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

RCRA/HSWA
Permit Renewal Application

Volume 6

October 1, 2020
VOLUME 6

CONTENTS IN THIS VOLUME:

SECTION CT1
SECTION CT2
SECTION CT3
SECTION CT4
SECTION EB1
SECTION EB2
SECTION EF1
SECTION CT1
Mr. Don Dillie
USPCI, Inc.
Rt. 2 Box 170
Waynoka, Oklahoma 73860

November 6, 1993

Dear Mr. Dillie:

At the time of our inspection of Caustic Storage Tanks 1-4 located at the pretreatment area were inspected and there were no visual apparent weld breaks, punctures, scrapes of protective coatings, cracks, corrosion or damage due to construction or installation. This is to certify that Caustic Storage Tanks 1-4 were installed in such a manner which did not produce any structurally adverse conditions in accordance with 40 CFR 264.192(b).

This is to certify that at the time of our inspection, the Caustic Storage Tanks 1-4 located at the pretreatment area of the Lone Mountain Facility, (Waynoka, Oklahoma), were filled with water and allowed to stand at static equilibrium for a period of several hours. During this time all welds and tank walls were monitored for leaks. There were no apparent leaks found therefore the tank appears to be capable of handling hazardous wastes without release for the intended life and use of the tank.

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 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 fines and imprisonment of knowing violations.

Sincerely,

MYERS ENGINEERING CORPORATION

E. E. Myers

EEM. 93

cc: Mr. Gene Walker
Environmental Engineer
Lone Mountain Facility

FILE INSTRUCTIONS

Unit... Pre-Treatment
Project... Caustic Tank Assessment
Section... Tank Construction

Rev'd by: L. J. ODEN

ROUTE COPY

FILE D. DODD

B. CORRE
SECTION 106

ASSESSMENT OF CAUSTIC TANK #1 (CT1)
LONE MOUNTAIN HAZARDOUS WASTE FACILITY
U.S.P.C.I.
WAYNOKA, OKLAHOMA

A. TANK VESSEL DESCRIPTION

Caustic Tank #1 is a large steel aboveground vertical tank located in the pretreatment area of the Lone Mountain Hazardous Waste Facility. Caustic Tank #1, Caustic Tank #2, Caustic Tank #3, Caustic Tank #4, Sludge Storage Tank #1 and, Caustic Overflow Tank, Cyanide Overflow tank, Cyanide Reactor, Cyanide Measure Tank and a portion of their ancillary equipment will be located together in a concrete containment area.

B. PRIMARY TANK VESSEL

1. General Description

Caustic Tank #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. Caustic Storage Tank #1 is an aboveground tank that will be used for the storage of caustic liquids. The tank is vertical in position and cylindrical in shape. The tank and contents are supported by a skirted base. There is a cone on the bottom of the tank inside the skirt. There is a platform connected to all four caustic storage tanks (CT1, CT2, CT3, CT4). There are two ladders for access to the tank top and platform. This tank is equipped with a 3" overflow line. There is a level gauge installed through an 18" nozzle, in addition to the level gauge there is a high level alarm installed through a nozzle on the top of the tank. This tank was manufactured by Scott Manufacturing, Inc from Lubbock, Texas. The temperature of the tank varies with the ambient temperature.

Influent piping is located from the pretreatment building to the caustic tank and to other tanks in the containment area.

2. Design Standards.

The tank is designed and constructed 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). The Mill Test reports and radiographic testing reports can be found in Appendix F of this assessment.
3. Hazardous Characteristics of Wastes Stored

The wastes to be stored in this tank have the following characteristics (Provided by USPCI):

Untreated wastes pH (7 - 13)
N > 1
Temperature = Ambient

The hazardous characteristics of the waste to be 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 interior of the tank is be coated with Gliden "Glid-Guard Epoxy Chemical Resistant Finish 5240 Series." This coating will withstand the chemical characteristics of the waste to be stored.

5. Documented Age of Tank

This is a new tank, it was constructed and installed in October of 1992.

6. Result of Leak Tests

A leak test was performed. In this test the tank was filled to maximum operating capacity with water. The tank was allowed to sit full for a minimum of 6 hours. After remaining full for this time there was no evidence of the tank leaking. In the inspection all welds, flanges, manways, nozzles, and sidewalls were checked for leaks.

7. Existing Data Obtained

<table>
<thead>
<tr>
<th>Diameter of Tank</th>
<th>12'-8-5/8&quot; Inside Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>40'</td>
</tr>
<tr>
<td>Material</td>
<td>A36 steel See Appendix F for Mill Test reports</td>
</tr>
<tr>
<td>Wall and top thickness</td>
<td>0.25&quot;</td>
</tr>
<tr>
<td>Bottom core thickness</td>
<td>0.3125&quot;</td>
</tr>
<tr>
<td>Maximum Volume</td>
<td>4426.27 cf. or 33,108 Gal.</td>
</tr>
<tr>
<td>Maximum Operating Volume</td>
<td>4299.22 cf. or 32,156 Gal.</td>
</tr>
<tr>
<td>Specific gravity of waste</td>
<td>1.5 (Provided by USPCI)</td>
</tr>
<tr>
<td>Temperature</td>
<td>Ambient</td>
</tr>
<tr>
<td>Seismic Zone</td>
<td>1</td>
</tr>
</tbody>
</table>

8. Calculation of Existing Foundation Loading

Total Weight of Tank and Contents = 216.54 tons

Detailed calculations reflecting the volume and weight of the tank are found in appendix A. The 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 0.2195 inches. This thickness includes 0.125 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 B and C of this assessment for detailed calculations or required wall thickness and structural analysis of the tank support system.)

10. Comparison of Actual Structure to Theoretical Values

<table>
<thead>
<tr>
<th>Wall Thickness Comparison</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculated Required Wall Thickness</td>
<td>0.2195&quot;</td>
</tr>
<tr>
<td>Minimum Required Wall Thickness By API-650-88</td>
<td>0.1875&quot;</td>
</tr>
<tr>
<td>Measured Wall Thickness</td>
<td>0.25&quot;</td>
</tr>
</tbody>
</table>

C. SECONDARY CONTAINMENT SYSTEM

1. General Description of Secondary Containment

The secondary containment system is designed and will be operated to prevent any migration of wastes or liquids out of the system. Cyanide Reactor Tank, Cyanide Measure Tank, Caustic Tanks #1-4, Sludge Storage Tank, Caustic Overflow Tank, Cyanide Overflow Tank will be located on a reinforced concrete base floor area with vertical concrete sidewalls. All associated piping is aboveground. The area is inspected on a daily basis. The containment system is walled off and receives no direct vehicular traffic. The foundation walls and base are mass poured in place. No cracks from compression or uplift are visually apparent. There are three low areas with a slight depression that are used to collect any waste spills and rainwater. Any released tank contents or surface runoff will drain on top of the sloped concrete to the sump areas. The accumulated liquids are then removed and pumped out in accordance with the permit condition. The slab floor also serves as a foundation support for the tanks in this area.

The concrete floor was removed and replaced in October of 1992. The floor was replaced in order to strengthen the foundation for the tank support.

2. Design Standards.

Design drawings for the walls 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 318-89/318-89) and these calculations were used as a guide in verifying the ability of the system to contain hazardous waste. The concrete floor and foundation are built in close adherence to the above mentioned codes. The floor as previously mentioned was removed and replaced.
3. Hazardous Characteristics of Wastes Stored

The wastes which are treated in the primary tank have the following characteristics:

- Untreated waste pH (7 - 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 is coated with Concrete Protection System, Inc "OVERKOTE" industrial flooring. For more information on this coating see Appendix H of this report.

5. Documented Age of The Containment Area

The secondary containment system was originally constructed and installed in 1987 however the floor was replaced in October 1992.

6. Result of Leak Tests

A visual inspection of the containment area was performed and from this inspection it was determined there are no cracks or breaks in the impermeable coating. The area will be inspected on a daily basis checking for leaks from the primary tank.

7. Data Obtained

<table>
<thead>
<tr>
<th>Area</th>
<th>2509.85 s.f.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Height</td>
<td>2.62 ft. (Min.)</td>
</tr>
<tr>
<td>Material</td>
<td>Concrete</td>
</tr>
<tr>
<td>Gross Volume</td>
<td>6575.81 c.f.</td>
</tr>
<tr>
<td>Thickness</td>
<td>30&quot;</td>
</tr>
</tbody>
</table>

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 of each 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 of this report for detailed calculations of the available containment volume. The containment capacity available = 4960.54 c.f.

9. Required Volume

**Containment Capacity Required (CCR)**

CCR = Volume of Largest Tank in the secondary containment

Volume of Largest Tank = 4426.27 c.f. (CT1) or 33,108 Gal.

10. Comparison of Available Volume to Required Volume

**Containment Capacity Comparison**

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Containment Capacity Required</td>
<td>4426.27 c.f.</td>
</tr>
<tr>
<td>Secondary Containment Volume Available</td>
<td>4960.54 c.f.</td>
</tr>
<tr>
<td>Excess Containment Volume</td>
<td>534.27 c.f.</td>
</tr>
</tbody>
</table>

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

D. CONCLUSIONS

1. Primary Tank Vessel

The primary tank vessel at the time of inspection was fit for use with the proposed waste stream at the given densities, chemical and physical characteristics as verified by USPCI. The useful life of the steel tank would be estimated at 20 years if the proposed 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 is fit for use, with the proposed waste stream at the 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 20 years. This useful life is determined by using a design life of 20 years less the period that the system has been in use at the USPCI Lone Mountain Facility.
E. RECOMMENDATIONS

The following repairs or modifications should be made:

1. **Primary Tank**

   The tank should be internally inspected periodically to insure no corrosion is occurring. The tank should be checked 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 conducted to detect any visual corrosion or defects.

2. **Secondary Containment**

   The secondary containment should be checked periodically for any deterioration and structural integrity.

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. 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. Myers
Date: 1/20/83

E. E. Myers
Engineer
Title 4126
P.E. 4126 OKLA

Page 106 - 6
APPENDIX A
Primary Tank Volume Calculations
SECTION 106 - APPENDIX A

CT1, Caustic Storage Tank No.1

PRIMARY TANK VOLUME CALCULATIONS

DIMENSIONS:

Geometry: CYLINDRICAL

Diameter: 12.72 FEET
Max Height: 34.00 FEET
Normal Operating Height: 33.00 FEET
Cone Height: 2.42 FEET
Bottom Cone Diameter: 0.50 FEET
Cone Length: 6.80 FEET
Cone Volume: 106.53 C.F. or 796.83 Gal.

VOLUME CALCULATIONS

Max. Volume: 4426.27 C.F. or 33108.49 Gal.
Normal Operating Volume: 4299.22 C.F. or 32158.15 Gal.

MAXIMUM OPERATING TANK VOLUME = 4426.27 C.F. OR 33108.49 GAL

WEIGHT ON FOUNDATION

CONTENTS S.G.: 1.50
DENSITY: 93.60 LB/C.F.

SURFACE AREA CALCULATION

Tank Top = 127.05 S.F.
Tank Bottom Cone = 257.87 S.F.
Tank Wall= Cir*h = 1356.54 S.F.

TOTAL SURFACE AREA WALL AND TOP = 1743.47 S.F.

Steel Thickness=
    Sidewalls and Top 0.25 INCHES
    Cone 0.31 INCHES

Volume of Steel =
    Sidewalls 26.30 C.F.
    Top and bottom 10.02 C.F.
Density of Steel = 490.00 LB/C.F.
Weight of Steel = 9.39 TONS

WEIGHT OF TANK CONTENTS = 207.15 TONS

TOTAL WEIGHT OF TANK AND CONTENTS = 216.54 TONS
APPENDIX B

Primary Tank Wall Thickness Calculations
SECTION 106 - APPENDIX B

CT1, Caustic Storage Tank No.1

PRIMARY TANK WALL THICKNESS

DIMENSIONS:
Geometry: CYLINDRICAL
Diameter: 12.72 FEET
Height: 34.00 FEET
Specific Gravity: 1.50
Normal Operating Temperature = ambient

STEEL THICKNESS CALCULATIONS @ BOTTOM RING

Thickness \( t \) = \frac{(2.6 \times H \times D \times S.G.)}{(s \times E)} + CA

\[ s = \text{Allowable Design Stress} = 21000.00 \text{ PSI} \]

\[ E = \text{Joint Efficiency} = 85.00\% \]

\[ \text{Thickness (t)} = 0.0945 \text{ INCHES} \]

\[ \text{Corrosion Allowance} = 0.1250 \text{ INCHES} \]

\[ \text{Calculated Req'd Wall thk.} = 0.2195 \text{ INCHES} \]

*** THIS DESIGN STRESS IS OBTAINED FROM API-650-88 WITH THE USE OF APPENDIX A.

CONE WALL THICKNESS CALCULATION

\[ \cos \alpha = \cos(67.6594) \]

\[ P1 = \text{Internal Pressure = Density} \times s.g. \times (x + D/3 \times \cot(\alpha)) \]

\[ P2 = H \times \text{density} \times s.g. = 33 \times 62.4 \times 1.5 = 3182.40 \text{ psi} \]

\[ Tc = \text{top cone radius} = 6.36 \text{ inches} \]

\[ Fb = \text{Allowable stress} = 23200 \text{ psi} \]

The required wall thickness of the cone will be the greater of the following Formulas.

1. \[ T_s = P1 \times Tc/2 \times \cos(\alpha) \times Fb = 0.098 + 1/8'^C.A. = 0.223 \text{ in.} \]

2. \[ T_s = P2 \times D/\cos(\alpha) \times Fb = 0.191 + 1/8'^C.A. = 0.316 \text{ in.} \]
APPENDIX C

Structural Support Calculations
SECTION 106 - APPENDIX C

CT1, Caustic Storage Tank No.1

STRUCTURAL SUPPORT CALCULATIONS

GIVEN:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank Diameter =</td>
<td>12.72 feet</td>
</tr>
<tr>
<td>Total Height =</td>
<td>40.00 feet</td>
</tr>
<tr>
<td>Weight of Tank =</td>
<td>16780.00 lbs</td>
</tr>
<tr>
<td>Weight of Max. Contents =</td>
<td>414300.00 lbs</td>
</tr>
<tr>
<td>Tank Nominal Thickness =</td>
<td>0.25 in</td>
</tr>
</tbody>
</table>

----SEISMIC DESIGN CHECK----

ZONE COEFFICIENT (Z): 0.1875

ESSENTIAL FACILITIES FACTOR (i): 1.000

LATERAL EARTHQUAKE FORCE COEFF. (C1): 0.240

D/H: 0.287

k factor: 0.590

SITE AMPLIFICATION FACTOR (S): 1.500

NATURAL PERIOD OF FIRST SLOSHING (T): 2.104

LATERAL EARTHQUAKE FORCE COEFF. (C2): 0.214

WEIGHT OF TANK SHELL (Wt): 16780.000 LBS

TOTAL WEIGHT OF TANK CONTENTS (Wt): 414300.000 LBS

W1/Wt: 0.950

W2/Wt: 0.050

WEIGHT OF EFFECTIVE MASS OF CONTENTS THAT MOVES IN UNISON WITH THE TANK SHELL (W1): 393585.000 LBS

WEIGHT OF EFFECTIVE MASS IN FIRST SLOSHING (W2): 20715.000 LBS

HT FROM BTM OF SHELL TO CENT. OF SHELL (Xs): 20.000 FEET

X1/H: 0.500

HT FROM BTM TO CENT. OF LAT. SEISMIC FORCE (X1): 20.000 FEET

X2/H: 0.900

HT FROM BTM TO CENT. OF LAT. SEISMIC FORCE (X2): 36.000 FEET
OVERTURNING MOMENT \( (M) = Z^* (C1^*W_s^*X_s + C1^*W_1^*X_1 + C2^*W_2^*X_2) \)

OVERTURNING MOMENT \( (M) \): 401030.873 FT-LBS

Note: All of the above calculations are based on API-650-88 Seismic Design Procedure (Appendix E).

CHECK STRESS IN TANK SHELL FROM SEISMIC FORCES:

\[ W_i = \text{MAXIMUM WEIGHT OF TANK CONTENTS THAT MAY BE USED TO RESIST THE SHELL OVERTURNING MOMENT} \]

\[ W_i = 7.9^*t_b^*(F_{by}^*G^*H)^{.5} \]

\[ t_b = \text{THK. OF BTM. PLATE UNDER SHELL}: 0.250 \text{ IN} \]

\[ F_{by} = \text{MINIMUM YIELD STRENGTH OF BOTTOM PLATE}: 9000.000 \text{ PSI} \]

\[ G = \text{DESIGN SPECIFIC GRAV. OF LIQUID}: 1.50 \]

\[ W_i = 1451.32 \text{ LBS/FT OF SHELL CIRCUMFERENCE} \]

DENSITY OF TANK SHELL MATERIAL:

\[ \text{DENSITY OF TANK SHELL MATERIAL}: 490.00 \text{ LBS/CF} \]

WT = WEIGHT OF TANK SHELL AND THE PORTION OF FIXED RCOF SUPPORTED BY TANK SHELL:

\[ \text{WT} = 408.33 \text{ LBS/FT OF SHELL CIRCUMFERENCE} \]

\[ \frac{M}{[D^2(2W + W_i)]}: 1.3328 \]

\[ b = \text{MAXIMUM LONGITUDINAL COMPRESSIVE FORCE AT THE BTM. OF TANK SHELL} \]

\[ b = W_t + 1.273^*M/D^2 \]

\[ b: 3563.57 \text{ LBS/FT OF SHELL} \]

\[ G^*H^*D^2/2t^2: 155326.46 \]

\[ F_a = \text{MINIMUM OF 10^*6^*D or F_{ty}/2}: 4500.00 \text{ PSI} \]

\[ F_{ty} = \text{MINIMUM YIELD STRENGTH OF BTM. PLATE}: 9000.00 \text{ PSI} \]

\[ \text{MAX. LONGITUDINAL COMPRESSIVE STRESS IN THE TANK SHELL} = \frac{b}{12t} = 1187.86 \text{ PSI} \]
CHECK OVERTURNING MOMENT FROM WIND PRESSURE

M must be Less Than or Equal To .66*(WD)/2
If M is Greater Than .66*(WD)/2 Anchor Bolts Would Be Required

Where:

W = Shell Weight Available To Resist Uplift (lbs)
D = Tank Diameter (feet)
M = Overturning Moment
M = Pw*Projected Area*H1
H1 = Height from ground to centroid of tank shell
Pw = Wind Pressure (18 psf for 100 MPH Wind on cylinders)

.66*(WD)/2: 78830.93 FT-LBS
M: 183168.00 FT-LBS
M > .66*(WD)/2 therefore anchor bolts are required

Number of Anchors: 12.00
Anchor Diameter: 1.25 inches
Dia. of Anchor Circle: 13.05 feet

TB = design tension load per anchor

TB: 3113.62 pounds
Allowable Load/Anchor: 24543.69 pounds
APPENDIX D

Containment Area Volume Calculations
SECTION 106 - APPENDIX D

CT1, Caustic Storage Tank No. 1

CONTAINMENT AREA No.8A VOLUME CALCULATIONS (CAUSTIC AREA)

Length = 70.70 feet
Width = 35.50 feet
Height = 2.62 feet
Surface Area = 2509.85 S.F.

Gross Volume = Area * Height = 6575.81 C.F.

Volumes of items of Displacement **

1. Steel skirting = 9.17 C.F.

Total volume to deduct for items in containment area = 9.17 C.F.

Subtraction for volume of rainfall

Volume of rain = Area x depth of rainfall
Depth of rainfall = 6.15 in.
Area = 2509.85 S.F.
Volume = 1286.30 C.F.

TOTAL AVAILABLE VOLUME = Gross Volume - Subtractions = 6575.81 C.F.
Items of displacement -9.17 C.F.
Volume of rainfall -1286.30 C.F.

TOTAL AVAILABLE VOLUME Area 8A 5280.34 C.F.

CONTAINMENT AREA No.8c VOLUME CALCULATIONS (TRUCK PAD)

This area will collect rain and deposit it into the caustic containment area (8a) when the valve is opened. This area does not contribute any volume for containment.

Length = 52.00 feet
Width = 12.00 feet
Surface Area = 624.00 S.F.

Subtraction for volume of rainfall

Volume of rain = Area x depth of rainfall
Depth of rainfall = 6.15 in.
Area = 624.00 S.F.
Volume = 319.80 C.F.
SUMMARY OF SECONDARY CONTAINMENT DATA

Surface Areas:

Caustic Area 8A = 2509.85 S.F.
Truck Unloading Pad 8C = 624.00 S.F.

Gross Volumes:

Caustic Area 8A = 6575.81 C.F.
Truck Unloading Pad 8C = 0.00 C.F.

Volume of displacements

Caustic Area 8A = 9.17 C.F.
Truck Unloading Pad 8C = 0.00 C.F.

Volume for 24hr rain:

Caustic Area 8A = 1286.30 C.F.
Truck Unloading Pad 8C = 319.80 C.F.

Total Gross Volume 8A = 6575.81 C.F.
Total Displacement Volumes = 9.17 C.F.
Total volume of Rain = 1606.10 C.F.

<table>
<thead>
<tr>
<th>Containment Capacity Available (CCA)</th>
<th>4960.54 C.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>37104.83 GAL</td>
</tr>
</tbody>
</table>
APPENDIX E

Foundation Design Analysis
SECTION 106 - APPENDIX E
CT1, Caustic Storage Tank No.1

FOUNDATION DESIGN ANALYSIS

ASSUMPTIONS:

\[ f'c = 4.00 \text{ ksi} \]
\[ f_y = 60.00 \text{ ksi} \]
\[ \text{Allowable Soil Press.} = 2.20 \text{ ksi} \]
\[ \text{Structural Steel} = \text{A36} \]

GIVEN:

\[ \text{Tank Diameter} = 12.72 \text{ feet} \]
\[ \text{Sidewall Height} = 40.00 \text{ feet} \]
\[ \text{Weight of Tank (Shell)} = 18780.00 \text{ lbs} \]
\[ \text{Weight of Max. Contents} = 414300.00 \text{ lbs} \]

Tank is resting on a concrete foundation.

CHECK CONCRETE FOUNDATION DESIGN:

\[ \text{Assume Footing Depth} = 30.00 \text{ inches} \]
\[ \text{Assume Footing Width} = 30.00 \text{ inches} \]
\[ \text{Assumed Effective Soil Press.} = 1925.00 \text{ psf} \]

Look at what is resisting overturning moment from seismic load:

\[ b = 3563.57 \text{ lb/ft of circ.} \]

Where \( b \) is the maximum shell compression at the bottom of the shell.

If the footing is
then the actual applied pressure to the subgrade is

\[ 30.00 \text{ inches wide} \]
\[ 1425.43 \text{ lb/ft} \]

This is less than the effective soil pressure.
APPENDIX F

MANUFACTURERS DATA, MILL TEST REPORTS, RADIOGRAPHIC REPORTS
CERTIFICATION TO OWNER OF COMPLIANCE WITH API 650-88

To: USPCI LONE MOUNTAIN FACILITY
               WAYNOKA, OKLAHOMA

To Whom It May Concern:
Scott Manufacturing, Inc. hereby certifies that the tank(s) constructed
for you at SCOTT MANUFACTURING, INC. WOLFFORTH, TEXAS
and described as follows: (4) 12/75' diameter by 40' shell height
Caustic Storage Tanks, Serial Numbers 451-1, 2, 3, 84
has/have been designed, fabricated, erected, and inspected in accordance
with all of the requirements of the American Petroleum Institute Standard
650-88 entitled, "Welded Steel Tanks for Oil Storage" and that the results
of all such inspections, radiographs, and other tests indicate that the
tanks(s) fully complies/comply with all of the requirements. We further
certify that all materials meet specifications.

SCOTT MANUFACTURING, INC.

By
William A. Bacon
MANAGER/HEAVY CONSTRUCTION
Title
23 OCTOBER 1992
Date

CITY OF LUBBOCK
STATE OF TEXAS

Acknowledged and sworn to before me this 23rd day of October, 1992.

Notary Public
USPC 1, Waynoke, D.K.

12.72' x 40' (overall)

\[ T_0 = \frac{\bar{v}}{2 \omega_0 \rho} \left( \frac{\rho}{2} \right) \left( 1 + \frac{\rho}{6} \cot \theta \right) \]
\[ = \frac{62.5(3.5)}{2 \times 4286.0} \left( \frac{12.72}{2} \right) \left( 33 + \frac{12.72}{6} \cot 67.65\,\text{o} \right) \]
\[ = 122.717 (6.36) (32.8712) \approx 24,523 \text{ lb/ft} \div 12 \]
\[ = 2210.21 \text{ lb/in} \div 23,200 \text{ lb/in}^2 \]
\[ = 0.09527" + 0.125" \]
\[ = 0.2203" \text{ max. } \frac{1}{4}" \]

\[ T_1 = \frac{\pi D X}{2 \omega_0 \rho} \]
\[ = \frac{62.5(3.5)(12.72)^{3.5}}{2 \times 4286.0} \]
\[ = 51.652 \text{ lb/ft} \div 12 \]
\[ = 4.306.80 \text{ lb/ft} \div 23,200 \text{ lb/in}^2 \]
\[ = 0.1856" + 0.125" \]
\[ = 0.3106" \text{ max. } \frac{5}{64}" \]

Gerber King

\[ C = \frac{\bar{v}}{8} \left( 1 + \frac{\rho}{6} \cot \theta \right) D^2 \tan \theta \]
\[ = \frac{62.5(3.5)}{8} \left( 33 + \frac{12.72}{6} \cot 67.65\,\text{o} \right) 12.72 \times \tan 67.65\,\text{o} \]
\[ = 11.70 (33.8712) 393.76\,\text{cfs} \]
\[ = 156,025 \text{ lb} \div 23,200 \text{ lb/in}^2 \]
\[ = 6.7252\,\text{in}^2 \]

\[ A_{\text{eff}} = 0.78 \left( \frac{D \cdot \sqrt{R_t} + \sqrt{R_t} \cdot \sqrt{R_t}}{D} \right) \]
\[ = 0.78 \left( 1.25 \sqrt{6375.23} + 3.25 \sqrt{173(3125)} + 25(6375.23) \right) \]
\[ = 1.0592\,\text{in}^2 \left( 0.8131\,\text{in}^2 \right) \]
\[ A_{\text{eff (max)}} = 16 \left( t_0^2 + t_1^2 + t_2^2 \right) = 16 \left( 0.25^2 + 3.25^2 + 0.25^2 \right) = 3.56250 \text{ in}^2 > 1.05927 \text{ in}^2 \text{ max. allowable} \]

\[ 6.72522 - 1.05927 = 5.666 \text{ in}^2 \]

\[ (6.72522 - 0.8131) = 5.9121 \text{ in}^2 \)
USPCI, WAYNOKA, OK

12.75' x 40' (overall) Contents: Caustic Liquid - Sp. Gr. 1.5 API 650

Corrosion Allowance - \( \frac{1}{8} \)" Thickness By 1 Foot Method

\[
\frac{2.6 (12.75)(40 - 1) 1.5}{23.200} + .125 = 0.2086 " \text{ min } \frac{1}{4} " \text{ R}
\]

Louis D. Wood, Jr.

STATE OF TEXAS
REGISTRATION NO. 60815
PROFESSIONAL ENGINEER

10/14/92
SUNBELT TRADING COMPANY, Inc.

Jo: Scott 1769
Attr: Wayne

REF: CUSTOMER'S P.O. NO. 27158
S.T.C.'s RELEASE NO. 2994
S.T.C.'s INVOICE NO. 010435

ATTACHED PLEASE FIND MILL TEST CERTIFICATES FOR YOUR ABOVE REFERENCED PURCHASE ORDER FOR THE FOLLOWING MATERIAL.

SEE BELOW

THANKS AND REGARDS,

Stacey
STACEY GESSERT

enclosure

20 pcs. 1/4 x 96 x 480 A-36 Plate
4 pcs 1/4 x 96 x 240 A-36 Plate
6 pcs 5/16 x 96 x 240 A-36 Plate
4 pcs 1/4 x 96 x 240 Floor Plate
**CERTIFICAT D'ANALYSE DIN 50049/2.2**

**N°29070**

**BLATT NR 1**

**PAGE No A03**

**FORGES DE CLABECQ**

**Rue de la Déportation 218**

**1100 BRUXELLES (BELGIQUE)**

**PLANES-BLEXE-PLATES**

---

**CLINTON / DESTINATIONIÉ / VENDÉE / AUFTRAG / PAINT / CONSTRUCTEUR**

**SUNBELT TRADING COMPANY INC.**

**1990 POST OAK BLVD. # 1550**

**US - HOUSTON - TEXAS 77056-3813**

**STC 11.695.**

---

**IDENTIFICATION DU PRODUIT**

<table>
<thead>
<tr>
<th>REFERENCE</th>
<th>SERIAL NR</th>
<th>PRODUCT IDENTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>289299</td>
<td></td>
<td></td>
</tr>
<tr>
<td>289300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>289301</td>
<td></td>
<td></td>
</tr>
<tr>
<td>289304</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**EPRICERIE - APPELLATIONS - EMPLOYAGE**

<table>
<thead>
<tr>
<th>EPRICERIE</th>
<th>APPELLATION</th>
<th>EMPLOYAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>26</td>
<td>1/4</td>
</tr>
<tr>
<td>36</td>
<td>1/4</td>
<td>96</td>
</tr>
<tr>
<td>53</td>
<td>1/4</td>
<td>96</td>
</tr>
<tr>
<td>67</td>
<td>1/4</td>
<td>96</td>
</tr>
</tbody>
</table>

---

**MECANIQUE DE TEST**

<table>
<thead>
<tr>
<th>MATERIAL NO.</th>
<th>IDENTIFICATION NR.</th>
<th>PRODUCT DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>289299</td>
<td>1</td>
<td>1/4</td>
</tr>
<tr>
<td>289300</td>
<td>1</td>
<td>1/4</td>
</tr>
<tr>
<td>289301</td>
<td>1</td>
<td>1/4</td>
</tr>
<tr>
<td>289304</td>
<td>1</td>
<td>1/4</td>
</tr>
</tbody>
</table>

---

**RESISTANCE - ESSENTIELS (N) - ACTION TRAITEMENT**

<table>
<thead>
<tr>
<th>RESISTANCE</th>
<th>ESSENTIELS (N)</th>
<th>ACTION TRAITEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>26</td>
<td>1/4</td>
</tr>
<tr>
<td>36</td>
<td>1/4</td>
<td>96</td>
</tr>
<tr>
<td>53</td>
<td>1/4</td>
<td>96</td>
</tr>
<tr>
<td>67</td>
<td>1/4</td>
<td>96</td>
</tr>
</tbody>
</table>

---

**SERVICE METALLURGIQUE**

**CLABECQ, le 27/04/92**

---

**RESULTATS DE L'ANALYSE**

<table>
<thead>
<tr>
<th>RESULTATS DE L'ANALYSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.475</td>
</tr>
<tr>
<td>0.463</td>
</tr>
<tr>
<td>0.446</td>
</tr>
</tbody>
</table>

**ANALYSE SUR PRODUIT - ÉCARTÉS - CHECK ANALYSIS**

<table>
<thead>
<tr>
<th>NbX</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001</td>
</tr>
</tbody>
</table>

---

**Signature**

**CLABECQ, le 27/04/92**
### Certificat d'usine DIN 50049/2.2

**Forces de Clarbec**

**Addresse:** avenue de la Département 212, 1680 TURGE (BELGIQUE)

**Plaque Bleue-Plates**

---

**Identification du produit**

<table>
<thead>
<tr>
<th>N° INDIC.</th>
<th>GLEBE</th>
<th>MM</th>
<th>TYPE</th>
<th>THICKNESS</th>
<th>LENGTH</th>
<th>WIDE</th>
<th>LENGTH</th>
<th>DUR</th>
<th>(kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>292080</td>
<td>34</td>
<td>3</td>
<td>0.5/16 96</td>
<td>240</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>292085</td>
<td>35</td>
<td>24</td>
<td>0.3/8 96</td>
<td>240</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>292086</td>
<td>35</td>
<td>24</td>
<td>0.3/8 96</td>
<td>240</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>292083</td>
<td>36</td>
<td>21</td>
<td>0.3/8 96</td>
<td>480</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>292085</td>
<td>36</td>
<td>21</td>
<td>0.3/8 96</td>
<td>480</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Service métallurgique**

**Contrôle de ruptures d'aspects et de dimensions :**

**Résultats:**

- Le contrôle des échantillons d'aspects et de dimensions a été effectué conformément aux spécifications de la norme.
- Les résultats des échantillons d'aspects et de dimensions ont été conformes aux spécifications de la norme.

**Clébecq, 1e 10/07/92**

---

**Notes:**

- Les résultats des essais sont conformes aux spécifications de la norme.
- Les échantillons d'aspects et de dimensions ont été prélevés conformément aux spécifications de la norme.
# Structural Material Test Report

**O'Neal Steel, Inc.**  
P.O. Box 98  
Birmingham, AL 35201  

**Chaparral Steel**  
MIDLOTHIAN  
308 WEST RD.  
TEXAS 76065  
(214) 775-8241

<table>
<thead>
<tr>
<th>TO</th>
<th>SHIP TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>O'Neal Steel, Inc.</td>
<td>O'Neal Steel, Inc.</td>
</tr>
<tr>
<td>P.O. Box 98</td>
<td>2834 Clovis Rd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ORDER</th>
<th>DATE</th>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>-04616</td>
<td>10-JUN-92</td>
<td>4.60</td>
<td>W 4 X 13#</td>
<td>40.06</td>
</tr>
</tbody>
</table>

**Rated According To**  
STM A6-90A  
36-90  
377-88C  

**Chemical Analysis**

<table>
<thead>
<tr>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cu</th>
<th>Ni</th>
<th>Cr</th>
<th>Mo</th>
<th>V</th>
<th>Nb</th>
</tr>
</thead>
<tbody>
<tr>
<td>.12</td>
<td>.07</td>
<td>.014</td>
<td>.05</td>
<td>.26</td>
<td>.57</td>
<td>.14</td>
<td>.06</td>
<td>.028</td>
<td>.000</td>
</tr>
</tbody>
</table>

**Physical Properties**

<table>
<thead>
<tr>
<th>YIELD STRENGTH</th>
<th>3/4 IN.</th>
<th>1-1/2 IN.</th>
<th>SPECIMEN AREA</th>
<th>ELONGATION</th>
<th>GAUGE LENGTH</th>
<th>BEND TEST</th>
<th>GRAIN SIZE</th>
<th>REDUC OF ARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>.5</td>
<td>77.7</td>
<td>3.727</td>
<td></td>
<td>43.5</td>
<td>2&quot;</td>
<td>0.5D PASS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60.4</td>
<td>80.0</td>
<td>3.727</td>
<td></td>
<td>39.0</td>
<td>2&quot;</td>
<td>0.5D PASS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I hereby certify that the contents of this report are correct and accurate. All test results and operations performed by this material manufacturer are in compliance with the requirements of the material specification, and when designated by the purchaser meet applicable material requirements of section III of the A.S.M.E. Boiler and Pressure Vessel Code.

Signed: 
Tom L. Harrington  
Quality Assurance Manager

Notarized on request only.

**Remarks**

O'Neal Steel, Inc.  
P.O. Box 5495  
Lubbock, TX 79417

**Notarized on Request Only**

**ANIFEST 499693**

Manu facturing processes of the steel materials in this product, including smelting, have occurred within the United States in compliance with the "buy America" provision of the Surface Transportation Assistance Act of 1982.
<table>
<thead>
<tr>
<th>TEST REPORTS</th>
<th>SHIPPING TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>O'NEAL STEEL, INC.</td>
<td>2834 CLOVIS ROAD</td>
</tr>
<tr>
<td>P. O. BOX 5906</td>
<td>LUBBOCK, TX</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CHEMICAL ANALYSIS - %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-1725 FLATS, 0.3750&quot; X 2.0000&quot; A36-90 5000# BUNDLE</td>
<td>C Mn P S iSi Cu Ni Cr Mo V Ca</td>
</tr>
<tr>
<td>01 8.20'00&quot;</td>
<td>0.49690 5.20 73.3 30.0 .16 .72 .015 .016 .16 .27</td>
</tr>
</tbody>
</table>

I certify the above results of tests and/or analyses to be correct as contained in the records of Atlantic Steel Company.

[Signature]

I certify the above results of tests and/or analyses to be correct as contained in the records of Atlantic Steel Company.

[Signature]
<table>
<thead>
<tr>
<th>SIZE</th>
<th>GRADE</th>
<th>SPECIFICATION</th>
<th>S. O. NO.</th>
<th>CUST. P.O. NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot; X 5-1/2</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>2013173</td>
<td>7-17424</td>
</tr>
<tr>
<td>2-1989</td>
<td>1/15</td>
<td>.69 .01 .03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-1989</td>
<td>1/15</td>
<td>.69 .01 .03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3&quot; X 3&quot; X 1/4</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>2013173</td>
<td>7-17424</td>
</tr>
<tr>
<td>2-2488</td>
<td>1/15</td>
<td>.73 .01 .04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-2488</td>
<td>1/15</td>
<td>.73 .01 .04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-1/2 X 1-1/2 X 3/16</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>2011544</td>
<td>7-13452</td>
</tr>
<tr>
<td>2-2827</td>
<td>1/14</td>
<td>.61 .01 .04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-1/2 X 1-1/2 X 3/16</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>2011544</td>
<td>7-13452</td>
</tr>
<tr>
<td>2-2827</td>
<td>1/14</td>
<td>.61 .01 .04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2&quot; X 2&quot; X 3/8</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>2009381</td>
<td>7-08587</td>
</tr>
<tr>
<td>2-2736</td>
<td>1/15</td>
<td>.69 .01 .05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2&quot; X 2&quot; X 3/8</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>2009381</td>
<td>7-08587</td>
</tr>
<tr>
<td>2-2736</td>
<td>1/15</td>
<td>.69 .01 .05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3&quot; X 3&quot; X 3/16</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>2013396</td>
<td>7-57936</td>
</tr>
<tr>
<td>2-2536</td>
<td>1/14</td>
<td>.66 .01 .03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3&quot; X 3&quot; X 3/16</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>2013396</td>
<td>7-57936</td>
</tr>
<tr>
<td>2-2536</td>
<td>1/14</td>
<td>.66 .01 .03</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This material including the billets, is produced and manufactured in the United States of America.

A. J. Turner
Quality Assurance Mgr.
Mill Group

We hereby certify that the above figures are correct as contained in the records of the company.

2 x 2 x 3/8 Angle
### CHEMICAL AND PHYSICAL TEST REPORT

**MADE IN USA**

<table>
<thead>
<tr>
<th>SIZE</th>
<th>GRADE</th>
<th>SPECIFICATION</th>
<th>S.O. NO.</th>
<th>CUSTOM. P.O. NUMBER</th>
<th>YIELD P.</th>
<th>TENSILE P.</th>
<th>BEND</th>
<th>DEF.</th>
<th>% U. O.</th>
<th>HEAVY</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4</td>
<td>A36</td>
<td>ASME-SA36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>A36</td>
<td>ASME-SA36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-1/2</td>
<td>A36</td>
<td>ASME-SA36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-1/2</td>
<td>A36</td>
<td>ASME-SA36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>A36</td>
<td>ASME-SA36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>A36</td>
<td>ASME-SA36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-1/2</td>
<td>A36</td>
<td>ASME-SA36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>A36</td>
<td>ASME-SA36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SHIPPING**: 35202-26

**SHIP DATE**: 6/10-17-89

**SHIPPER'S NUMBER**: 8582-1-977

**CUSTOM ACCOUNT NO.**: 36701666

**QUALITY ASSURANCE MGR. MILL GROUP**: A. J. TURNER

*THIS MATERIAL, INCLUDING THE BILLETS, WAS PRODUCED AND MANUFACTURED IN THE UNITED STATES OF AMERICA.*

We hereby certify that the above figures are correct as contained in the records of the company.
## CERTIFIED TEST REPORT

The following tests conform to the requirements of the specifications listed.

### HEAT NO.  | SECTION  | SPECIFICATION  | C   | Mn | P    | S   | Si | Cu | Cr  | Ni  | Mo  | Nb | V  | Al
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
1391 | AU 2.5X2X1/4 | ASTM A36 89 | .15 | 0.87 | .024 | .036 | .16 | .48 | 0.24 | 0.17 | .039 | .000 | .004 | .003
37196 | CH 6X10.5 | ASTM A36 89 | .17 | 0.68 | .009 | .031 | .26 | .37 | 0.23 | 0.23 | .049 | .004 | .002 | .001
37624 | SR 3/4 | ASTM A36 89 | .16 | 0.82 | .009 | .033 | .17 | .50 | 0.11 | 0.23 | .053 | .000 | .002 | .000
37625 | SB 3/4 | ASTM A36 89 | .15 | 0.76 | .006 | .028 | .19 | .46 | 0.10 | 0.22 | .054 | .000 | .002 | .000
37196 | CH 6X10.5 | ASTM A36 89 | .17 | 0.68 | .009 | .031 | .26 | .37 | 0.23 | 0.23 | .049 | .004 | .002 | .001
1476 | #B REBAR | ASTM A615-B9 GRADE 60  | AASHTO M31 | .42 | 0.97 | .008 | .032 | .23 | .42 | 0.08 | 0.17 | .041 | .013 | .002 | .000

### HEAT NO.  | TEST NO. | YIELD PSI | TENSILE PSI | %ELONG IN % | BEND | LBS/FT | DATE ROLLED  | MM/DD/YY
--- | --- | --- | --- | --- | --- | --- | --- | ---
1391 | 1 | 52100 | 74800 | 30.0 | 3.570 | 06/25/92
37196 | 1 | 51800 | 74400 | 39.0 | 10.400 | 06/28/91
37624 | 1 | 51500 | 73500 | 22.0 | 1.900 | 01/10/92
37625 | 1 | 51500 | 73500 | 22.0 | 1.900 | 01/10/92
37196 | 1 | 51800 | 74400 | 39.0 | 10.400 | 06/28/91
1476 | 1 | 69000 | 106300 | 12.0 | 60 | 2.600 | 06/26/92

**REMARKS:**

- P.O. 2-16717; 2-18477; 2-19078 & 2-57945 & BZ-42593
- THIS STEEL IS MELTED & MANUFACTURED IN THE USA
**Atlantic Steel Company**

A MEMBER OF THE IVACO GROUP

P.O. BOX 1714
ATLANTA, GEORGIA 30301

TEST CERTIFICATE

**SEND TO**

O'NEAL STEEL, INC.
TEST REPORTS
P.O. BOX 5906
LUBBOCK, TX 79417

**SHIPPED TO**

2834 CLOVIS ROAD
LUBBOCK, TX

**INVOICE NUMBER** | **CUSTOMER ORDER NO.** | **DESCRIPTION** | **HEAT NO.** | **YIELD STRENGTH KSI** | **TENSILE STRENGTH KSI** | **ELONGATION % CAGE** | **TENSILE TEST** | **CHEMICAL ANALYSIS - %**
--- | --- | --- | --- | --- | --- | --- | --- | ---
038447 Z-0798 FLATS, 0.2500" x 4.0000" 55 KSI 001 8 20'00" 5000# STACKED BUNDLE 48332 65.6 87.6 28.0 -20 88.017 022 .21 .37 .023

MATERIAL MELTED AND MANUFACTURED IN THE USA

I CERTIFY THE ABOVE RESULTS OF TEST AND/OR ANALYSES TO BE CORRECT AS CONTAINED IN THE RECORDS OF ATLANTIC STEEL COMPANY.

[Signature]

DAY
<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>DESCRIPTION</th>
<th>PHYSICAL TESTS</th>
<th>CHEMICAL TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>559213668</td>
<td>1/4x3&quot; F1 20' (A36) ASTM A36</td>
<td>Yield: 50,300 Tensile: 71,500 Elong: 25.0 Bend: OK Deflection: -4.9%</td>
<td>C: .15 Ni: .700 Mn: .014 P: .035 Cr: .16</td>
</tr>
<tr>
<td>559213692</td>
<td>1/4x4&quot; F1 20' (A36) ASTM A36</td>
<td>Yield: 45,800 Tensile: 65,900 Elong: 28.0 Bend: OK Deflection: -4.3%</td>
<td>C: .15 Ni: .600 Mn: .010 P: .038 Cr: .19</td>
</tr>
<tr>
<td>559310572</td>
<td>1/2x3&quot; F1 20' (A36) ASTM A36-91</td>
<td>Yield: 45,700 Tensile: 58,700 Elong: 31.0 Bend: OK Deflection: -2.9%</td>
<td>C: .14 Ni: .650 Mn: .021 P: .038 Cr: .11</td>
</tr>
<tr>
<td>559310573</td>
<td>1/2x3&quot; F1 20' (A36) ASTM A36-91</td>
<td>Yield: 45,300 Tensile: 67,600 Elong: 33.0 Bend: OK Deflection: -2.8%</td>
<td>C: .15 Ni: .720 Mn: .018 P: .036 Cr: .15</td>
</tr>
<tr>
<td>HEAT NO.</td>
<td>DESCRIPTION</td>
<td>YIELD</td>
<td>TENSILE</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>45215924</td>
<td>1/4 x 2&quot; Fl 20' (A36)</td>
<td>44,400</td>
<td>65,400</td>
</tr>
<tr>
<td></td>
<td>ASTM A36-90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45310382</td>
<td>3/4&quot; Rd 20' (A36)</td>
<td>56,689</td>
<td>74,630</td>
</tr>
<tr>
<td></td>
<td>ASTM A36-90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DATE</td>
<td>06/10/92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>2834 CLOVIS ROAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reception</td>
<td>LUBBOCK, TX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer Order No.</td>
<td>0167</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>FLATS, 0.7500&quot; X 4.0000&quot; 55 KSI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantity</td>
<td>20'00&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>9000# STACKED BUND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat Number</td>
<td>48782</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tensile Strength (ksi)</td>
<td>62.7 31.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yield Strength (ksi)</td>
<td>60.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bend Test</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical Analysis (%)</td>
<td>C Mn P S Si Cu Fe Ni Cr Mo V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.20 0.94 0.007 0.028 0.19 0.22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL MELTED AND MANUFACTURED IN THE USA**

I CERTIFY THE ABOVE RESULTS OF TESTS AND/OR ANALYSES TO BE CORRECT AS CONTAINED IN THE RECORDS OF ATLANTIC STEEL COMPANY.

SIGNED: [Signature]

IN TO AND SUBSCRIBED TO BEFORE ME THIS [Signature] DAY

19
<table>
<thead>
<tr>
<th>SHEET NO.</th>
<th>SECTION</th>
<th>SPECIFICATION</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cu</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>Nb</th>
<th>V</th>
<th>Al</th>
</tr>
</thead>
<tbody>
<tr>
<td>780</td>
<td>AE 2.5X1/4</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>.78</td>
<td>.008</td>
<td>.034</td>
<td>.24</td>
<td>.46</td>
<td>.012</td>
<td>.017</td>
<td>.037</td>
<td>.000</td>
<td>.0020</td>
<td></td>
</tr>
<tr>
<td>202</td>
<td>AE 2X3/8</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>.85</td>
<td>.008</td>
<td>.029</td>
<td>.25</td>
<td>.38</td>
<td>.019</td>
<td>.017</td>
<td>.052</td>
<td>.000</td>
<td>.0010</td>
<td></td>
</tr>
<tr>
<td>243</td>
<td>FL 3/4X6</td>
<td>A36 MODIFIED</td>
<td>.21</td>
<td>.83</td>
<td>.009</td>
<td>.042</td>
<td>.23</td>
<td>.41</td>
<td>.011</td>
<td>.018</td>
<td>.035</td>
<td>.004</td>
<td>.0020</td>
<td></td>
</tr>
<tr>
<td>094</td>
<td>FL 3/4X6</td>
<td>A36 MODIFIED</td>
<td>.21</td>
<td>.80</td>
<td>.009</td>
<td>.034</td>
<td>.22</td>
<td>.43</td>
<td>.016</td>
<td>.017</td>
<td>.037</td>
<td>.001</td>
<td>.0010</td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>AE 2X1/4</td>
<td>ASTM A36-89</td>
<td>.13</td>
<td>.87</td>
<td>.012</td>
<td>.029</td>
<td>.26</td>
<td>.60</td>
<td>.018</td>
<td>.021</td>
<td>.051</td>
<td>.000</td>
<td>.0020</td>
<td></td>
</tr>
<tr>
<td>176</td>
<td>AE 2X1/4</td>
<td>ASTM A36-89</td>
<td>.14</td>
<td>.80</td>
<td>.009</td>
<td>.029</td>
<td>.26</td>
<td>.47</td>
<td>.012</td>
<td>.017</td>
<td>.046</td>
<td>.000</td>
<td>.0010</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>FL 3/4X5</td>
<td>A36 MODIFIED</td>
<td>.22</td>
<td>.80</td>
<td>.007</td>
<td>.030</td>
<td>.23</td>
<td>.47</td>
<td>.013</td>
<td>.017</td>
<td>.041</td>
<td>.004</td>
<td>.0010</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SHEET NO.</th>
<th>Test No.</th>
<th>YIELD PSI</th>
<th>TENSILE PSI</th>
<th>%elong IN IN</th>
<th>BEND</th>
<th>LB/FT.</th>
<th>DATE ROLLED MM/ DD/YY</th>
</tr>
</thead>
<tbody>
<tr>
<td>780</td>
<td>1</td>
<td>52900</td>
<td>73100</td>
<td>31.0</td>
<td>4.045</td>
<td>11/16/91</td>
<td></td>
</tr>
<tr>
<td>202</td>
<td>1</td>
<td>51400</td>
<td>75000</td>
<td>30.0</td>
<td>4.560</td>
<td>10/19/91</td>
<td></td>
</tr>
<tr>
<td>243</td>
<td>1</td>
<td>52200</td>
<td>79400</td>
<td>25.0</td>
<td>15.150</td>
<td>04/27/91</td>
<td></td>
</tr>
<tr>
<td>094</td>
<td>1</td>
<td>51200</td>
<td>80000</td>
<td>25.0</td>
<td>15.200</td>
<td>08/18/91</td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>1</td>
<td>45800</td>
<td>-72900</td>
<td>32.0</td>
<td>-3.150</td>
<td>10/20/91</td>
<td></td>
</tr>
<tr>
<td>176</td>
<td>1</td>
<td>51200</td>
<td>72700</td>
<td>30.0</td>
<td>3.140</td>
<td>10/20/91</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>1</td>
<td>54400</td>
<td>81300</td>
<td>26.0</td>
<td>12.590</td>
<td>08/20/91</td>
<td></td>
</tr>
</tbody>
</table>

MARKS: THIS STEEL IS MELTED & MANUFACTURED IN THE USA

3/4X5 A36 MOD. FLAT
## TEST REPORT

The following tests conform to the requirements of the specifications listed.

### HEAT NO. | SECTION | SPECIFICATION | C | Mn | P | S | Si | Cu | Cr | Ni | Mo | Cb | V | Al
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
89511 | AU 2X1.5X3/16 | ASTM A36-89 | .15 | .79 | .011 | .033 | .19 | .33 | 0.11 | 0.15 | .036 | .000 | .0020 | 0.02
K1017 | AE 2X1/8 | ASTM A36-89 | .16 | .69 | .020 | .036 | .22 | .33 | 0.13 | 0.09 | .010 | .004 | .0020 | 0.02
K1056 | AE 2X1/8 | ASTM A36-89 | .15 | .66 | .017 | .037 | .24 | .36 | 0.12 | 0.11 | .020 | .003 | .0020 | 0.03
B8202 | AE 2X3/8 | ASTM A36-89 | .15 | .65 | .006 | .029 | .25 | .38 | 0.19 | 0.17 | .052 | .000 | .0010 | 0.01
00195 | AE 2.5X3/8 | ASTM A36-89 | .18 | .74 | .008 | .033 | .21 | .51 | 0.06 | 0.14 | .032 | .000 | .0020 | 0.01
00222 | AE 2.5X1/4 | ASTM A36-89 | .19 | .73 | .007 | .028 | .23 | .52 | 0.12 | 0.14 | .046 | .001 | .0020 | 0.01

### Test Results

<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>Tensile Test</th>
<th>% Elong</th>
<th>Bend</th>
<th>LB/FT</th>
<th>Date Rolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>89511</td>
<td>47800</td>
<td>71200</td>
<td>29.0</td>
<td>2.060</td>
<td>01/02/92</td>
</tr>
<tr>
<td>K1017</td>
<td>55300</td>
<td>73600</td>
<td>29.5</td>
<td>1.600</td>
<td>01/26/92</td>
</tr>
<tr>
<td>K1056</td>
<td>53900</td>
<td>71900</td>
<td>24.0</td>
<td>1.640</td>
<td>01/25/92</td>
</tr>
<tr>
<td>B8202</td>
<td>51400</td>
<td>75000</td>
<td>30.0</td>
<td>4.560</td>
<td>10/19/91</td>
</tr>
<tr>
<td>00195</td>
<td>54200</td>
<td>75200</td>
<td>30.0</td>
<td>5.630</td>
<td>09/21/92</td>
</tr>
<tr>
<td>00222</td>
<td>54000</td>
<td>77300</td>
<td>32.0</td>
<td>4.050</td>
<td>04/21/92</td>
</tr>
</tbody>
</table>

**Remarks:** This steel was cut, rolled, and manufactured in the USA.

---

Addendum:

- Part #: 27310
- WO #: JT41210

---
### Physical Properties

<table>
<thead>
<tr>
<th>Tube Dimension</th>
<th>Yield Point</th>
<th>U.T.S.</th>
<th>Elongation</th>
<th>Heat No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot; x 0.375</td>
<td>52014</td>
<td>68283</td>
<td>10</td>
<td>2483</td>
</tr>
<tr>
<td>1/2&quot; x 0.375</td>
<td>57736</td>
<td>72931</td>
<td>12</td>
<td>2485</td>
</tr>
<tr>
<td>1/2&quot; x 0.375</td>
<td>69167</td>
<td>74195</td>
<td>33</td>
<td>2486</td>
</tr>
<tr>
<td>1/2&quot; x 0.375</td>
<td>56364</td>
<td>70712</td>
<td>37</td>
<td>2488</td>
</tr>
<tr>
<td>1/2&quot; x 0.375</td>
<td>57206</td>
<td>72827</td>
<td>35</td>
<td>2489</td>
</tr>
<tr>
<td>1/2&quot; x 0.375</td>
<td>58303</td>
<td>74462</td>
<td>33</td>
<td>2490</td>
</tr>
<tr>
<td>1/2&quot; x 0.375</td>
<td>26742</td>
<td>76553</td>
<td>31</td>
<td>2491</td>
</tr>
<tr>
<td>1/2&quot; x 0.375</td>
<td>53931</td>
<td>65485</td>
<td>33</td>
<td>2492</td>
</tr>
<tr>
<td>1/2&quot; x 0.375</td>
<td>62406</td>
<td>76499</td>
<td>30</td>
<td>2493</td>
</tr>
<tr>
<td>1/2&quot; x 0.375</td>
<td>50029</td>
<td>73780</td>
<td>35</td>
<td>2494</td>
</tr>
</tbody>
</table>

Rama, 23/04/89
CHEMICAL ANALYSIS

<table>
<thead>
<tr>
<th>SE DIMENSIONS</th>
<th>% C</th>
<th>% MN.</th>
<th>% SI.</th>
<th>% P</th>
<th>% S</th>
<th>AL%</th>
<th>HEAT NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot; X 0.375</td>
<td>0.160</td>
<td>0.710</td>
<td>0.160</td>
<td>0.014</td>
<td>0.012</td>
<td>0.004</td>
<td>2483</td>
</tr>
<tr>
<td>2&quot; X 0.375</td>
<td>0.160</td>
<td>0.760</td>
<td>0.270</td>
<td>0.014</td>
<td>0.013</td>
<td>0.002</td>
<td>2485</td>
</tr>
<tr>
<td>2&quot; X 0.375</td>
<td>0.160</td>
<td>0.780</td>
<td>0.250</td>
<td>0.013</td>
<td>0.015</td>
<td>0.002</td>
<td>2486</td>
</tr>
<tr>
<td>2&quot; X 0.375</td>
<td>0.140</td>
<td>0.640</td>
<td>0.200</td>
<td>0.009</td>
<td>0.021</td>
<td>0.005</td>
<td>2490</td>
</tr>
<tr>
<td>2&quot; X 0.375</td>
<td>0.160</td>
<td>0.660</td>
<td>0.270</td>
<td>0.008</td>
<td>0.025</td>
<td>0.005</td>
<td>2492</td>
</tr>
<tr>
<td>2&quot; X 0.375</td>
<td>0.160</td>
<td>0.700</td>
<td>0.240</td>
<td>0.012</td>
<td>0.017</td>
<td>0.004</td>
<td>2491</td>
</tr>
<tr>
<td>2&quot; X 0.375</td>
<td>0.150</td>
<td>0.750</td>
<td>0.200</td>
<td>0.006</td>
<td>0.024</td>
<td>0.005</td>
<td>2491</td>
</tr>
<tr>
<td>2&quot; X 0.375</td>
<td>0.160</td>
<td>0.630</td>
<td>0.220</td>
<td>0.009</td>
<td>0.021</td>
<td>0.005</td>
<td>2493</td>
</tr>
</tbody>
</table>

AAMLA, 23/04/89
MILL CERTIFICATE NO. 1837/00

STANDARD: NB 1863: 1968

SPECIALS: None

TEST PSI: 1490

<table>
<thead>
<tr>
<th>ER. NO.</th>
<th>09/1/1-183</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>ER. WALL</th>
<th>KG/M</th>
<th>LENGTH MTR</th>
<th>LENGTH FT</th>
<th>TOTAL WT.</th>
<th>NO. OF PIECES</th>
</tr>
</thead>
<tbody>
<tr>
<td>.375</td>
<td>105.100</td>
<td>3150.36</td>
<td>10336.33</td>
<td>325.742</td>
<td>246</td>
</tr>
<tr>
<td>.375</td>
<td>105.100</td>
<td>269.24</td>
<td>883.30</td>
<td>27.940</td>
<td>23</td>
</tr>
</tbody>
</table>

02/04/89

MEMBER OF KOOR STEEL
HEAD OFFICE: P.O.B. 788 HAIFA 31007 ISRAEL. TELEPHONE: 04-810626 O. CABLE: METCO. HAIFA, TELEX: 47178 METCO. IL FAX: 04-912145
<table>
<thead>
<tr>
<th>Property Type</th>
<th>Property</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension Testing</td>
<td>YP</td>
<td>PSI</td>
<td>617.74</td>
</tr>
<tr>
<td>Tension Testing</td>
<td>TS</td>
<td>PSI</td>
<td>617.14</td>
</tr>
<tr>
<td>Tension Testing</td>
<td>UT</td>
<td>PSI</td>
<td>495.27</td>
</tr>
<tr>
<td>Tension Testing</td>
<td>UTS</td>
<td>PSI</td>
<td>742.28</td>
</tr>
</tbody>
</table>

**Certification:**
Certificate of tests and analysis for the material tested according to the technical standards and yields the results above mentioned.

Certified, April 13, 1992.

Salvatore de Mina
<table>
<thead>
<tr>
<th>HEAT NO</th>
<th>NOM. THICKNESS</th>
<th>LENGTH</th>
<th>HYDROSTATIC TESTED</th>
<th>WEIGHT</th>
<th>CHEMICAL COMPOSITION</th>
<th>TENSION TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1104271</td>
<td>3</td>
<td>21</td>
<td>2200</td>
<td>LBS. (KGS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.216</td>
<td></td>
<td></td>
<td>X100</td>
<td></td>
<td>C  Mn  P  S  Si</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X100</td>
<td></td>
<td>Y.P.  T.S.  E.L.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X100</td>
<td></td>
<td>PSI  PSI  %</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X100</td>
<td></td>
<td>KG/CN  KG/CN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MPA  MPA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13   44  11  21  0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>155  15.17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>267  334</td>
</tr>
</tbody>
</table>

3 SCH 40 453 welded
FOR: SHIELDED METAL ARC WELDING, CARBON STEEL (P-Number 1)

SCOPE:
1. This welding procedure specification covers the welding of carbon steel (P-1) in the fabrication of API 650 storage tanks.

PROCESS: Shielded metal arc.

BASE METAL: The steel base metal shall comply with one of the ASTM specifications and grades listed in the ASME Code under (P-1).

FILLER METAL: The filler metal shall comply with ASME Material Specification Part D E6010 (F3).

PREPARATION OF BASE METAL AND ALIGNMENT OF EDGES:
1. The edges to be joined shall be prepared in accordance with a single or double "V" Groove. Gas cutting may be used.
2. Edges to be joined and all surfaces within 1/2" of the welding edge shall be thoroughly cleaned immediately prior to welding.
3. Abutting edges of plates at longitudinal joints shall not, after welding, have an offset at any point in excess of one-quarter of the plate thickness with a maximum permissible offset of 1/8", except that plates less than 1/4" in thickness, the offset may be as much as 1/16".
4. Abutting edges circumferential joints shall be aligned with the following tolerances:
   - For plates up to 1/4" 1/16"
   - For plates over 1/4" to 3/4" 25% of plate thickness
   - For plates over 3/4" to 1" 3/16"
   - For plates over 1" 12 1/2% of plate thickness, but not over 1/4"

ELECTRIC CURRENT: Direct current shall be used with electrode positive and the base metal negative. (Reverse Polarity).

WELDING TECHNIQUE:
1. The welding technique shall be substantially as shown on the attached sketches.
2. (a) when making double-welded joints the reverse (root) side must be gouged, chipped, or ground out to sound metal before the finishing bead is deposited.
### Positions (QW-405)
- Position(s) of Groove: GG
- Welding Progression: Up: E7018, Down: E6010
- Position(s) of Fillet: ALL

### Preheat (QW-406)
- Preheat Temp. Min.: 70°F
- Interpass Temp. Max.: 500°F
- Preheat Maintenance: As Required

### Electrical Characteristics (QW-409)
- Current AC or DC: DC
- Polarity: Reverse
- Amps (Range): 120-190
- Volts (Range): 19-26

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

### Mode of Metal Transfer for GMAW
- NA
- (Spray arc, short circuiting arc, etc.)

### Electrode Wire Feed Speed Range
- NA

### Technique (QW-410)
- String or Weave Bead: String & Weave
- NA
- Initial and Interpass Cleaning (Brushing, Grinding, etc.): Grinding & Brush

### Method of Back Gouging
- Air Arc and Grinding

### Oscillation
- No pass greater than 1/16

### Contact Tube to Work Distance
- NA

### Multiple or Single Pass (per side)
- Multipass
- Single

### Travel Speed (Range)
- 8 to 10 Inches Per Minute

### Peening
- Not Allowed

### Other
- (e.g., Remarks, Comments, Ha: Wire Addition, Technique, Torch Angl., Etc.)

<table>
<thead>
<tr>
<th>Weld Layer(s)</th>
<th>Process</th>
<th>Class</th>
<th>Dia.</th>
<th>Type</th>
<th>Amp. Range</th>
<th>Volt Range</th>
<th>Travel Speed Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SMAW</td>
<td>E6010</td>
<td>1/8&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>8-10 IPM</td>
</tr>
<tr>
<td>2</td>
<td>SMAW</td>
<td>E7018</td>
<td>1/8</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>8-10 IPM</td>
</tr>
<tr>
<td>3-4-5</td>
<td>SMAW</td>
<td>E7018</td>
<td>5/32&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>8-10 IPM</td>
</tr>
<tr>
<td>CAP</td>
<td>SMAW</td>
<td>E7018</td>
<td>1/8&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>8-10 IPM</td>
</tr>
</tbody>
</table>
JOINTS (QW-402)
Joint Design: GROOVE
Backginc [(Ym] (No) N
Backginc Material (Type) (Refer to both backginc and retainers.)
☐ Metal ☐ Nonfusing Metal
☐ 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 Migr., 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. 1 Group No. 1 to P-No. 1 Group No. 1
OR
Specification type and grade A106 Gr. B
OR
Specification type and grade A106 Gr. B
OR
Thickness Range:
Base Metal: Groove .1876 to .864" Fillc Unlimited
Pipe Dia. Range: Groove 6 5/8" Fillc Unlimited
Other

*FILLER METALS (QW-404)
Spec. No. (SFA) 5.1 5.1-5.5
AWS No. (Class) E6010 E7018
F-No. 3 4
A-No. 1 1
Size of Filler Metals 1/8"
1/8"--5/32"
Deposited Weld Metal .125"
.0625" to .250"
Thickness Range:
Groove Fillc
Fillet All Unlimited
Electrode-Flux (Class) Iron Oxide
Flux Trade Name
Consumable Insert
Other

Each base metal-filler metal combination should be recorded individually.
**Company Name:** SCOTT MANUFACTURING, INC.

