Appendix B

T6, Wastewater Storage Tank

PRIMARY TANK WALL THICKNESS

DIMENSIONS:		
Geometry:	Cylindrical	
Diameter:	100.00	feet
Height:	19.00	feet
Specific Gravity:	1.3	
Normal Operating temperature:	Ambient	

FIRST COURSE

Thickness (t) = (2.6*H-1*D*S.G./(s*E)

s = Allowable Design Stress =	24,708	psi
E = Joint Efficiency =	100%	
Calculated Thickness (t) =	0.2462	inches
Corrosion Allowance =	0.0625	inches
Calculated Required Wall Thickness 1st Course	0.3087	inches
Measured Thickness (ultrasonic)	0.3154	inches
Safety Factor	1.02	

SECOND AND THIRD COURSES

Thickness (t) = (2.6*H*D*S.G.)/(s*E)

Height (second course)	11.00	feet
s = Allowable Design Stress =	24,708	psi
E = Joint Efficiency =	100%	
Thickness (t) =	0.1505	inches
Corrosion Allowance =	0.0625	inches
Calculated Required Wall Thickness 2nd Course	0.2130	inches
Measured Thickness (ultrasonic)	0.2490	inches
Safety Factor	1.14	

T6, Wastewater Storage Tank

SECONDARY TANK WALL THICKNESS CALCULATIONS

DIMENSIONS:		
Geometry:	Cylindrical	
Diameter:	108.00	feet
Height:	16.00	feet
Specific Gravity:	1.3	
Normal Operating temperature:	Ambient	

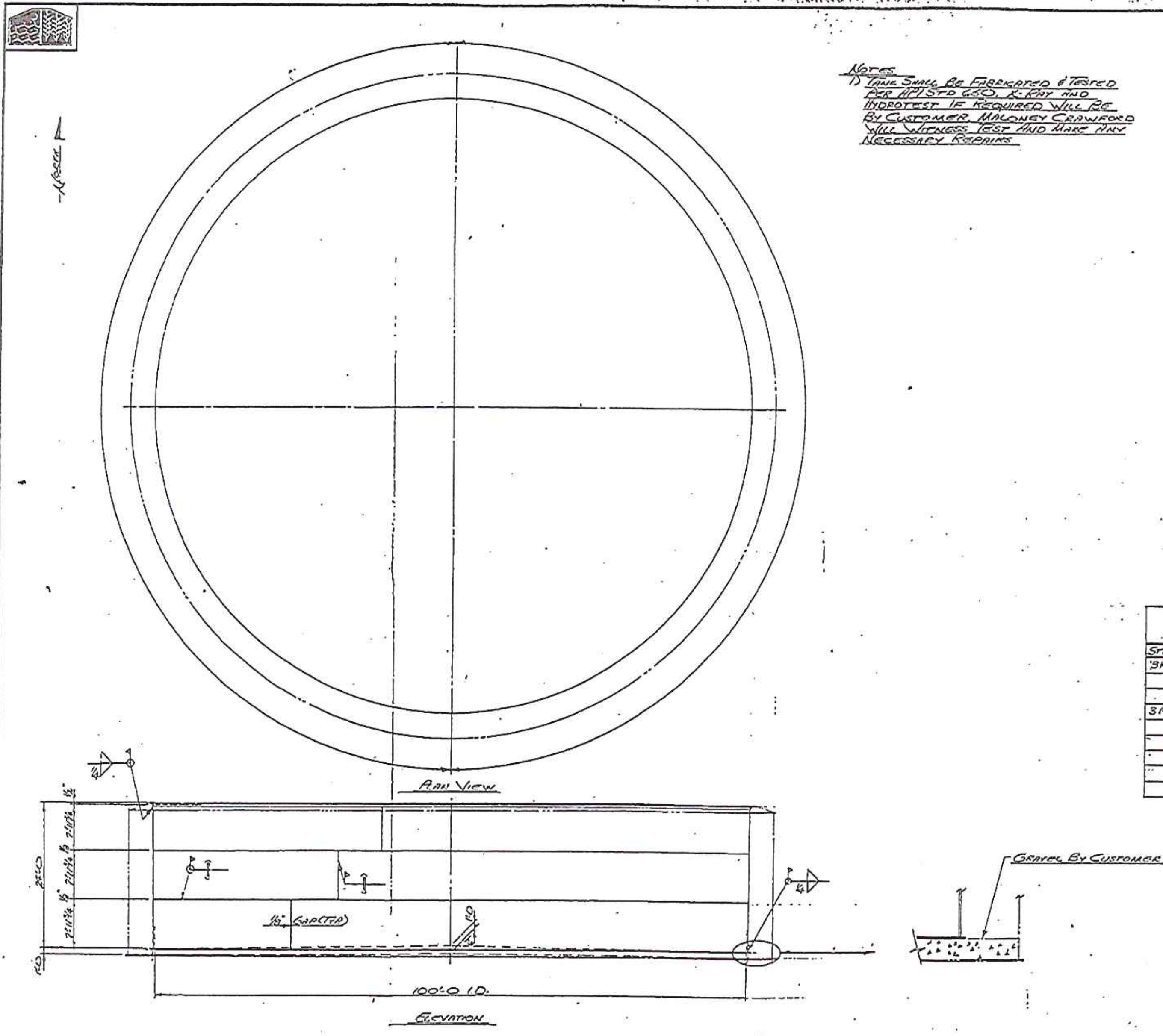
FIRST AND SECOND COURSE

Thickness (t) = (2.6*H-1*D*S.G./(s*E)		
s = Allowable Design Stress =	24,708	psi
E = Joint Efficiency =	100%	
Calculated Thickness (t) =	0.2216	inches
Corrosion Allowance =	0.0625	inches
Calculated Required Wall Thickness 1st Course	0.2841	Inches
Measured Thickness (ultrasonic)	0.3154	inches
Safety Factor	1.11	

THIRD COURSE

Thickness (t) = (2.6*H*D*S.G.)/(s*E)		
Height (third course)	4.00	feet
s = Allowable Design Stress =	24,708	psi
E = Joint Efficiency =	100%	
Thickness (t) =	0.0455	inches
	10	
Corrosion Allowance =	0.0625	inches
Calculated Required Wall Thickness 3rd. Course	0.1080	inches
Measured Thickness (ultrasonic)	0.2490	inches
Safety Factor	1.57	

Appendix C



NOTES:
1) TANK SHALL BE FABRICATED & TESTED PER API STD 650. X-RAY AND HYDROTEST IF REQUIRED WILL BE BY CUSTOMER. MALONEY CRAWFORD WILL WITNESS TEST AND MAKE ANY NECESSARY REPAIRS.

UNIT BILL OF MATERIAL
ONE (1) UNIT REQ'D

CUST. MK.	LOCATION	ITEM	REQ'D	DESCRIPTION	WEIGHT	DWG. NO.
		1	1	SHELL	85415	41
		2	1	BOTTOM	84233	4J
		3	1	INSIDE LADDER	391	4K
		4	1	24" SHELL MANWAY	382	4L
		5	1	6" SF SHELL NOZ. w/ FILL HOSE	51	4L
		6	1	4" SF SHELL NOZ. w/ FILL HOSE	30	4L
		7	1	3" SF SHELL NOZ. w/ FILL HOSE	19	4L
				TOTAL	170521	

PRELIMINARY

SHELL PLATE SCHEDULE
(ROLL TO: 50' I.S.R.

STRAP	& CIRC.	WEIGHT	RING	NO. REQ'D	TRIM TO	TRIM FROM	MAT'L
314'-5⅞	314'-2⅞	31978	1	15	5/16 x 95¾ x 239	5/16 x 96 x 240	SA36
			1	1	5/16 x 95¾ x 184	do	do
314'-3½	314'-2¾	51175	2,3	15	¼ x 95¾ x 239	¼ x 96 x 240	SA36
			2,3	1	¼ x 95¾ x 183½	do	do
	314'-4¾	2264	TOP ∠		ROLL ∠ 3 x 3 x 3/8 LEG OUT ON		SA36
					50'-0¼ INSIDE RADIUS x 314'-4¾		
					(FULL CIRCLE)		

APPROVAL
☐ APP'D. W/O COMMENT
☐ APP'D. AS NOTED
DATE ____
BY ____

RETURN TO:
MALONEY-CRAWFORD INC.
ATTN: DON COLLINS
P.O. BOX 659 TULSA, OKLA. 74101-0659

TC

MALONEY CRAWFORD INC.
TULSA, OKLAHOMA
PARKERSBURG TANK

DRAWN BY: GB DATE: 8-6-87
REDRAWN BY ____ DATE ____
CHECKED BY ____ DATE ____
APPROVED BY ____ DATE ____

SHELL FOR 100' DIA. x 24' PRIMARY CONTAINMENT TANK
P.O. NO.: 2333
LONE MOUNTAIN FACILITY

SHEET 1 OF 1 | REV. 0
DWG. NO. F131-4I

Appendix D

ENVIROTECH SERVICES, INC.
2500 North 11th Street
P.O. Box 6029
ENID, OKLAHOMA 73702
(405) 234-8780 FAX (405) 237-4302

JOB Appendix G - Secondary Cont
SHEET NO. Volume Calcs. OF
CALCULATED BY T-6 Assessment DATE
CHECKED BY DATE
SCALE

Volume of Secondary Containment

$\boxed{\text{Scenario \#1}}$ - Primary Tank Height = 24-ft
Sp Gr = 1.0

$$V_p = V_{\text{Primary Tank}} = (100^2)\left(\frac{\pi}{4}\right)(24) = 188,502 \text{ ft}^3$$

$$V_s = V_{\substack{\text{secondary}\\ \text{Tank}}} \text{ Containment} = (109^2 - 100^2)\left(\frac{\pi}{4}\right)(24) = 35,457 \text{ ft}^3$$

In the event of a Primary Tank failure, fluid will equalize at the following height (H):

$$(109^2)\left(\frac{\pi}{4}\right) H \cong V_p$$

$$H \approx \frac{V_p}{(109^2)\left(\frac{\pi}{4}\right)} = \frac{188,502}{(109^2)\left(\frac{\pi}{4}\right)} = \boxed{20.2\text{-ft.}}$$

$\boxed{\text{SCENARIO \#2}}$ - Primary Tank Height = 19-ft
Sp Gr = 1.3

$$H = \frac{(100^2)\left(\frac{\pi}{4}\right)(19)}{(109^2)(\pi/4)} = \boxed{16\text{-ft.}}$$

Appendix E

T6 Wastewater Storage Tank

STRUCTURAL SUPPORT CALCULATIONS

DIMENSIONS		
Tank Diameter =	100.00	ft.
Total Height =	24.00	ft.
Weight of Tank (Steel) =		lbs
Tank First Coarse Thickness =	0.3125	in.
Tank Bottom Thickness =	0.25	in.

SEISMIC DESIGN CHECK

OVERTURNING MOMENT

Zone Coefficient (Z):	0.1875	
Essential Facilities Factor (I):	1.0	
Lateral Earthquake Force Coeff. (C1):	0.24	
D/H:	4.17	
k Factor:	0.68	
Site Amplification Factor (S):	1.2	
Natural Period of First Sloshing (T):	6.8	
Lateral Earthquake Force Coeff. (C2):	0.035	
Weight of Tank Shell (Ws):	83,386.00	lbs.
Total Weight of Tank Contents (Wt):	15,291,282.24	lbs.
W1/Wt:	0.285	
W2/Wt:	0.67	
Weight of Effective Mass of Contents That Moves in Unison with the Tank Shell (W1):	4,358,015	lbs.
Weight of Effective Mass in First Sloshing (W2):	10,245,159.10	lbs.
Ht from Btm of Shell to Centroid of Shell (Xs)	12	ft.
X1/H:	0.375	
Ht. from Btm to the Centroid of Lateral Seismic Force (X1):	9	ft.
X2/H:	0.54	
Ht. from Btm to the Centroid of Lateral Seismic Force (X2):	12.96	ft.

STRUCTURAL SUPPORT CALCULATIONS

Overturning Moment (M) = Z*I*(C1*Ws*Xs+C1*W1*X1+C2*W2*X2)

Overturning Moment (M) = 2,637,208.48 lbs

Weight of tank to resist overturning moment: W_L

W_L = 7.9*tb*(F_{by}*S.G.*H)^0.5 =

Thickness of bottom plate (tb) = 0.25 inches

Minimum specified yeild of bottom plate (F_{by}) = 36,000 psi

Design specific gravity (S.G.) = 1.3

W_L = 2093.13 lb/ft. circum

1.25 * SG * H * D = 3900.00

W_L< 1.25*SG*H*D OK!

M / D^2 (W_t + W_L)

W_t = Ws / 3.1417 * D = 265.42

M / D^2 (Wt + W_L) = 0.112

M / D^2 (Wt + W_L) = 0.112 < 0.785 therefore the tank is stable.

SHELL COMPRESSION

Maximum longitudinal compressive force (b):

b = Wt + (1.273 * M / D^2) 601.13 lb / ft. circum

Maximum longitudional compressive stress (b/12t) 160.30 psi

S.G. * H * D^2 / t^2 = 3,194,880.00

S.G. * H * D^2 / t^2 > 10^6 therefore

Maximum allowable compressive stress (F_a):

F_a = 10^6*t/D 3125 psi

b/12t < F_a therefore shell compression is OK.

