

**FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS**  
 (Alternative Form for Single Chamber, Completely Shop -Fabricated Vessels Only)  
 As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

1. Manufactured and certified by SMITHCO Engineering, Inc., 6211 S. 39th W. Ave., Tulsa, OK 74132  
(Name and address of manufacturer)
2. Manufactured for MATRIX ENGINEERING Beaumont, TX 77720  
(Name and address of purchaser)
3. Location of installation A&B Builders - Liberty Colon, Panama  
(Name and address)
4. Type Horiz(Non-Cir) 2004B-3781-A ----- 2004B-3781 9650 2004  
(Horiz. or vert. tank) (Mfr's serial No.) (CRN) (Drawing No.) (Nat'l Bld. No.) (Year built)
5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE.  
 The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 2001  
Year
- to A03  
Addenda (Date)
6. Shell: Tube & Plug Sheets: SA-516 GR-70 N Fr 0.875/Bk 0.875 .1250 Fr 0' 9.8750"/Bk 0' 9.8750" 13' 10.5625"  
Mat'l. (Spec. No., Grade) Nom. Thk. (in.) Corr. Allow. (in.) Diam. I.D. (ft. & in.) Length (overall) (ft. & in.)
7. Seams: Corner Joint ----- 100 1100 60min. -----  
Long. (Welded, Chl., Singl. Lap, Butt) R.T. (Spot or Full) ERT% H.T. Temp. (°F) Time (hr) Girth (Welded, Dbl., Spot, Lap, Butt) R.T. (Spot, Partial or Full) No. of Courses
8. Heads: (a) Mat'l. (a) Covers: SA-516 GR-70 N b) Mat'l. (b) Ends: SA-516 GR-70 N  
(Spec. No., Grade) (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Cortical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	Fr/Bk	0.625/0.625	0.1250	--	--	--	--	--	7.5000/2.5000 x 166.5625	Flat
(b)	Fr/Bk	0.500/0.500	0.1250	--	--	--	--	--	7.5000/2.2500 x 9.3750/9.3750	Flat

If removable, bolts used (describe other fastenings) N/A  
(Mat'l., Spec. No., Gr., Size, No.)

9. MAWP 150 psi at max. temp 255 °F  
 Min. design metal temp. -20 °F at 150 psi. Hydro., pneu., or comb. test pressure 316 N & C psi

10. Nozzles, inspection and safety valve openings:

Purpose (Inlet, Outlet, Drain)	No.	Diameter or Size	Type	Material	Nominal Thickness	Reinforcement Material	How Attached	Location
Inlet	2	8"150/XS	RFWN	SA-105/	0.500	Integral	UW-16.1(a)	Front Head
Outlet	2	3"150/160	RFWN	SA-105/	0.438	Integral	UW-16.1(a)	Back Head
Vent/Drain	2	1.5"150/XX	RFWN	SA-105/	0.400	Integral	UW-16.1(a)	Fr/Bk Head

11. Supports: Skirts No Lugs (No.) Legs 4 Other (Describe) Attached Welded to covers  
(Yes or No) (Where and how)

12. Remarks: Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report:

(Name of part, item number, Mfr's name and identifying stamp)

Impact testing exempt per: UG-20(f) Item: 50-X-107 Service: CONDENSER

Tubes: SA-214 WLD- 358 x 1.00" x .083" x 50.0000'-Straight

Constructed per UW13

**CERTIFICATE OF SHOP COMPLIANCE**

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1. "U" Certificate of Authorization No. 4175 expires February 28th, 2006.  
 Date 05-26-2004 Co. name SMITHCO Engineering, Inc. Signed J. Carter  
(Manufacturer) (Representative)

**CERTIFICATE OF SHOP INSPECTION**

Vessel constructed by SMITHCO Engineering, Inc. at Tulsa, Oklahoma  
 I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State of Province of Oklahoma and employed by Seneca Insurance Company of Texas  
 have inspected the component described in this Manufacturer's Data Report on 5-27 20 04, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or loss of any kind arising from or connected with this inspection.  
 Date 5-27-04 Signed [Signature] Commissions NB7003,A,OK355  
(Authorized Inspector) (Nat'l Board (incl. endorsements), State, Prov. and No.)

# SMITHCO ENGINEERING INC.

P.O. Box 571330  
Tulsa, OK 74157-1330  
Phone (918) 446-4406 Fax (918) 445-2857

**Ship To:**

A&B Builders - Liberty  
1100 FM 3361  
Liberty, TX 77575  
ATTN: Nick Fountain

**Date:** 5/14/2004 *JKF***Job #:** 2004B378**Cust. PO:** 13356**Shipped Via:** TRANSIT  
SERVICES  
**Rev 0**

Item #	Qty	Description	Weight(lbs)
	1	SMITHCO Model 1 F50-140-3 Air Cooled Heat Exchanger	45441

UNIT DESCRIPTION: Size(ft)(Length x Width x Height) Weight(lbs)  
51.5 x 14.0 x 8.2 37000 each

**LOOSE STRUCTURE:**

Note: Stubbed Columns

111	3	BOTTOM CENTER COLUMN { W 6.00 x 15 x 58}	272
112	1	BOTTOM CENTER COLUMN W/G.L. { W 6.00 x 15 x 58}	90
131	16	END COLUMN BRACE { L 2.50 x 0.25 x 96.25}	540
136	24	SIDE COLUMN BRACE { L 2.50 x 0.25 x 96.25}	810

**WALKWAYS:****INLET END:**

1273

1311	1	BOTTOM LEFT COLUMN { W 6.00 x 15 x 58}	87
1316	1	BOTTOM RIGHT COLUMN { W 6.00 x 15 x 58}	87
1326	2	WALKWAY SUPPORT { W 6.00 x 15 x 52}	130
1331	2	WALKWAY COLUMN BRACE { L 3.00 x 0.25 x 70}	56
1336	1	WALKWAY FLOOR {FLR 31 x 5.00 x 174}	211
1338	1	GRATING { 1 X 30 X 174}	266
1341	1	WALKWAY OUTSIDE RAIL { L 42 x 2.50 x 174}	1226
1345	1	WALKWAY OUTSIDE RAIL { L 42 x 2.50 x 140}	986
1347	1	WALKWAY OUTSIDE RAIL { L 42 x 2.50 x 8}	56
1351	2	WALKWAY END TOP RAIL { L 2.00 x 2.00 x 37}	30
1352	2	WALKWAY END MID RAIL { L 2.00 x 2.00 x 37}	30
1354	2	WALKWAY END TOE PLATE { PL 0.18 x 5.00 x 37}	9.37
1361	1	LADDER { BAR 2.50 x 0.375 x 135}	128

1376 1 FABENCO SAFETY GATE 37

RETURN END:

1273

2311	1	BOTTOM LEFT COLUMN	{ W 6.00 x 15 x 58}	87
2316	1	BOTTOM RIGHT COLUMN	{ W 6.00 x 15 x 58}	87
2326	2	WALKWAY SUPPORT	{ W 6.00 x 15 x 52}	130
2331	2	WALKWAY COLUMN BRACE	{ L 3.00 x 0.25 x 70}	56
2336	1	WALKWAY FLOOR	{FLR 31 x 5.00 x 174}	211
2338	1	GRATING	{ 1 X 30 X 174}	266
2341	1	WALKWAY OUTSIDE RAIL	{ L 42 x 2.50 x 174}	1226
2345	1	WALKWAY OUTSIDE RAIL	{ L 42 x 2.50 x 140}	986
2347	1	WALKWAY OUTSIDE RAIL	{ L 42 x 2.50 x 8}	56
2351	2	WALKWAY END TOP RAIL	{ L 2.50 x 2.50 x 37}	124
2352	2	WALKWAY END MID RAIL	{ L 2.50 x 0.25 x 37}	12
2354	2	WALKWAY END TOE PLATE	{ PL 0.18 x 5.00 x 37}	9.37
2361	1	LADDER	{ BAR 2.50 x 0.375 x 135}	128
2376	1	FABENCO SAFETY GATE		37

20B378 (BOLTS)

LOOSE BOLTS:

130 BOLT,NUT,LOCK&(2)FLATS 5/8" X 2" SA-325 GALV.  
125 BOLT,NUT,LOCK&(2)FLATS 3/4" X 2 1/2" SA-325 GALV.  
30 STEEL GRATING SADDLE CLIPS W/#10 SELF-DRILLING SCREWS

VIBRATION TRANSMITTERS:

3 METRIX ST5484E  
3 1/4" NPT COUPLINGS

**SMITHCO Engineering Inc.**  
 P.O. Box 571330 Tulsa, OK 74157  
 Ph. (918) 446-4406 FAX (918) 445-2857

**AIR COOLED EXCHANGER  
 SPECIFICATION SHEET**

Date 16-APR-2004	REV.2
Proposal/Job No. 2004B-378-01	
Reference 13356	
Item No. 50-X-107	

1	Customer	MATRIX ENGINEERING			
2	Plant Location	Colon, Panama			
3	Service	Condenser			
4	Model	1 F50-140-3	Type	FORCED	
5	Surface per Unit-Finned Tube	99,290	Ft <sup>2</sup>	Bare Tubes	4,690 Ft <sup>2</sup>
6	Heat Exchanged	17,120,000	BTU/Hr	MTD (Eff.)	39.1 (Counter Flow)PF
7	Transfer Rate-Finned Tube	4.41	Bare Tube, Service	93.34	BTU/Hr. Ft <sup>2</sup> °F

**PERFORMANCE DATA-TUBE SIDE**

9	Fluid Name	DRY ETHANOL		Lethal Service	Yes	No <input checked="" type="checkbox"/>	IN	OUT
10	Total Fluid Entering	Lb/Hr	49,990	Density	Lb/Ft <sup>3</sup>		.244	46.8
11		IN	OUT	Specific Heat (Liq/Vap)	BTU/Lb°F		.877 / .398	.816 / .398
12	Temperature	°F	205.0	Cond. avg (Liq/Vap)	BTU/HrFt°F		.0800/	.0107
13	Liquid	Lb/Hr	11,870	Pour/Freeze Point	°F			
14	Vapor	Lb/Hr (MW)	38,120 (46.0)	Bubble Point	°F			
15	Nocond	Lb/Hr (MW)		Latent Heat	BTU/Lb			
16	Steam	Lb/Hr		Pressure	Psia		28.70	
17	Water	Lb/Hr		Pressure Drop Allow/Calc	Psi		2.00 / 0.77	
18	Viscosity (Liq/Vap)	Cp	.6200 / .0076	Fouling resist, Inside	ft <sup>2</sup> hr °F/BTU		0.00200	

**PERFORMANCE DATA-AIR SIDE**

20	Air Quantity	SCFM	414,800	Lb/Hr	1,866,000	Altitude	Ft	500
21	Air Quantity/Fan	ACFM	147,100	Temperature In	°F		95.0	
22				Temperature Out	°F		133.0	
23								

**DESIGN - MATERIAL - CONSTRUCTION**

25	Design Pressure	150 (SEE NOTE 2)	Psig	Test Pressure	316	Psig	Design Temperature	255 / MDMT -20 °F
26	<b>TUBE BUNDLE</b>	<b>HEADER, Type</b> PLUG BOX				<b>TUBE Material</b> SA-214 WLD		
27	Size	14.0 x 50.0		Material	SA-516 GR-70			
28	No. 1	No. Tube Rows	5	No. Passes	1	Slope	0.0000 In/Ft	OD 1.000 In Min. Thick 0.0830 In
29	Bays	1	In Parallel	In Series	Plug	A1051820		No./Bundle 358 Length 50.0 Ft
30	Bundles	1	In Parallel	In Series	Gasket	CS1813		Pitch 2.3125 InΔ
31	Pass Arrangement (Top to Bottom)	Corrosion Allowance 0.1250 In				FIN Type L-TENSION		
32	Rows / Pass	5 / 1		Size In Nozzle (2)	8.00 SCH XS SA-106B In	Material ALUM		
33				Size Out Nozzle (2)	3.00 SCH 160 SA-106B In	OD 2.250 In	Stock Thick 0.016 In	
34	Steam Coil	NO		Rating & Facing	150 -RF SA-105	No/In 10	Support Chan. / Staple	
35	Hailscreens	NO		Vent (1) FLG 1.50	Drain (1) FLG 1.50	Code-ASME VIII, Div 1	YES	Stamp NATL
36	Louvers	NONE (0)		TI	PI	Radiograph	YES API-661	Heat Treat YES
37	Frame Finish	WMSB 2 Coat Brand Name Paint		Header Finish	WMSB 2 Coat Brand Name Paint		Tube Hole Grooving YES	

**MECHANICAL EQUIPMENT**

39	FAN Mfg & Model	MOORE 49 5000	DRIVER Type	SIEMENS		SPEED REDUCER Type COG		
40	No./Bay	3	RPM	264	S.F.	1.15	Insul/TR CLASS F / B	14M - 55 SPROCKET 33.7/5.1
41	Dia.	12.0 Ft.	No. Blades	6	No./Bay	3	Frame 284T HP 25.0	No./Bay 3 Test Run Fan
42	Pitch	ADJUSTABLE	Angle°	11.	RPM (3)	1750	Duty CHEM	HP Rating 50.0 Ratio 6.62
43	Matl, Blade	ALUMINUM	Hub	CASTALUM	Enclosure	TEFC	V & D None	Support: SUSPENDED FROM STRUCTURE
44	HP/Fan, Des.	21.8	DBA	86.	V/P/C	480/3/60	Space Heater NO	Vibration Transmitter: SEE NOTE 1

**STRUCTURE**

**WALKWAYS**

45	Mounting	28 FEET ABOVE GRADE		Inlet Header	in. 30 GRATING
46	Windload - PSF	36.3	Seismic	2	Outlet/Return in. 30 GRATING
47	Finish	HTC 1 Coat Galvanize		Drive Access	in. None

**NOTES**

48	Coil Volume (ft <sup>3</sup> ):	77.						
49	Assembled Drive, Structure & Bundles (Within Shipping Restrictions)							
50	(1) REQUIRES: VIBRATION TRANSMITTER METRIX MODEL ST-5484E-121-020-00 (SHIPPED LOOSE)							
51	(2) MAWP UNCORRODED @ DESIGN T = 243 PSIG, LIMITING COMPONENT FLANGE							
52	MAWP CORRODED @ DESIGN T = 190 PSIG, LIMITING COMPONENT BACK HEADER							
53								
54								
55	Plot Area	14.0 x 50.0 ft	Weight Bundle	29,900	Lbs	Total Shipping	52,260	Lbs

Qty	Description	Approximate	P.O. No.
Ship reqd		Size(ft) (L x W x H) Weight (ea)	
1	SMITHCO Model 1 F50-140-3 Air Cooled Heat Exchanger		
2	**End panel		
2	**End center panel		
6	**Side panel		
6	**Fan deck panel		
28	**Panel stiffener		
2	**End backup angle		
6	**Half fan deck		
4	**Corner column		
4	**Side center column		
16	**Flat brace clip		
12	**Half fan ring		
3	**Bottom drive guard		
24	**Fan guard clip		
12	**Deck air seal		
3	**Drive frame		
3	**Motor mount		
3	**Drive adjustment rod		
6	**Half fan guard		
6	**Center fan guard		
3	** 144 INCH 6 BLADE RH ADJUSTABLE PITCH MODEL 495000	6.0 x 6.0 x 3.0	360. J1960
6	** 2.4375 SCM FLANGE BEARINGS	3.0 x 3.0 x 1.5	159. J1960
3	** 3360-14M - 55 HTD BELTS	3.0 x 3.0 x 1.5	159.
3	** P 29-14M - 55 HTD SPROCKET /1.8750 BORE .5000X.2500	3.0 x 3.0 x 1.5	159.
3	** P192-14M - 55 HTD SPROCKET /2.4375 BORE .6250X.3125	3.0 x 3.0 x 1.5	159.
3	** 2.4375 X 55.0000 SHAFT WITH 0.6250 X 0.3125 KEYWA	4.0 x 0.5 x 0.5	63. J1960
3	** 25.0 HP ELECTRIC MOTOR FRAME 284T CHEM DUTY 1750 RPM TE	0.0 x 0.0 x 0.0	380. J1960
3	** SPECIAL NAMEPLATES "SUITABLE FOR 480 VOLT OPERATION"ELEV 500.	0.0 x 0.0 x 0.0	380.
3	** METRIX #ST-5484E-121-020-00 TRANSMITTER	0.5 x 0.5 x 0.5	0. J1960
3	** 1/4" -3000# HALF COUPLING SA-105	0.0 x 0.0 x 0.0	0. J2014
	Total mechanical		17361.
1	**Pintube Bundle Item: 50-X-107 Service: CONDENSER	51.0 x 14.0 x 1.6	29900.
	Total bundle		29900.

\*\* - Shipped assembled

Size(ft) (L x W x H) Weight  
51.5 x 14.0 x 12.3 47261.

# Timbers : 4 Timber Size : 10 X 10 X 170

Use 6 X 6 vertical shipping timbers at edge of truck bed to bottom of plenum panels

Export preparation:

Shipping instructions:

Contact: Nick Fountain  
Telephone: 936-334-0704 x23  
Notification time: 5 Days

Ship to: A&B Builders - Liberty  
1100 FM 3361  
Liberty, TX 77575

P.O.No.: 13356  
Tag : 50-X-107  
Trucker: TRANSIT SERVICES  
PREPAID!

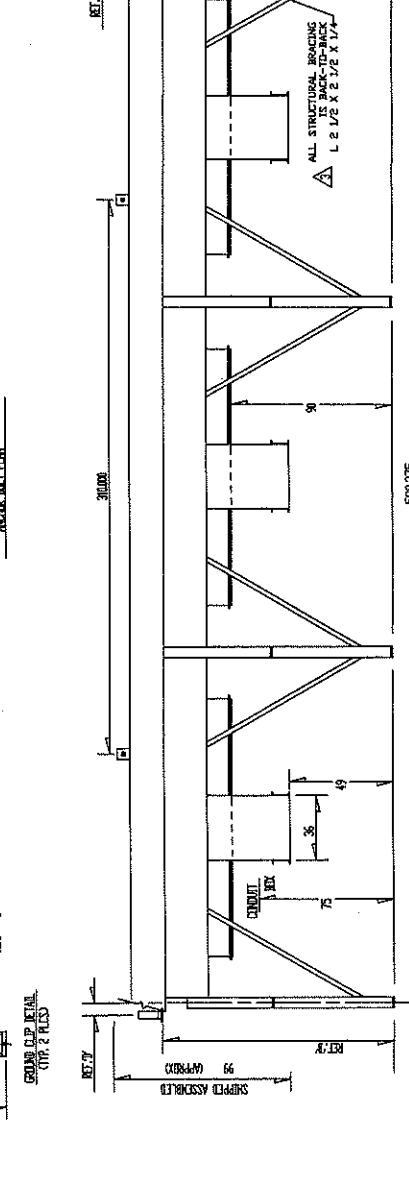
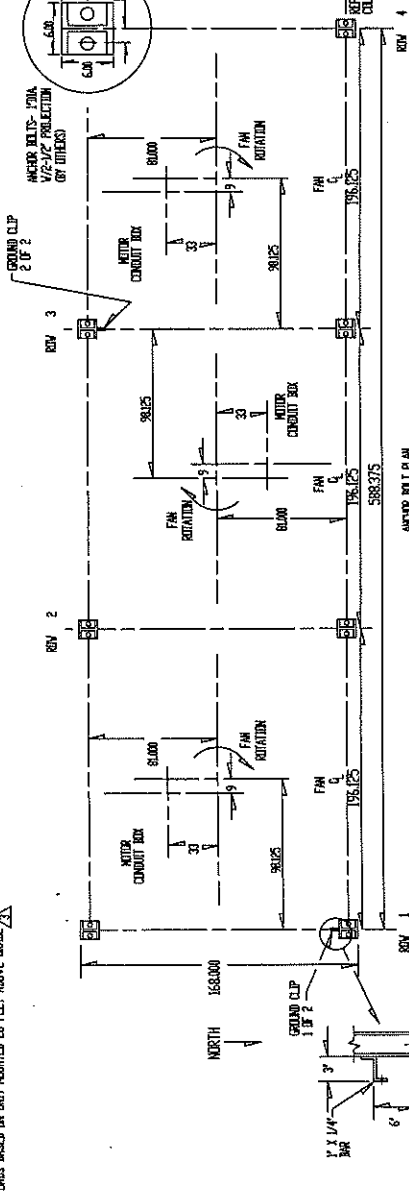
Assembly list

Date this shipment 05-14-2004

Job No. 2004B378

SHOP RUN IN TEST

WGT	454H	WGT	843	WGT	100	PLATE	2	SNOW	SEIS	SEIS	WIND	WIND	WIND	WIND	WIND	TOTAL
QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY	QTY
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4



NOTES:  
 1. DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE IN INCHES.  
 2. ALL DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED.  
 3. COILER REQUIREMENTS FOR METROX SYSTEM VIBRATION TRANSMITTERS TO BE SENT AS SHOP LOOSE ITEMS TO BE INSTALLED IN THE FIELD.  
 4. MOTORS ARE TO BE PARAGON WITH IEE-84 STANDARDS.  
 5. ALL STRUCTURAL STEEL TO BE A36.  
 6. BRACKET TO HAVE RIGIDEN FURLE.