**Procedure Qualification Record No.:** SA-1A

**Date:** 9-5-90

**WPS No.:** SA-1

**Welding Process(es):** SMAW


### 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)**

<table>
<thead>
<tr>
<th>Material Spec.</th>
<th>SA 516</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type or Grade</td>
<td>70</td>
</tr>
<tr>
<td>P.No.</td>
<td>1</td>
</tr>
<tr>
<td>Thickness of Test Coupon</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td>Diameter of Test Coupon</td>
<td>NA</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

---

**POSTWELD HEAT TREATMENT (QW-407)**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

---

**GAS (QW-408)**

<table>
<thead>
<tr>
<th>Type of Gas or Gases</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Composition of Gas Mixture</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

---

**ELECTRICAL CHARACTERISTICS (QW-409)**

<table>
<thead>
<tr>
<th>Current</th>
<th>DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polarity</td>
<td>Reverse</td>
</tr>
<tr>
<td>Amspt.</td>
<td>90-140</td>
</tr>
<tr>
<td>Volts</td>
<td>22-28</td>
</tr>
<tr>
<td>Tungsten Electrode Size</td>
<td>Other</td>
</tr>
</tbody>
</table>

---

**FILLER METALS (QW-404)**

<table>
<thead>
<tr>
<th>SFA Specification</th>
<th>5.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWS Classification</td>
<td>E6010</td>
</tr>
<tr>
<td>Filler Metal F-No.</td>
<td>3</td>
</tr>
<tr>
<td>Weld Metal Analysis A-No.</td>
<td>1</td>
</tr>
<tr>
<td>Size of Filler Metal</td>
<td>1/8&quot;-5/32&quot;</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

**Deposited Weld Metal**

| 5UU |

---

**POSITION (QW-405)**

<table>
<thead>
<tr>
<th>Position of Groove</th>
<th>1G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weld Progression (Uphill, Downhill)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

---

**PREHEAT (QW-406)**

<table>
<thead>
<tr>
<th>Preheat Temp.</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpass Temp.</td>
<td>450°F</td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

---

**TECHNIQUE (QW-410)**

<table>
<thead>
<tr>
<th>Travel Speed</th>
<th>8-10-IPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>String or Weave Bead</td>
<td>String &amp; Weave</td>
</tr>
<tr>
<td>Oscillation</td>
<td></td>
</tr>
<tr>
<td>Multipass or Single Pass (per side)</td>
<td>Multipass</td>
</tr>
<tr>
<td>Single or Multiple Electrodes</td>
<td>Single</td>
</tr>
<tr>
<td>Other</td>
<td>No pass greater than 1/2&quot;</td>
</tr>
</tbody>
</table>

---

This form (E00007) may be obtained from the Order Dept., ASME, 345 E. 47th St., New York, N.Y. 10017
Tensile Test (QW-150)

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Width</th>
<th>Thickness</th>
<th>Area</th>
<th>Ultimate Total Load</th>
<th>Ultimate Unit Stress</th>
<th>Type of Failure &amp; Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-1</td>
<td>1.043</td>
<td>.374</td>
<td>.360</td>
<td>27,500</td>
<td>70,513</td>
<td>Base Metal</td>
</tr>
<tr>
<td>T-2</td>
<td>1.035</td>
<td>.373</td>
<td>.386</td>
<td>27,250</td>
<td>70,598</td>
<td>Base Metal</td>
</tr>
</tbody>
</table>

Guided-Bend Tests (QW-160)

<table>
<thead>
<tr>
<th>Type and Figure No.</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>QW-463,1(d) Root 1</td>
<td>Accepted</td>
</tr>
<tr>
<td>QW-463,1(d) Root 2</td>
<td>Accepted</td>
</tr>
<tr>
<td>QW-463,1(d) Face 1</td>
<td>Accepted</td>
</tr>
<tr>
<td>QW-463,1(d) Face 2</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

Toughness Tests (QW-170)

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Notch Location</th>
<th>Notch Type</th>
<th>Test Temp.</th>
<th>Impact Values</th>
<th>Lateral Exp.</th>
<th>Drop Weight</th>
</tr>
</thead>
</table>

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: Jim Kirksey
Clock No. 423-76-1547 Stamp No.
Tests conducted by: Longview Inspection, Inc.
Laboratory Test No. 289-90
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: SCOTT MANUFACTURING, INC.

9-5-90

By William A. Basom

(All of record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)
**PERMIAN NON-DESTRUCTIVE TESTING**

**QUALIFICATION**

<table>
<thead>
<tr>
<th>METHOD</th>
<th>RT</th>
<th>UT</th>
<th>MT</th>
<th>PT</th>
<th>HT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NAME:</strong> Miller, Morris J.</td>
<td>I</td>
<td>II</td>
<td>I</td>
<td>II</td>
<td>I</td>
</tr>
<tr>
<td>S GENERAL/30%</td>
<td></td>
<td>26.70</td>
<td>/</td>
<td></td>
<td>25.50</td>
</tr>
<tr>
<td>E C</td>
<td></td>
<td></td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X D SPECIFIC/30%</td>
<td></td>
<td>24.00</td>
<td>/</td>
<td></td>
<td>22.50</td>
</tr>
<tr>
<td>A R</td>
<td></td>
<td></td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M E PRACTICAL/40%</td>
<td></td>
<td>36.00</td>
<td>/</td>
<td></td>
<td>34.80</td>
</tr>
<tr>
<td>S</td>
<td></td>
<td></td>
<td>/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPOSITE</td>
<td></td>
<td>36.70</td>
<td>/</td>
<td></td>
<td>32.80</td>
</tr>
<tr>
<td>CERTIFIED BY / LEVEL</td>
<td>DFM III</td>
<td>DFM III</td>
<td>DFM III</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CERTIFICATION DATE</td>
<td>10-17-90</td>
<td>10-17-90</td>
<td>10-17-90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RECERTIFICATION DUE</td>
<td>10-17-91</td>
<td>10-17-91</td>
<td>10-17-91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DOCUMENTED EXPERIENCE</td>
<td>On File</td>
<td>On File</td>
<td>On File</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRIOR CERTIFICATION LEVEL</td>
<td>II</td>
<td>II</td>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APPOINTMENT BY LETTER, III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ACCEPT: X CONDITIONS: None** DATE: 10-17-90

**COLOR PERCEPTION TEST**

| DATE EMPLOYED: | 1-25-88 | ASSIGNMENT TO NDT: 1-25-88 |
| EXPERIENCE TIME: | 9.5 Years |

**IMITATIONS:** Recertified RT, MT, PT only

**THIS INDIVIDUAL HAS SUCCESSFULLY COMPLETED THE ABOVE EXAMINATIONS AND HAS QUALIFIED FOR THE LEVEL IN THE NONDESTRUCTIVE TEST METHOD INDICATED ABOVE AS PER PERMIAN NON-DESTRUCTIVE TESTING'S WRITTEN PRACTICE. DOCUMENTATION SHALL BE ON FILE FOR REVIEW UPON REASONABLE REQUEST.**

AUTHORIZED EXAMINER / DATE

[Signature] 10-17-90

PERMIAN NON-DESTRUCTIVE TESTING
<table>
<thead>
<tr>
<th>Weld No.</th>
<th>By No.</th>
<th>Location</th>
<th>Pipe Size</th>
<th>Within Code</th>
<th>Defect &amp; Location</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>U-1</td>
<td></td>
<td>6&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>U-2</td>
<td></td>
<td>8&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>U-3</td>
<td></td>
<td>6&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>U-4</td>
<td></td>
<td>8&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>U-5</td>
<td></td>
<td>6&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>U-6</td>
<td></td>
<td>10&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>U-7</td>
<td></td>
<td>8&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>U-8</td>
<td></td>
<td>6&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>U-9</td>
<td></td>
<td>10&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>U-10</td>
<td></td>
<td>12&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>U-11</td>
<td></td>
<td>12&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>U-12</td>
<td></td>
<td>10&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>U-13</td>
<td></td>
<td>12&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>U-14</td>
<td></td>
<td>10&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>U-15</td>
<td></td>
<td>9&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>U-16</td>
<td></td>
<td>12&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>U-17</td>
<td></td>
<td>8&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>U-18</td>
<td></td>
<td>9&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>U-19</td>
<td></td>
<td>10&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>U-20</td>
<td></td>
<td>8&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>U-21</td>
<td></td>
<td>10&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>U-22</td>
<td></td>
<td>12&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>U-23</td>
<td></td>
<td>9&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>U-24</td>
<td></td>
<td>12&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>U-25</td>
<td></td>
<td>10&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>U-26</td>
<td></td>
<td>8&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>U-27</td>
<td></td>
<td>10&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>U-28</td>
<td></td>
<td>9&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>U-29</td>
<td></td>
<td>12&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>U-30</td>
<td></td>
<td>10&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>U-31</td>
<td></td>
<td>8&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>U-32</td>
<td></td>
<td>9&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>U-33</td>
<td></td>
<td>10&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>U-34</td>
<td></td>
<td>8&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>U-35</td>
<td></td>
<td>12&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>U-36</td>
<td></td>
<td>10&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>U-37</td>
<td></td>
<td>8&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>U-38</td>
<td></td>
<td>10&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>U-39</td>
<td></td>
<td>9&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>U-40</td>
<td></td>
<td>12&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weld No.</td>
<td>By No.</td>
<td>Location</td>
<td>Pipe Size</td>
<td>Within Code</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>----------</td>
<td>-----------</td>
<td>-------------</td>
<td>-----</td>
<td>----</td>
</tr>
<tr>
<td>1</td>
<td>0-1</td>
<td>0-1</td>
<td>76</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1-1</td>
<td>0-1</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2-1</td>
<td>0-1</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3-1</td>
<td>0-1</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>4-1</td>
<td>0-1</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>5-1</td>
<td>0-1</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>6-1</td>
<td>0-1</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>7-1</td>
<td>0-1</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>8-1</td>
<td>0-1</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>9-1</td>
<td>0-1</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test(s) Interpreted By: Mr. Miller Level: 2 P.O. 

Number of Testing Personnel: 2 Misc. Info:

Hours Worked: 9:00 AM to 5:00 PM

Job Location: W. 2000

NOTES: THIS ABBREVIATED REPORT IS NOT A SUBSTITUTE FOR THE CUENT REPRESENTATIVE'S REPORT. IT IS INTENDED TO PROVIDE A SUMMARY OF THE RESULTS OF THE RADIOPHOTOGRAPHIC TESTING. THE RESULTS SHOWN HEREIN ARE BASED ON THE BEST AVAILABLE DATA AND ARE NOT A SUBSTITUTE FOR THE OFFICIAL REPORT. THE CUSTOMER REPRESENTATIVE IS RESPONSIBLE FOR COMPLETING THE OFFICIAL REPORT.

TERMS AND CONDITIONS:

IN ALL CASES, THE CUSTOMER REPRESENTATIVE IS RESPONSIBLE FOR THE QUALITY OF THE WORK PERFORMED.

AGREED AND ACCEPTED: W. A. Bascom Date: 10/10/22

--- | --- | --- | --- | --- | --- | --- | --- | --- |
### PERMIAN NON-DESTRUCTIVE TESTING

**a DPM Subsidiary**

---

**Radiography**
- Ultrasonics
- Eddy Current
- Dye Penetrant
- Magnetic Particle
- Heat Treat

---

**Weld No.** | **Location** | **Pipe Size** | **Within Code** | **Detects & Location** | **Remarks**
--- | --- | --- | --- | --- | ---
1 | C-1 | O-1 | | | 
2 | | | | | 
3 | | | | | 
4 | | | | | 
5 | | | | | 
6 | | | | | 
7 | | | | | 
8 | | | | | 
9 | | | | | 
10 | | | | | 
11 | | | | | 
12 | | | | | 
13 | | | | | 
14 | | | | | 
15 | | | | | 
16 | | | | | 
17 | | | | | 
18 | | | | | 
19 | | | | | 
20 | | | | | 
21 | | | | | 
22 | | | | | 
23 | | | | | 
24 | | | | | 
25 | | | | | 
26 | | | | | 
27 | | | | | 
28 | | | | | 
29 | | | | | 
30 | | | | | 
31 | | | | | 
32 | | | | | 
33 | | | | | 
34 | | | | | 
35 | | | | | 
36 | | | | | 
37 | | | | | 
38 | | | | | 
39 | | | | | 
40 | | | | | 

**Test(s) Interpreted By:** M. M. 185 Level: II P.O. #:

---

**Number of Testing Personnel:** 2 Miles/Incl.:

---

**Hours Worked:** 8:40 AM to 5:40 PM Hours: RT 18 Hours: OT 3 Total: 21 Job: Wolf Refl, Texas

---

**NOTES:**
- The above report and any copy herewith is for the customer representative or customer's contractor retaining the results of the inspection with the code and specifying the acceptance or rejection of the project and the project acceptance, the material, and the equipment of the inspection. The customer representatives shall be responsible for the acceptance or rejection.

---

**ACTIONS:**
- MODERATE PENETRATION: CR
- PERFORMANCE PROOF: CR
- DETECTABLE PENETRATION: CR
- NOT TO HOLE: CR
- INCONC: CR
- INTERNAL CONTAMINATION: CR
- PHOTOGRAPHIC: CR
- INCOMPLETE FUSION: CR
- ISOLATED INCLUSIONS: CR
- ISOLATED BLEM INCLUSIONS: CR
- NON-METALLIC INCLUSIONS: CR
- NON-METALLIC BLEM INCLUSIONS: CR

---

**Agreed and Accepted:** Wulf's Industrial

---

**Date:** 12/10/22

---

**R.S.:** RIGHT OF WAY SIDE
**D.E.:** DISS SIDE
**T.O.:** TOP QUARTER
**B.S.:** BOTTOM QUARTER
WISCO WELDING INSPECTION SERVICE COMPANY
11811 NORTH FRWY., SUITE 670
HOUSTON, TEXAS 77060

REPORT DATES 10/16/92 10/17/92
CUSTOMER: USPCI
ORDER NO: PO 19350
DATE: DATED:
REV.

MAT'L DESTINATION: LONE MOUNTAIN
REQUIRED DATE: 11/1/92 SHIPMENT DATE IS NOW: SAME
AS OF: CHANGED FROM:
INSPECTOR ESTIMATED SHIPMENT DATE: SAME
ORDER IS 65% PERCENT COMPLETED:

VENDOR: SCOTT MFG. CO.
MANUFACTURER: SAME
PHONE: 806-866-9591 SHOP LOCATION: WOFORD, TX.
SHOP ORDER NO: 451
INSPECTOR'S CONTACT: BILL BASON POSITION: FIELD MANAGER
REPORT IS: INTERIM
REGARDING: INSPECTION
INSPECTOR: VICTOR HAGMAN

MATERIAL DESCRIPTION: (4) 12.75' DIAMETER BY 40' HEIGHT
CAUSTIC STORAGE TANKS.

STATUS OF ORDER: TWO TANKS TO SHIP 10/19/92

INSPECTION: WITNESS RADIOGRAPHS BE TAKEN OF WELDS AND REVIEW
OF SAME.

1. PICKED SPOTS FOR RADIOGRAPHS ON TWO TANKS. SHOTS WERE
TAKEN OF VERTICAL SEAMS GIRTH WELDS IN TANKS. ONE SPOT WAS
TAKEN ON THE BUTT WELDS ON THE CONE BOTTOM. THE CONE BOTTOM
HAS THREE BUTT WELDS.

2. REVIEW OF SPOT WELDS FOUND THE FOLLOWING. THE WELDS IN
THE CONE BOTTOM WERE BAD. PENALTY SHOTS WERE TAKEN AS PER API
650, AND ASME SEC. VIII UW 51, AND UW52. FOUND THAT A BAD
PROCEDURE WAS USED IN WELDING THE BUTT WELDS ON THE BOTTOM
OF ALL FOUR TANKS. THERE WAS NO PENETRATION ON ANY OF THE
WELDS. SO SCOTT MFG MADE REPAIRS ON THE TWO TANKS TO SHIP ON
10/19/92. REPAIR SHOTS WERE MADE. FOUND THAT THE WELDS WERE
STILL BAD, THE COMPLETE BUTT WELDS ON THE BOTTOM OF ALL FOUR
TANKS WAS REMOVED COMPLETELY.

10/17/92.
1. PICKED RADIOGRAPHS FOR BOTTOM BUTT WELDS. AFTER REVIEWING
FILM FOUND THAT ALL OF THE BOTTOM BUTT WELDS WERE NOW
ACCEPTABLE. THE REASON FOR THE PROBLEM TO START WITH WAS THAT
NO ROOT OPENING WAS LEFT FOR PENETRATION. THESE WELDS WERE
DONE BY THE SHOP PERSONAL, NOT THE CREW THAT IS BUILDING
THESE TANKS.

2. WITNESS FITTING THE TOP RING ON TANK NUMBER TWO, AND
WATCHED AS THE WELDERS MADE THE ROOT PASS. ALL WELDING WAS
PER SPECIFICATIONS AND WAS OF GOOD QUALITY.

WILL RETURN 10/19/92 FOR FINAL ON FIRST TWO TANKS AND WITNESS
REMARKS OF CONC.
REPORT DATES 10/14/92 10/15/92
CUSTOMER: USPCI
ORDER NO: DATED: REV: DATED:
DESTINATION: LONE MOUNTAIN
REQUIRED DATE: SHIPMENT DATE IS NOW:
AS OF CHANGED FROM:
INSPECTOR ESTIMATED SHIPMENT DATE:
ORDER IS PERCENT COMPLETED:
VENDOR: SCOTT MFG.
MANUFACTURER: SAME
PHONE: 716-856-9591 SHOP LOCATION: WOLFORD, TX
SHOP ORDER NO: 451
INSPECTOR'S CONTACT: BILL BASON POSITION: ENG.
REPORT IS: INTERIM
REGARDING: INSPECTION
INSPECTOR: VICTOR HAGMAN

ORDER NO: 451

MATERIAL DESCRIPTION: (4) 12'75" DIAMETER BY 40' HEIGHT CAUSTIC TANKS.

STATUS OF ORDER. COMPLETION IS ABOUT 50% TWO TANKS TO SHIP MON 10/19/92.

INSPECTION. MEETING WITH MR. BASON AND FIELD FOREMAN.

WENT OVER SPECIFICATIONS FROM USPCI. AND REVIEWED WHAT DRAWINGS WERE ON HAND. NO PROBLEMS WERE FOUND WITH SCOTT MFG. MEETING SPECIFICATIONS.

INSPECTION OF TANKS BEING WELDED.
1. WITNESS WELDING OF GIRTH WELDS ON TANKS, FOUND THAT THE ROOT OPENING WAS ACCEPTABLE FOR FULL PENETRATION WELDS.
2. WITNESS AIR TESTING OF REPADS ON TANK SHELLS. ALL NOZZLES ARE WELDED IN SHELLS BEFORE TANK SHELLS ARE FIT TOGETHER. THIS IS GOOD AS THAT ALL OF THE REPADS CAN BE AIR TESTED ON THE GROUND. NO DANGER OF FALLING AR OF PADS NOT BEING TESTED. SHOP AIR WAS USED FOR TESTING. WITH 18-20 POUNDS OF AIR APPLIED TO PADS, A SOAP AND WATER MIXTURE WAS USED TO CHECK FOR LEAKS BOTH ON THE INTERNAL AND THE EXTERNAL. REPAD TEST WAS ACCEPTABLE AS NO LEAKS WERE FOUND.
3. VISUAL INSPECTION OF WELDING BOTH INTERNAL AND EXTERNAL. NO DEFECTS WERE FOUND. VISUAL INSPECTION TO FIND UNDERCUTTING, PIN HOLES, COLD LAP, LOW FILLET WELDS, EXCESSIVE WELD BUILD UP ON GIRTH WELDS ETC. ALL THAT WAS FOUND WAS SOME SMALL PINHOLDS, THESE WERE REPAIRED.
VISUAL INSPECTION OF THE ROLLED RINGS. FOUND THAT ONE OF THE BRACES ON THE PAINTERS RING WAS WELDED TO THE VERTICAL WELD SEAM. AS API 650 STATES THAT ALL ATTACHMENTS MUST MISS VERTICAL SEAMS BY AT LEAST 6 INCHES. THESE WERE MOVED AND REWELDED.
10/15/92.

MET WITH MR. HAMWI THIS A.M. FOR INSPECTION OF TANKS. TALKED WITH MR. BASON ABOUT DELIVERY OF TANKS. THE FIRST TWO TANKS WILL BE ON TRUCKS TO JOB SITE BY 10/19/92 A.M.

REVIEW OF DRAWINGS ON TANKS AND WALK WAYS. NO PROBLEMS WERE FOUND.

FIELD INSPECTION OF TANKS BEING WELDED, AND A TOUR OF SHOP WAS TAKEN. SCOTT MFG. HAS A WIDE RANGE OF SERVICES THAT WERE SHOWN TO MR. HAMWI AND THIS WRITER.

A VISUAL INSPECTION OF TANKS WAS DONE AND NO PROBLEMS WERE FOUND.

PHOTOS OF TANKS, ERECTION, AND WELDING WAS TAKEN. THESE WILL SENT WITH DATA PACKAGES.

REVIEW OF MATERIAL TEST REPORTS FOR THE SHELL MATERIAL AND FOR THE STRUCTURAL MATERIAL. THE MTR'S FOR THE PIPING HAS NOT ARRIVED FROM THE SUPPLIER. AS SOON AS THESE OR IN THEY WILL BE CHECKED.

REVIEWED ALL WELDER QUALIFICATIONS, AND ALL WELD PROCEDURES. ALL WELDING OF TANKS WERE TO THESE PROCEDURES. ALL WELDER WORKING ON TANKS WERE QUALIFIED PER A 6G WELD TEST AND ALL PAPER WORK WAS IN ORDER.

ALL RADIOGRAPHS WILL BE SHOT 10/16/92 ON THE TWO TANKS TO SHIP ON 10/19/92. ALL OTHER NDE WORK HAS BEEN COMPLETED. ALL THAT WAS REQUIRED WAS A MAG PARTICLE OF NOZZLE WELDS. THIS HAS BEEN DONE AND PROPER PAPER WORK IS IN THE JOB FILE.

AT THIS TIME ALL API-650 AND USPCI SPECIFICATIONS ARE BEING FOLLOWED. ALL WORK SEEN ON THIS VISIT WAS OF GOOD QUALITY AND WAS ACCEPTABLE TO ALL SPECIFICATIONS.
QUALITY ASSURANCE INSPECTION RELEASE

PAGE 1 OF 1
DATE: 10-19-92
REP. NO.:  

CUSTOMER: US PCI
P.O. NO.: 19350
LOCATION: Lubbock, TX

VENDOR: Scott Mfg
PROJECT: Lone Mountain

☑ Satisfactorily completed Quality Assurance Inspection on: 10-19-92

<table>
<thead>
<tr>
<th>P.O. ITEM</th>
<th>QUANTITY</th>
<th>MATERIAL DESCRIPTION/TAG NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>12' x 40' Height Caustic Tank Ser. No. 451-1</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>12' x 40' Height Caustic Tank Ser. No. 451-2</td>
</tr>
</tbody>
</table>

Shipping Information: By truck to Lawton, OKLA.
Date Released for Shipment: 10-19-92

☑ Without exception to the Purchase Order Documents.
☑ With the following Exception from the Purchase Order, only with follow up in writing with a copy of telex or letter attached. (State specifics and name of Responsible Engineer)

Approval or release for shipment of any work by a representative of the purchaser, or purchaser's Client, shall in no way relieve the vendor or sub-vendor of any responsibility for meeting the requirements of the purchase order and/or specifications.

Signing of the form acknowledges the items have been inspected in accordance with the above purchase order.

10-19-92
Date

[Signature]
Agency Inspector's Signature

11811 North Fwy, Suite 670. Houston, Texas 77060 (713) 820-8066
QUALITY ASSURANCE INSPECTION RELEASE

PAGE OF
DATE: 10-24-92
REP. NO.:  

CUSTOMER: USPC
P.O. NO.: 19350
LOCATION: HU-BROCK, TX

VENDOR: Scott Mfg. Inc.
PROJECT: Lone Mountain

[ ] Satisfactorily completed Quality Assurance Inspection on: 10-24-92
(Date)

<table>
<thead>
<tr>
<th>P.O. ITEM</th>
<th>QUANTITY</th>
<th>MATERIAL DESCRIPTION/TAG NO.</th>
</tr>
</thead>
</table>
| /         | 1        | 12.75' x 40' height caustic tank
|           |          | Sen. No. 451-3              |
| /         | 1        | 12.75' x 40' height caustic tank
|           |          | Sen. No. 451-4              |

Shipping Information: By truck to Waynola, OKLA.

Date Released for Shipment: 10-24-92

[ ] Without exception to the Purchase Order Documents.
[ ] With the following Exception from the Purchase Order, only with follow up in writing with a copy of telex or letter attached. (State specifics and name of Responsible Engineer)

Approval or release for shipment of any work by a representative of the purchaser, or purchaser's Client, shall in no way relieve the vendor or sub-vendor of any responsibility for meeting the requirements of the purchase order and/or specifications.

Signing of the form acknowledges the items have been inspected in accordance with the above purchase order.

10-24-92

Date
Agency Inspector's Signature

11811 North Fwy, Suite 670- Houston, Texas 77060 (713) 820-8066
APPENDIX G

Drawings
NOTE: ANCHOR BOLTS TO STRADDLE N-S ⌂

(12) ANCHOR BOLTS

CHORD 3'-6" R

43"

8" THREAD

10" THREAD

14"

13"

1/2 X 45° CHAMFER

ANCHOR BOLT
12 REQUIRED
N'TS
DOUBLE NUT ANCHOR BOLTS
GALVANIZED

ANCHOR BOLT CHAIR
12 REQUIRED
3'-6"
DOUBLE NUT ANCHOR BOLTS
### Table

<table>
<thead>
<tr>
<th>USE</th>
<th>NOMINAL DIA D''</th>
<th>T''</th>
<th>ROLL RADIUS</th>
<th>A''</th>
<th>B''</th>
<th>R''</th>
<th>PER TANK C'TY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHELL MANHOLE</td>
<td>30</td>
<td>4</td>
<td>TANK RADIUS</td>
<td>60</td>
<td>30</td>
<td>15(\frac{3}{16})</td>
<td>1</td>
</tr>
<tr>
<td>OUTLET</td>
<td>6</td>
<td>4</td>
<td>&quot;</td>
<td>13(\frac{4}{8})</td>
<td>6(\frac{5}{8})</td>
<td>3(\frac{3}{8})</td>
<td>1</td>
</tr>
<tr>
<td>INLET</td>
<td>3</td>
<td>4</td>
<td>&quot;</td>
<td>7</td>
<td>3(\frac{1}{8})</td>
<td>1(\frac{1}{8})</td>
<td>2</td>
</tr>
<tr>
<td>OVERFLOW</td>
<td>3</td>
<td>4</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>1</td>
</tr>
<tr>
<td>SHELL ACCESS</td>
<td>—</td>
<td>—</td>
<td>&quot;</td>
<td>SEE DETAIL AT LEFT</td>
<td></td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**Front View**

- **Thickness, T''**: ROLL RADIUS
- **Edge View, Rolled**

**Diagram Notes**

- FOR SHELL ACCESS: 60"
- FOR OTHER FITTINGS AND SHELL MANHOLE: 4"

**Revisions**

<table>
<thead>
<tr>
<th>NO</th>
<th>DATE</th>
<th>BY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Scott Manufacturing, Inc.**

P.O. Box 10232 Lubbock, Texas 79406

Reinforcing Plate Detail

USPC, Waynoka, OK

Drawn by: L. W. Scale: 1/8" (drawn 1/16"

Sheet: 4/8" Date: 10/1982 Drawing No: 451-4
SECTION

(20) 3/4" X 11/2" NICKEL BOLT 2.25" PLATED

6" THICK TEPFEPRENE BASKET

7/8" X 4" X 1/2" R ROLLED TO 24" ID.

ROOF

BOLTHOLES SHALL STRADDLE THE CENTERLINES

(20) 1/8" HOLES

(22) 1/8" HOLES

COVER

OUTSIDE RADIUS

INSIDE RADIUS

BOLT CIRCLE RADIUS 3 1/2"

OUTSIDE RADIUS

FLANGE RING

SCALE: 1/2" = 1'0"

(1) REQ'D PER TANK

REVISIONS

SCOTT MANUFACTURING, INC.
PO BOX 10232 LUBBOCK, TEXAS 79408

API ROOF MANHOLE
USPC, WAINOKA, OK.

DRAWN BY: LDW

SCALE "AS SHOWN" MATERIAL

DATE: 10/9/92

DRAWING NO: 451-7
NOTE: EACH TANK'S HANDRAIL IS MADE IN 2 HALVES AND ARE MIRROR IMAGES. NOTE: THE VERTICALS ORIENTATIONS, THE HALVES ARE 180° OUT & LEAD DOWN. ALL WELDS ARE ALL-AROUND, LEGS OUT OF RAILS ARE HOLED TO TANK COLD.

HANDRAIL ON TANK—TYPICAL

VERTICALS SPACING IS UNIFORM—ABOUT 44-

2" x 2" x 3/8" L

1/4" x 1" TIE BOARD

HANDRAIL—TYPICAL
SECTION CT2
Dear Mr. Dillie:

At the time of our inspection of Caustic Storage Tanks 1-4 located at the pretreatment area were inspected and there were no visual apparent weld breaks, punctures, scrapes of protective coatings, cracks, corrosion or damage due to construction or installation. This is to certify that Caustic Storage Tanks 1-4 were installed in such a manner which did not produce any structurally adverse conditions in accordance with 40 CFR 264.192(b).

This is to certify that at the time of our inspection, the Caustic Storage Tanks 1-4 located at the pretreatment area of the Lone Mountain Facility, (Waynoka, Oklahoma), were filled with water and allowed to stand at static equilibrium for a period of several hours. During this time all welds and tank walls were monitored for leaks. There were no apparent leaks found therefore the tank appears to be capable of handling hazardous wastes without release for the intended life and use of the tank.

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 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 of knowing violations.

Sincerely,

MYERS ENGINEERING CORPORATION

E. E. Myers
EEM. Is

cc: Mr. Gene Walker
Environmental Engineer
Lone Mountain Facility

FILE INSTRUCTIONS

Unit: Pre-Treatment
Project: Ammonia Tank Assessment
Section: Tank Construction

Rev. by: L. J. ODEN
ROUTE COPY
FILE D. Dugan
B. Correa

1102 NORTH STRATFORD DRIVE • SUITE 2400 • OKLAHOMA CITY • OKLAHOMA • 73120 • 405/755-5525 • FAX 405/755-551
A. TANK VESSEL DESCRIPTION

Caustic Tank #3 is a large steel aboveground vertical tank located in the pretreatment area of the Lone Mountain Hazardous Waste Facility. Caustic Tank #1, Caustic Tank #2, Caustic Tank #3, Caustic Tank #4, Sludge Storage Tank #1 and, Caustic Overflow Tank, Cyanide Overflow tank, Cyanide Reactor, Cyanide Measure Tank and a portion of their ancillary equipment will be located together in a concrete containment area.

B. PRIMARY TANK VESSEL

1. General Description

Caustic Tank #3 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. Caustic Storage Tank #3 is an aboveground tank that will be used for the storage of caustic liquids. The tank is vertical in position and cylindrical in shape. The tank and contents are supported by a skirted base. There is a cone on the bottom of the tank inside the skirt. There is a platform connected to all four caustic storage tanks (CT1, CT2, CT3, CT4). There are two ladders for access to the tank top and platform. This tank is equipped with a 3" overflow line. There is a level gauge installed through an 18" nozzle, in addition to the level gauge there is a high level alarm installed through a nozzle on the top of the tank. This tank was manufactured by Scott Manufacturing, Inc from Lubbock, Texas. The temperature of the tank varies with the ambient temperature.

Influent piping is located from the pretreatment building to the caustic tank and to other tanks in the containment area.

2. Design Standards.

The tank is designed and constructed 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). The Mill Test reports and radiographic testing reports can be found in Appendix F of this assessment.
3. Hazardous Characteristics of Wastes Stored

The wastes to be stored in this tank have the following characteristics (Provided by USPCI):

Untreated wastes pH (7 - 13)
N > 1
Temperature = Ambient

The hazardous characteristics of the waste to be 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 interior of the tank is coated with Gliden "Glid-Guard Epoxy Chemical Resistant Finish 5240 Series." This coating will withstand the chemical characteristics of the waste to be stored.

5. Documented Age of Tank

This is a new tank, it was constructed and installed in October of 1992.

6. Result of Leak Tests

A leak test was performed. In this test the tank was filled to maximum operating capacity with water. The tank was allowed to sit full for a minimum of 6 hours. After remaining full for this time there was no evidence of the tank leaking. In the inspection all welds, flanges, manways, nozzles, and sidewalls were checked for leaks.

7. Existing Data Obtained

| Diameter of Tank | 12'-8-5/8" Inside Dia. |
| Height           | 40'                    |
| Material         | A36 steel See Appendix F for Mill Test reports |
| Wall and top thickness | 0.25" |
| Bottom cone thickness | 0.3125" |
| Maximum Volume   | 4428.27 cf. or 33,108 Gal. |
| Maximum Operating Volume | 4299.22 cf. or 32,156 Gal. |
| Specific gravity of waste | 1.5 (Provided by USPCI) |
| Temperature      | Ambient                |
| Seismic Zone     | 1                      |

8. Calculation of Existing Foundation Loading

Total Weight of Tank and Contents = 216.54 tons

Detailed calculations reflecting the volume and weight of the tank are found in appendix A. The 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 0.2195 inches. This thickness includes 0.125 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 B and C of this assessment for detailed calculations or required wall thickness and structural analysis of the tank support system.)

10. Comparison of Actual Structure to Theoretical Values

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculated Required Wall Thickness</td>
<td>0.2195&quot;</td>
</tr>
<tr>
<td>Minimum Required Wall Thickness by API-650-88</td>
<td>0.1875&quot;</td>
</tr>
<tr>
<td>Measured Wall Thickness</td>
<td>0.25&quot;</td>
</tr>
</tbody>
</table>

C. SECONDARY CONTAINMENT SYSTEM

1. General Description of Secondary Containment

The secondary containment system is designed and will be operated to prevent any migration of wastes or liquids out of the system. Cyanide Reactor Tank, Cyanide Measure Tank, Caustic Tanks #1-4, Sludge Storage Tank, Caustic Overflow Tank, Cyanide Overflow Tank will be located on a reinforced concrete base floor area with vertical concrete sidewalls. All associated piping is aboveground. The area will be inspected on a daily basis. The containment system is walled off and receives no direct vehicular traffic. The foundation walls and base were mass poured in place. No cracks from compression or uplift were visually apparent. There are three low areas with a slight depression that are used to collect any waste spills and rainwater. Any released tank contents or surface runoff will drain on top of the sloped concrete to the sump areas. The accumulated liquids are then removed and pumped out in accordance with the permit condition. The slab floor also serves as a foundation support for the tanks in this area.

The concrete floor was removed and replaced in October of 1992. The floor was replaced in order to strengthen the foundation for the tank support.

2. Design Standards.

Design drawings for the walls 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. The concrete floor and foundation were built in close adherence to the above mentioned codes. The floor as previously mentioned was removed and replaced.
3. Hazardous Characteristics of Wastes Stored

The wastes which are treated in the primary tank have the following characteristics:

- Untreated waste pH (7 - 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 is coated with Concrete Protection System, Inc "OVERKOTE" industrial flooring. For more information on this coating see Appendix H of this report.

5. Documented Age of The Containment Area

The secondary containment system was originally constructed and installed in 1987 however the floor was replaced in October 1992.

6. Result of Leak Tests

A visual inspection of the containment area was performed and from this inspection it was determined that there are no cracks or breaks in the impermeable coating. The area will be inspected on a daily basis checking for leaks from the primary tank.

7. Data Obtained

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>2509.85 s.f.</td>
</tr>
<tr>
<td>Wall Height</td>
<td>2.62 ft. (Min.)</td>
</tr>
<tr>
<td>Material</td>
<td>Concrete</td>
</tr>
<tr>
<td>Gross Volume</td>
<td>6575.81 c.f.</td>
</tr>
<tr>
<td>Thickness</td>
<td>30&quot;</td>
</tr>
</tbody>
</table>

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 of each 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 of this report for detailed calculations of the available containment volume. The containment capacity available = 4960.54 c.f.

9. Required Volume

Containment Capacity Required (CCR)

CCR = Volume of Largest Tank in the secondary containment

Volume of Largest Tank = 4426.27 c.f. (CT1)
or 33,108 Gal.

10. Comparison of Available Volume to Required Volume

Containment Capacity Comparison

Containment Capacity Required = 4,426.27 c.f.
Secondary Containment Volume Available = 4,960.54 c.f.
Excess Containment Volume = 534.27 c.f.

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

D. CONCLUSIONS

1. Primary Tank Vessel

The primary tank vessel at the of inspection was fit for use with the proposed waste stream at the given densities, chemical and physical characteristics as verified by USPCI. The useful life of the steel tank would be estimated at 20 years if the proposed 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 is fit for use, with the proposed 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 20 years. This useful life was determined by using a design life of 20 years less the period that the system has been in use at the USPCI Lone Mountain Facility.
E. RECOMMENDATIONS

The following repairs or modifications should be made:

1. Primary Tank

   The tank should be internally inspected periodically to insure no corrosion is occurring. The tank should be checked yearly 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 conducted to detect any visual corrosion or defects.

2. Secondary Containment

   The secondary containment should be checked periodically for any deterioration and structural integrity.

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. 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 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

[Signature]

Engineer
Title

[Stamp: Registered Professional Engineer]

[Stamp: Oklahoma 4126]
APPENDIX A

Primary Tank Volume Calculations
## SECTION 202 - APPENDIX A

CT3, Caustic Storage Tank No. 3

### PRIMARY TANK VOLUME CALCULATIONS

<table>
<thead>
<tr>
<th>DIMENSIONS:</th>
<th>CYLINDRICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometry:</td>
<td></td>
</tr>
<tr>
<td>Diameter:</td>
<td>12.72 FEET</td>
</tr>
<tr>
<td>Max Height:</td>
<td>34.00 FEET</td>
</tr>
<tr>
<td>Normal Operating Height:</td>
<td>33.00 FEET</td>
</tr>
<tr>
<td>Cone Height:</td>
<td>2.42 FEET</td>
</tr>
<tr>
<td>Bottom Cone Diameter</td>
<td>0.50 FEET</td>
</tr>
<tr>
<td>Cone Length</td>
<td>6.80 FEET</td>
</tr>
<tr>
<td>Cone Volume:</td>
<td>106.53 C.F. or 796.83 Gal.</td>
</tr>
</tbody>
</table>

### VOLUME CALCULATIONS

<table>
<thead>
<tr>
<th></th>
<th>C.F. or</th>
<th>Gal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Volume:</td>
<td>4426.27</td>
<td>33108.49</td>
</tr>
<tr>
<td>Normal Operating Volume</td>
<td>4299.22</td>
<td>32158.15</td>
</tr>
</tbody>
</table>

**MAXIMUM OPERATING TANK VOLUME =**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C.F. or</td>
<td></td>
</tr>
<tr>
<td>4426.27</td>
<td></td>
</tr>
<tr>
<td>33108.49 Gal.</td>
<td></td>
</tr>
</tbody>
</table>

### WEIGHT ON FOUNDATION

| CONTENTS S.G.: | 1.50 |
| DENSITY:       | 93.60 LB/C.F. |

### SURFACE AREA CALCULATION

<table>
<thead>
<tr>
<th></th>
<th>S.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank Top =</td>
<td>127.05</td>
</tr>
<tr>
<td>Tank Bottom Cone =</td>
<td>257.87</td>
</tr>
<tr>
<td>Tank Wall= $Cir^\text{2}h$</td>
<td>1358.54</td>
</tr>
</tbody>
</table>

**TOTAL SURFACE AREA WALL AND TOP**

<table>
<thead>
<tr>
<th></th>
<th>S.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1743.47</td>
<td></td>
</tr>
</tbody>
</table>

### Steel Thickness=

|                       | 0.25 INCHES |
| Cone                  | 0.31 INCHES |

### Volume of Steel =

|                       | C.F. |
| Sidewalls             | 28.30 |
| Top and bottom        | 10.02 |

### Density of Steel =

|                       | LB/C.F. |
| 490.00                |        |

### Weight of Steel =

|                       | TONS  |
| 9.39                  |       |

**WEIGHT OF TANK CONTENTS =**

|                       | TONS  |
| 207.15                |       |

**TOTAL WEIGHT OF TANK AND CONTENTS =**

|                       | TONS  |
| 216.54                |       |
APPENDIX B

Primary Tank Wall Thickness Calculations
SECTION 202 - APPENDIX B

CT3, Caustic Storage Tank No. 3

PRIMARY TANK WALL THICKNESS

DIMENSIONS:
Geometry: CYLINDRICAL
Diameter: 12.72 FEET
Height: 34.00 FEET
Specific Gravity: 1.50
Normal Operating Temperature = ambient

STEEL THICKNESS CALCULATIONS @ BOTTOM RING

\[
\text{Thickness (t)} = \frac{(2.6 \times H \times D \times S.G.)}{(s \times E) + CA}
\]

\[
s = \text{Allowable Design Stress} = 21000.00 \text{ PSI} \quad ***
\]

\[
E = \text{Joint Efficiency} = 85.00\%
\]

\[
\text{Thickness (t)} = 0.0945 \text{ INCHES}
\]

\[
\text{Corrosion Allowance} = 0.1250 \text{ INCHES}
\]

\[
\text{Calculated Req’ed Wall thk.} = 0.2195 \text{ INCHES}
\]

*** THIS DESIGN STRESS IS OBTAINED FROM API-650-88 WITH THE USE OF APPENDIX A.

CONE WALL THICKNESS CALCULATION

\[
\text{Cosine Alpha} = \cos(67.6594) = 0.3801
\]

\[
P1= \text{Internal Pressure} = 3263.33 \text{ psi}
\]

\[
P2= H \times \text{density} \times s.g. \times 33 \times 62.4 \times 1.5 = 3182.40 \text{ psi}
\]

\[
Tc= \text{top cone radius} = 6.36 \text{ inches}
\]

\[
Fb = \text{Allowable stress} = 23200 \text{ psi}
\]

The required wall thickness of the cone will be the greater of the following Formulas.

1. \[
Ts = P1 \times Tc / 2 \times \cos(\alpha) \times Fb = 0.098 +1/8\text{C.A.} = 0.223 \text{ in.}
\]

2. \[
Ts = P2 \times D / \cos(\alpha) \times Fb = 0.191 +1/8\text{C.A.} = 0.316 \text{ in.}
\]
APPENDIX C

Structural Support Calculations
SECTION 202 - APPENDIX C

CT3, Caustic Storage Tank No.3

STRUCTURAL SUPPORT CALCULATIONS

GIVEN:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank Diameter =</td>
<td>12.72 ft</td>
</tr>
<tr>
<td>Total Height =</td>
<td>40.00 ft</td>
</tr>
<tr>
<td>Weight of Tank =</td>
<td>18780.00 lbs</td>
</tr>
<tr>
<td>Weight of Max. Contents =</td>
<td>414300.00 lbs</td>
</tr>
<tr>
<td>Tank Nominal Thickness =</td>
<td>0.25 in</td>
</tr>
</tbody>
</table>

---SEISMIC DESIGN CHECK---

ZONE COEFFICIENT ($Z$): 0.1675

ESSENTIAL FACILITIES FACTOR ($f$): 1.000

LATERNAL EARTHQUAKE FORCE COEFF. ($C_1$): 0.240

$D/H$: 0.267

$k$ factor: 0.590

SITE AMPLIFICATION FACTOR ($S$): 1.500

NATURAL PERIOD OF FIRST SLOSHING ($T$): 2.104

LATERNAL EARTHQUAKE FORCE COEFF. ($C_2$): 0.214

WEIGHT OF TANK SHELL (W): 18780.000 LBS

TOTAL WEIGHT OF TANK CONTENTS W: 414300.000 LBS

$W_1/W$: 0.950

$W_2/W$: 0.050

WEIGHT OF EFFECTIVE MASS OF CONTENTS THAT MOVES IN UNISON WITH THE TANK SHELL ($W_1$): 363585.000 LBS

WEIGHT OF EFFECTIVE MASS IN FIRST SLOSHING ($W_2$): 20715.000 LBS

HT FROM BTM OF SHELL TO CENT. OF SHELL ($X_0$): 20.000 FEET

$X_1/H$: 0.500

HT FROM BTM TO CENT. OF LAT. SEISMIC FORCE ($X_1$): 20.000 FEET

$X_2/H$: 0.900

HT FROM BTM TO CENT. OF LAT. SEISMIC FORCE ($X_2$): 36.000 FEET
Note: All of the above calculations are based on API-650-88 Seismic Design Procedure (Appendix E).

CHECK STRESS IN TANK SHELL FROM SEISMIC FORCES:

Wt = MAXIMUM WEIGHT OF TANK CONTENTS THAT MAY BE USED TO RESIST THE SHELL OVERTURNING MOMENT

Wt = 7.9*tb*(Fby*G^H)^.5

tb = THK. OF BTM. PLATE UNDER SHELL: 0.250 IN

Fby = MINIMUM YIELD STRENGTH OF BOTTOM PLATE: 9000.00 PSI

G = DESIGN SPECIFIC GRAV. OF LIQUID: 1.50

Wt = 1451.32 LBS/FT OF SHELL CIRCUMFERENCE

DENSITY OF TANK SHELL MATERIAL:

490.00 LBS/CF

WT = WEIGHT OF TANK SHELL AND THE PORTION OF FIXED ROOF SUPPORTED BY TANK SHELL:

408.33 LBS/FT OF SHELL CIRCUMFERENCE

M/(D^2(WT+Wt)):

1.3328

b = MAXIMUM LONGITUDINAL COMPRESSION FORCE AT THE BTM. OF TANK SHELL

b = WT + 1.273*M/D^2

b: 3553.57 LBS/FT OF SHELL

G*H*D^2*T^2:

155236.46

Fe = MINIMUM OF 10*6*G or Fy/2:

4500.00 PSI

Fy = MINIMUM YIELD STRENGTH OF BTM. PLATE:

9000.00 PSI

MAX. LONGITUDINAL COMPRESSION STRESS IN THE TANK SHELL = b/12t = 1187.86 PSI
CHECK OVERTURNING MOMENT FROM WIND PRESSURE

M must be Less Than or Equal To \(0.66 \times (WD)/2\)
If M is Greater Than \(0.66 \times (WD)/2\) Anchor Bolts
Would Be Required

Where:

\(W\) = Shell Weight Available To Resist Uplift (lb)
\(D\) = Tank Diameter (feet)
\(M\) = Overturing Moment
\(M = P_w \times \text{Projected Area} \times H_1\)

\(H_1\) = Height from ground to centroid of tank shell

\(P_w\) = Wind Pressure (18 psf for 100 MPH Wind on cylinders)

\[0.66 \times (WD)/2: \quad 78830.93 \text{ FT-LBS}\]

\(M: \quad 183168.00 \text{ FT-LBS}\)

\(M > 0.66 \times (WD)/2\) therefore anchor bolts are required

Number of Anchors: 12.00

Anchor Diameter: 1.25 inches

Dia. of Anchor Circle: 13.05 feet

\(t_B = \text{design tension load per anchor}\)

\(t_B: \quad 3113.62 \text{ pounds}\)

Allowable Load/Anchor: 24543.69 pounds
APPENDIX D

Containment Area Volume Calculations
SECTION 202 - APPENDIX D

CT3, Caustic Storage Tank No.3

CONTAINMENT AREA No.8A VOLUME CALCULATIONS (CAUSTIC AREA)

Length = 70.70 feet
Width = 35.50 feet
Height = 2.62 feet
Surface Area = 2509.85 S.F.

Gross Volume = 

Volumes of items of Displacement **

1. Steel skirting = 

Total volume to deduct for items in containment area = 

Subtraction for volume of rainfall

Volume of rain = Area x depth of rainfall
Depth of rainfall = 6.15 in.
Area = 2509.85 S.F.
Volume = 1286.30 C.F.

TOTAL AVAILABLE VOLUME = Gross Volume - Subtractions =

Items of displacement
Volume of rainfall

TOTAL AVAILABLE VOLUME Area 8A

CONTAINMENT AREA No.8c VOLUME CALCULATIONS (TRUCK PAD)

This area will collect rain and deposit it into the caustic containment area (8a) when the valve is opened. This area does not contribute any volume for containment.

Length = 52.00 feet
Width = 12.00 feet
Surface Area = 624.00 S.F.

Subtraction for volume of rainfall

Volume of rain = Area x depth of rainfall
Depth of rainfall = 6.15 in.
Area = 624.00 S.F.
Volume = 318.80 C.F.
SUMMARY OF SECONDARY CONTAINMENT DATA

Surface Areas:

<table>
<thead>
<tr>
<th>Area</th>
<th>Square Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caustic Area 8A</td>
<td>2509.85</td>
</tr>
<tr>
<td>Truck Unloading Pad 8C</td>
<td>624.00</td>
</tr>
</tbody>
</table>

Gross Volumes:

<table>
<thead>
<tr>
<th>Area</th>
<th>Cubic Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caustic Area 8A</td>
<td>6575.81</td>
</tr>
<tr>
<td>Truck Unloading Pad 8C</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Volume of displacements:

<table>
<thead>
<tr>
<th>Area</th>
<th>Cubic Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caustic Area 8A</td>
<td>9.17</td>
</tr>
<tr>
<td>Truck Unloading Pad 8C</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Volume for 24hr rain:

<table>
<thead>
<tr>
<th>Area</th>
<th>Cubic Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caustic Area 8A</td>
<td>1286.30</td>
</tr>
<tr>
<td>Truck Unloading Pad 8C</td>
<td>319.80</td>
</tr>
</tbody>
</table>

Total Gross Volume 8A =
Total Displacement Volumes =
Total Volume of Rain =

<table>
<thead>
<tr>
<th>Volume</th>
<th>Cubic Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Gross Volume 8A</td>
<td>6575.81</td>
</tr>
<tr>
<td>Total Displacement Volumes</td>
<td>9.17</td>
</tr>
<tr>
<td>Total Volume of Rain</td>
<td>1606.10</td>
</tr>
</tbody>
</table>

Containment Capacity Available (CCA) =

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Containment Capacity Available</td>
<td>4960.54 C.F.</td>
</tr>
<tr>
<td>or</td>
<td>37104.83 GAL</td>
</tr>
</tbody>
</table>
APPENDIX E

Foundation Design Analysis
SECTION 202 - APPENDIX E
CT3, Caustic Storage Tank No.3

FOUNDATION DESIGN ANALYSIS

ASSUMPTIONS:

\[ f_c = \quad 4.00 \text{ KSI} \]
\[ f_y = \quad 60.00 \text{ KSI} \]
Allowable Soil Press. = 2.20 KSI
Structural Steel = A36

GIVEN:
Tank Diameter = 12.72 feet
Sidewall Height = 40.00 feet
Weight of Tank (Shell) = 18790.00 lbs
Weight of Max. Contents = 414300.00 lbs

Tank is resting on a concrete foundation.

CHECK CONCRETE FOUNDATION DESIGN:

Assume Footing Depth = 30.00 inches
Assume Footing Width = 30.00 inches
Assumed Effective Soil Press. = 1925.00 psf

Look at what is resisting overturning moment from seismic load:

\[ b = \quad 3563.57 \text{ lb/ft of circ.} \]

Where \( b \) is the maximum shell compression at the bottom of the shell.

If the footing is then the actual applied pressure to the subgrade is

This is less than the effective soil pressure.
APPENDIX F

MANUFACTURERS DATA, MILL TEST REPORTS, RADIOGRAPHIC REPORTS
CERTIFICATION TO OWNER OF COMPLIANCE WITH API 650-88

To: USPCi LONE MOUNTAIN FACILITY
   WAYNOKA, OKLAHOMA

To Whom It May Concern:

Scott Manufacturing, Inc. hereby certifies that the tank(s) constructed for you at SCOTT MANUFACTURING, INC. WOLFFORTH, TEXAS and described as follows: (4) 12/75' diameter by 40' shell height Caustic Storage Tanks, Serial Numbers 451-1, 2, 3, & 4

has/have been designed, fabricated, erected, and inspected in accordance with all of the requirements of the American Petroleum Institute Standard 650-88 entitled, "Welded Steel Tanks for Oil Storage" and that the results of all such inspections, radiographs, and other tests indicate that the tank(s) fully complies/comply with all of the requirements. We further certify that all materials meet specifications.

SCOTT MANUFACTURING, INC.

By: William A. Beasom
MANAGER/HEAVY CONSTRUCTION
Title
23 OCTOBER 1992
Date

CITY OF LUBBOCK
STATE OF TEXAS

Acknowledged and sworn to before me this 23rd day of October, 1992.

Notary Public
USPC 1, WAYNOKA, OK

12.72' x 40' (pole)

\[ T_0 = \frac{8}{2 \cos \theta} \left( \frac{D}{2} \right) (X + \frac{D}{2} \cot \theta) \]
\[ = \frac{8}{2 \cos \theta} \left( \frac{12.72}{2} \right) (12.72 + \frac{12.72}{2} \cot 62.659\degree) \]
\[ = 12.72 \times 12.72 \times 33.87/2 \]
\[ = 24.523 \text{ lb/ft } \div 12 \]
\[ = 2.042 \text{ lb/in } \div 23.200 \text{ lb/in}^2 \]
\[ = 0.09527 + 0.125 \]
\[ = 0.2203 \text{ in } \装入 \frac{1}{4} \text{ in } \]

\[ T_1 = \frac{8DX}{2 \cos \theta} \frac{12x(15)}{62.659\degree} (12.72)^{3/2} \]
\[ = 11.682 \text{ lb/ft } \div 12 \]
\[ = 0.9306 \text{ lb/in } \div 23.200 \text{ lb/in}^2 \]
\[ = 0.03166 + 0.125 \]
\[ = 0.3106 \text{ in } \装入 \frac{5}{16} \text{ in } \]

\[ C = \frac{8}{8} \left( X + \frac{D}{2} \cot \theta \right) D^2 \tan \theta \]
\[ = \frac{8}{8} \left( 33 + \frac{12.72}{2} \cot 62.659\degree \right) (12.72)^2 \tan 62.659\degree \]
\[ = 11.70 \times 33.87/2 \times 33 \times 7.04 \]
\[ = 1562.175 \text{ lb } \div 23.200 \text{ lb/in}^2 \]
\[ = 67.252 \text{ in}^2 \]

\[ A_{eff} = 0.78 \left( \frac{R_{top} + R_{tip} + \sqrt{R_{top} \times R_{tip}}}{R_{top} + R_{tip}} \right) \]
\[ = 0.78 \left( \frac{1.25 \times 1.375 \times 2.5 + 3.25 \times 1.375}{1.25 + 3.25} \right) \]
\[ = 1.051 \text{ in}^2 \left( 0.8131 \text{ in}^2 \right) \]
\( A_{\text{eff}}(\text{max}) = \frac{1}{16} (t_1^2 + t_2^2 + t_3^2) \)
\[ = \frac{1}{16} (1.25^2 + 3.75^2 + 0.25^2) \]
\[ = \frac{3.5625 + 14.0625 + 0.0625}{2.5625} \]
\[ = \frac{17.6875}{2.5625} \]
\[ = 6.9027 \text{ } \text{i}^2 \]
\[ \text{max} \text{ } 1.05927 \text{ } \text{i}^2 \]
\[ (6.7252 - 0.8131) = 5.9121 \text{ } \text{i}^2 \]

\[ 6.7252^2 - 1.05927 = 5.666 \text{ } \text{i}^2 \]

\[ (6.7252 - 0.8131) = 5.9121 \text{ } \text{i}^2 \]
USPC1, WAYNOH, OK
12.75' x 40' (original) Contents: Caustic Liquid - SAP - 1.5 API - 650
Corrosion Allowance - 1/8" Thickness by 1 Foot Method

\[
\frac{2.5 \times (12.75)(40-1.5)}{2300} + 0.125 = 0.2086" \text{ in. ft.}
\]

Louie D. Wood, Jr.
STATE OF TEXAS
PROFESSIONAL ENGINEER
60815
10/14/92
SUNBELT TRADING COMPANY, Inc.

TO: Scott 1779

ATTN: Wayne

REF:

CUSTOMER'S P.O. NO. 27158
S.T.C.'s RELEASE NO. 2994
S.T.C.'s INVOICE NO. 010435

ATTACHED PLEASE FIND MILL TEST CERTIFICATES FOR YOUR ABOVE REFERENCED PURCHASE ORDER FOR THE FOLLOWING MATERIAL.

See Below

THANKS AND REGARDS,

Stacey
STACEY GESSELT

enclosure

20 pcs. 1/4 X 96 X 480 A-36 Plate
4 pcs. 1/4 X 96 X 240 A-36 Plate
6 pcs. 5/16 X 96 X 240 A-36 Plate
4 pcs. 1/4 X 96 X 240 Floor Plate

NEW ADDRESS
1990 POST OAK BLVD., SUITE 1550
HOUSTON, TX 77056-3813

2000 Post Oak Blvd.  Suite 1867  Houston, Texas 77055
Tel. (713) 840-0550  TLX - 790313 - FAX (713) 840-8727
### Identification du Produit

<table>
<thead>
<tr>
<th>Réf. R0</th>
<th>Code ref.</th>
<th>Section</th>
<th>Dimension</th>
<th>Matériau</th>
<th>Type</th>
<th>Essai</th>
<th>Re</th>
<th>E</th>
<th>A</th>
<th>Test</th>
<th>Type</th>
<th>T°</th>
<th>Peak</th>
<th>Valeurs Propres</th>
<th>Vales Propres</th>
<th>Hb %</th>
<th>Note</th>
<th>Méthode</th>
<th>Méthode</th>
</tr>
</thead>
<tbody>
<tr>
<td>292080</td>
<td>34</td>
<td>3/5/16</td>
<td>96 x 240</td>
<td>(kg)</td>
<td>T</td>
<td>308</td>
<td>410</td>
<td>27,0</td>
<td>284</td>
<td>436</td>
<td>27,0</td>
<td>T</td>
<td>310</td>
<td>415</td>
<td>31,0</td>
<td>290</td>
<td>433</td>
<td>30,0</td>
<td>T</td>
</tr>
<tr>
<td>292085</td>
<td>35</td>
<td>3/4/8</td>
<td>96 x 240</td>
<td>(kg)</td>
<td>T</td>
<td>308</td>
<td>410</td>
<td>27,0</td>
<td>284</td>
<td>436</td>
<td>27,0</td>
<td>T</td>
<td>310</td>
<td>415</td>
<td>31,0</td>
<td>290</td>
<td>433</td>
<td>30,0</td>
<td>T</td>
</tr>
<tr>
<td>292084</td>
<td>35</td>
<td>3/4/8</td>
<td>96 x 240</td>
<td>(kg)</td>
<td>T</td>
<td>308</td>
<td>410</td>
<td>27,0</td>
<td>284</td>
<td>436</td>
<td>27,0</td>
<td>T</td>
<td>310</td>
<td>415</td>
<td>31,0</td>
<td>290</td>
<td>433</td>
<td>30,0</td>
<td>T</td>
</tr>
<tr>
<td>292083</td>
<td>36</td>
<td>3/4/8</td>
<td>96 x 240</td>
<td>(kg)</td>
<td>T</td>
<td>308</td>
<td>410</td>
<td>27,0</td>
<td>284</td>
<td>436</td>
<td>27,0</td>
<td>T</td>
<td>310</td>
<td>415</td>
<td>31,0</td>
<td>290</td>
<td>433</td>
<td>30,0</td>
<td>T</td>
</tr>
</tbody>
</table>

**Service Métallurgique**

CLAQUEC, le 10/07/92

Les résultats de tests sont corrects et conformes à la norme applicable. Les essais ont été réalisés dans les conditions normales de température et de humidité. Les spécifications des essais sont conformes à la norme applicable. Les résultats des tests sont présentés dans le tableau suivant.
<table>
<thead>
<tr>
<th><strong>Sample No.</strong></th>
<th><strong>Material</strong></th>
<th><strong>Tension Test</strong></th>
<th><strong>Density (g/cm³)</strong></th>
<th><strong>Density (g/cm³)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>292097</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>292098</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>292099</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>292100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- T: Tension
- D: Density
- (N/mm²): Stress
- (%) : Percentage

**Service Metallurgique:**

CLABLEQ, 13/07/92

---

**Identification du Projet:**
- Location: USA-Houston-Texas
- Project No.: 7704-3842 (USA)

**Identification du Mât:**
- Manufacturer: SUNDELL TRADING COMPANY INC.
- Location: 1990 Post Oak Blvd., #1550
- Houston, Texas 77024-3842 (U.S.A.)

**Identification du Mât:**
- Manufacturer: SUNDELL TRADING COMPANY INC.
- Location: 1990 Post Oak Blvd., #1550
- Houston, Texas 77024-3842 (U.S.A.)

**Identification du Mât:**
- Manufacturer: SUNDELL TRADING COMPANY INC.
- Location: 1990 Post Oak Blvd., #1550
- Houston, Texas 77024-3842 (U.S.A.)

**Identification du Mât:**
- Manufacturer: SUNDELL TRADING COMPANY INC.
- Location: 1990 Post Oak Blvd., #1550
- Houston, Texas 77024-3842 (U.S.A.)

---

**Certificate Information:**
- Project No.: 7704-3842 (USA)
- Manufacturer: SUNDELL TRADING COMPANY INC.
- Location: 1990 Post Oak Blvd., #1550
- Houston, Texas 77024-3842 (U.S.A.)
<table>
<thead>
<tr>
<th>Identification du produit</th>
<th>Traction - frottement / Test de résilience</th>
<th>Mettalicité</th>
<th>Service métallurgique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re</td>
<td>Rm</td>
<td>A2</td>
<td>(kg)</td>
</tr>
<tr>
<td>290634</td>
<td>2</td>
<td>2</td>
<td>1/4</td>
</tr>
<tr>
<td>290635</td>
<td>2</td>
<td>2</td>
<td>1/4</td>
</tr>
<tr>
<td>290638</td>
<td>2</td>
<td>2</td>
<td>1/4</td>
</tr>
<tr>
<td>289231</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Identification du produit</th>
<th>Vérification normes</th>
<th>Utilisation</th>
<th>Service métallurgique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re</td>
<td>Rm</td>
<td>A2</td>
<td>(kg)</td>
</tr>
<tr>
<td>290634</td>
<td>2</td>
<td>2</td>
<td>1/4</td>
</tr>
<tr>
<td>290635</td>
<td>2</td>
<td>2</td>
<td>1/4</td>
</tr>
<tr>
<td>290638</td>
<td>2</td>
<td>2</td>
<td>1/4</td>
</tr>
<tr>
<td>289231</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
STRUCTURAL MATERIAL TEST REPORT

O'NEAL STEEL, INC.
P.O. BOX 98

DREMBURGH
AL. 35201

O'NEAL STEEL INC
2834 CLOVIS RD

LUBNOCK
TX 79357

ORDER PURCHASE ORDER NUMBER
01616

DATE
10-JUN-92

QUANTITY
4.68

DESCRIPTION
W 4X13#

LENGTH
40.01

TED ACCORDING TO
TM A6-90A

SIZE
W 4X13#

GRADE
A36/A57250

PRODUCT
W F BEAMS

HEAT
0-9769

CHEMICAL ANALYSIS

Mn   P    S    Si   Cu   Ni   Cr   Mo   V   Nb
0.12 0.07 0.014 0.050 0.26 0.57 0.14 0.06 0.028 0.000 0.009

PHYSICAL PROPERTIES

YIELD TENSILE STRENGTH SPECIMEN ELONGATION FATTNESS
STRENGTH AREA LENGTH
20.5 77.7 3.727 43.5 2" 0.5D PASS
68.4 80.0 3.727 39.0 2" 0.5D PASS

hereby certify that the contents of this report are correct and accurate. All test results and operations performed by this manufacturer are in compliance with the requirements of the material specification, and when designated by the purchaser meet specific applicable material requirements of section III of the A.S.M.E. Boiler and Pressure Vessel Code.