STRUCTURAL SUPPORT CALCULATIONS

WIND LOADING CHECK

M_{max} must be less than or equal to .66*(WD)/2

where

W = Shell weight available to resist uplift (lbs)	83,386.00	lbs
D = Tank diameter (ft)	100	ft.
M = Overturning moment = PW * Area (projected) * H1		
H1 = Height from the ground to the centroid of the tank shell	12	ft
Pw = Wind Pressure (18 psf for up to 100 MPH winds on cylinder)		
M_{max} =	2,780,923	ft - lbs.
M =	518,400	ft - lbs.

$M < M_{max}$ therefore the tank is stable.

Appendix F

T6, Wastewater Storage Tank

TANK SYSTEM MEASUREMENT AND SETTLEMENT CALCULATIONS

ELEVATION MEASUREMENT

Pt. 1
Pt. 2
Pt. 3
Pt. 4
Pt. 5
Pt. 6
Pt. 7
Pt. 8
BM

Permissible Out of Plane Deflexion

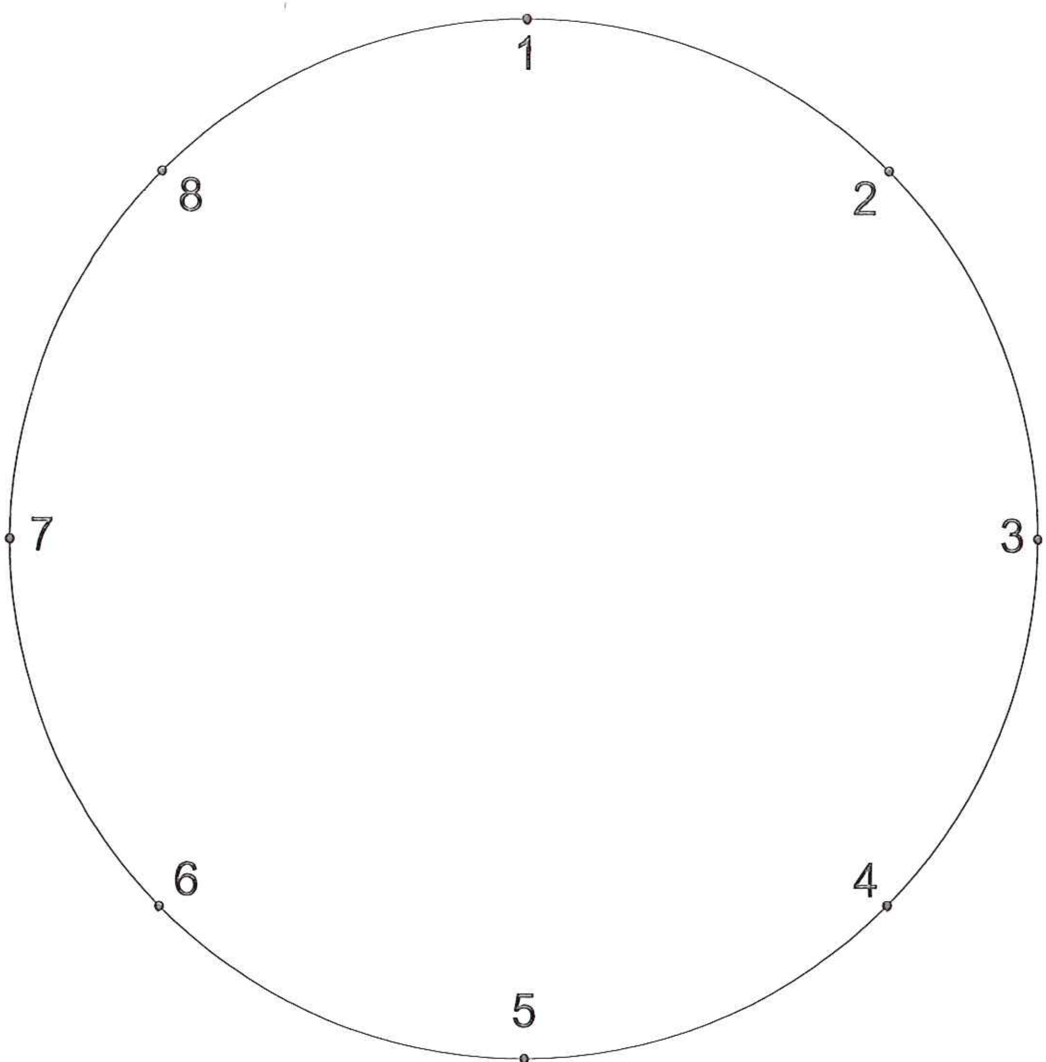
$S < (L^2 * Y * 11) / (2 * (E * H))$

S = Permissible Deflexion (ft.)		
L = Arc length between points (ft.)	42.41	ft.
Y = Yeild Strength (psi)	36,000	psi
E = Young's modulus (psi)	30×10^6	psi
H = tank height (ft.)	24	ft.

	$L^2*Y*11/(2*(E*H))$ =	0.49	ft.
From the graph	S =	0.23	ft.

.23 < .49 therefore settlement is acceptable

T6 WASTEWATER STORAGE TANK



POINT NUMBER	ELEVATION
1	1394.45
2	1394.22
3	1394.25
4	1394.38
5	1394.38
6	1394.25
7	1394.35
8	1394.40

CleanHarbors®

FIELD WORK 10-28-2013

JLS
JIVIDENS LAND SURVEY CO., INC.
1210 19TH STREET / P.O. BOX 943
WOODWARD, OKLAHOMA 73802
Phone 580-256-7174 - Fax 580-256-3424
roger@jividenslandsurvey.com mike@jividenslandsurvey.com

FOR:
ENVIROTECH
2500 N. 11TH STREET
ENID, OK 73701

JOB	DATE OF PLAT	SCALE	SHEET
609-13	10-29-2013	1"=20'	1 OF 1

DRAWN BY D.W.K.

OKLA. CA #2064, EXP. 06/30/2015
KANSAS CA #143, EXP. 12/31/2014

Section UT1

(Out of Service)

SECTION 113

ASSESSMENT OF UNLOADING TANK No.1 (UT1)
LONE MOUNTAIN HAZARDOUS WASTE FACILITY
U.S.P.C.I.
WAYNOKA, OKLAHOMA

A. TANK VESSEL DESCRIPTION

Unloading Tank No.1 is an existing small steel aboveground unloading tank located in the pretreatment Truckwash Building of the Lone Mountain Hazardous Waste Facility. Unloading Tank No.1 and a portion of the ancillary equipment are located together in a concrete containment area.

B. PRIMARY TANK VESSEL

1. General Description

Unloading Tank No.1 is being assessed to determine if the unit is adequately designed with sufficient structural strength, and compatibility with the waste to be stored or treated. Unloading Tank No.1 is an aboveground tank used for the unloading and transfer of caustic liquids. The tank is horizontal in position. The tank is supported by four C5x9 steel columns on concrete foundations. The tank is vented through hatch on top of the tank. The temperature of the tank varies with the temperature of the truck unloading (appoximately ambient).

Effluent piping is located from the pretreatment building to the caustic tanks.

2. Design Standards.

Structure calculations were performed to compare the existing tank and supports to those sections that are applicable in the American Petroleum Institute Standard 650 - 1988 edition (API-650) and the American Institute of Steel Construction (AISC) Manual of Steel Construction (8th Edition). Appendix A of API 650 was utilized for the design standard due to the small diameter of this vessel. These calculations can be found in the Appendix A of this assessment. The tank was originally built to AWWA D-100-84 standards with ATSM-A-36 Steel.

3. Hazardous Characteristics of Wastes Stored

The wastes which are stored in this tank have the following characteristics:

Untreated wastes pH (4 - 13)
N > 1
Temperature = Ambient

The hazardous characteristics of the waste stored in this tank were examined. It was determined that the pH and normality levels of the waste are the primary areas of concern. This is to determine the applicability of a corrosion allowance for the tank material type and thickness.

4. Existing Corrosion Protection

The tank has been coated with Anchor Paints TAR GARD BLACK. This is a coal tar epoxy paint. The specifications for this paint can be found in Appendix H of this report. This paint has been rated excellent for chemical resistance to Alkalis. The inside and out are coated with this material. It should be noted that when thickness calculations were compared a 1/16" corrosion allowance was used.

5. Documented Age of Tank

This tank was installed in June of 1991. The tank was manufactured just prior to installation therefore the tank age is 1 year.

6. Result of Leak Tests

The tank was hydrostaticaly tested prior to being put into service and no leaks were found. In addition the tank has been monitored during use and no leaks have been discovered.

7. Existing Data Obtained

Tank Deminsions	See Appendix G of this Assessment
Material	A36 steel
* Wall Thickness	0.188
Volume	159 cf.
Specific gravity of waste	1.5 (Provided by USPCI)
Temperature	Ambient
Seismic Zone	1

* A complete and exhaustive ultrasonic thickness corrosion survey has been completed, the results of which can be found in Appendix F of this assessment.

8. Calculation of Existing Foundation Loading

Total Weight of Tank and Contents = 7.21 tons

Detailed calculations reflecting the volume and weight of the tank are found in Appendix A of this assessment. The minimum required foundation thickness and steel reinforcement are included in Appendix E of this assessment.

9. Required Structural Calculation

The calculated required wall thickness for this tank is 0.2371 inches. This thickness includes 0.0625 inches added for corrosion allowance. This corrosion allowance is based on a best engineering estimate taking into account the materials being treated and a 20 year design life. (See Appendix A of this assessment for detailed calculations or required wall thickness and structural analysis of the tank support system.) As mention previously this tank is supported by four C5x9 steel column supports. Detailed structural calculations of these supports are shown in Appendix A of this assessment. The support legs were found to be adequate given the present loading conditions.

10. Comparison of Actual Structure to Theoretical Values

Wall Thickness Comparison

Calculated Required Wall Thickness	0.2371"
Minimum Required Wall Thickness By API-650-88	0.1875"
Measured Wall Thickness	0.188"

As mentioned previously the calculated required thickness includes a 0.0625" corrosion allowance, however a corrosion allowance of 0.0129" is all that is provided due to the measured wall thickness of only 0.188".

C. SECONDARY CONTAINMENT SYSTEM

1. General Description of Secondary Containment

The secondary containment system is designed and operated to prevent any migration of wastes or liquids out of the system. This tank is located within a containment area inside the Truckwash building and consists of a reinforced concrete base floor area with vertical concrete sidewalls. All associated piping is aboveground. The area is inspected on a daily basis. There is a large sump located in the East end of this area.

At the time of inspection the concrete area was withstanding daily operations, and routine climatic conditions. The foundation walls and base are mass poured in place. No cracks from compression or uplift were visually apparent.

The containment area and tanks are visually monitored on a daily basis for leaks. A sump pump and drain are located in the containment area. The floor is sloped to the sump to collect any drainage or spills. Any released tank contents or surface runoff will drain on top of the sloped concrete to the sump area. The accumulated liquids are then removed and pumped to the wastewater pretreatment area within a maximum of 24 hours.

2. Design Standards.

Design drawings for this area were obtained and used as a reference. It should be noted that these are design drawings and not as built drawings. The structural capacity of the foundation and walls were compared to those sections that are applicable in the API-650-88 and the American Concrete Institute (ACI 318-89/318r-89) and these calculations were used as a guide in verifying the ability of the system to contain hazardous waste.

3. Hazardous Characteristics of Wastes Stored

The wastes which are treated in the primary tank have the following characteristics:

Untreated waste pH (4 - 13)
N > 1
Temperature = Ambient

The hazardous characteristics of the waste treated in the primary tank were examined. It was determined that the pH and normality levels of the waste are the primary areas of concern. This is to determine the applicability of a corrosion allowance for the containment system material type and thickness.

4. Existing Corrosion Protection

The concrete containment area and sump pump have been coated with Dudick Protecto-coat 800/900. This impermeable coating is compatible with the present waste stream for this tank vessel. The coating was installed in 1991 by Mid-America Painters of Woodward, OK. See Appendix H of this report for detailed information on this coating.

5. Documented Age of The Containment Area

The secondary containment system was constructed and installed in 1987 thus making the containment system 5 years old.

6. Result of Leak Tests

A visual inspection of the containment area was performed and from this inspection there were no cracks or breaks in the impermeable coating, therefore it would be adequate to contain any leaks or spills. The area is inspected on daily basis checking for leaks from the primary tank.

7. Existing Data Obtained

Dimensions	See Drawings
Wall Height	See Drawings
Material	Concrete
Gross Volume	1210.38 c.f.
Thickness	8"

See Appendix G of this assessment for a detailed layout and cross sections of the secondary containment. Also included in Appendix D of this assessment are detailed calculations of the gross volumes the containment area.

8. **Calculation of Existing Capacity**

Containment Capacity Available (CCA)

CCA = Gross Volume - Volume of items in the containment - Volume of rainfall.

See the Appendix D of this assessment for detailed calculations of the available containment volume. The containment capacity available = 1209.21 c.f.

9. **Required Volume**

Containment Capacity Required (CCR)

CCR = Volume of Largest Tank in the secondary containment

Volume of Largest Tank =	159 c.f.(UT1)

10. **Comparison of Available Volume to Required Volume**

Containment Capacity Comparison

Containment Capacity Required =	159 c.f.
Secondary Containment Volume Available =	1209 c.f.
Excess Containment Volume =	1050 c.f.

CCA > CCR Adequate Capacity (under normal operating conditions) is available.