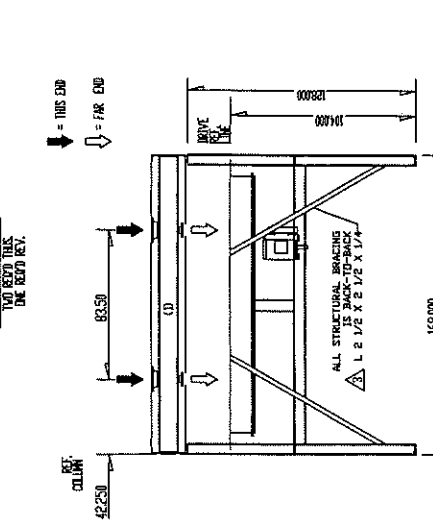
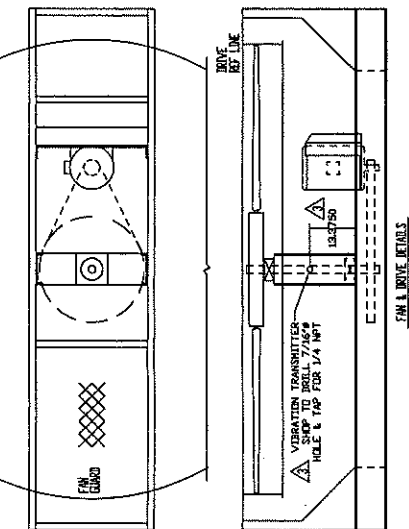
REV 5-REV. FRAME COATING JH 5/19/04  
 REV 4- ADDED INDICATED INFORMATION PER CUSTOMER JR/4/16/04  
 REV 3- ADDED & REVISED INFORMATION AS A RESULT OF STRUCTURAL CALCULATIONS & ISSUED FINAL CERTIFIED JR/3/30/04  
 REV 2-REVISED & RESENT FOR APPROVAL RLB 3/23/04  
 REV 1-REVISED HEIGHT PER CUSTOMER & RESENT FOR APPROVAL RLB 3/9/04  
 REV 0-SENT FOR APPROVAL RLB 2/13/04

ITEM	SERVICE	QUANTITY	REFERENCE DIMENSIONS	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND
2-2-17	CONDENSER	(2) 1800 - 150 # R.F. S&H VS	1800	150	148.65	1800	150	148.65	1800	150	148.65	1800	150	148.65	1800	150

**SMITHCO**  
AIR COOLED DIVISION  
TULSA, OKLAHOMA

DATE: 5/17/04  
 REV: 5  
 JOB: 2004B 378 -A

PPING EQUIPMENT OUTLINE & ANCHOR BOLT PLAN  
 LABEL: 1 P. 50 - 10 - 3 QUANTITY: 1



REV 5-REV. FRAME COATING JH 5/19/04  
 REV 4- ADDED INDICATED INFORMATION PER CUSTOMER JR/4/16/04  
 REV 3- ADDED & REVISED INFORMATION AS A RESULT OF STRUCTURAL CALCULATIONS & ISSUED FINAL CERTIFIED JR/3/30/04  
 REV 2-REVISED & RESENT FOR APPROVAL RLB 3/23/04  
 REV 1-REVISED HEIGHT PER CUSTOMER & RESENT FOR APPROVAL RLB 3/9/04  
 REV 0-SENT FOR APPROVAL RLB 2/13/04

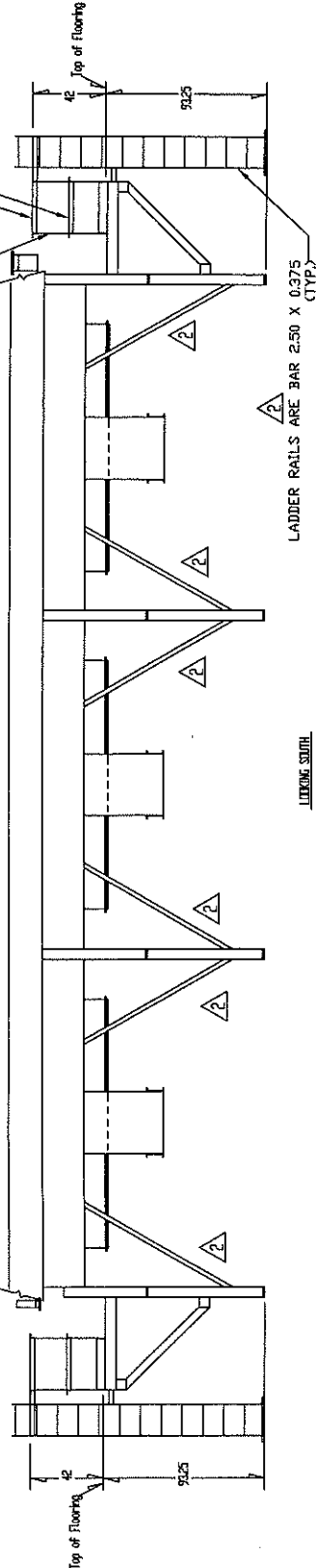
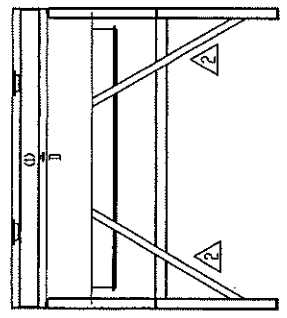
ITEM	SERVICE	QUANTITY	REFERENCE DIMENSIONS	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND	WIND
2-2-17	CONDENSER	(2) 1800 - 150 # R.F. S&H VS	1800	150	148.65	1800	150	148.65	1800	150	148.65	1800	150	148.65	1800	150

**SMITHCO**  
AIR COOLED DIVISION  
TULSA, OKLAHOMA

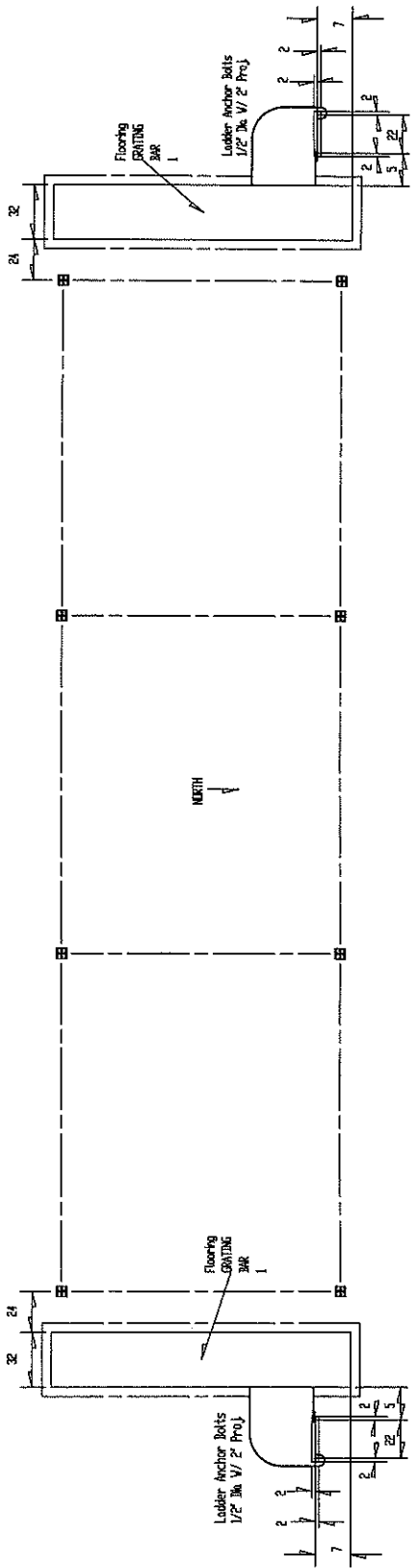
DATE: 5/17/04  
 REV: 5  
 JOB: 2004B 378 -A

PPING EQUIPMENT OUTLINE & ANCHOR BOLT PLAN  
 LABEL: 1 P. 50 - 10 - 3 QUANTITY: 1

POSTS ARE L 2.50 X 2.50 X 0.25 (TYP.)



LIVING STAIR



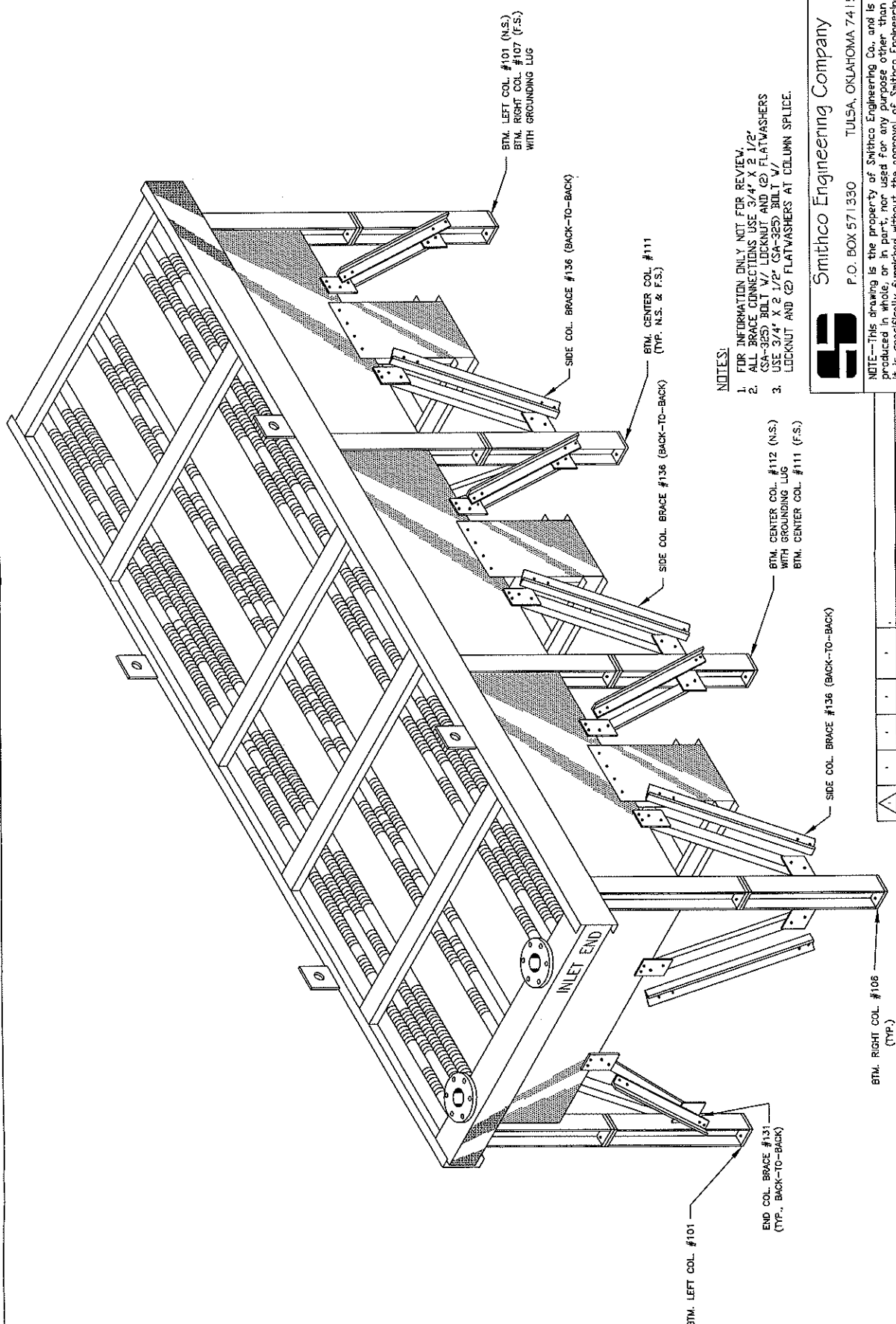
REV 2-REV. FRAME COATING 4/5/09/04  
 REV 2-REPLACED BRACE CLIPS PER STRUCTURAL CALCULATIONS, ADDED POST & RAIBORAL INFORMATION & ISSUED FINAL CERTIFIED 4/23/04  
 REV 4-REVISED PER CUSTOMER & RESUBMITTED FOR APPROVAL 4/3/04  
 REV 4-SENT FOR APPROVAL 4/3/04

VALVEWAY OUTLINE & ANCHOR BOLT PLAN MODEL 1 P-50-140-3 QUANTITY 1	
DWN	HP/RLB CDG
REV 3	DATE 3-3-2004
CERTIFIED BY: <i>[Signature]</i> DATE 5/19/04	

TELEGRAPHS -	ALL DIMENSIONS IN INCHES
MECHANICAL EQUIPMENT	± 1/8" PER 10' ± 0"
NOZZLE	± 1/8"
STRUCTURAL -	HAND TOOL CLEAN
WITH 1 COAT GALVANIZ	
FRAME -	HAND TOOL CLEAN
WITH 1 COAT GALVANIZ	
HEADERS -	3 COAT GALVANIZ
WITH 1 COAT GALVANIZ	
CUSTOMER	WATCO ENGINEERING
LOCATION	COLON PANAMA
REFERENCE	13356







- NOTES:**
1. FOR INFORMATION ONLY NOT FOR REVIEW.
  2. ALL BRACE CONNECTIONS USE 3/4" X 2 1/2" (SA-325) BOLT W/ LOCKNUT AND (2) FLATWASHERS USE 3/4" X 2 1/2" (SA-325) BOLT W/ LOCKNUT AND (2) FLATWASHERS AT COLUMN SPLICE.
  3. BTM. CENTER COL. #112 (N.S.) WITH GROUNDING LUG; BTM. CENTER COL. #111 (F.S.);

**Smithco Engineering Company**  
 P.O. BOX 571330 TULSA, OKLAHOMA 74157-1330

NOTE--This drawing is the property of Smithco Engineering Co., and is not to be produced in whole, or in part, nor used for any purpose other than that for which it is specifically furnished without the approval of Smithco Engineering Co.

TITLE		SCALE	JOB. NO.	DWG. NO.	REV.
TRIPLE FAN FIELD ERECTION		NONE	04B-378	378B-FEI	0
DRAWN	DATE	APP. DATE	JOB. NO.	DWG. NO.	REV.
J.R.	4.10.04	J.R.	04B-378	378B-FEI	0

REV.	DWG.	CHK.	APP.	DATE	DESCRIPTION

REVISIONS

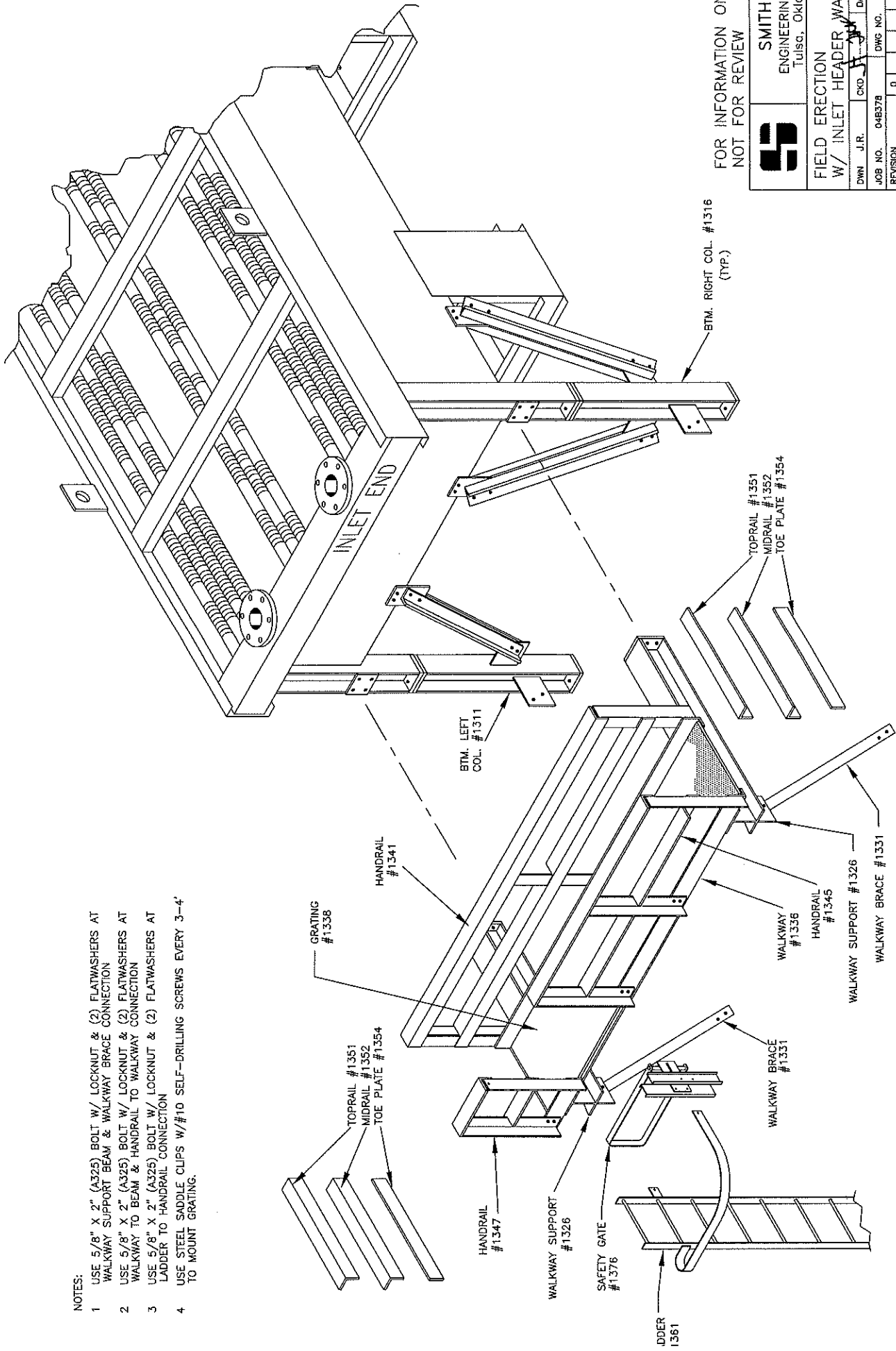
FOR INFORMATION ONLY  
NOT FOR REVIEW



SMITHCO  
ENGINEERING, INC.  
Tulsa, Oklahoma

FIELD ERECTION  
W/ INLET HEADER WALKWAY

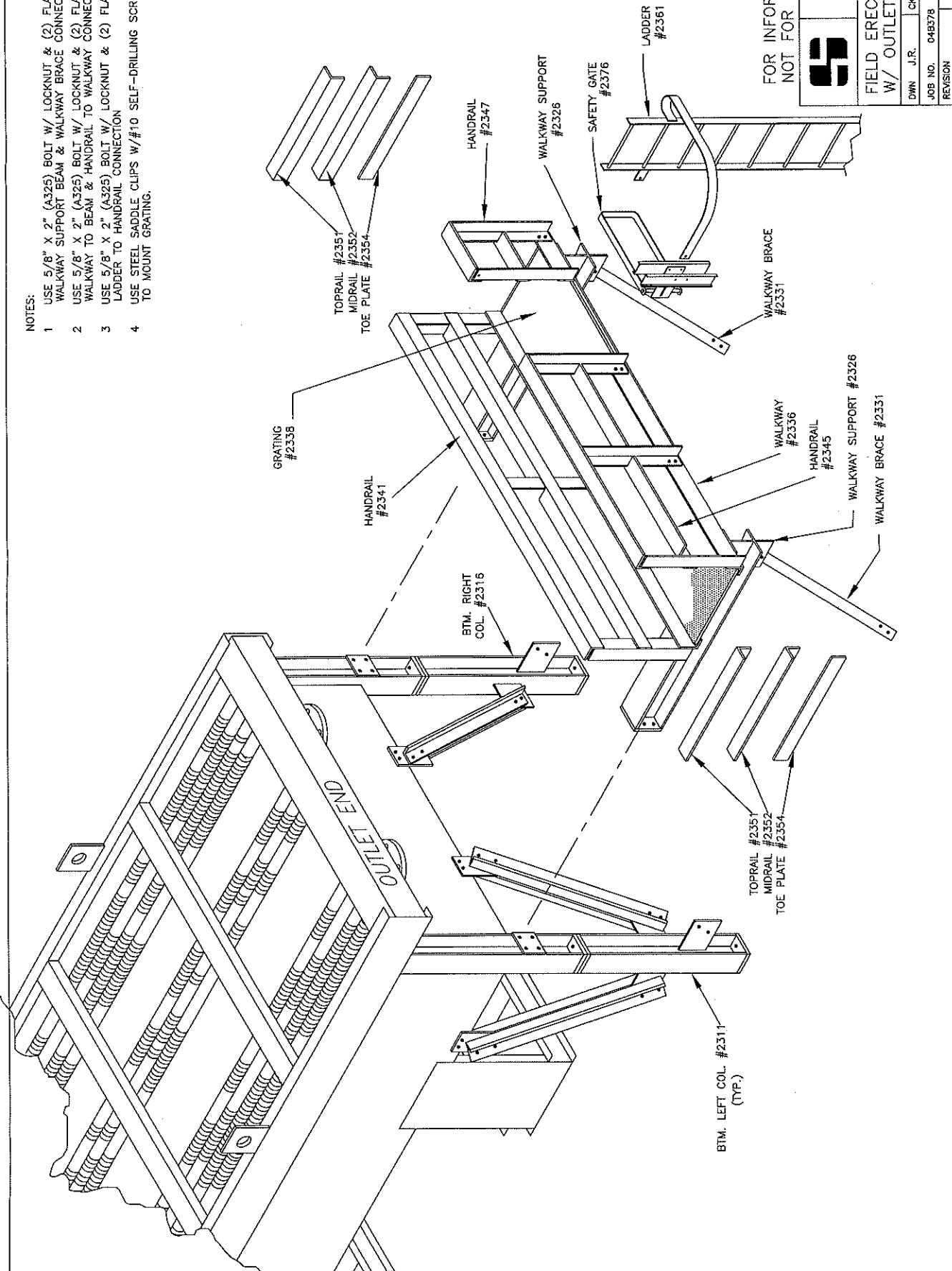
DWN	J.R.	CND	DATE	4.11.04
JOB NO.	046378	DWG NO.	378B-FEZ	
REVISION	0			



- NOTES:
- 1 USE 5/8" X 2" (A325) BOLT W/ LOCKNUT & (2) FLATWASHERS AT WALKWAY SUPPORT BEAM & WALKWAY BRACE CONNECTION
  - 2 USE 5/8" X 2" (A325) BOLT W/ LOCKNUT & (2) FLATWASHERS AT WALKWAY TO BEAM & HANDRAIL TO WALKWAY CONNECTION
  - 3 USE 5/8" X 2" (A325) BOLT W/ LOCKNUT & (2) FLATWASHERS AT LADDER TO HANDRAIL CONNECTION
  - 4 USE STEEL SADDLE CLIPS W/ #10 SELF-DRILLING SCREWS EVERY 3'-4' TO MOUNT GRATING.

NOTES:

- 1 USE 5/8" X 2" (A325) BOLT W/ LOCKNUT & (2) FLATWASHERS AT WALKWAY SUPPORT BEAM & WALKWAY BRACE CONNECTION
- 2 USE 5/8" X 2" (A325) BOLT W/ LOCKNUT & (2) FLATWASHERS AT WALKWAY TO BEAM & HANDRAIL TO WALKWAY CONNECTION
- 3 USE 5/8" X 2" (A325) BOLT W/ LOCKNUT & (2) FLATWASHERS AT LADDER TO HANDRAIL CONNECTION
- 4 USE STEEL SADDLE CLIPS W/ #10 SELF-DRILLING SCREWS EVERY 3'-4' TO MOUNT GRATING.