Tom L Harrington - Quality Assurance Manager

[Signature]

Harrington + Quality Assurance Manager

[Stamp]

[Stamp]

[Stamp]

NOTARIZED (ON REQUEST ONLY)

O'NEAL STEEL INC.
P.O. BOX 5495

LUBNOCK
TX 79417

REMARKS

[Signature]

[Signature]

[Signature]

[Signature]

NOTARY PUBLIC

[Stamp]

[Stamp]

[Stamp]

[Stamp]

ALL MANUFACTURING PROCESSES OF THE STEEL MATERIALS IN THIS PRODUCT, INCLUDING MELTING, HAVE OCCURRED WITHIN THE UNITED STATES IN COMPLIANCE WITH THE "BUY AMERICA" PROVISION OF THE SURFACE TRANSPORTATION ASSISTANCE ACT OF 1982.
<table>
<thead>
<tr>
<th>CUSTOMER ORDER NO.</th>
<th>DESCRIPTION</th>
<th>HEAT NUMBER</th>
<th>YIELD STRENGTH</th>
<th>TENSILE STRENGTH</th>
<th>VACUUM</th>
<th>RING TEST</th>
<th>CHEMICAL ANALYSIS (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5605 2-1725</td>
<td>FLATS, 0.3750&quot; X 2.0000&quot; A36-90</td>
<td>49690</td>
<td>52.0</td>
<td>73.3</td>
<td>30.0</td>
<td>16</td>
<td>C 0.16 P 0.015 S 0.016 Si 0.16 Cu 0.27 Ni Cr Mo V Cb</td>
</tr>
</tbody>
</table>

I CERTIFY THE ABOVE RESULTS OF TESTS AND/OR ANALYSES TO BE CORRECT AS CONTENTED IN THE RECORDS OF ATLANTIC STEEL COMPANY.

/Signature/
<table>
<thead>
<tr>
<th>SIZE</th>
<th>GRADE</th>
<th>SPECIFICATION</th>
<th>S.O. NO.</th>
<th>CUST. P.O. NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 3/8 x 5 4/8</td>
<td>A36</td>
<td>ASTM A36-91</td>
<td>2813173</td>
<td>7-17424</td>
</tr>
<tr>
<td>2 3/4 x 5 4/8</td>
<td>A36</td>
<td>ASTM A36-91</td>
<td>2813173</td>
<td>7-17424</td>
</tr>
<tr>
<td>3 3/8 x 1/4</td>
<td>A36</td>
<td>ASTM A36-91</td>
<td>2813173</td>
<td>7-17424</td>
</tr>
<tr>
<td>3 3/8 x 1/4</td>
<td>A36</td>
<td>ASTM A36-91</td>
<td>2813173</td>
<td>7-17424</td>
</tr>
<tr>
<td>1 1/2 x 1/2 x 3/16</td>
<td>A36</td>
<td>ASTM A36-91</td>
<td>2813173</td>
<td>7-17424</td>
</tr>
<tr>
<td>1 1/2 x 1/2 x 3/16</td>
<td>A36</td>
<td>ASTM A36-91</td>
<td>2813173</td>
<td>7-17424</td>
</tr>
<tr>
<td>2 3/8 x 3/8</td>
<td>A36</td>
<td>ASTM A36-91</td>
<td>2813173</td>
<td>7-17424</td>
</tr>
<tr>
<td>2 3/8 x 3/8</td>
<td>A36</td>
<td>ASTM A36-91</td>
<td>2813173</td>
<td>7-17424</td>
</tr>
<tr>
<td>3 3/8 x 3/16</td>
<td>A36</td>
<td>ASTM A36-91</td>
<td>2813173</td>
<td>7-17424</td>
</tr>
<tr>
<td>3 3/8 x 3/16</td>
<td>A36</td>
<td>ASTM A36-91</td>
<td>2813173</td>
<td>7-17424</td>
</tr>
</tbody>
</table>

**THIS MATERIAL, INCLUDING THE BILLETS, WAS PRODUCED AND MANUFACTURED IN THE UNITED STATES OF AMERICA.**

A. J. TURNER

QUALITY ASSURANCE MGR.

HILL GROUP
<table>
<thead>
<tr>
<th>SIZE</th>
<th>GRADE</th>
<th>SPECIFICATION</th>
<th>S.O. NO.</th>
<th>CUST. P.O. NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>AL</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
<tr>
<td>2-2764</td>
<td>12.15</td>
<td>1.70</td>
<td>01.04</td>
<td>ASME-SA36</td>
</tr>
</tbody>
</table>
## CERTIFIED TEST REPORT

The following tests conform to the requirements of the specifications listed.

**QUALITY CONTROL MANAGER**

DAN SCHACHT  B/ 7/92

<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>SECTION</th>
<th>SPECIFICATION</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cu</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>Cb</th>
<th>V</th>
<th>Al</th>
</tr>
</thead>
<tbody>
<tr>
<td>01391</td>
<td>AU 2.5X2X1/4</td>
<td>ASTM A36-B9</td>
<td>.15</td>
<td>.087</td>
<td>.024</td>
<td>.036</td>
<td>.16</td>
<td>.43</td>
<td>.24</td>
<td>.17</td>
<td>.039</td>
<td>.000</td>
<td>.040</td>
<td>.003</td>
</tr>
<tr>
<td>B7196</td>
<td>CH 6X10.5</td>
<td>ASTM A36-B9</td>
<td>.17</td>
<td>.068</td>
<td>.009</td>
<td>.031</td>
<td>.26</td>
<td>.37</td>
<td>.23</td>
<td>.23</td>
<td>.049</td>
<td>.004</td>
<td>.020</td>
<td>.001</td>
</tr>
<tr>
<td>B9624</td>
<td>SD 3/4</td>
<td>ASTM A36-B9</td>
<td>.16</td>
<td>.082</td>
<td>.009</td>
<td>.033</td>
<td>.17</td>
<td>.50</td>
<td>.11</td>
<td>.23</td>
<td>.053</td>
<td>.000</td>
<td>.020</td>
<td>.001</td>
</tr>
<tr>
<td>B9625</td>
<td>SD 3/4</td>
<td>ASTM A36-B9</td>
<td>.15</td>
<td>.076</td>
<td>.006</td>
<td>.028</td>
<td>.19</td>
<td>.46</td>
<td>.10</td>
<td>.22</td>
<td>.054</td>
<td>.000</td>
<td>.020</td>
<td>.001</td>
</tr>
<tr>
<td>B7196</td>
<td>CH 6X10.5</td>
<td>ASTM A36-B9</td>
<td>.17</td>
<td>.068</td>
<td>.009</td>
<td>.031</td>
<td>.26</td>
<td>.37</td>
<td>.23</td>
<td>.23</td>
<td>.049</td>
<td>.004</td>
<td>.020</td>
<td>.001</td>
</tr>
<tr>
<td>01476</td>
<td>#8 REBAR</td>
<td>ASTM A615-B9 GRADE 60</td>
<td>.42</td>
<td>.097</td>
<td>.008</td>
<td>.032</td>
<td>.23</td>
<td>.42</td>
<td>.08</td>
<td>.17</td>
<td>.041</td>
<td>.013</td>
<td>.020</td>
<td>.002</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>TENSILE PSI</th>
<th>%elong IN 8&quot;</th>
<th>BEND</th>
<th>LB/FT</th>
<th>DATE ROLLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>01391</td>
<td>52100</td>
<td>30.0</td>
<td>3.570</td>
<td>06/25/92</td>
<td></td>
</tr>
<tr>
<td>B7196</td>
<td>51800</td>
<td>39.0</td>
<td>10.400</td>
<td>08/28/91</td>
<td></td>
</tr>
<tr>
<td>B9624</td>
<td>51500</td>
<td>22.0</td>
<td>1.900</td>
<td>01/10/92</td>
<td></td>
</tr>
<tr>
<td>B9625</td>
<td>51500</td>
<td>22.0</td>
<td>1.900</td>
<td>01/10/92</td>
<td></td>
</tr>
<tr>
<td>B7196</td>
<td>51800</td>
<td>39.0</td>
<td>10.400</td>
<td>08/28/91</td>
<td></td>
</tr>
<tr>
<td>01476</td>
<td>69000</td>
<td>12.0</td>
<td>2.600</td>
<td>06/26/92</td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS:**

F.O. Z-16717; Z-19477; Z-19076; Z-57945 & BZ-42393

THIS STEEL IS MELTED & MANUFACTURED IN THE USA
<table>
<thead>
<tr>
<th>INVOICE NUMBER</th>
<th>CUSTOMER ORDER NO.</th>
<th>DESCRIPTION</th>
<th>HEAT NUMBER</th>
<th>YIELD STRENGTH KSI</th>
<th>TENSILE STRENGTH KSI</th>
<th>ELONGATION %</th>
<th>BEND TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>336447</td>
<td>Z-075</td>
<td>FLATS, 0.250&quot;X 4.0000&quot; 55 KSI 20'00&quot;, 5000% STACKED BUNDLE</td>
<td>45832</td>
<td>65.6</td>
<td>87.6</td>
<td>28.0</td>
<td>.20</td>
</tr>
</tbody>
</table>

MATERIAL MELTED AND MANUFACTURED IN THE USA

I CERTIFY THE ABOVE RESULTS OF TEST AND/OR ANALYSES TO BE CORRECT AS CONTAINED IN THE RECORDS OF ATLANTIC STEEL COMPANY.
<table>
<thead>
<tr>
<th>HEAT NO.*</th>
<th>DESCRIPTION</th>
<th>PHYSICAL TESTS</th>
<th>CHEMICAL TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>559213668</td>
<td>1/4&quot;x3&quot; F1 20' (A36)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASTM A36</td>
<td>YIELD P.S.I.</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50,500</td>
<td>-4.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TENSILE P.S.I.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ELONG</td>
<td>25.0</td>
</tr>
<tr>
<td>559213692</td>
<td>1/4&quot;x4&quot; F1 20' (A36)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASTM A36</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>YIELD P.S.I.</td>
<td>-4.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TENSILE P.S.I.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ELONG</td>
<td>28.0</td>
</tr>
<tr>
<td>559310572</td>
<td>1/2&quot;x2&quot; F1 20' (A36)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASTM A36-91</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>YIELD P.S.I.</td>
<td>-2.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TENSILE P.S.I.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ELONG</td>
<td>31.0</td>
</tr>
<tr>
<td>559310573</td>
<td>1/2&quot;x3&quot; F1 20' (A36)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASTM A36-91</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>YIELD P.S.I.</td>
<td>-2.8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TENSILE P.S.I.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ELONG</td>
<td>33.0</td>
</tr>
<tr>
<td>HEAT NO.</td>
<td>DESCRIPTION</td>
<td>YIELD</td>
<td>TEMPER</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------</td>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>849215924</td>
<td>1/4&quot;x2&quot; F1 200 (A36)</td>
<td>44,400</td>
<td>65,400</td>
</tr>
<tr>
<td></td>
<td>ASTM A36-90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>849310382</td>
<td>3/4&quot; Rd 200 (A36)</td>
<td>56,682</td>
<td>74,630</td>
</tr>
<tr>
<td>VOLUME</td>
<td>CUSTOMER ORDER NO.</td>
<td>DESCRIPTION</td>
<td>HEAT NUMBER</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>30167</td>
<td>Z-0270</td>
<td>FLATS, 0.7500&quot; X 4.0000&quot; 55 KSI</td>
<td>001</td>
</tr>
</tbody>
</table>

**MATERIAL MELTED AND MANUFACTURED IN THE USA**
<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>SECTION</th>
<th>SPECIFICATION</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cu</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>Cb</th>
<th>V</th>
<th>Al</th>
</tr>
</thead>
<tbody>
<tr>
<td>1780</td>
<td>AE 2.5X1/4</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>.076</td>
<td>.008</td>
<td>.034</td>
<td>.24</td>
<td>.46</td>
<td>.12</td>
<td>.017</td>
<td>.037</td>
<td>.000</td>
<td>.002</td>
<td>.000</td>
</tr>
<tr>
<td>1202</td>
<td>AE 2X3/8</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>.076</td>
<td>.008</td>
<td>.034</td>
<td>.24</td>
<td>.46</td>
<td>.12</td>
<td>.017</td>
<td>.037</td>
<td>.000</td>
<td>.002</td>
<td>.000</td>
</tr>
<tr>
<td>1243</td>
<td>FL 3/4X6</td>
<td>A36 MODIFIED</td>
<td>.21</td>
<td>.083</td>
<td>.008</td>
<td>.029</td>
<td>.25</td>
<td>.38</td>
<td>.19</td>
<td>.017</td>
<td>.052</td>
<td>.000</td>
<td>.001</td>
<td>.000</td>
</tr>
<tr>
<td>7094</td>
<td>FL 3/4X6</td>
<td>A36 MODIFIED</td>
<td>.21</td>
<td>.083</td>
<td>.008</td>
<td>.029</td>
<td>.25</td>
<td>.38</td>
<td>.19</td>
<td>.017</td>
<td>.052</td>
<td>.000</td>
<td>.001</td>
<td>.000</td>
</tr>
<tr>
<td>3175</td>
<td>AE 2X1/4</td>
<td>ASTM A36-89</td>
<td>.13</td>
<td>.087</td>
<td>.012</td>
<td>.029</td>
<td>.26</td>
<td>.60</td>
<td>.18</td>
<td>.018</td>
<td>.051</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>3176</td>
<td>AE 2X1/4</td>
<td>ASTM A36-89</td>
<td>.14</td>
<td>.080</td>
<td>.008</td>
<td>.029</td>
<td>.26</td>
<td>.60</td>
<td>.18</td>
<td>.018</td>
<td>.051</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>7105</td>
<td>FL 3/4X5</td>
<td>A36 MODIFIED</td>
<td>.12</td>
<td>.080</td>
<td>.008</td>
<td>.029</td>
<td>.26</td>
<td>.60</td>
<td>.18</td>
<td>.018</td>
<td>.051</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>Test No.</th>
<th>YIELD PSI</th>
<th>TENSILE PSI</th>
<th>%ELONG IN 8”</th>
<th>SEND</th>
<th>LEFT</th>
<th>DATE ROLLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>8780</td>
<td>1</td>
<td>52900</td>
<td>73100</td>
<td>31.0</td>
<td>4.045</td>
<td>11/16/91</td>
<td></td>
</tr>
<tr>
<td>8202</td>
<td>1</td>
<td>51400</td>
<td>75000</td>
<td>30.0</td>
<td>4.560</td>
<td>10/19/91</td>
<td></td>
</tr>
<tr>
<td>5243</td>
<td>1</td>
<td>52200</td>
<td>79400</td>
<td>25.0</td>
<td>15.150</td>
<td>04/27/91</td>
<td></td>
</tr>
<tr>
<td>7094</td>
<td>1</td>
<td>51200</td>
<td>80000</td>
<td>25.0</td>
<td>15.200</td>
<td>08/18/91</td>
<td></td>
</tr>
<tr>
<td>8175</td>
<td>1</td>
<td>45800</td>
<td>72900</td>
<td>32.0</td>
<td>3.150</td>
<td>10/20/91</td>
<td></td>
</tr>
<tr>
<td>6176</td>
<td>1</td>
<td>51200</td>
<td>72700</td>
<td>30.0</td>
<td>3.140</td>
<td>10/20/91</td>
<td></td>
</tr>
<tr>
<td>7105</td>
<td>1</td>
<td>54400</td>
<td>81300</td>
<td>26.0</td>
<td>12.590</td>
<td>08/20/91</td>
<td></td>
</tr>
</tbody>
</table>

Remarks: This steel is melted & manufactured in the USA.
<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>SECTION</th>
<th>SPECIFICATION</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cu</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>Cb</th>
<th>V</th>
<th>Al</th>
</tr>
</thead>
<tbody>
<tr>
<td>89511</td>
<td>AU 2X1.5X3/16</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>.77</td>
<td>.011</td>
<td>.033</td>
<td>.18</td>
<td>.33</td>
<td>.011</td>
<td>.015</td>
<td>.036</td>
<td>.000</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>K1017</td>
<td>AE 2X1/8</td>
<td>ASTM A36-89</td>
<td>.16</td>
<td>.69</td>
<td>.020</td>
<td>.036</td>
<td>.22</td>
<td>.33</td>
<td>.013</td>
<td>.009</td>
<td>.010</td>
<td>.004</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>K1056</td>
<td>AE 2X1/8</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>.66</td>
<td>.019</td>
<td>.037</td>
<td>.24</td>
<td>.34</td>
<td>.012</td>
<td>.011</td>
<td>.020</td>
<td>.003</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>00202</td>
<td>AE 2X3/8</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>.65</td>
<td>.008</td>
<td>.029</td>
<td>.25</td>
<td>.30</td>
<td>.019</td>
<td>.017</td>
<td>.052</td>
<td>.000</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>00195</td>
<td>AE 2.5X3/8</td>
<td>ASTM A36-89</td>
<td>.18</td>
<td>.71</td>
<td>.008</td>
<td>.033</td>
<td>.21</td>
<td>.51</td>
<td>.006</td>
<td>.014</td>
<td>.032</td>
<td>.000</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>00222</td>
<td>AE 2.5X1/4</td>
<td>ASTM A36-89</td>
<td>.19</td>
<td>.73</td>
<td>.007</td>
<td>.026</td>
<td>.23</td>
<td>.52</td>
<td>.012</td>
<td>.014</td>
<td>.046</td>
<td>.001</td>
<td>.002</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>TEST NO.</th>
<th>YIELD PSI</th>
<th>TENSILE PSI</th>
<th>%ELONG IN 8&quot;</th>
<th>BEND</th>
<th>LB/FT</th>
<th>DATE ROLLED MM-DD-YY</th>
</tr>
</thead>
<tbody>
<tr>
<td>89511</td>
<td>1</td>
<td>47800</td>
<td>71200</td>
<td>27.0</td>
<td>2.060</td>
<td>01/02/92</td>
<td></td>
</tr>
<tr>
<td>K1017</td>
<td>1</td>
<td>55300</td>
<td>73000</td>
<td>29.5</td>
<td>1.600</td>
<td>01/26/92</td>
<td></td>
</tr>
<tr>
<td>K1056</td>
<td>1</td>
<td>53900</td>
<td>71900</td>
<td>24.0</td>
<td>1.640</td>
<td>01/25/92</td>
<td></td>
</tr>
<tr>
<td>88202</td>
<td>1</td>
<td>51400</td>
<td>75000</td>
<td>30.0</td>
<td>4.560</td>
<td>10/19/91</td>
<td></td>
</tr>
<tr>
<td>00195</td>
<td>1</td>
<td>54200</td>
<td>75200</td>
<td>30.0</td>
<td>5.830</td>
<td>09/21/92</td>
<td></td>
</tr>
<tr>
<td>00222</td>
<td>1</td>
<td>54000</td>
<td>77300</td>
<td>32.0</td>
<td>4.050</td>
<td>04/21/92</td>
<td></td>
</tr>
</tbody>
</table>

REMARKS: THIS STEEL IS REELTED & MANUFACTURED IN THE USA

Signature: DAN SCHACHT
Date: 4/29/92

Handwritten Notes: P# 27310
W# 5741210

Logo: SMI
Structural Metals, Inc.
Box 911, Seguin, Texas 78155-0911
512-372-8020

CERTIFIED TEST REPORT
WE HEREBY CERTIFY THAT THE IS A TRUE COPY FROM TESTS PERFORMED IN OUR LABORATORY.
**PHYSICAL PROPERTIES**

<table>
<thead>
<tr>
<th>TUBE DIMENSION</th>
<th>YIELD POINT</th>
<th>U.T.S.</th>
<th>ELONGATION</th>
<th>HEAT NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot; X 0.375</td>
<td>52017</td>
<td>68334</td>
<td>10</td>
<td>2483</td>
</tr>
<tr>
<td>10&quot; X 0.375</td>
<td>57734</td>
<td>72931</td>
<td>32</td>
<td>2485</td>
</tr>
<tr>
<td>18&quot; X 0.375</td>
<td>59167</td>
<td>74195</td>
<td>23</td>
<td>2486</td>
</tr>
<tr>
<td>18&quot; X 0.375</td>
<td>56364</td>
<td>70712</td>
<td>37</td>
<td>2488</td>
</tr>
<tr>
<td>10&quot; X 0.375</td>
<td>57206</td>
<td>72527</td>
<td>33</td>
<td>2489</td>
</tr>
<tr>
<td>18&quot; X 0.375</td>
<td>53208</td>
<td>64162</td>
<td>31</td>
<td>2490</td>
</tr>
<tr>
<td>10&quot; X 0.375</td>
<td>59742</td>
<td>76563</td>
<td>33</td>
<td>2491</td>
</tr>
<tr>
<td>10&quot; X 0.375</td>
<td>55331</td>
<td>65485</td>
<td>20</td>
<td>2492</td>
</tr>
<tr>
<td>18&quot; X 0.375</td>
<td>62146</td>
<td>76499</td>
<td>30</td>
<td>2493</td>
</tr>
<tr>
<td>18&quot; X 0.375</td>
<td>50029</td>
<td>73783</td>
<td>35</td>
<td>2494</td>
</tr>
</tbody>
</table>

RAMLA, 23/04/83
**CHEMICAL ANALYSIS**

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>P</th>
<th>S</th>
<th>Al</th>
<th>HEAT NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot; x 0.375</td>
<td>0.150</td>
<td>0.710</td>
<td>0.160</td>
<td>0.014</td>
<td>0.012</td>
<td>0.004</td>
<td>2493</td>
</tr>
<tr>
<td>3&quot; x 0.375</td>
<td>0.160</td>
<td>0.760</td>
<td>0.270</td>
<td>0.014</td>
<td>0.013</td>
<td>0.006</td>
<td>2485</td>
</tr>
<tr>
<td>3&quot; x 0.375</td>
<td>0.160</td>
<td>0.780</td>
<td>0.250</td>
<td>0.013</td>
<td>0.015</td>
<td>0.006</td>
<td>2496</td>
</tr>
<tr>
<td>4&quot; x 0.375</td>
<td>0.140</td>
<td>0.640</td>
<td>0.200</td>
<td>0.008</td>
<td>0.021</td>
<td>0.005</td>
<td>2490</td>
</tr>
<tr>
<td>4&quot; x 0.375</td>
<td>0.160</td>
<td>0.690</td>
<td>0.270</td>
<td>0.008</td>
<td>0.025</td>
<td>0.005</td>
<td>2499</td>
</tr>
<tr>
<td>4&quot; x 0.375</td>
<td>0.160</td>
<td>0.700</td>
<td>0.240</td>
<td>0.013</td>
<td>0.017</td>
<td>0.004</td>
<td>2490</td>
</tr>
<tr>
<td>5&quot; x 0.375</td>
<td>0.150</td>
<td>0.750</td>
<td>0.300</td>
<td>0.006</td>
<td>0.027</td>
<td>0.005</td>
<td>2491</td>
</tr>
<tr>
<td>5&quot; x 0.375</td>
<td>0.160</td>
<td>0.690</td>
<td>0.220</td>
<td>0.009</td>
<td>0.022</td>
<td>0.004</td>
<td>2492</td>
</tr>
<tr>
<td>5&quot; x 0.375</td>
<td>0.160</td>
<td>0.740</td>
<td>0.200</td>
<td>0.006</td>
<td>0.021</td>
<td>0.005</td>
<td>2493</td>
</tr>
<tr>
<td>5&quot; x 0.375</td>
<td>0.160</td>
<td>0.770</td>
<td>0.240</td>
<td>0.015</td>
<td>0.016</td>
<td>0.012</td>
<td>2494</td>
</tr>
</tbody>
</table>

RAMLA, 23/04/89
**MILL CERTIFICATE NO. 1637/90**

**ER NO. : 07/J/1-183**

<table>
<thead>
<tr>
<th>ER. WALL THICK</th>
<th>KG/MTR</th>
<th>LENGTH MTR</th>
<th>LENGTH FT'</th>
<th>TOTAL MT</th>
<th>NO. OF PIECES</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.375</td>
<td>105.100</td>
<td>3150.36</td>
<td>10374.33</td>
<td>328.742</td>
<td>246</td>
<td>RED+RED</td>
</tr>
<tr>
<td>0.375</td>
<td>105.100</td>
<td>269.24</td>
<td>886.33</td>
<td>27.468</td>
<td>23</td>
<td>GREEN+GREEN</td>
</tr>
</tbody>
</table>

**TEST PSI : 1490**

02/04/89

---

**DEPARTMENT OF KOORN STEEL**

HEAD OFFICE: P.O.B. 700 HAIFA 31027 ISRAEL. TELEPHONE: 04-810501-0. CABLES: METCO. HAIFA, TELEX: 47178 METCO-IL. FAX: 04-912365
<table>
<thead>
<tr>
<th>HEAT No.</th>
<th>DIMENSION</th>
<th>CHEMICAL COMPOSITION%</th>
<th>TENSION TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1104217</td>
<td>3</td>
<td>C Mn P S Si</td>
<td>Y P T S E L</td>
</tr>
<tr>
<td></td>
<td>0.216</td>
<td>13 44 11 21 0</td>
<td>38755 61836 29</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>2200</td>
<td>2724 3412</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>155</td>
<td>267 334</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N B/L</th>
<th>WEIGHT</th>
<th>HYDROSTATIC</th>
<th>Tested PSI</th>
<th>(KGS/CM²)</th>
<th>(LBS/FT²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>21</td>
<td>2200</td>
<td>155</td>
<td>15.17</td>
<td>305</td>
</tr>
</tbody>
</table>

3 sch 40 PS3 welded
FOR: SHIELDED METAL ARC WELDING, CARBON STEEL (P-Number 1)

SCOPE
1. This welding procedure specification covers the welding of carbon steel (P-1) in the fabrication of API 650 storage tanks.

PROCESS: Shielded metal arc.

BASE METAL:
The steel base metal shall comply with one of the ASTM specifications and grades listed in the ASME Code under (P-1).

FILLER METAL:
The filler metal shall comply with ASME Material Specification Part C E6010 (F3).

PREPARATION OF BASE METAL AND ALIGNMENT OF EDGES:
1. The edges to be joined shall be prepared in accordance with a single or double "V" Groove. Gas cutting may be used.
2. Edges to joined and all surfaces within 1/2" of the welding edge shall be thoroughly cleaned immediately prior to welding.
3. Abutting edges of plates at longitudinal joints shall not, after welding, have an offset at any point in excess of one-quarter of the plate thickness with a maximum permissible offset of 1/8", except that plates less than 1/4" in thickness, the offset may be as much as 1/16".
4. Abutting edges circumferential joints shall be aligned with the following tolerances:
   - For plates up to 1/4" 1/16"
   - For plates over 1/4" to 3/4" 25% of plate thickness
   - For plates over 3/4" to 1 1/2" 3/16"
   - For plates over 1 1/2" 12 1/2% of plate thickness, but not over 1/4"

ELECTRIC CURRENT:
Direct current shall be used with electrode positive and the base metal negative. (Reverse Polarity).

WELDING TECHNIQUE:
1. The welding technique shall be substantially as shown on the attached sketches.
2. (a) When making double-welded joints the reverse (root) side must be gouged, chipped, or ground out to sound metal before the finishing bead is deposited.
POSITIONS (QW-405)
Position(s) of Groove: 6C
Welding Progression: Up E7018, Down E6010
Position(s) of Fillet: ALL

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

GAS (QW-408)
Shielding Gas(es):
Percent Composition (mixtures):
Flow Rate:
Gas Backing:
Trailing Shielding Gas Composition:

ELECTRICAL CHARACTERISTICS (QW-409)
Current AC or DC: DC
Polarity: Reverse
Amps (Range): 120-190
Volts (Range): 19-26

(Technical information 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: NA
(Pure Tungsten, 2% Thoriated, etc.)

Mode of Metal Transfer for GMAW: NA
(Spray arc, short circuiting arc, etc.)

Electrode Wire Feed Speed Range: NA

TECHNIQUE (QW-410)
String or Weave Bead: String & Weave
Orifice or Gas Cup Size: NA
Initial and Interpass Cleaning (Brushing, Grinding, etc.): Grinding & Brush

Method of Back Gouging: Air Arc and Grinding
Oscillation: No pass greater than 1/4"
Contact Tube to Work Distance: NA
Multiple or Single Pass (per side): Multipass
Multiple or Single Electrodes: Single
Travel Speed (Range): 8 to 10 Inches Per Minute
Peening: Not Allowed
Other:

<table>
<thead>
<tr>
<th>Weld Layer(s)</th>
<th>Process</th>
<th>Class</th>
<th>Dia.</th>
<th>Type</th>
<th>Amp.</th>
<th>Volt Range</th>
<th>Travel Speed Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SMAW</td>
<td>E6010</td>
<td>1/8&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>8-10 IPM</td>
</tr>
<tr>
<td>2</td>
<td>SMAW</td>
<td>E7018</td>
<td>1/8&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>8-10 IPM</td>
</tr>
<tr>
<td>3-4-5</td>
<td>SMAW</td>
<td>E7018</td>
<td>5/32&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>8-10 IPM</td>
</tr>
<tr>
<td>CAP</td>
<td>SMAW</td>
<td>E7018</td>
<td>1/8&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>8-10 IPM</td>
</tr>
</tbody>
</table>
JOINTS (QW-402)
Joint Design: GROOVE
Backin g (Yes): N
Backin g Material (Type): Metal, Nonfusing Metal, Nonmetallic, or 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 Migr., 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.: 1
Group No.: 1
to P-No.: 1
Group No.: 1

Specification type and grade: A106 Gr. B


Thickness Range:
- Base Metal: Groove: .1876 to .864"
- Groove: 6 5/8"

Other:

**FILLER METALS (QW-404)**

Spec. No. (SFA): 5.1
AWS No. (Class): E6010
F-No.: 3
A-No.: 1

Size of Filler Metals:
- 1/8"
- .125"
- .0625" to .250"

Electrode-Flux (Class): Iron Oxide
Flux Trade Name: Unlimited
Consumable Insert: Low Hydrogen
Other:

With base metal-filler metal combination should be recorded individually.
**Company Name:** Scott Manufacturing, Inc.  
**Procedure Qualification Record No.:** SA-1A  
**WPS No.:** SA-1  
**Date:** 9-5-90  
**Welding Process(es):** SMAW  

### 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.)

<table>
<thead>
<tr>
<th>BASE METALS (QW-403)</th>
<th>POSTWELD HEAT TREATMENT (QW-407)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Spec. SA 516</td>
<td>Temperature NA</td>
</tr>
<tr>
<td>Type or Grade 70</td>
<td>Time NA</td>
</tr>
<tr>
<td>P-No. 1 to P-No. 1</td>
<td>Other</td>
</tr>
<tr>
<td>Thickness of Test Coupon: 3.75&quot;</td>
<td>Other</td>
</tr>
<tr>
<td>Diameter of Test Coupon: NA</td>
<td>Other</td>
</tr>
</tbody>
</table>

**FILLER METALS (QW-404)**

<table>
<thead>
<tr>
<th>SFA Specification</th>
<th>AWS Classification</th>
<th>Fillmetal F-No.</th>
<th>Weld Metal Analysis A-No.</th>
<th>Size of Filler Metal</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>E6010</td>
<td>3</td>
<td>1</td>
<td>1/8&quot; - 5/32&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**POSITION (QW-405)**

<table>
<thead>
<tr>
<th>Position of Groove</th>
<th>1G</th>
</tr>
</thead>
</table>

**Weld Progression (Uphill, Downhill):** Other

**PREHEAT (QW-406)**

<table>
<thead>
<tr>
<th>Preheat Temp. None</th>
<th>Interpass Temp. 450°F</th>
</tr>
</thead>
</table>

**ELECTRICAL CHARACTERISTICS (QW-409)**

<table>
<thead>
<tr>
<th>Current</th>
<th>DC</th>
<th>Polarity</th>
<th>Reverse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amps.</td>
<td>90-140</td>
<td>Volts</td>
<td>22-26</td>
</tr>
</tbody>
</table>

**Tungsten Electrode Size:** Other

**TECHNIQUE (QW-410)**

<table>
<thead>
<tr>
<th>Travel Speed</th>
<th>8-10-1IPM</th>
</tr>
</thead>
</table>

**String or Weave Bead:** String & Weave

**Oscillation:** Other

**Multipass or Single Pass (per side):** Multipass

**Single or Multiple Electrodes:** Single

**Other:** No pass greater than 1/2"
Tensile Test (QW-150)

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Width</th>
<th>Thickness</th>
<th>Area</th>
<th>Ultimate Total Load</th>
<th>Ultimate Unit Stress</th>
<th>Type of Failure &amp; Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-1</td>
<td>1.043</td>
<td>.374</td>
<td>.380</td>
<td>27,500</td>
<td>70,513</td>
<td>Base Metal</td>
</tr>
<tr>
<td>T-2</td>
<td>1.035</td>
<td>.373</td>
<td>.385</td>
<td>27,250</td>
<td>70,596</td>
<td>Base Metal</td>
</tr>
</tbody>
</table>

Guided-Bend Tests (QW-160)

<table>
<thead>
<tr>
<th>Type and Figure No.</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>QW-463.1(d) Root 1</td>
<td>Accepted</td>
</tr>
<tr>
<td>QW-463.1(d) Root 2</td>
<td>Accepted</td>
</tr>
<tr>
<td>QW-463.1(d) Face 1</td>
<td>Accepted</td>
</tr>
<tr>
<td>QW-463.1(d) Face 2</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

Toughness Tests (QW-170)

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Notch Location</th>
<th>Notch Type</th>
<th>Test Temp.</th>
<th>Impact Values</th>
<th>Lateral Exp.</th>
<th>Drop Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>% Shear</td>
<td>Break</td>
</tr>
</tbody>
</table>

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: Tim Kirksey

Tests conducted by: Longview Inspection, Inc.

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: SCOTT MANUFACTURING, INC.

9-5-90

By William A. Basom

(Notes: record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)
# Permian Non-Destructive Testing

## Qualification

<table>
<thead>
<tr>
<th>Test Method</th>
<th>RT</th>
<th>UT</th>
<th>MT</th>
<th>PT</th>
<th>HT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: Miller, Morris J.</td>
<td>I</td>
<td>II</td>
<td>I</td>
<td>II</td>
<td>I</td>
</tr>
<tr>
<td>General/30%</td>
<td>26.70</td>
<td>/</td>
<td>25.50</td>
<td>/</td>
<td>29.25</td>
</tr>
<tr>
<td>Specific/30%</td>
<td>24.00</td>
<td>/</td>
<td>22.50</td>
<td>/</td>
<td>30.00</td>
</tr>
<tr>
<td>Practical/40%</td>
<td>36.00</td>
<td>/</td>
<td>34.80</td>
<td>/</td>
<td>38.00</td>
</tr>
<tr>
<td>Composite</td>
<td>36.70</td>
<td>/</td>
<td>82.80</td>
<td>/</td>
<td>97.25</td>
</tr>
</tbody>
</table>

### Certified by / Level
- DEM III
- DEM III
- DEM III

### Certification Date
- 10-17-90
- 10-17-90
- 10-17-90

### Recertification Due
- 10-17-91
- 10-17-91
- 10-17-91

### Documented Experience
- On File
- On File
- On File

### Prior Certification Level
- II
- II
- II

### Appointment by Letter, III

---

**Ger J-2 and J-1 Test**
- Accept: Y
- Conditions: None
- Date: 10-17-90

**Color Perception Test**
- Accept: Y
- Conditions: Name
- Date: 10-17-90

**Date Employed:** 4-25-88

**Assignment to NDT:** 1-25-88

**Education Level:** High School/Trade

**Experience Time:** 9.5 Years

**Limitations:** Recertified RT, MT, PT only

---

This individual has successfully completed the above examinations and has qualified for the level in the nondestructive test method indicated above as per Permian Non-Destructive Testing's written practice. Documentation shall be on file for review upon reasonable request.

**Authorized Examiner / Date:**

[Signature] 10-17-90

Permian Non-Destructive Testing
### Radiographic Testing Report

#### Details:
- **Location:** 14206 West Hwy. 80 East, Odessa, Texas 79765
- **Contact:** (915) 561-5000
- **Laboratory:** Permian Non-Destructive Testing
- **Weld No.:** 102691
- **Date:** 10-14-92

#### Weld Specifications:
- **Size:** 6”
- **Thickness:** 2”
- **Material:** Steel
- **Heat Treatment:** Normalized

<table>
<thead>
<tr>
<th>Weld No.</th>
<th>By No.</th>
<th>Location</th>
<th>Pipe Size</th>
<th>Weld Code</th>
<th>Within Code</th>
<th>Detects &amp; Location</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6”</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
<td>6”</td>
<td>No</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>4</td>
<td>6”</td>
<td>No</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>7</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>8</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>9</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>10</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>11</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>12</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>13</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>14</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>15</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td>16</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>17</td>
<td>17</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>18</td>
<td>18</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>19</td>
<td>19</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>20</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>21</td>
<td>21</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>22</td>
<td>22</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>23</td>
<td>23</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>24</td>
<td>24</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>25</td>
<td>25</td>
<td>6”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>26</td>
<td>26</td>
<td>6”</td>
<td>No</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>27</td>
<td>27</td>
<td>6”</td>
<td>No</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>28</td>
<td>28</td>
<td>6”</td>
<td>No</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>29</td>
<td>29</td>
<td>2”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>30</td>
<td>30</td>
<td>2”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>31</td>
<td>31</td>
<td>2”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>32</td>
<td>32</td>
<td>2”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>33</td>
<td>33</td>
<td>2”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>34</td>
<td>34</td>
<td>2”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>35</td>
<td>35</td>
<td>2”</td>
<td>No</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>36</td>
<td>36</td>
<td>2”</td>
<td>No</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>37</td>
<td>37</td>
<td>2”</td>
<td>No</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>38</td>
<td>38</td>
<td>1”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>39</td>
<td>39</td>
<td>1”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>40</td>
<td>40</td>
<td>2”</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Interpretation:
Interpreted by: [Name]

#### Test Results:
- **Number of Testing Personnel:** 1
- **Number of Miles:** 2,500 ft.
- **Welds Tested:** 42
- **Per Diem:** $14
- **Total Hours Worked:** 5.33
- **Total Pay:** $74.32

#### Locations:
- **R.L.**:
  - Right of Way
  - Top Quarter
  - Bottom Quarter

#### Terms and Conditions:
- The results of this test do not guarantee the quality or usability of any material or product. Any use of these results is at the user's discretion.

**Agreed and Accepted:** William H. Brown

**Date:** 10-14-92
<table>
<thead>
<tr>
<th>Weld No.</th>
<th>By No.</th>
<th>Location</th>
<th>Pipe Size</th>
<th>Within Code</th>
<th>Defect Code</th>
<th>Defects &amp; Location</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0-1</td>
<td>33-4</td>
<td>X</td>
<td>Yes</td>
<td>Yes</td>
<td>!P</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test(s) Interpreted By: M. Miller

Level: II

P.O. #: 10274

Number of Testing Personnel: 1

# Welds: 1

Par. Ins.: 1

Miles: 1

Hours Worked: AM 9:00 PM 4:00

Terms and Abbreviations:

- A: Inadequate Penetration
- I: Inadequate Preparation
- P: Piping
- C: Clustering
- D: DGS
- S: Surface
- H: Hull
- K: Kill
- E: Edge
- B: Base
- N: No
- Y: Yes

Agreed and Accepted: William A. Johnson 10/11/93

Locations:

- R.B.: Right of Way
- B.T.: Bottom Quarter
- T.B.: Top Quarter
- D.G.: Ditch Grade
- B.G.: Bottom Grade
WISCO WELDING INSPECTION SERVICE COMPANY
11811 NORTH FRWY., SUITE 670
HOUSTON, TEXAS 77060

REPORT DATES 10/16/92 10/17/92
CUSTOMER: USPCI
ATTN: MR. SAMAR HAMWI
ORDER NO: PO 19350 DATED:
REV: DATED:
MAT'L DESTINATION: LONE MOUNTAIN
REQUIRED DATE: 11/1/92 SHIPMENT DATE IS NOW: SAME
AS OF
INSPECTOR ESTIMATED SHIPMENT DATE: SAME
ORDER IS 65% PERCENT COMPLETED:
VENDOR: SCOTT MFG. CO.
MANUFACTURER: SAME
PHONE: 866-866-9591 SHOP LOCATION: WOFORD, TX.
SHOP ORDER NO: 451
INSPECTOR’S CONTACT: BILL BASON " POSITION: FIELD MANAGER
REPORT IS: INTERIM
REGARDING: INSPECTION
INSPECTOR: VICTOR HAGMAN

ORDER NO: 451

MATERIAL DESCRIPTION: (4) 12.75' DIAMETER BY 40' HEIGHT
CAUSTIC STORAGE TANKS.

STATUS OF ORDER: TWO TANKS TO SHIP 10/19/92

INSPECTION: WITNESS RADIOGRAPHS BE TAKEN OF WELDS AND REVIEW
OF SAME.

1. PICKED SPOTS FOR RADIOGRAPHS ON TWO TANKS. SHOTS WERE
TAKEN OF VERTICAL SEAMS GIRTH WELDS IN TANKS. ONE SPOT WAS
TAKEN ON THE BUTT WELDS ON THE CONE BOTTOM. THE CONE BOTTOM
HAS THREE BUTT WELDS.

2. REVIEW OF SPOT WELDS FOUND THE FOLLOWING. THE WELDS IN THE
CONE BOTTOM WERE BAD. PENALTY SHOTS WERE TAKEN AS PER API
650, AND ASME SEC. VIII UW 51, AND UW52. FOUND THAT A BAD
PROCEDURE WAS USED IN WELDING THE BUTT WELDS ON THE BOTTOM
OF ALL FOUR TANKS. THERE WAS NO PENETRATION ON ANY OF THE
WELDS. SO SCOTT MFG MADE REPAIRS ON THE TWO TANKS TO SHIP ON
10/19/92. REPAIR SHOTS WERE MADE. FOUND THAT THE WELDS WERE
STILL BAD. THE COMPLETE BUTT WELDS ON THE BOTTOM OF ALL FOUR
TANKS WAS REMOVED COMPLETELY.

10/17/92.
1. PICKED RADIOGRAPHS FOR BOTTOM BUTT WELDS. AFTER REVIEWING
FILM FOUND THAT ALL OF THE BOTTOM BUTT WELDS WERE NOW
ACCEPTABLE. THE REASON FOR THE PROBLEM TO START WITH WAS THAT
NO ROOT OPENING WAS LEFT FOR PENETRATION. THESE WELDS WERE
DONE BY THE SHOP PERSONAL. NOT THE CREW THAT IS BUILDING
THES TANKS.

2. WITNESS FITTING THE TOP RING ON TANK NUMBER TWO. AND
WATCHED AS THE WELDERS MADE THE ROOT PASS. ALL WELDING WAS
PER SPECIFICATIONS AND WAS OF GOOD QUALITY.
WILL RETURN 10/19/92 FOR FINAL ON FIRST TWO TANKS AND WITNESS
LOADING OF SAME.
R E P O R T  D A T E S  1 0 / 1 4 / 9 2  1 0 / 1 5 / 9 2
O R D E R  N O :  D A T E D :  R E V :  D A T E D :
M A T ' 1  D E S T I N A T I O N :  L O N E  M O U N T A I N
R E Q U I R E D  D A T E :  S H I P M E N T  D A T E  I S  N O W :
A S  O F  C H A N G E D  F R O M :
I N S P E C T O R  E S T I M A T E D  S H I P M E N T  D A T E :
O R D E R  I S  P E R C E N T  C O M P L E T E D :
V E N D O R :  S C O T T  M F G .
M A N U F A C T U R E R :  S A M E
P H O N E :  9 0 6 - 8 6 6 - 9 5 9 1  S H O P  L O C A T I O N :  W O L F O R D ,  T X
S H O P  O R D E R  N O :  4 5 1
R E P O R T  I S :  I N T E R I M
R E G A R D I N G :  I N S P E C T I O N
I N S P E C T O R :  V I C T O R  H A G M A N
O R D E R  N O :  4 5 1
M A T E R I A L  D E S C R I P T I O N :  ( 4 )  7 5 "  D I A M E T E R  B Y  4 0 "  H E I G H T
C A U S T I C  T A N K S .
S T A T U S  O F  O R D E R :  C O M P L E T I O N  I S  A B O U T  5 0 %  T W O  T A N K S  T O  S H I P
M O N  1 0 / 1 0 / 9 2
I N S P E C T I O N  O F  T A N K S  B E I N G  W E L D E D.
T H I S  I S  G O O D  A S  T H A T  A L L  O F  T H E  R E P A D S  C A N  B E  A I R  T E S T E D  O N
R E W E L D E D .
10/15/92.

MET WITH MR HAMWI THIS A.M. FOR INSPECTION OF TANKS. TALKED WITH MR. BASON ABOUT DELIVERY OF TANKS. THE FIRST TWO TANKS WILL BE ON TRUCKS TO JOB SITE BY 10/19/92 A.M.

REVIEW OF DRAWINGS ON TANKS AND WALK WAYS. NO PROBLEMS WERE FOUND.

FIELD INSPECTION OF TANKS BEING WELDED. AND A TOUR OF SHOP WAS TAKEN. SCOTT MFG. HAS A WIDE RANGE OF SERVICES THAT WERE SHOWN TO MR HAMWI AND THIS WRITER.

A VISUAL INSPECTION OF TANKS WAS DONE AND NO PROBLEMS WERE FOUND.

PHOTOS OF TANKS, ERECTION, AND WELDING WAS TAKEN. THESE WILL SENT WITH DATA PACKAGES.

REVIEW OF MATERIAL TEST REPORTS FOR THE SHELL MATERIAL AND FOR THE STRUCTURAL MATERIAL. THE MTR'S FOR THE PIPING HAS NOT ARRIVED FROM THE SUPPLIER. AS SOON AS THESE OR IN THEY WILL BE CHECKED.

REVIEWED ALL WELDER QUALIFICATIONS, AND ALL WELD PROCEDURES. ALL WELDING OF TANKS WERE TO THESE PROCEDURES. ALL WELDER WORKING ON TANKS WERE QUALIFIED PER A 6G WELD TEST AND ALL PAPER WORK WAS IN ORDER.

ALL RADIOGRAPHS WILL BE SHOT 10/16/92 ON THE TWO TANKS TO SHIP ON 10/19/92. ALL OTHER NDE WORK HAS BEEN COMPLETED. ALL THAT WAS REQUIRES WAS A MAG PARTICLE OF NOZZLE WELDS. THIS HAS BE DONE AND PROPER PAPER WORK IS IN THE JOB FILE.

AT THIS TIME ALL API-650 AND USPCI SPECIFICATIONS ARE BEING FOLLOWED. ALL WORK SEEN ON THIS VISIT WAS OF GOOD QUALITY AND WAS ACCEPTABLE TO ALL SPECIFICATIONS.
QUALITY ASSURANCE INSPECTION RELEASE

WELDING INSPECTION SERVICE COMPANY

PAGE 1 OF 1
DATE: 10-19-92

CUSTOMER: US PCI
P.O. NO.: 19350
LOCATION: Lubbock, TX

VENDOR: Scott MFG
PROJECT: Lone Mountain

☐ Satisfactorily completed Quality Assurance Inspection on: 10-19-92

<table>
<thead>
<tr>
<th>P.O. ITEM</th>
<th>QUANTITY</th>
<th>MATERIAL DESCRIPTION/TAG NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>12.75' x 40' Height Caustic Tank Ser. No. 451-1</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>12.75' x 40' Height Caustic Tank Ser. No. 451-2</td>
</tr>
</tbody>
</table>

Shipping Information: By truck to Lawton, OKLA.
Date Released for Shipment: 10-19-93

☐ Without exception to the Purchase Order Documents.
☐ With the following Exception from the Purchase Order, only with follow up in writing with a copy of telex or letter attached. (State specifics and name of Responsible Engineer)

Approval or release for shipment of any work by a representative of the purchaser, or purchaser's Client, shall in no way relieve the vendor or sub-vendor of any responsibility for meeting the requirements of the purchase order and/or specifications.

Signing of the form acknowledges the items have been inspected in accordance with the above purchase order.

10-19-92

Agency Inspector's Signature

11811 North Frwy, Suite 670, Houston, Texas 77060 (713) 820-8066
WELDING INSPECTION SERVICE COMPANY

QUALITY ASSURANCE INSPECTION RELEASE

CUSTOMER: US PCT
P.O. NO.: 19350
LOCATION: Lubbock, TX

VENDOR: Scott Mfg Inc.
PROJECT: Lone Mountain

[ ] Satisfactorily completed Quality Assurance Inspection on: 10-24-92 (Date)

<table>
<thead>
<tr>
<th>P.O. ITEM</th>
<th>QUANTITY</th>
<th>MATERIAL DESCRIPTION/TAG NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>12.75' x 40' height Caustic Tank</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sec. No. 451-3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>12.75' x 40' height Caustic Tank</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sec. No. 451-4</td>
</tr>
</tbody>
</table>

Shipping Information: By Truck to Wylie, OKA...
Date Released for Shipment: 10-24-92

[ ] Without exception to the Purchase Order Documents.
[ ] With the following Exception from the Purchase Order, only with follow up in writing with a copy of telex or letter attached. (State specifics and name of Responsible Engineer)

Approval or release for shipment of any work by a representative of the purchaser, or purchaser's Client, shall in no way relieve the vendor or sub-vendor of any responsibility for meeting the requirements of the purchase order and/or specifications.

Signing of the form acknowledges the items have been inspected in accordance with the above purchase order.

10-24-92

Agency Inspector's Signature

11811 North Fwy, Suite 670- Houston, Texas 77060  (713) 820-8066
NOTE: ANCHOR BOLTS TO STRADDLE N-S Ø

(12) ANCHOR BOLTS

CHORD 3-5½

ANCHOR BOLT
12 REQUIRED
NTS
DOUBLE NUT ANCHOR BOLTS
GALVANIZED

ANCHOR BOLT CHAIR
12 REQUIRED
3½ x 4½ CHAMFER
DOUBLE NUT ANCHOR BOLTS
### Table

<table>
<thead>
<tr>
<th>USE</th>
<th>NOMINAL DIA D&quot;</th>
<th>T&quot;</th>
<th>ROLL RADIUS</th>
<th>A&quot;</th>
<th>B&quot;</th>
<th>R&quot;</th>
<th>PER TANK</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHELL MANHOLE</td>
<td>30</td>
<td>4</td>
<td>TANK RADIUS</td>
<td>60</td>
<td>30</td>
<td>15</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>OUTLET</td>
<td>6</td>
<td>4</td>
<td>&quot;</td>
<td>13 1/2</td>
<td>6 1/2</td>
<td>3 1/2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>INLET</td>
<td>3</td>
<td>4</td>
<td>&quot;</td>
<td>7</td>
<td>3 1/2</td>
<td>1 1/2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>OVERFLOW</td>
<td>3</td>
<td>4</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SHELL ACCESS</td>
<td>—</td>
<td>—</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>SEE DETAIL AT LEFT 2</td>
<td></td>
</tr>
</tbody>
</table>

### Diagrams

1. **Front View**
   - For Shell Access
   - For Other Fittings and Shell Manhole

2. **Edge View, Rolled**
   - Thickness, T"
   - Roll Radius

---

**Scott Manufacturing, Inc.**

PO. Box 10232 Lubbock, Texas 79408

Reinforcing Plate Detail

USP, Waynoka, OK

---

**Revisions**

<table>
<thead>
<tr>
<th>NO</th>
<th>DATE</th>
<th>WT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Result:** 451-4
SECTION CT3
Mr. Don Dillie
USPCI, Inc.
Rt. 2 Box 170
Waynoka, Oklahoma 73860

Dear Mr. Dillie:

At the time of our inspection of Caustic Storage Tanks 1-4 located at the pretreatment area were inspected and there were no visual apparent weld breaks, punctures, scrapes of protective coatings, cracks, corrosion or damage due to construction or installation. This is to certify that Caustic Storage Tanks 1-4 were installed in such a manner which did not produce any structurally adverse conditions in accordance with 40 CFR 264.192(b).

This is to certify that at the time of our inspection, the Caustic Storage Tanks 1-4 located at the pretreatment area of the Lone Mountain Facility, (Waynoka, Oklahoma), were filled with water and allowed to stand at static equilibrium for a period of several hours. During this time all welds and tank walls were monitored for leaks. There were no apparent leaks found therefore the tank appears to be capable of handling hazardous wastes without release for the intended life and use of the tank.

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 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 of knowing violations.

Sincerely,

MYERS ENGINEERING CORPORATION

By: E.E. Myers

cc: Mr. Gene Walker
Environmental Engineer
Lone Mountain Facility

FILE INSTRUCTIONS

Unit: Pre-Treatment
Project: Caustic Tank Assessment
Section: Tank Construction

Rec'd by: L.J. ODEN
ROUTE: COPY
FILE: D. Doak

TEST
SECTION 202

ASSESSMENT OF CAUSTIC TANK #3 (CT3)
LONE MOUNTAIN HAZARDOUS WASTE FACILITY
U.S.P.C.I.
WAYNOKA, OKLAHOMA

A. TANK VESSEL DESCRIPTION

Caustic Tank #3 is a large steel aboveground vertical tank located in the pretreatment area of the Lone Mountain Hazardous Waste Facility. Caustic Tank #1, Caustic Tank #2, Caustic Tank #3, Caustic Tank #4, Sludge Storage Tank #1 and, Caustic Overflow Tank, Cyanide Overflow tank, Cyanide Reactor, Cyanide Measure Tank and a portion of their ancillary equipment will be located together in a concrete containment area.

B. PRIMARY TANK VESSEL

1. General Description

Caustic Tank #3 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. Caustic Storage Tank #3 is an aboveground tank that will be used for the storage of caustic liquids. The tank is vertical in position and cylindrical in shape. The tank and contents are supported by a skirted base. There is a cone on the bottom of the tank inside the skirt. There is a platform connected to all four caustic storage tanks (CT1, CT2, CT3, CT4). There are two ladders for access to the tank top and platform. This tank is equipped with a 3’ overflow line. There is a level gauge installed through an 18” nozzle, in addition to the level gauge there is a high level alarm installed through a nozzle on the top of the tank. This tank was manufactured by Scott Manufacturing, Inc from Lubbock, Texas. The temperature of the tank varies with the ambient temperature.

Influent piping is located from the pretreatment building to the caustic tank and to other tanks in the containment area.

2. Design Standards.

The tank is designed and constructed 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). The Mill Test reports and radiographic testing reports can be found in Appendix F of this assessment.
3. Hazardous Characteristics of Wastes Stored

The wastes to be stored in this tank have the following characteristics (Provided by USPCI):

Untreated wastes pH (7 - 13)
N > 1
Temperature = Ambient

The hazardous characteristics of the waste to be 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 interior of the tank is coated with Gilad "Gilad-Guard Epoxy Chemical Resistant Finish 5240 Series." This coating will withstand the chemical characteristics of the waste to be stored.

5. Documented Age of Tank

This is a new tank, it was constructed and installed in October of 1992.

6. Result of Leak Tests

A leak test was performed. In this test the tank was filled to maximum operating capacity with water. The tank was allowed to sit full for a minimum of 6 hours. After remaining full for this time there was no evidence of the tank leaking. In the inspection all welds, flanges, manways, nozzles, and sidewalls were checked for leaks.

7. Existing Data Obtained

<table>
<thead>
<tr>
<th>Diameter of Tank</th>
<th>12'-8 5/8” Inside Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>40'</td>
</tr>
<tr>
<td>Material</td>
<td>A36 steel See Appendix F for Mill Test reports</td>
</tr>
<tr>
<td>Wall and top thickness</td>
<td>0.25&quot;</td>
</tr>
<tr>
<td>Bottom cone thickness</td>
<td>0.3125”</td>
</tr>
<tr>
<td>Maximum Volume</td>
<td>4426.27 cf. or 33,108 Gal.</td>
</tr>
<tr>
<td>Maximum Operating Volume</td>
<td>4299.22 cf. or 32,156 Gal.</td>
</tr>
<tr>
<td>Specific gravity of waste</td>
<td>1.5 (Provided by USPCI)</td>
</tr>
<tr>
<td>Temperature</td>
<td>Ambient</td>
</tr>
<tr>
<td>Seismic Zone</td>
<td>1</td>
</tr>
</tbody>
</table>

8. Calculation of Existing Foundation Loading

Total Weight of Tank and Contents = 216.54 tons

Detailed calculations reflecting the volume and weight of the tank are found in appendix A. The 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 0.2195 inches. This thickness includes 0.125 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 B and C of this assessment for detailed calculations or required wall thickness and structural analysis of the tank support system.)

10. Comparison of Actual Structure to Theoretical Values

   Wall Thickness Comparison

   Calculated Required Wall Thickness                      0.2195"  
   Minimum Required Wall Thickness By API-650-88          0.1875"  
   Measured Wall Thickness                                 0.25"

C. SECONDARY CONTAINMENT SYSTEM

1. General Description of Secondary Containment

   The secondary containment system is designed and will be operated to prevent any migration of wastes or liquids out of the system. Cyanide Reactor Tank, Cyanide Measure Tank, Caustic Tanks #1-4, Sludge Storage Tank, Caustic Overflow Tank, Cyanide Overflow Tank will be located on a reinforced concrete base floor area with vertical concrete sidewalls. All associated piping is aboveground. The area will be inspected on a daily basis. The containment system is walled off and receives no direct vehicular traffic. The foundation walls and base were mass poured in place. No cracks from compression or uplift were visually apparent. There are three low areas with a slight depression that are used to collect any waste spills and rainwater. Any released tank contents or surface runoff will drain on top of the sloped concrete to the sump areas. The accumulated liquids are then removed and pumped out in accordance with the permit condition. The slab floor also serves as a foundation support for the tanks in this area.

   The concrete floor was removed and replaced in October of 1992. The floor was replaced in order to strengthen the foundation for the tank support.

2. Design Standards.

   Design drawings for the walls 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. The concrete floor and foundation were built in close adherence to the above mentioned codes. The floor as previously mentioned was removed and replaced.
3. Hazardous Characteristics of Wastes Stored

The wastes which are treated in the primary tank have the following characteristics:

Untreated waste pH (7 - 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 is coated with Concrete Protection System, Inc "OVERKOTE" Industrial flooring. For more information on this coating see Appendix H of this report.

5. Documented Age of The Containment Area

The secondary containment system was originally constructed and installed in 1987 however the floor was replaced in October 1992.

6. Result of Leak Tests

A visual inspection of the containment area was performed and from this inspection it was determined that there are no cracks or breaks in the impermeable coating. The area will be inspected on a daily basis checking for leaks from the primary tank.

7. Data Obtained

<table>
<thead>
<tr>
<th>Area</th>
<th>2509.85 s.f.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Height</td>
<td>2.62 ft. (Min.)</td>
</tr>
<tr>
<td>Material</td>
<td>Concrete</td>
</tr>
<tr>
<td>Gross Volume</td>
<td>6575.81 c.f.</td>
</tr>
<tr>
<td>Thickness</td>
<td>30&quot;</td>
</tr>
</tbody>
</table>

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 of each 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 of this report for detailed calculations of the available containment volume. The containment capacity available = 4900.54 c.f.

9. Required Volume

**Containment Capacity Required (CCR)**

CCR = Volume of Largest Tank in the secondary containment

Volume of Largest Tank = 4426.27 c.f. (CT1)

or 33,108 Gal.

10. Comparison of Available Volume to Required Volume

**Containment Capacity Comparison**

Containment Capacity Required = 4,426.27 c.f.
Secondary Containment Volume Available = 4,980.54 c.f.
Excess Containment Volume = 534.27 c.f.

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

D. CONCLUSIONS

1. Primary Tank Vessel

The primary tank vessel at the of inspection was fit for use with the proposed waste stream at the given densities, chemical and physical characteristics as verified by USPCI. The useful life of the steel tank would be estimated at 20 years if the proposed 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 is fit for use, with the proposed 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 20 years. This useful life was determined by using a design life of 20 years less the period that the system has been in use at the USPCI Lone Mountain Facility.

Page 202 - 5
E. RECOMMENDATIONS

The following repairs or modifications should be made:

1. Primary Tank

The tank should be internally inspected periodically to insure no corrosion is occurring. The tank should be checked yearly 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 conducted to detect any visual corrosion or defects.

2. Secondary Containment

The secondary containment should be checked periodically for any deterioration and structural integrity.

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. 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 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
APPENDIX A

Primary Tank Volume Calculations
SECTION 202 - APPENDIX A

CT3, Caustic Storage Tank No. 3

PRIMARY TANK VOLUME CALCULATIONS

DIMENSIONS:
Geometry: CYLINDRICAL
Diameter: 12.72 FEET
Max Height: 34.00 FEET
Normal Operating Height: 33.00 FEET
Cone Height: 2.42 FEET
Bottom Cone Diameter: 0.50 FEET
Cone Length: 6.60 FEET
Cone Volume: 106.53 C.F. or 796.83 Gal.

VOLUME CALCULATIONS

Max. Volume: 4426.27 C.F. or 33108.49 Gal.
Normal Operating Volume: 4299.22 C.F. or 32158.15 Gal.

MAXIMUM OPERATING TANK VOLUME = 4426.27 C.F. OR 33108.49 GAL

WEIGHT ON FOUNDATION

CONTENTS S.G.: 1.50
DENSITY: 93.60 LB/C.F.

SURFACE AREA CALCULATION

Tank Top = 127.05 S.F.
Tank Bottom Cone = 257.87 S.F.
Tank Wall= Cir*h = 1358.54 S.F.

TOTAL SURFACE AREA WALL AND TOP = 1743.47 S.F.

Steel Thickness=
   Sidewalls and Top 0.25 INCHES
   Cone 0.31 INCHES

Volume of Steel =
   Sidewalls 28.30 C.F.
   Top and bottom 10.02 C.F.

Density of Steel = 490.00 LB/C.F.
Weight of Steel = 9.39 TONS

WEIGHT OF TANK CONTENTS = 207.15 TONS

TOTAL WEIGHT OF TANK AND CONTENTS = 216.54 TONS
APPENDIX B
Primary Tank Wall Thickness Calculations
SECTION 202 - APPENDIX B

CT3, Caustic Storage Tank No. 3

PRIMARY TANK WALL THICKNESS

DIMENSIONS:
Geometry: CYLINDRICAL
Diameter: 12.72 FEET
Height: 34.00 FEET
Specific Gravity: 1.50
Normal Operating Temperature = ambient

STEEL THICKNESS CALCULATIONS @ BOTTOM RING

Thickness (t) = (2.6 * H * D * S.G.) / (s * E) + CA

s = Allowable Design Stress = 21000.00 PSI ***
E = Joint Efficiency = 85.00%
Thickness (t) = 0.0945 INCHES
Corrosion Allowance = 0.1250 INCHES
Calculated Req’d Wall thk. = 0.2195 INCHES

*** THIS DESIGN STRESS IS OBTAINED FROM API-650-88 WITH THE USE OF APPENDIX A.

CONE WALL THICKNESS CALCULATION

Cosine Alpha = \( \cos(67.6594) \) = 0.3801
P1 = Internal Pressure =

= Density * s.g. * (x + D/6 * cot(alpha)) = 3263.83 psi
P2= H*density*g = 3182.40 psi
To= top cone radius = 6.36 inches
Fb = Allowable stress = 23200 psi

The required wall thickness of the cone will be the greater of the following Formulas.

1. \( Ts=P1*To/2*cos(alpha)*Fb = 0.098 +1/8"C.A.= 0.223 \) in.