D. CONCLUSIONS

1. Primary Tank Vessel

The tank vessel at the time of inspection was fit for use with the present waste stream at given densities, chemical and physical characteristics as verified by USPCI. The useful life of the steel tank would be estimated at 19 years if the current waste stream is maintained. This useful life was determined by using a design life of 20 years less the period that the tank has been in use at the USPCI Lone Mountain Facility.

2. Secondary Containment System

The secondary containment area at the time of inspection was fit for use, if the present waste stream at given densities and chemical and physical characteristics as verified by USPCI were released from the primary tank. The useful life of the concrete containment area is estimated at 15 years. This useful life was determined by using a design life of 20 years less the period that the tank has been in use at the USPCI Lone Mountain Facility. There did not seem to be any extensive corrosion or deterioration of the secondary containment area.

E. RECOMMENDATIONS

The following repairs or modifications should be made:

1. Primary Tank

   The tank should be checked periodically with ultrasonic testing procedures to establish a verified limit of corrosion. USPCI should continually insure compatibility with the waste and densities stored. Daily inspections should be continued to detect any visual corrosion or defects.

2. Secondary Containment

   The secondary containment should be checked periodically for any deterioration and structural integrity. USPCI should continually insure compatibility with the waste and densities stored.

3. Routine Inspections

   When routine and preventative measures are to be completed, the tank should be cleaned and internally inspected to determine any interior defects or corrosion. Continued routine painting and coating of tanks on the interior and exterior, and routine inspection is recommended.

F. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to be the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

E.E Myers
Date: 1/20/93

Engineer
Title

P.E. 4126 OKLA

REGISTERED PROFESSIONAL ENGINEER
E. E. Myers
4126
OKLAHOMA

APPENDIX A

The following appendicies have been combined into one appendix:

Appendix A
Appendix B
Appendix C
Appendix E

These appendicies were combined due to the fact that the original design calculations were prepared by Gauger Engineering. The calculations included in this appendix are those that were prepared by Gauger Engineering.

USPCI - CAUSTIC UNLOADING # 1

WEIGHT & CAPACITY OF TANK

INSIDE DIAMETER OF END SECTION = 4.958'

AREA OF HALF CIRCLE $= \frac{\pi D^2}{4 \times 2} = \frac{\pi (4.958)^2}{8}$

$= \underline{9.655^{\square'}}$

AREA OF CENTER SECTION = $4.958 \times 4 = \underline{19.833^{\square'}}$

TOTAL INSIDE PLAN AREA = $2 \times 9.655 + 19.833$

$= \underline{39.142^{\square'}}$

HEIGHT OF TANK BASE RING TO TOP RING = 3'-8"

VOLUME = 3.667×39.141 = <u>143.532 CU. FT.</u>

VOLUME OF END CONE = $H \times A \times \frac{1}{3}$

$= .479 \times 9.655/3$ = <u>1.542 CU. FT.</u>

VOLUME OF CENTER BASE SECTION = $H \times A \times \frac{1}{2}$

$= .479 \times 4 \times 4.958/2$ = <u>4.75 CU. FT.</u>

TOTAL VOLUME TO TOP RING (OVERFLOW)

$143.532 + 2 \times 1.542 \times 4.75$ = 151.369 CU. FT

= <u>1132.24 GAL.</u>

(USE FOR LOAD DESIGN)

TOTAL VOLUME OF BASE SLOPE

$1.542 \times 2 + 4.75$ = 7.834 CU. FT.

= <u>58.6 GAL.</u>

VOLUME OF UNIT DEPTH = 7.48×39.142

= <u>292.782 GAL/FT.</u>

WORKING (NET) VOLUME = <u>1034.64 GAL.</u>

(BASED OF 4" FREEBOARD)

TOTAL INSIDE VOL. = 1132.24 + 58.6

= 1190.84 GAL.

SPECIFIC GRAVITY OF CONTENTS = 1.30
MAX. WT. FOR TANK DESIGN = 1132.24 × 8.33 × 1.30

= 12265.4 #

ESTIMATE OF DEAD WT.

5/16" PLATE	629#
3/16" SHELL	440#
3/16" TOP & BOT.	393#
1" ROD	71#
1/2" ROD	7#
5" CHANNEL	356#
2 × 2 × 3/16 L	116#
BP.	21#
COLLAR	20#
MISC. & WELD	97#
	2150#

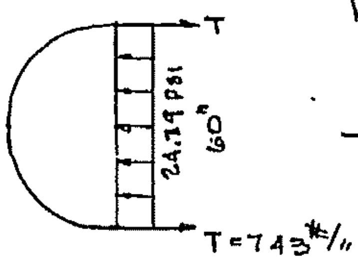
MAX. LOAD = 14,415# ±

LEG. LOAD = 3604# EACH.

BEARING PRESSURE = 100 PSI

END SHELL ANALYSIS

HOOP TENSION

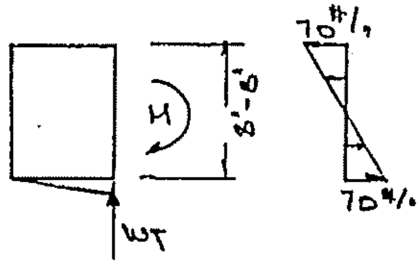


MAX. HYDRO. PRESS. @ BOTTOM

$3.67 \times 81.12 / 12 = 24.79$ PSI

$T = \frac{24.79 \times 60}{2} = 743$ #/"

CANTILEVER SUPPORT FORCES



WEIGHTS

CONTENTS @ 81.12 PCF

HALF CYL. $A = \frac{\pi (4.96)^2}{2 \times 4} = 9.65$ □'

$W_C = 9.65 \times 3.67 \times 81.12$

$= 2873$# CYLINDER

$W_B = 9.65 \times .5 \times .33 \times 81.12$

$= 130$#

CONTENTS 3003#

TANK WT. 1/4" PL = 10.2 #/□'

TOP OR BOTTOM :.

$9.65 \times 10.2 = 99$#

SHELL

$5\pi \times 3.67 / 2 \times 10.2 = 294$#

CORNER ANGLES

$5\pi \times 2.44 = 39$#

TOTAL WT = 3534# L+D

CENTROID OF LOAD

$\bar{X} = \frac{4 \times 2.5}{3\pi} = 1.061'$

MOMENT OF LOAD

$M = 3534 \times 1.061$

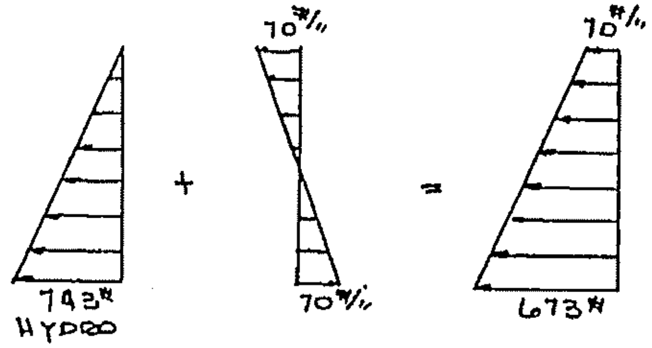
$= 3750$ '# TOTAL

$= 1875$ '#/SIDE

UNIT FORCES

$F = \frac{1875 \times 12}{\frac{44^2}{6}} = 70$ #/"

COMBINED FORCES ON END SHELLS



$$\text{SHEAR} = \frac{3584}{2 \times 44} = 40.7\,\#/''$$

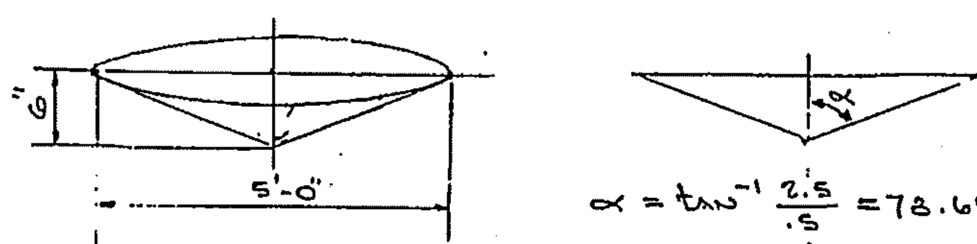
OK

REQUIRED SHELL THICKNESS

$$T = \frac{673}{15000} = .04'' + 1/16 = .11''$$

USE MIN. 3/16"

CLAM SHELL BOTTOM (DIVIDED)



$$\alpha = \tan^{-1}\frac{2.5}{.5} = 78.69°$$

$$\text{AREA} = \pi\, 5^2/4 = 19.63\,\square'$$

TOTAL LOAD ON BASE CIRCLE

$$F = 19.63 \times [3.667 + 1/3(.5)] \times 1.3 \times 62.4 = 6106\#$$

$$\text{SHEAR @ CORNER WELD} = \frac{6106}{5\pi \times 12} = 32.4\,\#/''$$

$$\text{RADIAL FORCE @ CORNER} = \frac{32.4}{\tan\alpha} = 159\,\#/''$$

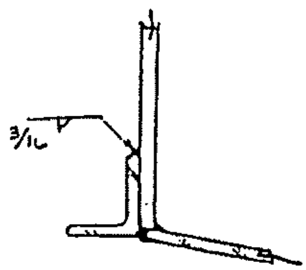
$$\text{PRINCIPAL TANGENTIAL (RAY)} = \sqrt{32.4^2 + 159^2} = 163\,\#/''$$

CORNER REINF. ANGLE

$C = 159 \times 20 = 4770^{\#}$ COMPRESSION

AREA OF ANGLE REQUIRED

$A = \dfrac{4770}{15000} = .32$ $\quad 2 \times 2 \times 3/16\ L = .440''$ OK



MAX. WELD FORCE $159^{\#}/''$

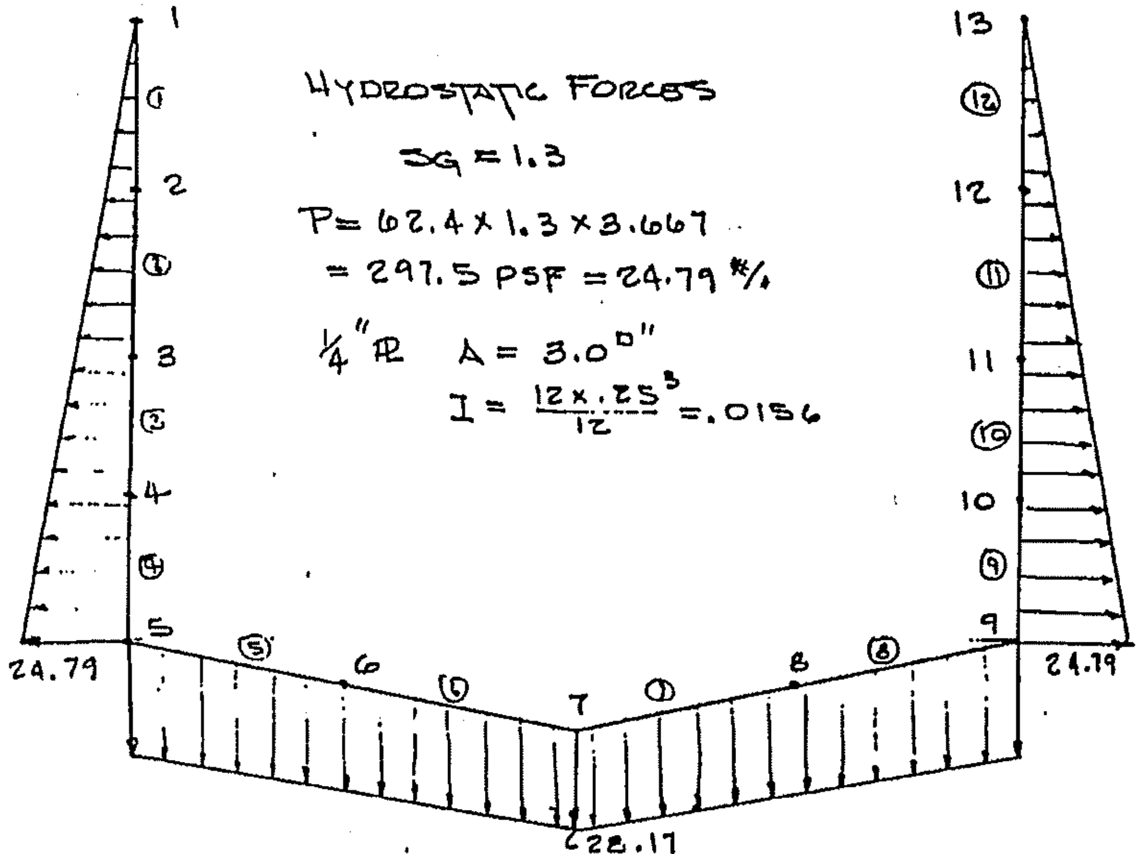
FILLET WELDS @ $.4 \times .707 \times 36000$

$= 10180^{\#}/\square''$ WELD LEG.