FOR INFORMATION ONLY  
NOT FOR REVIEW



SMITHCO  
ENGINEERING, INC.  
Tulsa, Oklahoma

FIELD ERECTION W/ OUTLET HEADER WALKWAY	
DWN J.R.	CHK J.S.P.
DATE 4.11.04	DWG NO. 3789-FE3
JOB NO. 048378	REVISION 0

Smithco Engineering Incorporated  
P.O. Box 571330  
Tulsa, Oklahoma 74157-1330  
(918) 446-4406

Customer: MATRIX ENGINEERING  
Customer P.O. No.: 13356  
Item no.: 50-X-107  
Service :Condenser

Date: 04-16-2004

\*\* CORRODED @ DESIGN TEMP \*\*



Approved: JMF

Header Design Calculations  
Per ASME Code Section VIII Division 1 2001 /A02 Appendix 13  
Fig. 13-2(A) Vessels of Rectangular Cross Section  
Sketch (1)

Job No.:2004B3781 (Inlet Header)

Short side = Cover Plate

Design Press. : 150. PSI

Max Allowable Working Press.(P): 190. PSI

Design Temp.: 255. Deg. F / -20. Deg. F MDMT

Material: sa-516 gr-70 Normalized

Allow. Membrane Stress: 20000. PSI

Allow. Bending and Total Stress: 30000. PSI (1.5 x Membrane Stress)

Corrosion Allowance: 0.1250 Inch

Long side Sheet Thickness: 0.8750 Inch

Long side Sheet Thickness Less Corr. Allow.= t2 = 0.7500 Inch

Short Side Thickness: 0.6250 Inch

Short Side Thickness Less Corr. Allow. = t1 = 0.5000 Inch

H (corroded) = 8.0000 In

h (corroded) = 9.8750 In

Horz. Tube Pitch (Pitch): 2.3125 In

D (Hole diameter): 1.0790

E= 1.0(see 13-4-g-1)

Bending & Membrane eff, eb = em = (Pitch - D)/Pitch = 0.5334

Short side eb = em = 1.0000

Long side eb = em = 0.5334

c = (c1 or c2)

c1 = t1/2 = 0.250000 In

c2 = t2/2 = 0.375000 In

a = H/h = 0.810127

I1 = t1<sup>3</sup>/12 = 0.010417 In\*\*4

I2 = t2<sup>3</sup>/12 = 0.035156 In\*\*4

K = (I2/I1) a = 2.734177

Lv = Vessel length = 166.5625 Inches

Job No.: 2004B3781 (Inlet Header)

(1) Membrane Stress  
 Short-Side Plates  

$$S_m = Ph / (2t_{1em}) = 1876. \text{ PSI} \quad (1)$$

Long-Side Plates  

$$S_m = PH / (2t_{2em}) = 1900. \text{ PSI} \quad (2)$$

(2) Bending Stress  
 Short-Side Plates  

$$(S_b)_N = \pm \frac{Phc_1}{12I_{1eb}} [1.5H^2 - h^2 \left( \frac{1+a^2K}{1+K} \right)] = -8749. \text{ PSI} \quad (3)$$

$$(S_b)_Q = - \frac{Ph^2c_1}{12I_{1E}} \left( \frac{1+a^2K}{1+K} \right) = 27731. \text{ PSI} \quad (4)$$

Long-Side Plates  

$$(S_b)_M = - \frac{Ph^2c_2}{12I_{2eb}} \left[ 1.5 - \left( \frac{1+a^2K}{1+K} \right) \right] = -23208. \text{ PSI} \quad (5)$$

$$(S_b)_Q = - \frac{Ph^2c_2}{12I_{2E}} \left( \frac{1+a^2k}{1+K} \right) = 12325. \text{ PSI} \quad (6)$$

(3) Total Stress  
 Short-Side Plates  

$$(ST)_N = EQ(1) + EQ(3) = 10626. \text{ PSI} \quad (7)$$
  

$$(ST)_Q = EQ(1) + EQ(4) = 29607. \text{ PSI} \quad (8)$$
  
 Long-Side Plates  

$$(ST)_M = EQ(2) + EQ(5) = 25108. \text{ PSI} \quad (9)$$
  

$$(ST)_Q = EQ(2) + EQ(6) = 14224. \text{ PSI} \quad (10)$$

(4) End Plate Stress UG 34, EQ. (3) & (4)  
 d (Corroded) = 8.0000  
 D (Corroded) = 9.8750  
 c = 0.2 (see 13-4(F))  
 End Plate Thickness: 0.5000 Inch  
 End Plate Thickness Less Corr. Allow. = T4 = 0.3750 Inch  

$$Z = 3.4 - 2.4 \left( \frac{d}{D} \right) = 1.4557 \quad \text{Max } 2.5$$

$$S = \frac{cd^2ZP}{T4^2} = 25175. \text{ PSI}$$

Header Design Calculations  
Per ASME Code Section VIII Division 1 2001 /A02 Appendix 13  
Fig. 13-2(A) Vessels of Rectangular Cross Section  
Sketch (1)

Job No.:2004B3781 (Outlet header)

Short side = Cover Plate

Design Press. : 150. PSI

Max Allowable Working Press.(P): 190. PSI

Design Temp.: 255. Deg. F / -20. Deg. F MDMT

Material: sa-516 gr-70 Normalized

Allow. Membrane Stress: 20000. PSI

Allow. Bending and Total Stress: 30000. PSI (1.5 x Membrane Stress)

Corrosion Allowance: 0.1250 Inch

Long side Sheet Thickness: 0.8750 Inch

Long side Sheet Thickness Less Corr. Allow.= t2 = 0.7500 Inch

Short Side Thickness: 0.6250 Inch

Short Side Thickness Less Corr. Allow. = t1 = 0.5000 Inch

H (corroded) = 2.7500 In

h (corroded) = 9.8750 In

Horz. Tube Pitch (Pitch): 2.3125 In

D (Hole diameter): 1.0790

E= 1.0(see 13-4-g-1)

Bending & Membrane eff, eb = em = (Pitch - D)/Pitch = 0.5334

Short side eb = em = 1.0000

Long side eb = em = 0.5334

c = (c1 or c2)

c1 = t1/2 = 0.250000 In

c2 = t2/2 = 0.375000 In

a = H/h = 0.278481

I1 = t1<sup>3</sup>/12 = 0.010417 In\*\*4

I2 = t2<sup>3</sup>/12 = 0.035156 In\*\*4

K = (I2/I1) a = 0.939873

Lv = Vessel length = 166.5625 Inches

2

Job No.: 2004B3781 (Outlet Header)

(1) Membrane Stress

Short-Side Plates

$$S_m = Ph / (2t_{1em}) = 1876. \text{ PSI} \quad (1)$$

Long-Side Plates

$$S_m = PH / (2t_{2em}) = 653. \text{ PSI} \quad (2)$$

(2) Bending Stress

Short-Side Plates

$$(S_b)_N = \pm \frac{Pc_1}{12I_{1eb}} [1.5H^2 - h^2 \left( \frac{1+a^2K}{1+K} \right)] = 16184. \text{ PSI} \quad (3)$$

$$(S_b)_Q = - \frac{Ph^2c_1}{12I_{1E}} \left( \frac{1+a^2K}{1+K} \right) = 20495. \text{ PSI} \quad (4)$$

Long-Side Plates

$$(S_b)_M = - \frac{Ph^2c_2}{12I_{2eb}} \left[ 1.5 - \left( \frac{1+a^2K}{1+K} \right) \right] = -29237. \text{ PSI} \quad (5)$$

$$(S_b)_Q = - \frac{Ph^2c_2}{12I_{2E}} \left( \frac{1+a^2k}{1+K} \right) = 9109. \text{ PSI} \quad (6)$$

(3) Total Stress

Short-Side Plates

$$(ST)_N = EQ(1) + EQ(3) = 18060. \text{ PSI} \quad (7)$$

$$(ST)_Q = EQ(1) + EQ(4) = 22371. \text{ PSI} \quad (8)$$

Long-Side Plates

$$(ST)_M = EQ(2) + EQ(5) = 29890. \text{ PSI} \quad (9)$$

$$(ST)_Q = EQ(2) + EQ(6) = 9762. \text{ PSI} \quad (10)$$

(4) End Plate Stress UG 34, EQ. (3) & (4)

d (Corroded) = 2.7500

D (Corroded) = 9.8750

c = 0.2 (see 13-4(F))

End Plate Thickness: 0.5000 Inch

End Plate Thickness Less Corr. Allow. = T4 = 0.3750 Inch

$$Z = 3.4 - 2.4 \left( -\frac{d}{D} \right) = 2.5000 \quad \text{Max } 2.5$$

$$S = \frac{cd^2ZP}{T4^2} = 5109. \text{ PSI}$$

Job No.:2004B3781 Tube wall and Nozzle Neck Calculations

Tube Wall:

Design Pressure (P): 190. PSI  
Tube OD (D): 1.00 In.  
Tube stress (S): 11400. PSI

Minimum wall =  $P * D/2 / (.4*P + S) = 0.0083$  In.  
Actual wall: 0.0830 In.

Nozzle neck:

Inlet nozzle:

Design Pressure (P): 190. PSI  
Nozzle OD (D): 8.625 In.  
Nozzle stress (S): 17100. PSI  
Corrosion (C): 0.1250 In.

Minimum wall =  $P * D/2 / (.4*P + S) + C = 0.1727$  In.  
Actual wall: 0.5000 In.

Outlet nozzle:

Design Pressure (P): 190. PSI  
Nozzle OD (D): 3.500 In.  
Nozzle stress (S): 17100. PSI  
Corrosion (C): 0.1250 In.

Minimum wall =  $P * D/2 / (.4*P + S) + C = 0.1444$  In.  
Actual wall: 0.4380 In.



6.1.10.1 Each nozzle in the corroded condition shall be capable of withstanding the simultaneous application of the moments and forces defined in Figure 8.

6.1.10.2 The design of each fixed or floating header, of the fixed header to side-frame connections, and of other support members shall be such that no damage will occur due to the simultaneous application of the sum of all nozzle loadings on a single header. The sum of all nozzle loadings on a single header will not exceed the following.

Moments, pound-feet		Forces, pounds	
Mx	Mz	Fx	Fz
4500	3000	2250	3750

This recognizes that the application of the moments and forces per Fig. 8 will cause movement and that this movement will tend to reduce the loads to the values given above.

Nozzle Load Table

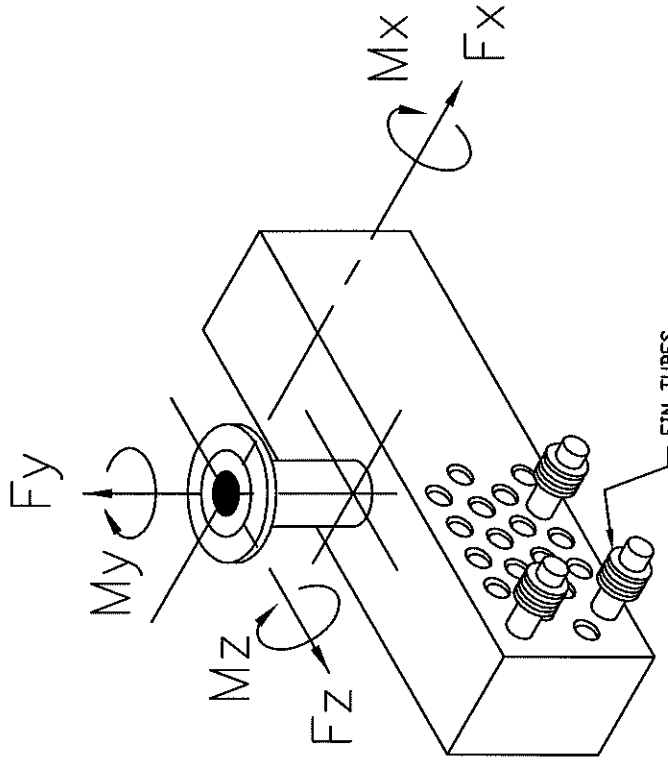
Nozzle Size, NPS inches	Moments, pound-feet <sup>a</sup>				Forces, pounds <sup>b</sup>			
	Mx	My	Mz	Fz	Fx	Fy	Fz	
1 1/2	80	110	80	150	230	150	150	
2	110	180	110	230	300	230	230	
3	300	450	300	450	380	450	450	
4	600	900	600	750	600	750	750	
6	1580	2250	1200	900	1130	1130	1130	
8	2250	4500	1650	1280	3000	1800	1800	
10	3000	4500	1880	1500	3000	2250	2250	
12	3750	4500	2250	1880	3000	3000	3000	
14	4500	5250	2630	2250	3750	3750	3750	

<sup>a</sup> 1 pound-foot = 1.35 Newton-meters

<sup>b</sup> 1 pound = 4.45 Newtons

6.1.10.3 The total of all nozzle loads on one multibundle bay shall not exceed three times that allowed for a single header.

FIG. 8



**CERTIFIED**

BY: \_\_\_\_\_

NOTES:

1. 1 X NOZZLES LOADS IN ACCORDANCE WITH API STD. 661 NOVEMBER 1997.



Smithco Engineering Co.

P.O. BOX 571330

TULSA, OKLAHOMA 74157-1330

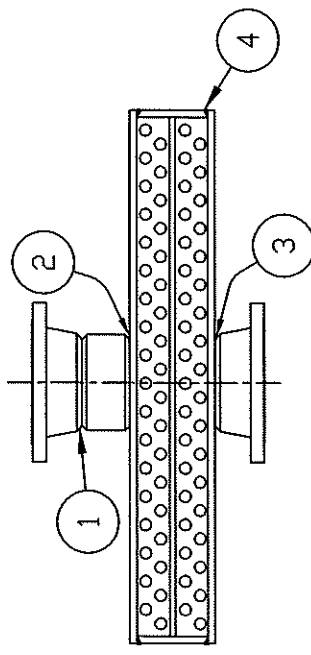
NOTE--This drawing is the property of Smithco Engineering Co., and is not to be produced in whole, or in part, nor used for any purpose other than that for which it is specifically furnished without the approval of Smithco Engineering Co.

TITLE **MAXIMUM ALLOWABLE MOMENTS AND FORCES FOR NOZZLES AND HEADERS**

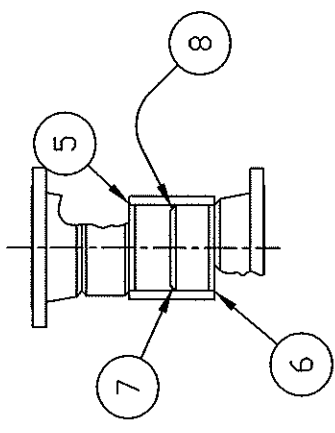
DWN. J.R.	APP.	DATE	SCALE	JOB. NO.	DWG. NO.	REV.
		2.24.04	NONE	04B387	387B-NL	1

REV.	DWG.	CKD.	APPR.	DATE	DESCRIPTION
1	J.R.			3.8.04	ISSUED FINAL CERTIFIED

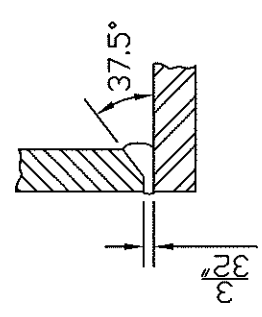
REVISIONS



TYPICAL HEADER

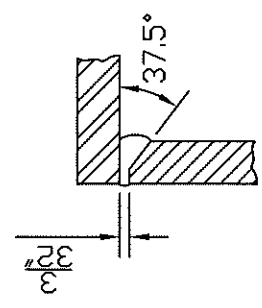


PIPE-FLANGE  
GWP01HT/FWP01HT



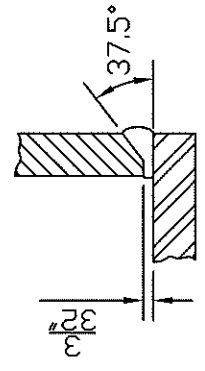
PIPE-HEAD  
GWP01HT/FWP01HT

(2)



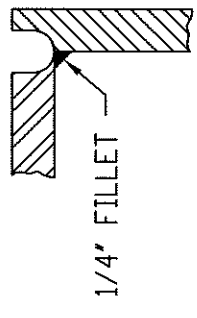
FLANGE-HEAD  
GWP01HT/SWP01HT

(3)



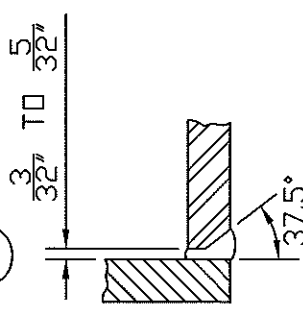
HAND WELD  
GWP01HT/FWP01HT

(4)



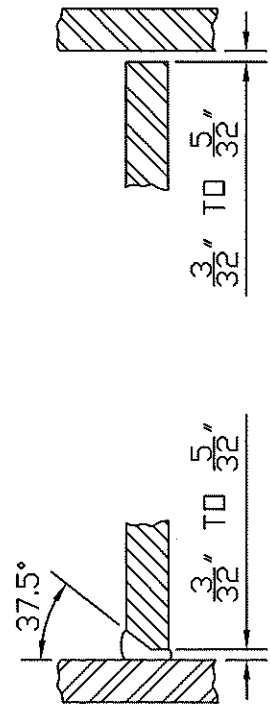
AUTO-WELD  
AWP01HT

(5)



AUTO-WELD  
GWP01HT/AWP01HT

(6)



HAND WELD  
GWP01HT/FWP01HT

(8)

CERTIFIED

BY: \_\_\_\_\_

NOTES:

1. WELD PROCEDURES LISTED ARE FOR CARBON STEEL PWHT WELDS.

HAND WELD  
GWP01HT/FWP01HT

(7)

HAND WELD  
GWP01HT/FWP01HT

Smithco Engineering Company

P.O. BOX 571330

TULSA, OKLAHOMA 74157-1330

NOTE--This drawing is the property of Smithco Engineering Co., and is not to be produced in whole, or in part, nor used for any purpose other than that for which it is specifically furnished without the approval of Smithco Engineering Co.

DWN. RLB		APP.	DATE	SCALE	JOB. NO.	DWG. NO.	REV.
3/5/04			2/13/04	NONE	04B378	378B-WM	1

REV.	DWG.	CKD.	APPR.	DATE	DESCRIPTION
1	RLB			3/5/04	SENT FINAL CERTIFIED
0	RLB			2/13/04	SENT FOR APPROVAL

WELD MAP AND WELD DETAILS

REVISIONS

# WELD PROCEDURES

CUSTOMER : MATRIX ENGINEERING

SMITHCO JOB NO : 04B378

WELD PROC NOS : GWP01HT, FWPO1HT, SWP01HT & AWP01HT

REVISION : 1, CERTIFIED

31-Mar-04

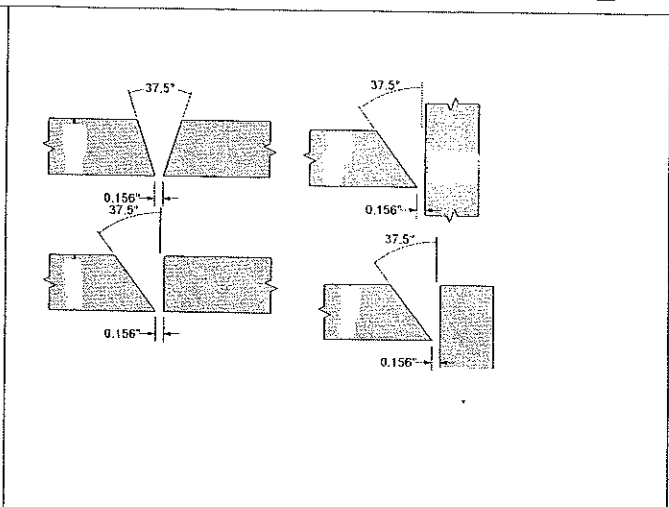
# Smithco Engineering, Inc.

## Welding Procedure Specification

GWP01HT

WPS No. GWP01HT Date 3/14/2003 By M. Olson  
 Revision 2 Date 6/23/2003  
 Supporting PQR(s) 01GFP03HT 01GFP03HT.1 01GFP03HT.3  
 Welding Process(es) GMAW Type Manual  Machine  Semi-Auto  Auto

**JOINT**  
 Type Single and Double "V" or fillet  
 Single  Double Weld   
 Backing Yes  No   
 Backing Material weld metal or base metal backing  
 Metal  Nonfusing-Metal  
 Nonmetallic  Other  
 Other See drawings for additional joint designs.



**BASE METALS (QW-403)**  
 P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2  
 Material Specification --- to ---  
 Type or Grade --- to ---  
 Thickness range Groove: .1875 to 8 in  
 Fillet: Unlimited to Unlimited  
 Pipe diameter range Groove: Unlimited to Unlimited  
 Fillet: Unlimited to Unlimited  
 Chemical analysis ---  
 Mechanical property ---  
 Other (When Charpy's are required thickness range is .375"-1.750")

**FILLER METALS (QW-404)**  
 SFA Specification 5.18  
 AWS Classification ER70S-2/ER70S-6  
 F Number 6  
 A Number 1  
 Size of filler metals .045, .052  
 Solid or tubular Solid  
 Weld metal thick. range Groove: .1875"-8.0"  
 Fillet: Unlimited  
 Electrode-flux classification ---  
 Flux trade name ---  
 Consumable Insert ---  
 Chemical analysis ---  
 Other ---

# Smithco Engineering, Inc.

## Welding Procedure Specification

GWP01HT

<p><b>POSITION (QW-405)</b></p> <p>Position of Groove <u>2G,1G</u> Fillet <u>Horizontal</u></p> <p>Vertical Progression: Up <input type="checkbox"/> Down <input type="checkbox"/></p> <p>Other <u>---</u></p> <hr/> <p><b>PREHEAT (QW-406)</b></p> <p>Preheat Temp. Min. <u>60F plt thk &lt;1.250"</u></p> <p>Interpass Temp. Min. <u>---</u> Max. <u>550 deg F.</u></p> <p>Preheat maintenance <u>None</u></p> <p>Other <u>200F plt thk &gt;1.250"</u></p> <hr/> <p><b>POSTWELD HEAT TREATMENT (QW-407)</b></p> <p>Required? <input type="checkbox"/> Temp. <u>1100 deg. F</u></p> <p>Time <u>2 hours</u></p> <p>Other <u>---</u></p>	<p><b>GAS (QW-408)</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 35%;">Gas</th> <th style="width: 35%;">Composition (mixture)</th> <th style="width: 15%;">Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shield.</td> <td><u>Argon/CO2</u></td> <td><u>75/25</u></td> <td><u>30-40 CFH</u></td> </tr> <tr> <td>Trail.</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Back.</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Other:</td> <td colspan="3"><u>---</u></td> </tr> </tbody> </table> <hr/> <p><b>ELECTRICAL CHARACTERISTICS (QW-409)</b></p> <p>Current: AC <input type="checkbox"/> DCEP <input checked="" type="checkbox"/> DCEN <input type="checkbox"/> Pulsed <input type="checkbox"/></p> <p>Amps: <u>See Table</u> Volts: <u>See Table</u></p> <p>Transfer Mode (GMAW):</p> <p style="padding-left: 40px;">Short-Circuiting <input checked="" type="checkbox"/> Globular <input type="checkbox"/> Spray <input type="checkbox"/></p> <p>Electrode wire feed speed range: <u>Not Recorded</u></p> <p>Tungsten Electrode (GTAW):</p> <p style="padding-left: 40px;">Size <u>---</u> Type <u>---</u></p> <p>Other <u>---</u></p>		Gas	Composition (mixture)	Flow Rate	Shield.	<u>Argon/CO2</u>	<u>75/25</u>	<u>30-40 CFH</u>	Trail.	<u>---</u>	<u>---</u>	<u>---</u>	Back.	<u>---</u>	<u>---</u>	<u>---</u>	Other:	<u>---</u>		
	Gas	Composition (mixture)	Flow Rate																		
Shield.	<u>Argon/CO2</u>	<u>75/25</u>	<u>30-40 CFH</u>																		
Trail.	<u>---</u>	<u>---</u>	<u>---</u>																		
Back.	<u>---</u>	<u>---</u>	<u>---</u>																		
Other:	<u>---</u>																				

<b>TECHNIQUE (QW-410)</b>	
Travel speed <u>See Table</u>	Gas Cup Size <u>3/8"-1/2"</u>
String or Weave Bead <u>Both</u>	Contact Tube to Work Distance <u>1/4"-1/2"</u>
Oscillation <u>None</u>	
Multi-pass or Single Pass (per side) <u>Multiple</u>	Number of Electrodes <u>Single</u>
Interpass Cleaning <u>Grinding, Chipping, Brushing to remove all dirt, rust, slag, grease from within 1" on each side of weld area</u>	
Back gouging Meth. <u>None</u>	
Peening <u>None</u>	
Other: <u>Max J/in qualified 61,066 J/in</u>	

WELDING PROCEDURE									
Layer/Pass	Process	Filler metal class	Diameter	Cur. type	Amps	WFS	Volts	Travel spd	Other
	GMAW	ER70S-2/6	.045	DCEP	165-220		17-22	3-8IPM	
	GMAW	ER70S-2/6	.052	DCEP	165-220		17-22	3-8IPM	

# Smithco Engineering, Inc. Welding Procedure Specification

FWP01HT

WPS No. FWP01HT Date 3/14/2003 By M. Olson  
 Revision 2 Date 6/23/2003  
 Supporting PQR(s) 01GFP03HT 01GFP03HT.2 01GFP03HT.3  
 Welding Process(es) FCAW Type Manual  Machine  Semi-Auto  Auto

**JOINT**

Type Single and Double "V" or fillet

Single  Double Weld

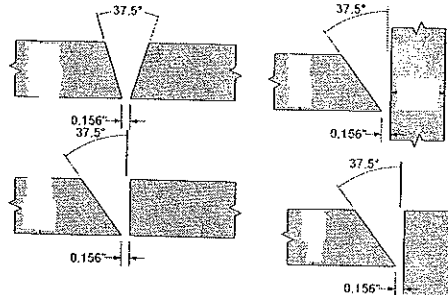
Backing Yes  No

Backing Material weld metal or base metal backing

Metal  Nonfusing-Metal

Nonmetallic  Other

Other See drawings for additional joint designs.