2. \( Ts=P2*D/cos(alpha)*Fb = 0.191 +1/8"C.A.= 0.316 \) in.
APPENDIX C

Structural Support Calculations
SECTION 202 - APPENDIX C

CT3, Caustic Storage Tank No.3

STRUCTURAL SUPPORT CALCULATIONS

<table>
<thead>
<tr>
<th>GIVEN:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank Diameter =</td>
<td>12.72 foot</td>
</tr>
<tr>
<td>Total Height =</td>
<td>40.00 foot</td>
</tr>
<tr>
<td>Weight of Tank =</td>
<td>18780.00 lbs</td>
</tr>
<tr>
<td>Weight of Mx. Contents =</td>
<td>414300.00 lbs</td>
</tr>
<tr>
<td>Tank Nominal Thickness =</td>
<td>0.25 in</td>
</tr>
</tbody>
</table>

---SEISMIC DESIGN CHECK---

ZONE COEFFICIENT (Z): 0.1875

ESSENTIAL FACILITIES FACTOR (I): 1.000

LATERAL EARTHQUAKE FORCE COEFF. (C1): 0.240

D/H: 0.287

k factor: 0.590

SITE Amplification Factor (S): 1.500

NATURAL PERIOD OF FIRST SLOSHING (T): 2.104

LATERAL EARTHQUAKE FORCE COEFF. (C2): 0.214

WEIGHT OF TANK SHELL (W₀): 18780.00 LBS

TOTAL WEIGHT OF TANK CONTENTS (W): 414300.00 LBS

W₁/W₀: 0.950

W₂/W₀: 0.050

WEIGHT OF EFFECTIVE MASS OF CONTENTS THAT MOVES IN UNISON WITH THE TANK SHELL (W₁): 393585.00 LBS

WEIGHT OF EFFECTIVE MASS IN FIRST SLOSHING (W₂): 20715.00 LBS

HT FROM BTM OF SHELL TO CENT. OF SHELL (X₀): 20.000 FEET

X₁/H: 0.500

HT FROM BTM TO CENT. OF LAT. SEISMIC FORCE (X₁): 20.000 FEET

X₂/H: 0.900

HT FROM BTM TO CENT. OF LAT. SEISMIC FORCE (X₂): 38.000 FEET
Note: All of the above calculations are based on API-650-68 Seismic Design Procedure (Appendix E).

CHECK STRESS IN TANK SHELL FROM SEISMIC FORCES:

\[ W_I = \text{MAXIMUM WEIGHT OF TANK CONTENTS THAT MAY BE USED TO RESIST THE SHELL OVERTURNING MOMENT} \]

\[ W_I = 7.9 * t_b * (F_y * G + H) ^ {0.5} \]

\[ t_b = \text{THK. OF BTM. PLATE UNDER SHELL:} \quad 0.250 \text{ IN} \]

\[ F_y = \text{MINIMUM YIELD STRENGTH OF BOTTOM PLATE:} \quad 9000.00 \text{ PSI} \]

\[ G = \text{DESIGN SPECIFIC GRAV. OF LIQUID:} \quad 1.50 \]

\[ W_I = 1451.32 \text{ LBS/FT OF SHELL CIRCUMFERENCE} \]

DENSITY OF TANK SHELL MATERIAL:

\[ \rho = 490.00 \text{ LBS/CF} \]

\[ W_T = \text{WEIGHT OF TANK SHELL AND THE PORTION OF FIXED ROOF SUPPORTED BY TANK SHELL:} \]

\[ W_T = 406.33 \text{ LBS/FT OF SHELL CIRCUMFERENCE} \]

\[ M/[(D^2(W_T+W_I)): \quad 1.3328 \]

\[ b = \text{MAXIMUM LONGITUDINAL COMRESSIVE FORCE AT THE BTM. OF TANK SHELL} \]

\[ b = W_T + 1.273 * M/D^2 \]

\[ b = 3563.57 \text{ LBS/FT OF SHELL} \]

\[ G * H * D^2/2/1.02; \quad 155326.46 \]

\[ F_a = \text{MINIMUM OF 10 * 8/D or F_y/2:} \quad 4500.00 \text{ PSI} \]

\[ F_y = \text{MINIMUM YIELD STRENGTH OF BTM. PLATE:} \quad 9000.00 \text{ PSI} \]

\[ \text{MAX. LONGITUDINAL COMPRESSIVE STRESS IN THE TANK SHELL} = b/12t = 1187.86 \text{ PSI} \]
CHECK OVERTURNING MOMENT FROM WIND PRESSURE

M must be Less Than or Equal To .65*(WD)/2
If M is Greater Than .65*(WD)/2 Anchor Bolts Would Be Required

Where:

W = Shell Weight Available To Resist Uplift (lbs)
D = Tank Diameter (feet)
M = Overturning Moment
M = Pw*Projected Area*H1
H1 = Height from ground to centroid of tank shell
Pw = Wind Pressure (18 psi for 100 MPH Wind on cylinders)

.65*(WD)/2: 78830.93 FT-LBS
M: 183169.00 FT-LBS

M > .65*(WD)/2 therefore anchor bolts are required

Number of Anchors: 12.00

Anchor Diameter: 1.25 inches
Dia. of Anchor Circle: 13.05 feet
tB = design tension load per anchor
tB: 3113.62 pounds

Allowable Load/Anchor: 24543.69 pounds
APPENDIX D

Containment Area Volume Calculations
**SECTION 202 - APPENDIX D**

CT3, Caustic Storage Tank No.3

**CONTAINMENT AREA No.8A VOLUME CALCULATIONS (CAUSTIC AREA)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>70.70 feet</td>
</tr>
<tr>
<td>Width</td>
<td>35.50 feet</td>
</tr>
<tr>
<td>Height</td>
<td>2.62 feet</td>
</tr>
<tr>
<td>Surface Area</td>
<td>2509.85 S.F.</td>
</tr>
</tbody>
</table>

Gross Volume = 

Volumes of items of Displacement **

1. Steel skirting = 9.17 C.F.

Total volume to deduct for items in containment area = 9.17 C.F.

**Subtraction for volume of rainfall**

Volume of rain = Area x depth of rainfall

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of rainfall</td>
<td>6.15 in.</td>
</tr>
<tr>
<td>Area</td>
<td>2509.85 S.F.</td>
</tr>
<tr>
<td>Volume</td>
<td>1286.30 C.F.</td>
</tr>
</tbody>
</table>

**TOTAL AVAILABLE VOLUME** = Gross Volume - Subtractions

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items of displacement</td>
<td>-9.17 C.F.</td>
</tr>
<tr>
<td>Volume of rainfall</td>
<td>-1286.30 C.F.</td>
</tr>
</tbody>
</table>

**TOTAL AVAILABLE VOLUME Area 8A** = 5280.34 C.F.

**CONTAINMENT AREA No.8c VOLUME CALCULATIONS (TRUCK PAD)**

This area will collect rain and deposit it into the caustic containment area (8a) when the valve is opened. This area does not contribute any volume for containment.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>52.00 feet</td>
</tr>
<tr>
<td>Width</td>
<td>12.00 feet</td>
</tr>
<tr>
<td>Surface Area</td>
<td>624.00 S.F.</td>
</tr>
</tbody>
</table>

**Subtraction for volume of rainfall**

Volume of rain = Area x depth of rainfall

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of rainfall</td>
<td>6.15 in.</td>
</tr>
<tr>
<td>Area</td>
<td>624.00 S.F.</td>
</tr>
<tr>
<td>Volume</td>
<td>319.80 C.F.</td>
</tr>
</tbody>
</table>
SUMMARY OF SECONDARY CONTAINMENT DATA

Surface Areas:

Caustic Area 8A = 2509.85 S.F.
Truck Unloading Pad 8C = 624.00 S.F.

Gross Volumes:

Caustic Area 8A = 6575.81 C.F.
Truck Unloading Pad 8C = 0.00 C.F.

Volume of displacements

Caustic Area 8A = 9.17 C.F.
Truck Unloading Pad 8C = 0.00 C.F.

Volume for 24hr rain:

Caustic Area 8A = 1266.30 C.F.
Truck Unloading Pad 8C = 319.80 C.F.

Total Gross Volume 8A = 6575.81 C.F.
Total Displacement Volumes = 9.17 C.F.
Total volume of Rain = 1606.10 C.F.

Containment Capacity Available (CCA) = 4980.54 C.F.

or

37104.83 GAL.
APPENDIX E

Foundation Design Analysis
SECTION 202 - APPENDIX E

CT3, Caustic Storage Tank No.3

FOUNDATION DESIGN ANALYSIS

ASSUMPTIONS:

\[
\begin{align*}
&f'c = 4.00 \text{ KSI} \\
&f_y = 60.00 \text{ KSI} \\
&\text{Allowable Soil Press.} = 2.20 \text{ KSI} \\
&\text{Structural Steel} = \text{A36}
\end{align*}
\]

GIVEN:

\[
\begin{align*}
&\text{Tank Diameter} = 12.72 \text{ feet} \\
&\text{Sidewall Height} = 40.00 \text{ feet} \\
&\text{Weight of Tank (Shell)} = 18750.00 \text{ lbs} \\
&\text{Weight of Max. Contents} = 414300.00 \text{ lbs}
\end{align*}
\]

Tank is resting on a concrete foundation.

CHECK CONCRETE FOUNDATION DESIGN:

\[
\begin{align*}
&\text{Assume Footing Depth} = 30.00 \text{ inches} \\
&\text{Assume Footing Width} = 30.00 \text{ inches} \\
&\text{Assumed Effective Soil Press.} = 1925.00 \text{ psf}
\end{align*}
\]

Lock at what is resisting overturning moment from seismic load:

\[
b = \frac{3563.57}{\text{circ.}} \\
\text{Where } b \text{ is the maximum shell compression at the bottom of the shell.}
\]

If the footing is then the actual applied pressure to the subgrade is

\[
30.00 \text{ inches wide} \quad 1425.43 \text{ lb/sf}
\]

This is less than the effective soil pressure.
APPENDIX F

MANUFACTURERS DATA, MILL TEST REPORTS, RADIOGRAPHIC REPORTS
CERTIFICATION TO OWNER OF COMPLIANCE WITH API 650-88

To: USPCI LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

To Whom It May Concern:

Scott Manufacturing, Inc. hereby certifies that the tank(s) constructed for you at SCOTT MANUFACTURING, INC. WOLFFORTH, TEXAS
and described as follows: (4) 12'75' diameter by 40' shell height

Caustic Storage Tanks, Serial Numbers 451-1, 2, 3, 84

has/have been designed, fabricated, erected, and inspected in accordance with all of the requirements of the American Petroleum Institute Standard 650-88 entitled, "Welded Steel Tanks for Oil Storage" and that the results of all such inspections, radiographs, and other tests indicate that the tanks(s) fully complies/comply with all of the requirements. We further certify that all materials meet specifications.

SCOTT MANUFACTURING, INC.

By

WILLIAM A. ROSS
MANAGER/HEAVY CONSTRUCTION

TITLE
23 OCTOBER 1992
Date

CITY OF LUBBOCK
STATE OF TEXAS

Acknowledged and sworn to before me this 23rd day of October, 1992:

Notary Public
USPC 1, WANDOVA, D.K.

12.72' x 10' (overall)

\[ T_0 = \frac{\pi}{2} \left( \frac{1}{2} \right)^2 \left( \frac{1}{2} \right)^2 \left( \frac{\pi}{12} \right) \]

\[ = \frac{2.41 \times 10^3}{2} \left( \frac{12.72}{6} \right) \left( 33 + \frac{12.72}{6} \right) = 67.50 \text{ ft}^2 \]

\[ = 12.12 (127) \left( 33.87 \right) \]

\[ 24,523 \text{ lb/ft} \div 12 \]

\[ 220,214 \text{ lb/in} \div 23,200 \text{ lb/in}^2 \]

\[ 0.09527'' + 0.125'' \]

\[ 0.2203 \text{ in} = \frac{1}{4} \text{ in} \]

\[ T_0 = 24,523 \text{ lb/ft} \div 12 \]

\[ 7,302,80 \text{ lb/in} \div 23,200 \text{ lb/in}^2 \]

\[ 0.1856'' + 0.125'' \]

\[ 0.3106'' \text{ in} \]

\[ 0.3106'' \text{ in} \]

\[ C = \frac{\pi}{6} \left( \frac{12.72}{6} \right) \left( 33 + \frac{12.72}{6} \right) \left( \frac{\pi}{12} \right) \]

\[ = 11.70 \left( 33.87 \right) 393.71 \text{ in} \]

\[ = 156,025 \text{ lb} \div 23,200 \text{ lb/in} \]

\[ = 6.725 \text{ in}^2 \]

\[ A_{\text{eff}} = 0.78 \left( \frac{13.75 + 0.25 \sqrt{13.75 \times 0.25} + 0.25 \sqrt{13.75 \times 0.25}}{0.8131 \text{ in}^2} \right) \]

\[ = 1.052 \text{ in}^2 \]
\[
A_{\text{eff(max)}} = 16 \left( t_1^2 + t_2^2 + t_3^2 \right) \\
= 16 \left( 0.25^2 + 3.75^2 + 0.25^2 \right) \\
= \frac{3.56250 \text{ in}^2}{2.5625} > 1.05927 \text{ in}^2 \text{ max. smaller} \\
= \text{ max. 1.05927 in}^2 \\
(0.8131)
\]

\[
6.7252^2 - 1.05927 = 5.666 \text{ in}^2 \\
(6.7252 - 0.8131 = 5.9121) \text{ in}^2
\]
USPC 1, WAYNOH, OK

12.75' x 40' (O.D.) Contents: Caustic Liquid, S.G. 1.5, API 650

Corrosion Allowance - 1/8" Thickness By 1 Foot Method

\[
\frac{2.6 (12.75)(40-1) 1.5}{25,200} + .125 = 0.02086" \text{ in. } \frac{1}{4}" A
\]

Louis D. Wood, Jr.

STATE OF TEXAS

LOUIS D. WOOD, JR.
60815

PROFESSIONAL ENGINEER

10/17/92
SUNBELT TRADING COMPANY, Inc.

To: Scott 1779

Attn: Wayne

REF: CUSTOMER'S P.O. NO. 27158
     S.T.C.'s RELEASE NO. 2994
     S.T.C.'s INVOICE NO. 010435

ATTACHED PLEASE FIND MILL TEST CERTIFICATES FOR YOUR ABOVE REFERENCED PURCHASE ORDER FOR THE FOLLOWING MATERIAL.

See Below

THANKS AND REGARDS,

Stacey

enclosure

20 pcs: 1/4 x 96 x 480 A-36 Plate
4 pcs  1/4 x 96 x 240 A-36 Plate
6 pcs  5/16 x 96 x 240 A-36 Plate
4 pcs  1/4 x 96 x 240 Floor Plate
### CERTIFICAT D'USINE DIN 50049/2.2

**FORGES DE CLABECQ**

**CERTIFICAT D'USINE DIN 50049/2.2**

**PLATEAUX-BELGIQ/PLATES**

**SUNBET TRADING COMPANY INC.**

**1990 POST OAK BLVD., #1550**

**US-HOUSTON-TX 77054-3813 (USA)**

**IDENTIFICATION DU PRODUIT**

<table>
<thead>
<tr>
<th>N° SERIE</th>
<th>N° COLLÉE</th>
<th>BASE</th>
<th>ÉPAISSEUR</th>
<th>LARG.</th>
<th>LONG.</th>
<th>IDENTIFICATION DU PRODUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>292080</td>
<td>34</td>
<td>1&quot;5/16</td>
<td>96&quot;</td>
<td>240</td>
<td>T</td>
<td>(kg)</td>
</tr>
<tr>
<td>292085</td>
<td>35</td>
<td>0&quot;3/8</td>
<td>96&quot;</td>
<td>240</td>
<td>T</td>
<td>(kg)</td>
</tr>
<tr>
<td>292086</td>
<td>35</td>
<td>0&quot;3/8</td>
<td>96&quot;</td>
<td>240</td>
<td>T</td>
<td>(kg)</td>
</tr>
<tr>
<td>292083</td>
<td>36</td>
<td>0&quot;3/8</td>
<td>96&quot;</td>
<td>480</td>
<td>T</td>
<td>(kg)</td>
</tr>
<tr>
<td>292085</td>
<td>36</td>
<td>0&quot;3/8</td>
<td>96&quot;</td>
<td>480</td>
<td>T</td>
<td>(kg)</td>
</tr>
</tbody>
</table>

**TRACTION - TÊTUATION - TOUCHE TEST**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>TOP</th>
<th>RE</th>
<th>A1</th>
<th>A2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RESISTANCE À LA DÉFORMATION**

<table>
<thead>
<tr>
<th>TOP</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SERVICE METALLURGIQUE**

**CLABECQ, le 10/07/92**
### Certificat d'Usine DIN 50843/2.2

**FORGES DE CLABECQ**  
1990 POST OAK BLVD., #1550  
US-HOUSTON-TEXAS 77036-5813 (USA)  
11.653

<table>
<thead>
<tr>
<th>Identification du produit</th>
<th>Forgerie de tubes</th>
<th>Dimension du tube</th>
<th>Matériau</th>
<th>Caractéristiques</th>
<th>Test</th>
<th>Echantillon</th>
<th>Référence</th>
<th>Description</th>
<th>V°</th>
<th>V°</th>
<th>L</th>
<th>M %</th>
</tr>
</thead>
<tbody>
<tr>
<td>290634</td>
<td>2</td>
<td>0&quot;1/4</td>
<td>96°</td>
<td>480°</td>
<td>T</td>
<td>204</td>
<td>ASTM A36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>290635</td>
<td>2</td>
<td>0&quot;1/4</td>
<td>96°</td>
<td>480°</td>
<td>T</td>
<td>204</td>
<td>ASTM A36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>290638</td>
<td>2</td>
<td>0&quot;1/4</td>
<td>96°</td>
<td>480°</td>
<td>T</td>
<td>204</td>
<td>ASTM A36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>289231</td>
<td>2</td>
<td>2&quot;</td>
<td>95°</td>
<td>480°</td>
<td>T</td>
<td>204</td>
<td>ASTM A36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Service Metallurgique

Contrôle de surface d'aspect et de dimension de saturation de la surface d'aspect de la surface d'aspect.

CLABECQ, le 29/05/92

---

**Notes:**
- **D/Y:** Diamètre / Longueur
- **CC:** Contrôle de la surface d'aspect
- **CE:** Certificat d'Usine DIN 50843/2.2
- **CS:** Caractéristiques du matériau

Les résultats des essais sont conformes aux prescriptions de la norme ASTM A36 et les contrôles de la surface d'aspect sont conformes aux prescriptions de la norme CS.
O'NEAL STEEL, INC.
P.O. BOX 90

DAYSHEMIIIIAG 35201

LUDNOCK TX 3035

CHAPARRAL STEEL
MIDLOTHIAN 76065
300 WARD RD.
(214) 775-8241

CERTIFIED MATERIAL TEST REPORT

OWNER PURCHASE ORDER NUMBER |
DATE | QUANTITY | DESCRIPTION | LEN|
---|---|---|---|
04616 | 8-JUN-92 | 4.68 | W 4 X 13# |

TED ACCORDING TO |
SIZE | GRADE | PRODUCT | HEAT |
---|---|---|---|
STN A6-90A | W 4 X 13# | A36/A57250 | HP BEAMS |
16-90 | 9-9769 |
| | | |

CHEMICAL ANALYSIS

<table>
<thead>
<tr>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cr</th>
<th>Ni</th>
<th>Cl</th>
<th>Mo</th>
<th>V</th>
<th>Nb</th>
</tr>
</thead>
<tbody>
<tr>
<td>.12</td>
<td>.007</td>
<td>.014</td>
<td>.050</td>
<td>.26</td>
<td>.57</td>
<td>.14</td>
<td>.06</td>
<td>.028</td>
<td>0.000</td>
</tr>
</tbody>
</table>

PHYSICAL PROPERTIES

<table>
<thead>
<tr>
<th>ELONGATION</th>
<th>SPECIMEN AREA</th>
<th>REDUCTION OF AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>77.7</td>
<td>3.727</td>
<td>43.5</td>
</tr>
<tr>
<td>88.0</td>
<td>3.727</td>
<td>39.0</td>
</tr>
</tbody>
</table>

hereby certify that the contents of this report are correct and accurate. All test results and operations performed by this mill manufacturer are in compliance with the requirements of the material specification, and when designated by the purchaser meet applicable material requirements of section III of the A.S.M.E. Boiler and Pressure Vessel Code.

Signed: 
Tom L. Harrington - Quality Assurance Manager

Notarized on request only

O'NEAL STEEL INC.
P.O. BOX 5495
LUDNOCK TX 79417

ALL MANUFACTURING PROCESSES OF THE STEEL MATERIALS IN THIS PRODUCT, INCLUDING SMELTING, HAVE OCCURRED WITHIN THE UNITED STATES IN COMPLIANCE WITH THE "BUY AMERICA" PROVISION OF THE SURFACE TRANSPORTATION
<table>
<thead>
<tr>
<th>CUSTOMER ORDER NO.</th>
<th>DESCRIPTION</th>
<th>HEAT NUMBER</th>
<th>TENSION STRENGTH</th>
<th>TENSION STRENGTH</th>
<th>TENSION STRENGTH</th>
<th>CHEMICAL ANALYSIS-%</th>
</tr>
</thead>
<tbody>
<tr>
<td>05 Z-1725 FLATLS, 0.3750&quot;X 2.0000&quot; A36-90</td>
<td>8 20&quot;00&quot;, 5000# BUNDLE</td>
<td>49690</td>
<td>52.0</td>
<td>73.3</td>
<td>30.0</td>
<td>C Mn P S iSi Cu Ni Cr Mo V Nb</td>
</tr>
</tbody>
</table>

To and subscribed to before me this _______________ day

I certify the above results of tests and/or analyses to be correct as contained in the records of Atlantic Steel Company.
<table>
<thead>
<tr>
<th>SIZE</th>
<th>GRADE</th>
<th>SPECIFICATION</th>
<th>SO. NO.</th>
<th>CUST. P.O. NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>17/4</td>
<td>36</td>
<td>ASME-SA36</td>
<td>7-17424</td>
<td></td>
</tr>
<tr>
<td>2 X 2 X 3/8 A36</td>
<td>ASME-SA36</td>
<td>7-08587</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2535</td>
<td>15</td>
<td>69.01</td>
<td>205</td>
<td></td>
</tr>
<tr>
<td>2 X 2 X 3/8 A36</td>
<td>ASME-SA36</td>
<td>7-08587</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2525</td>
<td>15</td>
<td>69.01</td>
<td>205</td>
<td></td>
</tr>
</tbody>
</table>

IS MATERIAL INCLUDING THE BILLET, PRODUCED AND MANUFACTURED IN THE UNITED STATES OF AMERICA.

A. J. TURNER
QUALITY ASSURANCE MGR.
MILL GROUP

WE HEREBY CERTIFY THAT THE ABOVE FIGURES ARE CORRECT AS CONTAINED IN THE RECORDS OF THE COMPANY.
## Chemical and Physical Test Report

### O'Neal Steel Inc.

**Address:**
- Box 2623
- P.O. Box 2623
- Birmingham, TX 75202-26

**INVOICE:**

**SHIP DATE:**
- 69-17-92

**CUST. ACCOUNT NO.:**
- 19528-1-03-78

**CUST. P.O. NUMBER:**

**SEND DEF.**

**SPECIFICATION:**
- ASME-SA36

**S. NO.:**

**CUST. P.O. NUMBER:**

### Table:

<table>
<thead>
<tr>
<th>HEAT ID NO.</th>
<th>C</th>
<th>MIN</th>
<th>P</th>
<th>S</th>
<th>V</th>
<th>SI</th>
<th>CR</th>
<th>CU</th>
<th>NI</th>
<th>SN</th>
<th>AL</th>
<th>MO</th>
</tr>
</thead>
<tbody>
<tr>
<td>2786:115</td>
<td>1.15</td>
<td>0.00</td>
<td>0.04</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
</tr>
<tr>
<td>2788:115</td>
<td>1.15</td>
<td>0.00</td>
<td>0.04</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
</tr>
<tr>
<td>2526:112</td>
<td>1.12</td>
<td>0.69</td>
<td>0.02</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
</tr>
<tr>
<td>2526:112</td>
<td>1.69</td>
<td>0.02</td>
<td>0.04</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
</tr>
<tr>
<td>3508:115</td>
<td>1.15</td>
<td>0.81</td>
<td>0.04</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
</tr>
<tr>
<td>2488:113</td>
<td>1.13</td>
<td>0.69</td>
<td>0.02</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
</tr>
<tr>
<td>2488:113</td>
<td>1.69</td>
<td>0.02</td>
<td>0.04</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
<td>0.01</td>
<td>0.70</td>
</tr>
</tbody>
</table>

### Certification:

**His material, including the billets, as produced and manufactured in the United States of America.**

**Quality Assurance Mgr.:**

**MILL GROUP:**

---

We hereby certify that the above figures are correct as contained in the records of the company.
# Certified Test Report

**Certifying Statement:**

We hereby certify that the following data is a true copy from tests performed in our laboratory.

**Signature:**

DAN SCHACHT

Date: 8/7/92

---

## Table: Test Results

<table>
<thead>
<tr>
<th>Heat No.</th>
<th>Section</th>
<th>Specification</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cu</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>Cb</th>
<th>V</th>
<th>Al</th>
</tr>
</thead>
<tbody>
<tr>
<td>.391</td>
<td>AU 2.5x2x1/4</td>
<td>ASTM A36-E9</td>
<td>.15</td>
<td>.07</td>
<td>.024</td>
<td>.036</td>
<td>.16</td>
<td>.10</td>
<td>.24</td>
<td>.17</td>
<td>.039</td>
<td>.000</td>
<td>.0040</td>
<td>.003</td>
</tr>
<tr>
<td>'196</td>
<td>CH 6x10.5</td>
<td>ASTM A36-E9</td>
<td>.17</td>
<td>.08</td>
<td>.009</td>
<td>.031</td>
<td>.26</td>
<td>.37</td>
<td>.23</td>
<td>.23</td>
<td>.049</td>
<td>.004</td>
<td>.0020</td>
<td>.001</td>
</tr>
<tr>
<td>7624</td>
<td>SQ 3/4</td>
<td>ASTM A36-E9</td>
<td>.16</td>
<td>.08</td>
<td>.009</td>
<td>.033</td>
<td>.17</td>
<td>.50</td>
<td>.11</td>
<td>.23</td>
<td>.053</td>
<td>.000</td>
<td>.0020</td>
<td></td>
</tr>
<tr>
<td>7625</td>
<td>SQ 3/4</td>
<td>ASTM A36-E9</td>
<td>.15</td>
<td>.07</td>
<td>.006</td>
<td>.028</td>
<td>.19</td>
<td>.46</td>
<td>.10</td>
<td>.22</td>
<td>.054</td>
<td>.000</td>
<td>.0020</td>
<td></td>
</tr>
<tr>
<td>'196</td>
<td>CH 6x10.5</td>
<td>ASTM A36-E9</td>
<td>.17</td>
<td>.08</td>
<td>.009</td>
<td>.031</td>
<td>.26</td>
<td>.37</td>
<td>.23</td>
<td>.23</td>
<td>.049</td>
<td>.004</td>
<td>.0020</td>
<td>.001</td>
</tr>
<tr>
<td>1476</td>
<td>#8 Rebar</td>
<td>ASTM A615-B9 Grade 60</td>
<td>.42</td>
<td>.09</td>
<td>.008</td>
<td>.032</td>
<td>.23</td>
<td>.42</td>
<td>.08</td>
<td>.17</td>
<td>.041</td>
<td>.013</td>
<td>.0020</td>
<td>.002</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Heat No.</th>
<th>Test No.</th>
<th>Yield</th>
<th>Tensile</th>
<th>Bend</th>
<th>Date Rolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>1391</td>
<td>1</td>
<td>52100</td>
<td>74800</td>
<td>30.0</td>
<td>06/25/92</td>
</tr>
<tr>
<td>7196</td>
<td>1</td>
<td>51800</td>
<td>74400</td>
<td>39.0</td>
<td>08/28/91</td>
</tr>
<tr>
<td>9624</td>
<td>1</td>
<td>51500</td>
<td>73500</td>
<td>22.0</td>
<td>01/10/92</td>
</tr>
<tr>
<td>9625</td>
<td>1</td>
<td>51500</td>
<td>73500</td>
<td>22.0</td>
<td>01/10/92</td>
</tr>
<tr>
<td>7194</td>
<td>1</td>
<td>51800</td>
<td>74400</td>
<td>39.0</td>
<td>08/28/91</td>
</tr>
<tr>
<td>1476</td>
<td>1</td>
<td>69000</td>
<td>106300</td>
<td>12.0</td>
<td>06/26/92</td>
</tr>
</tbody>
</table>

**Remarks:**

F.O. 2-16/17: 2-1947/7: 2-19076: 2-57945 & BZ-42393

This steel is melted & manufactured in the USA.
<table>
<thead>
<tr>
<th>VOICE</th>
<th>CUSTOMER ORDER NO.</th>
<th>DESCRIPTION</th>
<th>HEAT NUMBER</th>
<th>YIELD STRENGTH</th>
<th>TENSILE STRENGTH</th>
<th>CLOVIS &amp; GAGE</th>
<th>BOND TEST</th>
<th>CHEMICAL ANALYSIS - %</th>
</tr>
</thead>
<tbody>
<tr>
<td>36447</td>
<td>0779</td>
<td>FLATS, 0.2500&quot; X 4.0000&quot; 55 KSI 20' 00&quot;, 5000# STACKED BUNDLE</td>
<td>48832</td>
<td>65.6</td>
<td>87.6</td>
<td>28.0</td>
<td>20</td>
<td>0.17</td>
</tr>
<tr>
<td>701</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.22</td>
</tr>
</tbody>
</table>

MATERIAL MELTED AND MANUFACTURED IN THE USA

Z-87978

I CERTIFY THE ABOVE RESULTS OF TEST AND/OR ANALYSES TO BE CORRECT AS CONTAINED IN THE RECORDS OF ATLANTIC STEEL COMPANY.
<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>DESCRIPTION</th>
<th>YIELD P.S.I.</th>
<th>TENSILE P.S.I.</th>
<th>ELONG.</th>
<th>BEND</th>
<th>C</th>
<th>Ni</th>
<th>Mn</th>
<th>Mo</th>
<th>V</th>
<th>Si</th>
<th>Cr</th>
<th>Ni</th>
<th>PA</th>
<th>BA</th>
<th>C.E</th>
</tr>
</thead>
<tbody>
<tr>
<td>559213668</td>
<td>1/4 x 3&quot; F1 20' (A36)</td>
<td>50,500</td>
<td>71,500</td>
<td>25.0</td>
<td>OK</td>
<td>-4.9</td>
<td>.15</td>
<td>.702</td>
<td>.014</td>
<td>.035</td>
<td>.16</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASTM A36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>559213692</td>
<td>1/4 x 4&quot; F1 20' (A36)</td>
<td>45,800</td>
<td>65,900</td>
<td>28.0</td>
<td>OK</td>
<td>-4.3</td>
<td>.15</td>
<td>.600</td>
<td>.010</td>
<td>.038</td>
<td>.19</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASTM A36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>559310572</td>
<td>1/2 x 3&quot; F1 20' (A36)</td>
<td>45,700</td>
<td>68,700</td>
<td>31.0</td>
<td>OK</td>
<td>-2.9</td>
<td>.14</td>
<td>.650</td>
<td>.021</td>
<td>.036</td>
<td>.11</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASTM A36-91</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>559310573</td>
<td>1/2 x 3&quot; F1 20' (A36)</td>
<td>46,300</td>
<td>67,600</td>
<td>33.0</td>
<td>OK</td>
<td>-2.8</td>
<td>.15</td>
<td>.720</td>
<td>.018</td>
<td>.036</td>
<td>.15</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CERTIFIED MILL TEST REPORT

DATE: 08/18/92
JACKSON, MS STEEL DIV
FOURTH STREET OFF FLOWOOD DR.
JACKSON MS 36613

LOAD NO.: 84- 18261

PO: X-119006  Y-17704  Z-70833

RECON'D ONEAL STEEL
DALLAS
AUG 19 1992
ORIGINAL
<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>DESCRIPTION</th>
<th>PHYSICAL TESTS</th>
<th>CHEMICAL TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>9215924</td>
<td>1/4x2&quot; F1 20' (A36)</td>
<td>YIELD 44,400</td>
<td>C 1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TENSILE 65,400</td>
<td>Mo 0.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ELONG 25.0</td>
<td>Ni 0.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BEND</td>
<td>Cr 0.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>P 0.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Si 0.15</td>
</tr>
<tr>
<td>9318382</td>
<td>3/4&quot; Rd 20' (A36)</td>
<td>YIELD 50,000</td>
<td>C 1.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TENSILE 74,030</td>
<td>Mo 0.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ELONG 20.0</td>
<td>Ni 0.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BEND</td>
<td>Cr 0.29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>P 0.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Si 0.17</td>
</tr>
<tr>
<td>ORDER NO.</td>
<td>DESCRIPTION</td>
<td>HEAT NUMBER</td>
<td>YIELD STRENGTH (KSI)</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>-------------</td>
<td>----------------------</td>
</tr>
<tr>
<td></td>
<td>FLATS, 0.7500&quot; X 4.0000&quot;</td>
<td>167-02783</td>
<td>60.0</td>
</tr>
<tr>
<td></td>
<td>20'00&quot;, 9000# STACKED BUND</td>
<td>48782</td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL MELTED AND MANUFACTURED IN THE USA**

I CERTIFY THE ABOVE RESULTS OF TESTS AND/OR ANALYSES TO BE CORRECT AS CONTAINED IN THE RECORDS OF ATLANTIC STEEL COMPANY.
<table>
<thead>
<tr>
<th>AT</th>
<th>SECTION</th>
<th>SPECIFICATION</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cu</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>Cb</th>
<th>V</th>
<th>Al</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>AE 2.5X1/4</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>.78</td>
<td>.005</td>
<td>.034</td>
<td>.24</td>
<td>.46</td>
<td>.012</td>
<td>.17</td>
<td>.037</td>
<td>.000</td>
<td>.0020</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>AE 2X3/8</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>.85</td>
<td>.008</td>
<td>.029</td>
<td>.25</td>
<td>.38</td>
<td>.019</td>
<td>.17</td>
<td>.052</td>
<td>.000</td>
<td>.0040</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>FL 3/4X6</td>
<td>A36 MODIFIED</td>
<td>.21</td>
<td>.83</td>
<td>.009</td>
<td>.042</td>
<td>.23</td>
<td>.41</td>
<td>.011</td>
<td>.18</td>
<td>.035</td>
<td>.004</td>
<td>.0020</td>
<td>.001</td>
</tr>
<tr>
<td>94</td>
<td>FL' 3/4X6</td>
<td>A36 MODIFIED</td>
<td>.21</td>
<td>.50</td>
<td>.009</td>
<td>.034</td>
<td>.22</td>
<td>.43</td>
<td>.016</td>
<td>.17</td>
<td>.037</td>
<td>.001</td>
<td>.0040</td>
<td>.001</td>
</tr>
<tr>
<td>75</td>
<td>AE 2X1/4</td>
<td>ASTM A36-89</td>
<td>.13</td>
<td>.87</td>
<td>.012</td>
<td>.029</td>
<td>.26</td>
<td>.60</td>
<td>.018</td>
<td>.21</td>
<td>.051</td>
<td>.000</td>
<td>.0020</td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>AE 2X1/4</td>
<td>ASTM A36-89</td>
<td>.14</td>
<td>.80</td>
<td>.008</td>
<td>.029</td>
<td>.26</td>
<td>.47</td>
<td>.012</td>
<td>.17</td>
<td>.046</td>
<td>.000</td>
<td>.0040</td>
<td>.001</td>
</tr>
<tr>
<td>05</td>
<td>FL 3/4X5</td>
<td>A36 MODIFIED</td>
<td>.22</td>
<td>.80</td>
<td>.007</td>
<td>.030</td>
<td>.23</td>
<td>.47</td>
<td>.013</td>
<td>.17</td>
<td>.041</td>
<td>.004</td>
<td>.0040</td>
<td>.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AT</th>
<th>Test No.</th>
<th>YIELD PSI</th>
<th>TENSILE PSI</th>
<th>WELDING IN S&quot;</th>
<th>BEND</th>
<th>LFT.</th>
<th>DATE ROLLED MM-DD-YY</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>1</td>
<td>52900</td>
<td>73100</td>
<td>31.0</td>
<td>4.045</td>
<td>11/16/91</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>1</td>
<td>51400</td>
<td>75000</td>
<td>30.0</td>
<td>4.560</td>
<td>10/19/91</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>1</td>
<td>52200</td>
<td>79400</td>
<td>25.0</td>
<td>15.150</td>
<td>04/27/91</td>
<td></td>
</tr>
<tr>
<td>94</td>
<td>1</td>
<td>51200</td>
<td>80000</td>
<td>25.0</td>
<td>15.200</td>
<td>08/18/91</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>1</td>
<td>45800</td>
<td>72900</td>
<td>32.0</td>
<td>-3.150</td>
<td>10/20/91</td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>1</td>
<td>51200</td>
<td>72700</td>
<td>30.0</td>
<td>3.140</td>
<td>10/20/91</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>1</td>
<td>54400</td>
<td>61300</td>
<td>26.0</td>
<td>12.590</td>
<td>08/20/91</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:** THIS STEEL IS MELTED & MANUFACTURED IN THE USA

**CERTIFIED TEST REPORT**

The following tests conform to the requirements of the specifications listed.

DAN SCHACHT 
12/19/91 
QUALITY CONTROL MANAGER
# Certificate Test Report

The following tests conform to the requirements of the specifications listed.

## Heat No. | Section | Specification | C | Mn | P | S | Si | Cu | Cr | Ni | Mo | V | Al
---|---|---|---|---|---|---|---|---|---|---|---|---|---
39511 | AU 2X1.5X3/16 | ASTM A36-B9 | .15 | .03 | .13 | .16 | .11 | .15 | .036 | .000 | .020 |
31017 | AE 2X1/8 | ASTM A36-B9 | .15 | .06 | .17 | .36 | .12 | .011 | .020 | .001 | .002 |
31056 | AE 2X1/8 | ASTM A36-B9 | .15 | .085 | .029 | .36 | .17 | .052 | .000 | .001 | .020 |
89202 | AE 2X3/8 | ASTM A36-B9 | .19 | .074 | .033 | .51 | .046 | .046 | .000 | .000 | .001 |
00195 | AE 2.5X3/8 | ASTM A36-B9 | .15 | .073 | .023 | .52 | .12 | .014 | .046 | .000 | .020 |
00222 | AE 2.5X1/4 | ASTM A36-B9 | .15 | .067 | .027 | .53 | .12 | .014 | .046 | .000 | .020 |

## Test Results

<table>
<thead>
<tr>
<th>Heat No.</th>
<th>Test No.</th>
<th>Yield</th>
<th>Tensile</th>
<th>% elong. in % bend</th>
<th>LB/FT</th>
<th>Date rolled</th>
</tr>
</thead>
</table>
89511 | 1 | 49800 | 71200 | 27.0 | 2.060 | 01/02/92 |
K1017 | 1 | 55300 | 73800 | 29.5 | 1.440 | 01/26/92 |
K1056 | 1 | 53700 | 71900 | 24.0 | 1.650 | 01/01/92 |
89202 | 1 | 51400 | 75000 | 30.0 | 1.450 | 04/21/92 |
00195 | 1 | 54200 | 75200 | 30.0 | 5.030 | 04/21/92 |
00222 | 1 | 54000 | 77300 | 32.0 | 4.050 | 04/21/92 |

REMARKS: THIS STEEL IS TELLED & MANUFACTURED IN THE USA

**Signature:**

DAN SCHACHT 4/29/92

QUALITY CONTROL MANAGER

*Handwritten notes:*

- Patch 27310
- Work 41210
### Physical Properties

<table>
<thead>
<tr>
<th>Tube Dimension</th>
<th>Yield Point</th>
<th>U.T.S.</th>
<th>Elongation</th>
<th>Heat No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot; X 0.375</td>
<td>52017</td>
<td>66394</td>
<td>10</td>
<td>2493</td>
</tr>
<tr>
<td>10&quot; X 0.275</td>
<td>57736</td>
<td>72931</td>
<td>22</td>
<td>2485</td>
</tr>
<tr>
<td>18&quot; X 0.375</td>
<td>59167</td>
<td>74195</td>
<td>23</td>
<td>2486</td>
</tr>
<tr>
<td>16&quot; X 0.375</td>
<td>56964</td>
<td>70712</td>
<td>37</td>
<td>2488</td>
</tr>
<tr>
<td>16&quot; X 0.375</td>
<td>57206</td>
<td>72827</td>
<td>37</td>
<td>2489</td>
</tr>
<tr>
<td>18&quot; X 0.375</td>
<td>52208</td>
<td>61462</td>
<td>31</td>
<td>2490</td>
</tr>
<tr>
<td>10&quot; X 0.375</td>
<td>56742</td>
<td>76653</td>
<td>33</td>
<td>2491</td>
</tr>
<tr>
<td>10&quot; X 0.375</td>
<td>53391</td>
<td>65466</td>
<td>30</td>
<td>2492</td>
</tr>
<tr>
<td>18&quot; X 0.375</td>
<td>62406</td>
<td>76499</td>
<td>35</td>
<td>2493</td>
</tr>
<tr>
<td>18&quot; X 0.375</td>
<td>50829</td>
<td>73783</td>
<td>35</td>
<td>2494</td>
</tr>
</tbody>
</table>

RAMLA, 23/04/89
**CHEMICAL ANALYSIS**

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>% C</th>
<th>% MN.</th>
<th>% SI.</th>
<th>% P</th>
<th>% S</th>
<th>AL%</th>
<th>HEAT NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot; X 0.375</td>
<td>0.160</td>
<td>0.710</td>
<td>0.160</td>
<td>0.014</td>
<td>0.012</td>
<td>0.004</td>
<td>2483</td>
</tr>
<tr>
<td>3&quot; X 0.375</td>
<td>0.160</td>
<td>0.760</td>
<td>0.270</td>
<td>0.014</td>
<td>0.013</td>
<td>0.006</td>
<td>2485</td>
</tr>
<tr>
<td>3&quot; X 0.375</td>
<td>0.160</td>
<td>0.780</td>
<td>0.250</td>
<td>0.013</td>
<td>0.015</td>
<td>0.005</td>
<td>2486</td>
</tr>
<tr>
<td>3&quot; X 0.375</td>
<td>0.140</td>
<td>0.640</td>
<td>0.200</td>
<td>0.008</td>
<td>0.021</td>
<td>0.005</td>
<td>2488</td>
</tr>
<tr>
<td>3&quot; X 0.375</td>
<td>0.160</td>
<td>0.690</td>
<td>0.270</td>
<td>0.008</td>
<td>0.025</td>
<td>0.005</td>
<td>2489</td>
</tr>
<tr>
<td>3&quot; X 0.375</td>
<td>0.160</td>
<td>0.730</td>
<td>0.210</td>
<td>0.006</td>
<td>0.027</td>
<td>0.005</td>
<td>2490</td>
</tr>
<tr>
<td>3&quot; X 0.375</td>
<td>0.160</td>
<td>0.740</td>
<td>0.200</td>
<td>0.008</td>
<td>0.021</td>
<td>0.005</td>
<td>2492</td>
</tr>
<tr>
<td>3&quot; X 0.375</td>
<td>0.160</td>
<td>0.770</td>
<td>0.240</td>
<td>0.015</td>
<td>0.016</td>
<td>0.012</td>
<td>2493</td>
</tr>
</tbody>
</table>

RAMLA, 23/04/89
**Mill Certificate No. 1937/00**

**Test P/D: 1490**

<table>
<thead>
<tr>
<th>ER.</th>
<th>WALL THICK.</th>
<th>KG/ MTR</th>
<th>LENGTH MTR</th>
<th>LENGTH FT'</th>
<th>TOTAL M. TON</th>
<th>PIECES</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>105.100</td>
<td>3150.36</td>
<td>1033.33</td>
<td>325.742</td>
<td>246 RED+RED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>105.100</td>
<td>249.24</td>
<td>883.30</td>
<td>27.948</td>
<td>23 GREEN+GREEN</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

02/04/09

---

**Middle East Tube Co. Ltd.**

**Import/Export Dept.**

P.O.B 83 Rama 72100 Israel

Telephone: 0-355312-4

Fax: 0-221199

---

**Koor Steel**

Head Office: P.O.B. 716 Haifa 31007 Israel

Telephone: 04-80488-80

Fax: 04-912115
<table>
<thead>
<tr>
<th>N°</th>
<th>FORMA</th>
<th>FORNO</th>
<th>PROPRDIDADES FÍSICAS</th>
<th>PROPRDIDADES FÍSICAS</th>
<th>PROPRDIDADES FÍSICAS</th>
<th>PROPRDIDIDADES FÍSICAS</th>
<th>PROPRDIDIDADES FÍSICAS</th>
<th>PROPRDIDIDADES FÍSICAS</th>
<th>PROPRDIDIDADES FÍSICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eixo</td>
<td>Eixo</td>
<td>Eixo</td>
<td>Eixo</td>
<td>Eixo</td>
<td>Eixo</td>
<td>Eixo</td>
</tr>
<tr>
<td>501377</td>
<td>46476</td>
<td>51750</td>
<td>312</td>
<td>312</td>
<td>312</td>
<td>312</td>
<td>312</td>
<td>312</td>
<td>312</td>
</tr>
<tr>
<td>502360</td>
<td>33981</td>
<td>50954</td>
<td>336</td>
<td>336</td>
<td>336</td>
<td>336</td>
<td>336</td>
<td>336</td>
<td>336</td>
</tr>
<tr>
<td>501573</td>
<td>451</td>
<td>66591</td>
<td>332</td>
<td>332</td>
<td>332</td>
<td>332</td>
<td>332</td>
<td>332</td>
<td>332</td>
</tr>
<tr>
<td>501375</td>
<td>52005</td>
<td>61724</td>
<td>357</td>
<td>357</td>
<td>357</td>
<td>357</td>
<td>357</td>
<td>357</td>
<td>357</td>
</tr>
<tr>
<td>501375</td>
<td>30396</td>
<td>68265</td>
<td>457</td>
<td>457</td>
<td>457</td>
<td>457</td>
<td>457</td>
<td>457</td>
<td>457</td>
</tr>
<tr>
<td>501377</td>
<td>42757</td>
<td>49527</td>
<td>422</td>
<td>422</td>
<td>422</td>
<td>422</td>
<td>422</td>
<td>422</td>
<td>422</td>
</tr>
<tr>
<td>501381</td>
<td>61714</td>
<td>4228</td>
<td>330</td>
<td>330</td>
<td>330</td>
<td>330</td>
<td>330</td>
<td>330</td>
<td>330</td>
</tr>
<tr>
<td>501372</td>
<td>50054</td>
<td>61760</td>
<td>379</td>
<td>379</td>
<td>379</td>
<td>379</td>
<td>379</td>
<td>379</td>
<td>379</td>
</tr>
<tr>
<td>EAT N°</td>
<td>DIMENSION</td>
<td>WEIGHT</td>
<td>CHEMICAL COMPOSITION</td>
<td>TENSION TEST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-----------</td>
<td>--------</td>
<td>-----------------------</td>
<td>--------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1104271</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nom.</td>
<td>Thickness</td>
<td>Hydrostatic Tested PSI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ft (Mts)</td>
<td>Lbs. (Kgs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>2200</td>
<td>13 44 11 21 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.216</td>
<td></td>
<td>155</td>
<td>38755 48536 29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MPA</td>
<td>15.17</td>
<td></td>
<td>2724 3412</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>267 334</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 Sch 40, 453 welded
FOR: SHIELDED METAL ARC WELDING, CARBON STEEL (P-Number 1)

SCOPE
1. This welding procedure specification covers the welding of carbon steel (P-1) in the fabrication of API 650 storage tanks.

PROCESS: Shielded metal arc.

BASE METAL:
The steel base metal shall comply with one of the ASTM specifications and grades listed in the ASME Code under (P-1).

FILLER METAL:
The filler metal shall comply with ASME Material Specification Part C E6010 (F3).

PREPARATION OF BASE METAL AND ALIGNMENT OF EDGES:
1. The edges to be joined shall be prepared in accordance with a single or double "Y" Groove. Gas cutting may be used.
2. Edges to be joined and all surfaces within 1/2" of the welding edge shall be thoroughly cleaned immediately prior to welding.
3. Abutting edges of plates at longitudinal joints shall not, after welding, have an offset at any point in excess of one-quarter of the plate thickness with a maximum permissible offset of 1/8", except that plates less than 1/4" in thickness, the offset may be as much as 1/16".
4. Abutting edges circumferential joints shall be aligned with the following tolerances:
   - For plates up to 1/4" 1/16"
   - For plates over 1/4" to 3/4" 25% of plate thickness
   - For plates over 3/4" to 1 1/2" 3/16"
   - For plates over 1 1/2" 12 1/2% of plate thickness, but not over 1/4"

ELECTRIC CURRENT:
Direct current shall be used with electrode positive and the base metal negative. (Reverse Polarity).

WELDING TECHNIQUE:
1. The welding technique shall be substantially as shown on the attached sketches.
2. (a) When making double-welded joints the reverse (root) side must be gouged, chipped, or ground out to sound metal before the finishing bead is deposited.
**POSTWELD HEAT TREATMENT (QW-407)**

<table>
<thead>
<tr>
<th>Temperature Range</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Range</td>
<td>NA</td>
</tr>
</tbody>
</table>

**GAS (QW-409)**

<table>
<thead>
<tr>
<th>Shielding Gas(es)</th>
<th>Percent Composition (mixtures)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Rate</td>
<td></td>
</tr>
<tr>
<td>Gas Backing</td>
<td></td>
</tr>
<tr>
<td>Trailing Shielding Gas Composition</td>
<td></td>
</tr>
</tbody>
</table>

**ELECTRICAL CHARACTERISTICS (QW-409)**

<table>
<thead>
<tr>
<th>Current AC or DC</th>
<th>DC</th>
<th>Polarity</th>
<th>Reverse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amps (Range)</td>
<td>120-190</td>
<td>Volts (Range)</td>
<td>19-26</td>
</tr>
</tbody>
</table>

(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**

| NA | (Pure Tungsten, 2% Thoriated, etc.) |

**Mode of Metal Transfer for GMAW**

| NA | (Spray arc, short circuiting arc, etc.) |

**Electrode Wire Feed Speed Range**

| NA |

**TECHNIQUE (QW-410)**

<table>
<thead>
<tr>
<th>String or Weave Bead</th>
<th>String &amp; Weave</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Drill or Gas Cup Size</td>
<td>NA</td>
</tr>
<tr>
<td>Initial and Interpass Cleaning (Brushing, Grinding, etc.)</td>
<td>Grinding &amp; Brush</td>
</tr>
</tbody>
</table>

**Method of Back Gouging**

<table>
<thead>
<tr>
<th>Air Arc and Grinding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oscillation</td>
</tr>
<tr>
<td>Contact Tube to Work Distance</td>
</tr>
<tr>
<td>Multiples or Single Pass (per side)</td>
</tr>
<tr>
<td>Multiple or Single Electrodes</td>
</tr>
<tr>
<td>Travel Speed (Range)</td>
</tr>
<tr>
<td>Peening</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

**Filler Metal**

<table>
<thead>
<tr>
<th>Current</th>
<th>Travel Speed Range</th>
</tr>
</thead>
</table>

**Weld Layer(s)**

<table>
<thead>
<tr>
<th>Process</th>
<th>Class</th>
<th>Dia.</th>
<th>Type Polar</th>
<th>Amp. Range</th>
<th>Volt Range</th>
<th>9-10 IPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMAW</td>
<td>E6010</td>
<td>1/8&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td></td>
</tr>
<tr>
<td>SMAW</td>
<td>E4910</td>
<td>1/8</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>6-8 IPM</td>
</tr>
<tr>
<td>SMAW</td>
<td>E7018</td>
<td>5/32&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>8-10 IPM</td>
</tr>
<tr>
<td>SMAW</td>
<td>E7018</td>
<td>1/8&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>6-8 IPM</td>
</tr>
</tbody>
</table>
**QW-492  SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)**

(See QW-201.1, Section IX, ASME Boiler and Pressure Vessel Code)

**By:** James H. Tipton  
**Date:** 8-18-90  
**Supporting PQR No(s):** SMI 121A  
**Revision No:** 0  
**Welding Process(es):** SMAU  
**Type(s):** Manual

---

### JOINTS (QW-402)

<table>
<thead>
<tr>
<th>Joint Design</th>
<th>GROOVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backing (Yes)</td>
<td>[No] N</td>
</tr>
<tr>
<td>Backing Material (Type)</td>
<td>(Refer to both backing and retainer.)</td>
</tr>
</tbody>
</table>

- Metal
- 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 Migr., sketches may be attached to illustrate joint design, weld layers and bead sequence, r.g. for notch toughness procedures, for multiple process procedures, etc.)

### BASE METALS (QW-403)

<table>
<thead>
<tr>
<th>P-No.</th>
<th>Group No. 1</th>
<th>to P-No.</th>
<th>Group No. 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Specification type and grade: A106 Gr. B
- Thickness Range:  
  - Bead Metal:  
    - Groove: 1/8"  
    - Fillet: Unlimited
  - Pipe Dia. Range:  
    - Groove: 6 5/8"
    - Fillet: Unlimited

### FILLER METALS (QW-404)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E6010</td>
<td>3</td>
<td>1</td>
<td>1/8&quot;</td>
<td>.0625&quot; to .250&quot;</td>
<td>5.1-5.5</td>
</tr>
<tr>
<td></td>
<td>E7018</td>
<td>4</td>
<td>1</td>
<td>1/8&quot;-5/32&quot;</td>
<td>.0825&quot;-.614&quot;</td>
<td>5.1-5.5</td>
</tr>
</tbody>
</table>

- Electrode-Flux (Class): Iron Oxide
- Flux Trade Name: Low Hydrogen
- Consumable Insert:

---

*With base metal-filler metal combination should be recorded individually.*
**Company Name**: SCOTT MANUFACTURING, INC.

**Procedure Qualification Record No.**: SA-1A

**Date**: 9-5-90

**WPS No.**: SA-1

**Welding Process(es)**: SMAW


### JOINTS (QW-492)

### Groove Design of Test Coupon

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

<table>
<thead>
<tr>
<th>BASE METALS (QW-403)</th>
<th>POSIWELD HEAT TREATMENT (QW-407)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Spec.</td>
<td>Temperature</td>
</tr>
<tr>
<td>SA 516</td>
<td>NA</td>
</tr>
<tr>
<td>Type or Grade</td>
<td>70</td>
</tr>
<tr>
<td>P-No.</td>
<td>to P-No.</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Thickness of Test Coupon</td>
<td>.375&quot;</td>
</tr>
<tr>
<td>Diameter of Test Coupon</td>
<td>NA</td>
</tr>
<tr>
<td>Other</td>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FILLER METALS (QW-404)</th>
<th>ELECTRICAL CHARACTERISTICS (QW-409)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFA Specification</td>
<td>Current</td>
</tr>
<tr>
<td>E6010</td>
<td>DC</td>
</tr>
<tr>
<td>AWS Classification</td>
<td>Polarity</td>
</tr>
<tr>
<td>5.1</td>
<td>Reverse</td>
</tr>
<tr>
<td>Filler Metal F-No.</td>
<td>Amps</td>
</tr>
<tr>
<td>3</td>
<td>90-140</td>
</tr>
<tr>
<td>Weld Metal Analysis A-No.</td>
<td>Volts</td>
</tr>
<tr>
<td>1</td>
<td>22-26</td>
</tr>
<tr>
<td>Size of Filler Metal</td>
<td>Tungsten Electrode Size</td>
</tr>
<tr>
<td>1/8&quot; - 5/32&quot;</td>
<td>Other</td>
</tr>
<tr>
<td>Other</td>
<td>Other</td>
</tr>
<tr>
<td>Deposited Weld Metal</td>
<td></td>
</tr>
<tr>
<td>.500&quot;</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POSITION (QW-405)</th>
<th>TECHNIQUE (QW-410)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position of Groove</td>
<td>Travel Speed</td>
</tr>
<tr>
<td>1G</td>
<td>8-10-1IPM</td>
</tr>
<tr>
<td>Weld Progression (Uphill, Downhill)</td>
<td>String or Weave Bead</td>
</tr>
<tr>
<td>Other</td>
<td>String &amp; Weave</td>
</tr>
</tbody>
</table>

| PREHEAT (QW 406) | | |
|------------------|-----------------|
| Preheat Temp. | Multipass |
| None | |
| Interpass Temp. | Single |
| 450°F | |
| Other | No pass greater than 1/2" |

This form (E00007) may be obtained from the Order Dept., ASME, 345 E. 47th St., New York, N.Y. 10017
## Tensile Test (OY-150)

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Width</th>
<th>Thickness</th>
<th>Area</th>
<th>Ultimate Total Load</th>
<th>Ultimate Unit Stress</th>
<th>Type of Failure &amp; Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-1</td>
<td>1.043</td>
<td>.374</td>
<td>.380</td>
<td>27,500</td>
<td>70,513</td>
<td>Base Metal</td>
</tr>
<tr>
<td>T-2</td>
<td>1.035</td>
<td>.373</td>
<td>.366</td>
<td>27,250</td>
<td>70,596</td>
<td>Base Metal</td>
</tr>
</tbody>
</table>

## Guided-Bend Tests (OY-160)

<table>
<thead>
<tr>
<th>Type and Figure No.</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>OY-453.1(d) Root 1</td>
<td>Accepted</td>
</tr>
<tr>
<td>OY-453.1(d) Root 2</td>
<td>Accepted</td>
</tr>
<tr>
<td>OY-453.1(d) Face 1</td>
<td>Accepted</td>
</tr>
<tr>
<td>OY-453.1(d) Face 2</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

## Toughness Tests (OY-170)

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Notch Location</th>
<th>Notch Type</th>
<th>Test Temp.</th>
<th>Impact Values</th>
<th>Lateral Exp. % Shear</th>
<th>Mils</th>
<th>Drop Weight</th>
<th>Break</th>
<th>No Break</th>
</tr>
</thead>
</table>

## Fillet-Weld Test (OY-160)

Result — Satisfactory: Yes           No
Penetration Into Parent Metal: Yes    No
Macro-Results

## Other Tests

Type of Test
Deposit Analysis
Other

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: SCOTT MANUFACTURING, INC.

9-5-90

By William A. Basson
### PERMIAN NON-DESTRUCTIVE TESTING

**QUALIFICATION**

<table>
<thead>
<tr>
<th>METHOD</th>
<th>RT</th>
<th>UT</th>
<th>MT</th>
<th>PT</th>
<th>HT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME</td>
<td>Miller Morris J.</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>II</td>
<td></td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>GENERAL/30%</td>
<td>26.70</td>
<td>/</td>
<td>25.50</td>
<td>29.25</td>
<td>/</td>
</tr>
<tr>
<td>SPECIFIC/30%</td>
<td>/</td>
<td>24.00</td>
<td>/</td>
<td>22.50</td>
<td>30.00</td>
</tr>
<tr>
<td>PRACTICAL/40%</td>
<td>36.00</td>
<td>/</td>
<td>34.80</td>
<td>38.00</td>
<td>/</td>
</tr>
<tr>
<td>COMPOSITE</td>
<td>66.70</td>
<td>/</td>
<td>62.80</td>
<td>97.25</td>
<td>/</td>
</tr>
</tbody>
</table>

**CERTIFIED BY / LEVEL**
- DPM III
- DPM III
- DPM III

**CERTIFICATION DATE**
- 10-17-90
- 10-17-90
- 10-17-90

**RECERTIFICATION DUE**
- 10-17-91
- 10-17-91
- 10-17-91

**DOCUMENTED EXPERIENCE**
- On File
- On File
- On File

**PRIOR CERTIFICATION LEVEL**
- II
- II
- II

**APPOINTMENT BY LETTER, III**

**GER J-2 AND J-1 TEST**
- ACCEPT: X
- CONDITIONS: None
- DATE: 10-17-90

**COLOR PERCEPTION TEST**
- ACCEPT: X
- CONDITIONS: None
- DATE: 10-17-90

**DATE EMPLOYED:** 1-25-88

**EDUCATION LEVEL:** High School/Trade

**EXPERIENCE TIME:** 9.5 Years

**LIMITATIONS:** Recertified RT, MT, PT only

---

**THIS INDIVIDUAL HAS SUCCESSFULLY COMPLETED THE ABOVE EXAMINATIONS AND HAS QUALIFIED FOR THE LEVEL IN THE NONDESTRUCTIVE TEST METHOD INDICATED ABOVE AS PER PERMIAN NON-DESTRUCTIVE TESTING'S WRITTEN PRACTICE. DOCUMENTATION SHALL BE ON FILE FOR REVIEW UPON REASONABLE REQUEST.**

**AUTHORIZED EXAMINER**

[Signature]

**DATE**

10-17-90

**PERMIAN NON-DESTRUCTIVE TESTING**
## PERMIAN NON-DESTRUCTIVE TESTING

**a DPM Subsidiary**

### Test No. 10269

<table>
<thead>
<tr>
<th>Weld By. No.</th>
<th>Location</th>
<th>Piece Size</th>
<th>Yes</th>
<th>No</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**

Test Interpreted By: [Signature]

P.O. #: [Signature]

Number of Testing Personnel: 1

Test Interpreted By: M. Mill. Level: [Signature]

Hours Worked: [Signature]

M.T.W.F.S 3:00 PM

Notice: The test report is not complete without the customer representative or customer's principal present for the testing of the test report. All tests performed in the presence of the customer representative or customer's principal present for the testing of the test report. The test report is not complete without the customer representative or customer's principal present for the testing of the test report. The test report is not complete without the customer representative or customer's principal present for the testing of the test report.

Agreed and Accepted: [Signature] Date: 10-14-92
<table>
<thead>
<tr>
<th>Weld No.</th>
<th>By No.</th>
<th>Location</th>
<th>Pipe Size</th>
<th>Within Code</th>
<th>Defects</th>
<th>Detection &amp; Location</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-1</td>
<td>O-1</td>
<td></td>
<td>Yes</td>
<td>No</td>
<td>TP</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test(s) Interpreted by: [Signature]  Level: [Level]  P.O. #: [P.O.]

Number of Testing Personnel: [Number]

Test(s) Location: [Location]
WISCO WELDING INSPECTION SERVICE COMPANY  
11011 NORTH FWY. SUITE 670  
HOUSTON, TEXAS 77060

REPORT DATES 10/16/92 10/17/92  
ATTN: MR. SAMAR HAMWI

CUSTOMER: USPCLI  
ORDER NO: PO 19350  
DATING:  
MAT'L DESTINATION: LONE MOUNTAIN  
REQUIRED DATE: 11/1/92 SHIPMENT DATE IS NOW: SAME

AS OF CHANGED FROM:  
INSPECTOR ESTIMATED SHIPMENT DATE: SAME  
ORDER IS 65% PERCENT COMPLETED:

VENDOR: SCOTT MFG. CO.  
MANUFACTURER: SAME

PHONE: 806-866-9591  
SHOP LOCATION: WOFORD, TX.

SHOP ORDER NO: 451  
INSPECTOR'S CONTACT: BILL BASON  
POSITION: FIELD MANAGER

REPORT IS: INTERIM REGARDING: INSPECTION

INSPECTOR: VICTOR HAGMAN

MATERIAL DESCRIPTION: (4) 12.75' DIAMETER BY 40' HEIGHT CAUSTIC STORAGE TANKS.

STATUS OF ORDER: TWO TANKS TO SHIP 10/19/92

INSPECTION: WITNESS RADIOGRAPHS BE TAKEN OF WELDS AND REVIEW OF SAME.

1. PICKED SPOTS FOR RADIOGRAPHS ON TWO TANKS. SHOTS WERE TAKEN OF VERTICAL SEAMS GIRTH WELDS IN TANKS. ONE SPOT WAS TAKEN ON THE BUTT WELDS ON THE CORN BOTTOM. THE CORN BOTTOM HAS THREE BUTT WELDS.

2. REVIEW OF SPOT WELDS FOUND THE FOLLOWING: THE WELDS IN THE CORN BOTTOM WERE BAD, PENALTY SHOTS WERE TAKEN AS PER API 650, AND ASME SEC. VIII UW 51, AND UW52. FOUND THAT A BAD PROCEDURE WAS USED IN WELDING THE BUTT WELDS ON THE BOTTOM OF ALL FOUR TANKS. THERE WAS NO PENETRATION ON ANY OF THE WELDS. SO SCOTT MFG MADE REPAIRS ON THE TWO TANKS TO SHIP ON 10/19/92. REPAIR SHOTS WERE MADE. FOUND THAT THE WELDS WERE STILL BAD. THE COMPLETE BUTT WELDS ON THE BOTTOM OF ALL FOUR TANKS WAS REMOVED COMPLETELY.

10/17/92.

1. PICKED RADIOGRAPHS FOR BOTTOM BUTT WELDS. AFTER REVIEWING FILM FOUND THAT ALL OF THE BOTTOM BUTT WELDS WERE NOW ACCEPTABLE. THE REASON FOR THE PROBLEM TO START WITH WAS THAT NO ROOT OPENING WAS LEFT FOR PENETRATION. THESE WELDS WERE DONE BY THE SHOP PERSONAL. NOT THE CREW THAT IS BUILDING THESE TANKS.