$L = \dfrac{159}{10180} = .02''$ USE $3/16''$

CENTRAL TANK SHELL

CONTINUITY ANALYSIS OF PLATES

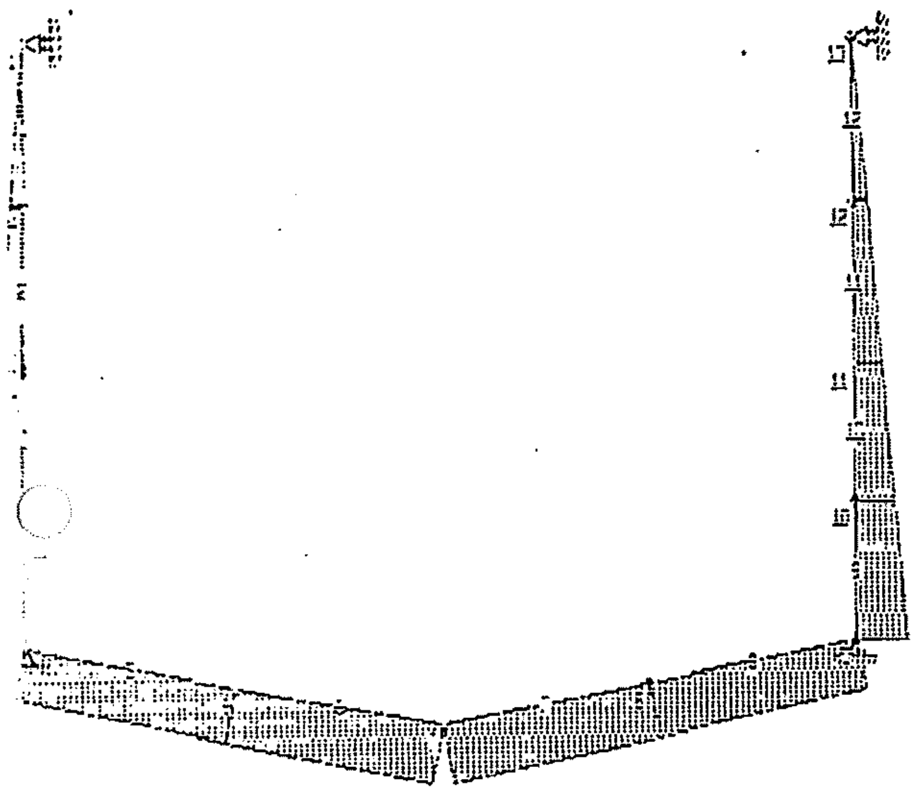


JOINT COORD.

#	X	Y
1	-30	50
2	-30	38
3	-30	26
4	-30	16
5	-30	6
6	-15	3
7	0	0
8	15	3
9	30	6
10	30	16
11	30	26
12	30	38
13	30	50

MEMBERS

1	1	2
2	2	3
3	3	4
4	4	5
5	5	6
6	6	7
7	7	8
8	8	9
9	9	10
10	10	11
11	11	12
12	12	13
13	5	9



GAUGER ENGINEERING CO.
1306 E. 13TH. STREET
TULSA, OKLAHOMA

CAUSTIC UNLOADING TANK SHEET CONTINUITY ALALYSIS
USPCI LONE MOUNTIAN FACILITY

I C R O S A F E --- STRUCTURAL ANALYSIS BY FINITE ELEMENTS
Version: SAFE2STA (2-D) Rel. 3.0 5/28/1991 2:49:34

ZE OF THE STRUCTURE

ımber of nodes	:	13
mber of materials	:	1
mber of beams	:	12
mber of beam end releases	:	0
mber of plates	:	0
mber of fasteners	:	0
mber of primary loadcases	:	1
mber of superposition loadcases	:	0
mber of restrained degrees of freedom	:	6

ORDINATES

de	Coordinate X	Coordinate Y
1	-.300000E+02	.500000E+02
2	-.300000E+02	.380000E+02
3	-.300000E+02	.260000E+02
4	-.300000E+02	.160000E+02
5	-.300000E+02	.600000E+01
6	-.150000E+02	.300000E+01
7	.000000E+00	.000000E+00
8	.150000E+02	.300000E+01
9	.300000E+02	.600000E+01
10	.300000E+02	.160000E+02
11	.300000E+02	.260000E+02
12	.300000E+02	.380000E+02
13	.300000E+02	.500000E+02

TERIAL PROPERTIES

de	Young's modulus	Poisson's ratio	Specific weight
1	.290000E+08	.300000E+00	.000000E+00

AM DATA

am	I	J	Length	Area	M. Inertia	Material
1	1	2	.12000E+02	.30000E+01	.15600E-01	1
2	2	3	.12000E+02	.30000E+01	.15600E-01	1
3	3	4	.10000E+02	.30000E+01	.15600E-01	1
4	4	5	.10000E+02	.30000E+01	.15600E-01	1
5	5	6	.15297E+02	.30000E+01	.15600E-01	1
6	6	7	.15297E+02	.30000E+01	.15600E-01	1
7	7	8	.15297E+02	.30000E+01	.15600E-01	1
8	8	9	.15297E+02	.30000E+01	.15600E-01	1
9	9	10	.10000E+02	.30000E+01	.15600E-01	1
10	10	11	.10000E+02	.30000E+01	.15600E-01	1
11	11	12	.12000E+02	.30000E+01	.15600E-01	1
12	12	13	.12000E+02	.30000E+01	.15600E-01	1

IMARY LOADCASES

adcase name	:	
adcase number	:	1
mber of loaded nodes	:	0
n of loaded beams	:	12
of loaded plates	:	0
avity loads factor	:	.0000E+00

AM LOADS

am	Loading direction	End Distributed Loads	
1	Local Y axis	.000000E+00	-.676000E+01
2	Local Y axis	-.676000E+01	-.135200E+02
3	Local Y axis	-.135200E+02	-.191500E+02
4	Local Y axis	-.191500E+02	-.247900E+02
5	Local Y axis	-.247900E+02	-.264800E+02
6	Local Y axis	-.264800E+02	-.281700E+02
7	Local Y axis	-.281700E+02	-.264800E+02
8	Local Y axis	-.264800E+02	-.247900E+02
9	Local Y axis	-.247900E+02	-.191500E+02
10	Local Y axis	-.191500E+02	-.135200E+02
11	Local Y axis	-.135200E+02	-.676000E+01
12	Local Y axis	-.676000E+01	.000000E+00

VEMENT RESTRAINTS

de	Type of restraint	Displacement
1	Translation along X axis	.000000E+00
[illegible]	Translation along X axis	.000000E+00
5	Translation along Y axis	.000000E+00
9	Translation along X axis	.000000E+00
9	Translation along Y axis	.000000E+00
13	Translation along X axis	.000000E+00

)LUTION SUMMARY

ımber of degrees of freedom : 39 (39 in RAM and 0 on disk)
ındwidth : 6
ımber of loadcases : 1

:==
:====================
:SULTS FOR LOADCASE 1 :

:==
:====================

IDE DISPLACEMENTS

de	U	V	Omega
1	.00000E+00	.00000E+00	-.45278E-01
2	-.47052E+00	.00000E+00	-.27578E-01
3	-.56789E+00	.00000E+00	.12611E-01
4	-.30193E+00	.00000E+00	.36131E-01
[illegible]	.00000E+00	.00000E+00	.12750E-01
[illegible]	-.16627E-01	-.84828E-01	-.34803E-02
7	.17353E-17	-.33853E-02	.10361E-16
8	.16627E-01	-.84828E-01	.34803E-02
9	.00000E+00	.00000E+00	-.12750E-01
10	.30193E+00	.00000E+00	-.36131E-01
11	.56789E+00	.00000E+00	-.12611E-01
2	.47052E+00	.00000E+00	.27578E-01
13	.00000E+00	.00000E+00	.45278E-01

AM CORNER FORCES

am	I	J	FX1	FY1	MZ1	FX2	FY2	MZ2
1	1	2	.11842E+03	.00000E+00	-.30287E-12	-.77864E+02	.00000E+00	.12534E+04
2	2	3	.77864E+02	.00000E+00	-.12534E+04	.43816E+02	.00000E+00	.15334E+04
3	3	4	-.43816E+02	.00000E+00	-.15334E+04	.20717E+03	.00000E+00	.32233E+03
4	4	5	-.20717E+03	.00000E+00	-.32233E+03	.42687E+03	.00000E+00	-.28040E+04
5	5	6	-.17664E+04	.79440E+03	.28040E+04	.18433E+04	-.40987E+03	.84418E+03
6	6	7	-.18433E+04	.40987E+03	-.84418E+03	.19253E+04	.18733E-11	-.17040E+04
7	7	8	-.19253E+04	.28169E-12	.17040E+04	.18433E+04	.40987E+03	.84418E+03
8	8	9	-.18433E+04	-.40987E+03	-.84418E+03	.17664E+04	.79440E+03	-.28040E+04
9	9	10	-.42687E+03	.00000E+00	.28040E+04	.20717E+03	.00000E+00	.32233E+03
0	10	11	-.20717E+03	.00000E+00	-.32233E+03	.43816E+02	.00000E+00	.15334E+04
1	11	12	-.43816E+02	.00000E+00	-.15334E+04	-.77864E+02	.00000E+00	.12534E+04
2	12	13	.77864E+02	.00000E+00	-.12534E+04	-.11842E+03	.00000E+00	.47073E-13

AM LOADS AND STRESSES

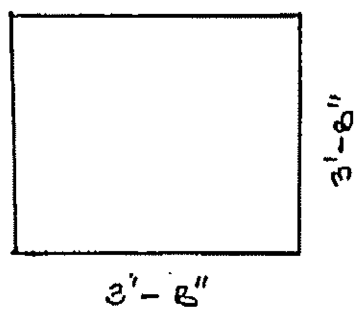
```
am      I      J          FX1          SX1          FX2          SX2          SH1
          BM1         BM2

 1      1      2    .00000E+00   .00000E+00   .00000E+00   .00000E+00  -.11842E+03  -.77864E+02
287E-12   .12534E+04
 2      2      3    .00000E+00   .00000E+00   .00000E+00   .00000E+00  -.77864E+02   .43816E+02
534E+04   .15334E+04
 3      3      4    .00000E+00   .00000E+00   .00000E+00   .00000E+00   .43816E+02   .20717E+03
334E+04   .32233E+03
 4      4      5    .00000E+00   .00000E+00   .00000E+00   .00000E+00   .20717E+03   .42687E+03
233E+03  -.28040E+04
 5      5      6    .18879E+04   .62931E+03   .18879E+04   .62931E+03  -.43255E+03  -.40406E+02  -
040E+04   .84418E+03
 6      6      7    .18879E+04   .62931E+03   .18879E+04   .62931E+03  -.40406E+02   .37759E+03
18E+03  -.17040E+04
 7      7      8    .18879E+04   .62931E+03   .18879E+04   .62931E+03  -.37759E+03   .40406E+02  -
40E+04   .84418E+03
 8      8      9    .18879E+04   .62931E+03   .18879E+04   .62931E+03   .40406E+02   .43255E+03
418E+03  -.28040E+04
 9      9     10    .00000E+00   .00000E+00   .00000E+00   .00000E+00  -.42687E+03  -.20717E+03  -
[illegible]+04   .32233E+03
       10     11    .00000E+00   .00000E+00   .00000E+00   .00000E+00  -.20717E+03  -.43816E+02
33E+03   .15334E+04
 1     11     12    .00000E+00   .00000E+00   .00000E+00   .00000E+00  -.43816E+02   .77864E+02
334E+04   .12534E+04
12     12     13    .00000E+00   .00000E+00   .00000E+00   .00000E+00   .77864E+02   .11842E+03
34E+04   .47073E-13
```

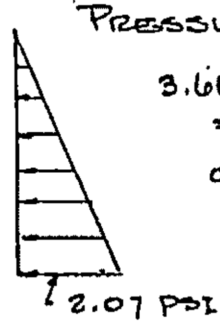
E INTERNAL FORCES AND REACTIONS

de	Coordinate X	Coordinate Y	FX		FY		MZ
1	-.300000E+02	.500000E+02	.11842E+03	Reaction	.00000E+00		-.30287E-12
2	-.300000E+02	.380000E+02	.26853E-05		.00000E+00		.89746E-05
3	-.300000E+02	.260000E+02	-.11294E-05		.00000E+00		-.12568E-04
4	-.300000E+02	.160000E+02	.45927E-05		.00000E+00		-.23346E-05
5	-.300000E+02	.600000E+01	-.13396E+04	Reaction	.79440E+03	Reaction	.10962E-03
6	-.150000E+02	.300000E+01	.71504E-05		-.28610E-05		-.14251E-04
7	.000000E+00	.000000E+00	-.16691E-04		.21550E-11		.74037E-05
8	.150000E+02	.300000E+01	.71504E-05		.28610E-05		-.14251E-04
9	.300000E+02	.600000E+01	.13396E+04	Reaction	.79440E+03	Reaction	.10962E-03
10	.300000E+02	.160000E+02	.45927E-05		.00000E+00		-.23346E-05
11	.300000E+02	.260000E+02	-.11294E-05		.00000E+00		-.12568E-04
12	.300000E+02	.380000E+02	.26853E-05		.00000E+00		.89746E-05
13	.300000E+02	.500000E+02	-.11842E+03	Reaction	.00000E+00		.47073E-13

CENTRAL TANK SHELL

SIDE PLATE





PRESSURE:

$3.667 \times 1.3 \times 62.4$
$= 298\ \#/\square'$

$q = 2.07$

REFER TO TIMOSHENKO, WOINOWSKY KRIEGER
THEORY OF PLATES & SHELLS

RATIO OF SIDES $\quad \frac{b}{a} = 1.0$

FROM TABLES

$\beta = .0264 \qquad \beta_1 = .0245$

$M_x = \beta q_o a^2 \qquad M_y = \beta_1 q_o a^2$

$= .0264 \times 2.07 \times 44^2 \qquad = .0245 \times 2.07 \times 44^2$

$= 105.8\ ''\#/'' \qquad = 98.18\ ''\#/''$

SECTION MODULUS $= \frac{bt^2}{6}$ ∴

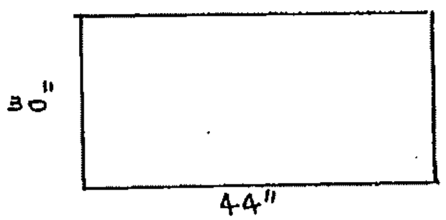
$S = .167t^2 = \frac{M}{\sigma} = \frac{105.8}{15000} = .0071$