**BASE METALS (QW-403)**

P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2

Material Specification --- to ---

Type or Grade --- to ---

Thickness range Groove: .1875 to 8 in

Fillet: Unlimited to Unlimited

Pipe diameter range Groove: Unlimited to Unlimited

Fillet: Unlimited to Unlimited

Chemical analysis ---

Mechanical property ---

Other (When Charpy's are required thickness range is .375"-1.750")

**FILLER METALS (QW-404)**

SFA Specification 5.20

AWS Classification E70T-1/5

F Number 6

A Number 1

Size of filler metals 3/32,5/64,.045

Solid or tubular Tubular

Weld metal thick. range Groove: .1875"-8.0"

Fillet: Unlimited

Electrode-flux classification ---

Flux trade name ---

Consumable Insert ---

Chemical analysis ---

Other (Use E70T-5 when charpy's required)

# Smithco Engineering, Inc.

## Welding Procedure Specification

<p><b>POSITION (QW-405)</b></p> <p>Position of Groove <u>2G,1G</u> Fillet <u>Horizontal</u></p> <p>Vertical Progression: Up <input type="checkbox"/> Down <input type="checkbox"/></p> <p>Other <u>---</u></p> <hr/> <p><b>PREHEAT (QW-406)</b></p> <p>Preheat Temp. Min. <u>60F plt thk &lt;1.250"</u></p> <p>Interpass Temp. Min. <u>---</u> Max. <u>550 deg F.</u></p> <p>Preheat maintenance <u>None</u></p> <p>Other <u>200F plt thk &gt;1.250"</u></p> <hr/> <p><b>POSTWELD HEAT TREATMENT (QW-407)</b></p> <p>Required? <input type="checkbox"/> Temp. <u>1100 deg F</u></p> <p>Time <u>2 Hours</u></p> <p>Other <u>---</u></p>	<p><b>GAS (QW-408)</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 30%; text-align: center;">Gas</td> <td style="width: 20%; text-align: center;">Composition (mixture)</td> <td style="width: 20%; text-align: center;">Flow Rate</td> </tr> <tr> <td>Shield.</td> <td><u>Argon/CO2</u></td> <td><u>75/25</u></td> <td><u>30-40 CFH</u></td> </tr> <tr> <td>Trail.</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Back.</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Other:</td> <td colspan="3"><u>---</u></td> </tr> </table> <hr/> <p><b>ELECTRICAL CHARACTERISTICS (QW-409)</b></p> <p>Current: AC <input type="checkbox"/> DCEP <input checked="" type="checkbox"/> DCEN <input type="checkbox"/> Pulsed <input type="checkbox"/></p> <p>Amps: <u>See Table</u> Volts: <u>See Table</u></p> <p>Transfer Mode (GMAW):</p> <p style="padding-left: 40px;">Short-Circuiting <input type="checkbox"/> Globular <input type="checkbox"/> Spray <input checked="" type="checkbox"/></p> <p>Electrode wire feed speed range: <u>Not Recorded</u></p> <p>Tungsten Electrode (GTAW):</p> <p style="padding-left: 40px;">Size <u>---</u> Type <u>---</u></p> <p>Other <u>---</u></p>		Gas	Composition (mixture)	Flow Rate	Shield.	<u>Argon/CO2</u>	<u>75/25</u>	<u>30-40 CFH</u>	Trail.	<u>---</u>	<u>---</u>	<u>---</u>	Back.	<u>---</u>	<u>---</u>	<u>---</u>	Other:	<u>---</u>		
	Gas	Composition (mixture)	Flow Rate																		
Shield.	<u>Argon/CO2</u>	<u>75/25</u>	<u>30-40 CFH</u>																		
Trail.	<u>---</u>	<u>---</u>	<u>---</u>																		
Back.	<u>---</u>	<u>---</u>	<u>---</u>																		
Other:	<u>---</u>																				

**TECHNIQUE (QW-410)**

Travel speed <u>See Table</u>	Gas Cup Size <u>3/8"-1/2"</u>
String or Weave Bead <u>Both</u>	Contact Tube to Work Distance <u>1/4"-1"</u>
Oscillation <u>None</u>	
Multi-pass or Single Pass (per side) <u>Multiple</u>	Number of Electrodes <u>Single</u>
Interpass Cleaning <u>Grinding, Chipping, Brushing to remove all dirt, rust, slag, grease from within 1" on each side of weld area</u>	
Back gouging Meth. <u>None</u>	
Peening <u>None</u>	
Other: <u>Max J/in qualified 67,888 J/in</u>	

### WELDING PROCEDURE

Layer/Pass	Process	Filler metal class	Diameter	Cur. type	Amps	WFS	Volts	Travel spd	Other
	FCAW	E70T-1/5	3/32	DCEP	350-450		26-32	8-15IPM	
	FCAW	E70T-1/5	5/64	DCEP	350-450		26-32	8-15IPM	

# Smithco Engineering, Inc.

## Procedure Qualification Record

PQR No. 01GFP03HT Revision \_\_\_\_\_ Date 2/28/2003 By M. Olson

Reference WPS No. GWP01HT/FWP01HT

Welding Process(es) GMAW FCAW Type Manual  Machine  Semi-Auto  Auto

**JOINT (QW-402)**

Type Butt

Single  Double Weld

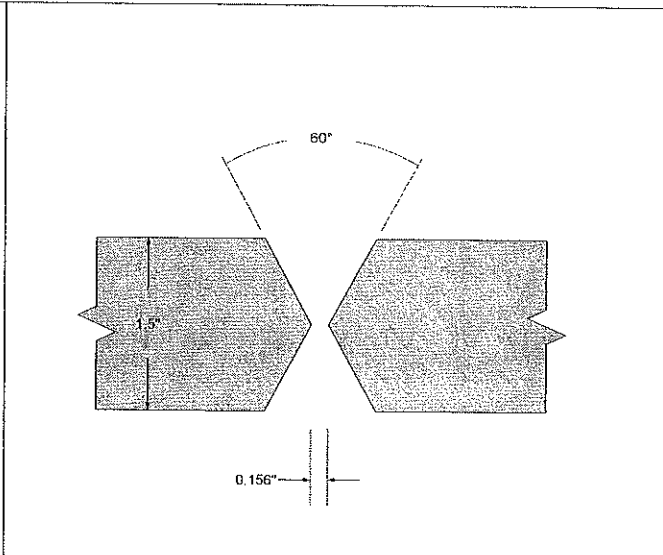
Backing Yes  No

Backing Material Weld metal or base metal backing

Metal  Nonfusing-Metal

Nonmetallic  Other

Other \_\_\_\_\_



**BASE METALS (QW-403)**

P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2

Material Specification: SA516 to SA516

Type or Grade: 65N or 70N to 65N or 70N

Thickness of test coupon: 1.500 in

Diameter of test coupon: ---

Chemical analysis: ---

Mechanical property: ---

Other: ---

**FILLER METALS (QW-404)**

SFA Specification	<u>5.18</u>	<u>5.20</u>	_____
AWS Classification	<u>ER70S-6</u>	<u>E70T-1</u>	_____
F-Number	<u>6</u>	<u>6</u>	_____
A-Number	<u>1</u>	<u>1</u>	_____
Size of filler metals	<u>.045</u>	<u>3/32</u>	_____
Solid or tubular	<u>Solid</u>	<u>Tubular</u>	_____
Weld metal thickness	<u>.750</u>	<u>.750</u>	_____
Electrode-flux classification	<u>---</u>	<u>---</u>	_____
Flux trade name	<u>---</u>	<u>---</u>	_____
Consumable insert	<u>---</u>	<u>---</u>	_____
Chemical analysis	<u>---</u>	<u>---</u>	_____
Other	<u>Hobart HB-28</u>	<u>Tri-Mark TM-72</u>	_____



Procedure Qualification Record

01GFP03HT

<p><b>POSITION (QW-405)</b></p> <p>Position of Groove <u>1G</u> Fillet <u>---</u></p> <p>Vertical Progression: Up <input type="checkbox"/> Down <input type="checkbox"/></p> <p>Other <u>---</u></p>	<p><b>GAS (QW-408)</b></p> <table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:30%;"></td> <td style="width:30%; text-align: center;">Gas</td> <td style="width:20%; text-align: center;">Composition (mixture)</td> <td style="width:20%; text-align: center;">Flow Rate</td> </tr> <tr> <td>Shield.</td> <td><u>Argon/CO2</u></td> <td><u>75/25</u></td> <td><u>30-40 CFH</u></td> </tr> <tr> <td>Trail.</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Back.</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Other:</td> <td colspan="3"><u>---</u></td> </tr> </table>		Gas	Composition (mixture)	Flow Rate	Shield.	<u>Argon/CO2</u>	<u>75/25</u>	<u>30-40 CFH</u>	Trail.	<u>---</u>	<u>---</u>	<u>---</u>	Back.	<u>---</u>	<u>---</u>	<u>---</u>	Other:	<u>---</u>		
	Gas	Composition (mixture)	Flow Rate																		
Shield.	<u>Argon/CO2</u>	<u>75/25</u>	<u>30-40 CFH</u>																		
Trail.	<u>---</u>	<u>---</u>	<u>---</u>																		
Back.	<u>---</u>	<u>---</u>	<u>---</u>																		
Other:	<u>---</u>																				
<p><b>PREHEAT (QW-406)</b></p> <p>Preheat Temp., Min. <u>150 deg. F</u></p> <p>Interpass Temp., Min. <u>---</u> Max. <u>550 deg. F</u></p> <p>Preheat maintenance <u>None</u></p> <p>Other <u>---</u></p>	<p><b>ELECTRICAL CHARACTERISTICS (QW-409)</b></p> <p>Current: AC <input type="checkbox"/> DCEP <input checked="" type="checkbox"/> DCEN <input type="checkbox"/> Pulsed <input type="checkbox"/></p> <p>Amps: <u>See Table</u> Volts: <u>See Table</u></p> <p>Transfer Mode (GMAW):</p> <p style="padding-left: 40px;">Short-Circuiting <input checked="" type="checkbox"/> Globular <input type="checkbox"/> Spray <input checked="" type="checkbox"/></p> <p>Electrode wire feed speed range: <u>Not Recorded</u></p> <p>Tungsten electrode (GTAW):</p> <p style="padding-left: 40px;">Size <u>---</u> Type <u>---</u></p> <p>Other <u>---</u></p>																				
<p><b>POSTWELD HEAT TREATMENT (QW-407)</b></p> <p>Required? <input type="checkbox"/></p> <p>Temperature <u>1150 deg F +/- 25 deg F</u></p> <p>Time <u>2 HRS</u></p> <p>Other: <u>---</u></p>																					

**TECHNIQUE (QW-410)**

Travel speed See Table Gas Cup Size 1/2" max

String or Weave Bead Both Contact Tube to Work Distance 1/2"-1"

Oscillation ---

Multi-pass or Single Pass (per side) Multiple Number of Electrodes Single

Interpass Cleaning Chipping, Grinding, Brushing to remove all dirt, rust, slag, grease from within 1" of each side of weld area

Back gouging Method None

Peening None

Other: ---

**WELDING PROCEDURE**

Layer/pass	Process	Filler metal class	Diameter	Cur. type	Amps	WFS	Volts	Travel spd.	Other
1	GMAW	ER70S-6	.045	DCEP	165		18	4.14IPM	43,043 J/in
2	GMAW	ER70S-6	.045	DCEP	170		18.2	3.53IPM	52,589 J/in
3	GMAW	ER70S-6	.045	DCEP	170		18.2	6.49IPM	28,604 J/in
4	GMAW	ER70S-6	.045	DCEP	170		18.2	4.71IPM	39,414 J/in
5	GMAW	ER70S-6	.045	DCEP	170		18.2	3.81IPM	48,724 J/in
6	GMAW	ER70S-6	.045	DCEP	170		18.2	3.04IPM	61,066 J/in
7	GMAW	ER70S-6	.045	DCEP	170		18.2	5.22IPM	35,563 J/in
8	FCAW	E70T-1	3/32	DCEP	380		26.5	12.7IPM	47,575 J/in
9	FCAW	E70T-1	3/32	DCEP	435		28	10.4IPM	70,269 J/in
10	FCAW	E70T-1	3/32	DCEP	435		28	8.9IPM	82,112 J/in
11	FCAW	E70T-1	3/32	DCEP	435		28	14.1IPM	51,830 J/in
12	FCAW	E70T-1	3/32	DCEP	435		28	14.1IPM	51,830 J/in
13	FCAW	E70T-1	3/32	DCEP	440		28	10.9IPM	67,046 J/in
14	FCAW	E70T-1	3/32	DCEP	440		28	10.9IPM	67,046 J/in

**Smithco Engineering, Inc.**  
**Procedure Qualification Record**

**TESTS (QW-483)**

**TENSILE TEST (QW-150)**

Specimen no.	Width	Thickness	Area	Ultimate tensile load, lb	Ultimate unit stress, psi	Character of failure and location
Top A	.750	.682	.512	36,600	71,600	Weld Metal/Ductile
Top B	.757	.732	.551	39,300	70,600	Weld Metal/Ductile
Bottom A	.753	.732	.551	39,300	71,300	Base Metal/Ductile
Bottom B	.757	.755	.572	40,750	71,200	Base Metal/Ductile

**GUIDED BEND TEST (QW-160)**

Specimen no.	Type of bend	Figure No.	Result	Remark
1	Side Bends		Satisfactory	
2	Side Bends		Satisfactory	
3	Side Bends		Satisfactory	
4	Side Bends		Satisfactory	

Are impact required?

**TOUGHNESS TEST (QW-170)**

Specimen no.	Notch Location	Notch Type	Test Temp. ( F )	Impact Values(ft-lb)	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break

**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 John Moore Clock no. 19 Stamp no. 19

Test conducted by Sherry Lab Laboratory test no. 2003020509 Test Date 2/28/2003

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 Smithco Engineering, Inc. By Michael Olson Code Year 2001

Date 2/28/2003

Remark: \_\_\_\_\_

# Smithco Engineering, Inc.

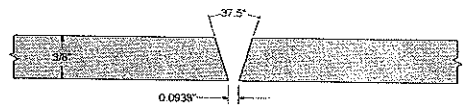
## Procedure Qualification Record

PQR No. 01GFP03HT.1      Revision \_\_\_\_\_      Date 2/28/2003      By M. Olson

Reference WPS No. GWP01HT

Welding Process(es) GMAW      Type    Manual     Machine     Semi-Auto     Auto

**JOINT (QW-402)**  
 Type Butt  
           Single     Double Weld   
 Backing    Yes     No   
 Backing Material Weld metal or base metal backing  
            Metal                     Nonfusing-Metal  
            Nonmetallic             Other  
 Other **CVN PQR Only**  
**Mechanical testing done on PQR 01GFP03HT**  
**This PQR was qualified for supplementary**  
**essential variables per QW-403**



**BASE METALS (QW-403)**  
 P-No. 1      Group No. 1 or 2      to P-No. 1      Group No. 1 or 2  
 Material Specification: SA516      to SA516  
           Type or Grade: 65N or 70N      to 65N or 70N  
 Thickness of test coupon: .375 in  
 Diameter of test coupon: ---  
 Chemical analysis: ---  
 Mechanical property: ---  
 Other: ---

**FILLER METALS (QW-404)**

SFA Specification	<u>5.18</u>	_____	_____
AWS Classification	<u>ER70S-6</u>	_____	_____
F-Number	<u>6</u>	_____	_____
A-Number	<u>1</u>	_____	_____
Size of filler metals	<u>.045</u>	_____	_____
Solid or tubular	<u>Solid</u>	_____	_____
Weld metal thickness	<u>.375</u>	_____	_____
Electrode-flux classification	<u>---</u>	_____	_____
Flux trade name	<u>---</u>	_____	_____
Consumable Insert	<u>---</u>	_____	_____
Chemical analysis	<u>---</u>	_____	_____
Other	<u>Hobart HB-28</u>	_____	_____

**Procedure Qualification Record**

01GFP03HT.1

<p><b>POSITION (QW-405)</b>                  Position of Groove <u>1G</u>      Fillet <u>---</u>                  Vertical Progression:    Up <input type="checkbox"/>    Down <input type="checkbox"/>                  Other <u>---</u></p>	<p><b>GAS (QW-408)</b>  <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="width:33%;">Gas</th> <th style="width:33%;">Composition (mixture)</th> <th style="width:33%;">Flow Rate</th> </tr> <tr> <td>Shield. <u>Argon/CO2</u></td> <td><u>75/25</u></td> <td><u>30-40 CFH</u></td> </tr> <tr> <td>Trail. <u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Back. <u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td colspan="3">Other: <u>---</u></td> </tr> </table> </p>	Gas	Composition (mixture)	Flow Rate	Shield. <u>Argon/CO2</u>	<u>75/25</u>	<u>30-40 CFH</u>	Trail. <u>---</u>	<u>---</u>	<u>---</u>	Back. <u>---</u>	<u>---</u>	<u>---</u>	Other: <u>---</u>		
Gas	Composition (mixture)	Flow Rate														
Shield. <u>Argon/CO2</u>	<u>75/25</u>	<u>30-40 CFH</u>														
Trail. <u>---</u>	<u>---</u>	<u>---</u>														
Back. <u>---</u>	<u>---</u>	<u>---</u>														
Other: <u>---</u>																
<p><b>PREHEAT (QW-406)</b>                  Preheat Temp., Min. <u>150 deg. F</u>                  Interpass Temp., Min. <u>---</u>      Max. <u>550 deg. F</u>                  Preheat maintenance <u>None</u>                  Other <u>---</u></p>	<p><b>ELECTRICAL CHARACTERISTICS (QW-409)</b>                  Current:    AC <input type="checkbox"/>    DCEP <input checked="" type="checkbox"/>    DCEN <input type="checkbox"/>    Pulsed <input type="checkbox"/>                  Amps:      <u>See Table</u>                          Volts: <u>See Table</u>                  Transfer Mode (GMAW):                                  Short-Circuiting <input checked="" type="checkbox"/>    Globular <input type="checkbox"/>    Spray <input type="checkbox"/>                  Electrode wire feed speed range:      <u>Not Recorded</u>                  Tungsten electrode (GTAW):                                  Size <u>---</u>                          Type <u>---</u>                  Other <u>---</u></p>															
<p><b>POSTWELD HEAT TREATMENT (QW-407)</b>                  Required?    <input type="checkbox"/>                  Temperature <u>1150 deg F +/- 25 deg F</u>                  Time <u>8 HRS</u>                  Other: <u>---</u></p>																

**TECHNIQUE (QW-410)**  
 Travel speed See Table    Gas Cup Size 1/2" max  
 String or Weave Bead Both    Contact Tube to Work Distance 1/2"-1"  
 Oscillation ---  
 Multi-pass or Single Pass (per side) Multiple      Number of Electrodes Single  
 Interpass Cleaning Chipping, Grinding, Brushing to remove all dirt, rust, slag, grease from within 1" of each side of weld area  
 Back gouging Method None  
 Peening None  
 Other: ---

**WELDING PROCEDURE**

Layer/pass	Process	Filler metal class	Diameter	Cur. type	Amps	WFS	Volts	Travel spd.	Other
1	GMAW	ER70S-6	.045	DCEP	170		18	3.53IPM	52,589 J/in
2	GMAW	ER70S-6	.045	DCEP	170		18	3.04IPM	61,066 J/in

**Smithco Engineering, Inc.**  
**Procedure Qualification Record**

**TESTS (QW-483)**

**TENSILE TEST (QW-150)**

Specimen no.	Width	Thickness	Area	Ultimate tensile load, lb	Ultimate unit stress, psi	Character of failure and location

**GUIDED BEND TEST (QW-160)**

Specimen no.	Type of bend	Figure No.	Result	Remark

Are impact required?

**TOUGHNESS TEST (QW-170)**

Specimen no.	Notch Location	Notch Type	Test Temp. ( F )	Impact Values(ft-lb)	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break
<b>GMAW</b>	<b>Weld</b>	<b>Charpy V</b>	<b>-56</b>	<b>62,52,68</b>	<b>60,45,65</b>	<b>74,60,79</b>		
<b>GMAW</b>	<b>HAZ</b>	<b>Charpy V</b>	<b>-56</b>	<b>75,31,82</b>	<b>70,30,75</b>	<b>83,37,83</b>		

**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 John Moore Clock no. 19 Stamp no. 19

Test conducted by Sherry Lab Laboratory test no. 2003050023-3 Test Date 5/8/2003

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 Smithco Engineering, Inc. By Michael Olson Code Year 2001

Date 5/8/2003

Remark: Specimen Size-10mm x 7.33mm

# Smithco Engineering, Inc.

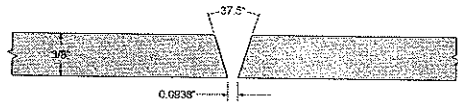
## Procedure Qualification Record

PQR No. 01GFP03HT.2      Revision \_\_\_\_\_      Date 5/22/2003      By M. Olson

Reference WPS No. FWP01HT

Welding Process(es) FCAW      Type    Manual     Machine     Semi-Auto     Auto

**JOINT (QW-402)**  
 Type Butt  
           Single     Double Weld   
 Backing    Yes     No   
 Backing Material Weld metal or base metal backing  
            Metal                       Nonfusing-Metal  
            Nonmetallic             Other  
 Other **CVN PQR Only**  
**Mechanical testing done on PQR 01GFP03HT**  
**This PQR was qualified for supplementary**  
**essential variables per QW-403**



**BASE METALS (QW-403)**  
 P-No. 1      Group No. 1 or 2      to P-No. 1      Group No. 1 or 2  
 Material Specification: SA516      to SA516  
           Type or Grade: 65N or 70N      to 65N or 70N  
 Thickness of test coupon: .375 in  
 Diameter of test coupon: ---  
 Chemical analysis: ---  
 Mechanical property: ---  
 Other: ---

**FILLER METALS (QW-404)**

SFA Specification	<u>5.20</u>	_____	_____
AWS Classification	<u>E70T-5</u>	_____	_____
F-Number	<u>6</u>	_____	_____
A-Number	<u>1</u>	_____	_____
Size of filler metals	<u>3/32</u>	_____	_____
Solid or tubular	<u>Tubular</u>	_____	_____
Weld metal thickness	<u>.375</u>	_____	_____
Electrode-flux classification	<u>---</u>	_____	_____
Flux trade name	<u>---</u>	_____	_____
Consumable Insert	<u>---</u>	_____	_____
Chemical analysis	<u>---</u>	_____	_____
Other	<u>Fabco 85</u>	_____	_____

Procedure Qualification Record

01GFP03HT.2

<b>POSITION (QW-405)</b> Position of Groove <u>1G</u> Fillet <u>---</u> Vertical Progression: Up <input type="checkbox"/> Down <input type="checkbox"/> Other <u>---</u>	<b>GAS (QW-408)</b> <table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:30%;"></td> <td style="width:30%; text-align: center;">Gas</td> <td style="width:30%; text-align: center;">Composition (mixture)</td> <td style="width:10%; text-align: center;">Flow Rate</td> </tr> <tr> <td>Shield.</td> <td><u>Argon/CO2</u></td> <td><u>75/25</u></td> <td><u>30-40 CFH</u></td> </tr> <tr> <td>Trail.</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Back.</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Other:</td> <td colspan="3"><u>---</u></td> </tr> </table>		Gas	Composition (mixture)	Flow Rate	Shield.	<u>Argon/CO2</u>	<u>75/25</u>	<u>30-40 CFH</u>	Trail.	<u>---</u>	<u>---</u>	<u>---</u>	Back.	<u>---</u>	<u>---</u>	<u>---</u>	Other:	<u>---</u>		
	Gas	Composition (mixture)	Flow Rate																		
Shield.	<u>Argon/CO2</u>	<u>75/25</u>	<u>30-40 CFH</u>																		
Trail.	<u>---</u>	<u>---</u>	<u>---</u>																		
Back.	<u>---</u>	<u>---</u>	<u>---</u>																		
Other:	<u>---</u>																				
<b>PREHEAT (QW-406)</b> Preheat Temp., Min. <u>150 deg. F</u> Interpass Temp., Min. <u>---</u> Max. <u>550 deg. F</u> Preheat maintenance <u>None</u> Other <u>---</u>	<b>ELECTRICAL CHARACTERISTICS (QW-409)</b> Current: AC <input type="checkbox"/> DCEP <input checked="" type="checkbox"/> DCEN <input type="checkbox"/> Pulsed <input type="checkbox"/> Amps: <u>See Table</u> Volts: <u>See Table</u> Transfer Mode (GMAW): Short-Circuiting <input type="checkbox"/> Globular <input type="checkbox"/> Spray <input checked="" type="checkbox"/> Electrode wire feed speed range: <u>Not Recorded</u> Tungsten electrode (GTAW): Size <u>---</u> Type <u>---</u> Other <u>---</u>																				
<b>POSTWELD HEAT TREATMENT (QW-407)</b> Required? <input type="checkbox"/> Temperature <u>1150 deg F +/- 25 deg F</u> Time <u>8 HRS</u> Other: <u>---</u>																					

<b>TECHNIQUE (QW-410)</b>	
Travel speed <u>See Table</u>	Gas Cup Size <u>1/2" max</u>
String or Weave Bead <u>Both</u>	Contact Tube to Work Distance <u>1/2"-1"</u>
Oscillation <u>---</u>	
Multi-pass or Single Pass (per side) <u>Multiple</u>	Number of Electrodes <u>Single</u>
Interpass Cleaning <u>Chipping,Grinding,Brushing to remove all dirt,rust,slag,grease from within 1" of each side of weld area</u>	
Back gouging Method <u>None</u>	
Peening <u>None</u>	
Other: <u>---</u>	

WELDING PROCEDURE									
Layer/pass	Process	Filler metal class	Diameter	Cur. type	Amps	WFS	Volts	Travel spd.	Other
1	FCAW	E70T-5	3/32	DCEP	435		28	8.9IPM	82,112 J/in
2	FCAW	E70T-5	3/32	DCEP	440		28	10.9IPM	67,046 J/in

**Smithco Engineering, Inc.**  
**Procedure Qualification Record**

**TESTS (QW-483)**

**TENSILE TEST (QW-150)**

Specimen no.	Width	Thickness	Area	Ultimate tensile load, lb	Ultimate unit stress, psi	Character of failure and location

**GUIDED BEND TEST (QW-160)**

Specimen no.	Type of bend	Figure No.	Result	Remark

Are impact required?