2. WITNESS FITTING THE TOP RING ON TANK NUMBER TWO, AND WATCHED AS THE WELDERS MADE THE ROOT PASS. ALL WELDING WAS PER SPECIFICATIONS AND WAS OF GOOD QUALITY.

REVIEW 10/18/92 FOR FINAL ON FIRST TWO TANKS AND WITNESS
WTSCo Welding Inspection Service Company
11811 North Fwy., Suite 670
Houston, Texas 77060

Report Date: 10/14/92 10/15/92
Customer: USPCI
Order No.: 451
Atttn: Mr. Samar Hamwi

MAT#: DESTINATION: LONG MOUNTAIN

Required Date: Shipment Date is now

AS OF: Changed from:

Inspector Estimated Shipment Date:

Order 18: Percent Completed:

Vendor: Scott Mfg.

Manufacturer: Same
Phone: 606-666-9391 Shop Location: Wolford, TX
Shop Order No.: 451
Inspector's Contact: Bill Bason Position: Eng.
Report Is: Interim

Went over Specifications from USPCI and reviewed what drawings were on hand. No problems were found with Scott Mfg. meeting specifications.

Inspection - Meeting with Mr. Bason and Field Foreman.

Inspection of tanks being welded.
1. Witness welding of girth welds on tanks, found that the root opening was acceptable for full penetration welds.
2. Witness air testing of repads on tank shells. All nozzles are welded in shells before tank shells are fit together. This is good as that all of the repads can be air tested on the ground. No danger of falling air of pads not being tested. Shop air was used for testing. With 18-20 pounds of air applied to pads. A soap and water mixture was used to check for leaks both on the internal and the external. Repad test was acceptable as no leaks were found.
3. Visual inspection of welding both internal and external, no defects were found. Visual inspection was to find undercutting, pin holes, cold lap, low fillet welds. Excessive weld build up on girth welds etc. All that was found was some small pinholes, these were repaired.

Visual inspection of the rolled rings. Found that one of the braces on the painters ring was welded to the vertical weld seam. As API 650 states that all attachments must miss vertical seams by at least 6 inches. These were moved and rewelded.
10/15/92.

MET WITH MR HAMWI THIS A.M. FOR INSPECTION OF TANKS.
TALKED WITH MR. BASON ABOUT DELIVERY OF TANKS. THE FIRST TWO TANKS WILL BE ON TRUCKS TO JOB SITE BY 10/19/92 A.M.

REVIEW OF DRAWINGS ON TANKS AND WALK WAYS. NO PROBLEMS WERE FOUND.

FIELD INSPECTION OF TANKS BEING WELDED, AND A TOUR OF SHOP WAS TAKEN. SCOTT MFG. HAS A WIDE RANGE OF SERVICES THAT WERE SHOWN TO MR HAMWI AND THIS WRITER.

A VISUAL INSPECTION OF TANKS WAS DONE AND NO PROBLEMS WERE FOUND.

PHOTOS OF TANKS, ERECTION, AND WELDING WAS TAKEN. THESE WILL SENT WITH DATA PACKAGES.

REVIEW OF MATERIAL TEST REPORTS FOR THE SHELL MATERIAL AND FOR THE STRUCTURAL MATERIAL. THE MTR'S FOR THE PIPING HAS NOT ARRIVED FROM THE SUPPLIER. AS SOON AS THESE OR IN THEY WILL BE CHECKED.

REVIEWED ALL WELDER QUALIFICATIONS, AND ALL WELD PROCEDURES. ALL WELDING OF TANKS WERE TO THESE PROCEDURES. ALL WELDER WORKING ON TANKS WERE QUALIFIED PER A 6G WELD TEST AND ALL PAPER WORK WAS IN ORDER.

ALL RADIOGRAPHS WILL BE SHOT 10/16/92 ON THE TWO TANKS TO SHIP ON 10/19/92. ALL OTHER NDE WORK HAS BEEN COMPLETED. ALL THAT WAS REQUIRED WAS A MAG PARTICLE OF NOZZLE WELDS, THIS HAS BEEN DONE AND PROPER PAPER WORK IS IN THE JOB FILE.

AT THIS TIME ALL API-650 AND USPCI SPECIFICATIONS ARE BEING FOLLOWED. ALL WORK SEEN ON THIS VISIT WAS OF GOOD QUALITY AND WAS ACCEPTABLE TO ALL SPECIFICATIONS.
WELDING INSPECTION SERVICE COMPANY

QUALITY ASSURANCE INSPECTION RELEASE

PAGE 1 OF 1

DATE: 10-19-92

REP. NO.:__

CUSTOMER: US PCI
P.O. NO.: 79350
LOCATION: Lubbock TX

VENDOR: Scott Mfg
PROJECT: Lone Mountain

☑ Satisfactorily completed Quality Assurance Inspection on: 10-19-92

<table>
<thead>
<tr>
<th>P.O. ITEM</th>
<th>QUANTITY</th>
<th>MATERIAL DESCRIPTION/TAG NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>12.95' X 40' HEIGHT CAUSTIC TANK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ser. No. GI-1</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>12.95' X 40' HEIGHT CAUSTIC TANK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ser. No. GI-2</td>
</tr>
</tbody>
</table>

Shipping Information: By truck to LUKAY NOCA OKLA.
Date Released for Shipment: 10-19-92

☒ Without exception to the Purchase Order Documents.
☒ With the following Exception from the Purchase Order, only with follow up in writing with a copy of telex or letter attached. (State specifics and name of Responsible Engineer)

Approval or release for shipment of any work by a representative of the purchaser, or purchaser's Client, shall in no way relieve the vendor or sub-vendor of any responsibility for meeting the requirements of the purchase order and/or specifications.

Signing of the form acknowledges the items have been inspected in accordance with the above purchase order.

10-19-92

Agency Inspector's Signature

11811 North Fwy, Suite 670 • Houston, Texas 77060 • (713) 820-8066
QUALITY ASSURANCE INSPECTION RELEASE

CUSTOMER: USPCT
P.O. NO.: 19350
LOCATION: Lubbock, TX

VENDOR: Scott Mfg. Inc.
PROJECT: Lone Mountain

[ ] Satisfactorily completed Quality Assurance Inspection on: 10-24-92

<table>
<thead>
<tr>
<th>P.O. ITEM</th>
<th>QUANTITY</th>
<th>MATERIAL DESCRIPTION/TAG NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>12.75' x 40' height caustic tank, seq. no. 451-3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>12.75' x 40' height caustic tank, seq. no. 451-4</td>
</tr>
</tbody>
</table>

Shipping Information: By Truck to Way Nola, OK.
Date Released for Shipment: 10-24-92

[ ] Without exception to the Purchase Order Documents.

[ ] With the following Exception from the Purchase Order, only with follow up in writing with a copy of telex or letter attached. (State specifics and name of Responsible Engineer)

Approval or release for shipment of any work by a representative of the purchaser, or purchaser's Client, shall in no way relieve the vendor or sub-vendor of any responsibility for meeting the requirements of the purchase order and/or specifications.

Signing of the form acknowledges the items have been inspected in accordance with the above purchase order.

10-24-92

Agency Inspector’s Signature

11811 North Frwy, Suite 670- Houston, Texas 77060  (713) 820-8066
APPENDIX G

Drawings
PAINTERS RING
(2) REQ'D PER TANK IN & OUT

SCOTT MANUFACTURING, INC.
P.O. BOX 10232 LUBBOCK, TEXAS 79408
USPCl, WAYNOKA, OK

drawn: LDW
scale: 1/4" = 1'-0"
date: 10/4/82
TRUCK UNLOADING PAD

NOTE: ADD GAGE TO ALL ELEVATIONS

RECORD DRAWING

USPCI
A Subsidiary of
General Pacific Corporation

USPCI
LONE MOUNTAIN FACILITY
WAYNOCA, OKLAHOMA

CAUSTIC TANKS 1-4 REPLACEMENT PLANS
LAYOUT OF AREA
SECTION CT4
Mr. Don Dillie  
USPCI, Inc.  
Rt. 2 Box 170  
Waynoka, Oklahoma 73860

Dear Mr. Dillie:

At the time of our inspection of Caustic Storage Tanks 1-4 located at the pretreatment area were inspected and there were no visual apparent weld breaks, punctures, scrapes of protective coatings, cracks, corrosion or damage due to construction or installation. This is to certify that Caustic Storage Tanks 1-4 were installed in such a manner which did not produce any structurally adverse conditions in accordance with 40 CFR 264.192(b).

This is to certify that at the time of our inspection, the Caustic Storage Tanks 1-4 located at the pretreatment area of the Lone Mountain Facility, (Waynoka, Oklahoma), were filled with water and allowed to stand at static equilibrium for a period of several hours. During this time all welds and tank walls were monitored for leaks. There were no apparent leaks found therefore the tank appears to be capable of handling hazardous wastes without release for the intended life and use of the tank.

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 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 of knowing violations.

Sincerely,

Mr. Gene Walker  
Environmental Engineer  
Lone Mountain Facility

cc: Mr. Gene Walker  
Environmental Engineer  
Lone Mountain Facility

FILE INSTRUCTIONS

<table>
<thead>
<tr>
<th>Unit:</th>
<th>Pre-Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project:</td>
<td>Caustic Tank Assessment</td>
</tr>
<tr>
<td>Section:</td>
<td>Tank Analysis</td>
</tr>
</tbody>
</table>

Rev'd by: L. J. ODEN
ROUTE COPY
FLM R.Dodd B.Conway
SECTION 205

ASSESSMENT OF CAUSTIC TANK #4 (CT4)
LONE MOUNTAIN HAZARDOUS WASTE FACILITY
U.S.P.C.I.
WAYNOKA, OKLAHOMA

A. TANK VESSEL DESCRIPTION

Caustic Tank #4 is a large steel aboveground vertical tank located in the pretreatment area of the Lone Mountain Hazardous Waste Facility. Caustic Tank #1, Caustic Tank #2, Caustic Tank #3, Caustic Tank #4, Sludge Storage Tank #1 and, Caustic Overflow Tank, Cyanide Overflow tank, Cyanide Reactor, Cyanide Measure Tank and a portion of their ancillary equipment will be located together in a concrete containment area.

B. PRIMARY TANK VESSEL

1. General Description

Caustic Tank #4 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. Caustic Storage Tank #4 is an aboveground tank that will be used for the storage of caustic liquids. The tank is vertical in position and cylindrical in shape. The tank and contents are supported by a skirted base. There is a cone on the bottom of the tank inside the skirt. There is a platform connected to all four caustic storage tanks (CT1, CT2, CT3, CT4). There are two ladders for access to the tank top and platform. This tank is equipped with a 3" overflow line. There is a level gauge installed through an 18" nozzle, in addition to the level gauge there is a high level alarm installed through a nozzle on the top of the tank. This tank was manufactured by Scott Manufacturing, Inc from Lubbock, Texas. The temperature of the tank varies with the ambient temperature.

Influent piping is located from the pretreatment building to the caustic tank and to other tanks in the containment area.

2. Design Standards.

The tank is designed and constructed 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 (6th Edition). The Mill Test reports and radiographic testing reports can be found in Appendix F of this assessment.
3. Hazardous Characteristics of Wastes Stored

The wastes to be stored in this tank have the following characteristics (Provided by USPCI):

Untreated wastes pH (7 - 13)
N > 1
Temperature = Ambient

The hazardous characteristics of the waste to be 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 interior of the tank is coated with Gliden "Glid-Guard Epoxy Chemical Resistant Finish 5240 Series." This coating will withstand the chemical characteristics of the waste to be stored.

5. Documented Age of Tank

This is a new tank, it was constructed and installed in October of 1992.

6. Result of Leak Tests

A leak test was performed. In this test the tank was filled to maximum operating capacity with water. The tank was allowed to sit full for a minimum of 6 hours. After remaining full for this time there was no evidence of the tank leaking. In the inspection all welds, flanges, manways, nozzles, and sidewalls were checked for leaks.

7. Existing Data Obtained

<table>
<thead>
<tr>
<th>Diameter of Tank</th>
<th>12'-8-5/8&quot; Inside Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>40'</td>
</tr>
<tr>
<td>Material</td>
<td>A36 steel See Appendix F for Mill Test reports</td>
</tr>
<tr>
<td>Wall and top thickness</td>
<td>0.25&quot;</td>
</tr>
<tr>
<td>Bottom cone thickness</td>
<td>0.3125&quot;</td>
</tr>
<tr>
<td>Maximum Volume</td>
<td>4426.27 cf. or 33,108 Gal.</td>
</tr>
<tr>
<td>Maximum Operating Volume</td>
<td>4299.22 cf. or 32,156 Gal.</td>
</tr>
<tr>
<td>Specific gravity of waste</td>
<td>1.5 (Provided by USPCI)</td>
</tr>
<tr>
<td>Temperature</td>
<td>Ambient</td>
</tr>
<tr>
<td>Seismic Zone</td>
<td>1</td>
</tr>
</tbody>
</table>

8. Calculation of Existing Foundation Loading

Total Weight of Tank and Contents = 216.54 tons

Detailed calculations reflecting the volume and weight of the tank are found in appendix A. The 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 0.2195 inches. This thickness includes 0.125 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 B and C of this assessment for detailed calculations or required wall thickness and structural analysis of the tank support system.)

10. Comparison of Actual Structure to Theoretical Values

<table>
<thead>
<tr>
<th>Wall Thickness Comparison</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculated Required Wall Thickness</td>
<td>0.2195&quot;</td>
</tr>
<tr>
<td>Minimum Required Wall Thickness By API-650-88</td>
<td>0.1875&quot;</td>
</tr>
<tr>
<td>Measured Wall Thickness</td>
<td>0.25&quot;</td>
</tr>
</tbody>
</table>

C. SECONDARY CONTAINMENT SYSTEM

1. General Description of Secondary Containment

The secondary containment system is designed and will be operated to prevent any migration of wastes or liquids out of the system. Cyanide Reactor Tank, Cyanide Measure Tank, Caustic Tanks #1-4, Sludge Storage Tank, Caustic Overflow Tank, Cyanide Overflow Tank will be located on a reinforced concrete base floor area with vertical concrete sidewalls. All associated piping is aboveground. The area will be inspected on a daily basis. The containment system is walled off and receives no direct vehicular traffic. The foundation walls and base were mass poured in place. No cracks from compression or uplift were visually apparent. There are three low areas with a slight depression that are used to collect any waste spills and rainwater. Any released tank contents or surface runoff will drain on top of the sloped concrete to the sump areas. The accumulated liquids are then removed and pumped out in accordance with the permit condition. The slab floor also serves as a foundation support for the tanks in this area.

The concrete floor was removed and replaced in October of 1992. The floor was replaced in order to strengthen the foundation for the tank support.

2. Design Standards.

Design drawings for the walls 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. The concrete floor and foundation were built in close adherence to the above mentioned codes. The floor as previously mentioned was removed and replaced.
3. Hazardous Characteristics of Wastes Stored

The wastes which are treated in the primary tank have the following characteristics:

Untreated waste pH (7 - 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 will be coated with Concrete Protection System, Inc "OVERKOTE" industrial flooring. For more information on this coating see Appendix H of this report.

5. Documented Age of The Containment Area

The secondary containment system was originally constructed and installed in 1987 however the floor was replaced in October 1992.

6. Result of Leak Tests

A visual inspection of the containment area was performed and from this inspection it was determined that there are no cracks or breaks in the impermeable coating. The area will be inspected on a daily basis checking for leaks from the primary tank.

7. Data Obtained

<table>
<thead>
<tr>
<th>Area</th>
<th>2509.85 s.f.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Height</td>
<td>2.62 ft. (Min.)</td>
</tr>
<tr>
<td>Material</td>
<td>Concrete</td>
</tr>
<tr>
<td>Gross Volume</td>
<td>6575.81 c.f.</td>
</tr>
<tr>
<td>Thickness</td>
<td>30&quot;</td>
</tr>
</tbody>
</table>

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 of each 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 of this report for detailed calculations of the available containment volume. The containment capacity available = 4960.54 c.f.

9. Required Volume

Containment Capacity Required (CCR)

CCR = Volume of Largest Tank in the secondary containment

Volume of Largest Tank = 4426.27 c.f. (CT1) or 33,108 Gal.

10. Comparison of Available Volume to Required Volume

Containment Capacity Comparison

Containment Capacity Required = 4,426.27 c.f.
Secondary Containment Volume Available = 4,960.54 c.f.
Excess Containment Volume = 534.27 c.f.

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

D. CONCLUSIONS

1. Primary Tank Vessel

The primary tank vessel at the of inspection was fit for use with the proposed waste stream at the given densities, chemical and physical characteristics as verified by USPCI. The useful life of the steel tank would be estimated at 20 years if the proposed 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 is fit for use, with the proposed 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 20 years. This useful life was determined by using a design life of 20 years less the period that the system has been in use at the USPCI Lone Mountain Facility.
E. RECOMMENDATIONS

The following repairs or modifications should be made:

1. Primary Tank

   The tank should be internally inspected periodically to insure no corrosion is occurring. The tank should be checked yearly 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 conducted to detect any visual corrosion or defects.

2. Secondary Containment

   The secondary containment should be checked periodically for any deterioration and structural integrity.

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. 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 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
APPENDIX A
Primary Tank Volume Calculations
SECTION 205 - APPENDIX A

CT4, Caustic Storage Tank No. 4

PRIMARY TANK VOLUME CALCULATIONS

DIMENSIONS:
Geometry: CYLINDRICAL
Diameter: 12.72 FEET
Max Height: 34.00 FEET
Normal Operating Height: 33.00 FEET
Cone Height: 2.42 FEET
Bottom Cone Diameter: 0.50 FEET
Cone Length: 6.80 FEET
Cone Volume: 106.53 C.F. or

VOLUME CALCULATIONS
Max. Volume : 4426.27 C.F. or
Normal Operating Volume 4299.22 C.F. or

MAXIMUM OPERATING TANK VOLUME = 4426.27 C.F. OR 33108.49 GAL

WEIGHT ON FOUNDATION

CONTENTS S.G.: 1.50
DENSITY: 93.60 LB/C.F.

SURFACE AREA CALCULATION
Tank Top = 127.05 S.F.
Tank Bottom Cone = 257.87 S.F.
Tank Wall= Cir*h 1358.54 S.F.
TOTAL SURFACE AREA WALL AND TOP 1743.47 S.F.

Steel Thickness=
Sidewalls and Top 0.25 INCHES
Cone 0.31 INCHES
Volume of Steel =
Sidewalls 28.30 C.F.
Top and bottom 10.02 C.F.
Density of Steel =
Weight of Steel = 490.00 LB/C.F. 9.39 TONS

WEIGHT OF TANK CONTENTS = 207.15 TONS

TOTAL WEIGHT OF TANK AND CONTENTS = 216.54 TONS
APPENDIX B

Primary Tank Wall Thickness Calculations
SECTION 205 - APPENDIX B

CT4, Caustic Storage Tank No. 4

PRIMARY TANK WALL THICKNESS

DIMENSIONS:
Geometry: CYLINDRICAL
Diameter: 12.72 FEET
Height: 34.00 FEET
Specific Gravity: 1.50
Normal Operating Temperature = ambient

STEEL THICKNESS CALCULATIONS @ BOTTOM RING

Thickness (t) = (2.6 * H * D * S.G.) / (s * E) + CA
s = Allowable Design Stress = 21000.00 PSI ***
E = Joint Efficiency = 85.00%
Thickness (t) = 0.0945 INCHES
Corrosion Allowance = 0.1250 INCHES
Calculated Req'd Wall thk. = 0.2195 INCHES

*** THIS DESIGN STRESS IS OBTAINED FROM API-650-88 WITH THE USE OF APPENDIX A.

CONE WALL THICKNESS CALCULATION

Cosine Alpha = cos(67.6594)
P1 = Internal Pressure = 3263.83 psi
=Density*s.g.*(x+D/5*cot(alpha))
P2 = H*density*s.g. =33*62.4*1.5 =
Tc = top cone radius = 6.36 inches
Fb = Allowable stress 23200 psi

The required wall thickness of the cone will be the greater of the following Formulas.

1. Ts=P1*Tc/2*cos(alpha)*fb = 0.098 +1/8"C.A. = 0.223 in.
2. Ts=P2*D/cos(alpha)*Fb = 0.191 +1/8"C.A. = 0.316 in.
APPENDIX C

Structural Support Calculations
SECTION 205 - APPENDIX C

CT4, Caustic Storage Tank No.4

STRUCTURAL SUPPORT CALCULATIONS

GIVEN:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank Diameter</td>
<td>12.72 feet</td>
</tr>
<tr>
<td>Total Height</td>
<td>40.00 feet</td>
</tr>
<tr>
<td>Weight of Tank</td>
<td>18750.00 lbs</td>
</tr>
<tr>
<td>Weight of Max. Contents</td>
<td>414300.00 lbs</td>
</tr>
<tr>
<td>Tank Nominal Thickness</td>
<td>0.25 in</td>
</tr>
</tbody>
</table>

---SEISMIC DESIGN CHECK---

ZONE COEFFICIENT (Z): 0.1875

ESSENTIAL FACILITIES FACTOR (f): 1.000

LATERAL EARTHQUAKE FORCE COEFF. (C1): 0.240

D/H: 0.267

k factor: 0.590

SITE AMPLIFICATION FACTOR (S): 1.500

NATURAL PERIOD OF FIRST SLOSHING (T): 2.104

LATERAL EARTHQUAKE FORCE COEFF. (C2): 0.214

WEIGHT OF TANK SHELL (Wt): 18750.000 LBS

TOTAL WEIGHT OF TANK CONTENTS (Wt): 414300.000 LBS

W1/Wt: 0.950

W2/Wt: 0.050

WEIGHT OF EFFECTIVE MASS OF CONTENTS THAT MOVES IN UNISON WITH THE TANK SHELL (W1): 383585.000 LBS

WEIGHT OF EFFECTIVE MASS IN FIRST SLOSHING (W2): 20715.000 LBS

HT FROM BTM OF SHELL TO CENT. OF SHELL (Xh): 20.000 FEET

X1/H: 0.500

HT FROM BTM TO CENT. OF LAT. SEISMIC FORCE (X1): 20.000 FEET

X2/H: 0.900

HT FROM BTM TO CENT. OF LAT. SEISMIC FORCE (X2): 36.000 FEET
Note: All of the above calculations are based on API-650-68 Seismic Design Procedure (Appendix E).

CHECK STRESS IN TANK SHELL FROM SEISMIC FORCES:

\[ W_t = 7.94b^b(F_{by}G^gH^h)^{-.5} \]

\( b = \text{THK. OF BTM. PLATE UNDER SHELL:} \quad 0.250 \text{ IN} \)

\( F_{by} = \text{MINIMUM YIELD STRENGTH OF BOTTOM PLATE:} \quad 9000.00 \text{ PSI} \)

\( G = \text{DESIGN SPECIFIC GRAV. OF LIQUID:} \quad 1.50 \)

\( W_l = \quad 0.250 \quad \text{IN} \)

\( \text{DENSITY OF TANK SHELL MATERIAL:} \quad 1451.32 \text{ LBS/FT OF SHELL CIRCUMFERENCE} \)

\( W_t = \text{WEIGHT OF TANK SHELL AND THE PORTION OF FIXED ROOF SUPPORTED BY TANK SHELL:} \quad 490.00 \text{ LBS/CF} \)

\( M[D^2(2W_t+W_l)]: \quad 408.33 \text{ LBS/FT OF SHELL CIRCUMFERENCE} \)

\( b = \text{MAXIMUM LONGITUDINAL COMPRESSION FORCE AT THE BTM. OF TANK SHELL} \)

\( b = W_t + 1.273*M/D^2 \quad 1.3328 \)

\( b: \quad 3563.57 \text{ LBS/FT OF SHELL} \)

\( G^hD^2b^2/2: \quad 155326.46 \)

\( F_a = \text{MINIMUM OF 10 \cdot 6/D or Fy/2:} \quad 4500.00 \text{ PSI} \)

\( F_{by} = \text{MINIMUM YIELD STRENGTH OF BTM. PLATE:} \quad 9000.00 \text{ PSI} \)

\[ \text{MAX. LONGITUDINAL COMPRESSION STRESS IN THE TANK SHELL} = \frac{b}{12t} = 1187.86 \text{ PSI} \]
CHECK OVERTURNING MOMENT FROM WIND PRESSURE

M must be Less Than or Equal To $0.66\times(WD)/2$
If M is Greater Than $0.66\times(WD)/2$ Anchor Bolts Would Be Required

Where:

$W =$ Shell Weight Available To Resist Uplift (lbs)
$D =$ Tank Diameter (feet)
$M =$ Overturning Moment

$M = P_w \times \text{Projected Area} \times H_1$

$H_1 =$ Height from ground to centroid of tank shell

$P_w =$ Wind Pressure (18 psf for 100 MPH Wind on cylinder)

$0.66\times(WD)/2:$ \hspace{1cm} 78330.93 \hspace{0.2cm} \text{FT-LBS}
$M:$ \hspace{3cm} 183168.00 \hspace{0.2cm} \text{FT-LBS}

$M > 0.66\times(WD)/2$ therefore anchor bolts are required

Number of Anchors: \hspace{1cm} 12.00

Anchor Diameter: \hspace{1cm} 1.25 \hspace{0.2cm} \text{inches}

Dia. of Anchor Circle: \hspace{1cm} 13.05 \hspace{0.2cm} \text{feet}

$t_B =$ design tension load per anchor

$t_B:$ \hspace{1cm} 3113.62 \hspace{0.2cm} \text{pounds}

Allowable Load/Anchor: \hspace{1cm} 24543.69 \hspace{0.2cm} \text{pounds}
APPENDIX D
Containment Area Volume Calculations
SECTION 205 - APPENDIX D

CT4, Caustic Storage Tank No.4

CONTAINMENT AREA No.8A VOLUME CALCULATIONS (CAUSTIC AREA)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>70.70 feet</td>
</tr>
<tr>
<td>Width</td>
<td>35.50 feet</td>
</tr>
<tr>
<td>Height</td>
<td>2.62 feet</td>
</tr>
<tr>
<td>Surface Area</td>
<td>2509.85 S.F.</td>
</tr>
</tbody>
</table>

Gross Volume = Area * Height = 6575.81 C.F.

Volumes of Items of Displacement **

1. Steel skirting = 9.17 C.F.

Total volume to deduct for items in containment area = 9.17 C.F.

Subtraction for volume of rainfall

Volume of rain = Area x depth of rainfall
Depth of rainfall = 6.15 in.
Area = 2509.85 S.F.
Volume = 1286.30 C.F.

TOTAL AVAILABLE VOLUME = Gross Volume - Subtractions =

Items of displacement
Volume of rainfall

TOTAL AVAILABLE VOLUME Area 8A = 5280.34 C.F.

CONTAINMENT AREA No.8c VOLUME CALCULATIONS (TRUCK PAD)

This area will collect rain and deposit it into the caustic containment area (8a) when the valve is opened. This area does not contribute any volume for containment.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>52.00 feet</td>
</tr>
<tr>
<td>Width</td>
<td>12.00 feet</td>
</tr>
<tr>
<td>Surface Area</td>
<td>624.00 S.F.</td>
</tr>
</tbody>
</table>

Subtraction for volume of rainfall

Volume of rain = Area x depth of rainfall
Depth of rainfall = 6.15 in.
Area = 624.00 S.F.
Volume = 319.80 C.F.
SUMMARY OF SECONDARY CONTAINMENT DATA

Surface Areas:

Caustic Area 8A = 2509.85 S.F.
Truck Unloading Pad 8C = 624.00 S.F.

Gross Volumes:

Caustic Area 8A = 6575.81 C.F.
Truck Unloading Pad 8C = 0.00 C.F.

Volume of displacements:

Caustic Area 8A = 9.17 C.F.
Truck Unloading Pad 8C = 0.00 C.F.

Volume for 24hr rain:

Caustic Area 8A = 1286.30 C.F.
Truck Unloading Pad 8C = 319.80 C.F.

Total Gross Volume 8A = 6575.81 C.F.
Total Displacement Volumes = 9.17 C.F.
Total volume of Rain = 1606.10 C.F.

Containment Capacity Available (CCA) = 4960.54 C.F.
or 37104.83 GAL.
APPENDIX E

Foundation Design Analysis
SECTION 205 - APPENDIX E

CT4, Caustic Storage Tank No.4

FOUNDATION DESIGN ANALYSIS

ASSUMPTIONS:

\[ f_c = 4.00 \text{ KSI} \]
\[ f_y = 60.00 \text{ KSI} \]
\[ \text{Allowable Soil Press.} = 2.20 \text{ KSI} \]
\[ \text{Structural Steel} = A36 \]

GIVEN:

Tank Diameter = 12.72 feet
Sidewall Height = 40.00 feet
Weight of Tank (Shell) = 18780.00 lbs
Weight of Max. Contents = 414300.00 lbs

Tank is resting on a concrete foundation.

CHECK CONCRETE FOUNDATION DESIGN:

Assume Footing Depth = 30.00 inches
Assume Footing Width = 30.00 inches
Assumed Effective Soil Press. = 1925.00 psf

Look at what is resisting overturning moment from seismic load:

\[ b = \frac{3563.57}{30.00} \text{ lb/ft of circ.} \]

Where \( b \) is the maximum shell compression at the bottom of the shell.

If the footing is 30.00 inches wide then the actual applied pressure to the subgrade is 1425.43 lb/sf.

This is less than the effective soil pressure.
APPENDIX F

MANUFACTURERS DATA, MILL TEST REPORTS, RADIOGRAPHIC REPORTS
CERTIFICATION TO OWNER OF COMPLIANCE WITH API 650-88

To: USPCI LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

To Whom It May Concern:

Scott Manufacturing, Inc. hereby certifies that the tank(s) constructed for you at SCOTT MANUFACTURING, INC. WOLFFORTHEX, TEXAS and described as follows: (4) 12/75' diameter by 40' shell height Caustic Storage Tanks, Serial Numbers 451-1, 2, 3, 4

has/have been designed, fabricated, erected, and inspected in accordance with all of the requirements of the American Petroleum Institute Standard 650-88 entitled, "Welded Steel Tanks for Oil Storage" and that the results of all such inspections, radiographs, and other tests indicate that the tanks(s) fully complies/comply with all of the requirements. We further certify that all materials meet specifications.

SCOTT MANUFACTURING, INC.

By

MANAGER/HEAVY CONSTRUCTION

Title
23 OCTOBER 1992
Date

CITY OF LUBBOCK
STATE OF TEXAS

Acknowledged and sworn to before me this 23rd day of October 1992.

Notary Public
USPC1, Waynoka, OK

12.72 ft x 40 ft (evenly)

\[ T_2 = \frac{\delta}{2 \lambda} \left( \frac{D}{2} \right) (X + \frac{R}{2} \cos \theta) \tan \theta \]
\[ = \frac{62.54 (15)}{2} \left( \frac{33 + \frac{12.72}{6} \cos \theta}{2} \right) \tan \theta \]
\[ = 12.127 \times 1.636 \times 33.8712 \]
\[ = 24.523 \text{ lbf/ft} \quad \div 12 \]
\[ = 2.043 \text{ lbf/in} \quad \div 23.200 \quad \text{in}^2 \]
\[ = 0.09527" + 0.125" \]
\[ = 0.2203" \quad \text{max} \quad \frac{3}{8} \text{in} \]

\[ T_1 = \frac{\gamma d x}{2 \cdot 10^3 (1.5) (12.72) 3.3} \]
\[ = 51.682 \text{ lbf/ft} \quad \div 12 \]
\[ = 4.306.80 \text{ lbf/in} \quad \div 23.200 \quad \text{in}^2 \]
\[ = 0.1856" + 0.125" \]
\[ = 0.3106" \quad \text{max} \quad \frac{5}{32} \text{in} \]

C = \frac{\delta}{8} (X + \frac{R}{2} \cos \theta) D^2 \tan \theta

\[ = \frac{62.54 (15)}{8} \left( 33 + \frac{12.72}{6} \cos \theta \right) 12.72^2 \tan \theta \]
\[ = 11.70 \times 33.8712 \times 393.764 \]
\[ = 156,025 \text{ lbf} \quad \div 23.200 \quad \text{in}^2 \]
\[ = 6.7252 \text{in}^2 \]

\[ A_{\text{eff}} = 0.78 \left( \frac{t_e}{R_e t_e} + t_1 R_1 t_1 + \ldots + t_5 R_5 t_5 \right) \]
\[ = 0.78 \left( \frac{t_e}{1.375 (2.8)} + \frac{t_1 R_1 t_1}{325 (3125)} + \ldots + \frac{t_5 R_5 t_5}{25 \times 325 (2.5)} \right) \]
\[ = 1.057 \text{in}^2 \left( 0.8131 \text{in}^2 \right) \]
\[ A_{\text{eff}}(\text{max}) = 16 \left( t_1^2 + t_2^2 + t_3^2 \right) \]
\[ = 16 \left( 1.25^2 + 3.25^2 + 25^2 \right) \]
\[ = 3.56250 \text{ in}^2 > 1.05927 \text{ in}^2 \text{ max. allowed} \]
\[ \left( \frac{2.5625}{0.8131} \right) \]
\[ 6.2522 - 1.05927 = 5.666 \text{ in}^2 \]
\[ (6.2522 - 0.8131 = 5.4121 \text{ in}^2) \]
USPC1, WAYNOKA, OK
12.75' x .40' (internal) Contents - Caustic Liquid - Sp. Gr. 1.5 - API-650
Corrosion Allowance - 1/8" Thickness by 1 Foot Method

\[
\frac{2.6 \times (12.75 \times 0.40 - 1.5)}{2.2 \times 200} + 0.125 = 0.2086" \text{ min. } 1/8" \text{ thk.}
\]

Louis D. Wood, Jr.

State of Texas

Louis D. Wood, Jr.
Professional Engineer

10/14/92
SUNBELT TRADING COMPANY, Inc.

Jo: Scott 1779
Attn: Wayne

REF:  
CUSTOMER'S P.O. NO. 27668
S.T.C.'s RELEASE NO. 2994
S.T.C.'s INVOICE NO. 010435

ATTACHED PLEASE FIND MILL TEST CERTIFICATES FOR YOUR ABOVE REFERENCED PURCHASE ORDER FOR THE FOLLOWING MATERIAL.

See Below

THANKS AND REGARDS,

Stacey Gessert

enclosure

20 pcs. 1/4 x 96 x 480 A-36 Plate
4 pcs 1/4 x 96 x 240 A-36 Plate
6 pcs 1/16 x 96 x 240 A-36 Plate
4 pcs 1/4 x 96 x 240 Floor Plate
### Certificat d'Analyse DIN-50049/2.2

#### Identification du Produit
- **Détails du Produit:**
  - **Marque:**
  - **But de la Prise:**
  - **Lieu de Fabrication:**
  - **Zone de Fabrication:**
  - **Matière:**
  - **Grade:**

<table>
<thead>
<tr>
<th>Référence N°</th>
<th>Détails du Produit</th>
<th>Désignation du Produit</th>
<th>Matière</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>28929</td>
<td>1</td>
<td>26 1/4 96° 240°</td>
<td>G4</td>
<td>C1</td>
</tr>
<tr>
<td>28930</td>
<td>1</td>
<td>36 1/4 96° 240°</td>
<td>G4</td>
<td>C1</td>
</tr>
<tr>
<td>28931</td>
<td>1</td>
<td>53 1/4 96° 240°</td>
<td>G4</td>
<td>C1</td>
</tr>
<tr>
<td>28930</td>
<td>1</td>
<td>67 1/4 96° 240°</td>
<td>G4</td>
<td>C1</td>
</tr>
</tbody>
</table>

#### Test de résistance
- **Type de Test:**
- **Conditions de Test:**
- **Résultats:**

#### Revêtement métallurgique
- **Service:**
- **Contrôle de surface:**

#### Signature
- **Date:** 27/04/92
- **Signataire:**

**Note:**
- Les tests ont été effectués conformément aux spécifications de la norme DIN-50049/2.2.
### Certificat d'Usine DIN 50049/2.2

**FONDS DE LA-CABECO**

**SUDBALL TRADING COMPANY INC.**

**US-HOUSTON-TEXAS 77056-1813 (USA)**

**Ref: 29774 PAGE N° 9 BLATT NR 9**

**Matière:** Acier forgé - Acier semi-fini - Acier forgé et semi-fini

**N° Forme:** 11654B

**N° Manufacture:** 115527

**Couleur:** Rouge

**Type de Test:** Tension - Faisabilité - Tenue de Test

**Échelle:** Normalisée

**Échantillon:** Type 1

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>292080</td>
<td>292080</td>
<td>292080</td>
<td>292080</td>
<td>292080</td>
<td>292080</td>
<td>292080</td>
<td>292080</td>
<td>292080</td>
<td>292080</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Métrique</th>
<th>Valeur</th>
<th>Unité</th>
</tr>
</thead>
<tbody>
<tr>
<td>épaisseur</td>
<td>5/16</td>
<td>&quot;</td>
</tr>
<tr>
<td>diamètre</td>
<td>9/16</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

**Résultats de Test:**

<table>
<thead>
<tr>
<th>Échelle</th>
<th>Valeur</th>
<th>Unité</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension</td>
<td>306</td>
<td>10</td>
</tr>
<tr>
<td>Faisabilité</td>
<td>284</td>
<td>10</td>
</tr>
<tr>
<td>Tenue de Test</td>
<td>307</td>
<td>10</td>
</tr>
</tbody>
</table>

**Service Métallurgique:**

**Date:** 10/07/92

**Contrôle de la norme d'exécution et de dématérialisation:**

**Dispositions:**

- Traitement thermique: Normalisé
- Structure: Grain fin
- Condition: Avec grain fin

**Certificat:**

- La présente certificat est conforme aux prescriptions de la norme DIN 50049/2.2
- Les échantillons ont été préparés en conformité avec les prescriptions de la norme.

**Certificat:**

La présente certificat est conforme aux prescriptions de la norme DIN 50049/2.2.

**Echantillon:**

- Échantillon prélevé sur les échantillons de lancement.
- Échantillon conforme aux prescriptions de la norme DIN 50049/2.2.

**Échantillon:**

- Échantillon prélevé sur les échantillons de lancement.
- Échantillon conforme aux prescriptions de la norme DIN 50049/2.2.

**Échantillon:**

- Échantillon prélevé sur les échantillons de lancement.
- Échantillon conforme aux prescriptions de la norme DIN 50049/2.2.

**Échantillon:**

- Échantillon prélevé sur les échantillons de lancement.
- Échantillon conforme aux prescriptions de la norme DIN 50049/2.2.

**Échantillon:**

- Échantillon prélevé sur les échantillons de lancement.
- Échantillon conforme aux prescriptions de la norme DIN 50049/2.2.
### Certificat d'Usine DIN 50049/2.2

#### Identité du Produit
- **Nom du Produit**: EDF
- **Type**: Tube en Acier
- **Diamètre**: 11.653
- **Longueur**: 6000
- **Marque**: SUNBELT TRADING COMPANY INC.
- **Adresse**: 1920 POST OAK BLVD., #1550
- **Adresse**: US-HOUSTON-TEXAS 77056-3613 (USA)

#### Test de Traction
- **Méthode**: Découverte
- **Type de Test**: Tension

#### Resilience - Fibrosités-Intégrité - Notions de Solidité

<table>
<thead>
<tr>
<th>Réf.</th>
<th>Nombre</th>
<th>Diamètre</th>
<th>Longueur</th>
<th>Température</th>
<th>Vitesse de Commutation</th>
<th>Force à la Supplies</th>
<th>Types de Matériau</th>
</tr>
</thead>
<tbody>
<tr>
<td>290634</td>
<td>2</td>
<td>9/4</td>
<td>96</td>
<td>60°C</td>
<td>300 g/mm²</td>
<td>1.12</td>
<td>0.011</td>
</tr>
<tr>
<td>290635</td>
<td>2</td>
<td>9/4</td>
<td>96</td>
<td>60°C</td>
<td>300 g/mm²</td>
<td>1.12</td>
<td>0.011</td>
</tr>
<tr>
<td>290638</td>
<td>2</td>
<td>9/4</td>
<td>96</td>
<td>60°C</td>
<td>300 g/mm²</td>
<td>1.12</td>
<td>0.011</td>
</tr>
<tr>
<td>290933</td>
<td>3</td>
<td>9/4</td>
<td>96</td>
<td>60°C</td>
<td>300 g/mm²</td>
<td>1.12</td>
<td>0.011</td>
</tr>
</tbody>
</table>

#### Service Métallurgique
- **Date**: 29/05/92
- **Mise à Conformité**: SAS (Société d'Assurance Scolarisés)

#### Notes
- Le certificat indique que les produits sont conformes aux prescriptions de la norme DIN 50049/2.2.
- Les résultats des essais sont conformes aux normes prescrites.

---

**CLABECQ, le 29/05/92**
### Structural Certified Material Test Report

**Company:** Chaparral Steel

**Address:** 300 Ward Rd., Midlothian, TX 76065

**Contact:** (214) 775-8241

**Shipment To:**

**Shipper:** O'Neal Steel, Inc.  
**Receiver:** O'Neal Steel Inc

**Location:**

- **Birmingham:** Al. 35201  
- **Lubbock:** TX 79417

**Purchase Order Number:** 04616  
**Date:** 10-JUN-92  
**Quantity:** 4.60  
**Description:** W 4 x 13#

**TED According To:**

- **Size:** 4 x 13#
- **Grade:** A36/A57250
- **Product:** WF Beams
- **Heat:** 9-9769

### Chemical Analysis

<table>
<thead>
<tr>
<th>Element</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mn</td>
<td>0.12</td>
</tr>
<tr>
<td>P</td>
<td>0.07</td>
</tr>
<tr>
<td>S</td>
<td>0.014</td>
</tr>
<tr>
<td>Si</td>
<td>0.050</td>
</tr>
<tr>
<td>Cu</td>
<td>0.26</td>
</tr>
<tr>
<td>Ni</td>
<td>0.57</td>
</tr>
<tr>
<td>Cr</td>
<td>0.14</td>
</tr>
<tr>
<td>Mo</td>
<td>0.06</td>
</tr>
<tr>
<td>V</td>
<td>0.028</td>
</tr>
<tr>
<td>Nd</td>
<td>0.000</td>
</tr>
</tbody>
</table>

### Physical Properties

- **Yield Strength:** 60.4 ksi
- **Tensile Strength:** 77.7 ksi
- **Specimen Area:** 3.727
- **Elongation:** 43.5%
- **Gauge Length:** 2"
- **Bend Test:** 0.50 P Pass
- **Grain Size:**
- **Reduction of Area:**

**Remarks:**

**NOTARIZED (ON REQUEST ONLY)**

**ANTIFRAUD:** 499603

**Commission Expires**

**Validity:** 27230

**Expiration:** JT 41210

**O'Neal Steel Inc.**

**P.O. Box 5495**

**Lubbock, TX 79417**

**Certification:**

Hereby certify that the contents of this report are correct and accurate. All test results and operations performed by this manufacturer are in compliance with the requirements of the material specification, and when designated by the purchaser meet all applicable material requirements of section III of the A.S.M.E. Boiler and Pressure Vessel Code.

**Signature:**

**[Signature of Quality Assurance Manager]**

**Date:** 10th June 1992

**Certified Public:**

**Number:** 0-00003

**Expiration:** JT 41210

**MANUFACTURING PROCESSES**

Manufacturing processes of the steel materials in this product, including melting, have occurred within the United States in compliance with the "Buy America" provision of the Surface Transportation Assistance Act of 1982.
<table>
<thead>
<tr>
<th>ORDER NUMBER</th>
<th>DESCRIPTION</th>
<th>HEAT NUMBER</th>
<th>TENSILE STRENGTH</th>
<th>TENSILE STRENGTH</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>Si</th>
<th>Cu</th>
<th>Ni</th>
<th>Cr</th>
<th>Mo</th>
<th>V</th>
<th>Co</th>
</tr>
</thead>
<tbody>
<tr>
<td>45605-001-0</td>
<td>FLATS, 0.3750&quot; X 2.0000&quot;</td>
<td>49690</td>
<td>52.0</td>
<td>73.3</td>
<td>0.16</td>
<td>.72</td>
<td>.015</td>
<td>.016</td>
<td>.16</td>
<td>.27</td>
<td>.22</td>
<td>.02</td>
<td>.27</td>
<td>.16</td>
</tr>
</tbody>
</table>

I certify the above results of tests and/or analyses to be correct as contained in the records of Atlantic Steel Company.

By: [Signature]

Day: [Date]
<table>
<thead>
<tr>
<th>SIZE</th>
<th>GRADE</th>
<th>SPECIFICATION</th>
<th>YIELD PT</th>
<th>% EYELET</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 X 5.44</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>48270</td>
<td>72169</td>
</tr>
<tr>
<td>V2-1989</td>
<td>.15</td>
<td>.69.01 .03</td>
<td>48173</td>
<td>71742</td>
</tr>
<tr>
<td>3 X 3 X 1/4</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>52586</td>
<td>71724</td>
</tr>
<tr>
<td>V2-2486</td>
<td>.15</td>
<td>.73.01 .04</td>
<td>52777</td>
<td>72222</td>
</tr>
<tr>
<td>3 X 3 X 1/4</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>51154</td>
<td>71352</td>
</tr>
<tr>
<td>V2-2827</td>
<td>.14</td>
<td>.61.01 .04</td>
<td>48113</td>
<td>66981</td>
</tr>
<tr>
<td>2 X 2 X 3/8</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>46626</td>
<td>76522</td>
</tr>
<tr>
<td>V2-2736</td>
<td>.15</td>
<td>.69.01 .05</td>
<td>46626</td>
<td>76522</td>
</tr>
<tr>
<td>3 X 3 X 3/16</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>47201</td>
<td>71455</td>
</tr>
<tr>
<td>V2-2530</td>
<td>.14</td>
<td>.68.01 .03</td>
<td>48394</td>
<td>68119</td>
</tr>
<tr>
<td>3 X 3 X 3/16</td>
<td>A36</td>
<td>ASTM A36-91 ASME-SA36</td>
<td>47706</td>
<td>67686</td>
</tr>
</tbody>
</table>

**This material, including the billets, was produced and manufactured in the United States of America.**

A. J. Turner
Quality Assurance Mgr.
Hill Group
<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>GRADE</th>
<th>SPECIFICATION</th>
<th>IMPACT ENERGY</th>
<th>TENSILE STRENGTH</th>
<th>ELONGATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-172</td>
<td>1.15</td>
<td>ASTM A36</td>
<td>20,000</td>
<td>56,000</td>
<td>25.0</td>
</tr>
<tr>
<td>2-178</td>
<td>1.15</td>
<td>ASTM A36</td>
<td>20,000</td>
<td>56,000</td>
<td>25.0</td>
</tr>
<tr>
<td>2-179</td>
<td>1.15</td>
<td>ASTM A36</td>
<td>20,000</td>
<td>56,000</td>
<td>25.0</td>
</tr>
<tr>
<td>2-180</td>
<td>1.15</td>
<td>ASTM A36</td>
<td>20,000</td>
<td>56,000</td>
<td>25.0</td>
</tr>
<tr>
<td>2-181</td>
<td>1.15</td>
<td>ASTM A36</td>
<td>20,000</td>
<td>56,000</td>
<td>25.0</td>
</tr>
<tr>
<td>2-182</td>
<td>1.15</td>
<td>ASTM A36</td>
<td>20,000</td>
<td>56,000</td>
<td>25.0</td>
</tr>
</tbody>
</table>

*THIS MATERIAL, INCLUDING THE BILLETS, WAS PRODUCED AND MANUFACTURED IN THE UNITED STATES OF AMERICA.*

*E. J. TURNER*  
QUALITY ASSURANCE MGR.  
MILL GROUP

WE HEREBY CERTIFY THAT THE ABOVE FIGURES ARE CORRECT AS CONSUMED IN THE RECORDS OF THE COMPANY.
# CERTIFIED TEST REPORT

The following tests conform to the requirements of the specifications listed.

## HEAT NO. | SECTION | SPECIFICATION | C | Mn | P | S | Si | Cu | Cr | Ni | Mo | Cb | V | Al
---|---|---|---|---|---|---|---|---|---|---|---|---|---|---
01391 | AU 2.5X2X1/4 | ASTM A36-B9 | .15 | 0.87 | .024 | .036 | .16 | .43 | 0.24 | 0.17 | .039 | .000 | .004 | .003
B7196 | CH 6X10.5 | ASTM A36-B9 | .17 | 0.68 | .009 | .031 | .26 | .37 | 0.23 | 0.23 | .049 | .004 | .002 | .001
B9624 | SD 3/4 | ASTM A36-B9 | .16 | 0.82 | .009 | .033 | .17 | .50 | 0.11 | 0.23 | .053 | .000 | .002 | .002
B9625 | SD 3/4 | ASTM A36-B9 | .15 | 0.76 | .006 | .028 | .19 | .46 | 0.10 | 0.22 | .054 | .000 | .002 | .001
B7196 | CH 6X10.5 | ASTM A36-B9 | .17 | 0.68 | .009 | .031 | .26 | .37 | 0.23 | 0.23 | .049 | .004 | .002 | .001
01476 | #B REBAR | ASTM A615-B9 GRADE 60 | .42 | 0.97 | .008 | .032 | .23 | .42 | 0.08 | 0.17 | .041 | .013 | .002 | .002

## HEAT NO. | TEST NO. | YIELD PSI | TENSILE PSI | %ELONG. IN 8" | BEND | LB/FT | DATE ROLLED (MM-DD-YY)
---|---|---|---|---|---|---|---
01391 | 1 | 52100 | 74800 | 30.0 | 3.570 | 06/25/92
B7196 | 1 | 51800 | 74400 | 39.0 | 10.400 | 08/28/91
B9624 | 1 | 51500 | 73500 | 22.0 | 1.900 | 01/10/92
B9625 | 1 | 51500 | 73500 | 22.0 | 1.900 | 01/10/92
B7196 | 1 | 51800 | 74400 | 39.0 | 10.400 | 08/28/91
01476 | 1 | 69000 | 106300 | 12.0 | DK | 2.600 | 06/26/92

### REMARKS
- F.O. Z-16717, Z-19477, Z-19076, Z-57945 & BZ-42393
- THIS STEEL IS MELTED & MANUFACTURED IN THE USA

DAN SCHACHT
B/ 7/92

QUALITY CONTROL MANAGER
# Atlantic Steel COMPANY

**A MEMBER OF THE INACO GROUP**

P.O. BOX 1714  
ATLANTA, GEORGIA 30301

**TEST CERTIFICATE**

O'NEAL STEEL INC.

TEST REPORTS

P. O. BOX 5506

LUBBOCK, TX 79417

<table>
<thead>
<tr>
<th>INVOICE NUMBER</th>
<th>CUSTOMER ORDER NO</th>
<th>DESCRIPTION</th>
<th>HEAT NUMBER</th>
<th>YIELD STRENGTH KSI</th>
<th>TENSILE STRENGTH KSI</th>
<th>LOWEST % GAGE</th>
<th>BLIND TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>736447-001</td>
<td>Z-079</td>
<td>FLATS, 0.2500 X 4.0000 55 KSI</td>
<td>48832</td>
<td>65.6</td>
<td>87.6</td>
<td>28.0</td>
<td>.20</td>
</tr>
</tbody>
</table>

2834 CLOVIS ROAD

LUBBOCK, TX

**CHEMICAL ANALYSIS - %**

<table>
<thead>
<tr>
<th>Element</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>.37</td>
</tr>
<tr>
<td>Mn</td>
<td>.023</td>
</tr>
<tr>
<td>Si</td>
<td>1.1</td>
</tr>
<tr>
<td>Cu</td>
<td>.016</td>
</tr>
<tr>
<td>Ni</td>
<td>.17</td>
</tr>
<tr>
<td>Cr</td>
<td>.007</td>
</tr>
<tr>
<td>Mo</td>
<td>.25</td>
</tr>
</tbody>
</table>

MATERIAL MELTED AND MANUFACTURED IN THE USA

I CERTIFY THE ABOVE RESULTS OF TEST AND/OR ANALYSES TO BE CORRECT AS CONTAINED IN THE RECORDS OF ATLANTIC STEEL COMPANY.
<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>DESCRIPTION</th>
<th>PHYSICAL TESTS</th>
<th>CHEMICAL TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>YIELD P.S.I.</td>
<td>TENSILE P.S.I.</td>
</tr>
<tr>
<td>55913668</td>
<td>1/4x3&quot; F1 20' (A36)</td>
<td>50,500</td>
<td>71,500</td>
</tr>
<tr>
<td></td>
<td>ASTM A36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55913692</td>
<td>1/4x4&quot; F1 20' (A36)</td>
<td>45,800</td>
<td>65,900</td>
</tr>
<tr>
<td></td>
<td>ASTM A36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>559310572</td>
<td>1/2x3&quot; F1 20' (A36)</td>
<td>45,700</td>
<td>68,700</td>
</tr>
<tr>
<td></td>
<td>ASTM A36-91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>559310573</td>
<td>1/2x3&quot; F1 20' (A36)</td>
<td>46,300</td>
<td>67,500</td>
</tr>
<tr>
<td></td>
<td>ASTM A36-91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEAT NO.</td>
<td>DESCRIPTION</td>
<td>YIELD P.S.I.</td>
<td>TENSILE P.S.I.</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------</td>
<td>--------------</td>
<td>----------------</td>
</tr>
<tr>
<td>B49215924</td>
<td>1/4 x 2&quot; F1 20' (A36) ASTM A36-90</td>
<td>44,400</td>
<td>65,400</td>
</tr>
<tr>
<td>B49316382</td>
<td>3/4&quot; Rd 20' (A36) ASTM A36-90</td>
<td>56,680</td>
<td>74,830</td>
</tr>
<tr>
<td>VOGUE MEBER</td>
<td>CUSTOMER NO.</td>
<td>DESCRIPTION</td>
<td>YIELD STRENGTH</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------</td>
<td>-------------</td>
<td>----------------</td>
</tr>
<tr>
<td>30167</td>
<td>Z-0270 FLAT, 0.7500&quot; X 4.0000&quot; 55 KSI</td>
<td>20.00&quot;, 9000# STACKED BUND</td>
<td>48782 6.00</td>
</tr>
</tbody>
</table>

MATERIAL MELTED AND MANUFACTURED IN THE USA

I CERTIFY THE ABOVE RESULTS OF TESTS AND/OR ANALYSES TO BE CORRECT AS CONTAINED IN THE RECORDS OF ATLANTIC STEEL COMPANY.
<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>SECTION</th>
<th>SPECIFICATION</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cu</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>Cb</th>
<th>V</th>
<th>Al</th>
</tr>
</thead>
<tbody>
<tr>
<td>780</td>
<td>AE 2.5X1/4</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>0.78</td>
<td>.008</td>
<td>.034</td>
<td>.24</td>
<td>.12</td>
<td>.017</td>
<td>.037</td>
<td>.000</td>
<td>.0020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>202</td>
<td>AE 2.5X3/8</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>0.85</td>
<td>.008</td>
<td>.029</td>
<td>.25</td>
<td>.19</td>
<td>.017</td>
<td>.052</td>
<td>.000</td>
<td>.0010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>243</td>
<td>FL 3/4X6</td>
<td>A36 MODIFIED</td>
<td>.21</td>
<td>0.83</td>
<td>.009</td>
<td>.042</td>
<td>.23</td>
<td>.11</td>
<td>.018</td>
<td>.035</td>
<td>.004</td>
<td>.0020</td>
<td>001</td>
<td></td>
</tr>
<tr>
<td>094</td>
<td>FL 3/4X6</td>
<td>A36 MODIFIED</td>
<td>.21</td>
<td>0.80</td>
<td>.007</td>
<td>.026</td>
<td>.26</td>
<td>.10</td>
<td>.017</td>
<td>.037</td>
<td>.001</td>
<td>.0010</td>
<td>001</td>
<td></td>
</tr>
<tr>
<td>176</td>
<td>AE 2X1/4</td>
<td>ASTM A36-89</td>
<td>.13</td>
<td>0.87</td>
<td>.010</td>
<td>.029</td>
<td>.26</td>
<td>.18</td>
<td>.016</td>
<td>.051</td>
<td>.000</td>
<td>.0020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>FL 3/4X5</td>
<td>A36 MODIFIED</td>
<td>.14</td>
<td>0.80</td>
<td>.009</td>
<td>.026</td>
<td>.26</td>
<td>.17</td>
<td>.017</td>
<td>.046</td>
<td>.000</td>
<td>.0010</td>
<td>001</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>Test No.</th>
<th>YIELD PSI</th>
<th>TENSILE PSI</th>
<th>%ELONG IN 8&quot;</th>
<th>BEND</th>
<th>LB/FT</th>
<th>DATE ROLLED MM-DD-YY</th>
</tr>
</thead>
<tbody>
<tr>
<td>8780</td>
<td>1</td>
<td>52900</td>
<td>73100</td>
<td>31.0</td>
<td></td>
<td>4.045</td>
<td>11/16/91</td>
</tr>
<tr>
<td>8202</td>
<td>1</td>
<td>51400</td>
<td>75000</td>
<td>30.0</td>
<td></td>
<td>4.560</td>
<td>10/19/91</td>
</tr>
<tr>
<td>5243</td>
<td>1</td>
<td>52200</td>
<td>79400</td>
<td>25.0</td>
<td></td>
<td>15.150</td>
<td>04/27/91</td>
</tr>
<tr>
<td>7094</td>
<td>1</td>
<td>51200</td>
<td>80000</td>
<td>25.0</td>
<td></td>
<td>15.200</td>
<td>08/18/91</td>
</tr>
<tr>
<td>8175</td>
<td>1</td>
<td>45800</td>
<td>72900</td>
<td>32.0</td>
<td></td>
<td>3.150</td>
<td>10/20/91</td>
</tr>
<tr>
<td>8176</td>
<td>1</td>
<td>51200</td>
<td>72700</td>
<td>30.0</td>
<td></td>
<td>3.140</td>
<td>10/20/91</td>
</tr>
<tr>
<td>7105</td>
<td>1</td>
<td>54400</td>
<td>81300</td>
<td>26.0</td>
<td></td>
<td>12.550</td>
<td>08/20/91</td>
</tr>
</tbody>
</table>

REMARKS: THIS STEEL IS MELTED & MANUFACTURED IN THE USA.
**CERTIFIED TEST REPORT**

The following tests conform to the requirements of the specifications listed.

<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>SECTION</th>
<th>SPECIFICATION</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cu</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>Cb</th>
<th>V</th>
<th>Al</th>
</tr>
</thead>
<tbody>
<tr>
<td>B9511</td>
<td>AU 2X1.5X3/16</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>.77</td>
<td>.011</td>
<td>.033</td>
<td>.13</td>
<td>.38</td>
<td>.11</td>
<td>.015</td>
<td>.036</td>
<td>.000</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>K1017</td>
<td>AE 2X1/8</td>
<td>ASTM A36-89</td>
<td>.16</td>
<td>.67</td>
<td>.020</td>
<td>.036</td>
<td>.22</td>
<td>.33</td>
<td>.13</td>
<td>.010</td>
<td>.000</td>
<td>.010</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>K1056</td>
<td>AE 2X1/8</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>.66</td>
<td>.017</td>
<td>.037</td>
<td>.29</td>
<td>.36</td>
<td>.12</td>
<td>.011</td>
<td>.020</td>
<td>.000</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>50202</td>
<td>AE 2X3/8</td>
<td>ASTM A36-89</td>
<td>.15</td>
<td>.85</td>
<td>.008</td>
<td>.029</td>
<td>.25</td>
<td>.38</td>
<td>.11</td>
<td>.011</td>
<td>.052</td>
<td>.000</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>00195</td>
<td>AE 2.5X3/8</td>
<td>ASTM A36-89</td>
<td>.18</td>
<td>.79</td>
<td>.008</td>
<td>.033</td>
<td>.21</td>
<td>.51</td>
<td>.19</td>
<td>.014</td>
<td>.032</td>
<td>.000</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>00222</td>
<td>AE 2.5X1/4</td>
<td>ASTM A36-89</td>
<td>.19</td>
<td>.73</td>
<td>.007</td>
<td>.020</td>
<td>.23</td>
<td>.52</td>
<td>.12</td>
<td>.014</td>
<td>.046</td>
<td>.001</td>
<td>.002</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>TEST NO.</th>
<th>YIELD PSI</th>
<th>TENSILE PSI</th>
<th>% ELONG IN &quot;</th>
<th>BEND</th>
<th>LB/FT</th>
<th>DATE ROLLED MM-DD-YY</th>
</tr>
</thead>
<tbody>
<tr>
<td>B9511</td>
<td>1</td>
<td>19800</td>
<td>71200</td>
<td>27.0</td>
<td>2.060</td>
<td>01/02/92</td>
<td></td>
</tr>
<tr>
<td>K1017</td>
<td>1</td>
<td>55300</td>
<td>73800</td>
<td>29.5</td>
<td>1.600</td>
<td>01/26/92</td>
<td></td>
</tr>
<tr>
<td>K1056</td>
<td>1</td>
<td>53900</td>
<td>71900</td>
<td>21.0</td>
<td>1.640</td>
<td>01/25/92</td>
<td></td>
</tr>
<tr>
<td>50202</td>
<td>1</td>
<td>51400</td>
<td>75000</td>
<td>30.0</td>
<td>4.560</td>
<td>10/19/91</td>
<td></td>
</tr>
<tr>
<td>00195</td>
<td>1</td>
<td>51400</td>
<td>75200</td>
<td>30.0</td>
<td>5.830</td>
<td>04/21/92</td>
<td></td>
</tr>
<tr>
<td>00222</td>
<td>1</td>
<td>54000</td>
<td>77300</td>
<td>32.0</td>
<td>4.050</td>
<td>04/21/92</td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS:** THIS STEEL IS HEATED & MANUFACTURED IN THE USA

**SPECIFICATIONS:**

- ASTM A36-89
- YIELD: 55300 PSI
- TENSILE: 73800 PSI
- % ELONG IN ": 29.5
- BEND: 2.060
- DATE ROLLED: 01/02/92

**QUALITY CONTROL MANAGER:**

DAN SCHACHT

4/29/92
<table>
<thead>
<tr>
<th>Tube Dimension</th>
<th>Yield Point</th>
<th>U.T.S.</th>
<th>Elongation</th>
<th>Heat No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10&quot; x 0.375</td>
<td>52017</td>
<td>68334</td>
<td>10</td>
<td>2483</td>
</tr>
<tr>
<td>10&quot; x 0.375</td>
<td>57736</td>
<td>72931</td>
<td>22</td>
<td>2485</td>
</tr>
<tr>
<td>10&quot; x 0.375</td>
<td>59167</td>
<td>74195</td>
<td>23</td>
<td>2486</td>
</tr>
<tr>
<td>10&quot; x 0.375</td>
<td>56361</td>
<td>70773</td>
<td>27</td>
<td>2488</td>
</tr>
<tr>
<td>10&quot; x 0.375</td>
<td>57206</td>
<td>72927</td>
<td>25</td>
<td>2489</td>
</tr>
<tr>
<td>10&quot; x 0.375</td>
<td>53200</td>
<td>64462</td>
<td>24</td>
<td>2490</td>
</tr>
<tr>
<td>10&quot; x 0.375</td>
<td>56742</td>
<td>76653</td>
<td>31</td>
<td>2491</td>
</tr>
<tr>
<td>10&quot; x 0.375</td>
<td>55391</td>
<td>65465</td>
<td>33</td>
<td>2492</td>
</tr>
<tr>
<td>10&quot; x 0.375</td>
<td>62406</td>
<td>76499</td>
<td>29</td>
<td>2493</td>
</tr>
<tr>
<td>10&quot; x 0.375</td>
<td>50029</td>
<td>73783</td>
<td>37</td>
<td>2494</td>
</tr>
</tbody>
</table>

RAMLAX, 23/04/89
**Middle East Tube Co. Ltd.**

**Import/Export Dept.**
P.O.B 62 Ramla 72100 Israel  
Telex: 361502 PIPE IL  
Telephone: 6-258362 4  
Fax: 6-221198

---

**Mill Certificate No. 89/J/1-183**  
**Page 1**

---

**Chemical Analysis**

<table>
<thead>
<tr>
<th>IB Dimensions</th>
<th>% C</th>
<th>% Mn</th>
<th>% Si</th>
<th>% P</th>
<th>% S</th>
<th>Al%</th>
<th>Heat No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot; x 0.375</td>
<td>0.160</td>
<td>0.710</td>
<td>0.160</td>
<td>0.014</td>
<td>0.012</td>
<td>0.004</td>
<td>2483</td>
</tr>
<tr>
<td>8&quot; x 0.375</td>
<td>0.160</td>
<td>0.760</td>
<td>0.270</td>
<td>0.014</td>
<td>0.013</td>
<td>0.006</td>
<td>2485</td>
</tr>
<tr>
<td>8&quot; x 0.375</td>
<td>0.160</td>
<td>0.780</td>
<td>0.250</td>
<td>0.013</td>
<td>0.015</td>
<td>0.006</td>
<td>2486</td>
</tr>
<tr>
<td>8&quot; x 0.375</td>
<td>0.140</td>
<td>0.640</td>
<td>0.200</td>
<td>0.008</td>
<td>0.021</td>
<td>0.005</td>
<td>2480</td>
</tr>
<tr>
<td>8&quot; x 0.375</td>
<td>0.160</td>
<td>0.690</td>
<td>0.270</td>
<td>0.008</td>
<td>0.025</td>
<td>0.005</td>
<td>2499</td>
</tr>
<tr>
<td>8&quot; x 0.375</td>
<td>0.160</td>
<td>0.700</td>
<td>0.240</td>
<td>0.013</td>
<td>0.017</td>
<td>0.004</td>
<td>2490</td>
</tr>
<tr>
<td>8&quot; x 0.375</td>
<td>0.160</td>
<td>0.750</td>
<td>0.300</td>
<td>0.005</td>
<td>0.021</td>
<td>0.005</td>
<td>2493</td>
</tr>
<tr>
<td>8&quot; x 0.375</td>
<td>0.160</td>
<td>0.690</td>
<td>0.220</td>
<td>0.009</td>
<td>0.021</td>
<td>0.004</td>
<td>2492</td>
</tr>
<tr>
<td>8&quot; x 0.375</td>
<td>0.160</td>
<td>0.740</td>
<td>0.200</td>
<td>0.005</td>
<td>0.021</td>
<td>0.005</td>
<td>2493</td>
</tr>
<tr>
<td>8&quot; x 0.375</td>
<td>0.160</td>
<td>0.770</td>
<td>0.240</td>
<td>0.015</td>
<td>0.016</td>
<td>0.012</td>
<td>2494</td>
</tr>
</tbody>
</table>

RAMLA, 23/04/89

---

**Member of** Koor Steel

Head Office: P.O.B 708 Haifa 31002 Israel  
Telephone: 04-81457-50 Cables: Metco. Haifa  
Telex: 473789 Metco-I  Fax: 04-91746
**Middle East Tube Co., Ltd.**

**Import / Export Dept.**
P.O. Box 92, Ramla, 72100, Israel
TELEX: 381503 PIPE.IL
TELEPHONE: 0-2683524
FAX: 8122199

**Middle East Tube Co., Ltd.**

**Mill Certificate No. 1937/00**

<table>
<thead>
<tr>
<th>ER No.: 09/J/1-183</th>
<th>Test FS: 1490</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>ER WALL</th>
<th>KG/MTR</th>
<th>LENGTH MTR</th>
<th>LENGTH FT</th>
<th>TOTAL H. TON</th>
<th>PIECE</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.375</td>
<td>105.100</td>
<td>3150.36</td>
<td>10336.33</td>
<td>325.742</td>
<td>246</td>
<td>RED+RED</td>
</tr>
<tr>
<td>0.375</td>
<td>105.100</td>
<td>267.24</td>
<td>883.38</td>
<td>27.948</td>
<td>23</td>
<td>GREEN+GREEN</td>
</tr>
</tbody>
</table>

07/04/09

---

Memb. of **Koor Steel**
Head Office: P.O.B. 786, Haifa 31003, Israel.
Telephone: 04-910452, 912187, 912141.
Telex: 4131243, Metco-Haifa.
Fax: 04-912545.
# Certificado de Ensaios e Análises

**Mill Test Certificate**

**Material:** ERW LINE PIPE / QPE - OR A - SCH 40.

**Fabricante:** DLRL

**Unidade de Medida:** FEET

---

### Características Físicas

<table>
<thead>
<tr>
<th>Propriedade</th>
<th>Unidade</th>
<th>Valor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistência à Tensão</td>
<td>PSI</td>
<td>50,157</td>
</tr>
<tr>
<td>Comportamento</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Análise Química

<table>
<thead>
<tr>
<th>Elemento</th>
<th>Contento (% com base em 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.13</td>
</tr>
<tr>
<td>Mn</td>
<td>0.31</td>
</tr>
<tr>
<td>P</td>
<td>0.15</td>
</tr>
<tr>
<td>S</td>
<td>0.05</td>
</tr>
<tr>
<td>Cr</td>
<td>15.2</td>
</tr>
<tr>
<td>Mo</td>
<td>12.1</td>
</tr>
<tr>
<td>Cu</td>
<td>10.1</td>
</tr>
</tbody>
</table>

**Observações:**

- Certificação do presente material foi testado em nosso laboratório, de acordo com as especificações técnicas, resultando nos valores acima referidos. Nós, portanto, certificamo-nos de que o material descrito está na conformidade com as especificações e que os resultados estão acima mencionados.