$t = \sqrt{\frac{.0071}{.167}} = .2055''$ SIMPLE SPAN

$\frac{105.8}{105.8 + 98.18} = 52\%$

BOTTOM PLATE

SIMPLE SUPPORTED CASE



$q = .4.0 \times 1.3 \times 62.4$

$= 324.5$ PSF

$= 2.25$ PSI

RATIO OF SIDES $\frac{b}{a} = \frac{44}{30} = 1.467 \approx 1.5$

FROM TABLES @ ℄ PL

$\beta = .0812$ $\qquad$ $\beta_1 = .0498$

$M_x = \beta q a^2$ $\qquad$ $M_Y = \beta_1 q a^2$

$= .0812 \times 2.25 \times 30^2$ $\qquad$ $= .0498 \times 2.25 \times 30^2$

$= 164.4$ "#/" $\qquad$ $= 100.85$ "#/"

BUILT IN SUPPORTS CASE

@ ℄ PLATE

$M_x = .0368 \times 2.25 \times 30^2$ $\qquad$ $M_Y = .0203 \times 2.25 \times 30^2$

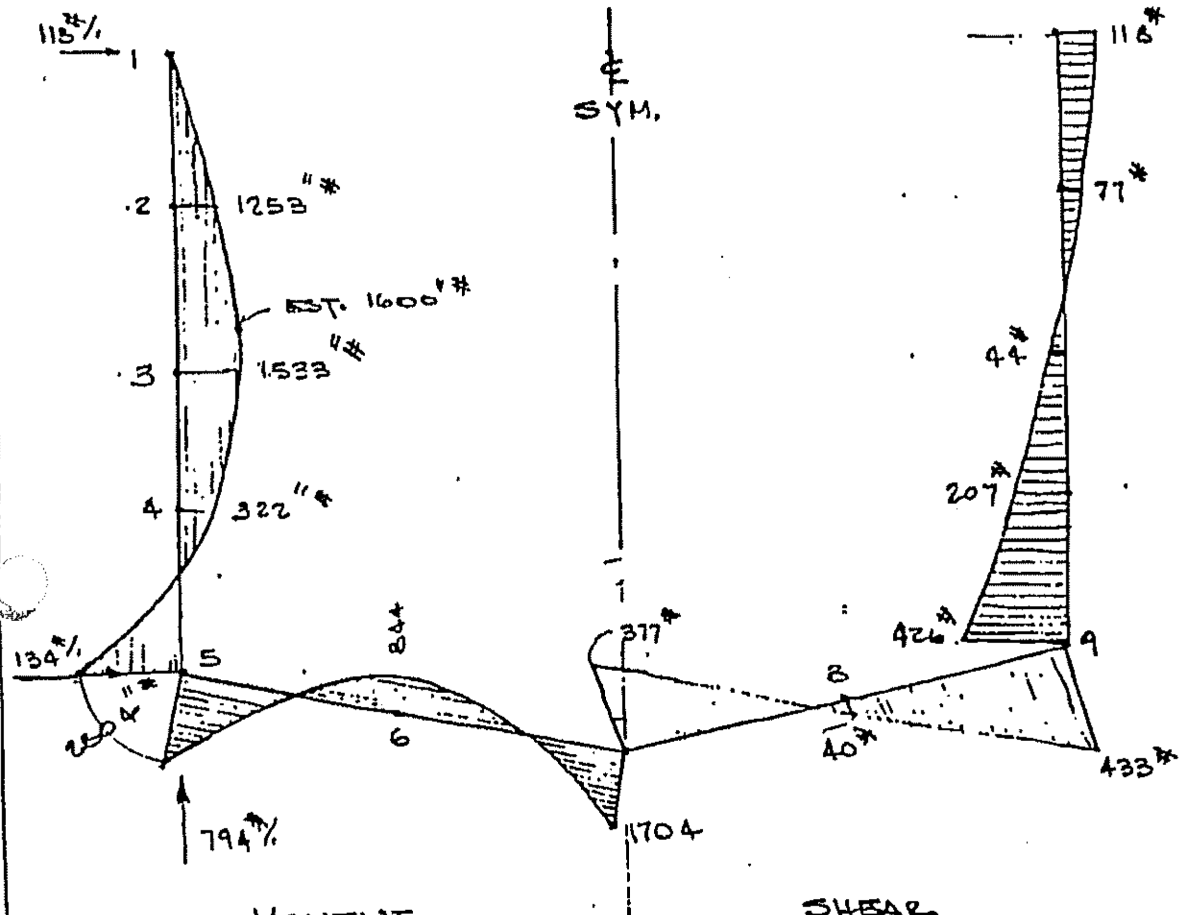
$= 74.52$ "#/" $\qquad$ $= 41.11$ "#/"

@ ℄ EDGE

$M_x = -.0757 \times 2.25 \times 30^2$ $\qquad$ $M_Y = -.0570 \times 2.25 \times 30^2$

$= -153.3$ "#/" $\qquad$ $= -115.43$ "#/"

CENTRAL TANK SHELL



STATIC MOMENT

$844 + \frac{2804+1704}{2} = 3098''\#/$

$= 258.17''\#/$

LOAD RATIO FOR THIS DIRECTION = 52%

$M_s = .52 \times 258.17 = 134.24''\# > 105.6$ OK

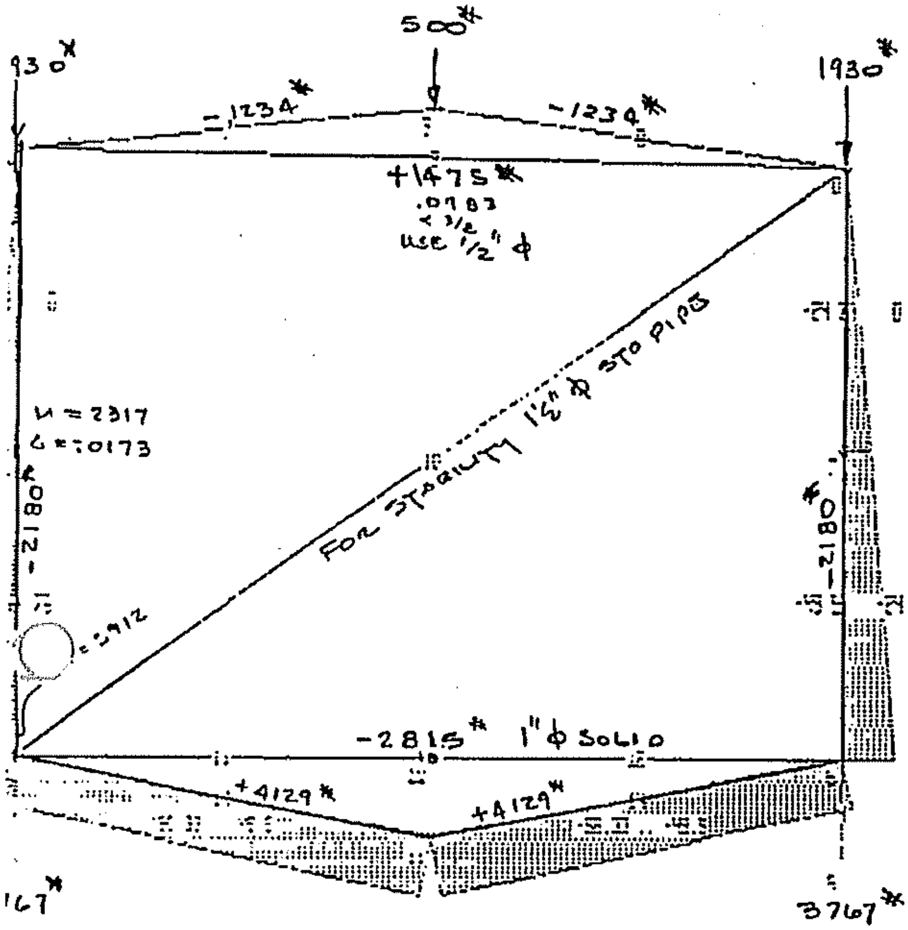
$M_5 = .52 \times 2804/12 = 121.5''\#/$

$S = \frac{M}{\sigma} = \frac{t^2}{6} = \frac{121.5}{15000}$

$t = .22'' + 1/16 = .283 < 5/16$ USE 5/16 PL

CLIPS :

For Frame Design Assume All Loads Carried on Frame Plates Totally Supported by Frame



(10) Strut

$\frac{L}{r} = \frac{74.4}{.62} = 120$

1½" φ STD Pipe

A = .799

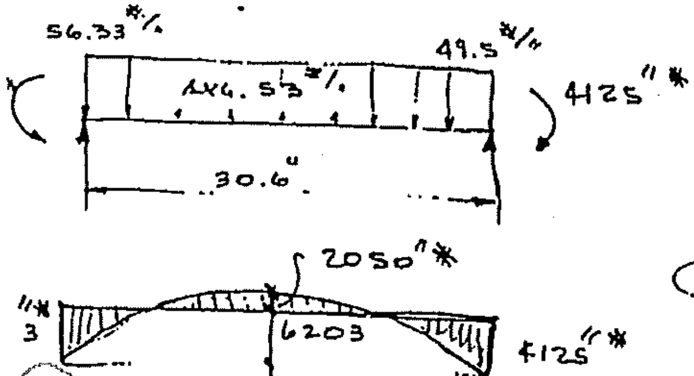
$\frac{L}{r} : \frac{60}{.50} = 120$

$\frac{R}{2} = .5 \quad R = 1.00$

A = .785 □"

$F_a = 10.28$

$.785 \times 10.2 = 8.07$* ok

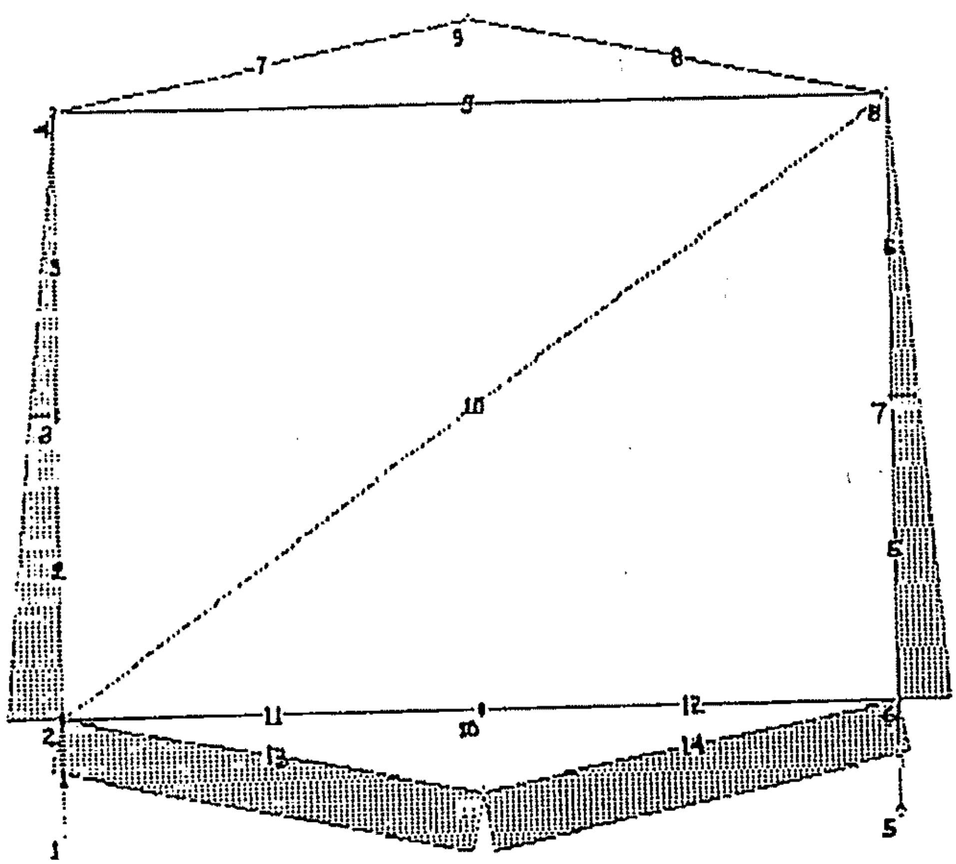


$S_R = \frac{4183}{15000} = .2789$

$S_Y = .45$ ok

(Use 2)

$\frac{5912}{15000} = .3941 < .45$ ok



7
9
8
4
5
8
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5
11
12
2
10
6
13
14
1
5
1

GAUGER ENGINEERING CO.
1306 E. 13TH. STREET
TULSA, OKLAHOMA

ANALYSIS OF CAUSTIC UNLOADING TANK SUPPORT FRAME
USPCI LONE MOUNTIAN FACILITY

C R O S A F E --- STRUCTURAL ANALYSIS BY FINITE ELEMENTS
Version: SAFE2STA (2-D) Rel. 3.0 5/06/1991 2:34:31

E OF THE STRUCTURE

ber of nodes	:	11
ber of materials	:	1
ber of beams	:	14
ber of beam end releases	:	0
ber of plates	:	0
ber of fasteners	:	0
ber of primary loadcases	:	1
ber of superposition loadcases	:	0
ber of restrained degrees of freedom	:	4