**TOUGHNESS TEST (QW-170)**

Specimen no.	Notch Location	Notch Type	Test Temp. ( F )	Impact Values(ft-lb)	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break
FCAW	Weld	Charpy V	-58	41,15,27	35,20,30	56,24,39		
FCAW	HAZ	Charpy V	-58	27,22,24	35,25,30	38,31,34		

**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 Wilson Ryder Clock no. 9 Stamp no. 9

Test conducted by Sherry Lab Laboratory test no. 2003050466 Test Date 5/22/2003

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 Smithco Engineering, Inc. By Michael Olson Code Year 2001

Date 5/22/2003

Remark: Specimen Size-10mm x 7.0mm



# Smithco Engineering, Inc.

## Procedure Qualification Record

01GFP03HT.3

PQR No. 01GFP03HT.3 Revision \_\_\_\_\_ Date 6/23/2003 By M. Olson

Reference WPS No. GWP01HT/FWP01HT

Welding Process(es) GMAW FCAW Type Manual  Machine  Semi-Auto  Auto

**JOINT (QW-402)**

Type Butt

Single  Double Weld

Backing Yes  No

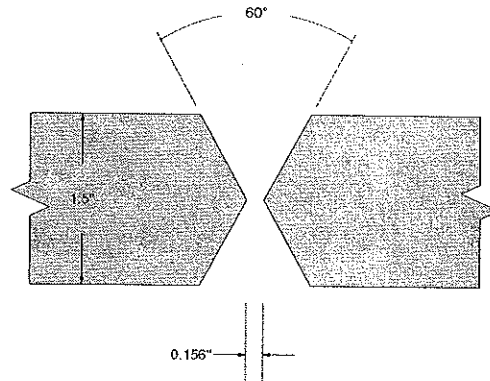
Backing Material Weld metal or base metal backing

Metal  Nonfusing-Metal

Nonmetallic  Other

Other **CVN PQR Only**

**Mechanical testing done on PQR 01GFP03HT  
This PQR was qualified for supplementary  
essential variables per QW-403**



**BASE METALS (QW-403)**

P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2

Material Specification: SA516 to SA516

Type or Grade: 65N or 70N to 65N or 70N

Thickness of test coupon: 1.500 in

Diameter of test coupon: ---

Chemical analysis: ---

Mechanical property: ---

Other: ---

**FILLER METALS (QW-404)**

SFA Specification 5.18 5.20

AWS Classification ER70S-6 E70T-5

F-Number 6 6

A-Number 1 1

Size of filler metals .045 3/32

Solid or tubular Solid Tubular

Weld metal thickness .750 .750

Electrode-flux classification --- ---

Flux trade name --- ---

Consumable Insert --- ---

Chemical analysis --- ---

Other Hobart HB-28 Fabco 85

Procedure Qualification Record

01GFP03HT.3

<p><b>POSITION (QW-405)</b></p> <p>Position of Groove <u>1G</u> Fillet <u>---</u></p> <p>Vertical Progression: Up <input type="checkbox"/> Down <input type="checkbox"/></p> <p>Other <u>---</u></p> <hr/> <p><b>PREHEAT (QW-406)</b></p> <p>Preheat Temp., Min. <u>150 deg. F</u></p> <p>Interpass Temp., Min. <u>---</u> Max. <u>550 deg. F</u></p> <p>Preheat maintenance <u>None</u></p> <p>Other <u>---</u></p> <hr/> <p><b>POSTWELD HEAT TREATMENT (QW-407)</b></p> <p>Required? <input type="checkbox"/></p> <p>Temperature <u>1150 deg F +/- 25 deg F</u></p> <p>Time <u>4 HRS</u></p> <p>Other: <u>---</u></p>	<p><b>GAS (QW-408)</b></p> <table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:30%;"></td> <td style="width:30%; text-align: center;">Gas</td> <td style="width:20%; text-align: center;">Composition (mixture)</td> <td style="width:20%; text-align: center;">Flow Rate</td> </tr> <tr> <td>Shield.</td> <td><u>Argon/CO2</u></td> <td><u>75/25</u></td> <td><u>30-40 CFH</u></td> </tr> <tr> <td>Trail.</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Back.</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Other:</td> <td colspan="3"><u>---</u></td> </tr> </table> <hr/> <p><b>ELECTRICAL CHARACTERISTICS (QW-409)</b></p> <p>Current: AC <input type="checkbox"/> DCEP <input checked="" type="checkbox"/> DCEN <input type="checkbox"/> Pulsed <input type="checkbox"/></p> <p>Amps: <u>See Table</u> Volts: <u>See Table</u></p> <p>Transfer Mode (GMAW):</p> <p style="padding-left: 40px;">Short-Circuiting <input checked="" type="checkbox"/> Globular <input type="checkbox"/> Spray <input checked="" type="checkbox"/></p> <p>Electrode wire feed speed range: <u>Not Recorded</u></p> <p>Tungsten electrode (GTAW):</p> <p style="padding-left: 40px;">Size <u>---</u> Type <u>---</u></p> <p>Other <u>---</u></p>		Gas	Composition (mixture)	Flow Rate	Shield.	<u>Argon/CO2</u>	<u>75/25</u>	<u>30-40 CFH</u>	Trail.	<u>---</u>	<u>---</u>	<u>---</u>	Back.	<u>---</u>	<u>---</u>	<u>---</u>	Other:	<u>---</u>		
	Gas	Composition (mixture)	Flow Rate																		
Shield.	<u>Argon/CO2</u>	<u>75/25</u>	<u>30-40 CFH</u>																		
Trail.	<u>---</u>	<u>---</u>	<u>---</u>																		
Back.	<u>---</u>	<u>---</u>	<u>---</u>																		
Other:	<u>---</u>																				

**TECHNIQUE (QW-410)**

Travel speed See Table Gas Cup Size 1/2" max

String or Weave Bead Both Contact Tube to Work Distance 1/2"-1"

Oscillation ---

Multi-pass or Single Pass (per side) Multiple Number of Electrodes Single

Interpass Cleaning Chipping, Grinding, Brushing to remove all dirt, rust, slag, grease from within 1" of each side of weld area

Back gouging Method None

Peening None

Other: ---

WELDING PROCEDURE									
Layer/pass	Process	Filler metal class	Diameter	Cur. type	Amps	WFS	Volts	Travel spd.	Other
1	GMAW	ER70S-6	.045	DCEP	170		19	4.5IPM	43,067 J/in
2	GMAW	ER70S-6	.045	DCEP	170		18.2	4.5IPM	41,253 J/in
3	GMAW	ER70S-6	.045	DCEP	173		18	6IPM	31,140 J/in
4	GMAW	ER70S-6	.045	DCEP	170		18	5IPM	36,720 J/in
5	GMAW	ER70S-6	.045	DCEP	173		18	4IPM	46,710 J/in
6	GMAW	ER70S-6	.045	DCEP	173		18	3.06IPM	61,059 J/in
7	GMAW	ER70S-6	.045	DCEP	173		18	5.5IPM	33,971 J/in
8	FCAW	E70T-5	3/32	DCEP	380		27	13IPM	47,354 J/in
9	FCAW	E70T-5	3/32	DCEP	435		28	12IPM	60,900 J/in
10	FCAW	E70T-5	3/32	DCEP	435		28	10IPM	73,080 J/in
11	FCAW	E70T-5	3/32	DCEP	435		28	14IPM	52,200 J/in
12	FCAW	E70T-5	3/32	DCEP	430		28	14IPM	51,600 J/in
13	FCAW	E70T-5	3/32	DCEP	442		28	11IPM	67,505 J/in
14	FCAW	E70T-5	3/32	DCEP	442		28	12IPM	61,880 J/in

Procedure Qualification Record

01GFP03HT.3

TESTS (QW-483)

TENSILE TEST (QW-150)

Specimen no.	Width	Thickness	Area	Ultimate tensile load, lb	Ultimate unit stress, psi	Character of failure and location

GUIDED BEND TEST (QW-160)

Specimen no.	Type of bend	Figure No.	Result	Remark

Are impact required?

TOUGHNESS TEST (QW-170)

Specimen no.	Notch Location	Notch Type	Test Temp. ( F )	Impact Values(ft-lb)	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break
1	Weld	Charpy V	-50	46,56,46	35,45,35	37,45,38		
2	HAZ	Charpy V	-50	42,37,41	35,35,35	36,31,34		

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 Dale Madison Clock no. 42 Stamp no. 42

Test conducted by Sherry Lab Laboratory test no. 20030206371 Test Date 6/23/2003

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 Smithco Engineering, Inc. By Michael Olson Code Year 2001

Date 6/23/2003

Remark: \_\_\_\_\_

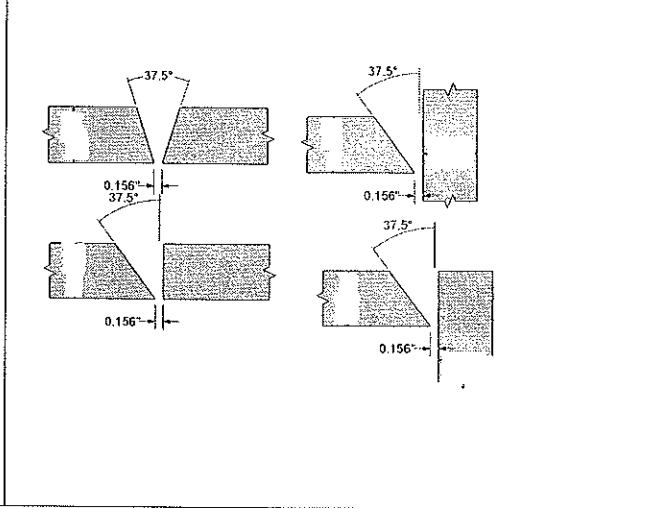
# Smithco Engineering, Inc.

## Welding Procedure Specification

SWP01HT

WPS No. SWP01HT Date 3/14/2003 By M. Olson  
 Revision 2 Date 6/23/2003  
 Supporting PQR(s) 01SAP03HT 01SAP03HT.1 01SAP03HT.3  
 Welding Process(es) SMAW Type Manual  Machine  Semi-Auto  Auto

**JOINT**  
 Type Single and Double "V" or fillet  
 Single  Double Weld   
 Backing Yes  No   
 Backing Material weld metal or base metal backing  
 Metal  Nonfusing-Metal  
 Nonmetallic  Other  
 Other See drawings for additional joint designs.



**BASE METALS (QW-403)**  
 P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2  
 Material Specification --- to ---  
 Type or Grade --- to ---  
 Thickness range Groove: .1875 to 8.0 in  
 Fillet: Unlimited to Unlimited in  
 Pipe diameter range Groove: Unlimited to Unlimited  
 Fillet: Unlimited to Unlimited  
 Chemical analysis ---  
 Mechanical property ---  
 Other (When charpy's are required thickness range is .375"-1.750")

**FILLER METALS (QW-404)**  
 SFA Specification 5.1  
 AWS Classification E7018-1  
 F Number 4  
 A Number 1  
 Size of filler metals 5/32,1/8,3/16,1/4  
 Solid or tubular N/A  
 Weld metal thick. range Groove: .1875"-8.0"  
 Fillet: Unlimited  
 Electrode-flux classification ---  
 Flux trade name ---  
 Consumable Insert ---  
 Chemical analysis ---  
 Other ---

# Smithco Engineering, Inc.

## Welding Procedure Specification

<p><b>POSITION (QW-405)</b></p> <p>Position of Groove <u>2G,1G</u> Fillet <u>Horizontal</u></p> <p>Vertical Progression: Up <input type="checkbox"/> Down <input type="checkbox"/></p> <p>Other <u>---</u></p> <hr/> <p><b>PREHEAT (QW-406)</b></p> <p>Preheat Temp. Min. <u>60 F plt thk &lt; 1.25"</u></p> <p>Interpass Temp. Min. <u>---</u> Max. <u>550 deg F.</u></p> <p>Preheat maintenance <u>None</u></p> <p>Other <u>200 F plt thk &gt; 1.250"</u></p> <hr/> <p><b>POSTWELD HEAT TREATMENT (QW-407)</b></p> <p>Required? <input type="checkbox"/> Temp. <u>1100 deg F</u></p> <p>Time <u>2 Hours</u></p> <p>Other <u>---</u></p>	<p><b>GAS (QW-408)</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 35%;">Gas</th> <th style="width: 35%;">Composition (mixture)</th> <th style="width: 15%;">Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shield.</td> <td><u>none</u></td> <td><u>none</u></td> <td><u>none</u></td> </tr> <tr> <td>Trail.</td> <td><u>none</u></td> <td><u>none</u></td> <td><u>none</u></td> </tr> <tr> <td>Back.</td> <td><u>none</u></td> <td><u>none</u></td> <td><u>none</u></td> </tr> <tr> <td>Other:</td> <td colspan="3"><u>N/A</u></td> </tr> </tbody> </table> <hr/> <p><b>ELECTRICAL CHARACTERISTICS (QW-409)</b></p> <p>Current: AC <input type="checkbox"/> DCEP <input checked="" type="checkbox"/> DCEN <input type="checkbox"/> Pulsed <input type="checkbox"/></p> <p>Amps: <u>See Table</u> Volts: <u>See Table</u></p> <p>Transfer Mode (GMAW):</p> <p style="padding-left: 40px;">Short-Circuiting <input type="checkbox"/> Globular <input type="checkbox"/> Spray <input type="checkbox"/></p> <p>Electrode wire feed speed range: <u>Not Recorded</u></p> <p>Tungsten Electrode (GTAW):</p> <p style="padding-left: 40px;">Size <u>---</u> Type <u>---</u></p> <p>Other <u>---</u></p>		Gas	Composition (mixture)	Flow Rate	Shield.	<u>none</u>	<u>none</u>	<u>none</u>	Trail.	<u>none</u>	<u>none</u>	<u>none</u>	Back.	<u>none</u>	<u>none</u>	<u>none</u>	Other:	<u>N/A</u>		
	Gas	Composition (mixture)	Flow Rate																		
Shield.	<u>none</u>	<u>none</u>	<u>none</u>																		
Trail.	<u>none</u>	<u>none</u>	<u>none</u>																		
Back.	<u>none</u>	<u>none</u>	<u>none</u>																		
Other:	<u>N/A</u>																				
<p><b>TECHNIQUE (QW-410)</b></p> <p>Travel speed <u>See Table</u> Gas Cup Size <u>---</u></p> <p>String or Weave Bead <u>Both</u> Contact Tube to Work Distance <u>1/4"-1/2"</u></p> <p>Oscillation <u>None</u></p> <p>Multi-pass or Single Pass (per side) <u>Multiple</u> Number of Electrodes <u>Single</u></p> <p>Interpass Cleaning <u>Grinding, Chipping, Brushing to remove all dirt,rust,slag,grease or water from within 1" on each side of weld area</u></p> <p>Back gouging Meth. <u>None</u></p> <p>Peening <u>None</u></p> <p>Other: <u>Max J/in qualified SMAW-65,506 J/in</u></p>																					
<b>WELDING PROCEDURE</b>																					
Layer/Pass	Process	Filler metal class	Diameter	Cur. type	Amps	WFS	Volts	Travel spd	Other												
	SMAW	E7018-1	3/32	DCEP	90-120			5-10IPM													
	SMAW	E7018-1	1/8	DCEP	100-150			6-12IPM													
	SMAW	E7018-1	5/32	DCEP	120-230			8-14IPM													
	SMAW	E7018-1	3/16	DCEP	180-300			8-14IPM													
	SMAW	E7018-1	1/4	DCEP	250-375			10-16IPM													

# Smithco Engineering, Inc.

## Welding Procedure Specification

AWP01HT

WPS No. AWP01HT Date 3/14/2003 By M. Olson  
 Revision 2 Date 6/23/2003  
 Supporting PQR(s) 01SAP03HT 01SAP03HT.2 01SAP03HT.3  
 Welding Process(es) SAW Type Manual  Machine  Semi-Auto  Auto

**JOINT**

Type Single and Double "V" or fillet

Single  Double Weld

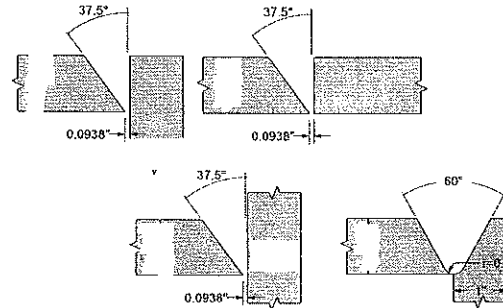
Backing Yes  No

Backing Material weld metal or base metal backing

Metal  Nonfusing-Metal

Nonmetallic  Other

Other See drawings for additional joint designs.



**BASE METALS (QW-403)**

P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2

Material Specification --- to ---

Type or Grade --- to ---

Thickness range Groove: .1875 to 8.00 in

Fillet: Unlimited to Unlimited

Pipe diameter range Groove: Unlimited to Unlimited

Fillet: Unlimited to Unlimited

Chemical analysis ---

Mechanical property ---

Other (When Charpy's are required thickness range is .375"-1.750")

**FILLER METALS (QW-404)**

SFA Specification 5.17

AWS Classification EM12K

F Number 6

A Number 1

Size of filler metals 5/32, 1/8

Solid or tubular Solid

Weld metal thick. range Groove: .1875-8.00

Fillet: Unlimited

Electrode-flux classification ---

Flux trade name L-Tech #429

Consumable Insert ---

Chemical analysis ---

Other EM-12K(L-Tech #81)

# Smithco Engineering, Inc.

## Welding Procedure Specification

<b>POSITION (QW-405)</b> Position of Groove <u>1G</u> Fillet <u>Horizontal</u> Vertical Progression:    Up <input type="checkbox"/> Down <input type="checkbox"/> Other <u>---</u>			<b>GAS (QW-408)</b> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Gas</th> <th style="width: 33%;">Composition (mixture)</th> <th style="width: 33%;">Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shield: <u>none</u></td> <td><u>none</u></td> <td><u>none</u></td> </tr> <tr> <td>Trail: <u>none</u></td> <td><u>none</u></td> <td><u>none</u></td> </tr> <tr> <td>Back: <u>none</u></td> <td><u>none</u></td> <td><u>none</u></td> </tr> <tr> <td colspan="3">Other: <u>N/A</u></td> </tr> </tbody> </table>			Gas	Composition (mixture)	Flow Rate	Shield: <u>none</u>	<u>none</u>	<u>none</u>	Trail: <u>none</u>	<u>none</u>	<u>none</u>	Back: <u>none</u>	<u>none</u>	<u>none</u>	Other: <u>N/A</u>		
Gas	Composition (mixture)	Flow Rate																		
Shield: <u>none</u>	<u>none</u>	<u>none</u>																		
Trail: <u>none</u>	<u>none</u>	<u>none</u>																		
Back: <u>none</u>	<u>none</u>	<u>none</u>																		
Other: <u>N/A</u>																				
<b>PREHEAT (QW-406)</b> Preheat Temp. Min. <u>60F plt thk &lt;1.250"</u> Interpass Temp. Min. <u>---</u> Max. <u>500 deg. F</u> Preheat maintenance <u>none</u> Other <u>200F plt thk &gt;1.250"</u>			<b>ELECTRICAL CHARACTERISTICS (QW-409)</b> Current:    AC <input type="checkbox"/> DCEP <input checked="" type="checkbox"/> DCEN <input type="checkbox"/> Pulsed <input type="checkbox"/> Amps: <u>See Table</u> Volts: <u>See Table</u> Transfer Mode (GMAW): Short-Circuiting <input type="checkbox"/> Globular <input type="checkbox"/> Spray <input type="checkbox"/> Electrode wire feed speed range: <u>Not Recorded</u> Tungsten Electrode (GTAW): Size <u>---</u> Type <u>---</u> Other <u>---</u>																	
<b>POSTWELD HEAT TREATMENT (QW-407)</b> Required? <input checked="" type="checkbox"/> Temp. <u>1100 deg F</u> Time <u>2 Hours</u> Other <u>---</u>			<b>TECHNIQUE (QW-410)</b> Travel speed <u>See Table</u> Gas Cup Size <u>3/4"-1"</u> String or Weave Bead <u>Both</u> Contact Tube to Work Distance <u>1"-11/4"</u> Oscillation <u>none</u> Multi-pass or Single Pass (per side) <u>Multiple</u> Number of Electrodes <u>Single</u> Interpass Cleaning <u>Grinding, chipping, brushing, to remove all dirt, slag, grease and rust within 1" of weld</u> Back gouging Meth. <u>none</u> Peening <u>none</u> Other: <u>Max J/in qualified 69,767 J/in</u>																	
<b>WELDING PROCEDURE</b>																				
Layer/Pass	Process	Filler metal class	Diameter	Cur. type	Amps	WFS	Volts	Travel spd	Other											
	SAW	EM12K	5/32	DCEP	325-510		28-34	10-15IPM												
	SAW	EM12K	1/8	DCEP	350-580		28-34	10-17IPM												

Procedure Qualification Record

01SAP03HT

PQR No. 01SAP03HT Revision \_\_\_\_\_ Date 2/28/2003 By M. Olson

Reference WPS No. AWP01HT,SWP01HT

Welding Process(es) SMAW SAW Type Manual  Machine  Semi-Auto  Auto

**JOINT (QW-402)**

Type Butt

Single  Double Weld

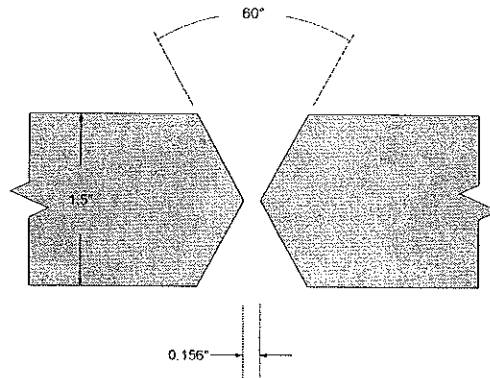
Backing Yes  No

Backing Material weld metal or base metal backing

Metal  Nonfusing-Metal

Nonmetallic  Other

Other **CVN PQR Only**  
**Mechanical testing done on PQR 01SAP03HT**  
**This PQR was qualified for supplementary**  
**essential variables per QW-403**



**BASE METALS (QW-403)**

P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2

Material Specification: SA516 to SA516

Type or Grade: 65N or 70N to 65N or 70N

Thickness of test coupon: 1.500 in

Diameter of test coupon: ---

Chemical analysis: ---

Mechanical property: ---

Other: ---

**FILLER METALS (QW-404)**

SFA Specification 5.1 5.17

AWS Classification E7018-1 EM12K

F-Number 4 6

A-Number 1 1

Size of filler metals 3/16,1/4 1/8

Solid or tubular N/A Solid

Weld metal thickness .750 .750

Electrode-flux classification --- ---

Flux trade name --- L-Tech 429 (ESAB)

Consumable Insert --- ---

Chemical analysis --- ---

Other ESAB 7018-1 Spoolarc 81 (ESAB)