**Assinaturas:**

**Dra飿.**, 13/04/1992

Salvatore di Mondo
<table>
<thead>
<tr>
<th>HEAT NO.</th>
<th>DIMENSION</th>
<th>HYDROSTATIC</th>
<th>WEIGHT</th>
<th>CHEMICAL COMPOSITION %</th>
<th>TENSION TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TESTED PSI</td>
<td>LBS.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1104271</td>
<td>3</td>
<td>2200</td>
<td>13</td>
<td>44 11 21 0</td>
<td>38755</td>
</tr>
<tr>
<td></td>
<td></td>
<td>155</td>
<td>15.17</td>
<td></td>
<td>2724</td>
</tr>
</tbody>
</table>

TUBERIA NACIONAL, S. A.

INSPECTION CERTIFICATE

2 sch 40 453 welded
FOR: SHIELDED METAL ARC WELDING, CARBON STEEL (P-Number 1)

SCOPE
1. This welding procedure specification covers the welding of carbon steel (P-1) in the fabrication of API 650 storage tanks.

PROCESS: Shielded metal arc.

BASE METAL:
The steel base metal shall comply with one of the ASTM specifications and grades listed in the ASME Code under (P-1).

FILLER METAL:
The filler metal shall comply with ASME Material Specification Part C E6010 (F3).

PREPARATION OF BASE METAL AND ALIGNMENT OF EDGES:
1. The edges to be joined shall be prepared in accordance with a single or double "V" Groove. Gas cutting may be used.
2. Edges to joined and all surfaces within 1/2" of the welding edge shall be thoroughly cleaned immediately prior to welding.
3. Abutting edges of plates at longitudinal joints shall not, after welding, have an offset at any point in excess of one-quarter of the plate thickness with a maximum permissible offset of 1/8", except that plates less than 1/4" in thickness, the offset may be as much as 1/16".
4. Abutting edges circumferential joints shall be aligned with the following tolerances:
   - For plates up to 1/4" 1/16"
   - For plates over 1/4" to 3/4" 25% of plate thickness
   - For plates over 3/4" to 1½" 3/16"
   - For plates over 1½" 12 1/2% of plate thickness, but not over 1/4"

ELECTRIC CURRENT:
Direct current shall be used with electrode positive and the base metal negative. (Reverse Polarity).

WELDING TECHNIQUE:
1. The welding technique shall be substantially as shown on the attached sketches.
2. (a) When making double-welded joints the reverse (root) side must be gouged, chipped, or ground out to sound metal before the finishing bead is deposited.
### Positions (QW-405)
- Position(s) of Groove: 6G
- Welding Progression: Up E7018 Down E6010
- Position(s) of Fillet: ALL

### Postweld Heat Treatment (QW-407)
- Temperature Range: NA
- Time Range: NA

### Preheat (QW-406)
- Preheat Temp. Min.: 70°F
- Interpass Temp. Max.: 500°F
- Preheat Maintenance: As Required

### Electrical Characteristics (QW-409)
- Current AC or DC: DC
- Polarity: Reverse
- Amps (Range): 120-190
- Volts (Range): 19-26

- Tungsten Electrode Size and Type: NA
  - (Pure Tungsten, 2% Thoriated, etc.)
- Mode of Metal Transfer for GMAW: NA
  - (Spray arc, short circuiting arc, etc.)
- Electrode Wire Feed Speed Range: NA

### Technique (QW-410)
- String or Weave Bead: String & Weave
- Orifice or Gas Cup Size: NA
- Initial and Interpass Cleaning (Brushing, Grinding, etc.): Grinding & Brush
- Method of Back Gouging: Air Arc and Grinding
- Oscillation: No pass greater than 1" off
- Contact Tube to Work Distance: NA
- Multiple or Single Pass (Per Side): Multipass
- Multiple or Single Electrodes: Single
- Travel Speed (Range): 8 to 10 Inches Per Minute
- Peening: Not Allowed
- Other: 

### Filler Metal

<table>
<thead>
<tr>
<th>Weld Layer(s)</th>
<th>Process</th>
<th>Class</th>
<th>Dia.</th>
<th>Type Polar.</th>
<th>Amp. Range</th>
<th>Volt Range</th>
<th>Travel Speed Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SMAW</td>
<td>E6010</td>
<td>1/8&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>8-10 IPM</td>
</tr>
<tr>
<td>2</td>
<td>SMAW</td>
<td>E7018</td>
<td>1/8</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>6-8 IPM</td>
</tr>
<tr>
<td>3-4-5</td>
<td>SMAW</td>
<td>E7018</td>
<td>5/32&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>8-10 IPM</td>
</tr>
<tr>
<td>CAP</td>
<td>SMAW</td>
<td>E7018</td>
<td>1/8&quot;</td>
<td>Rev.</td>
<td>120-190</td>
<td>19-26</td>
<td>6-8 IPM</td>
</tr>
</tbody>
</table>

### Other
- (e.g., Remarks, Comments, Hot Wire Addition, Technique, Torch Angle, Etc.)
### JOINTS (QW-402)
- **Joint Design:** GROOVE
- **Backing (Yes) (No):** N
- **Backing Material (Type):** (Refer to both backing and retainer)
  - Metal
  - 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 grooves may be specified.

(At the option of the Mgr., 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. 1 to P.No. 1
- Group No. 1 to Group No. 1

**OR**
- Specification type and grade: A106 Gr B

**OR**

**Thickness Range:**
- **Base Metal:** Groove 1.876 to .864" Fillet Unlimited
- **Pipe Dia. Range:** Groove 6 5/8" Fillet Unlimited

### FILLER METALS (QW-404)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E6010</td>
<td>5.4</td>
<td>3</td>
<td>1</td>
<td>1/8&quot;</td>
<td>.125&quot;</td>
<td>.0625&quot; to .250&quot;</td>
<td>Iron Oxide</td>
</tr>
<tr>
<td>E7018</td>
<td>4</td>
<td></td>
<td>1</td>
<td>1/8&quot;--5/32&quot;</td>
<td>.307&quot;</td>
<td>All</td>
<td>Low Hydrogen</td>
</tr>
</tbody>
</table>

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

---

*QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)*

(See QW-201.1, Section IX, ASME Boiler and Pressure Vessel Code)
**Company Name**: SCOTT MANUFACTURING, INC.

**Procedure Qualification Record No.**: SA-1A

**WPS No.**: SA-1

**Weighing Process**: SRAW


**JOINTS (GW-402)**

**Groove Design of Test Coupon**

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

<table>
<thead>
<tr>
<th>BASE METALS (GW-403)</th>
<th>POSTWELD HEAT TREATMENT (GW-407)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Spec.</td>
<td>Temperature</td>
</tr>
<tr>
<td>SA 516</td>
<td>NA</td>
</tr>
<tr>
<td>Type or Grade</td>
<td>Time</td>
</tr>
<tr>
<td>70</td>
<td>Other</td>
</tr>
<tr>
<td>P-No.</td>
<td></td>
</tr>
<tr>
<td>1 to P-No. 1</td>
<td></td>
</tr>
<tr>
<td>Thickness of Test Coupon</td>
<td></td>
</tr>
<tr>
<td>.375&quot;</td>
<td></td>
</tr>
<tr>
<td>Diameter of Test Coupon</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FILLER METALS (GW-404)</th>
<th>POSTWELD HEAT TREATMENT (GW-407)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFA Specification</td>
<td>Temperature</td>
</tr>
<tr>
<td>5.1</td>
<td>NA</td>
</tr>
<tr>
<td>AWS Classification</td>
<td>Time</td>
</tr>
<tr>
<td>E6010</td>
<td>Other</td>
</tr>
<tr>
<td>Filler Metal F-No.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Weld Metal Analysis A-No.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Size of Filler Metal</td>
<td></td>
</tr>
<tr>
<td>1/8&quot; - 5/32&quot;</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Deposited Weld Metal</td>
<td></td>
</tr>
<tr>
<td>.500&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**POSITION (GW-405)**

<table>
<thead>
<tr>
<th>POSITION (GW-405)</th>
<th>TECHNIQUE (GW-410)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position of Groove</td>
<td>Travel Speed</td>
</tr>
<tr>
<td>1G</td>
<td>B-10-IPM</td>
</tr>
<tr>
<td>Weld Progression (Uphill, Downhill)</td>
<td>String or Weave Bead</td>
</tr>
<tr>
<td>Other</td>
<td>String &amp; Weave</td>
</tr>
</tbody>
</table>

**PREHEAT (GW-406)**

<table>
<thead>
<tr>
<th>PREHEAT (GW-406)</th>
<th>TECHNIQUE (GW-410)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preheat Temp.</td>
<td>Travel Speed</td>
</tr>
<tr>
<td>None</td>
<td>B-10-IPM</td>
</tr>
<tr>
<td>Interpass Temp.</td>
<td>String or Weave Bead</td>
</tr>
<tr>
<td>450°F</td>
<td>String &amp; Weave</td>
</tr>
<tr>
<td>Other</td>
<td>Oscillation</td>
</tr>
</tbody>
</table>

This form (E00007) may be obtained from the Order Dept., ASME, 345 E. 47th St., New York, N.Y. 10017.
### Tensile Test (QW-150)

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Width</th>
<th>Thickness</th>
<th>Area</th>
<th>Ultimate Total Load (lb)</th>
<th>Ultimate Unit Stress (psi)</th>
<th>Type of Failure &amp; Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-1</td>
<td>1.043</td>
<td>.374</td>
<td>.390</td>
<td>27,500</td>
<td>70,513</td>
<td>Base Metal</td>
</tr>
<tr>
<td>T-2</td>
<td>1.035</td>
<td>.373</td>
<td>.388</td>
<td>27,250</td>
<td>70,598</td>
<td>Base Metal</td>
</tr>
</tbody>
</table>

### Guiled-Bend Tests (QW-160)

<table>
<thead>
<tr>
<th>Type and Figure No.</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>QW-463.1 (d) Root 1</td>
<td>Accepted</td>
</tr>
<tr>
<td>QW-463.1 (d) Root 2</td>
<td>Accepted</td>
</tr>
<tr>
<td>QW-463.1 (d) Face 1</td>
<td>Accepted</td>
</tr>
<tr>
<td>QW-463.1 (d) Face 2</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

### Toughness Tests (QW-170)

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Notch Location</th>
<th>Notch Type</th>
<th>Test Temp.</th>
<th>Impact Values</th>
<th>Lateral Exp.</th>
<th>Drop Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>% Shear</td>
<td>Break</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Miles</td>
<td></td>
</tr>
</tbody>
</table>

### 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: Tim Kirksey  
Tests conducted by: Lonview Inspection, Inc.  
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: Scotti Manufacturing, Inc.  
9-5-90  
By William A. Basom  
(All record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)
# PERMIAN NON-DESTRUCTIVE TESTING

## QUALIFICATION

<table>
<thead>
<tr>
<th>METHOD</th>
<th>RT</th>
<th>UT</th>
<th>MT</th>
<th>PT</th>
<th>HT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miller, Morris J.</td>
<td>I</td>
<td>II</td>
<td>I</td>
<td>II</td>
<td>I</td>
</tr>
<tr>
<td>S GENERAL/30%</td>
<td>26.70</td>
<td>/</td>
<td>25.50</td>
<td>59.25</td>
<td>/</td>
</tr>
<tr>
<td>SPECIFIC/30%</td>
<td>24.00</td>
<td>/</td>
<td>22.50</td>
<td>40.00</td>
<td>/</td>
</tr>
<tr>
<td>PRACTICAL/40%</td>
<td>36.00</td>
<td>/</td>
<td>34.80</td>
<td>38.00</td>
<td>/</td>
</tr>
<tr>
<td>COMPOSITE</td>
<td>86.70</td>
<td>/</td>
<td>82.80</td>
<td>97.25</td>
<td>/</td>
</tr>
<tr>
<td>CERTIFIED BY / LEVEL</td>
<td>DFM III</td>
<td>DFM III</td>
<td>DFM III</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CERTIFICATION DATE</td>
<td>10-17-90</td>
<td>10-17-90</td>
<td>10-17-90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RECERTIFICATION DUE</td>
<td>10-17-91</td>
<td>10-17-91</td>
<td>10-17-91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DOCUMENTED EXPERIENCE</td>
<td>On File</td>
<td>On File</td>
<td>On File</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRIOR CERTIFICATION LEVEL</td>
<td>II</td>
<td>II</td>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APPOINTMENT BY LETTER, III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## J-2 AND J-1 TEST

<table>
<thead>
<tr>
<th>ACCEPT:</th>
<th>X</th>
<th>CONDITIONS: None</th>
<th>DATE: 10-17-90</th>
</tr>
</thead>
</table>

## COLOR PERCEPTION TEST

<table>
<thead>
<tr>
<th>ACCEPT:</th>
<th>X</th>
<th>CONDITIONS: None</th>
<th>DATE: 10-17-90</th>
</tr>
</thead>
</table>

## DATE EMPLOYED:

- 1-25-88

## ASSIGNMENT TO NDT:

- 1-25-88

## EDUCATION LEVEL:

- High School/Technical

## EXPERIENCE TIME:

- 9.5 Years

## LIMITATIONS:

- Recertified RT, MT, PT only

---

This individual has successfully completed the above examinations and has qualified for the level in the nondestructive test method indicated above as per Permian Non-Destructive Testing's written practice. Documentation shall be on file for review upon reasonable request.

AUTHORIZED EXAMINER / DATE

[Signature]

10-17-90

PERMIAN NON-DESTRUCTIVE TESTING
WISCO WELDING INSPECTION SERVICE COMPANY
11811 NORTH FWY., SUITE 670
HOUSTON, TEXAS 77060

REPORT DATES 10/16/92 10/17/92
CUSTOMER: USPCI ATTN: MR. SAMAR HAMWI
ORDER NO: PO 19350 DATED: REV: DATED:
MAT'L DESTINATION: LONE MOUNTAIN
REQUIRED DATE: 11/1/92 SHIPMENT DATE IS NOW: SAME
AS OF CHANGED FROM:
INSPECTOR ESTIMATED SHIPMENT DATE: SAME
ORDER IS 65% PERCENT COMPLETED:
VENDOR: SCOTT MFG. CO. ORDER NO: 451
MANUFACTURER: SAME
PHONE: 806-856-9591 SHOP LOCATION: WOFORD, TX.
SHOP ORDER NO: 451
INSPECTOR'S CONTACT: BILL BASON POSITION: FIELD MANAGER
REPORT IS: INTERIM REGARDING: INSPECTION
INSPECTOR: VICTOR HAGMAN

MATERIAL DESCRIPTION: (4) 12.75' DIAMETER BY 40' HEIGHT CAUSTIC STORAGE TANKS.

STATUS OF ORDER: TWO TANKS TO SHIP 10/19/92

INSPECTION: WITNESS RADIOGRAPHS BE TAKEN OF WELDS AND REVIEW OF SAME.

1. PICKED SPOTS FOR RADIOGRAPHS ON TWO TANKS. SHOTS WERE TAKEN OF VERTICAL SEAMS GIRTH WELDS IN TANKS. ONE SPOT WAS TAKEN ON THE BUTT WELDS ON THE CONE BOTTOM. THE CONE BOTTOM HAS THREE BUTT WELDS.

2. REVIEW OF SPOT WELDS FOUND THE FOLLOWING. THE WELDS IN THE CONE BOTTOM WERE BAD, PENALTY SHOTS WERE TAKEN AS PER API 650, AND ASME SEC. VIII UW 51, AND UW52. FOUND THAT A BAD PROCEDURE WAS USED IN WELDING THE BUTT WELDS ON THE BOTTOM OF ALL FOUR TANKS. THERE WAS NO PENETRATION ON ANY OF THE WELDS, SO SCOTT MFG. MADE REPAIRS ON THE TWO TANKS TO SHIP ON 10/19/92. REPAIR SHOTS WERE MADE. FOUND THAT THE WELDS WERE STILL BAD, THE COMPLETE BUTT WELDS ON THE BOTTOM OF ALL FOUR TANKS WAS REMOVED COMPLETELY.

10/17/92.

1. PICKED RADIOGRAPHS FOR BOTTOM BUTT WELDS. AFTER REVIEWING FILM FOUND THAT ALL OF THE BOTTOM BUTT WELDS WERE NOW ACCEPTABLE. THE REASON FOR THE PROBLEM TO START WITH WAS THAT NO ROOT OPENING WAS LEFT FOR PENETRATION. THESE WELDS WERE DONE BY THE SHOP PERSONAL. NOT THE CREW THAT IS BUILDING THESE TANKS.

2. WITNESS FITTING THE TOP RING ON TANK NUMBER TWO, AND WATCHED AS THE WELDERS MADE THE ROOT PASS. ALL WELDING WAS PER SPECIFICATIONS AND WAS OF GOOD QUALITY. WILL RETURN 10/19/92 FOR FINAL ON FIRST TWO TANKS AND WITNESS LOADING OF SAME.
WISCO WELDING INSPECTION SERVICE COMPANY
11811 NORTH FRWY., SUITE 670
HOUSTON, TEXAS 77060

REPORT DATES: 10/14/92 10/15/92
CUSTOMER: USPOT
ORDER NO.: ATTN: MR SAMAR HAMWI
DATED: REV: DATED:
MATERIAL DESTINATION: LONE MOUNTAIN
REQUIRED DATE: SHIPMENT DATE IS NOW:
AS OF CHANGED FROM:
INSPECTOR ESTIMATED SHIPMENT DATE:
ORDER IS PERCENT COMPLETED:
VENDOR: SCOTT MFG.
MANUFACTURER: SAME
PHONE: 713-866-9591 SHOP LOCATION: WOLFORD, TX
SHOP ORDER NO.: 451
INSPECTOR'S CONTACT: BILL BASON POSITION: ENG.
REPORT IS: INTERIM
PREPARING: INSPECTION
INSPECTOR: VICTOR HAGMAN

MATERIAL DESCRIPTION: (4) 12.75'' DIAMETER BY 40 HEIGHT CAUSTIC TANKS.

STATUS OF ORDER: COMPLETION IS ABOUT 50% TWO TANKS TO SHIP MON 10/19/92

INSPECTION: MEETING WITH MR BASON AND FIELD FOREMAN.
WENT OVER SPECIFICATIONS FROM USPCI, AND REVIEWED WHAT DRAWINGS WERE ON HAND. NO PROBLEMS WERE FOUND WITH SCOTT MFG.
MEETING SPECIFICATIONS.

INSPECTION OF TANKS BEING WELDED.
1. WITNESS WELDING OF GIRTH WELDS ON TANKS. FOUND THAT THE ROOT OPENING WAS ACCEPTABLE FOR FULL PENETRATION WELDS.
2. WITNESS AIR TESTING OF REPADS ON TANK SHELLS. ALL NOZZLES ARE WELDED IN SHELLS BEFORE TANK SHELLS ARE FIT TOGETHER. THIS IS GOOD AS THAT ALL OF THE REPADS CAN BE AIR TESTED ON THE GROUND. NO DANGER OF FALLING AR OF PADS NOT BEING TESTED. SHOP AIR WAS USED FOR TESTING. WITH 18-20 POUNDS OF AIR APPLIED TO PADS, A SOAP AND WATER MIXTURE WAS USED TO CHECK FOR LEAKS BOTH ON THE INTERNAL AND THE EXTERNAL. REPAD TEST WAS ACCEPTABLE AS NO LEAKS WERE FOUND.
3. VISUAL INSPECTION OF WELDING BOTH INTERNAL AND EXTERNAL. NO DEFECTS WERE FOUND. VISUAL INSPECTION WAS TO FIND UNDERCUTTING, PIN HOLES, COLD LAP, LOW FILLET WELDS, EXSSIVE WELD BUILD UP ON GIRTH WELDS ETC. ALL THAT WAS FOUND WAS SOME SMALL PINHOLES, THESE WERE REPAIRED.
VISUAL INSPECTION OF THE ROLLED RINGS. FOUND THAT ONE OF THE BRACES ON THE PAINTERS RING WAS WELDED TO THE VERTICAL WELD SEAM. AS API 650 STATES THAT ALL ATTACHMENTS MUST MISS VERTICAL SEAMS BY AT LEAST 6 INCHES, THESE WERE MOVED AND REWELDED.
10/15/92.

MET WITH MR. HAMWI THIS A.M. FOR INSPECTION OF TANKS.
TALKED WITH MR. BASON ABOUT DELIVERY OF TANKS. THE FIRST TWO TANKS WILL BE ON TRUCKS TO JOB SITE BY 10/19/92 A.M.

REVIEW OF DRAWINGS ON TANKS AND WALK WAYS. NO PROBLEMS WERE FOUND.

FIELD INSPECTION OF TANKS BEING WELDED. AND A TOUR OF SHOP WAS TAKEN. SCOTT MFG. HAS A WIDE RANGE OF SERVICES THAT WERE SHOWN TO MR. HAMWI AND THIS WRITER.

A VISUAL INSPECTION OF TANKS WAS DONE AND NO PROBLEMS WERE FOUND.

PHOTOS OF TANKS, ERECTION. AND WELDING WAS TAKEN. THESE WILL SEND WITH DATA PACKAGES.

REVIEW OF MATERIAL TEST REPORTS FOR THE SHELL MATERIAL AND FOR THE STRUCTURAL MATERIAL. THE MTR'S FOR THE PIPING HAS NOT ARRIVED FROM THE SUPPLIER. AS SOON AS THESE OR IN THEY WILL BE CHECKED.

REVIEWED ALL WELDER QUALIFICATIONS. AND ALL WELD PROCEDURES. ALL WELDING OF TANKS WERE TO THESE PROCEDURES. ALL WELDER WORKING ON TANKS WERE QUALIFIED PER A 6G WELD TEST AND ALL PAPER WORK WAS IN ORDER.

ALL RADIOGRAPHS WILL BE SHOT 10/16/92 ON THE TWO TANKS TO SHIP ON 10/19/92. ALL OTHER NDE WORK HAS BEEN COMPLETED. ALL THAT WAS REQUIRES WAS A MAG PARTICLE OF NOZZLE WELDS. THIS HAS BEEN DONE AND PROPER PAPER WORK IS IN THE JOB FILE.

AT THIS TIME ALL API-650 AND USPCI SPECIFICATIONS ARE BEING FOLLOWED. ALL WORK SEEN ON THIS VISIT WAS OF GOOD QUALITY AND WAS ACCEPTABLE TO ALL SPECIFICATIONS.
WELDING INSPECTION SERVICE COMPANY

QUALITY ASSURANCE INSPECTION RELEASE

CUSTOMER: US PCI
P.O. NO.: 19350
LOCATION: Lubbock, TX

VENDOR: Scott Mfg
PROJECT: Lone Mountain

☒ Satisfactorily completed Quality Assurance Inspection on: 10-19-92 (Date)

<table>
<thead>
<tr>
<th>P.O. ITEM</th>
<th>QUANTITY</th>
<th>MATERIAL DESCRIPTION/TAG NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>12.75' X 40' HEAT Caustic Tank Ser. No. 451-1</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>12.75' X 40' HEAT Caustic Tank Ser. No. 451-2</td>
</tr>
</tbody>
</table>

Shipping Information: By truck to Lubbock, OKLA.
Date Released for Shipment: 10-19-92

☒ Without exception to the Purchase Order Documents.
☒ With the following Exception from the Purchase Order, only with follow up in writing with a copy of telex or letter attached. (State specifics and name of Responsible Engineer)

Approval or release for shipment of any work by a representative of the purchaser, or purchaser's Client, shall in no way relieve the vendor or sub-vendor of any responsibility for meeting the requirements of the purchase order and/or specifications.

Signing of the form acknowledges the items have been inspected in accordance with the above purchase order.

10-19-92
Date

Agency Inspector's Signature

11811 North Frwy, Suite 670 • Houston, Texas 77060 • (713) 820-8066
WELDING INSPECTION SERVICE COMPANY

QUALITY ASSURANCE INSPECTION RELEASE

PAGE OF
DATE: 10-24-92
REP. NO.: 

CUSTOMER: US PCT
P.O. NO.: 19350
LOCATION: Kebrock TX

VENDOR: Scott Mfg Inc
PROJECT: Lone Mountain

[ ] Satisfactorily completed Quality Assurance Inspection on: 10-24-92 (Date)

<table>
<thead>
<tr>
<th>P.O. ITEM</th>
<th>QUANTITY</th>
<th>MATERIAL DESCRIPTION/TAG NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>12.75' x 40' height Caustic Tank, Ser. No. 451-3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>12.75' x 40' height Caustic Tank, Ser. No. 451-4</td>
</tr>
</tbody>
</table>

Shipping Information: By Truck to Watonga, OK.
Date Released for Shipment: 10-24-92

[ ] Without exception to the Purchase Order Documents.
[ ] With the following Exception from the Purchase Order, only with follow up in writing with a copy of telex or letter attached. (State specifics and name of Responsible Engineer)

Approval or release for shipment of any work by a representative of the purchaser, or purchaser's Client, shall in no way relieve the vendor or sub-vendor of any responsibility for meeting the requirements of the purchase order and/or specifications.

Signing of the form acknowledges the items have been inspected in accordance with the above purchase order.

[Signature]
Agency Inspector's Signature

11811 North Fwy, Suite 670 - Houston, Texas 77060 (713) 820-8066
APPENDIX G

Drawings
USPCI
CAUSTIC STORAGE TANKS
LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

PROJECT ENGINEER: MYERS ENGINEERING CORP.
102 N. STRATFORD DRIVE
OKC, OK 73120
(405) 755-5325
NOTE: ANCHOR BOLTS TO STRADDLE N-S &

(12) ANCHOR BOLTS

CHORD 3'-5.5"

43"

16.5"

6" THREAD

1.5" Ø

ANCHOR BOLT
12 REQUIRED
N.T.S.
DOUBLE NUT ANCHOR BOLTS
GALVANIZED

ANCHOR BOLT CHAIR
12 REQUIRED
33.1"
DOUBLE NUT ANCHOR BOLTS

REVISIONS

SCOTT MANUFACTURING, INC.
PO. BOX 10232 LUBBOCK, TEXAS 79408

FOUNDOATION FOR:
SUSPC. MARIPOSA, CA

"LDW" Rated 10/882 45'-2"
SECTION EB2
ASSESSMENT OF EVAPORATOR BLOWDOWN TANK NO. 2 (EB2)
LONE MOUNTAIN HAZARDOUS WASTE FACILITY
U.S.P.C.I./LAIDLAW
WAYNOKA, OKLAHOMA

A TANK SYSTEM DESCRIPTION

Evaporator Blowdown Tank No. 2 (EB2) is a new welded above-ground wastewater storage and treatment tank to be installed as a part of the final wastewater treatment plant at the Lone Mountain Facility. Evaporator Blowdown Tank #2 (EB2) is located within the Wastewater Final Treatment building on the ground floor level of the building. The tank system consists of Evaporator Blowdown Tank #2 (EB2), Circulating Pump (P82), Circulating Pump (P84), and associated piping and instruments.

B PRIMARY TANK VESSEL

1. General Description

Evaporator Blowdown Tank No. 2 (EB2) is a circular steel tank with an outside diameter of 5'0" and a height of 12'0". The tank proper has a skirt that is anchored to the concrete floor. The top of the tank is flat with a vent to the atmosphere. The bottom of the tank is cone shaped. Evaporator Blowdown Tank No. 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. 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

$7 < \text{pH} < 12$

(Blowdown Tank EB-2)

(09/18/96)
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 Sherwin Williams Hi-Mil Sher-Tar Epoxy. Each layer is applied at a dry film thickness of not less than 7.0 mils. 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 than 3.0 mils. Appendix F contains manufacturer’s information on both the interior and the exterior corrosion protection systems.

5. Documented Age of Tank

This tank was manufactured by Lide Tank Company of Mexia, Texas, in November 1993 and installed in February of 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 items:

a) Weld break  
b) Punctures  
c) Scratches 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 will also be included in Appendix D of this assessment. From these tests, a determination will be made as to the primary tank’s integrity.

(Blowdown Tank EB-2) 
(09/18/96)
7. **Existing Data Obtained**

   a. Diameter of Tank            5'0"
   b. Nominal Height of Tank      12'0"
   c. Maximum Capacity           1017 gal.
   d. Overflow Liquid level       11'0"
   e. Overflow Volume             881.5 gal.
   f. Design Specific Gravity     1.5
   g. Maximum Bottom Pressure     5.9 psi
   h. Maximum Operating Temperature 250°F
   i. Material of Construction
      i) Shell, Root & Bottom      ASTM A36
      ii) Reinforcing Pads        ASTM A36
      iii) Structural Supports    ASTM A36
      iv) Steel Pipe              ASTM SA106, Grade B
      v) Bolts                     ASTM SA193, B7
      vi) Flanges, Blinds, Couplings & Plugs
      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 17,112 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.

(Blowdown Tank EB-2)
(09/18/96)
10. Comparison of Actual to Theoretical Structural Values

Wall Thickness Comparison

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"

C ANCILLARY EQUIPMENT

1. General Description

The ancillary equipment for the Evaporator Blowdown Tank No. 2 (EB2) system includes the following:

a) Circulating Pump (P82) - a centrifugal pump designed to pump 80 GPM at 50 feet of discharge head with a suction head of 5 feet.

b) Circulation Pump (P84) -- a centrifugal pump designed to pump 80 gpm at 50 ft. discharge head with a suction head of 5 ft.

c) 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" 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 is to be 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 will be 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 5 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 will be installed in April 1995.

5. Result of Leak Tests

A Hydrostatic leak test will be 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 inserted 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. Piping Support System

A visual inspection of the pipe support system will be conducted. This inspection will include a look at such things as materials of construction, welds, and construction methods. From this inspection a determination will be made as to the adequacy of the piping support system.

D SECONDARY CONTAINMENT SYSTEM

1. General Description of Secondary Containment

The secondary containment system was originally 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.

(Blowdown Tank EB-2)

(09/18/96)
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 comprehensive 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)

<table>
<thead>
<tr>
<th>Area</th>
<th>2738 s.f.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curb Height</td>
<td>0.25 ft.</td>
</tr>
<tr>
<td>Material</td>
<td>Concrete</td>
</tr>
<tr>
<td>Gross Volume</td>
<td>685 c.f.</td>
</tr>
</tbody>
</table>

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

**Containment Capacity Required (CCR)**

\[
\text{CCR} = \text{Volume of Largest Tank in the secondary containment} \\
\text{Volume of Largest Tank} = (\text{FT1}) = 401 \text{ c.f.}
\]

(Blowdown Tank EB-2)  
(09/18/96)
8. Comparison of Available Volume to Required Volume

**Containment Capacity**

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

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

**CONCLUSIONS**

1. The foundation, structural support beams, connections, and controls for the Evaporator Blowdown Tank No. 2 (EB2) System have been adequately designed.

2. The Evaporator Blowdown Tank No. 2 (EB2) 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 Blowdown Tank No. 2 (EB2) system was inspected on 3/1/95 for weld breaks, punctures scrapes of protective coating, cracks, leaks, corrosion, and other structural damage or inadequacies of construction/installation.

4. The Evaporator Blowdown Tank No. 2 (EB2) was tightness tested after installation is complete.

5. The Secondary Containment for the Evaporator Blowdown Tank No. 2 (EB2) 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 Blowdown Tank No. 2 (EB2) system is properly supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.

7. The Evaporator Blowdown Tank No. 2 (EB2) system associated ancillary equipment was tightness tested after equipment installation in accordance with ASME/ANSI B31.

(Blowdown Tank EB-2)
(09/18/96)
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.

[Signature]

Date: [Date]

(Blowdown Tank EB-2)
(09/18/96)
Primary Tank Volume Calculations
EB2 Volume Calculations

Shell Volume = \pi r^2 H
= 3.14 \times 2.5 \times 2.5 \times 6
\approx 118 \text{ ft}^3

Cone Volume = \frac{1}{3} \pi r^2 H
= 0.33 \times 3.14 \times 2.5 \times 2.5 \times 3
\approx 19.5 \text{ ft}^3

Total Volume = Shell Volume + Cone Volume
= 118 + 19.5
= 137.5 \text{ ft}^3

Weight of contents = Volume \times 62.4 \text{ lb/ft}^3 \times 1.5 \text{ sp. ft.}
= 137.5 \text{ ft}^3 \times 62.4 \text{ lb/ft}^3 \times 1.5
= 12,870 \text{ lb.}

Weight of tank \approx 570 \text{ lb.}
Manufacturers Design Information
Primary Tank
U.S.P.C.

Item# EB2

*EF4

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

Welding Procedure Specification No.: BB01
Welding Process(es): SMAW
Supporting PQR No.(s): BB01
Revision No.: 1
Date: 5-1-90

LIDE VESSELS INC.

Evan Lemon

Details

JOINTS (QW-402)
Joint Design: SEE PRODUCTION DRAWINGS
Backig (Yes) F4 (No) F3
Backig Material (Type): WELD METAL OR BASE METAL
(Refer to both backig 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 Mfg., 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)

1 Group No. 1/2 to P-No. 1 Group No. 1/2

OR

□ Specification type and grade
□ to Specification type and grade

□ OR

Chem. Analysis and Mech. Prop. 1
□ to Chem. Analysis and Mech. Prop. 1

Thickness Range:
Base Metal: Groove 1.675 - 1.500 * Fillet ALL
Pipe Dia. Range: Groove ALL Fillet ALL
Other 2 PROCEDURE LIMITED TO 1.500 DUE TO NO PWHT

* FILLER METALS (QW-404)

Spec. No. (SFA) 5.1 5.1
AWS No. (Class) E6010 E7018
F-No. 3 4
A-No. 1 1
Size of Filler Metals 1/8" - 5/32" 1/8" - 5/32"
Deposited Weld Metal .250 .614
Thickness Range:
Groove .500 .1228
Fillet ALL ALL
Electrode-Flux (Class) --- ---
Flux Trade Name --- ---
Forgamable Insert --- ---

Each base metal-filler metal combination should be recorded individually.
**Positions (GWF-405)**
- Position(s) of Groove: ALL
- Welding Progression: Up: F4
- Down: F3
- Position(s) of Fillet: ALL

**Preheat (GWF-406)**
- Preheat Temp. Min.: 50°F (°F)
- Interpass Temp. Max.: 600°F (°F)
- Preheat Maintenance: NA

**Gas (GWF-408)**
- Percent Composition
  - [Gas(es)]
  - [Mixt]ure
  - Flow Rate
  - Shielding
  - Trailing
  - Backing

**Electrical Characteristics (GWF-409)**
- Current AC or DC: DC
- Polarity: REV
- Amps (Range): SEE BELOW
- Volts (Range): SEE BELOW

**Technique (GWF-410)**
- String or Weave: STRING
- Orifice or Gas Cup Size: ---
- Initial and Interpass Cleaning: BRUSH, GRIND, OR CHIP AS NEEDED
- Method of Back Gouging: AIR ARC OR GRIND AS NEEDED
- Oscillation: ---
- Contact Tube to Work Distance: MULTIPLE
- Multiple or Single Pass (per side): SINGLE
- Multiple or Single Electrodes: ---
- Travel Speed (Range): ---

**Other**
- Peening: ---
- No Single Pass to Exceed 1/2" in Thickness
- **200°F Minimum Preheat for Thicknesses over 1.25" and Through 1.5"**

| Weld Layer(s) | Process | Class | Dia. | Type | Amp. Range | Volt Range | Travel | Other
|---------------|---------|-------|------|------|------------|------------|--------|-------
| 1 & 2         | SMAW    | E6010 | 1/8" | REV  | 75-125     | 18-24      | NA     |
|               |         |       | 5/32"|      | 110-170    | 20-26      |        |
| REM           | SMAW    | E7018 | 1/8" |      | 115-165    | 20-26      |        |
|               |         |       | 5/32"|      | 150-220    | 21-27      |        |
QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)
(See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
Record Actual Conditions Used to Weld Test Coupon.

Company Name: LIDE VESSELS INC.
Procedure Qualification Record No.: BB01
WPS No.: BB01
Welding Processes: SMAW
Types (Manual, Automatic, Semi-Auto.): MANUAL

JOINTS (CW-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 (CW-403)
Material Spec.: SA-106
Type or Grade: B
P-No. to F-No.: 1
Thickness of Test Coupon: .964
Diameter of Test Coupon: 6-5/8" OD
Other ---

FILLER METALS (CW-404)
AWS Classification: E6010 E7018
Filler Metal F-No.: 3 4
Weld Metal Analysis A-No.: 1 1
Size of Filler Metal: 1/8" 1/8"
Other ---
Deposited Weld Metal: .250 .614

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

GAS (CW-408)
Percent Composition
Shielding --- --- --- ---
Trailing --- --- --- ---
Backing --- --- --- ---

ELECTRICAL CHARACTERISTICS (CW-409)
Current: DC
Polarity: REV
Amperage: F3-120, F4-120, F3-20, F4-24
Votage: NA
Tungsten Electrode Size: ---
Other ---

TECHNIQUE (CW-410)
Travel Speed: NOT RECORDED
Stringer or Weave: STRING
Oscillation: NONE
Multipass or Single Pass (per side): MULTIPLE
Single or Multiple Electrodes: SINGLE
Other ---

HEAT (CW-406)
Preheat Temp.: 70°F
Interpass Temp.: 500°F
Other ---
### Tensile Test (QW-150)

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Width</th>
<th>Thickness</th>
<th>Area</th>
<th>Ultimate Total Load (lb)</th>
<th>Ultimate Unit Stress (psi)</th>
<th>Type of Failure &amp; Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.506</td>
<td>DIA</td>
<td>.201</td>
<td>15600</td>
<td>78600</td>
<td>SM DUCT</td>
</tr>
<tr>
<td>2</td>
<td>.506</td>
<td>DIA</td>
<td>.201</td>
<td>15600</td>
<td>78600</td>
<td>SM DUCT</td>
</tr>
</tbody>
</table>

### Guided-Bend Tests (QW-160)

<table>
<thead>
<tr>
<th>Type and Figure No.</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIDE BEND QW-462.2</td>
<td>ACCEPTABLE</td>
</tr>
<tr>
<td>SIDE BEND QW-462.2</td>
<td>ACCEPTABLE</td>
</tr>
<tr>
<td>SIDE BEND QW-462.2</td>
<td>ACCEPTABLE</td>
</tr>
<tr>
<td>SIDE BEND QW-462.2</td>
<td>ACCEPTABLE</td>
</tr>
</tbody>
</table>

### Toughness Tests (QW-170)

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Notch Location</th>
<th>Notch Type</th>
<th>Test Temp.</th>
<th>Impact Values</th>
<th>Lateral Exp. (Shear)</th>
<th>Drop Weight</th>
</tr>
</thead>
</table>

### Fillet-Weld Test (QW-180)

Result — Satisfactory: Yes
Penetration into Parent Metal: Yes
Macro-Results

### Other Tests

Type of Test: BNH F3 WELD-174 HAZ-179, F4 WELD-179 HAZ-182 & 185
Deposit Analysis
Other

Welder's Name: JOHN MCKINNEY
Clock No. 114
Stamp No. M
Tests conducted by: SOUTHWESTERN LAB
Laboratory Test No. 09-8220-2

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 VESSELS, INC.

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

Company Name: LIDE VESSELS INC.
Procedure Qualification Record No.: BBO2
WPS No.: BBO2
Welding Process(es): SMAW
Types (Manual, Automatic, Semi-Auto.): MANUAL

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-402)
Material Spec.: SA-36
Line or Grade: ---
Thickness of Test Coupon: .750
Diameter of Test Coupon: ---
Other: PLATE

FILLER METALS (QW-404)
EPA Specification: E6010
AWS Classification: E7024
Filler Metal F-No.: 3
Weld Metal Analysis A-No.: 1
Size of Filler Metal: 1/8" 3/16"
Other: ---
Deposited Weld Metal: .250" .500"

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

GAS (QW-408)
Gas(es): ---
(Mixture): ---
Flow Rate: ---
Shielding: ---
Trailing: ---
Backing: ---

ELECTRICAL CHARACTERISTICS (QW-409)
Current: DC
Polarity: REV
Amps: F3-110, F1-250 Vo.F3-20, F1-22
Tungsten Electrode Size: ---
Other: ---

TECHNIQUE (QW-410)
Travel Speed: NOT RECORDED
String or Weave Bead: STRING
Oscillation: ---
Multiple or Single Pass (per side): MULTIPLE
Single or Multiple Electrodes: SINGLE
Other: ---

HEAT (QW-406)
Heat Temp.: 70°F
Interpass Temp.: 500°F
Other: ---

(12/89)
This form (E00007) may be obtained from the Order Dept., ASME, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300.
## Tensile Test (CW-150)

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Width</th>
<th>Thickness</th>
<th>Area</th>
<th>Ultimate Total Load lb</th>
<th>Ultimate Unit Stress psi</th>
<th>Type of Failure &amp; Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.505</td>
<td>DIA.</td>
<td>.200</td>
<td>14120</td>
<td>70600</td>
<td>WLD DUCT</td>
</tr>
<tr>
<td>2</td>
<td>.506</td>
<td>DIA.</td>
<td>.201</td>
<td>13740</td>
<td>68400</td>
<td>BM DUCT</td>
</tr>
</tbody>
</table>

## Guided-Bend Tests (CW-160)

<table>
<thead>
<tr>
<th>Type and Figure No.</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIDE BEND CW-462.2</td>
<td>ACCEPTABLE</td>
</tr>
<tr>
<td>SIDE BEND CW-462.2</td>
<td>ACCEPTABLE</td>
</tr>
<tr>
<td>SIDE BEND CW-462.2</td>
<td>ACCEPTABLE</td>
</tr>
<tr>
<td>SIDE BEND CW-462.2</td>
<td>ACCEPTABLE</td>
</tr>
</tbody>
</table>

## Toughness Tests (CW-170)

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Notch Location</th>
<th>Notch Type</th>
<th>Test Temp.</th>
<th>Impact Values</th>
<th>Lateral Exp. % Shear</th>
<th>Mils</th>
<th>Drop Weight</th>
<th>Break</th>
<th>No Break</th>
</tr>
</thead>
</table>

## Fillet-Weld Test (CW-180)

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

Macro-Results

## Other Tests

Type of Test
Deposit Analysis
Other

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 VESSELS INC.

Date: 9-11-90

(Please note: The record is illustrative only and may be modified to conform to the type and number of tests required by the Code.)
**QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)**

<table>
<thead>
<tr>
<th>Specification No.</th>
<th>Date</th>
<th>Supporting PQR No.(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S802</td>
<td>5-28-82</td>
<td>BB02</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Revision No.</th>
<th>Date</th>
<th>Type(s)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3-7-89</td>
<td>MANUAL</td>
<td>(Automatic, Manual, Machine, or Semi-Auto)</td>
</tr>
</tbody>
</table>

**JOINTS (QW-402)**

- **Joint Design**: SEE PRODUCTION DRAWINGS
- **Backing (Yes)**: XX
- **Backing Material (Type)**: WELD METAL OR BASE METAL

- **Metal**: [ ] No Retainers Used
- **Nonmetallic**: [ ] Other

**BASE METALS (QW-403)**

- **Group No. 1 & 2 to P-No. 1 Group No. 1 & 2**

**FILLER METALS (QW-404)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>E6010</td>
<td>5.1</td>
<td>1</td>
<td>1/8&quot;, 5/32&quot;</td>
<td>.250</td>
<td>.500</td>
</tr>
</tbody>
</table>

**OTHER**

- **Electrode-Flux (Class)**: ---
- **Flux Trade Name**: ---
- **Consumable Insert**: ---

*Each base metal-filler metal combination should be recorded individually.*
POSTWELD HEAT TREATMENT (QW-407)
Temperature Range NA
Time Range

GAS (QW-408)
Percent Composition
Gaseous (Mixture) Flow Rate

Shielding

Trailing

Backing

ELECTRICAL CHARACTERISTICS (QW-409)
Current AC or DC DC Polarity REV
Amperes (Range) SEE BELOW Volts (Range) SEE BELOW
(Amperes 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
(Spray arc, short circuiting arc, etc.)

Electrode Wire feed speed range

TECHNIQUE (QW-410)
String or Weave Bead
Orifice or Gas Cup Size
Initial and Interpass Cleaning (Brushing, Grinding, etc.) BRUSH, GRIND, OR CHIP AS NEEDED

Method of Back Gouging AIR ARC OR GRIND AS NEEDED
Oscillation
Contact Tube to Work Distance
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

200°F MINIMUM PREHEAT FOR THICKNESSES OVER 1.25"
AND INCLUDING 1.5"

<table>
<thead>
<tr>
<th>Weld Layer(s)</th>
<th>Process</th>
<th>Filler Metal</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Class</td>
<td>Dia.</td>
</tr>
<tr>
<td>1 &amp; 2</td>
<td>SMAW</td>
<td>E6010</td>
<td>1/8&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E7024</td>
<td>5/32&quot;</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>1/8&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5/32&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3/16&quot;</td>
</tr>
</tbody>
</table>
Tank Wall Thickness
Check Seismic

\[ \frac{D}{H} = \frac{5.0}{12.0} = 0.42 \]

Tank Shell = 3360 lb/sq ft
Tank Roof = 400 lb/sq ft
Tank Contents = 14,700 lb

Effective Mass \( W_1 + W_2 \)

From App. E Fig. E-2 For \( \frac{D}{H} = 0.42 \)

\[ \frac{W_1}{W_T} = 0.1 \quad \frac{W_2}{W_T} = 0.9 \]

\[ W_1 = 1470 \text{ lb} \quad W_2 = 13,230 \text{ lb} \]

Find \( X_1 \) & \( X_2 \) from Fig. E-3

\[ \frac{X_1}{H} = 0.43 \quad \frac{X_2}{H} = 0.85 \]

\( X_1 = 5.2 \text{ ft} \quad X_2 = 10.2 \text{ ft} \)

Natural Period \( T = k \sqrt{\frac{1}{M_k}} \) where \( k = 0.59 \) for Fig. E-4

\[ T = 0.59 \sqrt{\frac{1}{5}} = 1.32 \text{ sec} \]

\[ C_1 = 1.24 \quad C_2 = 0.30 \frac{5.2}{1.32} = 1.8 \]

\( C_2 = 1.8 \) for \( s = 1.5 \) Unknown soil condition

\[ M = 2I \left( C_1 W_1 X_1 + C_1 W_R H_z + C_1 W_1 X_1 + C_2 W_2 X_2 \right) \]

\[ M = 1.175(1.0) \left[ 1.24(3360)(9.0) + 1.24(400)(12) + 1.24(1470)(5.2) + 1.34(13,230)(10.2) \right] = 10,524 \text{ lb-ft} \]

For Anchorage Tank Check Shell Conf. Stress \( b \)

\[ b = \frac{4200 \ell}{50(7.25)} + \frac{1273(10,524)}{(50)^2} = 90.3 \text{ lb/ft sq ciirc} \]

Sdrass = \( \frac{803}{12(7.25)} = 270 \text{ psi} \)

Allow. Compressive \( f = 150 \text{ psi} = 1.5 \)
Sheel Design

\[ t_s = \frac{2.62 \times D(H-1)G + CA}{E(21,000)} \]

\[ t_s = \frac{2.61.5 \times 1.5 + \frac{1}{16}}{21,000} \approx 0.08 + \frac{1}{16} = 0.133\text{ in} \]

\[ \frac{3}{8}\text{ in} \text{ shell OK} \]

Head Design

\[ t_c = t_s / \cos \alpha = 0.08 / \cos 42.7 = 0.109 + \frac{1}{16} = 0.136\text{ in} \]

\[ \frac{3}{8}\text{ in} \text{ cone OK} \]

Top Head: Flat Plate Design

Loading is 50% (Dead + Live) LCE Load

\[ 150 \times \frac{1}{144} = 1.04\mu \text{ in} \]

\[ t_h = 0.05 \sqrt{E} + \frac{1}{16} \text{ in} \]

\[ c = 0.25 \text{ for Welded Contra Joint} \]

\[ t_h = 0.5 \times \left( \frac{25(1.64)}{21000} \right) + \frac{1}{16} = 0.211 + \frac{1}{16} = 0.336\text{ in} \]

\[ \frac{3}{8}\text{ in} \text{ head plate OK} \]

Check Wind

Assume: Tensile Empty

Eff Dia = 4'

Shape Factor = 80

Wind Press. \[ 100 \times 12 (100)^2 = 26,400 \psi \]

Wind Force \[ 26,400 \times 0.18 \times 1.1 \times 1.25 = 15,000 \]

Momentum \[ 15,000 \times (12.5) - 4200 \times (5.2) = -2130 \text{ in-lb} \]

No Upset
STRUCTURAL DESIGN

5'-0" I.D. x 12'-0" TALL

DESIGN CONDITIONS:

Atmospheric Tank

Design Temp. 250°F

Wind Velocity 100 mph Sismic Zone 1

S.G. = 1.5

CORROSION ALLOW. = 3/8"

HELIUM HEAD 3/8" THK

Cone Angle x = 22.7°

Tank Empty 4200 cu ft

Tank Full 17,200 cu ft

STRESS CORRECTION FOR 250°F = 0.90 Ys

0.90(3600) = 3240 psi

Allowable = 3/2 Ys = 2/3 (3240)

Allowable = 21,600 psi
Foundation Design Analysis
EB2 Tank Loading

Tank Volume = 1017 gal
Fluid Sp. Gr. = 1.5 maximum
Fluid Weight (max) = 1017 gal x 8.35 lb/l (max) x 1.5 sp.gr. = 12,750 lb.

Tank Weight = 5700 lb.

Weight of Tank + contents = 5700 lb + 12,750 lb = 18,450 lb.

Weight distribution to base plate
Base plate Area = \( \pi (R^2 - r^2) = \pi [(2.10^2) - (2.0^2)] = 10.5 \text{ ft}^2 \)

Loading = \( \frac{W_t (\text{tank + contents})}{A} \)
\[ L = \frac{18,450 \text{ lb}}{10.5 \text{ ft}^2} = 1757 \text{ lb/ft}^2 \]

Tank base plate

Assuming soil bearing capacity of 3000 lb/ft\(^3\), calculations show sufficient bearing.
To: USPCI  
Lone Mountain Facility  
Route 2, Box 180A  
Waynoka, Okla. 73806  
Attn: Lawson Fenton

Feb. 8, 1995

The following is an investigation for the foundation support for the mezzanine platforms and pipe supports for the Wastewater Final Treatment Facility.

<table>
<thead>
<tr>
<th>COLUMN</th>
<th>LOAD, KIPS</th>
<th>FOUNDATION CONDITION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
<td>1.2</td>
<td>17&quot; floor slab</td>
<td>OK (see note #2)</td>
</tr>
<tr>
<td>A-2</td>
<td>2.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-3</td>
<td>2.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-5</td>
<td>3.4</td>
<td>6&quot; floor slab</td>
<td>OK (see note #1)</td>
</tr>
<tr>
<td>A-7</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-1</td>
<td>8.8</td>
<td>17&quot; floor slab</td>
<td>OK (see note #2)</td>
</tr>
<tr>
<td>B-2</td>
<td>25.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-3</td>
<td>19.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-5</td>
<td>5.9</td>
<td>6&quot; floor slab</td>
<td>OK (see note #1)</td>
</tr>
<tr>
<td>B-7</td>
<td>2.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-3.1</td>
<td>5.2</td>
<td>17&quot; floor slab</td>
<td>OK (see note #2)</td>
</tr>
<tr>
<td>C-4</td>
<td>15.1</td>
<td>24&quot; x 36&quot; cont. ftg.</td>
<td>Ok (see note #3)</td>
</tr>
<tr>
<td>C-6</td>
<td>15.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COLUMN</td>
<td>LOAD, KIPS</td>
<td>FOUNDATION CONDITION</td>
<td>REMARKS</td>
</tr>
<tr>
<td>--------</td>
<td>------------</td>
<td>-----------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>C-7</td>
<td>7.6</td>
<td>6&quot; floor slab</td>
<td>OK (see note #1)</td>
</tr>
<tr>
<td>C.9-1</td>
<td>9.0</td>
<td>17&quot; floor slab</td>
<td>OK (see note #2)</td>
</tr>
<tr>
<td>C.9-3</td>
<td>15.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D-2</td>
<td>46.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D.1-1</td>
<td>14.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D.1-3</td>
<td>14.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-1</td>
<td>14.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-2</td>
<td>29.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-3</td>
<td>14.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-3.1</td>
<td>6.7</td>
<td>6&quot; floor slab</td>
<td>OK (see note #1)</td>
</tr>
<tr>
<td>F-4</td>
<td>13.5</td>
<td>24&quot; x 36&quot; cont. ftg.</td>
<td>OK (see note #3)</td>
</tr>
<tr>
<td>F-6</td>
<td>13.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-7</td>
<td>6.8</td>
<td>6&quot; floor slab</td>
<td>OK (see note #1)</td>
</tr>
</tbody>
</table>

**Note #1 - 6" floor slab.** The 6" floor slab is reinforced with #4 @ 12" each way. Heaviest concentrated load on this slab is 7.6 kips. Using 3,000 lbs per sq. ft. allowable soil bearing the loaded area would be a 1'-7" square area under the column. This condition is OK.

**Note #2 - 17" floor slab.** The heaviest concentrated load on this slab is 46.1 kips. Using 3,000 lbs per sq. ft. allowable soil bearing would give a 4'-0" square area supporting this column. This condition is OK.

**Note #3 - 24" x 36" cont. footing.** The heaviest concentrated load on this footing is 15.1 kips. With 3,000 lb soil bearing only a 2'-6" strip (1'-3" each side of column) would be in bearing. This condition is OK.
CORE HOLE TO BE FILLED WITH SEMSTONE 140 WITH SAND DINDER

FILL PLUG TO 1/4" BELOW FINISH GRADE, LEAVE SURFACE ROUGH

PROTECTIVE COATING TO MATCH EXISTING.

EXIST. CONCRETE (VARIABLE THICK.)

REMOVE DIRT AROUND FULL CIRCUMFERENCE 1.5" WIDE MIN.

FILL TO 1.5" BELOW CONC. W/ BENTONITE PELLETS

CORE PLUG DETAIL
<table>
<thead>
<tr>
<th>Specimen</th>
<th>Diameter, in.</th>
<th>Drilled Length, in.</th>
<th>Capped Length, In.</th>
<th>Crushing Load, lb.</th>
<th>L/D Correction Factor</th>
<th>Compressive Strength, psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHT-1</td>
<td>3.75</td>
<td>5.5</td>
<td>5.7</td>
<td>32,440</td>
<td>0.96</td>
<td>2,810</td>
</tr>
<tr>
<td>PHT-2</td>
<td>3.75</td>
<td>5.5</td>
<td>4.9</td>
<td>47,200</td>
<td>0.93</td>
<td>3,980</td>
</tr>
<tr>
<td>PHT-3</td>
<td>3.75</td>
<td>6.5</td>
<td>4.5</td>
<td>41,400</td>
<td>0.93</td>
<td>3,490</td>
</tr>
<tr>
<td>PHT-4</td>
<td>3.75</td>
<td>7.5</td>
<td>4.6</td>
<td>60,700</td>
<td>0.93</td>
<td>5,110</td>
</tr>
<tr>
<td>PHT-5</td>
<td>3.75</td>
<td>7.0</td>
<td>7.1</td>
<td>43,000</td>
<td>0.93</td>
<td>3,860</td>
</tr>
<tr>
<td>PHT-6</td>
<td>3.75</td>
<td>6.5</td>
<td>4.1</td>
<td>57,100</td>
<td>0.88</td>
<td>4,550</td>
</tr>
<tr>
<td>PHT-7</td>
<td>3.75</td>
<td>7.0</td>
<td>5.8</td>
<td>43,800</td>
<td>0.96</td>
<td>3,810</td>
</tr>
<tr>
<td>PHT-8</td>
<td>3.75</td>
<td>6.0</td>
<td>5.8</td>
<td>74,800</td>
<td>0.96</td>
<td>6,480</td>
</tr>
<tr>
<td>PHT-9</td>
<td>3.75</td>
<td>5.0</td>
<td>5.5</td>
<td>33,900</td>
<td>0.96</td>
<td>2,950</td>
</tr>
<tr>
<td>PHT-10</td>
<td>3.75</td>
<td>6.0</td>
<td>4.7</td>
<td>72,500</td>
<td>0.93</td>
<td>6,100</td>
</tr>
<tr>
<td>PHT-11</td>
<td>3.75</td>
<td>6.0</td>
<td>5.6</td>
<td>55,720</td>
<td>0.96</td>
<td>4,040</td>
</tr>
<tr>
<td>PHT-12</td>
<td>3.75</td>
<td>6.0</td>
<td>6.6</td>
<td>65,600</td>
<td>0.98</td>
<td>5,800</td>
</tr>
<tr>
<td>PHT-13</td>
<td>3.75</td>
<td>5.0</td>
<td>5.3</td>
<td>68,700</td>
<td>0.94</td>
<td>5,650</td>
</tr>
<tr>
<td>PHT-14</td>
<td>3.76</td>
<td>5.0</td>
<td>5.3</td>
<td>80,700</td>
<td>0.95</td>
<td>6,900</td>
</tr>
<tr>
<td>PHT-15</td>
<td>3.76</td>
<td>6.0</td>
<td>5.1</td>
<td>60,200</td>
<td>0.97</td>
<td>5,290</td>
</tr>
<tr>
<td>FHT-1A</td>
<td>3.75</td>
<td>6.0</td>
<td>4.7</td>
<td>53,800</td>
<td>0.93</td>
<td>4,520</td>
</tr>
<tr>
<td>FHT-1B</td>
<td>3.75</td>
<td>6.0</td>
<td>5.0</td>
<td>50,800</td>
<td>0.97</td>
<td>4,660</td>
</tr>
<tr>
<td>FHT-2</td>
<td>3.75</td>
<td>2.0</td>
<td>7.0</td>
<td>30,740</td>
<td>0.99</td>
<td>2,760</td>
</tr>
<tr>
<td>sFHT-3</td>
<td>3.75</td>
<td>15.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>FHT-4</td>
<td>3.75</td>
<td>6.0</td>
<td>7.0</td>
<td>81,500</td>
<td>0.99</td>
<td>7,320</td>
</tr>
<tr>
<td>FHT-5</td>
<td>3.75</td>
<td>6.0</td>
<td>5.8</td>
<td>81,700</td>
<td>0.96</td>
<td>7,100</td>
</tr>
<tr>
<td>sFHT-6</td>
<td>3.75</td>
<td>19.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>sFHT-7</td>
<td>3.75</td>
<td>14.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>FHT-9</td>
<td>3.75</td>
<td>7.0</td>
<td>7.0</td>
<td>53,200</td>
<td>0.99</td>
<td>4,770</td>
</tr>
</tbody>
</table>

PHT - Pre-Water Treatment
FHT - Final Water Treatment

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

[Signature]
Lawson Fenton
Project Manager

Our Mission:
Provide the highest quality waste and by-product management services that consistently meet or exceed customer needs and regulatory requirements at competitive cost while enhancing shareholder value.
Tank Leak Tests
Hydrostatic Test Record

Customer: USPCI - Lone Mt. Facility
Project: Evaporation Blowdown Tank No. 2
Location: Waynoke, OK

Test Start Date 5/1/95  Test Start Time 2:30 p.m.
Test Finish Date 5/2/95  Test Finish Time 8:00 a.m.

Test Procedure:
Fill evaporator blowdown tank to the top mtd. nozzle with water.

Results:
All tank nozzles were flanged off below the test water level. There was no change in water level inside the feed tank. Visual inspection of tank and tank nozzles indicated no water leaks.