E COORDINATES

	Coordinate X	Coordinate Y
1	.000000E+00	.000000E+00
2	.000000E+00	.800000E+01
3	.000000E+00	.300000E+02
	.000000E+00	.520000E+02
	.600000E+02	.000000E+00
6	.600000E+02	.800000E+01
7	.600000E+02	.300000E+02
8	.600000E+02	.520000E+02
9	.300000E+02	.580000E+02
0	.300000E+02	.800000E+01
1	.300000E+02	.200000E+01

ERIAL PROPERTIES

e	Young's modulus	Poisson's ratio	Specific weight
1	.290000E+08	.250000E+00	.283600E+00

AM DATA

eam	I	J	Length	Area	M. Inertia	Material
1	1	2	.80000E+01	.52800E+01	.24700E+01	1
2	2	3	.22000E+02	.26400E+01	.63200E+00	1
3	3	4	.22000E+02	.26400E+01	.63200E+00	1
4	5	6	.80000E+01	.52800E+01	.24700E+01	1
5	6	7	.22000E+02	.26400E+01	.63200E+00	1
6	7	8	.22000E+02	.26400E+01	.63200E+00	1
7	4	9	.30594E+02	.17800E+01	.17800E+01	1
8	8	9	.30594E+02	.17800E+01	.17800E+01	1
9	4	8	.60000E+02	.75000E+00	.30000E-01	1
10	2	8	.74404E+02	.75000E+00	.30000E-01	1
11	10	2	.30000E+02	.17800E+01	.17800E+01	1
12	10	6	.30000E+02	.17800E+01	.17800E+01	1
13	11	2	.30594E+02	.93800E+00	.30000E-02	1
14	11	6	.30594E+02	.93800E+00	.30000E-02	1

IMARY LOADCASES

adcase name : TOTAL LD
adcase number : 1
of loaded nodes : 3
of loaded beams : 6
er of loaded plates : 0
vity loads factor : .0000E+00

E LOADS

de	FX	FY	MZ
4	.000000E+00	-.193000E+04	.000000E+00
8	.000000E+00	-.193000E+04	.000000E+00
9	.000000E+00	-.500000E+03	.000000E+00

AM LOADS

eam	Loading direction	End Distributed Loads	
2	Local Y axis	.495000E+02	.247800E+02
3	Local Y axis	.247800E+02	.000000E+00
5	Local Y axis	-.495000E+02	-.247800E+02
6	Local Y axis	-.247800E+02	.000000E+00
13	Local Y axis	.563300E+02	.495000E+02
14	Local Y axis	-.563300E+02	-.495000E+02

VEMENT RESTRAINTS

de	Type of restraint	Displacement
[illegible]	Translation along X axis	.000000E+00
1	Translation along Y axis	.000000E+00
5	Translation along X axis	.000000E+00
5	Translation along Y axis	.000000E+00

LUTION SUMMARY

mber of degrees of freedom : 33 (33 in RAM and 0 on disk)
ndwidth :   30
mber of loadcases :   1

==
====================
SULTS FOR LOADCASE 1 : TOTAL LD

==
====================

DE DISPLACEMENTS

de	U	V	Omega
1	.00000E+00	.00000E+00	-.24664E-03
[illegible]	.16727E-02	-.19684E-03	-.13398E-03
[illegible]	-.17304E-01	-.82295E-03	.22602E-03
4	-.14835E-02	-.14491E-02	-.89890E-03
5	.00000E+00	.00000E+00	.23742E-03
6	-.15989E-02	-.19684E-03	.12476E-03
7	.17868E-01	-.82304E-03	-.25533E-03
8	.25816E-02	-.14493E-02	.88565E-03
9	.54921E-03	-.15342E-01	.33061E-05
10	.36890E-04	-.21374E-02	.23056E-05
11	.36889E-04	-.32055E-01	.23056E-05

:AM CORNER FORCES

?am	I	J	FX1	FY1	MZ1	FX2	FY2	MZ2
1	1	2	-.25219E+03	.37675E+04	-.14559E-11	.25219E+03	-.37675E+04	.20175E+04
2	2	3	.82491E+03	.21789E+04	-.59127E+04	-.78308E+01	-.21789E+04	-.23169E+04
3	3	4	.78308E+01	.21789E+04	.23169E+04	.26475E+03	-.21789E+04	.14420E+04
4	5	6	.25219E+03	.37675E+04	.97033E-12	-.25219E+03	-.37675E+04	-.20175E+04
5	6	7	-.82628E+03	.21792E+04	.59445E+04	.91991E+01	-.21792E+04	.23152E+04
6	7	8	-.91991E+01	.21792E+04	-.23152E+04	-.26338E+03	-.21792E+04	-.14136E+04
7	4	9	.12089E+04	.24888E+03	-.14156E+04	-.12089E+04	-.24888E+03	.16289E+04
8	8	9	-.12089E+04	.25112E+03	.13486E+04	.12089E+04	-.25112E+03	-.16289E+04
9	4	8	-.14736E+04	-.19202E-01	-.26452E+02	.14736E+04	.19202E-01	.25300E+02
10	2	8	.13683E+01	.19310E+01	.15904E+02	-.13683E+01	-.19310E+01	.39749E+02
[illegible]	10	2	-.28147E+04	.79343E+00	.22260E+03	.28147E+04	-.79343E+00	-.24641E+03
[illegible]	10	6	.28147E+04	-.79343E+00	-.22260E+03	-.28147E+04	.79343E+00	.19880E+03
[illegible]	11	2	.42107E+04	.13113E-02	-.41283E+04	-.38932E+04	.15874E+04	.41257E+04
14	11	6	-.42107E+04	-.13113E-02	.41283E+04	.38932E+04	.15875E+04	-.41258E+04

M LOADS AND STRESSES

```
m       I       J            FX1          SX1          FX2          SX2          SH1
          BM1           BM2

1   ' 1       2  -.37674E+04 -.71353E+03 -.37674E+04 -.71353E+03 -.25219E+03 -.25219E+03
59E-11   .20175E+04
2       2       3  -.21789E+04 -.82533E+03 -.21789E+04 -.82533E+03  .82491E+03  .78308E+01
27E+04 -.23169E+04
3       3       4  -.21789E+04 -.82533E+03 -.21789E+04 -.82533E+03  .78308E+01 -.26475E+03 -
69E+04   .14420E+04
4       5       6  -.37674E+04 -.71353E+03 -.37674E+04 -.71353E+03  .25219E+03  .25219E+03 -
33E-12 -.20175E+04
5       6       7  -.21792E+04 -.82546E+03 -.21792E+04 -.82546E+03 -.82628E+03 -.91991E+01 -
45E+04   .23152E+04
6       7       8  -.21792E+04 -.82546E+03 -.21792E+04 -.82546E+03 -.91991E+01  .26238E+03
52E+04 -.14136E+04
7       4       9  -.12342E+04 -.69337E+03 -.12342E+04 -.69337E+03 -.69728E+01 -.69728E+01
56E+04   .16289E+04
3       8       9  -.12346E+04 -.69361E+03 -.12346E+04 -.69361E+03  .91635E+01  .91635E+01 -
36E+04 -.16289E+04
9       4       8   .14736E+04  .19648E+04  .14736E+04  .19648E+04  .19202E-01  .19202E-01
5[illegible]02   .25300E+02
        2       8  -.22453E+01 -.29938E+01 -.22453E+01 -.29938E+01 -.74798E+00 -.74798E+00 -
04E+02   .39749E+02
1      10       2  -.28147E+04 -.15813E+04 -.28147E+04 -.15813E+04  .79343E+00  .79343E+00 -
50E+03 -.24641E+03
2      10       6  -.28147E+04 -.15813E+04 -.28147E+04 -.15813E+04  .79343E+00  .79343E+00
50E+03   .19880E+03
3      11       2   .41289E+04  .44018E+04  .41289E+04  .44018E+04  .82578E+03 -.79311E+03
33E+04   .41257E+04
4      11       6   .41289E+04  .44018E+04  .41289E+04  .44018E+04 -.82578E+03  .79311E+03 -
33E+04 -.41258E+04
```

E INTERNAL FORCES AND REACTIONS

e	Coordinate X	Coordinate Y	FX		FY		MZ
1	.000000E+00	.000000E+00	-.25219E+03	Reaction	.37674E+04	Reaction	-.14559E-11
2	.000000E+00	.800000E+01	.77631E-04		.10779E-03		.25487E-03
3	.000000E+00	.300000E+02	.16276E-06		-.15219E-04		-.33749E-04
4	.000000E+00	.520000E+02	-.41231E-04		.39184E-07		-.40558E-04
5	.600000E+02	.000000E+00	.25219E+03	Reaction	.37674E+04	Reaction	.97033E-12
6	.600000E+02	.800000E+01	-.77631E-04		.44798E-04		-.31823E-03
7	.600000E+02	.300000E+02	.32194E-06		-.66327E-04		-.98007E-04
8	.600000E+02	.520000E+02	.45378E-05		-.52525E-05		-.41468E-04
9	.300000E+02	.580000E+02	-.39668E-04		.63653E-05		.16168E-04
0	.300000E+02	.800000E+01	.34592E-04		-.12366E-07		.31206E-05
	.300000E+02	.200000E+01	.62372E-04		.46881E-10		-.69368E-04

GAUGER
ENGINEERING

PHONE 582-1144

STRUCTURAL CIVIL ENGINEERS
1308 EAST 13th STREET TULSA, OKLAHOMA 74120

June 3, 1991

Mr. Gene Walker
Environmental Engineer
USPCI Inc. Lone Mountain Facility
Route 2, Box 180 A
Waynoka, Oklahoma 73860

Re: Caustic Unloading Tank #1
Pretreatment Washdown Area

Dear Mr. Walker

The several items which were incomplete on my visit of May 30, 1991 have been satisfactorily completed at this time. Those items were concerned with touchup repainting, and completion of the ancillary piping to the pump location.

The leak test of the system was performed today and upon careful inspection, no leaks were detected.

This letter is to certify that the Caustic Unloading Tank #1 was installed in a manner that no structurally adverse conditions were produced in accordance with 40 CFR 264.192(b).

If there are questions please call at your convenience.

Sincerely,

Fred N. Gauger

Fred N. Gauger M.S.C.E.
Registered Professional Engineer
Oklahoma #5823

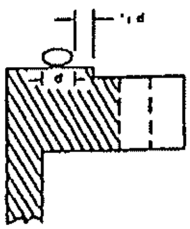
6/3/91

GORE-TEX® JOINT SEALANT
INSTALLATION INSTRUCTIONS

ean the flanges Dirt and scale provide leakage
iths

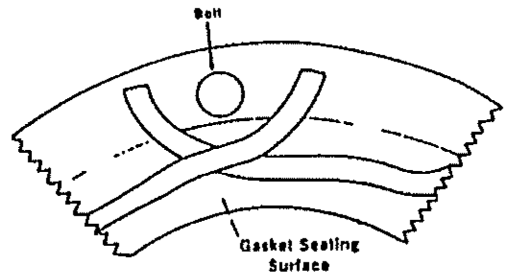
ıbricate the bolts and the underside of the nuts. heavy graphite and oil mixture will do, but for aximum clamping force use Teflon pipe thread pe Threads should be well formed and free nning Lubricating the threads doubles the amping force.

ace the Joint Sealant on the flange toward the itside of the gasket sealing area so that a width of ange about equal to half the width of Joint Sealant on the outside as shown Firmly press the Joint

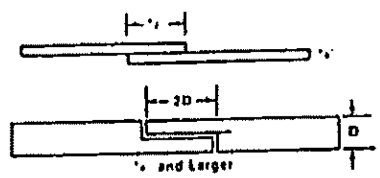


in place as you go. The adhesive stripe will Joint Sealant in position. The placement of Joint Sealant is important because it makes a ry thin gasket which spreads wider as the bolts e torqued Flanges, especially blind flanges, nd appreciably when the bolts are torqued and ight come together without adequately compressing the gasket if it were placed further toward inside

4. Complete the seal by crossing the ends near a bolt hole. Cross one end over the other about 1" and cut.

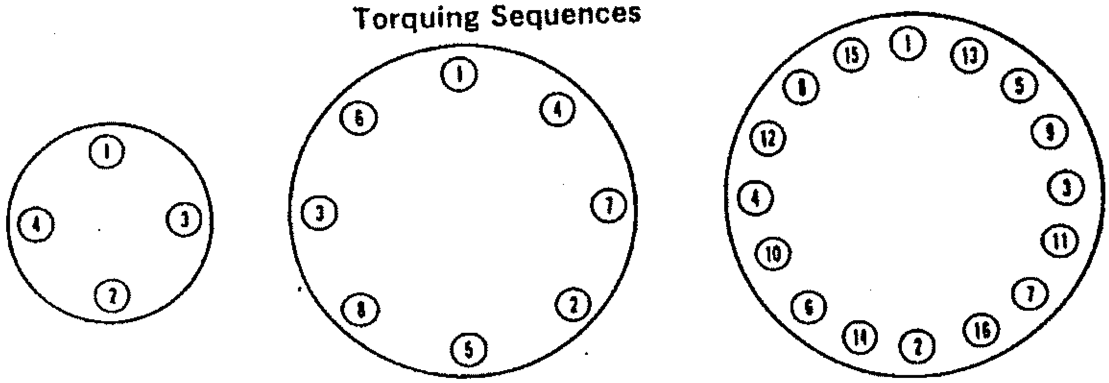


For the few critical applications where the extra bulk at the crossover could cause trouble, lap the ends as shown:



5. Assemble the flanged joint and torque the bolts as follows:
   a Run up all nuts finger tight.
   b Develop the required bolt stress in a minimum of three about equal steps, following a tightening up sequence as shown. Joint Sealant is highly compressible, but has little resilience, so gradual tightening is necessary to form a gasket of uniform thickness. Use a torque wrench if it is available.