Procedure Qualification Record

01SAP03HT

<p><b>POSITION (QW-405)</b></p> <p>Position of Groove <u>1G</u> Fillet <u>---</u></p> <p>Vertical Progression: Up <input type="checkbox"/> Down <input type="checkbox"/></p> <p>Other <u>---</u></p>	<p><b>GAS (QW-408)</b></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:30%;"></th> <th style="width:30%;">Gas</th> <th style="width:20%;">Composition (mixture)</th> <th style="width:20%;">Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shield:</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Trail:</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Back:</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Other:</td> <td colspan="3"><u>---</u></td> </tr> </tbody> </table>		Gas	Composition (mixture)	Flow Rate	Shield:	<u>---</u>	<u>---</u>	<u>---</u>	Trail:	<u>---</u>	<u>---</u>	<u>---</u>	Back:	<u>---</u>	<u>---</u>	<u>---</u>	Other:	<u>---</u>		
	Gas	Composition (mixture)	Flow Rate																		
Shield:	<u>---</u>	<u>---</u>	<u>---</u>																		
Trail:	<u>---</u>	<u>---</u>	<u>---</u>																		
Back:	<u>---</u>	<u>---</u>	<u>---</u>																		
Other:	<u>---</u>																				
<p><b>PREHEAT (QW-406)</b></p> <p>Preheat Temp., Min. <u>150 deg. F</u></p> <p>Interpass Temp., Min. <u>---</u> Max. <u>550 deg. F</u></p> <p>Preheat maintenance <u>None</u></p> <p>Other <u>---</u></p>	<p><b>ELECTRICAL CHARACTERISTICS (QW-409)</b></p> <p>Current: AC <input type="checkbox"/> DCEP <input checked="" type="checkbox"/> DCEN <input type="checkbox"/> Pulsed <input type="checkbox"/></p> <p>Amps: <u>See Table</u> Volts: <u>See Table</u></p> <p>Transfer Mode (GMAW):</p> <p style="padding-left: 40px;">Short-Circuiting <input type="checkbox"/> Globular <input type="checkbox"/> Spray <input type="checkbox"/></p> <p>Electrode wire feed speed range: <u>Not Recorded</u></p> <p>Tungsten electrode (GTAW):</p> <p style="padding-left: 40px;">Size <u>---</u> Type <u>---</u></p> <p>Other <u>---</u></p>																				
<p><b>POSTWELD HEAT TREATMENT (QW-407)</b></p> <p>Required? <input type="checkbox"/></p> <p>Temperature <u>1150 deg F +/- 25 deg F</u></p> <p>Time <u>2 HRS</u></p> <p>Other: <u>---</u></p>																					
<p><b>TECHNIQUE (QW-410)</b></p> <p>Travel speed <u>See Table</u> Gas Cup Size <u>3/4"-1" max</u></p> <p>String or Weave Bead <u>Both</u> Contact Tube to Work Distance <u>1"-1 1/4"</u></p> <p>Oscillation <u>---</u></p> <p>Multi-pass or Single Pass (per side) <u>Multiple</u> Number of Electrodes <u>Single</u></p> <p>Interpass Cleaning <u>Chipping, Grinding, Brushing to remove all dirt, rust, slag, grease from within 1" of each side of weld area</u></p> <p>Back gouging Method <u>None</u></p> <p>Peening <u>None</u></p> <p>Other: <u>---</u></p>																					

Procedure Qualification Record

01SAP03HT

TESTS (QW-483)

TENSILE TEST (QW-150)

Specimen no.	Width	Thickness	Area	Ultimate tensile load, lb	Ultimate unit stress, psi	Character of failure and location
Top A	.758	.656	.497	35,950	72,300	Base Metal/Ductile
Top B	.765	.664	.508	35,150	71,200	Base Metal/Ductile
Bottom A	.754	.751	.566	40,350	71,300	Base Metal/Ductile
Bottom B	.761	.773	.588	41,650	70,800	Base Metal/Ductile

GUIDED BEND TEST (QW-160)

Specimen no.	Type of bend	Figure No.	Result	Remark
1	Side Bends		Satisfactory	
2	Side Bends		Satisfactory	
3	Side Bends		Satisfactory	
4	Side Bends		Satisfactory	

Are impact required?

TOUGHNESS TEST (QW-170)

Specimen no.	Notch Location	Notch Type	Test Temp. ( F )	Impact Values(ft-lb)	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break

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 John Moore/Leonard Smith Clock no. 19/5 Stamp no. 19/5

Test conducted by Sherry Lab Laboratory test no. 2003020511 Test Date 2/28/2003

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 Smithco Engineering, Inc. By Michael Olson Code Year 2001

Date 2/28/2003



Remark: \_\_\_\_\_

**Smithco Engineering, Inc.**  
**Procedure Qualification Record**

WELDING PROCEDURE									
Layer/pass	Process	Filler metal class	Diameter	Cur. type	Amps	WFS	Volts	Travel spd.	Other
1	SMAW	E7018-1	3/16	DCEP	205		22	6.01IPM	45,025 J/in
2	SMAW	E7018-1	1/4	DCEP	300		23	6.32IPM	65,506 J/in
3	SMAW	E7018-1	1/4	DCEP	300		23	10.93IPM	37,877 J/in
4	SMAW	E7018-1	1/4	DCEP	300		23	7.75IPM	53,419 J/in
5	SMAW	E7018-1	1/4	DCEP	300		23	8.89IPM	45,569 J/in
6	SMAW	E7018-1	1/4	DCEP	300		23	8.30IPM	49,880 J/in
7	SMAW	E7018-1	1/4	DCEP	300		23	6.67IPM	62,069 J/in
8	SMAW	E7018-1	1/4	DCEP	300		23	6.33IPM	65,403 J/in
9	SAW	EM12K	1/8	DCEP	400		28	16IPM	42,000 J/in
10	SAW	EM12K	1/8	DCEP	500		30	13.3IPM	67,669 J/in
11	SAW	EM12K	1/8	DCEP	500		30	12.9IPM	69,767 J/in
12	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in
13	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in
14	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in
15	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in
16	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in
17	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in
18	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in
19	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in
20	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in
21	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in
22	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in

# Smithco Engineering, Inc.

## Procedure Qualification Record

PQR No. 01SAP03HT.1 Revision \_\_\_\_\_ Date 5/8/2003 By M. Olson

Reference WPS No. AWP01HT,SWP01HT

Welding Process(es) SMAW Type Manual  Machine  Semi-Auto  Auto

**JOINT (QW-402)**

Type Butt

Single  Double Weld

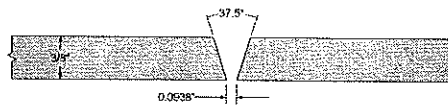
Backing Yes  No

Backing Material weld metal or base metal backing

Metal  Nonfusing-Metal

Nonmetallic  Other

Other **CVN PQR Only**  
**Mechanical testing done on PQR 01SAP03HT**  
**This PQR was qualified for supplementary essential variables per QW-403**



**BASE METALS (QW-403)**

P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2

Material Specification: SA516 to SA516

Type or Grade: 65N or 70N to 65N or 70N

Thickness of test coupon: .375 in

Diameter of test coupon: ---

Chemical analysis: ---

Mechanical property: ---

Other: ---

**FILLER METALS (QW-404)**

SFA Specification	<u>5.1</u>	_____	_____
AWS Classification	<u>E7018-1</u>	_____	_____
F-Number	<u>4</u>	_____	_____
A-Number	<u>1</u>	_____	_____
Size of filler metals	<u>3/16, 1/4</u>	_____	_____
Solid or tubular	<u>N/A</u>	_____	_____
Weld metal thickness	<u>.375</u>	_____	_____
Electrode-flux classification	<u>---</u>	_____	_____
Flux trade name	<u>---</u>	_____	_____
Consumable Insert	<u>---</u>	_____	_____
Chemical analysis	<u>---</u>	_____	_____
Other	<u>ESAB 7018-1</u>	_____	_____

Procedure Qualification Record

01SAP03HT.1

<p><b>POSITION (QW-405)</b></p> <p>Position of Groove <u>1G</u> Fillet <u>---</u></p> <p>Vertical Progression: Up <input type="checkbox"/> Down <input type="checkbox"/></p> <p>Other <u>---</u></p>	<p><b>GAS (QW-408)</b></p> <table style="width:100%; border-collapse: collapse;"> <tr> <th style="width:30%;"></th> <th style="width:30%;">Gas</th> <th style="width:20%;">Composition (mixture)</th> <th style="width:20%;">Flow Rate</th> </tr> <tr> <td>Shield</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Trail</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Back</td> <td><u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Other:</td> <td colspan="3"><u>---</u></td> </tr> </table>		Gas	Composition (mixture)	Flow Rate	Shield	<u>---</u>	<u>---</u>	<u>---</u>	Trail	<u>---</u>	<u>---</u>	<u>---</u>	Back	<u>---</u>	<u>---</u>	<u>---</u>	Other:	<u>---</u>		
	Gas	Composition (mixture)	Flow Rate																		
Shield	<u>---</u>	<u>---</u>	<u>---</u>																		
Trail	<u>---</u>	<u>---</u>	<u>---</u>																		
Back	<u>---</u>	<u>---</u>	<u>---</u>																		
Other:	<u>---</u>																				
<p><b>PREHEAT (QW-406)</b></p> <p>Preheat Temp., Min. <u>150 deg. F</u></p> <p>Interpass Temp., Min. <u>---</u> Max. <u>550 deg. F</u></p> <p>Preheat maintenance <u>None</u></p> <p>Other <u>---</u></p>	<p><b>ELECTRICAL CHARACTERISTICS (QW-409)</b></p> <p>Current: AC <input type="checkbox"/> DCEP <input checked="" type="checkbox"/> DCEN <input type="checkbox"/> Pulsed <input type="checkbox"/></p> <p>Amps: <u>See Table</u> Volts: <u>See Table</u></p> <p>Transfer Mode (GMAW):</p> <p style="padding-left: 20px;">Short-Circuiting <input type="checkbox"/> Globular <input type="checkbox"/> Spray <input type="checkbox"/></p> <p>Electrode wire feed speed range: <u>Not Recorded</u></p> <p>Tungsten electrode (GTAW):</p> <p style="padding-left: 20px;">Size <u>---</u> Type <u>---</u></p> <p>Other <u>---</u></p>																				
<p><b>POSTWELD HEAT TREATMENT (QW-407)</b></p> <p>Required? <input type="checkbox"/></p> <p>Temperature <u>1150 deg F +/- 25 deg F</u></p> <p>Time <u>8 HRS</u></p> <p>Other: <u>---</u></p>																					

**TECHNIQUE (QW-410)**

Travel speed See Table Gas Cup Size ---

String or Weave Bead Both Contact Tube to Work Distance 1/4"-1/2"

Oscillation ---

Multi-pass or Single Pass (per side) Multiple Number of Electrodes Single

Interpass Cleaning Chipping,Grinding,Brushing to remove all dirt,rust,slag,grease from within 1" of each side of weld area

Back gouging Method None

Peening None

Other: ---

**WELDING PROCEDURE**

Layer/pass	Process	Filler metal class	Diameter	Cur. type	Amps	WFS	Volts	Travel spd.	Other
1	SMAW	E7018-1	3/16	DCEP	205		22	6.01IPM	45,025 J/in
2	SMAW	E7018-1	1/4	DCEP	300		23	6.32IPM	65,506 J/in

Procedure Qualification Record

01SAP03HT.1

TESTS (QW-483)

TENSILE TEST (QW-150)

Specimen no.	Width	Thickness	Area	Ultimate tensile load, lb	Ultimate unit stress, psi	Character of failure and location

GUIDED BEND TEST (QW-160)

Specimen no.	Type of bend	Figure No.	Result	Remark

Are impact required?

TOUGHNESS TEST (QW-170)

Specimen no.	Notch Location	Notch Type	Test Temp. ( F )	Impact Values(ft-lb)	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break
SMAW	Weld	Charpy V	-56	69,45,24	65,40,25	81,51,29		
SMAW	HAZ	Charpy V	-56	26,34,38	25,30,35	30,40,42		

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: \_\_\_\_\_

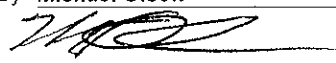
Welder's name John Moore Clock no. 19 Stamp no. 19

Test conducted by Sherry Lab Laboratory test no. 2003050023-1 Test Date 5/8/2003

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 Smithco Engineering, Inc. By Michael Olson Code Year 2001

Date 5/8/2003



Remark: Specimen Size-10mm x 7.33mm

Procedure Qualification Record

01SAP03HT.2

PQR No. 01SAP03HT.2 Revision 0 Date 11/6/2003 By M. Olson

Reference WPS No. AWP01HT

Welding Process(es) SAW Type Manual  Machine  Semi-Auto  Auto

**JOINT (QW-402)**

Type Butt

Single  Double Weld

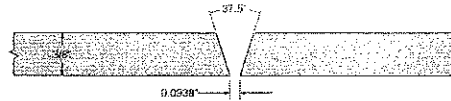
Backing Yes  No

Backing Material weld metal or base metal backing

Metal  Nonfusing-Metal

Nonmetallic  Other

Other **CVN PQR Only**  
**Mechanical testing done on PQR 01SAP03HT**  
**This PQR was qualified for supplementary**  
**essential variables per QW-403**



**BASE METALS (QW-403)**

P-No. 1 Group No. 1 or 2 to P-No. 1 Group No. 1 or 2

Material Specification: SA516 to SA516

Type or Grade: 65N or 70N to 65N or 70N

Thickness of test coupon: .375 in

Diameter of test coupon: ---

Chemical analysis: ---

Mechanical property: ---

Other: ---

**FILLER METALS (QW-404)**

SFA Specification 5.17

AWS Classification EM12K

F-Number 6

A-Number 1

Size of filler metals 5/32, 1/8

Solid or tubular Solid

Weld metal thickness .375

Electrode-flux classification ---

Flux trade name L-Tech #429

Consumable Insert ---

Chemical analysis ---

Other EM12K(L-Tech #81)

Procedure Qualification Record

01SAP03HT.2

<p><b>POSITION (QW-405)</b></p> <p>Position of Groove <u>1G</u> Fillet <u>---</u></p> <p>Vertical Progression: Up <input type="checkbox"/> Down <input type="checkbox"/></p> <p>Other <u>---</u></p>	<p><b>GAS (QW-408)</b></p> <table style="width:100%; border-collapse: collapse;"> <tr> <th style="width:30%;">Gas</th> <th style="width:30%;">Composition (mixture)</th> <th style="width:40%;">Flow Rate</th> </tr> <tr> <td>Shield. <u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Trail. <u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Back. <u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td colspan="3">Other: <u>---</u></td> </tr> </table>	Gas	Composition (mixture)	Flow Rate	Shield. <u>---</u>	<u>---</u>	<u>---</u>	Trail. <u>---</u>	<u>---</u>	<u>---</u>	Back. <u>---</u>	<u>---</u>	<u>---</u>	Other: <u>---</u>		
Gas	Composition (mixture)	Flow Rate														
Shield. <u>---</u>	<u>---</u>	<u>---</u>														
Trail. <u>---</u>	<u>---</u>	<u>---</u>														
Back. <u>---</u>	<u>---</u>	<u>---</u>														
Other: <u>---</u>																
<p><b>PREHEAT (QW-406)</b></p> <p>Preheat Temp., Min. <u>150 deg. F</u></p> <p>Interpass Temp., Min. <u>---</u> Max. <u>550 deg. F</u></p> <p>Preheat maintenance <u>None</u></p> <p>Other <u>---</u></p>	<p><b>ELECTRICAL CHARACTERISTICS (QW-409)</b></p> <p>Current: AC <input type="checkbox"/> DCEP <input checked="" type="checkbox"/> DCEN <input type="checkbox"/> Pulsed <input type="checkbox"/></p> <p>Amps: <u>See Table</u> Volts: <u>See Table</u></p> <p>Transfer Mode (GMAW):</p> <p style="padding-left: 40px;">Short-Circuiting <input type="checkbox"/> Globular <input type="checkbox"/> Spray <input type="checkbox"/></p> <p>Electrode wire feed speed range: <u>Not Recorded</u></p> <p>Tungsten electrode (GTAW):</p> <p style="padding-left: 40px;">Size <u>---</u> Type <u>---</u></p> <p>Other <u>---</u></p>															
<p><b>POSTWELD HEAT TREATMENT (QW-407)</b></p> <p>Required? <input type="checkbox"/></p> <p>Temperature <u>1150 deg F +/- 25 deg F</u></p> <p>Time <u>8 HRS</u></p> <p>Other: <u>---</u></p>																

**TECHNIQUE (QW-410)**

Travel speed See Table Gas Cup Size 3/4"-1" max

String or Weave Bead Both Contact Tube to Work Distance 1"-11/4"

Oscillation ---

Multi-pass or Single Pass (per side) Multiple Number of Electrodes Single

Interpass Cleaning Chipping, Grinding, Brushing to remove all dirt, rust, slag, grease from within 1" of each side of weld area

Back gouging Method None

Peening None

Other: ---

**WELDING PROCEDURE**

Layer/pass	Process	Filler metal class	Diameter	Cur. type	Amps	WFS	Volts	Travel spd.	Other
1	SAW	EM12K	1/8	DCEP	500		30	12.9IPM	69,767 J/in
2	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in



Procedure Qualification Record

01SAP03HT.2

TESTS (QW-483)

TENSILE TEST (QW-150)

Specimen no.	Width	Thickness	Area	Ultimate tensile load, lb	Ultimate unit stress, psi	Character of failure and location

GUIDED BEND TEST (QW-160)

Specimen no.	Type of bend	Figure No.	Result	Remark

Are impact required?

TOUGHNESS TEST (QW-170)

Specimen no.	Notch Location	Notch Type	Test Temp. ( F )	Impact Values(ft-lb)	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break
SAW	Weld	Charpy V	-50	20,26,24				
SAW	Haz	Charpy V	-50	31,28,30				

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 Leonard Smith Clock no. 5 Stamp no. 5

Test conducted by Bennett Steel Laboratory test no. 03-3393 Test Date 11/6/2003

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 Smithco Engineering, Inc. By Michael Olson Code Year 2001

Date 11/6/2003



Remark: \_\_\_\_\_

# Smithco Engineering, Inc.

## Procedure Qualification Record

PQR No. 01SAP03HT.3      Revision \_\_\_\_\_      Date 6/23/2003      By M. Olson

Reference WPS No. AWP01HT,SWP01HT

Welding Process(es) SMAW    SAW      Type    Manual     Machine     Semi-Auto     Auto

**JOINT (QW-402)**

Type Butt

Single     Double Weld

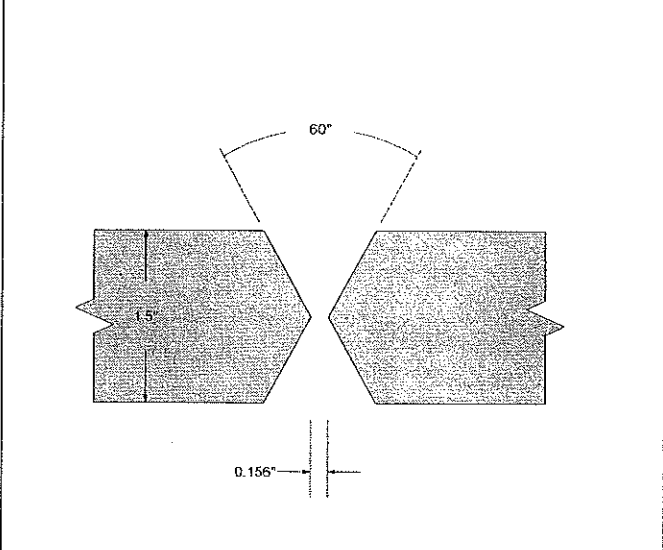
Backing    Yes     No

Backing Material weld metal or base metal backing

Metal                       Nonfusing-Metal

Nonmetallic                 Other

Other **CVN PQR Only**  
**Mechanical testing done on PQR 01SAP03HT**  
**This PQR was qualified for supplementary**  
**essential variables per QW-403**



**BASE METALS (QW-403)**

P-No. 1      Group No. 1 or 2      to P-No. 1      Group No. 1 or 2

Material Specification: SA516      to SA516

Type or Grade: 65N or 70N      to 65N or 70N

Thickness of test coupon: 1.500 in

Diameter of test coupon: ---

Chemical analysis: ---

Mechanical property: ---

Other: ---

**FILLER METALS (QW-404)**

SFA Specification	<u>5.1</u>	<u>5.17</u>	_____
AWS Classification	<u>E7018-1</u>	<u>EM12K</u>	_____
F-Number	<u>4</u>	<u>6</u>	_____
A-Number	<u>1</u>	<u>1</u>	_____
Size of filler metals	<u>3/16,1/4</u>	<u>1/8</u>	_____
Solid or tubular	<u>N/A</u>	<u>Solid</u>	_____
Weld metal thickness	<u>.750</u>	<u>.750</u>	_____
Electrode-flux classification	<u>---</u>	<u>---</u>	_____
Flux trade name	<u>---</u>	<u>L-Tech 429 (ESAB)</u>	_____
Consumable Insert	<u>---</u>	<u>---</u>	_____
Chemical analysis	<u>---</u>	<u>---</u>	_____
Other	<u>ESAB 7018-1</u>	<u>Spoolarc 81 (ESAB)</u>	_____

Procedure Qualification Record

01SAP03HT.3

<p><b>POSITION (QW-405)</b></p> <p>Position of Groove <u>1G</u> Fillet <u>---</u></p> <p>Vertical Progression: Up <input type="checkbox"/> Down <input type="checkbox"/></p> <p>Other <u>---</u></p>	<p><b>GAS (QW-408)</b></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:30%;">Gas</th> <th style="width:30%;">Composition (mixture)</th> <th style="width:40%;">Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shield. <u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Trail. <u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td>Back. <u>---</u></td> <td><u>---</u></td> <td><u>---</u></td> </tr> <tr> <td colspan="3">Other: <u>---</u></td> </tr> </tbody> </table>	Gas	Composition (mixture)	Flow Rate	Shield. <u>---</u>	<u>---</u>	<u>---</u>	Trail. <u>---</u>	<u>---</u>	<u>---</u>	Back. <u>---</u>	<u>---</u>	<u>---</u>	Other: <u>---</u>		
Gas	Composition (mixture)	Flow Rate														
Shield. <u>---</u>	<u>---</u>	<u>---</u>														
Trail. <u>---</u>	<u>---</u>	<u>---</u>														
Back. <u>---</u>	<u>---</u>	<u>---</u>														
Other: <u>---</u>																
<p><b>PREHEAT (QW-406)</b></p> <p>Preheat Temp., Min. <u>150 deg. F</u></p> <p>Interpass Temp., Min. <u>---</u> Max. <u>550 deg. F</u></p> <p>Preheat maintenance <u>None</u></p> <p>Other <u>---</u></p>	<p><b>ELECTRICAL CHARACTERISTICS (QW-409)</b></p> <p>Current: AC <input type="checkbox"/> DCEP <input checked="" type="checkbox"/> DCEN <input type="checkbox"/> Pulsed <input type="checkbox"/></p> <p>Amps: <u>See Table</u> Volts: <u>See Table</u></p> <p>Transfer Mode (GMAW):</p> <p style="padding-left: 40px;">Short-Circuiting <input type="checkbox"/> Globular <input type="checkbox"/> Spray <input type="checkbox"/></p> <p>Electrode wire feed speed range: <u>Not Recorded</u></p> <p>Tungsten electrode (GTAW):</p> <p style="padding-left: 40px;">Size <u>---</u> Type <u>---</u></p> <p>Other <u>---</u></p>															
<p><b>POSTWELD HEAT TREATMENT (QW-407)</b></p> <p>Required? <input type="checkbox"/></p> <p>Temperature <u>1150 deg F +/- 25 deg F</u></p> <p>Time <u>4 HRS</u></p> <p>Other: <u>---</u></p>																
<p><b>TECHNIQUE (QW-410)</b></p> <p>Travel speed <u>See Table</u> Gas Cup Size <u>3/4"-1" max</u></p> <p>String or Weave Bead <u>Both</u> Contact Tube to Work Distance <u>1"-1 1/4"</u></p> <p>Oscillation <u>---</u></p> <p>Multi-pass or Single Pass (per side) <u>Multiple</u> Number of Electrodes <u>Single</u></p> <p>Interpass Cleaning <u>Chipping,Grinding,Brushing to remove all dirt,rust,slag,grease from within 1" of each side of weld area</u></p> <p>Back gouging Method <u>None</u></p> <p>Peening <u>None</u></p> <p>Other: <u>---</u></p>																

Procedure Qualification Record

01SAP03HT.3

TESTS (QW-483)

TENSILE TEST (QW-150)

Specimen no.	Width	Thickness	Area	Ultimate tensile load, lb	Ultimate unit stress, psi	Character of failure and location

GUIDED BEND TEST (QW-160)

Specimen no.	Type of bend	Figure No.	Result	Remark

Are impact required?