Witness [Signature]  Date: 5/2/95
WISco, INC.

11811 North Fwy., Suite 670
Houston, Texas 77060
(713) 820-8066

Customer  USPCI  Order No. 12418-30-46  Dated ___________  Rev. ___________  Dated ___________
Mail Destination  Lone Mt. Facility, Wyomia, OK
Shipment Date is now  11/24/93
Inspector estimated shipment date  11/24/93
Vendor  Lide Tank Co.
Manufacturer  Lide Tank Co.
Shop Location  Mexia, TX
Inspector's Contact  Mr. Billy Lide
Report is:  x  Interim  _____  Final  Regarding:  x  Inspection  _____  Expediting  _____  Status

MATERIAL DESCRIPTION:

Two (2) tanks - one 6' 4" OD x 12' 0" high; one 5' 0" OD X 12' 0" high
To specifications of USPCI and API 650

STATUS OF ORDER:  Engineering, Materials, Fabrication, Inspection, Completion

The following was performed on each item:

Dimensional checks covering elevation, orientation, projection of all nozzles and manways. All of
which were noted to be acceptable and as noted on shop approved drawings.

Fit-up of material: seams, junctions and welding of same was found to be very good. Visual inspection
on nozzle fit-up and welding was noted as very good.

Review of two (2) spot x-rays (one on each item) was found to be satisfactory.

Leak test on each item was performed and noted as acceptable. Vessels were filled for over twelve (12)
hours. Visual inspection disclosed no leaks or seeps.

Inspection of blasting and painting is scheduled for Wednesday, 11/24/93.

Inspector:  Dub Greer

INSPCNO:  12418-30-46
Piping Leak Tests
Tank Metallurgy
SOURCE: TYPE \( T \) 192
SIZE .1
STRENGTH 41 cl.

EXPOSURE: S. TO F. DISTANCE 16"
MAT'L THICKNESS .375
TIME 1 min 45 sec

VIEWING: SINGLE
COMPOSITE
SINGLE WALL
DOUBLE WALL

LM: MFG Kodak
TYPE T
SIZE 4½ x 10"

PENETRATOR:
SIZE 17
SHIM THICKNESS .093
SOURCE SIDE YES
FILM SIDE

VIEW NUMBER

ACCEPT REJECT SLAG POROSITY MC. FUSION BURN THRO CRACK UNDERCUT AVG. PENET CONCAVE ROOT CONVEX ROOT UNDERFILL OTHER

1-1
1-2

ADIOPHAGER D. St. A.
LEVEL II Q.C. MGR. E. Van Lemon DATE 11-18-93
AUTHORIZED INSPECTOR RE: Lumps DATE 11-19-93

COMMENTS: 11-19-93 Wisco Inc.
<table>
<thead>
<tr>
<th>VIEW NUMBER</th>
<th>ACCEPT</th>
<th>REJECT</th>
<th>SLAG</th>
<th>POROSITY</th>
<th>INC. FUSION</th>
<th>BURN THRU</th>
<th>CRACK</th>
<th>UNDERCUT</th>
<th>MC PENET</th>
<th>CONCAVE ROOT</th>
<th>CONVEX ROOT</th>
<th>UNDERFALL</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-2</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RADIOTRANT STANDARD**: API L50  
**ITEM DESCRIPTION**: TK. EB 2  
**RADIOGRAPHIC REQUIREMENTS**: RT-3  
**SOURCE**:  
- TYPE: Ir-192  
- SIZE: 1  
- STRENGTH: 41 Ci.  
**EXPOSURE**:  
- S. TO F. DISTANCE: 16"  
- MAT'L THICKNESS: 0.375"  
- TIME: 1 MIN 45.85 sec  
**VIEWING**:  
- SINGLE  
**SCREENS**:  
- FRONT: 0.005  
- BACK: 0.018  
**LM**:  
- MFG: Kodak  
- TYPE: 1  
- SIZE: 4 1/2 x 10"  
**PENETRANTER**:  
- SIZE: 17  
- SHIM THICKNESS: 0.03  
- SOURCE SIDE: YES  
- FILM SIDE:  

**RADIOGRAPHER**: D. Staley  
**LEVEL**: II  
**Q.C. MGR.**: Evan Lemon  
**DATE**: 11-13-93  
**AUTHORIZED INSPECTOR**:  
**REVIEWED**:  
**DATE**: 11-19-93  
**WISCO INC.**:  
**COMMENTS**:  

11-19-93
<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>MATERIAL DESCRIPTION</th>
<th>THICKNESS OR SECTION</th>
<th>WEIGHT</th>
<th>HEAT NO.</th>
<th>TEST OR PIECE IDENTITY</th>
<th>YIELD PT. PSI</th>
<th>TENSILE STR. PSI</th>
<th>ELONGATION % IN 8&quot;</th>
<th>% RED. OF AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>.3650&quot; 72.0000&quot; COIL 655782</td>
<td>48630$</td>
<td>103294</td>
<td>.3610&quot;</td>
<td>43000</td>
<td>62500</td>
<td>27.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.3680&quot;</td>
<td>46700</td>
<td>44900</td>
<td>24.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><em><strong>END OF DATA</strong></em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HEAT NO. 103294

**GENEVA STEEL COMPANY CERTIFIES ALL SHELTING, MELTING AND MANUFACTURING PROCESES OCCURRED IN THE USA.**

**END OF DATA**
**Geneva Steel**  
P.O. Box 2500  
Provo, Utah 84603

**Mannesmann Pipe & Steel Corp**  
1990 Post Oak Blvd  
Houston, TX 77056-3811

---

**Ferro Union**  
7400 Mesa Road  
SP SPIN#243093  
Houston, Texas

---

**H.R. Sheet:** C.25max P.040max S.050max HR36S058 Y/P 36 KSI min T/S  
58 KSI min DRY NO OIL

---

01 Mill RA/SN CERTIFIED T/R ANALYSIS REPORT TEST RESULTS PER PROD Spec CAPTION

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Thickness</th>
<th>Width (in) Width (ft. wt.)</th>
<th>Length</th>
<th>Quantity</th>
<th>Weight</th>
<th>Heat No.</th>
<th>Test or Piece Identity</th>
<th>Yield PT.</th>
<th>Tensile Str.</th>
<th>Elongation %</th>
<th>% Red. Of Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.360&quot;</td>
<td>72.000&quot;</td>
<td></td>
<td>1</td>
<td>43230#</td>
<td>LC3269</td>
<td>.360&quot; .360&quot; <em><strong>END OF DATA</strong></em></td>
<td>46600</td>
<td>70600</td>
<td>20.0</td>
<td>23.0</td>
</tr>
</tbody>
</table>

---

**Geneva Steel Company Certifies All Melting, Melting and Manufacturing Processes Occurred in the USA.**

***END OF DATA***
Piping Metallurgy
**BELLEVILLE TUBE CORP**  

**MILL CERTIFICATION**

<table>
<thead>
<tr>
<th>S.O. #</th>
<th>CUSTOMER ORDER #</th>
<th>DATE</th>
<th>BILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>001353</td>
<td>74434</td>
<td>5-13-93</td>
<td>20142</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S:</th>
<th>T:</th>
<th>D:</th>
<th>L:</th>
<th>Q:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>SIZE</th>
<th>WALL</th>
<th>GRADE</th>
<th>TYPE</th>
<th>LENGTH</th>
<th>THERMAL</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.500&quot;</td>
<td>216&quot;</td>
<td>A55 Gr B/8X421</td>
<td>S.E.</td>
<td>BELOW 1,303 Pcs.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SPECIAL INSTRUCTIONS:** 25° DEVELED FOR WELDING

<table>
<thead>
<tr>
<th>LOT</th>
<th>HEAT</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>ULT.</th>
<th>YIELD</th>
<th>WELT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE009</td>
<td>25963</td>
<td>.20</td>
<td>.99</td>
<td>.010</td>
<td>.006</td>
<td>.22</td>
<td>72,710</td>
<td>51,254</td>
<td>45.7</td>
</tr>
<tr>
<td>DE010</td>
<td>25965</td>
<td>.21</td>
<td>.98</td>
<td>.010</td>
<td>.004</td>
<td>.21</td>
<td>72,510</td>
<td>50,313</td>
<td>45.7</td>
</tr>
<tr>
<td>DE011</td>
<td>25985</td>
<td>.21</td>
<td>.98</td>
<td>.010</td>
<td>.004</td>
<td>.21</td>
<td>72,903</td>
<td>51,479</td>
<td>44.7</td>
</tr>
<tr>
<td>DE012</td>
<td>25965</td>
<td>.21</td>
<td>.98</td>
<td>.010</td>
<td>.004</td>
<td>.21</td>
<td>72,905</td>
<td>51,479</td>
<td>44.7</td>
</tr>
<tr>
<td>DE013</td>
<td>25962</td>
<td>.20</td>
<td>1.00</td>
<td>.011</td>
<td>.005</td>
<td>.20</td>
<td>71,971</td>
<td>49,872</td>
<td>45.4</td>
</tr>
<tr>
<td>DE014</td>
<td>25962</td>
<td>.20</td>
<td>1.00</td>
<td>.011</td>
<td>.005</td>
<td>.20</td>
<td>72,206</td>
<td>53,979</td>
<td>43.8</td>
</tr>
<tr>
<td>DE015</td>
<td>25962</td>
<td>.20</td>
<td>1.00</td>
<td>.011</td>
<td>.005</td>
<td>.20</td>
<td>74,687</td>
<td>54,291</td>
<td>42.1</td>
</tr>
<tr>
<td>DE016</td>
<td>25965</td>
<td>.21</td>
<td>.98</td>
<td>.010</td>
<td>.004</td>
<td>.21</td>
<td>71,451</td>
<td>48,730</td>
<td>45.1</td>
</tr>
</tbody>
</table>

All material has passed API flatting tests, and Hydrostatic tests.

Notwithstanding any other provisions in this contract, B.T.C. makes no warranty as to the suitability or fitness of this product for upgrading by fluxing and temper or any other process, unless B.T.C. shall be consulted in advance and give its approval in writing.

We hereby certify that the above information is true and correct as contained in the records of this division.

[Signature]

[Name]

[Title]
<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description/Specification</th>
<th>HEAT CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>G STD LR 90</td>
<td>A234-92A/SA234 WPE</td>
<td>C66W</td>
<td></td>
</tr>
<tr>
<td>A106B 09 / U50907</td>
<td>STRESS RELIEVED AT 1200 F</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEAT CODE</th>
<th>Tensile *KSI</th>
<th>YIELD KSI</th>
<th>% Elong. IN 2''</th>
<th>Hardness HB</th>
<th>Size MinH x 10 mm</th>
<th>Temp. *F</th>
<th>FOOT POUNDS</th>
<th>LATERAL Expansion</th>
<th>% SHEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>C66W</td>
<td>65.9</td>
<td>41.9</td>
<td>33.0</td>
<td>126</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* LONGITUDINAL, T = TRANSVERSE

C66W CONFORMS TO THE REQUIREMENTS OF NACE MR0175-92

Above items were heat treated in accordance with the requirements of the specification to which they were manufactured.

The tests at the products covered by this report comply with the applicable requirements of ASTM and/or ASME specifications, as noted for each item.

It is certified that the above figures are correct, as contained in the records of the Company.

[Signature]
**CERTIFIED TEST REPORT**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>DESCRIPTION/SPECIFICATION</th>
<th>HEAT CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>6 150 RF WN. STD</td>
<td>1293LB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A105-92 /SA105</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A105 01 / DJB</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>AS FORGED</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>8 STD LR. 90</td>
<td>C67R</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A234-92A/SA234 WPB</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STRESS RELIEVED AT 1200 F</td>
<td></td>
</tr>
</tbody>
</table>

**CHEMICAL ANALYSIS**

<table>
<thead>
<tr>
<th>CODE</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cr</th>
<th>Mo</th>
<th>Cu</th>
<th>Ni</th>
<th>V</th>
<th>Nb</th>
<th>C.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1293LB</td>
<td>.19</td>
<td>.02</td>
<td>.012</td>
<td>.022</td>
<td>.25</td>
<td>.07</td>
<td>.11</td>
<td>.17</td>
<td>.06</td>
<td>.02</td>
<td>.00</td>
<td>.40</td>
</tr>
<tr>
<td>C67R</td>
<td>.18</td>
<td>.84</td>
<td>.008</td>
<td>.005</td>
<td>.25</td>
<td>.02</td>
<td>.01</td>
<td>.02</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.33</td>
</tr>
</tbody>
</table>

**PHYSICAL PROPERTIES**

<table>
<thead>
<tr>
<th>HEAT CODE</th>
<th>TENSILE KSI</th>
<th>YIELD KSI</th>
<th>% Elong. IN 2″</th>
<th>Hardness HB</th>
<th>Size MM x 10 mm</th>
<th>Temp. °F</th>
<th>FOOT POUNDS</th>
<th>LATERAL EXPANSION</th>
<th>% SHEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1293LB</td>
<td>88.8</td>
<td>58.4</td>
<td>30.6</td>
<td>187</td>
<td>MAX</td>
<td>153</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C67R</td>
<td>71.1</td>
<td>46.6</td>
<td>37.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* L = LONGITUDINAL, T = TRANSVERSE

1293LB/C67R CONFORM TO THE REQUIREMENTS OF NACE MR0175-92

The following 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.

By: [Signature]
**Mill Test Reports Furnished By Texas Pipe & Supply Co., Inc.**

**Customer:**

**Heat No.:** S600167

**Product Description:**

6-025 OD 0.280 WALL 10.97 LBS/FT PE DAL

**Customer Order No.:**

**Customer Spec.:**

**Grade:** API 5L X42/8

**Chemical Properties - Longitudinal:**

<table>
<thead>
<tr>
<th>Density (lb/ft³)</th>
<th>Yield (ksi)</th>
<th>Tensile (ksi)</th>
<th>Proof (ksi)</th>
<th>Elongation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>48.0</td>
<td>42.0</td>
<td>60.0</td>
<td>36.0</td>
<td>20.0</td>
</tr>
</tbody>
</table>

**Mechanical Analysis - ANSL:**

<table>
<thead>
<tr>
<th>Element</th>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td></td>
<td>0.11</td>
</tr>
<tr>
<td>Mn</td>
<td></td>
<td>0.75</td>
</tr>
<tr>
<td>P</td>
<td></td>
<td>0.08</td>
</tr>
<tr>
<td>S</td>
<td></td>
<td>0.08</td>
</tr>
<tr>
<td>Si</td>
<td></td>
<td>0.35</td>
</tr>
<tr>
<td>Cu</td>
<td></td>
<td>0.35</td>
</tr>
<tr>
<td>Cr</td>
<td></td>
<td>0.07</td>
</tr>
<tr>
<td>Ni</td>
<td></td>
<td>0.07</td>
</tr>
<tr>
<td>Mo</td>
<td></td>
<td>0.07</td>
</tr>
<tr>
<td>Cd</td>
<td></td>
<td>0.07</td>
</tr>
<tr>
<td>V</td>
<td></td>
<td>0.07</td>
</tr>
<tr>
<td>Al</td>
<td></td>
<td>0.07</td>
</tr>
<tr>
<td>P</td>
<td>12.00</td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>4.50</td>
<td></td>
</tr>
</tbody>
</table>

**Supplemental Requirements:**

- **Hardness:** Yes
- **Charpy Impact Test:** Passed
- **Flattening Test:** Yes
- **NACE Test:** Passed
- **Grain Size:** Solution NACE MR-01-75

**Comments:**

This material is also manufactured to:

- API 510 Rev. 9th
- API 510 Rev. 9th
- API 510 Rev. 9th
- API 510 Rev. 9th

**Hydrostatic Test:** 2500 psi

**Remarks:**

- **Supervision and Discharge:** Before use
- **Check:**

**Supervised and Discharged to Before Use**

**Checked:**

- **Date:**

**N.O.P.:**

**This Certificate is Not Used for Other Test Purposes**

**Prepared:**

- **Date:**

**Prepared By:**

- **Date:**

**Prepared For:**

- **Date:**

**Prepared For:**

- **Date:**
## TUBULAR TEST REPORT

**SOLD TO:**
TEXAS PIPE & SUPPLY CO., INC.
ATTN: PURCHASING DEPARTMENT
2330 HOLMES ROAD
HOUSTON, TX 77051

**SHIP TO:**
TEXAS PIPE & SUPPLY CO., INC.
HOUSTON, TX 774190
B. PIERCE JUNCTION TEAM

**SPECIFICATION:**
ASTM A335-93a SA/SA106-93/API 5L CR B/X42

**CONDITION (SPECIAL):**

<table>
<thead>
<tr>
<th>HEAT #</th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>P</th>
<th>S</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>Cu</th>
<th>Al</th>
<th>SH</th>
<th>CF</th>
<th>N</th>
<th>CA</th>
</tr>
</thead>
</table>

**LOT #**

<table>
<thead>
<tr>
<th>SPECIMEN</th>
<th>YIELD KSI</th>
<th>TENSILE KSI</th>
<th>ELONG 2&quot;</th>
<th>R/A</th>
<th>BHN</th>
<th>ROCKWELL</th>
<th>GRAIN SIZE</th>
<th>H.G./J.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td>750 x STR</td>
<td>48.8</td>
<td>71.2</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>49.6</td>
<td>72.3</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### OTHER

- HYDRO: 3000 PSI 5 SEC HOLD PLATE: OK
- CERTIFIED NACE MR0175
- MILL TEST REPORTS FURNISHED BY TEXAS PIPE & SUPPLY, CO., INC.
- CUSTOMER
- CUSTOMER PO# 

**DATE**

07-26-94

**QUALITY ASSURANCE**

- MATERIAL WAS NOT EXPOSED TO MERCURY DURING PROCESSING.
- NO WELDING OR WELD REPAIR PERFORMED ON THIS MATERIAL.

---

**Koppel Steel Corporation**

Ambridge Tubular Operations
P.O. Box 610
Ambridge, PA 16003

Koppel Steel Operations/General Office
P.O. Box 710
Beaver Falls, PA 15010
Phone 814-862-7100, FAX 412-847-4222

---

**823**

---
MILL TEST REPORTS FURNISHED BY
TEXAS PIPE & SUPPLY CO., INC.

CUSTOMER:

CUSTOMER PO #

KOPPEL DIVISION
AMEBRIDGE DIVISION
PHONE 412-641-7100
FAX: 412-847-4071

TUBULAR

ORDER NO: T3661

SOLD TO:
TEXAS PIPE & SUPPLY CO., INC.
ATTN: PURCHASING DEPARTMENT
2333 HOLMES ROAD
HOUSTON, TX 77005

SHIP TO:
TEXAS PIPE & SUPPLY CO., INC.
ATTN: PURCHASING DEPARTMENT
2333 HOLMES ROAD
HOUSTON, TX 77005

CUST P.O.
8047718

SPECIFICATION(S):
API 5L X65

CERTIFIED NACE MR0175:

D.D. 3.5000
WALL .116
WT/FT 7.58
GRADE 1022M
QUALITY SEAMLESS HOT FINISH

CONDITION (SPECIAL):

<table>
<thead>
<tr>
<th>HEAT #</th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>Cu</th>
<th>Al</th>
<th>BN</th>
<th>CS</th>
<th>V</th>
<th>CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>418412</td>
<td>.20</td>
<td>.51</td>
<td>.011</td>
<td>.006</td>
<td>.26</td>
<td>.07</td>
<td>.07</td>
<td>.01</td>
<td>.15</td>
<td>.021</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.19</td>
<td>.49</td>
<td>.018</td>
<td>.004</td>
<td>.25</td>
<td>.08</td>
<td>.01</td>
<td>.15</td>
<td>.020</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.18</td>
<td>.49</td>
<td>.010</td>
<td>.006</td>
<td>.26</td>
<td>.08</td>
<td>.01</td>
<td>.15</td>
<td>.020</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.18</td>
<td>.49</td>
<td>.010</td>
<td>.006</td>
<td>.26</td>
<td>.07</td>
<td>.01</td>
<td>.15</td>
<td>.020</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LOT # | SPECIMEN | YIELD | TENSILE | ELONG | R/A | BHN | ROCK | GRAIN | MAGNIFICATION |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>750</td>
<td>SHEET</td>
<td>55.8</td>
<td>72.8</td>
<td>26</td>
<td>36</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLAT</td>
<td>52.7</td>
<td>73.5</td>
<td>34</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MATERIAL MELTED AND MANUFACTURED IN USA

OTHER
HYDRO - 3000 PSI 3 SEC HOLD
FLATS - OK

DATE: 10-11-94
QUALITY ASSURANCE

MATERIAL WAS NOT EXPOSED TO MERCURY DURING PROCESSING.
NO WELDING OR WELD REPAIR PERFORMED ON THIS MATERIAL.

TEST REPORT

Koppe Steel Corporation

Ambridge Tube Operations
P.O. Box 410
Ambridge, PA 15003

Koppe Steel Operations/General Offices
P.O. Box 725
Sewert Falls, PA 15210
Phone 412-723-1100, Fax 412-847-4235

10-11-94 9:08 AM 762
| NO. | HEAT NO. | TYPE | G | M1 | P | S | SI | CU | Ni | Cr | Mo | BN | Al | N | Y | P | Ti | CE | HRB |
|-----|----------|------|---|----|---|---|---|---|---|---|----|---|---|---|---|---|---|----|----|-----|
| 1   | N66003   | HEAT | 18| 106| 012| 008| 28| 02| 01| 04| 81 | 001| 001| 001| 001| 001| 001| N66000 | 74000 | 35.06 | 3/4 |
| 2   | N66003   | PROD| 19| 107| 008| 007| 25| 01| 01| 08| 81 | 001| 001| 001| 001| 001| 001| N66011 | 75700 | 32.03 | 3/4 |
| 3   | N66011   | HEAT | 17| 103| 011| 014| 26| 02| 01| 06| 01 | 001| 001| 001| 001| 001| 001| N66011 | 74000 | 35.06 | 3/4 |

**END OF DATA THIS SHEET***

ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.
MILL TEST REPORTS FURNISHED BY
TEXAS PIPE & SUPPLY CO., INC.

CUSTOMER

KOPPEL DIVISION
AMBRIDGE DIVISION

PHONE: 412-343-7100
FAX: 412-347-4071

SOLD TO:
TEXAS PIPE & SUPPLY CO., INC.
ATTN: PURCHASING DEPARTMENT
3300 HOLMES ROAD
HOUSTON, TX 77051

SHIP TO:
TEXAS PIPE & SUPPLY CO., INC.
RAIL SPIN 774190
HOUSTON, TX

SPECIFICATION(S): ASTM A695 SA/A33-93 SA/SA-106-93 API 5L OR B/X42

<table>
<thead>
<tr>
<th>O.D.</th>
<th>WALL</th>
<th>WT/FT</th>
<th>GRADE</th>
<th>QUALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.750</td>
<td>.184</td>
<td>5.65</td>
<td>1023N</td>
<td>SEAMLESS HOT FINISH</td>
</tr>
</tbody>
</table>

CONDITION (SPECIAL):

<table>
<thead>
<tr>
<th>HEAT #</th>
<th>C</th>
<th>Mn</th>
<th>S</th>
<th>P</th>
<th>Si</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>Cu</th>
<th>Al</th>
<th>SN</th>
<th>CS</th>
<th>V</th>
<th>CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>416027</td>
<td>.19</td>
<td>.52</td>
<td>.009</td>
<td>.006</td>
<td>.29</td>
<td>.09</td>
<td>.02</td>
<td>.18</td>
<td>.018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>416027</td>
<td>.19</td>
<td>.52</td>
<td>.010</td>
<td>.006</td>
<td>.26</td>
<td>.10</td>
<td>.02</td>
<td>.18</td>
<td>.020</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>416027</td>
<td>.19</td>
<td>.52</td>
<td>.010</td>
<td>.006</td>
<td>.27</td>
<td>.09</td>
<td>.02</td>
<td>.19</td>
<td>.019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>416027</td>
<td>.19</td>
<td>.52</td>
<td>.010</td>
<td>.006</td>
<td>.27</td>
<td>.09</td>
<td>.02</td>
<td>.18</td>
<td>.018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOT #</th>
<th>SPECIMEN</th>
<th>YIELD KSI</th>
<th>TENSILE KSI</th>
<th>ELONG 2&quot;</th>
<th>N/A</th>
<th>BHN</th>
<th>ROCK WEL</th>
<th>GRAIN SIZE</th>
<th>RADIOFLUX</th>
</tr>
</thead>
<tbody>
<tr>
<td>.750</td>
<td>STR</td>
<td>54.9</td>
<td>73.8</td>
<td>51</td>
<td>7</td>
<td>7</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>.750</td>
<td>STR</td>
<td>54.4</td>
<td>73.1</td>
<td>30</td>
<td>7</td>
<td>7</td>
<td></td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

MATERIAL MELTED AND MANUFACTURED IN USA

OTHER

- HYDRO = 3000 PSI 5 SEC HOLD
- BENDS = OK
- CERTIFIED NACE MR0175

1 MILL TEST REPORTS FURNISHED BY
TEXAS PIPE & SUPPLY, CO., INC.

CUSTOMER

CUSTOMER PO #

9-30-94

DATE

QUALITY ASSURANCE

MATERIAL WAS NOT EXPOSED TO MERCURY DURING PROCESSING.

NO WELDING OR WELD REPAIR PERFORMED ON THIS MATERIAL.

Koppel Steel Corporation

Ambridge Tube Operations
P.O. Box 410
Ambridge PA 15003
Phone: 412-343-7100

Koppel Steel Operations/General Offices
P.O. Box 140
Beaver Falls, PA 15010

TOTAL F: 02

P: 02 7-14-94
**CERTIFIED TEST REPORT**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>DESCRIPTION/SPECIFICATION</th>
<th>HEAT CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td></td>
<td>3X1 STD CONC.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A106B 09 / N99775</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>12</td>
<td>3X2 STD CONC.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A106B 09 / LB2128</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>6</td>
<td>4X2 STD CONC.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A106B 09 / C86737</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>12</td>
<td>4X3 STD CONC.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A106B 09 / C86737</td>
<td></td>
</tr>
</tbody>
</table>

**CHEMICAL ANALYSIS**

<table>
<thead>
<tr>
<th>T CODE</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cr</th>
<th>Mo</th>
<th>Cu</th>
<th>Ni</th>
<th>V</th>
<th>Nb</th>
<th>C.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>XGJ</td>
<td>.18</td>
<td>.82</td>
<td>.010</td>
<td>.009</td>
<td>.26</td>
<td>.06</td>
<td>.01</td>
<td>.01</td>
<td>.02</td>
<td>.00</td>
<td>.00</td>
<td>.33</td>
</tr>
<tr>
<td>LYH1</td>
<td>.18</td>
<td>.83</td>
<td>.011</td>
<td>.004</td>
<td>.26</td>
<td>.06</td>
<td>.02</td>
<td>.03</td>
<td>.02</td>
<td>.00</td>
<td>.00</td>
<td>.34</td>
</tr>
<tr>
<td>MAL1</td>
<td>.18</td>
<td>.78</td>
<td>.010</td>
<td>.010</td>
<td>.24</td>
<td>.03</td>
<td>.01</td>
<td>.01</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.32</td>
</tr>
<tr>
<td>MAL1</td>
<td>.18</td>
<td>.78</td>
<td>.010</td>
<td>.010</td>
<td>.24</td>
<td>.03</td>
<td>.01</td>
<td>.01</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.32</td>
</tr>
</tbody>
</table>

**PHYSICAL PROPERTIES**

<table>
<thead>
<tr>
<th>HEAT CODE</th>
<th>TENSILE *</th>
<th>YIELD *</th>
<th>% Elong.</th>
<th>HARDNESS</th>
<th>SIZE MM x 10 mm</th>
<th>TEMP. *F</th>
<th>FOOT POUNDS</th>
<th>LATERAL EXPANSION</th>
<th>% SHEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>XGJ</td>
<td>70.0 L</td>
<td>45.3</td>
<td>37.0</td>
<td>197</td>
<td>MAX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LYH1</td>
<td>62.1 L</td>
<td>42.5</td>
<td>26.0</td>
<td>125</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAL1</td>
<td>67.80 L</td>
<td>47.7</td>
<td>31.0</td>
<td>121</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAL1</td>
<td>67.80 L</td>
<td>47.7</td>
<td>31.0</td>
<td>121</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*L = LONGITUDINAL, T = TRANSVERSE, R = ROUND, S = STRIP*

"HACKNEY is a domestic manufacturer, and these items conform to the following specifications as they apply:


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 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, 3-1/2 Class Vessel Code Requirements, Paragraph UCS-79d. We certify these flanges and fittings capable of passing a hydrostatic test capable of withstanding the required pressure, and that the above figures are correct as contained in the records of the Company. Hardness testing and stamping are per NACE MR0-1-75."
### CERTIFIED TEST REPORT

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>DESCRIPTION/SPECIFICATION</th>
<th>HEAT CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>7</td>
<td>8 STD WC A516-70 TUSCL 5892016</td>
<td>ALKJ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A516-70 TUSCL 5892016</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>3</td>
<td>10 STD WC A516-70 TUSCL 5892016</td>
<td>AZJH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A516-70 TUSCL 5892016</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>8</td>
<td>3X1 STD CONC: A106B 09 / - N76276</td>
<td>XCV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A106B 15 / - 76406</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>3X1 STD CONC: A106B 15 / - 76406</td>
<td>XCC</td>
</tr>
</tbody>
</table>

#### CHEMICAL ANALYSIS

<table>
<thead>
<tr>
<th>CODE</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cr</th>
<th>Mo</th>
<th>Cu</th>
<th>Ni</th>
<th>V</th>
<th>Nb</th>
<th>C.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALKJ</td>
<td>.24</td>
<td>.107</td>
<td>.020</td>
<td>.009</td>
<td>.22</td>
<td>.03</td>
<td>.00</td>
<td>.03</td>
<td>.02</td>
<td>.00</td>
<td>.00</td>
<td>.43</td>
</tr>
<tr>
<td>AZJH</td>
<td>.24</td>
<td>.107</td>
<td>.020</td>
<td>.009</td>
<td>.22</td>
<td>.03</td>
<td>.00</td>
<td>.03</td>
<td>.02</td>
<td>.00</td>
<td>.00</td>
<td>.43</td>
</tr>
<tr>
<td>XCV</td>
<td>.17</td>
<td>.03</td>
<td>.004</td>
<td>.003</td>
<td>.22</td>
<td>.04</td>
<td>.01</td>
<td>.02</td>
<td>.02</td>
<td>.00</td>
<td>.00</td>
<td>.36</td>
</tr>
<tr>
<td>XCC</td>
<td>.19</td>
<td>.00</td>
<td>.026</td>
<td>.009</td>
<td>.29</td>
<td>.01</td>
<td>.01</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.36</td>
</tr>
</tbody>
</table>

#### PHYSICAL PROPERTIES

**TENSION RESULTS**

<table>
<thead>
<tr>
<th>HEAT CODE</th>
<th>TENSILE KSI</th>
<th>YIELD KSI</th>
<th>% Elong. IN 2&quot;</th>
<th>Hardness HB</th>
<th>Size MM x 10 mm</th>
<th>Temp. °F</th>
<th>FOOT POUNDS</th>
<th>LATERAL EXPANSION</th>
<th>% SHEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALKJ</td>
<td>80.1 T</td>
<td>55.7</td>
<td>33.0</td>
<td>197</td>
<td>MAX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AZJH</td>
<td>85.0 T</td>
<td>58.6</td>
<td>32.0</td>
<td>197</td>
<td>MAX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>XCV</td>
<td>74.4 L</td>
<td>48.1</td>
<td>35.0</td>
<td>197</td>
<td>MAX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>XCC</td>
<td>75.4 L</td>
<td>51.5</td>
<td>31.0</td>
<td>197</td>
<td>MAX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

Vessel Code Requirements, Paragraph UCS-79d. We certify these flanges and fittings capable of passing a hydrostatic test capable 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.
<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Specification</th>
<th>Heat Co.</th>
</tr>
</thead>
<tbody>
<tr>
<td>24CE</td>
<td>6</td>
<td>3.600 RF. BLIND</td>
<td>A105-938/SA105</td>
<td>D394C2</td>
</tr>
<tr>
<td>25</td>
<td>6</td>
<td>2 STD. HC</td>
<td>NORMALIZED AT 1650 F</td>
<td>AZFO</td>
</tr>
<tr>
<td>26</td>
<td>5</td>
<td>3 STD. HC</td>
<td>A234-92A/SA234 HPB</td>
<td>AZHP</td>
</tr>
<tr>
<td>27</td>
<td>5</td>
<td>6 STD. H/C</td>
<td>A234-92A/SA234 HPB</td>
<td>AZJH</td>
</tr>
</tbody>
</table>

**CHEMICAL ANALYSIS**

<table>
<thead>
<tr>
<th>Code</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>24CE</td>
<td>.25</td>
<td>.04</td>
<td>.015</td>
<td>.027</td>
</tr>
<tr>
<td>AZFO</td>
<td>.17</td>
<td>.01</td>
<td>.027</td>
<td>.010</td>
</tr>
<tr>
<td>AZHP</td>
<td>.15</td>
<td>.08</td>
<td>.010</td>
<td>.009</td>
</tr>
<tr>
<td>AZJH</td>
<td>.26</td>
<td>.19</td>
<td>.013</td>
<td>.014</td>
</tr>
</tbody>
</table>

**PHYSICAL PROPERTIES**

<table>
<thead>
<tr>
<th>Heat Code</th>
<th>Tensile</th>
<th>Yield</th>
<th>% Elong.</th>
<th>Size MM</th>
<th>Temp F</th>
<th>Foot Pounds</th>
<th>Lateral Expansion</th>
<th>% Shear</th>
</tr>
</thead>
<tbody>
<tr>
<td>0894CE</td>
<td>93.5</td>
<td>55.6</td>
<td>27.0</td>
<td>159.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AZFO</td>
<td>73.7</td>
<td>54.0</td>
<td>29.0</td>
<td>197.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AZHP</td>
<td>73.9</td>
<td>54.3</td>
<td>29.0</td>
<td>197.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AZJH</td>
<td>79.1</td>
<td>52.1</td>
<td>33.0</td>
<td>197.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CERTIFIED TEST REPORT**

**HEAT CODE:**

- 0894CE
- AZFO
- AZHP
- AZJH

**DATE SHIPPED:**

12/02/94

**SHIP TO:**

H & M SUPPLY

3923 OKLAHOMA AVE

WOODHARD, OK 73801

**NOTES:**

- 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 B16.26, and NACE MR-01-75.
  - **Flanges:** ASTM A105 and A516-70, ASME SA105, ANSI B16.5, and NACE MR-01-75.
- These heat treated as required by the applicable specification. They also conform to the requirements of Para 192 and 195, Title 49, Code of Federal Regulations, and the requirements of Paragraph UG-11, Section VIII, Division I of the ASME code. Hackney weld caps meet ASME Division 1, Section VIII Pressure Vessel Code Requirements, Paragraph UG-75. We certify these flanges and fittings are 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 MR-01-75.
# CERTIFIED TEST REPORT

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>DESCRIPTION/SPECIFICATION</th>
<th>HEAT CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>100</td>
<td>3 STD. LR: 90 A106B 09 / L02412</td>
<td>LZA1</td>
</tr>
<tr>
<td>51</td>
<td>3</td>
<td>8 STD. TEE A106B 07 / H60403</td>
<td>LZE1</td>
</tr>
<tr>
<td>53</td>
<td>6</td>
<td>4 XH LR 90 A106B 09 / U82173</td>
<td>MCY1</td>
</tr>
</tbody>
</table>

## CHEMICAL ANALYSIS

<table>
<thead>
<tr>
<th>CODE</th>
<th>C (%)</th>
<th>Mn (%)</th>
<th>P (%)</th>
<th>S (%)</th>
<th>Si (%)</th>
<th>Cr (%)</th>
<th>Mo (%)</th>
<th>Cu (%)</th>
<th>Ni (%)</th>
<th>V (%)</th>
<th>Nb (%)</th>
<th>C.E. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LZA1</td>
<td>0.19</td>
<td>0.80</td>
<td>0.011</td>
<td>0.009</td>
<td>0.26</td>
<td>0.045</td>
<td>0.01</td>
<td>0.02</td>
<td>0.02</td>
<td>0.00</td>
<td>0.00</td>
<td>0.34</td>
</tr>
<tr>
<td>LZE1</td>
<td>0.14</td>
<td>0.70</td>
<td>0.006</td>
<td>0.007</td>
<td>0.17</td>
<td>0.009</td>
<td>0.02</td>
<td>0.18</td>
<td>0.09</td>
<td>0.00</td>
<td>0.00</td>
<td>0.30</td>
</tr>
<tr>
<td>MCY1</td>
<td>0.17</td>
<td>0.78</td>
<td>0.012</td>
<td>0.010</td>
<td>0.23</td>
<td>0.03</td>
<td>0.01</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.31</td>
</tr>
</tbody>
</table>

## PHYSICAL PROPERTIES

<table>
<thead>
<tr>
<th>HEAT CODE</th>
<th>TENSILE STRENGTH KSI</th>
<th>YIELD STRENGTH KSI</th>
<th>% ELONG. IN 2ND</th>
<th>HARDNESS HB</th>
<th>Size MM x 10 mm</th>
<th>TEMP. F</th>
<th>FOOT POUNDS</th>
<th>LATERAL EXPANSION</th>
<th>% SHEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>LZA1</td>
<td>67.5 L</td>
<td>45.1</td>
<td>26.0</td>
<td>127</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LZE1</td>
<td>67.4 L</td>
<td>46.9</td>
<td>36.0</td>
<td>114</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCY1</td>
<td>70.2 L</td>
<td>51.9</td>
<td>32.0</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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:**

**Flanges:**
- ASTM A105 and AS516-70, ASME SA105; ANSI B16.5, and NACE MR01-75.

These were heat treated as required by the applicable specification. They also conform to the requirements of Parts 182 and 195, Code of Federal Regulations, Title 49. The ASME Code Requirements, 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-7.9d. We certify these flanges and fittings capable of passing a hydrostatic test consistent with their rating, and that all welds are in conformance as contained in the records of the Company. Hardness testing and stamping are per NACE MR01-75.
### HYDRAULIC SCREW JET PUMP

**Hackney, Inc.**
A Division of Trinity Industries
P.O. Box 5688, 5656 Stemmons Freeway
Dallas, Texas 75287

**To:** H & M Supply Co.
**From:** L & M Supply Co.
**Address:** 3923 Oklahoma Ave.
**City:** Woodharp, OK 73601

**Date Shipped:** 01/12/95

---

**Order Information**

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Reference</th>
<th>Customer No.</th>
<th>Invoice No.</th>
<th>Invoice Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>0099-002979</td>
<td>C133954A</td>
<td>454634</td>
<td>824237</td>
<td>01/12/95</td>
</tr>
</tbody>
</table>

**Certified Test Report**

- **Item:** 35
  - **Quantity:** 12
  - **Description/Specification:** A234-92A/SAC234 WPB
  - **Stress Relieved at 1200°F**
  - **Heat Code:** MCA1

- **Item:** 41
  - **Quantity:** 80
  - **Description/Specification:** A234-92A/SAC234 WPB
  - **Stress Relieved at 1200°F**
  - **Heat Code:** MCH1

- **Item:** 45
  - **Quantity:** 18
  - **Description/Specification:** A234-92A/SAC234 WPB
  - **Stress Relieved at 1200°F**
  - **Heat Code:** LZA1

- **Item:** 46
  - **Quantity:** 18
  - **Description/Specification:** A234-92A/SAC234 WPB
  - **Stress Relieved at 1200°F**
  - **Heat Code:** MCD1

---

**Chemical Analysis**

<table>
<thead>
<tr>
<th>Heat Code</th>
<th>C</th>
<th>Mn</th>
<th>Si</th>
<th>P</th>
<th>S</th>
<th>Mn</th>
<th>Mo</th>
<th>Cr</th>
<th>Ni</th>
<th>V</th>
<th>Cu</th>
<th>nbr</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCA1</td>
<td>.14</td>
<td>.64</td>
<td>.007</td>
<td>.006</td>
<td>.21</td>
<td>.084</td>
<td>.022</td>
<td>.14</td>
<td>.09</td>
<td>.00</td>
<td>.00</td>
<td>.25</td>
</tr>
<tr>
<td>MCH1</td>
<td>.17</td>
<td>.80</td>
<td>.010</td>
<td>.008</td>
<td>.24</td>
<td>.05</td>
<td>.012</td>
<td>.02</td>
<td>.03</td>
<td>.00</td>
<td>.06</td>
<td>.32</td>
</tr>
<tr>
<td>LZA1</td>
<td>.19</td>
<td>.78</td>
<td>.014</td>
<td>.007</td>
<td>.22</td>
<td>.03</td>
<td>.012</td>
<td>.02</td>
<td>.02</td>
<td>.00</td>
<td>.00</td>
<td>.34</td>
</tr>
<tr>
<td>MCD1</td>
<td>.16</td>
<td>.78</td>
<td>.014</td>
<td>.007</td>
<td>.22</td>
<td>.03</td>
<td>.012</td>
<td>.02</td>
<td>.02</td>
<td>.00</td>
<td>.00</td>
<td>.32</td>
</tr>
</tbody>
</table>

**Physical Properties Test Results**

<table>
<thead>
<tr>
<th>Heat Code</th>
<th>Tensile Strength</th>
<th>Yield Strength</th>
<th>Elong. %</th>
<th>HB</th>
<th>Time to Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCA1</td>
<td>62.6 L 43.7</td>
<td>38.0</td>
<td>107</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCH1</td>
<td>70.2 L 45.9</td>
<td>35.5</td>
<td>197, MAX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LZA1</td>
<td>67.5 L 45.1</td>
<td>26.0</td>
<td>127</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCD1</td>
<td>68.1 L 46.7</td>
<td>47.6</td>
<td>197, MAX</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**L = Longitudinal, T = Transverse, R = Round, S = Stress**

**Test Details**

- **Heat Code:** MCA1, MCH1, LZA1, MCD1

**Certification**

- **A高压: 46.7 尺寸 (Yield Stress) 47.6 尺寸 (Tensile Strength) 197 尺寸 (Elongation) 127 尺寸 (Hardness) **

**Signatures:**

- **Hackney, Inc.**

---

**Notes:**

- Hackney is a domestic manufacturer, and these items conform to the following specifications as they apply:
  - **Fittings:** ASTM A234 WPB, ASME SA234 WPB, ANSI B16.5, B16.5, and NACE MR01-75.
  - **Flanges:** ASTM A105 and A516-70, ASME SA105, ANSI B16.5, and NACE MR01-75.

---

**Assurances:**

- All welded fittings are weld by certified welders to ASME Section X, and 100% radiographically examined per Article 2, ASME Section V. All are in:
  - compliance with the requirements of Paragraph UG-11, Section VII, Division 1 of the ASME code.

---

**Additional Information:**

- Heat numbers are correct as contained in the records of the Company. Hardness testing and stamping are per NACE MR01-75.

---

**Additional Notes:**

- This document is a certified test report for a hydraulic screw jet pump manufactured by Hackney, Inc.
# HACKNEY INC.
A DIVISION OF TRINITY INDUSTRIES
P.O. Box 500887
2250 Stemmons Freeway
Dallas, Texas 75231-8887
(214) 634-2850

<table>
<thead>
<tr>
<th>ORDER NO.</th>
<th>REFERENCE</th>
<th>CUSTOMER NO.</th>
<th>INVOICE NO.</th>
<th>INVOICE DATE</th>
<th>DATE SHIPPED</th>
</tr>
</thead>
<tbody>
<tr>
<td>0099-002979</td>
<td>C139654</td>
<td>454634</td>
<td>826204</td>
<td>01/25/95</td>
<td>01/25/95</td>
</tr>
</tbody>
</table>

**SHIPPED TO:** M & M SUPPLY
3923 OKLAHOMA AVE
WOODWARD, OK 73801

## CERTIFIED TEST REPORT

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>DESCRIPTION/SPECIFICATION</th>
<th>HEAT CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1048</td>
<td>6</td>
<td>2.150 RF SD A105-938/SA105 AS FORGED</td>
<td>1194 CK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A105 26 / 494-3223 A234-92A/SA234 WPB</td>
<td>MC1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6X3 STD CONC # A106B 07 / H90368 STRESS RELIEVED AT 1200 F</td>
<td></td>
</tr>
</tbody>
</table>

## CHEMICAL ANALYSIS

<table>
<thead>
<tr>
<th>CODE</th>
<th>C%</th>
<th>Mn</th>
<th>P%</th>
<th>S%</th>
<th>Si</th>
<th>Cr%</th>
<th>Mo%</th>
<th>Ni</th>
<th>Cu%</th>
<th>Nb</th>
<th>CE</th>
</tr>
</thead>
<tbody>
<tr>
<td>94CR</td>
<td>.19</td>
<td>.83</td>
<td>.019</td>
<td>.029</td>
<td>.21</td>
<td>.05</td>
<td>.02</td>
<td>.22</td>
<td>.10</td>
<td>0.00</td>
<td>.36</td>
</tr>
<tr>
<td>MCA1</td>
<td>.14</td>
<td>.64</td>
<td>.007</td>
<td>.006</td>
<td>.21</td>
<td>.08</td>
<td>.02</td>
<td>.14</td>
<td>.09</td>
<td>0.00</td>
<td>.23</td>
</tr>
</tbody>
</table>

## PHYSICAL PROPERTIES

<table>
<thead>
<tr>
<th>HEAT CODE</th>
<th>TENSILE</th>
<th>YIELD</th>
<th>% Elong</th>
<th>Hardness</th>
<th>TAN THQ</th>
<th>E10 MM</th>
<th>TANG. EXP</th>
<th>LATERAL</th>
<th>% SHEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1194 CR</td>
<td>65.0</td>
<td>65.0</td>
<td>31.30</td>
<td>135.0</td>
<td>3.4</td>
<td>1.3</td>
<td>12.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCA1</td>
<td>63.0</td>
<td>63.0</td>
<td>31.30</td>
<td>135.0</td>
<td>3.4</td>
<td>1.3</td>
<td>12.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## CONCLUSIONS

- **Fittings:** Conform to the following specifications as they apply:
  - **FLANGES:** ASTM A105 and A156.70 ASME SA105 and SA156.70.
  - **FITTINGS:** ASTM A234 WPB and ASME SA234 WPB. All material meets ASME Section II, Division 1. All material is heat treated according to ASME 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 stress relieved material are per NACE MR01-75.
<table>
<thead>
<tr>
<th>MOUNTING</th>
<th>DESCRIPTION/SPECIFICATION</th>
<th>HEAT CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>6 15C RF WN STD</td>
<td>A105-92 / SA105</td>
</tr>
<tr>
<td></td>
<td>A105 26 / 493-1631</td>
<td>AS FORGED</td>
</tr>
<tr>
<td></td>
<td>6 15C RF WN STD</td>
<td>A105-92 / SA105</td>
</tr>
<tr>
<td></td>
<td>A105 26 / 493-1247</td>
<td>AS FORGED</td>
</tr>
</tbody>
</table>

**CHEMICAL ANALYSIS**

<table>
<thead>
<tr>
<th>HEAT CODE</th>
<th>C</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Si</th>
<th>Cr</th>
<th>Ni</th>
<th>Mo</th>
<th>Co</th>
<th>Cn</th>
</tr>
</thead>
<tbody>
<tr>
<td>593CA</td>
<td>.22</td>
<td>.84</td>
<td>.020</td>
<td>.023</td>
<td>.23</td>
<td>.07</td>
<td>.32</td>
<td>.27</td>
<td>.09</td>
<td>.00</td>
</tr>
<tr>
<td>593AX</td>
<td>.25</td>
<td>.83</td>
<td>.034</td>
<td>.029</td>
<td>.24</td>
<td>.12</td>
<td>.02</td>
<td>.34</td>
<td>.09</td>
<td>.00</td>
</tr>
</tbody>
</table>

**PHYSICAL PROPERTIES**

<table>
<thead>
<tr>
<th>HEAT CODE</th>
<th>TENSILE * KSI</th>
<th>YIELD KSI</th>
<th>% Elong. IN 2&quot;</th>
<th>Hardness H Br</th>
<th>Size x 10 mm</th>
<th>Temp - F</th>
<th>FOOT POUNDS</th>
<th>LATERAL EXPANSION</th>
<th>% SHEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>593CA</td>
<td>74.4</td>
<td>56.0</td>
<td>30.0</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% R. A. = 56.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>593AX</td>
<td>54.3</td>
<td>46.9</td>
<td>24.0</td>
<td>156</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% R. A. = 52.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* LONGITUDINAL, T = TRANSVERSE

---

593CA & 593AX CONFORM TO THE REQUIREMENTS OF NACE MR0175-92

---

* Items were heat treated in accordance with the requirements of the specification to which they were manufactured.

Verify that the products covered by this report comply with the applicable requirements of ASME and/or ASME specifications, as noted for each item.

Not to certify that the above figures are correct, as contained in the records of the Company.
Tank Corrosion Protection
PROTECTIVE MAINTENANCE COATINGS DATA
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.
See other cautions on last page. DSF1-0690

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 B 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) — 666 sq.ft./gallon
  *Recommended Film Build/Coverage
  (theoretical, unreduced)
  - Minimum — 3.0 mls dry (5.5 mls wet)
  - Maximum — 8.0 mls dry (15.0 mls
  wet) 108 sq.ft./gallon
- Typical — 5.0 mls dry (9.5 mls wet)
  — 173 sq.ft./gallon
- Weight — 1.1 lbs.
- Flash Point (Closed Cup) — Base No.
  5467 — 46°F, Curing Agent No.
  5469 — 43°F
- VOC — 3.24 lbs/gallon (388 gm/liter)
  unreserved
  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
  Hard — 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 — 1:1 by Volume
- Induction Before Use — 30 minutes @
  material temperatures > 70°F.
  60 minutes @ material temperatures
  60°-70°F.
- Pot Life — 2 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 projec-
  tions 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 (1.2 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-SP-5-82 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 for 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: GLIDEN 500™, GLIDEN 750™, GLIDEN 750GE™, GLIDEN 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 638 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. 5465/5489 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. 5281/5285
GLID-GUARD Coal Tar Epoxy No. 5270/5271
GLID-GUARD Hi-Build Coel Tar Epoxy No. 5273/5274
GLID-GUARD® GLID-TILE™ Epoxyide No. 5550/5552 series
NU-PON® COTE Color Coat No. 7240/7200 series

WATER-BORNE EPOXY FINISHES
GLID-GUARD Acrylic Epoxy No. 5273/5278
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
# Hi-Mil Sher-Tar™ Epoxy—B69B40/B60V40

## Description
Hi-Mil Sher-Tar Epoxy is a high build, polyamide cured epoxy coal tar coating. Can be applied at high film thicknesses in one coat.

## Characteristics
- **Color:** Black
- **Coverage:**
  - Recommended: 24-35 mils wet; 16-24 mils dry
  - Theoretical, no loss: 1090 sq. ft./gal @ 1.0 mil dry
- **Curing Mechanism:** Crosslink Polymerization
- **Drying Schedule:** (temperature & humidity dependent)
  - @ 77°F & 50% RH @ 29 mils wet:
    - To Touch: 8-10 hours
    - To Recoat: Minimum 24 hours; Maximum 72 hours
- **Semi-Gloss Finish**
- **Flash Point:** 110°F (Pensky-Martens Closed Cup)
- **Number of Components (Ratio):** 2 (3:1)
- **Pot Life:** 4 hours @ 77°F
- **Sweat-In time:** 30 minutes @ 77°F
- **Solvent/Reducer:** Polyamide Epoxy
- **Vehicle Type:** Reducer #54
- **VOC:** 306 grams/liter; 2.55 lbs/gal
- **Volume Solids:** 65 ± 2%
- **Weight Solids:** 77 ± 2%
- **Weight per Gallon:** 10.3 ± .3 lbs

## Specifications

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Surface Preparation (See pages 2 through 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum, atmospheric only</td>
<td>SPCP SP7/SW-18</td>
</tr>
<tr>
<td>Concrete</td>
<td>No primer needed</td>
</tr>
<tr>
<td>Galvanized Metal, atmospheric only</td>
<td>SPCP SP7/SW-18</td>
</tr>
<tr>
<td>Steel, atmospheric only</td>
<td>No primer needed</td>
</tr>
<tr>
<td>Steel, immersion</td>
<td>SPCP SP5/SW-16</td>
</tr>
</tbody>
</table>

## Performance Specifications

### Physical Properties:
- **Abrasion Resistance (ASTM D4060, 1000 cycles):** 101 mg
- **Direct Impact (ASTM G44):** >80 inch lbs.
- **Dry Heat Resistance (ASTM D2334):** 250°F
- **Elcometer Adhesion (ASTM D4541):** 600 psi
- **Flexibility (ASTM D522, 180° bend):** 1" mandrel
- **Moisture Condensation Resistance (ASTM D4585):** 1000 hours
- **Pencil Hardness (ASTM D3363):** 4H
- **Salt Fog Resistance (ASTM B117):** 1000 hours
- **Thermal Shock (ASTM D2246):** 250 cycles
- **Wet Heat Resistance (not immersion):** 120°F

### Resistance Guide:
- **(Resistance to fungi, solvents and spillage - not immersion: ASTM 03512)**
  - Add Salt Solutions: Severe
  - Aliphatic Hydrocarbons: Severe
  - Alkalies: Severe
  - Alkali Salt Solutions: Severe
  - Aromatic Hydrocarbon Solvents: Moderate
  - Chlorinated Solvents: Moderate
  - Fresh Water: Immersion
  - Salt Water: Immersion
  - Glycol ethers, alcohols, formaldehyde: Severe
  - Inorganic Acids: Severe
  - Oils (cutting, vegetable, lubricating): Severe
  - Organic Acids: Severe
  - Oxygenated Solvents: Moderate
WISco, INC.

11811 North Fwy., Suite 670
Houston, Texas 77060
(713) 820-8066

Page 1 of
Report Date 11/25/93
Report No. 002

Customer USPCI Attn: Bruce Patterson
Order No. 12418-30-46 Dated
Req. Date

Mat'l Destination Lone Mt. Facility, Waynoka, OK Dated

Shipment Date is now unknown As of 11/25/93 Changed from

Inspector estimated shipment date
Vendor Delta Tank Co.
Manufacturer Lide Tank Co.
Shop Location Mexia, TX
Inspector's Contact Mr. Billy Lide

Report is: x Interim Final Regarding: x Inspection Exediting Status

MATERIAL DESCRIPTION:

Two (2) tanks - one 6' 4" OD x 12' 0" high; one 5' 0" OD x 12' 0" high
To specifications of USPCI and API 650

STATUS OF ORDER: Engineering, Materials, Fabrication, Inspection, Completion

Writer's visit to vendor on Wednesday, 11/24/93, was to witness sandblast, initial paint coating and first coat of Sher-Tar epoxy.

Sandblast was verified to be as required SSPC-SP6, but due to immediate change in weather conditions, writer informed vendor's Mr. Billy Lide, that painting and/or epoxy coating at this time was not recommended. He also agreed. Items are to be reblasted and inspection of first coatings is to be on Monday, 11/29/93 or Tuesday, 11/30/93, weather permitting.

A spark or holiday test is to be performed on Sher-Tar epoxy along with micro-test of same and external coating of Glidden epoxy #5466-3 to 4 mils. A requirement of 7 mils on Sher-Tar epoxy will also be verified.

INSPECTOR: Dub Greer

INSPECTION ORDER: 12418-30-46
Customer: USPCI
Order No. 12418-30-46
Mat'l Destination: Lone Mt. Facility, Waynoka, OK
Shipment Date is now ready now
Inspector estimated shipment date ready now
Vendor: Delta Tank Co.
Manufacturer: Lide Tank Co.
Shop Location: Mexia, TX
Inspector's Contact: Mr. Billy Lide

Report is: Interim x Final Regarding: x Inspection ___ Expediting ___ Status

MATERIAL DESCRIPTION:
Two (2) tanks - one 6' 4" OD x 12' 0" high; one 5' 0" OD X 12' 0" high
To specifications of USPCI and API 650

STATUS OF ORDER: Engineering, Materials, Fabrication, Inspection, Completion

Writer's visits to vendor on Tuesday, 11/30/93, and Friday, 12/3/93, inspection functions were performed as follows:

11/30/93
First coat of Sher-Tar epoxy (internally) was micro-tested. Results were noted to be acceptable with an average of 3.5 mils.

Sandblast was verified to be SSPC-SP-6 with anchor pattern of 3.5 to 4.0. A Keane-Tator surface comparator was used to verify anchor pattern on each vessel.

12/3/93
Writer verified Sher-Tar epoxy to have mil thickness ranging from 7.2 to 14.8 on each vessel.

External gray primer paint range from 3.5 to 6.5 on each vessel.

A holiday test was performed internally on each vessel and found to be satisfactory. Items were released for shipment.

INSPECTOR: Dub Greer
INSPECTION ORDER: 12418-30-46
Piping Corrosion Protection
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.  
- **Theoretical, no loss:** 816 sq. ft./gal. @ 1.0 mil dry  
**Curing Mechanism:** Oxidation  
**Drying Schedule:** (temperature & humidity dependent)  
- @ 6 mils wet, 50% R. H. and:  
  - @ 40°F: 2 hours  
  - @ 77°F: 1 hour  
  - @ 110°F: 15 minutes  
**To Touch:** 2½ hours  
**Tack Free:** 1 hour  
**To Recoat with:**  
- alkyds: 2½ hours  
- epoxy: 16 hours  
- urethane: 16 hours

**Finish:** 0-10 units @ 85°F  
**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  
- 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 psig  
- Tip: .015” - .019”  
- Hose: 1/4” I.D.  
- Filter: 50 mesh

**Conventional spray:** normally no reduction required

### Specifications

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Surface Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>SSPC SP2/ SW-14</td>
</tr>
</tbody>
</table>

*Top coats are recommended over all primers/substrates.*

**Suggested topcoats:**
- A-100 Exterior Latex Finishes: 24-26  
- Corotherm 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  
- Metalex Semi-Gloss Coating: 64  
- ProMar Interior & Exterior Alkyd & Latex Topcoats: 73-95  
- Sher-Tile Epoxy: 100  
- Silver Brits 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 D2471): 200°F  
- Electrostatic Adhesion (ASTM D3414): 260 psi  
- Exterior Durability (with chalk): 1/4” mandrel  
- Flexibility (ASTM D522, 180° bend): Good  
- Pencil Hardness (ASTM D3359): H  
- Salt Fog Resistance (ASTM B117): 500 hours  
- Thermal Shock (ASTM D2668): 5 cycles

**Resistance Guide:**
- Resistance to flames, solvents, and shrinkage - Not Invasion (ASTM D9312).
- Acid Salt Solutions: Moderate
- Aliphatic Hydrocarbons: Moderate
- Aromatic Hydrocarbons: Not recommended
- 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
Secondary Containment Corrosion Protection
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 2,000 - 2,500 PSI
ASTM C-307
Tensile Elongation 12-25 %
ASTM C-307
Adhesion to Concrete Cohesive Failure
ASTM D-4541 of concrete
Adhesion to Steel 2,200-2,500 PSI
ASTM D-4541
Electrical Properties < 25,000 ohms
NFPA #99,
ASTM F-150

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

<table>
<thead>
<tr>
<th>SQUARE FEET PER GALLON</th>
<th>CONCRETE</th>
<th>STEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primer 67</td>
<td>150-200</td>
<td>250-300</td>
</tr>
<tr>
<td>Primer 67C</td>
<td>100-150</td>
<td>—</td>
</tr>
</tbody>
</table>

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 muratic 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:

<table>
<thead>
<tr>
<th>Component</th>
<th>Primer 67</th>
<th>Primer 67C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1 gal.</td>
<td>1 gal.</td>
</tr>
<tr>
<td>B</td>
<td>1 gal.</td>
<td>95 fl oz.</td>
</tr>
</tbody>
</table>

*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:

<table>
<thead>
<tr>
<th>TEMPERATURE</th>
<th>POT LIFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>50°F</td>
<td>60 min.</td>
</tr>
<tr>
<td>75°F</td>
<td>60 min.</td>
</tr>
<tr>
<td>90°F</td>
<td>30 min.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Ozs./Accelerator #1</th>
<th>Pot Life</th>
<th>Thin Film Cure</th>
</tr>
</thead>
<tbody>
<tr>
<td>per mixed gal., Primer 67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-4</td>
<td>36 min.</td>
<td>4 hrs.</td>
</tr>
<tr>
<td>6-7</td>
<td>15 min.</td>
<td>2 hrs.</td>
</tr>
</tbody>
</table>

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:**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Minimum Recoat Time</th>
<th>Maximum Recoat Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>50°F</td>
<td>12 hrs.</td>
<td>8 Days</td>
</tr>
<tr>
<td>75°F</td>
<td>6-8 hrs.</td>
<td>5 Days</td>
</tr>
<tr>
<td>90°F</td>
<td>4-5 hrs.</td>
<td>3 Days</td>
</tr>
</tbody>
</table>

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 (Setalash) 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 MERCHANDABLE 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.
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

<table>
<thead>
<tr>
<th>Protecto-Coat 200</th>
<th>40 Mil Basecoat</th>
<th>20 Mil Topcoat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>2,400-2,600</td>
<td>2,200-2,500</td>
</tr>
<tr>
<td>Elongation</td>
<td>225% to 250%</td>
<td>50 to 60%</td>
</tr>
<tr>
<td>Shore D Hardness</td>
<td>40-45</td>
<td>65-70</td>
</tr>
<tr>
<td>Abrasion Resistance CS 17 wheels/1000 cycles x 1000 gm load</td>
<td>10 mg weight loss</td>
<td>32 mg weight loss</td>
</tr>
<tr>
<td>Solids by Volume</td>
<td>80%</td>
<td>100%</td>
</tr>
</tbody>
</table>

*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 mls thick, 50-100% solids aromatic urethane resin, consisting of 2 basecoats and a topcoat of 20 mls 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 57 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 10 of 11 pages

To: Donnino Dunn
From: Roy

Fax: 609-3592
Phone: 1-973-844-8989

Date: 4/3/92

Co.: 
Dept.: 
Fax #: 
Phone #: 
Mid. America
ESTIMATING QUANTITIES AND ORDER BILL OF MATERIAL

<table>
<thead>
<tr>
<th>SQUARE FEET PER GALLON</th>
<th>CONCRETE</th>
<th>STEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primer 67</td>
<td>150-200</td>
<td>250-300</td>
</tr>
<tr>
<td>2 Base Coats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>35-40 mil DFT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top Coat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>15-20 mil DFT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-10 Solvent</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>

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**

| 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 until 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 mils 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**

<table>
<thead>
<tr>
<th>TEMPERATURE</th>
<th>RECOAT TIME</th>
<th>CURE TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>50°</td>
<td>48 Hrs.</td>
<td>96 Hrs.</td>
</tr>
<tr>
<td>70°</td>
<td>24 Hrs.</td>
<td>48 Hrs.</td>
</tr>
<tr>
<td>90°</td>
<td>16 Hrs.</td>
<td>36 Hrs.</td>
</tr>
</tbody>
</table>

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 costs 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:

<table>
<thead>
<tr>
<th>TEMPERATURE</th>
<th>POT LIFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>50°F</td>
<td>120 Min.</td>
</tr>
<tr>
<td>75°F</td>
<td>60 Min.</td>
</tr>
<tr>
<td>90°F</td>
<td>45 Min.</td>
</tr>
</tbody>
</table>

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 lacquer 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 MERCHANTABILITY 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
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)
- 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)

Distribution Of Reports
2-Bruce Patterson of USPCI
Ph. (405) 697-3500 Fax (405) 697-3592

Respectfully Submitted,
Anachem, Inc.

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 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 qualities of apparently identical or similar materials.
Client Name: USPCI
Submission #: 94080000203
Project Name: HEAT EXCHANGERS
Report Date: 08/26/94

Sample #: TREATED EXHAUST BLOWOFF
Laboratory ID #: 35372
Matrix: Liquid
Sample Container: 3xGallon Plastic
Sample Location: Not listed on the chain of custody.
Sample Date: Not listed on the chain of custody.