Torquing Sequences



W. L. GORE & ASSOCIATES, INC.
100 AIRPORT RD. • P.O. BOX 1010 • ELKTON, MD 21921 • PHONE: 301/392-3200

Section 113 - Appendix D

UT1, Unloading Tank No.1

SECONDARY CONTAINMENT VOLUME CALCULATIONS

Area No. 1 West End		
Length =	34.50	feet
Width =	8.50	feet
Height = (0.24+(0.54-0.24/2)	0.39	feet
Surface Area =	293.25	S.F.
Volume =	114.37	

Area No. 2 East End		
Length =	61.50	feet
Width =	34.50	feet
Height = (0.2+(0.54-0.2/2)	0.37	feet
Surface Area =	2121.75	S.F.
Volume =	785.05	

Sump South End	
Length =	29.33
Width =	3.75
Height = (0.5+(3.66-0.5/2)	2.08
Surface Area =	110.00
Volume =	228.80

Sump North End	
Length =	6.58
Width =	3.75
Height = (3+(3.66-3/2)	3.33
Surface Area =	24.68
Volume =	82.17

Gross Area =	Area 1 - Area 2 =	2549.67	S.F
Gross Volume =	Area * Heigth =	1210.38	C.F.

Volumes of Items of Displacement **

1. Pipe Supports (9)	1.00	C.F.
2. Steel Pump Base	0.17	C.F.
Total volume to deduct for items in containment area =	1.17	C.F.

Subtraction for volume of rainfall

This entire area is covered and will not recieve any rain

TOTAL AVAILABLE VOLUME = Gross Volume - Subtractions =	1210.38	C.F.
Items of diplacement	-1.17	C.F
Volume of rainfall	0.00	C.F
TOTAL AVAILABLE VOLUME	1209.21	C.F.
	or	
	9044.92	Gal.

REPORT OF UT THICKNESS INSPECTION

TESTED FOR: U.S PC I LONG MOUNTAIN

PROJECT: CORROSION SURVEY

DATE: 7-13-92

OUR REPORT NO.: 10

Client Order Number:	Lab Number:	Location: UT-1
Test Method Standard: QC UT-S	Acceptance Standard: QC UT .S	Scanning Method: RANDOM

UT UNIT

- ____ A-Scan
- ✓ Direct Readout
- ____ A-Scan and Direct Readout

Manufacturer: KBA
Model: OME
Serial No.: 103 162

CALIBRATION BLOCK

ID Number: 01
Material Type: STEEL
Size: .100 - .500 STEP

SEARCH UNIT

- ____ Single Element
- ✓ Dual Element

Size: .625
Frequency: 5 MHZ
Serial No.: E08 931

Measurements

1	.186	18	.313	35		52	
2	.189	19	.322	36		53	
3	.187	20	.318	37		54	
4	.188	21	.184	38		55	
5	.187	22	.187	39		56	
6	.186	23	.188	40		57	
7	.326	24	.186	41		58	
8	.331	25	.184	42		59	
9	.191	26	.189	43		60	
10	.195	27	.184	44		61	
11	.189	28	.186	45		62	
12	.188	29	.186	46		63	
13	.188	30	.192	47		64	
14	.187	31	.186	48		65	
15	.193	32		49		66	
16	.188	33		50		67	
17	.318	34		51		68	

Diagram

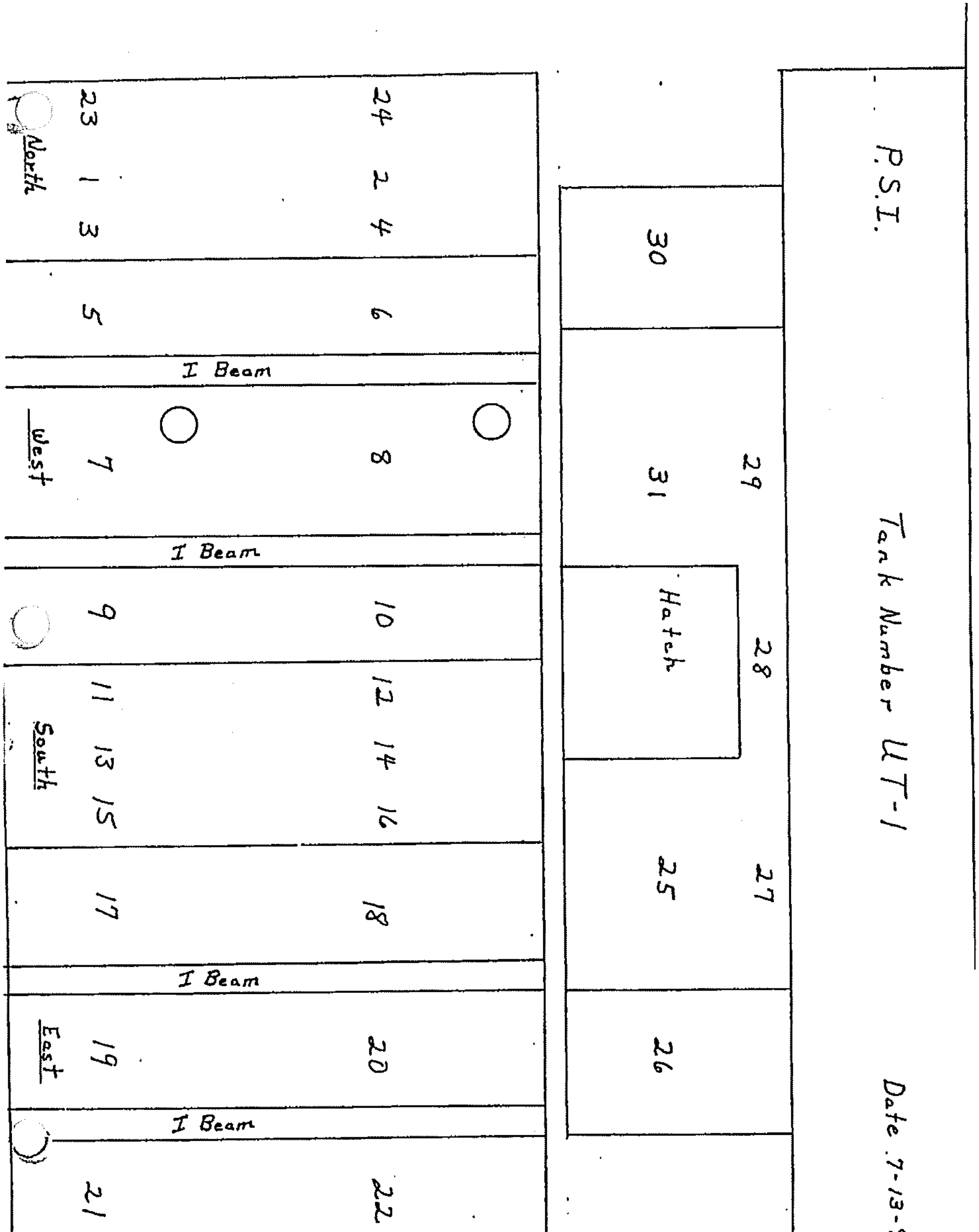
SEE DRWG. # UT-1

* NOTE: THESE READINGS TAKEN WITH PAINT REMOVED.

Technician: R. SHAKLEE Level:

Technician: J. Brooks Level: II

REMARKS:

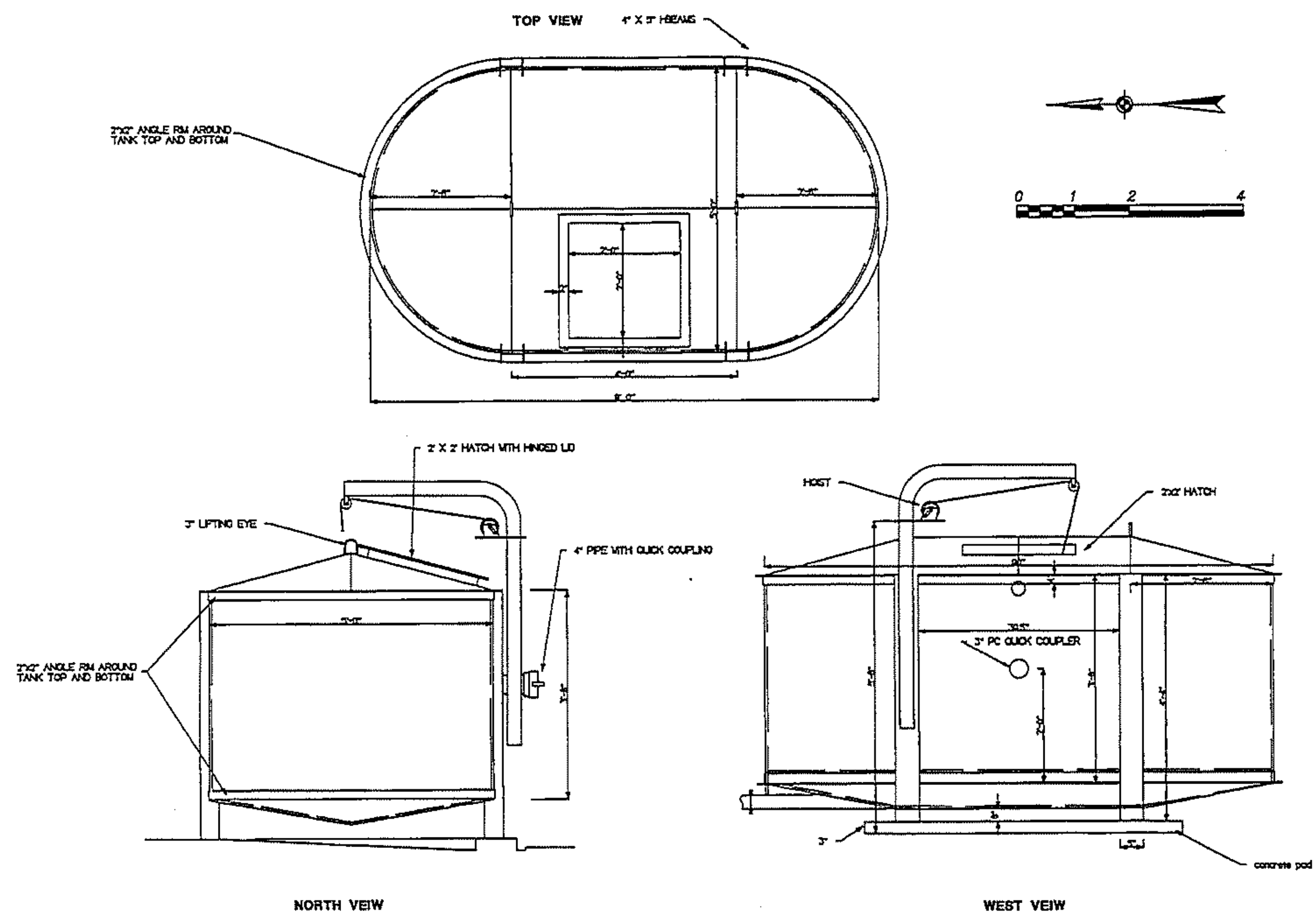

P.S.I.
Tank Number UT-1
Date 7-13-92
30
29
31
Hatch
28
27
25
26
24 2 4
23 1 3
North
5 6
I Beam
West
7 8
I Beam
9 10
11 12
South
13 14
15 16
17 18
I Beam
East
19 20
I Beam
21 22

P.S.I. Tank Number UT- 1 Date 7 / 14 / 92

	.186	29	0.186	57	0.	85	0.	113	0.	141	0.	168	0.
	0.189	30	0.192	58	0.	86	0.	114	0.	142	0.	169	0.
	0.187	31	0.186	59	0.	87	0.	115	0.	143	0.	170	0.
	0.188	32	0.	60	0.	88	0.	116	0.	144	0.	171	0.
	0.187	33	0.	61	0.	89	0.	117	0.	145	0.	172	0.
	0.186	34	0.	62	0.	90	0.	118	0.	146	0.	173	0.
	0.326	35	0.	63	0.	91	0.	119	0.	147	0.	174	0.
	0.331	36	0.	64	0.	92	0.	120	0.	148	0.	175	0.
	0.191	37	0.	65	0.	93	0.	121	0.	149	0.	176	0.
0	0.195	38	0.	66	0.	94	0.	122	0.	150	0.	177	0.
1	0.189	39	0.	67	0.	95	0.	123	0.	151	0.	178	0.
2	0.188	40	0.	68	0.	96	0.	124	0.	152	0.	179	0.
3	0.188	41	0.	69	0.	97	0.	125	0.	153	0.	180	0.
	.189	42	0.	70	0.	98	0.	126	0.	154	0.	181	0.
5	0.193	43	0.	71	0.	99	0.	127	0.	155	0.	182	0.
6	0.188	44	0.	72	0.	100	0.	128	0.	156	0.	183	0.
	0.318	45	0.	73	0.	101	0.	129	0.	157	0.	184	0.
	0.313	46	0.	74	0.	102	0.	130	0.	157	0.	185	0.
9	0.322	47	0.	75	0.	103	0.	131	0.	158	0.	186	0.
20	0.318	48	0.	76	0.	104	0.	132	0.	159	0.	187	0.
21	0.184	49	0.	77	0.	105	0.	133	0.	160	0.	188	0.
22	0.187	50	0.	78	0.	106	0.	134	0.	161	0.	189	0.
23	0.188	51	0.	79	0.	107	0.	135	0.	162	0.	190	0.
4	0.186	52	0.	80	0.	108	0.	136	0.	163	0.	192	0.
5	0.184	53	0.	81	0.	109	0.	137	0.	164	0.	193	0.
6	0.189	54	0.	82	0.	110	0.	138	0.	165	0.	194	0.
7	.184	55	0.	83	0.	111	0.	139	0.	166	0.	195	0.
8	0.186	56	0.	84	0.	112	0.	140	0.	167	0.	196	0.