TOUGHNESS TEST (QW-170)

Specimen no.	Notch Location	Notch Type	Test Temp. ( F )	Impact Values(ft-lb)	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break
1	Weld	Charpy V	-50	32,41,56	30,35,45	26,33,44		
2	HAZ	Charpy V	-50	37,33,35	30,25,30	32,29,30		

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: \_\_\_\_\_

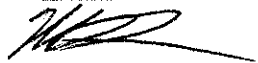
Welder's name Dale Madison Clock no. 42 Stamp no. 42

Test conducted by Sherry Lab Laboratory test no. 2003060376 Test Date 6/23/2003

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 Smithco Engineering, Inc. By Michael Olson Code Year 2001

Date 6/23/2003



Remark: \_\_\_\_\_

**Procedure Qualification Record**

01SAP03HT.3

WELDING PROCEDURE									
Layer/pass	Process	Filler metal class	Diameter	Cur. type	Amps	WFS	Volts	Travel spd.	Other
1	SMAW	E7018-1	3/16	DCEP	210		22	6.21IPM	44,638 J/in
2	SMAW	E7018-1	1/4	DCEP	305		23	6.52IPM	64,555 J/in
3	SMAW	E7018-1	1/4	DCEP	305		23	11IPM	38,264 J/in
4	SMAW	E7018-1	1/4	DCEP	305		23	8IPM	52,613 J/in
5	SMAW	E7018-1	1/4	DCEP	300		23	8IPM	51,750 J/in
6	SMAW	E7018-1	1/4	DCEP	300		23	8.5IPM	48,706 J/in
7	SMAW	E7018-1	1/4	DCEP	300		23	7IPM	59,143 J/in
8	SMAW	E7018-1	1/4	DCEP	300		23	7IPM	59,143 J/in
9	SAW	EM12K	1/8	DCEP	400		29	17IPM	40,941 J/in
10	SAW	EM12K	1/8	DCEP	500		30	14IPM	64,286 J/in
11	SAW	EM12K	1/8	DCEP	500		30	13IPM	69,231 J/in
12	SAW	EM12K	1/8	DCEP	500		30	14IPM	64,286 J/in
12	SAW	EM12K	1/8	DCEP	500		30	14IPM	64,286 J/in
12	SAW	EM12K	1/8	DCEP	500		30	14IPM	64,286 J/in
12	SAW	EM12K	1/8	DCEP	500		30	14IPM	64,286 J/in
16	SAW	EM12K	1/8	DCEP	500		30	14.1IPM	63,830 J/in
12	SAW	EM12K	1/8	DCEP	500		30	14IPM	64,286 J/in
12	SAW	EM12K	1/8	DCEP	500		30	14IPM	64,286 J/in
12	SAW	EM12K	1/8	DCEP	500		30	14IPM	64,286 J/in
12	SAW	EM12K	1/8	DCEP	500		30	14IPM	64,286 J/in



# MOORE FANS LLC

INSTALLATION MANUAL

800 S. MISSOURI AVENUE  
 MARCELINE, MO 64658 USA  
 TELEPHONE: (660) 376-3575  
 FACSIMILE: (660) 376-2909

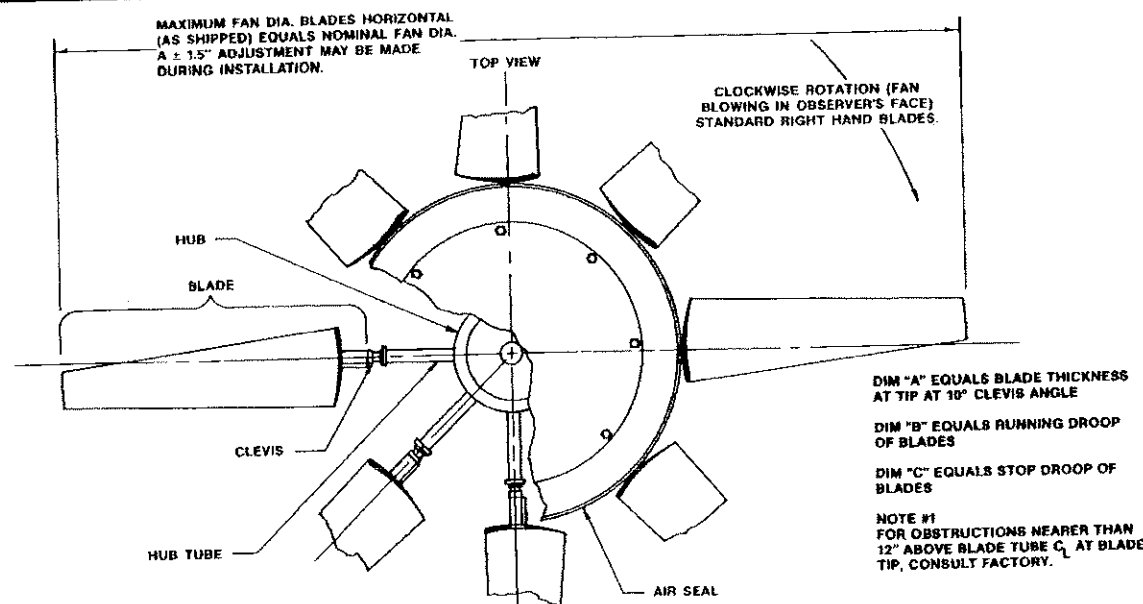
SOLD TO SMITHCO ENGINEERING INC.  
 304  
 PO BOX 571330  
 TULSA OK 74157-1330

JOB NO.: 78251

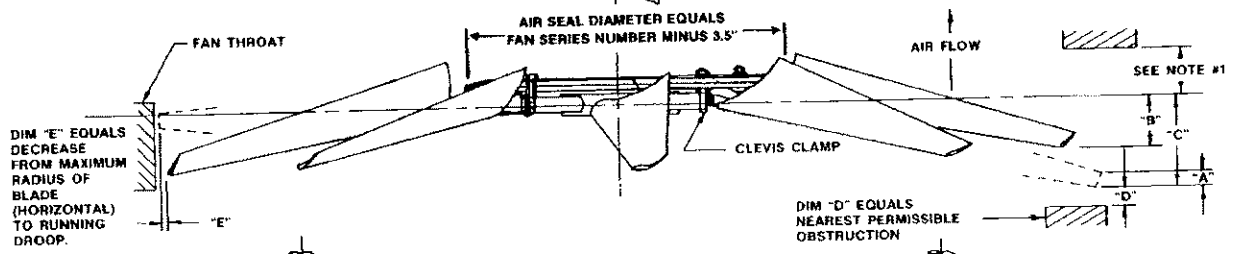
SHIP TO METAL SERVICES  
 644 W. 41ST ST  
 TULSA OK 74107

INVOICE DATE:  
 MODEL NO.: 5449/8B-M-12-A-6  
 PURCHASE ORDER NO: J19604  
 CUSTOMER JOB NO: 04B378  
 SHIP REQUIRED: 05/05/2004  
 PAYMENT TERMS: NET 30 DAYS  
 ROUTING: MOORE TULSA  
 F.O.B. POINT: MARCELINE, MO.  
 FREIGHT: PREPAID  
 CRATING: STANDARD DOMESTIC

QTY	DESCRIPTION
3	5449/8B-M-12-A-6
Serial Nos.: F124675-124677	
ASSEMBLY DATA	
MATERIAL: ALUMINUM	
SERIES: 49	DIA.: 12.00
BLADES: 6	TYPE: MANUAL
ARRANGEMENT: 8B	MOUNTS: SMALL
CLEVIS ANGLE: 9.0°	WEIGHT:
HUB LENGTH C/L TO BASE: 2.50	STOP DROOP: 8.50
4 INCH HOLE IN AIR SEAL: NO	CH TO TIP: 52.00
	BALANCE WT.:
	CUT DROOP
	COLOR CODE:
AIR PERFORMANCE DATA	
ELEVATION: 500 Ft.	AIR TEMPERATURE: 95 °
ACFM/FAN: 147063	RPM: 264
STATIC PRESSURE: 0.480" WG	PHUD: 1.33
VELOCITY THROUGH FAN: 1429 FPM	VELOCITY PRESSURE: 0.119" WG
BHP REQUIRED: 18.7	TIP CLEARANCE: 0.36"
THEORETICAL NO. OF BLADES: 4.9	*MOTOR HP: 25.0
	*MAXIMUM APPLIED TORQUE: 995 FT.LBS.
	BLADE LOAD FACTOR: 0.82
* MAXIMUM APPLIED TORQUE USING FACTOR OF NOMINAL TIMES 2.00 CAUTION: (FACTORY SHOULD BE NOTIFIED IF MAX. APPLIED TORQUE OR MOTOR HP IS GREATER THAN THE VALUE SHOWN.)	
ADDITIONAL NOTES: TAG HUBS AND AIR SEALS WITH JOB NO. 04B378	MARKS: P.O. NO. J19604 JOB NO. 04B378

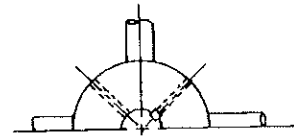


DIM "A" EQUALS BLADE THICKNESS AT TIP AT 10° CLEVIS ANGLE  
 DIM "B" EQUALS RUNNING DROOP OF BLADES  
 DIM "C" EQUALS STOP DROOP OF BLADES  
 NOTE #1  
 FOR OBSTRUCTIONS NEARER THAN 12" ABOVE BLADE TUBE C<sub>2</sub> AT BLADE TIP, CONSULT FACTORY.



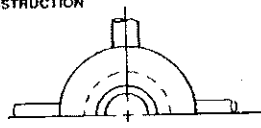
DIM "E" EQUALS DECREASE FROM MAXIMUM RADIUS OF BLADE (HORIZONTAL) TO RUNNING DROOP.

DIM "D" EQUALS NEAREST PERMISSIBLE OBSTRUCTION



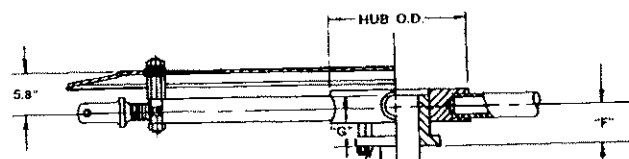
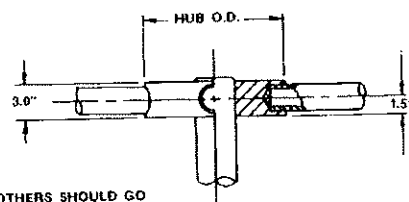
MODEL "A" HUB STRAIGHT BORE

HUB O.D.	MAX. BORE	MAX. NO. BLADES
8.0"	3.80"	6
9.0"	4.00"	8
12.0"	5.50"	10



MODEL "B" "QD" BUSHING HUB

HUB O.D.	MAX. NO. BLADES	BUSHINGS AVAILABLE
8.0"	6	SF
9.0"	8	SF, E
12.0"	10	E, J



MODEL "QD" BUSHING

BUSHING TYPE	DIM "F"	DIM "G"	MAX. BORE	MAX. BORE
SF	2.5"	2.1"	2.313"	2.688" (68mm)
E	2.8"	2.7"	2.875"	3.50" (90mm)
J	3.2"	4.6"	3.750"	4.50" (100mm)

SHAFT BY OTHERS SHOULD GO COMPLETELY THROUGH HUB OR "QD" BUSHING  
 \*MAXIMUM BORE DIMENSIONS ARE WITH U.S. STANDARD SQUARE KEY  
 \*MAXIMUM BORE DIMENSIONS ARE WITH U.S. STANDARD SHALLOW KEYWAY

LETTER DIMENSIONS MAY VARY WITH BLADE ANGLE AND LOADING

NOTES	WITH FAN OPERATING AT 12000 FT./MINUTE BLADE TIP SPEED						
	FAN DIA.	DIM A	PERCENT OF BLADE LOAD		DIM C	DIM D	DIM E
			100%	75%			
	8'	4.0"	3.4"	2.9"	6.3"	1.9"	.20"
	9'	3.8"	4.1"	3.4"	7.4"	2.2"	.24"
	10'	3.4"	4.8"	3.9"	8.4"	2.5"	.29"
	11'	3.2"	5.6"	4.5"	9.5"	2.8"	.33"
	12'	2.7"	6.4"	5.1"	8.5"	3.2"	.39"
	13'	2.5"	7.2"	5.8"	11.6"	3.5"	.45"
	14'	2.3"	8.2"	6.5"	12.7"	3.8"	.52"
	15'	2.0"	9.2"	7.3"	13.8"	4.1"	.61"
	16'	1.7"	10.3"	8.2"	14.9"	4.5"	.71"

**SERIES 49 PRESSURE BLOWER**  
**MOORE FANS LLC**

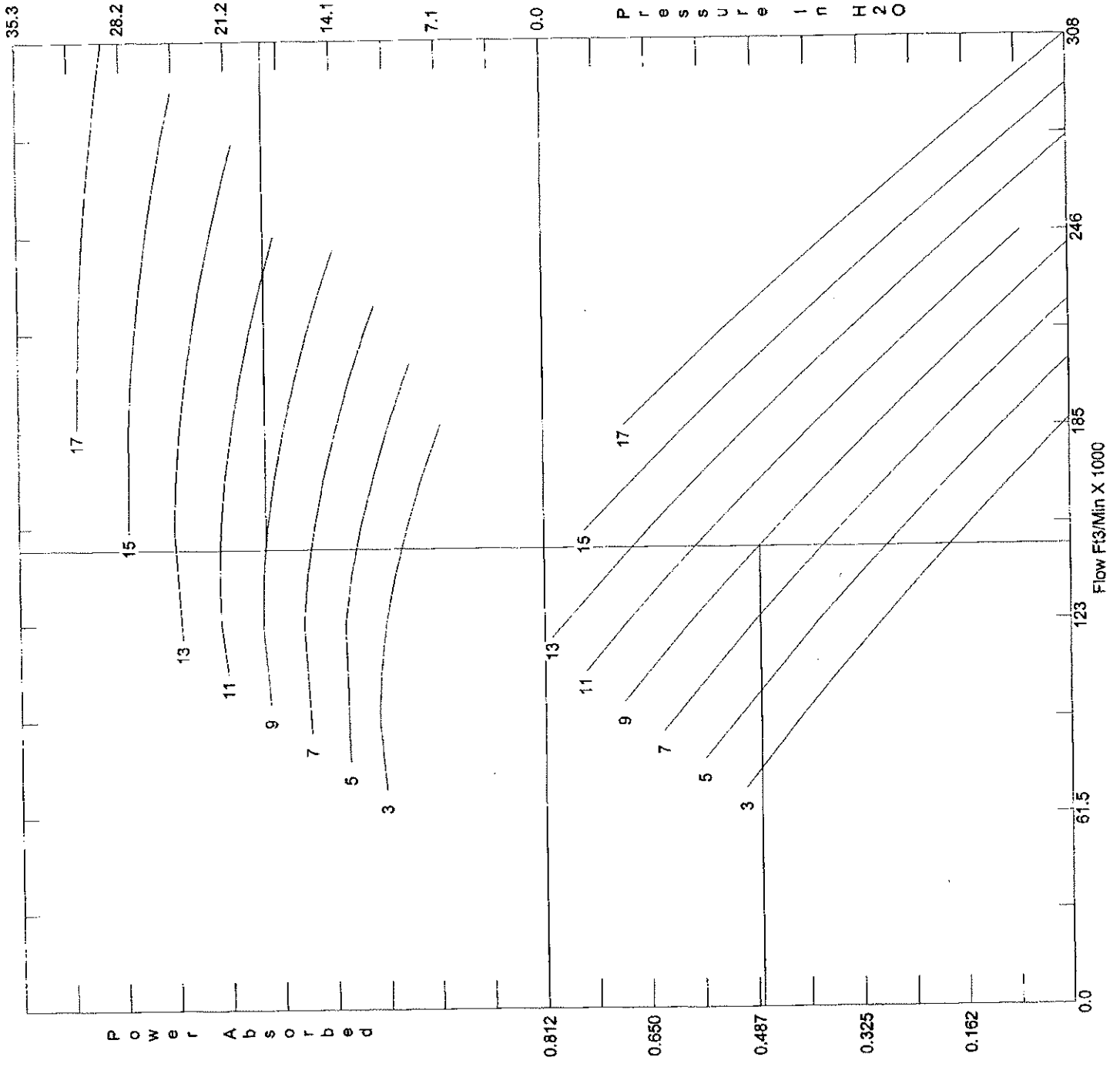
ARRANGEMENT M  
 MANUAL ADJUSTMENT

Moore Fans LLC  
 300 S. Missouri Ave  
 Marcelline, MO 64658  
 Telephone: (660) 376-3575  
 Facsimile: (660) 376-2909

Customer: SMITHCO ENGINEERING  
 Reference: P.O. NO. J19604  
 Item: JOB NO. 04B378  
 Curve No: MOORE JOB NO. 78251

CLASS 5000  
 SERIES 49  
 Diameter feet 12  
 No. Blades 6  
 R.P.M. 264  
 Temperature 95 Fahrenheit  
 Elevation 500 feet  
 Density 0.94 Ratio  
 Duty Volume 147063 F3/Mir  
 Duty Pressure 0.48 In H2O  
 Power Absorbed 18.69 bhp  
 Clevis Angle 9.0

Curve generated by Moore Fans Version 1.3c





**SIEMENS ENERGY AND AUTOMATION, INC.  
TYPICAL ELECTRICAL MOTOR DATA**

CUSTOMER: SMITHCO ENGINEERING

CUSTOMER ORDER NO.: J19607, JOB#2004B3780-06

SERIAL NO.: 2009395

TYPE: RGZEESDX Totally Enclosed Fan Cooled, NEMA PREMIUM EFFICIENT, IEEE841

HORSEPOWER: 25

VOLTS: 460

PHASE: 3

HERTZ: 60

FRAME: 284T

SYNC. R.P.M.: 1800

F.L. R.P.M.: 1775

EFFICIENCY:	1/2	93.5%
	3/4	94.0%
	F.L.	93.6%

POWER FACTOR:	1/2	71%
	3/4	80%
	F.L.	84%

F.L. AMPS: 30

L.R. AMPS: 183

FULL LOAD TORQUE: 74 LB.FT

STARTING TORQUE: 180 %

BREAKDOWN TORQUE: 250 %

INSULATION: F

SERVICE FACTOR: 1.15

AMBIENT TEMP: 40 DEGREES C

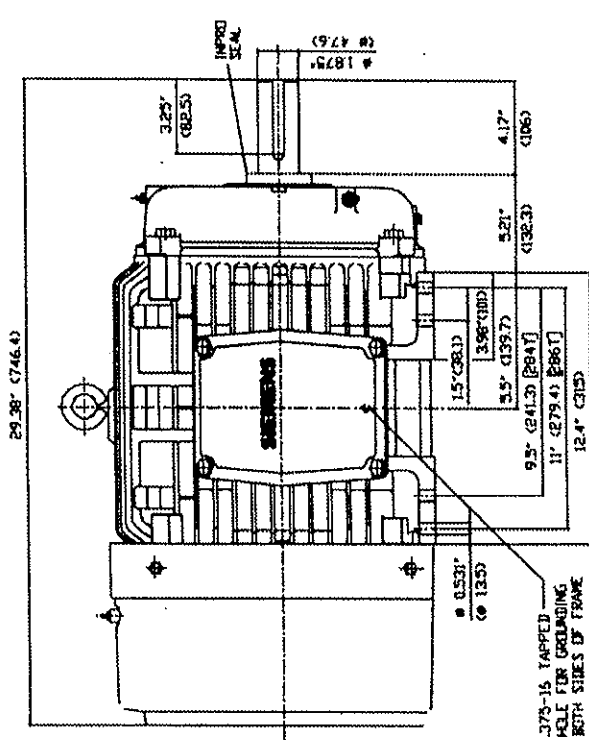
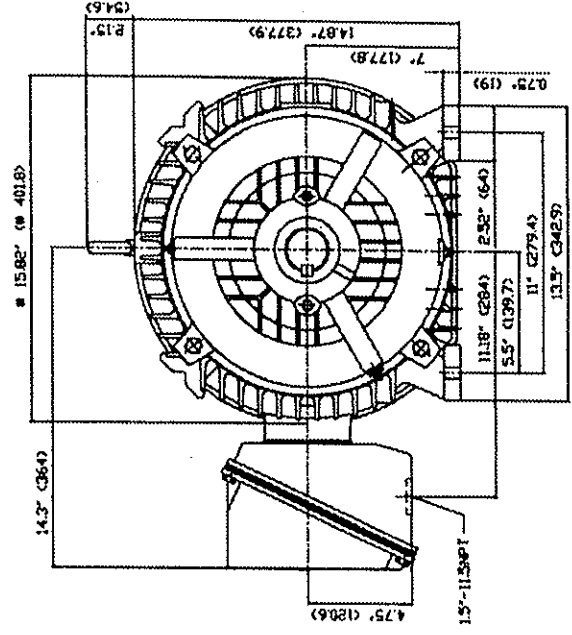
ACCESSORIES: SUITABLE FOR 480VOLT OPERATION

51-774-997-409 410 1

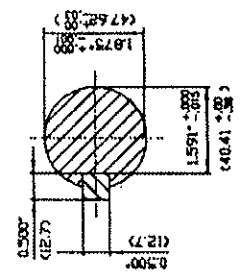
THIS IS A CAD DRAWING  
DO NOT SCALE DIMENSIONS

01 04-12-04

- NOTES:
1. CONDUIT BOX HAS OPENING FOR SIZE OF CONDUIT SHOWN FOR SMALLER CONDUIT WIRING CONTRACTOR SHOULD FURNISH REDUCING BUSHINGS.
  2. CONDUIT BOX MAY BE ROTATED IN STEPS OF 90 DEGREES.
  3. DIMENSIONS ARE SUFFICIENTLY ACCURATE FOR ORDINARY INSTALLATION.
  4. DECIMAL DIMENSIONS WITHOUT LIMITS ARE NOMINAL. NO TOLERANCES ARE IMPLIED
  5. DIMENSIONS GIVEN IN INCHES. DIMENSIONS IN PARENTHESIS ( ) ARE IN MM.



CERTIFIED PRINT		PROPERTY OF Siemens Energy & Automation, Inc. Industrial Motor Division - Little Rock, AR	
CUSTOMER	SMITHCO ENGINEERING	FRAME	284T
P.O. #	J19607	TYPE	RGZEESDX
H.P.	25	STANDARD	286T
R.P.M.	1800	TYPE	RGZEESDX
VOLTS	460	PH	3
PH	3	RZ	60
S.O. # 2009395			
TOTALLY ENCLOSED, FAN COOLED IEEE-841 ONLY FOR 4 AND 6 POLES			
1LA0			
DATE	04-12-04	DATE	
BY		BY	
CHECKED		CHECKED	
DATE		DATE	
BY		BY	
PART NO.	51-774-997-409	PART NO.	409
REV	B	REV	B



SECTION A-A

4 3 2 1



Serving the Industry Since 1952  
Member of HTRI & AICHEM

## SMITHCO ENGINEERING, INC.

P.O. Box 571330  
Tulsa, Oklahoma 74157  
Phone: (918) 446-4406  
Fax: (918) 446-7439

Co: **Matrix Engineering, Ltd**  
Ref: 13356  
Item: 50-X-107

Date: 5/5/2004

### RECOMMENDED SPARE PARTS FOR 2 YEAR OPERATION SMITHCO JOB NO. 2004B378

Item #	QTY	Description	Net Each	Total Net
001	35	A1051820 Plugs	\$5.00	\$175.00
002	70	CS1813 gasket	\$.50	\$35.00
003	1	Fan, 144 inch 6 Blade RH Adjustable Pitch Model 495000 2.4375 bore with 0.6250 X 0.3125 keyway	\$1,660.00	\$1,660.00
004	1	2.4375 X 55 Shaft with 0.6250 X 0.3125 Keyway 6.0000 one end 6.0000 other end with keys	\$258.32	\$258.32
005	1	25 HP Electric Motor Frame 284T Chem Duty 1750 RPM TEFC Enclosure 480/3/60 IEEE-841 Standards	\$1,565.00	\$1,565.00
006	2	2.4375 SCM Flange Bearings	\$166.96	\$333.92
007	1	3360 HPR 14M 55 HTD Belt	\$412.86	\$412.86
008	1	P192-14M-55 F Sprocket with 2.4375 bore 0.625 X 0.3125 keyway	\$903.02	\$903.02
009	1	P29-14M-55 SK Sprocket with 1.8750 bore 0.500 X 0.2500 keyway	\$120.50	\$120.50
			<b>TOTAL</b>	<b>\$5,463.62</b>

The recommended quantities are for remote locations.