KALINITY, TOTAL (EPA 310.1)
Alkalinity
Results (mg/l): 7.600
Det. Limit: 1

ION/CATION RATIO (CALCULATION)
Ion/Cation Ratio
Results (%): 1.00
Det. Limit: 0

LCIUM/Ca (EPA 215.1)
Lcium
Results (mg/l): 30.2
Det. Limit: 0.01

LORIDE (EPA 300.6)
Loride
Results (mg/l): 14.300
Det. Limit: 0.1

ANIDE, TOTAL (EPA 335.2)
Cyanide
Results (mg/l): 23.9
Det. Limit: 0.20

NESS, TOTAL (BASED ON AAS/ICP)
ess
Results (mg/l): 15.00
Det. Limit:

SCAN (EPA 200.7)

Results (mg/l): 0.120
Det. Limit: 0.0120

Results (mg/l): 0.072
Det. Limit: 0.0014

Results (mg/l): 0.112
Det. Limit: 0.0146

Results (mg/l): 0.286
Det. Limit: 0.0046

Results (mg/l): 1.38
Det. Limit: 0.028

Results (mg/l): 0.362
Det. Limit: 0.042

Results (mg/l): 0.034
Det. Limit: 0.004

Results (mg/l): 0.925
Det. Limit: 0.004

Results (mg/l): 0.286
Det. Limit: 0.056

Results (mg/l): 0.004
Det. Limit: 0.031

Results (mg/l): 0.031
Det. Limit: 0.044

Results (mg/l): 0.061
Det. Limit: 0.002

Results (mg/l): 2.96
Det. Limit: 0.107

Results (mg/l): 0.152
Det. Limit: 0.045

Results (mg/l): 0.236
Det. Limit: 0.0011

Results (mg/l): 31.2
Det. Limit: 0.0059

Results (mg/l): 0.023
Det. Limit: 0.023

Results (mg/l): 0.017
Det. Limit: 0.017

Results (mg/l): 4.09
Det. Limit: 0.037

Results (mg/l): 1.53
Det. Limit: 0.015

Results (mg/l): 12
Det. Limit: 0.001

ICE (EPA 236.1)

Results (mg/l): 5.09
Det. Limit: 0.03

IGNESIUM/Mg (EPA 242.1)
Gnesium
Results (mg/l): 31.7
Det. Limit: 0.01
<table>
<thead>
<tr>
<th>Analyte</th>
<th>Results (mg/l)</th>
<th>Det. Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH For Liquid</td>
<td>7.5</td>
<td>0</td>
</tr>
<tr>
<td>POTASSIUM (EPA 400.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td>12300</td>
<td>0.010</td>
</tr>
<tr>
<td>SILICA (EPA 370.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silicon Dioxide/Silica</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>SODIUM/Na (EPA 273.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>105000</td>
<td>0.01</td>
</tr>
<tr>
<td>SPECIFIC CONDUCTANCE (EPA 120.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific Conductance</td>
<td>78900</td>
<td>1</td>
</tr>
<tr>
<td>SULFATE (EPA 375.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfate</td>
<td>30200</td>
<td>1</td>
</tr>
<tr>
<td>TDS-TOTAL DISSOLVED SOLIDS (EPA 160.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dissolved Solids</td>
<td>299000</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL SUSPENDED SOLIDS (EPA 160.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>1440</td>
<td>1</td>
</tr>
</tbody>
</table>
QUALITY CONTROL DATA

<table>
<thead>
<tr>
<th>ANALYTE</th>
<th>DATE ANALYZED</th>
<th>SPIKE VOL</th>
<th>STAND. DEV.</th>
<th>COEFF. OF VAR. %</th>
<th>REC1%</th>
<th>REC2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness, Calc.</td>
<td>8/19/94</td>
<td>---</td>
<td>0</td>
<td>0</td>
<td>96</td>
<td>---</td>
</tr>
<tr>
<td>Total Alkalinity</td>
<td>8/19/94</td>
<td>---</td>
<td>5.7</td>
<td>0.7</td>
<td>100</td>
<td>---</td>
</tr>
<tr>
<td>Silica</td>
<td>8/25/94</td>
<td>---</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>---</td>
</tr>
<tr>
<td>Sulfate</td>
<td>8/19/94</td>
<td>---</td>
<td>0.31</td>
<td>1.2</td>
<td>100</td>
<td>---</td>
</tr>
<tr>
<td>Chloride</td>
<td>8/25.04</td>
<td>---</td>
<td>178</td>
<td>8</td>
<td>100</td>
<td>---</td>
</tr>
<tr>
<td>T.S.S.</td>
<td>8/18/94</td>
<td>---</td>
<td>151</td>
<td>10</td>
<td>99</td>
<td>98</td>
</tr>
<tr>
<td>Total Cyanide</td>
<td>8/25/94</td>
<td>---</td>
<td>0</td>
<td>0</td>
<td>109</td>
<td>---</td>
</tr>
</tbody>
</table>

Standard Deviation = (x1-x2)/1.414
Coefficient of Variability % = (S.D/Avg.) * 100

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.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results (mg/l)</th>
<th>Det. Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN (EPA 6010)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar</td>
<td>333</td>
<td></td>
</tr>
<tr>
<td>Be</td>
<td>2.4 -</td>
<td></td>
</tr>
<tr>
<td>Br</td>
<td>0.166</td>
<td></td>
</tr>
<tr>
<td>Ca</td>
<td>0.514</td>
<td></td>
</tr>
<tr>
<td>Co</td>
<td>1.76</td>
<td></td>
</tr>
<tr>
<td>Cs</td>
<td>97.6</td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>12600</td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>0.242</td>
<td></td>
</tr>
<tr>
<td>Mn</td>
<td>41.7</td>
<td></td>
</tr>
<tr>
<td>Mo</td>
<td>0.264</td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>136000</td>
<td></td>
</tr>
<tr>
<td>Ni</td>
<td>36.4</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>0.338</td>
<td></td>
</tr>
<tr>
<td>Pb</td>
<td>0.198</td>
<td></td>
</tr>
<tr>
<td>Ti</td>
<td>0.264</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>52.2</td>
<td></td>
</tr>
<tr>
<td>Zn</td>
<td>4.5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results (mg/l)</th>
<th>Det. Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury Digestion (EPA 7470)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recovery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recovery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCVN/Hg BY COLD VAPOR (EPA 245.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample #: 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2x2 Liter Plastic Bottle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not listed on the chain of custody.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KALINITY, TOTAL (EPA 310.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Results (mg/l)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ION/CATION RATIO (CALCULATION)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Results (mg/l)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALKALINITY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Results (mg/l)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NITRATE ALKALINITY (EPA 310.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Results (mg/l)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCHUM / Ca (EPA 200.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Results (mg/l)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Page 2 of 4
<table>
<thead>
<tr>
<th>Test Description</th>
<th>Results (mg/l)</th>
<th>Det. Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATE ALKALINITY (EPA 310.1) alk Alkalinity</td>
<td>&lt;1</td>
<td>1</td>
</tr>
<tr>
<td>IDE (EPA 300.6)</td>
<td>176000</td>
<td>0.1</td>
</tr>
<tr>
<td>DE, TOTAL (EPA 335.2)</td>
<td>&lt;0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Fe (EPA 200.7)</td>
<td>112</td>
<td>0.013</td>
</tr>
<tr>
<td>SSiUM/Mg (EPA 200.7)</td>
<td>222</td>
<td>0.030</td>
</tr>
<tr>
<td>A 150.1</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>SIUM/K (EPA 200.7)</td>
<td>17400</td>
<td>0.010</td>
</tr>
<tr>
<td>EPA 370.1</td>
<td>400</td>
<td>2</td>
</tr>
<tr>
<td>Dioxide/Silica</td>
<td>130000</td>
<td>0.001</td>
</tr>
<tr>
<td>FIC CONDUCTANCE (EPA 120.1)</td>
<td>840000</td>
<td>1</td>
</tr>
<tr>
<td>FIC GRAVITY (USP 841)</td>
<td>1.31</td>
<td>1</td>
</tr>
<tr>
<td>ATE (EPA 375.4)</td>
<td>55300</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL DISSOLVED SOLIDS (EPA 160.1)</td>
<td>417000</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL SUSPENDED SOLIDS (EPA 160.2)</td>
<td>6780</td>
<td>1</td>
</tr>
</tbody>
</table>
## QUALITY CONTROL DATA

<table>
<thead>
<tr>
<th>ALYTE</th>
<th>DATE ANALYZED</th>
<th>SPIKE VOL</th>
<th>STAND. DEV.</th>
<th>COEFF. OF VAR %</th>
<th>REC1/%</th>
<th>REC2/%</th>
</tr>
</thead>
<tbody>
<tr>
<td>arcy</td>
<td>7/20/94</td>
<td>---</td>
<td>0.141</td>
<td>2.0</td>
<td>102</td>
<td>99</td>
</tr>
<tr>
<td>al Alkalinity</td>
<td>7/26/94</td>
<td>---</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>---</td>
</tr>
<tr>
<td>S</td>
<td>7/28/94</td>
<td>995</td>
<td>304</td>
<td>0.1</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>icon Dioxide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lica</td>
<td>8/1/94</td>
<td>---</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>---</td>
</tr>
<tr>
<td>flate</td>
<td>8/1/94</td>
<td>---</td>
<td>5</td>
<td>2.4</td>
<td>99</td>
<td>---</td>
</tr>
<tr>
<td>loride</td>
<td>7/26/94</td>
<td>500</td>
<td>2.1</td>
<td>1.1</td>
<td>100</td>
<td>99</td>
</tr>
<tr>
<td>rdness, Calcium</td>
<td>8/1/94</td>
<td>---</td>
<td>±4.2</td>
<td>1.1</td>
<td>110</td>
<td>100</td>
</tr>
<tr>
<td>S</td>
<td>7/21/94</td>
<td>298</td>
<td>0.7</td>
<td>0</td>
<td>98</td>
<td>95</td>
</tr>
</tbody>
</table>

Standard Deviation = (x1-x2)/1.414

Coefficient of Variability % = (S.D./Avg.) X 100

\[ y \% = (\text{spiked}-\text{unspiked})/\text{expected} \times 100 \]

## ICP SCAN INFORMATION

I.C.P. 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
Ancillary Equipment Drawings
Secondary Containment Drawings
SECTION EF1
EVAPORATOR FEED TANK NO. 1 (EF1)
ASSESSMENT

LONE MOUNTAIN FACILITY
WAYNOKA, OKLAHOMA

PREPARED FOR

CleanHarbors
ENVIRONMENTAL SERVICES, INC.

April 2016
# TABLE OF CONTENTS

1. TANK SYSTEM DESCRIPTION ................................................................. 1.

2. TANK SYSTEM ASSESSMENT ................................................................. 1.
   2.1 General Description of Evaporator Feed Tank No. 1 (EF1) ........ 1.
   2.2 Design Standard(s) ................................................................. 1.
   2.3 Hazardous Characteristics of Waste(s) to be Handled .......... 1.
   2.4 Existing Corrosion Protection ............................................... 2.
   2.5 Documented Age of Tank ....................................................... 2.
   2.6 Results of Leak Test ............................................................. 2.
   2.7 Existing Data Obtained ....................................................... 2.
   2.8 Calculation of Foundation Loading ...................................... 3.
   2.9 Required Structural Calculation ........................................... 3.
   2.10 Comparison of Actual Structural to Theoretical Values ........ 3.
       2.10.1 Wall Thickness Comparison ....................................... 3.
       2.10.2 Bottom Thickness Comparison .................................... 3.
       2.10.3 Foundation Integrity .................................................. 4.

3. SECONDARY CONTAINMENT SYSTEM .................................................... 5.
   3.1 General Description of Secondary Containment ................. 5.
   3.2 Design Standards ............................................................... 6.
   3.3 Hazardous Characteristics of Wastes Stored ..................... 6.
   3.4 Existing Corrosion Protection ............................................. 6.
   3.5 Documented Age of the Containment System ..................... 6.
   3.6 Results of Leak Test .......................................................... 7.
   3.7 Existing Data Obtained ....................................................... 7.
   3.8 Calculation of Existing Capacity ....................................... 7.
   3.9 Required Volume .............................................................. 7.
   3.10 Comparison of Available Volume to Required Volume ....... 8.

4. CONCLUSIONS .................................................................................. 8.
   4.1 Primary Tank Vessel .............................................................. 8.
   4.2 Secondary Containment .......................................................... 8.

5. RECOMMENDATIONS ........................................................................ 9.
   5.1 Primary Tank ......................................................................... 9.
   5.2 Secondary Containment .......................................................... 9.
   5.3 Routine Inspections ............................................................... 9.

6. CERTIFICATION ................................................................................ 9.
LIST OF TABLES:

TABLE 2.1  EF1 TANK DATA
TABLE 2.2  COMPARISON OF ACTUAL STRUCTURAL TO THEORETICAL VALUES FOR THE EF1 TANK
TABLE 2.3  COMPARISON OF HISTORICAL DEFLECTION DATA
TABLE 3.1  SECONDARY CONTAINMENT AREA DATA

LIST OF FIGURES:

FIGURE 1.  TANK DETAIL "AS- BUILT" DRAWING
FIGURE 1a.  MEASURED PLATE THICKNESS
FIGURE 2.  INITIAL DEFLECTION DATA MEASURING POINTS
FIGURE 3.  SURVEY POINT SCHEMATIC
FIGURE 4.  HISTORICAL FOUNDATION DATA
FIGURE 5.  SECONDARY CONTAINMENT SYSTEM
FIGURE 6.  SECONDARY CONTAINMENT SYSTEM

LIST OF APPENDICES:

APPENDIX A.  PRIMARY TANK VOLUME CALCULATIONS (NOVEMBER 2000)
APPENDIX B.  PRIMARY TANK WALL THICKNESS (NOVEMBER 2000)
APPENDIX C.  SEISMIC CALCULATIONS (NOVEMBER 2000)
APPENDIX D.  WIND LOAD CALCULATIONS (NOVEMBER 2000)
APPENDIX E.  FOUNDATION DESIGN ANALYSIS (NOVEMBER 2000)
APPENDIX F.  FOUNDATION INTEGRITY MONITORING DOCUMENTS
APPENDIX G.  LAW ENGINEERING GEOTECHNICAL REPORT
APPENDIX H.  CHEMPROOF PERMACOAT 3000 DOCUMENTATION
APPENDIX I.  SECONDARY CONTAINMENT CALCULATIONS (NOVEMBER 2000)
1. TANK SYSTEM DESCRIPTION

ENVIROTECH ENGINEERING & CONSULTING, INC., was retained by Clean Harbors, Inc., to conduct the required 5-year reassessment of Evaporator Feed Tank No. 1 (EF1), as outlined in the previous March 2010 Assessment. A visual inspection of Tank EF1 was conducted by Envirotech on October 29, 2015. This report is a continuation of previous assessments and references the original design data developed for this tank. Evaporator Feed Tank No. 1 (EF1) is a 60-ft.-dia. circular-steel aboveground open-top wastewater storage and treatment tank installed in July 1987. The 360,000-gal. (nominal) tank is utilized for the storage and incidental treatment of pre-treated wastewater. Certain wastewater not requiring pretreatment may also be stored in the tank (i.e., contaminated rainwater, landfill leachates, etc.) After storage, the wastewater is transferred for final treatment and/or disposal. The tank (along with Tank EF2 and a tank holding reagent-grade bleach) is located immediately east of the pretreatment area in a common, concrete-lined secondary containment system. Tank volume calculations are included in Appendix A. An "As-Built" drawing depicting the tank details is included herein as Figure 1.

2. TANK SYSTEM ASSESSMENT

2.1 General Description of Evaporator Feed Tank No. 1 (EF1). Evaporator Feed Tank No. 1 (EF1) is a vertical, circular, carbon-steel tank with a nominal diameter of 60-ft. sitting on an 8-in. channel resting upon a concrete ring wall foundation. A sand base and high-density polyethylene (HDPE) liner leak detection system is located directly under the primary tank floor with detector pipes extending through the ring wall and liner for positive leak identification.

2.2 Design Standard(s). The tank was constructed in 1987 and appears to be field-designed and constructed. Previous structural calculations (November 2000 assessment) that compared the existing tank and supports to applicable sections 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 are included in Appendices B through D. The actual steel specifications to which the tanks are constructed are not known, but were assumed to be A36 (carbon steel).

2.3 Hazardous Characteristics of Waste(s) to be Handled. The wastes managed in this tank are both characteristic and listed waste, as found in 40 CFR Part 261, Subparts C and D. This is a storage tank where aqueous-based waste materials that required oxidation, neutralization, filtration, or settling (among other physical/chemical treatment methods) were stored prior to evaporation or shipment off-site. Currently, the only material placed in the tank is treated wastewater. According to Clean Harbors, Inc., the waste managed in this tank has the following general characteristics:

☐ 4 < pH < 13;
☐ N > 1;
☐ Temperature = Ambient; and
Low Solvent Constituents.

The inside of the tank is coated with coal tar that is resistant to most constituents-of-concern. The coal tar coating has survived well in this working environment.

Regarding the potential for corrosion, it was previously determined that the pH and normality levels of the waste are the primary areas-of-concern. This was to determine the applicability of a corrosion allowance for the tank material-type and thickness.

2.4 Existing Corrosion Protection. The tank is isolated from soil and water by means of a ring wall equipped with a leak detection system below. This system is comprised of an HDPE liner between a layer of sand and a concrete mat foundation. The HDPE and concrete mat foundation isolate the sand from the underlying soil. Water may be entrained in the sand that was placed prior to construction of the tank bottom, but the secondary containment system is designed to drain entrained fluids to one of the leak detection drains that penetrate the ring wall. For further protection, a coal tar coating is employed on the bottom and sidewalls of the tank interior. In addition, the tank has an exterior epoxy paint layer and the new tank bottom has a protective coating on the underside of the plate.

2.5 Documented Age of Tank. Tank EF1 was erected/installed in July 1987 and is approximately 28-years-old as of this assessment conducted in October 2015.

2.6 Results of Leak Test. On October 25, 2015, a visual inspection of the containment area and leak detection pipes was conducted to satisfy the requirements of a leak test. A visual inspection of the containment area and leak detection pipes was conducted to satisfy the requirements of a leak test. No evidence of leakage from the manways or signs of penetration of the tank was observed. Based on this inspection, this tank appears not to be leaking.

2.7 Existing Data Obtained. The following Table 2.1 summarizes the existing data associated with the referenced tank.

<p>| TABLE 2.1  |</p>
<table>
<thead>
<tr>
<th>EFT TANK DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank Diameter</td>
</tr>
<tr>
<td>Tank Height</td>
</tr>
<tr>
<td>Maximum Operating Level</td>
</tr>
<tr>
<td>Material</td>
</tr>
<tr>
<td>Wall Thickness (See Appendix B)</td>
</tr>
<tr>
<td>Specific Gravity</td>
</tr>
<tr>
<td>Operating Temperature</td>
</tr>
</tbody>
</table>
2.8 **Calculation of Foundation Loading.** The total weight of the tank and its contents equals 1,976-ton. Previous detailed calculations (November 2000 assessment) reflecting the minimum required foundation thickness and steel reinforcement are included herein as Appendix E.

2.9 **Required Structural Calculation.** The calculated required wall thickness for this tank is 0.2363-in. This thickness includes 0.0625-in. added for corrosion allowance, based on a "best-engineering" estimate that considered the materials being treated and a 20-yr. design life. Previous detailed calculations (November 2000 assessment) required for wall thickness and structural analysis of the tank support system are included herein as Appendices B thru D.

2.10 **Comparison of Actual Structural to Theoretical Values.** The following Table 2.2 summarizes the comparison of actual structural to theoretical values. Some minor variance of instrument readings can be attributed partially to the idiosyncrasies of the testing equipment such as density of “complant” and roughness of tank surface at each test point.

| TABLE 2.2 | COMPARISON OF ACTUAL STRUCTURAL TO THEORETICAL VALUES FOR THE EF1 TANK |
| WALL THICKNESS COMPARISON | |
| Calculated Required Wall Thickness | 0.2363-in. |
| Minimum Required Wall Thickness by API 650 | 0.1875-in. |
| Original Plate Thickness | 0.250 |
| Measured Wall Thickness w/Coating (Minimum) | 0.270-in. |

| BOTTOM THICKNESS COMPARISON | |
| Minimum Required Bottom Thickness by API 650 | 0.250-in. |
| Original Plate Thickness | 0.375 |
| Measured Bottom Thickness w/Coating (Inner) | 0.392-in. |
| Measured Bottom Thickness w/Coating (Outer Ring) | 0.397-in. |

2.10.1 **Wall Thickness Comparison.** In the October 2015 assessment, a visual inspection and an ultrasonic thickness corrosion survey were conducted on the tank walls. Wall thickness measurements of the interior protective surface ranging from 0.246- to 0.280-in. exceeded the minimum required wall thickness of 0.236-in. and 0.1738-in., as graphically depicted on Figure 1a. Separate readings indicating that
Note:
2. Wall thickness measured at height of 3' to 6' above floor, base, and inner floor around the perimeter.
3. Thickness shown in 0.000" measured inside the tank.

Measurements in Inches
.332 Metal Thickness
.010 Paint Thickness
.342 Total Thickness

Survey Points Tank (EF1)
Scale 1"=20'
the coating thickness varies are attributed to normal wear and tear. Furthermore, the difference in values does not indicate a reduction that would adversely impact the minimum thickness requirement.

2.10.2 Bottom Thickness Comparison. A new tank bottom was installed in May 1994 by Ratliff, Inc., of Ponca City, Oklahoma. The specifications called for the bottom material to be A-36 steel with a thickness of 0.375-in. that exceeded the API-88 minimum thickness requirement of 0.25-in. An ultrasonic thickness corrosion survey was conducted by ENVIROTECH on October 29, 2015. This survey included the new bottom plates and the existing outer fringe portion of the original floor that the new floor was welded to. Floor (plate) thickness measurements of the interior protective surface ranging from 0.372 in. (minimum bottom thickness on the new floor section) and 0.369-in. (original floor perimeter section) exceeded the minimum required floor thickness of 0.250-in. and 0.1875-in., as graphically depicted on Figure 1a. Furthermore, the difference in values does not indicate a reduction that would adversely impact the minimum thickness requirement.

2.10.3 Foundation Integrity. Evaporator Feed Tank No. 1 (EF1) is situated on a concrete ring foundation with a sand base. The sand base rests on a concrete slab that is tied to the foundation ring. Minor cracks in the foundation ring are apparent from a visual inspection and continue to be coated with an impermeable coating. The tank is attached to a steel channel located on the top of the foundation ring. The steel channel experienced a rotation deformation when the new bottom was installed in the tank.

In order to monitor the foundation integrity, the angle of deflection caused by rotation deformation of the steel channel has been measured frequently, as outlined in the monitoring documents included in Appendix F. ENVIROTECH's recommendation in the July 1995 tank assessment report indicated that deflection measurements should be collected annually and compared with the initial measurements recorded subsequent to rotation deformation. In the event the deflection measurement is 2° greater than the initial measurement, ENVIROTECH recommended that a new assessment of the tank be conducted. Time has shown that deflection has settled into a movement range of two degrees (2°). Therefore, we recommend that a new assessment be considered when a deflection greater than two degrees (2°) of the previous two (2) measurements is observed. Actual deflection data is included in Appendix F, and Figure 2 illustrates the measuring points with the initial deflection data. An updated evaluation of this angle deflection is summarized in the following Table 2.3.
TABLE 2.3
COMPARISON OF HISTORICAL DEFLECTION DATA

<table>
<thead>
<tr>
<th>Initial Deflection Data</th>
<th>Measurement Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3/97</td>
</tr>
<tr>
<td>S 5°</td>
<td>4°</td>
</tr>
<tr>
<td></td>
<td>5°</td>
</tr>
<tr>
<td>E 4°</td>
<td>4°</td>
</tr>
<tr>
<td></td>
<td>6°</td>
</tr>
<tr>
<td>N 7°</td>
<td>4°</td>
</tr>
<tr>
<td></td>
<td>10°</td>
</tr>
<tr>
<td>E 7°</td>
<td>6°</td>
</tr>
<tr>
<td></td>
<td>10°</td>
</tr>
</tbody>
</table>

A review of the data indicates that the entrance hatch area of the tank experiences deflection measurements greater than 2° from the initial measurements. However, the visual inspection gave no indication of compromised foundation integrity.

In addition, previous field survey data indicated that some settlement had occurred in the tank foundation ring. In September 1993, USPCI (former facility owner) retained Law Engineering to conduct an investigation that would yield site-specific subsurface data in the vicinity of Tank EF1. Law drilled four (4) geotechnical borings as part of this investigation. In general, the soil profile consisted of 1- to 2-ft. of gravel followed by 15- to 20-ft. of soft-to-hard, reddish-brown silty clay. A review of the data within the Law report, including the boring logs, indicates the soil strengths should be adequate to support the tank and associated ring foundation. The applicable portion of the Law report is included herein as Appendix G. Based on this information, a foundation design analysis, prepared in November 2000, is included in Appendix E.

To quantify foundation settlement since the March 2010 assessment, Jividens Surveying shot eight (8) points around the perimeter of the tank on several occasions, as indicated in the monitoring documents included in Appendix F. The survey points are graphically depicted on the drawing included herein as Figure 3. These existing foundation elevations were compared with previous surveys of the same points. The historical foundation data is graphically presented as Figure 4. The latest elevation measurements indicate greater movement than past observations. The movement is upward and generally uniform. As a whole, it appears that the tank foundation
experienced fairly uniform movement. In addition, no significant impacts to the foundation or tank structure were observed.

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 Feed Tank Nos. 1 and 2 are located in a reinforced-concrete-base floor area with vertical concrete sidewalls. This area is inspected on a daily basis.

Prior to the November 2000 assessment, a visual inspection revealed apparent stress cracks or other conditions that would indicate an insufficiency in the foundation design. A previously-referenced geotechnical investigation addressed these issues. This apparent failure in the concrete was determined to be the result of a lack of proper steel reinforcement and/or differential settlement (consolidation) in the subgrade. The subgrade appeared to be fill material and it is possible that the subgrade was not properly compacted prior to pouring the concrete.

During this assessment, the concrete secondary containment area appeared to be in fair condition. The ground surrounding the secondary containment system is sloped to shed rainfall runoff to aid in preventing saturated soil.

The containment system is walled-off and receives no direct vehicular traffic. The foundation walls and base are mass-poured in-place.

The containment area and tanks are visually monitored on a daily basis for leaks. The floor is sloped to collect any drainage or spills, and any released tank contents or surface runoff will drain on top of the sloped concrete to the sump area. The accumulated liquids are then withdrawn within a specified time period. The secondary containment system is graphically depicted in the drawings included herein as Figures 5 and 6.

3.2 Design Standards. For purposes of the November 2000 assessment, "As-Built" drawings for this area were utilized as a reference. The structural capacity of the foundation and walls were compared to those sections that are applicable in the API 550-88 and the American Concrete Institute (ACI 318/89/318r-89). These calculations were used as a guide in verifying the ability of the system to contain hazardous waste.

3.3 Hazardous Characteristics of Wastes Stored. The wastes managed in the primary tank are both characteristic and listed waste, as found at 40 CFR Part 261, Subparts C and D. This is a storage tank where aqueous-based waste materials that required oxidation, neutralization, filtration, or settling (among other physical/chemical treatment methods) were stored prior to evaporation or shipment off-site. Currently, the only material placed in the tank is treated wastewater. The waste managed in this tank has the following general characteristics:
Evaporator Feed Storage Tank No. 1
Secondary Containment Section A-A
4 < pH < 13;
N > 1;
Temperature = Ambient; and
Low Solvent Constituents.

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.

3.4 Existing Corrosion Protection. The entire secondary containment area has been coated with Dudick, Inc., Protecto-Coat 200.

3.5 Documented Age of the Containment System. The secondary containment system was constructed and installed in 1987, thus making the system 28-yr. old at the time of this assessment. The system has undergone significant upgrading since it was initially installed to include the following:

- A coating was applied in June 2012. The secondary containment surface coating is comprised of Chemproof Polymers-Permacoat 3000 on horizontal surfaces and Chemproof Polymers-Permacoat 3000V on vertical surfaces. Equivalent or superior coating materials are used during any necessary repairs to the coating. Information regarding Chemproof Polymere-Permacoat is included herein as Appendix H.

- Potential cross-connections were eliminated in 1993. The main lines from the primary treatment and storage area exited the containment area through the floor of the secondary containment area down to the final treatment area, thereby potentially allowing material from a tank failure to migrate into the secondary containment area within the final treatment area. Elimination of this potential cross-connection acts to segregate the secondary containment area for EF1 and EF2 from any other.

3.6 Results of Leak Test. A visual inspection of the containment area and leak detection pipes was conducted to satisfy the requirements of a leak test. No evidence of leakage from the manways or signs of penetration of the tank was observed. Based on this inspection, the secondary containment does not appear to be leaking. Prior to the November 2000 assessment, an inspection of the non-exposed portion of the containment area beneath the tank floor revealed it was in fair condition, and installation of the HDPE liner appears to prohibit migration of waste out of the containment area.
3.7 Existing Data Obtained. The following Table 3.1 summarizes the existing data collected as regards the secondary containment area.

<table>
<thead>
<tr>
<th>Area</th>
<th>14,589-ft.$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available Wall Height</td>
<td>5.5-ft.</td>
</tr>
<tr>
<td>Material</td>
<td>Concrete</td>
</tr>
<tr>
<td>Gross Volume</td>
<td>80,240-ft.$^3$</td>
</tr>
</tbody>
</table>

3.8 Calculation of Existing Capacity. The volume containment capacity available (CCA) calculation is:

\[
CCA = \text{Gross Volume} - \text{Volume of Items in Containment} - \text{Volume of Rainfall}
\]

The containment capacity available is 59,487-cf, as depicted in the detailed calculations included herein as Appendix I.

3.9 Required Volume. The containment capacity required (CCR) is calculated as follows:

\[
CCR = \text{Volume of Largest Tank in Secondary Containment} = (EF1) = 47,785.26-cf
\]

3.10 Comparison of Available Volume to Required Volume. The containment capacity comparison is calculated as follows:

- Containment Capacity Required = 47,785.26-cf
- Secondary Containment Volume Available = 59,487-cf
- Excess Containment Volume = 11,702-cf
- Safety Factor = 1.24

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

4. CONCLUSIONS

4.1 Primary Tank Vessel. The tank vessel at the time of inspection is appropriate for use with the present waste stream at given densities and chemical and physical characteristics, as verified by Clean Harbors, Inc. The useful life of the steel tank would be estimated at 5-yr., provided as follows:

(a) Although the original design life was estimated to be 20-years in 1987, the tank appears to be in good condition with coatings that demonstrate no significant deterioration.
(b) The 8-in. channel has been inspected annually at the points previously identified in Figure 2 and some deflection has been observed greater than 2° from its current position.

(c) A Survey of the tank foundation has been conducted at the points previously identified in Figure 3 and the annual maximum settlement does not exceed 1-in.

In the event the 8-in. channel deflection increases more than 2° from its current position and/or the tank foundation settles more than 1-in/yr., ENVIROTECH requests that a new tank assessment be conducted immediately.

4.2 Secondary Containment. The secondary containment area at the time of inspection is appropriate for use with the present waste stream at given densities and chemical and physical characteristics. The useful life of the secondary containment area would be estimated at 5-yr., provided the constraints addressed in Section 4.1(b) and (c) are observed.
5. RECOMMENDATIONS

5.1 Primary Tank. Clean Harbors should continually ensure compatibility with the waste and densities stored. Daily inspections should be continued to detect any visual corrosion or defects. Due to the known history and pattern of movement, inspection in terms of collecting and evaluating the 8-inch channel deflection and foundation survey for settlement shall be performed between one (1) to three (3) years. Since the steel base channel under Tank EF1 rotated greater than 20°, it is recommended to evaluate the foundation settlement and rotation in 2017. Repair action shall be evaluated on a case-by-case basis.

5.2 Secondary Containment. The secondary containment should be visually inspected periodically for any deterioration as well as structural integrity.

5.3 Routine Inspections. When routine and preventive measures are to be implemented, 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, as well as routine inspections, is recommended.

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 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 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."

DATED this ______ day of April, 2016.

Ron Erdman, P.E.
ENVIROTECH ENGINEERING & CONSULTING, INC.

C.A. 1960 - Expiration 06/30/16
APPENDIX A.

PRIMARY TANK VOLUME CALCULATIONS
**PRIMARY TANK VOLUME CALCULATIONS**

☐ **DIMENSIONS:**

<table>
<thead>
<tr>
<th>Geometry</th>
<th>Cylindrical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>60.00-ft.</td>
</tr>
<tr>
<td>Height</td>
<td>16.90-ft.</td>
</tr>
<tr>
<td>Operating Height</td>
<td>15.50-ft.</td>
</tr>
<tr>
<td>Bottom</td>
<td>Flat</td>
</tr>
</tbody>
</table>

☐ **TANK VOLUME:**

- Operating Volume = 43,826.72-cf = 327,846.63-gal.

**Total Primary Tank Volume** = 47,785.26-cf = 357,458.57-gal.

☐ **WEIGHT ON FOUNDATION:**

- Contents S.G. = 1.3
- Density = 81.12-lb/cf

☐ **SURFACE AREA CALCULATION:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank Top</td>
<td>n/a</td>
</tr>
<tr>
<td>Tank Bottom</td>
<td>2,827.53-sf</td>
</tr>
<tr>
<td>Tank Wall</td>
<td>3,185.68-sf</td>
</tr>
</tbody>
</table>

**Total Surface Area** = 6,013.21-sf

- Steel Thickness: Sidewalls = 0.250-in.
- Bottom = 0.375-in.
- Volume of Steel: Sidewalls = 66.37-cf
- Bottom = 88.36-cf

- Density of Steel = 490-lb/cf
- Weight of Steel (Tank): = 37.91-ton = 75,817.08-lb.
- Weight of Tank Contents = 1,938-ton = 3,876,340-lb.
- Total Weight of Tank and Contents = 1,976-ton = 3,952,157-lb.
APPENDIX B.

PRIMARY TANK WALL THICKNESS
PRIMARY TANK WALL THICKNESS

DIMENSIONS:

Geometry: Cylindrical
Diameter: 60.00-ft.
Height: 16.90-ft.
Specific Gravity: 1.30
Normal Operating Temperature: Ambient

STEEL THICKNESS CALCULATIONS:

Thickness \( t \) = \frac{(2.6 \times H \times D \times S.G.)}{(s \times E)} + CA

\[
\begin{align*}
\text{s} & = \text{Allowable Design Stress} = 23,200.00\text{-psi} \\
\text{E} & = \text{Joint Efficiency} = 85.00\% \\
\text{Thickness (t)} & = 0.1738\text{-in.} \\
\text{Corrosion Allowance} & = 0.0625\text{-in.}
\end{align*}
\]

Calculated Minimum Wall Thickness = 0.2363-in.
APPENDIX C.

SEISMIC CALCULATIONS
SEISMIC CALCULATIONS

DIMENSIONS:
- Diameter: 60.00-ft.
- Height: 16.90-ft.
- Weight of Tank (Steel): 75,817.00-lb.
- Weight of Maximum Contents: 3,876,340.00-lb.
- Tank Shell Thickness: 0.25-in.
- Tank Bottom Thickness: 0.375-in.

STRESS IN TANK SHELL FROM SEISMIC FORCES:

Maximum weight of tank contents that may be used to resist shell overturning moment: W_l

\[ W_l = 7.9 \times t_b \times (F_{by} \times G \times H)^{0.5} \]

- F_{by} = Minimum Yield Strength in Bottom Plate = 36,000.00
- t_b = Thickness of Tank Bottom = 0.375
- G = Design Specific Gravity of Liquid = 1.3
- W_l = 2,634.66

Note: W_l Shall Not Exceed 1.25 \times G \times H \times D

1,647.75-lb/ft. of Shell Circumference

Density of Tank Shell Material = 490.00-lb/ft³

WT = Weight of Tank Shell = 172.52-lb/ft. of Shell Circumference

M/[D^{0.2}(WT+W_l)] = 0.1071

b = Maximum Longitudinal Compressive Force at the Bottom of Tank Shell

b = WT + 1.273 \times M/D^{0.2}

b = 420.63-lb/ft. of Shell

G \times H \times D^{0.2}/t^{0.2} = 1,265,472

Fa = 10^{0.6}*t/D = 4,167-psi

OR

Fa = .5*F_{ty} = 18,000-psi

Use Minimum Value for Fa

Fa = 4,167-psi

b/12*t = 140.21-psi

Note: b/12t Cannot Exceed Fa for a Stable Tank
**OVERTURNING MOMENT:**

- Overturning Moment (M) = $Z^*I^*(C1*W_s*X_s+C1*W_1*X_1+C2*W_2*X_2)$
- Zone Coefficient (Z) = 0.1875
- Essential Facilities Factor (I) = 1.000
- Lateral Earthquake Force Coefficient (C1) = 0.240
- D/H = 3.55
- k Factor (@ D/H = 3.55) = 0.680
- Site Amplification Factor (S) = 1.5
- Natural Period of First Sloshing Mode (T) = 5.11
- Lateral Earthquake Force Coefficient (C2) = 0.07755
- Weight of Tank (W_s) = 75,817.00

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight of Tank Contents (W_t)</td>
<td>3,876,340.00</td>
</tr>
<tr>
<td>W1 / Wt (@ D/H = 3.55)</td>
<td>0.32</td>
</tr>
<tr>
<td>W2 / Wt (@ D/H = 3.55)</td>
<td>0.60</td>
</tr>
<tr>
<td>Weight of Effective Mass (W1)</td>
<td>1,240,428.80</td>
</tr>
<tr>
<td>Weight of Effective Mass (W2)</td>
<td>2,325,804.00</td>
</tr>
<tr>
<td>Ht from Btm of Shell to Cent. of Shell (X_s)</td>
<td>8.45</td>
</tr>
<tr>
<td>X1/H</td>
<td>0.38</td>
</tr>
<tr>
<td>Ht from Btm of Cent. of Lat Seismic Force (X1)</td>
<td>6.422</td>
</tr>
<tr>
<td>X2/H</td>
<td>0.55</td>
</tr>
<tr>
<td>Ht from Btm of Cent. of Lat. Seismic Force (X2)</td>
<td>9.295</td>
</tr>
<tr>
<td>Overturning Moment ($M$)</td>
<td>701,645-ft/lb.</td>
</tr>
<tr>
<td>Opposing Moment ($M^*$)</td>
<td>118,564,710-ft/lb.</td>
</tr>
</tbody>
</table>
APPENDIX D.

WIND LOAD CALCULATIONS
WIND LOAD CALCULATIONS

DIMENSIONS:

- Diameter: 60.00-ft.
- Height: 16.90-ft.
- Weight of Tank (Steel): 75,817.00-lb.
- Weight of Max. Contents: 3,876,340.00-lb.
- Tank Shell Thickness: 0.25-in.
- Tank Bottom Thickness: 0.375-in.

OVERTURNING MOMENT FROM WIND LOADS:

\[ M = \text{Overturning Moment Due to Wind Loading} \]

\[ M = P_w \times A_p \times H_c \]

- Wind Pressure (Assume 18-psi for 100-MPH Wind on Cylinders) \( P_w = 18.00 \text{-psi} \)
- Projected Frontal Area of Tank \( A_p = 1,014 \text{-ft}^2 \)
- Height from Ground to Centroid of Tank \( H_1 = 8.45 \text{-ft} \)
- \( M = 154,229.40 \text{-ft-lb.} \)
- \( M_{\text{Max}} = 0.66 \times (W \times D)/2 \)
- Weight of Tank \( W = 75,817 \text{-lb.} \)
- \( M_{\text{Max}} = 1,501,177 \text{-ft-lb.} \)

\[ M \text{ Must Be Less Than } M_{\text{Max}} \]
APPENDIX E.

FOUNDATION DESIGN ANALYSIS
FOUNDATION DESIGN ANALYSIS

Dimensions:

- Diameter: 60.00-ft.
- Height: 16.90-ft.
- Weight of Tank (Steel): 75,817.00-lb.
- Weight of Max. Contents: 3,876,340.00-lb.
- Tank Shell Thickness: 0.25-in.
- Tank Bottom Thickness: 0.375-in.

Concrete Foundation Design:

- Assumed Footing Depth = 48-in.
- Assumed Footing Width = 12-in.

Assumed Effective Soil Pressure
(Based on Law Engineering Investigation) = 1,500-psf

Maximum Shell Compression at Bottom of Shell
(Based on Seismic Analysis) b = 420.63-lb/ft. of circ.

- Footing Width = 1.00-ft.
- Actual Applied Loading = 420.63-psf

The actual applied loading is significantly less than the assumed effective soil pressure and therefore, the foundation should be stable.
APPENDIX F.

FOUNDATION INTEGRITY MONITORING DOCUMENTS
Annual Tank In-Service Inspection Checklist

Tank Name: EF-1
Tank Location: USWPT
Inspected By: JUWEN SURVEY

Date: 04-01-2012
Signature: MVE Podd

Date of Last Inspection: ___________

I. Foundation

A. Measure foundation levelness and bottom elevations (8 points for EF-1 and 9 points for EF-2).
   Note: No other tanks require foundation levelness and elevation survey.

   **EF-1:**
   37 1425.86 47 1425.86 55 1426.01 283 1426.01
   271 1426.13 279 1426.17 283 1426.14 303 1425.97

   **EF-2:**
   65 ______ 73 ______ 31 ______ 89 ______ 181 ______
   205 ______ 211 ______ 219 ______ 227 ______

B. Has the yearly maximum settlement exceeded 1 inch? (EF-1 and EF-2 only)

   **EF-1:** Yes____ No____
   **EF-2:** Yes____ No____

C. Check 8 inch annular channel for deflection of more than 2 degrees from its correct position. (EF-1 only)

   Deflection ______________

Comments: ________________________________________________________

_________________________________________________________________

_________________________________________________________________
Annual Tank In-Service Inspection Checklist

Tank Name: EF-1
Tank Location: USWPT
Inspected By: JUDEN SURVEY

Date of Last Inspection: 

Tank Number: #1
Date: 05-19-2014
Signature: MIKE GOSSETT

I. Foundation

A. Measure foundation levelness and bottom elevations (8 points for EF-1 and 9 points for EF-2).
Note: No other tanks require foundation levelness and elevation survey.

EF-1:

| 37 | 1425.84 |
| 47 | 1425.98 |
| 55 | 1426.01 |
| 263 | 1426.00 |
| 271 | 1426.12 |
| 279 | 1426.20 |
| 233 | 1426.14 |
| 303 | 1425.96 |

EF-2:

| 65 | 73 | 81 | 89 | 191 |
| 205 | 211 | 219 | 227 |

B. Has the yearly maximum settlement exceeded 1 inch? (EF-1 and EF-2 only)

EF-1: Yes ___ No ___
EF-2: Yes ___ No ___

C. Check 8 inch annular channel for deflection of more than 2 degrees from its correct position. (EF-1 only)

Deflection __________

Comments: ___________________________
Annual Tank In-Service Inspection Checklist

Tank Name: EF-1  Tank Number: 11-09-2015
Tank Location: WWP T  Date:
Inspected By:  Signature: 
Date of Last Inspection: 

I. Foundation

A. Measure foundation levelness and bottom elevations (8 points for EF-1 and 9 points for EF-2). Note: No other tanks require foundation levelness and elevation survey.

EF-1:
37 1425.85 47 1426.00 55 1426.02 283 1426.00
271 1426.14 278 1426.21 293 1426.14 303 1425.98

EF-2:
65 ______ 73 ______ 81 ______ 89 ______ 191 ______
205 ______ 211 ______ 219 ______ 227 ______

B. Has the yearly maximum settlement exceeded 1 inch? (EF-1 and EF-2 only)

EF-1: ______  EF-2: ______
Yes ______ No ______  Yes ______ No ______

C. Check 8 inch annular channel for deflection of more than 2 degrees from its correct position. (EF-1 only)

Deflection: 

Comments:

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

Page 1 of 4
APPENDIX G.

LAW ENGINEERING GEOTECHNICAL REPORT
November 22, 1993

Law Engineering and Environmental Services

Ir. Walter Sonne, P.E.
USPCI, Inc.
515 West Greens Road, Suite 500
Houston, Texas 77067

SUBJECT: REVISED REPORT OF GEOTECHNICAL EXPLORATION
Expansion of Wastewater Treatment Facilities--
Lone Mountain Facility, Major County, Oklahoma
Law Engineering Projects No. 392-01406-01

Law Engineering, Inc. has completed the geotechnical exploration at the subject site. Our
services were provided in accordance with our Revised Proposal for Geotechnical
exploration Services No. HP-8173-93G, dated September 22, 1993; and a Request for
Change Order letter dated October 12, 1993. This report briefly discusses our
understanding of the project information, describes our exploratory procedures and
findings, and presents our recommendations and conclusions. The data obtained during
the field exploration and from the laboratory testing program is presented in the
endixes.

We will be happy to discuss our recommendations with you and would welcome the
opportunity to provide the additional studies or construction testing services necessary
to complete this project. We look forward to serving as your geotechnical engineer on
the remainder of this project and on future projects.

If you have any questions, or if you require additional information, please do not hesitate
to contact us.

Sincerely,

Law Engineering, Inc.

Fernando Pons, E.I.
Project Geotechnical Engineer

(Handwritten signature)

Distribution Copies:
Walter Sonne (2) - USPCI
Larry Marr (1) - USPCI/LAW COMPANIES GROUP, INC.

5500 Gurn Road • Houston, TX 77040
(713) 539-6444 • FAX (713) 462-1653
REVISED REPORT OF GEOTECHNICAL EXPLORATION

EXPANSION OF WASTEWATER TREATMENT FACILITIES

LONE MOUNTAIN FACILITY
MAJOR COUNTY, OKLAHOMA

prepared for
USPCI, Inc.
HOUSTON, TEXAS

LAW ENGINEERING PROJECT NO. 392-1406-01

NOVEMBER 1993
1.0 PURPOSE OF EXPLORATION

The purpose of this exploration was to obtain specific subsurface data at the site and to provide recommendations and opinions for:

- General geotechnical design and construction criteria for the Expansion of Wastewater Final Treatment Facilities (WWFT): Phase I (Expansion of the WWFT Building) and Phase II (Leachate Storage Tanks).
- Site preparation and construction of compacted fills for the WWFT Phase I and the WWFT Phase II.
- Soil stratigraphy at the Wastewater Pretreatment Facilities (WWPT): Phase III tanks.

It should be noted that it was not the purpose of this study to directly assess or to address any environmental conditions at the site, i.e., the presence of contaminants or substances in the soil, rock, or ground water. An additional study should be undertaken if USPCI decides to specifically address environmental conditions.
2.2 LEACHATE STORAGE TANKS

We understand that USPCI plans to construct three tanks within a containment area. The proposed site of construction is south of Cell 4. The proposed tanks will include a 60-foot diameter, 16-feet tall, 300,000 gallon tank; and two 33-foot diameter, 16-feet tall, 100,000 gallon tanks.

The proposed tanks, containing leachate with a specific gravity of 1.3, will be located within a concrete containment structure with walls on the order of 7 feet in height.

2.3 WASTEWATER PRETREATMENT (WWPT) BUILDING

We understand that two existing on-line 300,000 storage tanks structures within the Wastewater Pretreatment (WWPT) Building are experiencing foundation distress. We further understand that these two tanks and the containment area are supported on shallow footings.
4.1.3 Wastewater Pretreatment (WWPT) Building

Exploration borings L-5, L-6, L-6A, and L-7 were drilled in this area. The measured surface elevation of these borings were 1418.35, 1428.62, 1428.48, and 1430.23 feet MSL, respectively, as provided by USPCI. The subsurface conditions for this area are generalized as follows:

### AREA C

#### WASTEWATER PRETREATMENT BUILDING

(Borings L-5, L-6, L-6A, and L-7)

<table>
<thead>
<tr>
<th>STRATUM</th>
<th>DEPTH (ft)</th>
<th>DESCRIPTION</th>
<th>USCS CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I C</td>
<td>0 to 2</td>
<td>FILL* GRAVEL</td>
<td>Unclassified</td>
</tr>
<tr>
<td>II C</td>
<td>1 to 22.5</td>
<td>FILL: Soft to hard, reddish brown with gray, silty CLAY, with gypsum fragments and gravel.</td>
<td>CL</td>
</tr>
<tr>
<td>III C</td>
<td>15.5 to 20.5</td>
<td>Very stiff to hard, reddish brown with gray, silty CLAY, with gypsum fragments and gray silt streaks.</td>
<td>CL</td>
</tr>
<tr>
<td>IV C</td>
<td>18.5 to TOB</td>
<td>Gray silty CLAYSTONE to reddish brown silty CLAYSTONE.</td>
<td>Unclassified</td>
</tr>
</tbody>
</table>

Termination of Boring

Unified Soil Classification System
ith reference to the Soil Stratum Summary, the TEST BORING RECORDS, Soil Profiles and the Laboratory Test Results, our discussion of the soil conditions for Area C is as follows:

Stratum IC consists of GRAVEL to gravelly fill soils encountered in all borings from a existing surface to approximately 2 feet below existing grade.

Stratum IIC consists of fill soils of soft to hard, reddish brown with gray, silty CLAY with psam fragments and gravel. Law personnel performed continuous sampling with Shelby tubes, and utilized on-site extruding techniques to better identify the extent of this fill stratum. These fill soils were encountered from a depth of 1 foot from existing surface 22.5 feet below grade. Organic odor and wet seams were identified in the lower two feet of this formation in Borings L-6 and L-7. Plasticity for this stratum was medium with plasticity index values ranging from 17 to 21. Liquid limit values range from 43 to 45 percent and plastic limit values range from 24 percent to 26 percent. Stratum IIC soils were generally moist with occasional wet seams. Natural moisture contents ranged from 4 to 30 percent, and were from 0 to 2 percent above corresponding PL values.

Pocket penetrometer tests and laboratory unconfined compression tests, on relatively undisturbed samples, indicated shear strength values that varied erratically throughout a fill depth in Boring L-5 (easternmost boring). Shear strength values in Borings L-6 and L-7 were similar throughout the same depths of the fill stratum. There was a similar uniform decrease of shear strength values with depth in Borings L-6 and L-7 to a depth approximately 12.5 feet. (See TEST BORING RECORDS L-6 and L-7).

Stratum IIC consists of very stiff to hard, reddish brown with gray, silty CLAY with psam fragments and gray silt streaks. These soils were encountered in all borings, except Boring L-5, from 15.5 feet from existing surface to a depth of 20.5 feet below grade. One Standard Penetration Test N-value was 40 blows per foot (bpf) at a depth 17 feet in Boring L-6A. Plasticity for this stratum was medium with a plasticity index value of 13, a LL value of 32 percent, and a PL value of 19 percent. One natural moisture intent was 24 percent. Based on this natural moisture content and corresponding terberg Limit tests, the soil was very moist with a moisture content 5 percent above the corresponding PL value. Pocket penetrometer tests resulted in cohesion values ranging from 3,750 psf to an excess of 4,500 psf.
Stratum IV consists of gray silty CLAYSTONE to reddish brown silty CLAYSTONE. This formation was encountered from a depth of 18.5 feet below existing surface to termination depth. Standard Penetration Test N-values resulted in refusal values ranging from 6 inches per 50 blows to 4.5 inches per 50 blows. One natural moisture content was 21 percent. All pocket penetrometer tests resulted in cohesion values in excess of 4,500 psf.

4.2 WATER LEVEL CONDITIONS

Water level observations were made in the boreholes during drilling operations and 24 hours after completion of drilling to investigate the short term ground water levels.

Ground water was identified during our subsurface exploration at depths of 7 feet and 3.5 feet in Borings L-1 and L-2A, respectively (24 hour readings). Ground water was encountered 1.5-feet to 1-foot above the top of the claystone formation in these borings. Borings L-3 and L-4 were dry at the time of drilling and 24 hours thereafter.

Water was identified during drilling at a depth of 24 feet below existing ground surface in Boring L-5. Boring L-6 was dry to termination depth during drilling operations and 24 hours thereafter. Ground water was not identified in Borings L-6A and L-7 during and immediately following drilling operations. Law personnel could not obtain 24 hour water level readings at L-5, L-6A, or L-7, due to caving soils in L-5 at 15.8 feet, and surficial cuttings that obstructing the boreholes at L-6A and L-7.

Fluctuations in rainfall, evaporation, construction activity, surface runoff, and other site specific factors could cause ground water conditions at the time of construction to vary from that observed during our field exploration.
3.4.3 Settlement

Predicted settlements for the drilled piers will be relatively small and are expected to be limited to the elastic compression of the founding claystone formation. The maximum total settlement of any drilled shaft under the anticipated sustained loading conditions is predicted to be less than 0.25 inch.

3.5 CONSTRUCTION CONSIDERATIONS

Once a foundation excavation is completed, the setting of reinforcing steel and placement of concrete should proceed expeditiously to reduce exposure of the bearing stratum and possible disturbance of the material. Should the bottom of an excavation become disturbed due to ponding of water or desiccation, the disturbed soils should be removed before concrete is placed.

I recommend that the geotechnical engineer, or their representative, observe the footing excavations immediately prior to placing concrete. The engineer should compare the soils exposed with those encountered in the soil test borings and document the results. Any significant differences should be brought to the attention of the Owner’s representatives along with appropriate recommendations. The foundation bearing area should be level or suitably benched. It should also be free of loose soil, ponded water and debris prior to the inspection.

3.6 WASTEWATER PRETREATMENT BUILDING STRATIGRAPHY

We understand that two existing on-line 300,000 storage tanks structures within the Wastewater Pretreatment (WWPT) Building are experiencing foundation distress. We further understand that these two tanks and the containment area are supported on shallow footings, which are currently bearing in fill soils consisting of soft to hard, reddish brown with gray, silty CLAY with gypsum fragments and gravel (Stratum IIC).
As discussed previously in this report, the soil stratigraphy encountered in the WWPT area generally consists of silty fill soils to a maximum depth of 22.5 feet underlain by silty clay soils which grade into claystone. Law personnel performed continuous sampling in borings L-5, L-6, and L-7 and utilized Shelby tubes and on-site extruding techniques to better identify the extent of this fill stratum.

The properties of the soils, deemed significant in the evaluation of distress of the structures, are the following:

(a) the moist condition of the silty clay fill soils (Stratum IIc) at the site;
(b) the medium shrink-swell potential of the silty clay matrix within the zone of major seasonal moisture change;
(c) the erratic variation in consistency of the fill soils encountered in Boring L-5;
(d) the similar uniform decrease in shear strength in Borings L-6 and L-7 to a minimum at approximately 13 feet from existing ground level;
(e) the presence of wet seams, organics, and organic odor in the fill soils of Boring L-6 and Boring L-5;
(f) the presence of ground water in Boring L-5 at a depth of 24.5 feet;
FIGURE 3
Boring Location Plan—Phase III
Expansion of Wastewater Treatment Facilities
Lone Mountain Facility
USPCI
Major County, OK
Law Engineering
#392-01405-01
**Description of Material**

**Surf. El.: 1428.48 ft. MSL**

- Very stiff to soft, reddish brown, silty
- Gypsum fragments and gravel

---

**Samples/Test Results**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Plastic Limit (%)</th>
<th>NW (%)</th>
<th>Liquid Limit (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cohesion (100 psi)**

- 5.5'\(\times\) 50
- 6'\(\times\) 50

---

**Test Boring Record**

- **Bores: N10823.08 E9535.23.**
- Borehole advanced truck-mounted drill rig using 3 1/4" I.D. hollow
- Soil classification from 0 to 16 feet is based on cold Caeser

---

**Key Sheet for Explanation of Symbols and Abbreviations Used Above**
SCRIPCIÓN DE MATERIALES


depth

5 - 1423.6
7.0 - 4
99.0

wet seams at 8'-10'

wet seams and organics at 10'-12'

organic odor and 1' to 2' thick wet seam

brown with some gray, silty CLAY with

Boring terminated at 18 feet

TEST BORING RECORD

BORING NUMBER
DATES DRILLED
PROJECT NUMBER
PROJECT
PAGE 1 OF 1

ARES: N10826.85 E9250.31. Borehole advanced
75 truck-mounted drill rig using 3 1/4" I.D. hollow
pipes. Borehole dry 24 hours after drilling.

Arnold Casper

SEE KEY SHEET FOR EXPLANATION OF
SYMBOLS AND ABBREVIATIONS USED ABOVE.
**DESCRIPTION OF MATERIAL**

<table>
<thead>
<tr>
<th>DEPTH (R)</th>
<th>ELEVATION</th>
<th>SAMPLES / TESTS</th>
<th>Plastic Limit(%)</th>
<th>NJA (%)</th>
<th>Liquid Limit(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>1413.4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td>1413.4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.0</td>
<td>1413.4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.0</td>
<td>1413.4</td>
<td>4</td>
<td>96.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.0</td>
<td>1413.4</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.0</td>
<td>1413.4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.0</td>
<td>1413.4</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.0</td>
<td>1413.4</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.0</td>
<td>1413.4</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.0</td>
<td>1413.4</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.0</td>
<td>1413.4</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.0</td>
<td>1413.4</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.0</td>
<td>1413.4</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LEVEL**

- Soft to hard, reddish brown with gray, silty
- with some gravel

**TEST BORING RECORD**

- **BOARING NUMBER:** L-5
- **DATES DRILLED:**
  - Start: October 1, 1993
  - Complete: October 1, 1993
- **PROJECT NUMBER:** 392-01406-01
- **PROJECT:** Expansion of WWT Facilities
- **PAGE:** 1 OF 1
APPENDIX H.

CHEMPROOF, PERMACOAT 3000 DOCUMENTATION
PERMACOAT 3000 Chemical Resistant Flooring

**DESCRIPTION**

PERMACOAT 3000 is a 100% solids floor coating. PERMACOAT 3000 can be utilized as a glaze coat for the PERMATEC high build floors, or as a two coat floor or containment system (30-80 mils). When applied as a two coat floor or containment system, a silica broadcast is used between coats.

The PERMACOAT 3000 consists of two components, resin and hardener, in both the horizontal and vertical formulations. Its application is accomplished with rubber squeegees and short nap paint rollers.

**FUNCTION**

PERMACOAT 3000 is designed as a medium duty (30-80 mils) floor coating and/or secondary containment system where moderate mechanical abuse and chemical exposure are anticipated, so you may use the Chemical Resistant Flooring. PERMACOAT 3000 can be installed over most sound floors, including new or old concrete, steel and wood, providing a cost effective alternative to high-build floor toppings.

**TYPICAL APPLICATIONS**

- Food processing plants
- Chemical processing plants
- Breweries
- Laboratories
- Pulp and paper mills

**TYPICAL PROPERTIES**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solids, by Volume</td>
<td>100%</td>
</tr>
<tr>
<td>Hardness Shore D</td>
<td>82-85</td>
</tr>
<tr>
<td>ASTM D2240</td>
<td></td>
</tr>
<tr>
<td>Taber Abrasion ASTM D4060</td>
<td>Loss/1000 cycles = 25mg</td>
</tr>
<tr>
<td>CS 17 Wheels</td>
<td></td>
</tr>
<tr>
<td>Compressive Strength ASTM C579</td>
<td>14,400 psi</td>
</tr>
<tr>
<td>Flexural Strength ASTM D790</td>
<td>16,500 psi</td>
</tr>
<tr>
<td>Tensile Strength ASTM D307</td>
<td>11,000 psi</td>
</tr>
<tr>
<td>Bond Strength to Concrete ASTM D4541</td>
<td>Exceeds tensile strength of concrete. Failure in concrete</td>
</tr>
</tbody>
</table>

**PACKAGING & COVERAGE**

PERMACOAT 3000 is packaged in one and three gallon units. Each unit consists of premeasured components, Part A (Resin) and Part B (Hardener).

Application thickness may vary from 30 to 80 mils, depending on the expected service conditions. Factors to consider are 1) length of chemical exposure; 2) mechanical abuses; and 3) substrate texture.
PERMACOAT 3000 Chemical Resistant Flooring

- Processing area in general where chemicals are used
- Any area that requires a safe, non-slip floor

FEATURES
PERMACOAT 3000 allows for fast, easy application. It also offers chemical resistance and physical performance much higher than those found in paints and other thin mil coatings.

Note: At 30-50 mils, PERMACOAT 3000 provides excellent chemical resistance for splash and spill exposures. In addition, when applied at 50-80 mils, it can often be recommended for containment service. (For specific recommendations refer to PERMATEC 3000 "Chemical Resistance Guide" and your local distributor.)

OTHER FEATURES INCLUDE:
- Rapid cure resulting in minimal "downtime"
- Odor-free
- Nonskid safety finish optional

MIXING
Prior to application, the PERMACOAT 3000 (Resin, Hardener, and Silica) and the substrate should be between 70 degrees and 95 degrees F.

Premix the Resin (Part A) for 30 seconds using a Jiffler mixer blade attached to a 500-750 RPM drill. Add the Hardener (Part B) only when the batch is ready to be applied. Mix for approx. 90-120 seconds. After mixing pour immediately onto floor.

APPLICATION
Use a rubber squeegee to spread

CURE TIME
The cure time of PERMACOAT 3000 and other resinous systems are very dependent upon the temperature of the substrate. The chart below represents the approximate times for the respective service conditions, following the last coat:

<table>
<thead>
<tr>
<th>Service (hours)</th>
<th>70°F</th>
<th>80°F</th>
<th>90°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot traffic</td>
<td>10</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Light Chemical</td>
<td>14</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Fork Lift</td>
<td>20</td>
<td>16</td>
<td>12</td>
</tr>
</tbody>
</table>

CLEAN-UP
All mixing and application equipment should be cleaned immediately after use. If this is done, soap and water, or biodegradable cleaners can be used. If the material has begun to set, more aggressive solvents may be necessary. Before using solvents, refer to their respective MSDS for handling considerations.

MAINTENANCE
For systems designed for splash and spill exposures, routine washdowns are recommended to reduce the length of chemical exposure. This step is not necessary where the product is recommended for containment service.

WARRANTY
For product warranty see ChemProof Polymers, Inc. "Standard Limited Warranty." If one is not included with this literature contact your local distributor or ChemProof Polymers, Inc. for a copy.

STORAGE & SHELF LIFE
PERMACOAT 3000 should be stored at 50-90°F out of direct sunlight. All containers should

http://www.chemproof.com/permacoat3000.html
the resin over the pre-measured area to be covered. Immediately back roll the PERMACOAT 3000 with a short nap (1/8 inches) wool or mohair roller. At this point several pre-specified readings should be made with a wet mil gauge to assure uniform coverage. After the coating has been back rolled and uniform thickness verified, the surface should be saturated with a silica broadcast.

After the first coat supports foot traffic, the excess silica can be removed. Within 24 hours a second coat of PERMACOAT 3000 should be applied using the same procedure, minus the silica broadcast.

Note: Additional broadcasts and roll coats can be utilized to increase floor thickness.

SAFETY
PERMACOAT 3000 contains blended Epoxies as the resin and blended Amines as the hardener. Protective clothing and gloves are recommended to prevent sensitization to these materials. In case of ingestion or eye contact, contact a physician immediately. MSDS are available for this product upon request.

remain unopened until ready for use. If stored as set out above, PERMACOAT 3000 has a minimum shelf life of one year.

WHERE PERMACOAT 3000 SHOULD NOT BE INSTALLED
PERMACOAT 3000 should not be applied over substrates:

- which are wet during the application
- subject to hydrostatic pressure
- which are unsound
- which are contaminated and cannot be cleaned
- at temperatures below 70°F

(consult ChemProof Polymers)
APPENDIX I.

SECONDARY CONTAINMENT CALCULATIONS
SECONDARY CONTAINMENT CALCULATIONS

DIMENSIONS:

EF Tank Diameter: 60.00-ft.
PCL Tank Diameter: 12.00-ft.
Secondary Containment Height - Hsc 5.50
Secondary Containment Surface Area - Asc 14,589.00-sf
Gross Volume of Secondary Containment 80,239.50-cf

DISPLACEMENT VOLUMES:

EF Tank Base $\pi * D^2 / 4 * Hsc$ 15,551.42-cf
PCL Tank Base $\pi * D^2 / 4 * Hsc$ 622.06-cf

Note: Displacement volumes include only one of the EF tanks. It is assumed that a failed tank would not displace available secondary containment.

Displacement Volume 16,173.47-cf

RAINFALL VOLUMES:

Depth of Rainfall 6.150-in.
Impacted Area 8,934.00-sf
Rainfall Volume 4,578.68-cf

CONTAINMENT CAPACITY AVAILABLE:

CCA = Gross Volume - Displacement Volume - Rainfall Volume

CCA = 59,487-cf

Volume of Largest Tank (EF1) = 47,785.26-cf

Excess Containment Volume = 11,702-cf

Safety Factor = 1.24