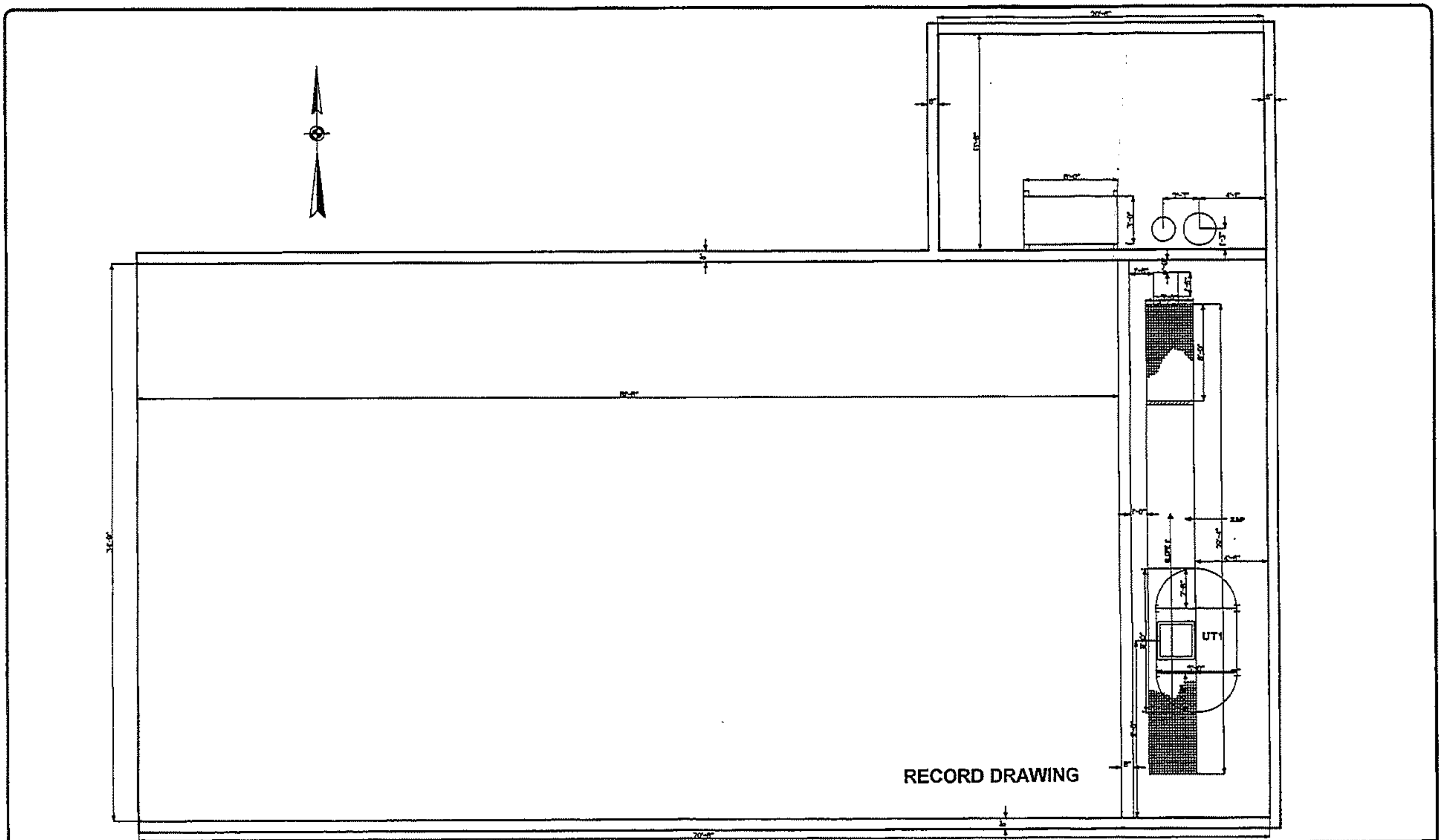
APPENDIX G

Drawings



RECORD DRAWING

REVISIONS	USPCI A Subsidiary of Union Pacific Corporation	USPCI LONE MOUNTAIN FACILITY WAYNOKA, OKLAHOMA	Myers ENGINEERING CORPORATION 1102 N. Stratford Dr. Suite B400 Oklahoma City, Oklahoma 73120 (405) 755-6325	(UT1) UNLOADING TANK NO. 1 TANK DETAIL	JOB NO. 511 SCALE DRAWN CRS DATE 7-9-92 SHEET OF



REVISIONS		

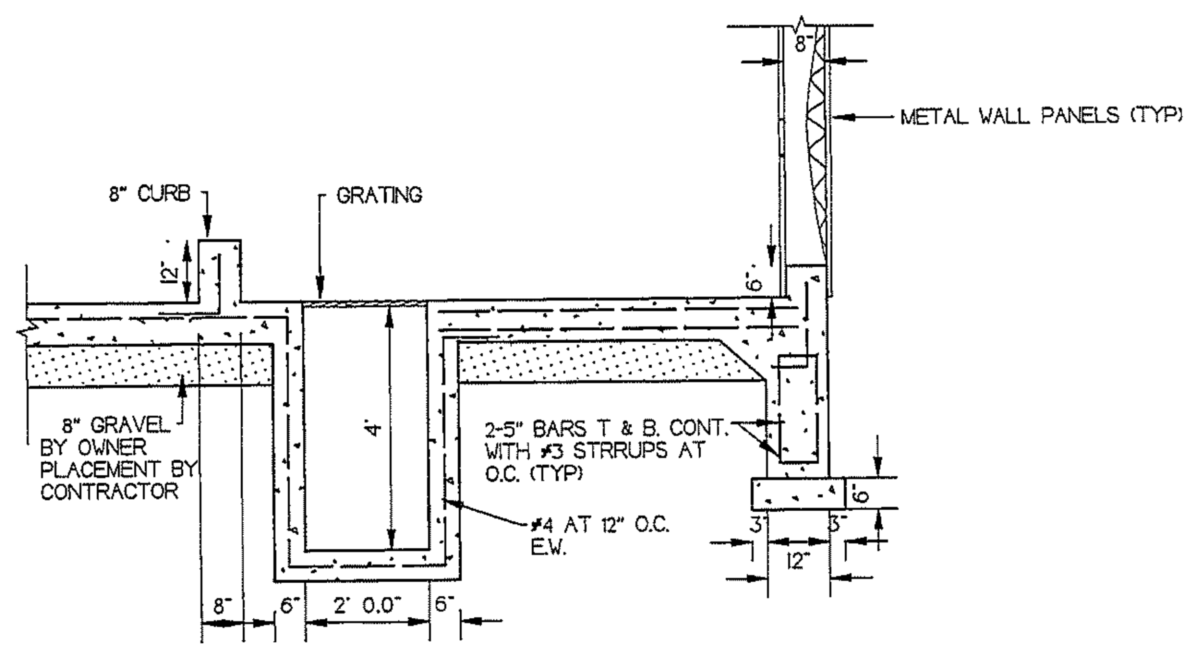
USPCI
A Subsidiary of Union Pacific Corporation

USPCI
LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

Myers
ENGINEERING CORPORATION
11102 N. Stratford Dr. Suite B400
Oklahoma City, Oklahoma 73120
(405) 755-6325

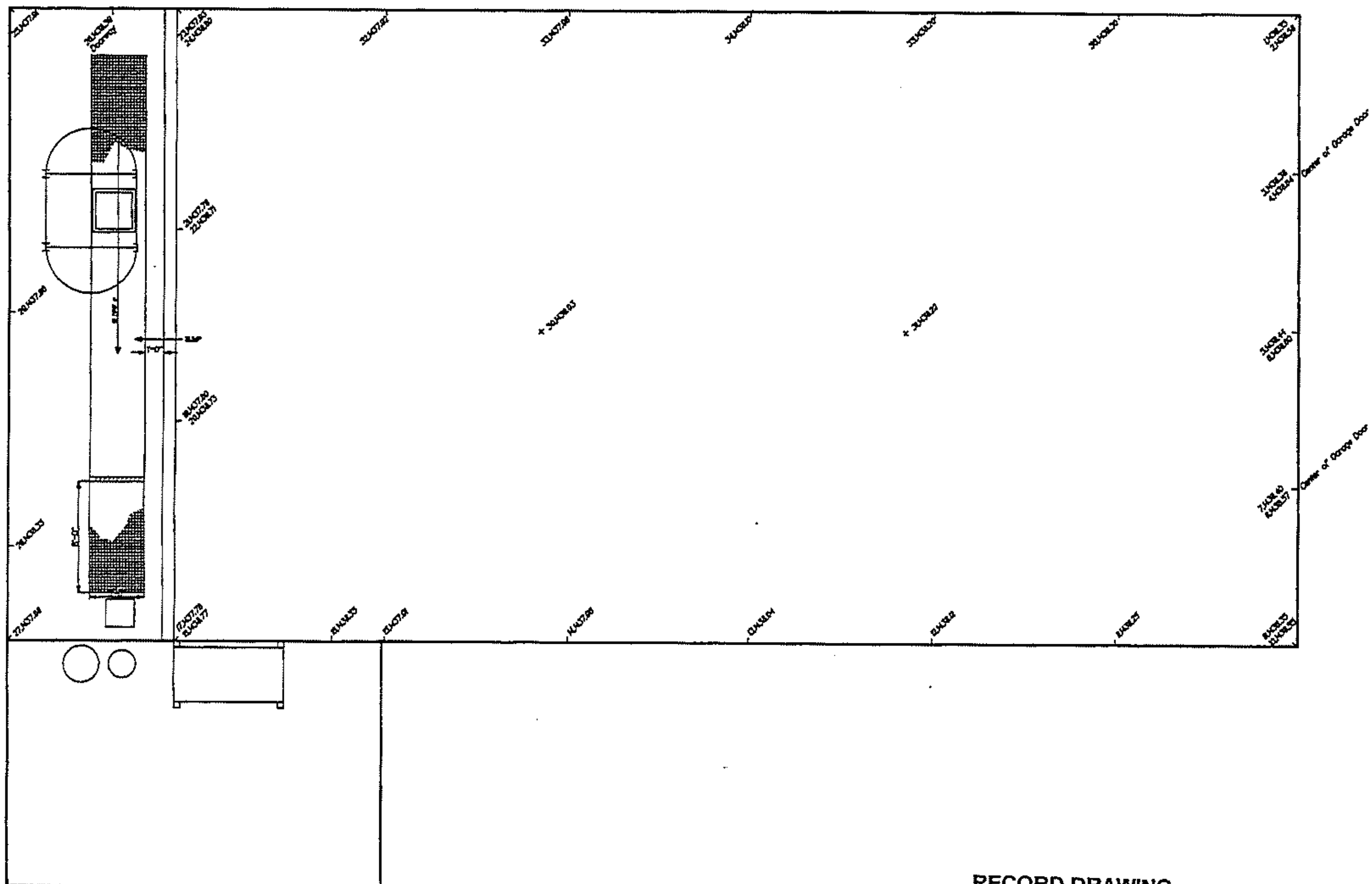
(UT1) UNLOADING TANK NO. 1
CONTAINMENT AREA DETAIL

JOB NO. 511
SCALE
DRAWN CRS
DATE 10-13-92
SHEET
OF



RECORD DRAWING

REVISIONS	USPCI A Subsidiary of Union Pacific Corporation	USPCI LONE MOUNTAIN FACILITY WAYNOKA, OKLAHOMA	Myers ENGINEERING CORPORATION 1110 N. Stratford Dr. Suite B400 Oklahoma City, Oklahoma 73120 (405) 755-6326	UNLOADING TANK NO. 1 (UT1) SECTIONS "A" - "A"	JOB NO. 511 SCALE DRAWN TR DATE 10/92 SHEET OF



RECORD DRAWING

REVISIONS	USPCI	USPCI	Myers		
NO. DATE DESCRIPTION	USPCI A Subsidiary of Union Pacific Corporation	USPCI LONE MOUNTAIN FACILITY WAYNOKA, OKLAHOMA	Myers Engineering Corporation 7702 N. Stratford Dr. Suite B400 Oklahoma City, Oklahoma 73120 (405) 756-6325	(UT1) UNLOADING TANK NO. 1 CONTAINMENT AREA ELEVATIONS	JOB NO. 510 SCALE DRAWN rmc DATE 10-13-92 SHEET OF