#### PARTS / SERVICE DEPARTMENT

Tom Montgomery, Manager  
Direct line: (918) 388-0325  
[tmontgomery@smithco-eng.com](mailto:tmontgomery@smithco-eng.com)

Carol Wiley, Sales Associate  
Direct line: (918) 388-0328  
[cwiley@smithco-eng.com](mailto:cwiley@smithco-eng.com)

Customer Ni Fntn Customer Inspector Matrix Engineering, Ltd. Notification Time  
 Liberty, TX 77575 409-981-6700 5 days before fabrication start  
 Houston, TX 5 days before hydrostatic test  
 Richard Gresham

Location: Colon, Panama P.O.No.: 13356  
 Design Pressure 150. Test Pressure **3770 PSI** for 60.00 MIN. Design Temp 255. Corr.Allow.0.1250

MAWP 150. PSI at 255. Deg F.  
 MDMT -20. Deg F. at 150. PSI  
 Item 50-X-107 Service CONDENSER

Customer report requirements Copies  
 ASME U-1 8  
 Plant material report 8  
 Material mill test report 8  
 Name plate rubbing 1  
 Hydrostatic test/Temp. chart 8  
 Weld procedure & Welder qualif. 8

Customer Inspection Requirements  
 Code - ASME Section VIII Div.1 2001 /A03 Appendix 13  
 Stamp - NATL ED  
 Radiograph EACH HEAD (1)END (1)COVER  
 MDMT Charpy impact testing exempt as per UG-20(f)

NOTE: All plate must be normalized  
 Fan Test/Run-in Required

Description	Material Designation	Corroded Span	Actual Thick	Calculated Corner	Stress Midpoint	MBR Manufacturer	Heat No./Slab No.	Control or P.O. No.
Tube Sheet-front	SA-516 GR-70	9.8750	0.8750	11230.	19822.	1500. highveld	e3103 627826	1422
Length-166.5625								
-back	SA-516 GR-70	9.8750	0.8750	7707.	23598.	516. highveld	e3103 627826	1422
Length-166.5625								
Plug Sheet-front	SA-516 GR-70	9.8750	0.8750	11230.	19822.	1500. highveld	e3103 627826	1422
-back	SA-516 GR-70	9.8750	0.8750	7707.	23598.	516. highveld	e3103 627826	1422
Cover -front	SA-516 GR-70	8.0000	0.6250	23374.	8389.	1481. Oregon	121271 D2	1026
-back	SA-516 GR-70	2.7500	0.6250	17661.	14258.	1481. Oregon	121271 D2	1026
End Plate -front	SA-516 GR-70	8.0000	0.5000		19875.	vitkovice	11584 2980	0847
-back	SA-516 GR-70	2.7500	0.5000		4033.	vitkovice	11584 2980	0847
Nozzles-flange	SA-105	8.00/	3.00"	150. RF	xs	/160		J19599
-vent	SA-105	1.50"	150. RF	XX				J19599
-drain	SA-105	1.50"	150. RF	XX				J19599
Tubes	SA-214 WLD	1.0000	0.0830		0.0131			J19221
Plugs ( 716)	A1051820							

Webco B34118

Date: 05-25-2004 Plant inspection requirements & material report for ASME code vessel

Fintube bundle design No.2004B3781A Qty- 1 Serial No.



HIGHVELD STEEL AND VANADIUM CORPORATION LIMITED

P O BOX 111, WITBANK, 1035  
Registration No. 1960/001900/06

E3103 627826 1422

J19500

TELEPHONE  
National (013) 6909911  
International 27 13 6909911

FAX (013) 690 9556

Test Certificate No: P000076932 TO WHOM IT MAY CONCERN Account No: OREP 01 Date: 2002-12-12

Sales Order No: 202225/ 4 Customer Order: 4991-P77 Quality: ASME SA516 GRADE 70 - 2001  
ASTM A516 GR70 - 2001

Product: PRIME HOT ROLLED STEEL PLATES  
Dimensions: 7/8" X 96" X 425.253 KG/M  
Length: 480"

Total Pieces: 8

Cast No:	E3103	Slab No:	627821	Sub Slab No:	A	Chem:	C	0.189%	Si	0.392%	S	0.007%	P	0.007%	Mn	1.073%	V	0.009%	Ni	0.108%	Cr	0.060%	Cu	0.066%	Al	0.027%
Chem:	N	0.007%	Nb	0.001%	PIECES	1PCS	W.C.E.	0.393%																		
Mech:	AREA	1.419	SQ IN .GL	8	INCH .YP	49	KSI .UTS	76	KSI .ELG	31	% .C1	164	J .C2	161	J .C3	135	J .AVG	CHАРPY								
	153	J .TEMP	- 46DEG C																							
Cast No:	E3103	Slab No:	627822	Sub Slab No:	A	Chem:	C	0.189%	Si	0.392%	S	0.007%	P	0.007%	Mn	1.073%	V	0.009%	Ni	0.108%	Cr	0.060%	Cu	0.066%	Al	0.027%
Chem:	N	0.007%	Nb	0.001%	PIECES	1PCS	W.C.E.	0.393%																		
Mech:	AREA	1.407	SQ IN .GL	8	INCH .YP	55	KSI .UTS	76	KSI .ELG	32	% .C1	89	J .C2	111	J .C3	100	J .AVG	CHАРPY								
	100	J .TEMP	- 46DEG C																							
Cast No:	E3103	Slab No:	627823	Sub Slab No:	A	Chem:	C	0.189%	Si	0.392%	S	0.007%	P	0.007%	Mn	1.073%	V	0.009%	Ni	0.108%	Cr	0.060%	Cu	0.066%	Al	0.027%
Chem:	N	0.007%	Nb	0.001%	PIECES	1PCS	W.C.E.	0.393%																		
Mech:	AREA	1.401	SQ IN .GL	8	INCH .YP	52	KSI .UTS	76	KSI .ELG	30	% .C1	94	J .C2	96	J .C3	91	J .AVG	CHАРPY								
	100	J .TEMP	- 46DEG C																							
Cast No:	E3103	Slab No:	627824	Sub Slab No:	A	Chem:	C	0.189%	Si	0.392%	S	0.007%	P	0.007%	Mn	1.073%	V	0.009%	Ni	0.108%	Cr	0.060%	Cu	0.066%	Al	0.027%
Chem:	N	0.007%	Nb	0.001%	PIECES	1PCS	W.C.E.	0.393%																		
Mech:	AREA	1.378	SQ IN .GL	8	INCH .YP	54	KSI .UTS	78	KSI .ELG	32	% .C1	87	J .C2	83	J .C3	88	J .AVG	CHАРPY								
	100	J .TEMP	- 46DEG C																							
Cast No:	E3103	Slab No:	627825	Sub Slab No:	A	Chem:	C	0.189%	Si	0.392%	S	0.007%	P	0.007%	Mn	1.073%	V	0.009%	Ni	0.108%	Cr	0.060%	Cu	0.066%	Al	0.027%
Chem:	N	0.007%	Nb	0.001%	PIECES	1PCS	W.C.E.	0.393%																		
Mech:	AREA	0.191	SQ IN .GL	2	INCH .YP	48	KSI .UTS	77	KSI .ELG	37	% .C1	89	J .C2	111	J .C3	100	J .AVG	CHАРPY								
	100	J .TEMP	- 46DEG C																							
Cast No:	E3103	Slab No:	627826	Sub Slab No:	A	Chem:	C	0.189%	Si	0.392%	S	0.007%	P	0.007%	Mn	1.073%	V	0.009%	Ni	0.108%	Cr	0.060%	Cu	0.066%	Al	0.027%
Chem:	N	0.007%	Nb	0.001%	PIECES	1PCS	W.C.E.	0.393%																		
Mech:	AREA	1.393	SQ IN .GL	8	INCH .YP	56	KSI .UTS	78	KSI .ELG	31	% .C1	161	J .C2	154	J .C3	137	J .AVG	CHАРPY								
	151	J .TEMP	- 46DEG C																							
Cast No:	E3103	Slab No:	627827	Sub Slab No:	A	Chem:	C	0.189%	Si	0.392%	S	0.007%	P	0.007%	Mn	1.073%	V	0.009%	Ni	0.108%	Cr	0.060%	Cu	0.066%	Al	0.027%
Chem:	N	0.007%	Nb	0.001%	PIECES	1PCS	W.C.E.	0.393%																		
Mech:	AREA	1.199	SQ IN .GL	8	INCH .YP	53	KSI .UTS	77	KSI .ELG	32	% .C1	77	J .C2	70	J .C3	74	J .AVG	CHАРPY								
	100	J .TEMP	- 46DEG C																							

REMARKS GL = GAUGE LENGTH, YP = YIELD POINT, UTS = ULTIMATE TENSILE STRENGTH, ELG = ELONGATION, W.C.E. = WELDABILITY CARBON EQUIVALENT, CI = CHARPY TEST 1, C2 = CHARPY TEST 2, C3 = CHARPY TEST 3  
 IN ANY DISPUTE RELATING TO THIS TEST CERTIFICATE THE ORIGINAL FORMAT AND DATA AS RETAINED BY HIGHVELD IN ELECTRONIC FORMAT  
 WILL CONSTITUTE PRIMA FACIE PROOF OF THE FORMAT AND CONTENT OF THE CERTIFICATE

SMITHCO ENGINEERING, INC.  
 QUALITY CONTROL

APPROVED BY JM DATE 4-15-04

JAIN GREENHORN (METALLURGIST)



METALLURGICAL DIVISION - WEB TEST CERTIFICATE

TELEPHONE

National (013) 6909911

Page 2 of 2

HIGHVELD STEEL AND VANADIUM CORPORATION LIMITED  
P O BOX 111, WITBANK, 1035

Registration No. 1960/001900/06

International 27 13 6909911

FAX (013) 690 9556

Test Certificate No: P000076932 TO WHOM IT MAY CONCERN

Account No: OREP 01 Date: 2002-12-12

Sales Order No: 202225/ 4 Customer Order: 4991-P/7

Quality: ASME SA516 GRADE 70 - 2001  
ASTM A516 GR70 - 2001

Product: PRIME HOT ROLLED STEEL PLATES  
Dimensions: 7/8" X 96" X 425.253 KG/M  
Length: 480"

Total Pieces: 8

Cast No:	E3103	Slab No:	637763	Sub Slab No:	A																				
Chem:	C	0.189%	SI	0.392%	S	0.007%	P	0.007%	Mn	1.073%	V	0.009%	Ni	0.108%	Cr	0.060%	Cu	0.066%	Al	0.027%					
	N	0.007%	Nb	0.001%	PIECES	1PCS	W.C.E.	0.393%																	
Mech:	AREA	1.379	SQ.IN.	GL	8	INCH	YP	51	KSI	UTS	74	KSI	ELG	27	%	CI	137	J	C2	155	J	C3	134	J	AVG CHARPY
	142	J	TEMP	-	46	DEG	C																		

REMARKS

QUALITY PLAN PL40/02

SLAB 627821/A WAS NORMALISED AT 918°C FOR 0 HR 45 MIN  
 SLAB 627822/A WAS NORMALISED AT 920°C FOR 0 HR 45 MIN  
 SLAB 627823/A WAS NORMALISED AT 908°C FOR 0 HR 45 MIN  
 SLAB 627824/A WAS NORMALISED AT 925°C FOR 0 HR 45 MIN  
 SLAB 627825/A WAS NORMALISED AT 906°C FOR 0 HR 45 MIN  
 SLAB 627826/A WAS NORMALISED AT 940°C FOR 0 HR 45 MIN  
 SLAB 627827/A WAS NORMALISED AT 920°C FOR 0 HR 45 MIN  
 SLAB 637763/A WAS NORMALISED AT 927°C FOR 0 HR 45 MIN

MATERIAL TESTED AND SUPPLIED IN THE NORMALISED CONDITION.  
 TEST CERTIFICATE IN ACCORDANCE WITH DIN 50049 3.1B/EN 10204 3.1B  
 CHARPY DIMENSION: 10MM X 10MM X 55MM.  
 ROLLING TOLERANCE CONFORMS TO ASTM A20.  
 PRODUCED IN THE REPUBLIC OF SOUTH AFRICA.  
 WE HEREBY CERTIFY THAT THE MATERIAL HEREIN HAS BEEN TESTED PRIOR TO DESPATCH FROM MILL.

SMITHCO ENGINEERING, INC.  
QUALITY CONTROL

APPROVED BY MD  
DATE 4-15-04

REMARKS GL = GAUGE LENGTH, YP = YIELD POINT, UTS = ULTIMATE TENSILE STRENGTH, ELG = ELONGATION, W.C.E. = WELDABILITY CARBON EQUIVALENT, CI = CHARPY TEST 1, C2 = CHARPY TEST 2, C3 = CHARPY TEST 3

IN ANY DISPUTE RELATING TO THIS TEST CERTIFICATE THE ORIGINAL FORMAT AND DATA AS RETAINED BY HIGHVELD IN ELECTRONIC FORMAT WILL CONSTITUTE PRIMA FACIE PROOF OF THE FORMAT AND CONTENT OF THE CERTIFICATE

METALLURGIST

IAN GREENHORN (METALLURGIST)

1/2/04

12/16/04

5/8 x 9 1/2 x 480 A51670 Norm.

**OREGON STEEL MILLS**  
 P.O. BOX 2760, Portland, Oregon 97208 • (503) 286-9651 Fax (503) 240-5268

**REPORT OF CHEMICAL/PHYSICAL TESTS**



**SOLD TO**  
 PORT CITY METAL SERVICES  
 16028  
 2PCS. 5/8 X 96 X 480 A516-70 NORM. PLATE  
 121271 D2 1026  
 J19500

STEEL SERVICE CO  
 24412 AMAH PARKWAY  
 CLAREMORE, OK 74017

CERTIFICATE NO.	DATE	PAGE
772,368	Sep 15 2003	1
MILL ORDER NO.	DATE	
159147		
CUSTOMER ORDER NO.		
12003		
JOB/REQ. NO.		
SHIPPING NO.	DATE	
772,368	09/15/2003	
CARRIER		
BURLINGTON NORTHERN		
CAR/TRUCK NO.		
CM6067		

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS  
 OSM CARBON PRESSURE VESSEL QUALITY ASTM A516-01 GRADE 70 ASME SA516 GRADE 70  
 2001/2002 ADDEN NORMALIZED. LCVN 15 FT/LBS AVG @ -50 F (P) 12 FT/LBS MIN.

**PHYSICAL PROPERTIES**

OSM (ITEM)	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI X 100	TENSILE PSI X 100	% ELONG 8" 2"	% RA	HARDNESS BHN	BEND TEST	IMPACTS
1	0.6250 X 96.000ME X 480.000 THE FOLLOWING PLATES WERE NORMALIZED AT 4 PCS 32672 LBS	1680	D2	550	780	23				44 42 42 42 / 42 Ft/lbs
2	0.7500 X 96.000ME X 480.000 THE FOLLOWING PLATES WERE NORMALIZED AT 2 PCS 19602 LBS 2 PCS 19602 LBS	1680	A25	515	770	26				40 40 40 34 / 38 Ft/lbs
3	1.0000 X 96.000ME X 480.000 THE FOLLOWING PLATES WERE NORMALIZED AT 1 PC 13068 LBS	1680	A24	515	760	27				42 40 35 / 39 Ft/lbs

**CHEMICAL ANALYSIS**

HEAT NO.	C	Mn	P	S	SI	CU	NI	V	CB	AL	CR	MO	TI	B	N <sub>2</sub>	CA	CE	Mg
+121271	.21	1.00	.006	.007	.25	.27	.08	<.003	<.003	.027	.08	.03	.002					
V01614	.23	1.13	.016	.009	.27	.02	<.02	.002	.002	.042	<.02	<.02	.002					

HEATS INDICATED WITH (+) WERE MELTED & MANUFACTURED IN THE USA.

SMITHCO ENGINEERING, INC.  
 QUALITY CONTROL

I certify the above to be correct as contained in the records of OREGON STEEL MILLS By

*Christine Wrinkle*

APPROVED BY *MW*

CHRISTINE WRINKLE  
 O.C. RECORDS ADMINISTRATOR  
 DATE APPROVED 09-15-04

BY *MW* Date *09/15/04*

11584 2980 0847

J19500

1/2 - (N)



INSPECTION CERTIFICATE, ABNAHMEPRUFZEUGNIS, CERTIFICAT DE RECEPTION DU MATERIEL

**VÍTKOVICE STEEL, a.s.**

ČSN EN 10204 3.1.B

L.No./Nr.

Date/Date

Sheet/Page-Seite

34884/2003

03.11.2003

1/1

Ostrava-Hřbitvy  
Štramberská 2873/47, PSČ 709 00  
ČESKÁ REPUBLIKA

Zakázka č./Purchase Order No.  
Bestel - Nr./Commande - No.

152045/2003

Objednávka č./Shop Order No.  
Auftrag - Nr./Ordre No.

0311K30449/009  
3317800

Objednatel/Customer/Besteller/Acheteur

**FERROSTAAL INCORPORATED**

16510 Northchase Drive  
77060

Houston, Texas  
US

Avízo č./Advice Note No./Avízo Nr./Avízo No.:  
637088

Vozón č./Wagon No./Wagon Nr.:  
815439419814

Hmotnost/Weight/ Masse:  
17 778 kg

Hot rolled steel plates



Vyrobeno v systému jakosti dle EN ISO 9001.  
Made in quality system according to EN ISO 9001.  
Hergerstellt im Qualitätssicherungssystem laut EN ISO 9001.  
Fabriqué en système qualité conformément à la EN ISO 9001.

EN ISO 9001:2000 / EN ISO 14001  
Certifikáty č. 041003144, 04104 3144

Druh, rozměr a hmotnost výrobku. Type, Dimension and weight of products.  
Art, Abmessungen und Masse der Erzeugnisse. Sorts, dimensions et masse des produits:

12,7-2438-12192 mm  
1/2"x96"x480"  
17 778 kg  
6 plates

Jakost, Material quality, Material qualitat, Qualité

Stav dodání  
As delivered  
Lieferungs-zustand  
Etat de livraison

A516GR70 N

Stav zkoušený  
As tested  
Prüfungs-zustand  
Etat de épruvé

A516GR70 N

Norma, Standard, Norm, Norme

ASTM A516-01,ED.03  
GR.70/ASME SA516 ED01  
ASTM A20-01b,ED.2003  
ASME SA20.ED.01.AD 02

Tavba č. Heat No. Schmelze Nr. No. de la coulée	1	Probet kusů No. of pieces Stückzahl No. de pièces	Zkouška č. Test No. Probe Nr. No. de fessal	2	Zkouška tahem, Tensile test, Zugversuchtest, Essai de traction							Ráz v ohybu (J), Impact test (J), Kerbschlagversuchtest (J), Essai de résilience										
					3	T [°C]	Type 4	Type 6	4	5	6	7	3	T [°C]	Type	8						
11584	Y	2	2980	A q	20	Reh		387	529	25.5												
		2	2981	A q	20	Reh		375	527	27.0												
		2	2982	A q	20	Reh		381	517	27.0												

Heat	C	Mn	Si	P	S	Cu	Ni	Cr	Mo	V	Ti	Al	Nb
11584	0.19	1.08	0.25	0.019	0.014	0.08	0.03	0.09	0.01	0.01	0.01	0.039	0.01

Heat	Test	plates
11584	2980	548189 001 002 f
	2981	548190 001 002
	2982	548191 001 002

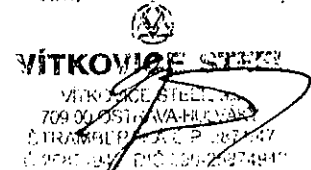
Internal homogeneity is guaranteed acc. to US test ASTM A435.  
NORMALIZED:walking beam furnace-length 70m,temperature 900°C/dwell 9min.

SMITHCO ENGINEERING, INC.  
QUALITY CONTROL

APPROVED BY JMD

DATE 4-15-04

Tímto prohlášením na svou výlučnou odpovědnost, že uvedené výrobky na něž se vztahuje toto prohlášení jsou ve shodě s předpisy, které jsou specifickými kusní smlouvou. Es wird hiermit auf ausschliessliche Verantwortlichkeit erklärt, dass die hier angeführten Erzeugnisse auf die sich diese Erklärung bezieht, entsprechen den im Kaufvertrag spezifizierten Vorschriften. Thereby we declare to our exclusive responsibility that the mentioned products to which this declaration is in accordance with regulations, which are specified by the contract. Nous déclarons à notre responsabilité exclusive que les produits mentionnés se réfèrent à cette déclaration sont conformes aux prescriptions spécifiées par le contrat d'achat.



Rostislav TOMAN

Zavodní znalec / Works Inspector  
Der Werkssachverständige/ L'expert de l'usine

O.A. APPROVED

By ALL Date 3/5/04

1 Způsob výroby oceli. Steelmaking process, Erschmelzung, Mode d'élaboration de l'acier, BO=Y  
2 A - hlava, Top; Kapsl. léte: Z - pato, Bottom, Fuss, pied  
3 l - podélná, longitudinal, längs; q - příčná, transverse, quer, transversal; t - tangenciální, tangential, tangente;  
r - radiální, radial; z - vertikální, vertical, senkrecht  
4 Mez kluzu, Yield Stress, Streckgrenze, Limite d'élasticité  
5 Mez pevnosti, Tensile strength, Zugfestigkeit, Résistance  
6 Tažnost A, Elongation A, Dehnung A, Allongement A  
7 Žilnění Z, Reduction of area Z, Bruchschmiz Z, Striction Z  
8 Průměr, Average, Mittel, Durchmesser  
200-F63



# Piping Products, Inc.

**NEW REMIT TO ADDRESS**  
 5814 Harvey Wilson Dr., Houston, TX 77020  
 Phone: 713-675-5374, 800-775-5374, Fax: 713-675-7910

## \*\*\* MILL TEST REPORT \*\*\*

S MATTSO  
 O PO BOX 2925  
 L  
 D TULSA, OK 74101

S MATTSO  
 H 5740 E. ADMIRAL PL.  
 I  
 P TULSA, OK 74135

### ITEMS

170 8 150 WN RF XH SA105 125-250 AARH

ITEM	HEAT NO.	C	SIL	MN	PHOS	SUL	CR	NI	MO	N	CO	CU	V	AL	NB	C/EQ
170	BMYZ	0.190	0.260	0.850	0.011	0.009	0.140	0.080	0.023	0.000	0.000	0.280	0.003	0.000	0.000	0.389

### CHEMICAL PROPERTIES

ITEM	YIELD STRENGTH	TENSILE STRENGTH	ELONG. % IN 2"	RED. AREA	BHN	CHARPY TEST	LAT. EXPAN	SHEAR FRAC.	TEST TEMP
170	48,800	81,700	27.50	57.50	163-163			0.00	

### PHYSICAL PROPERTIES

### ITEM NOTES

170

### ORDER NOTES

Additional Notes or Comments:  
 We hereby certify that all test results and process information contained herein are correct and true as contained in the records of the company.

*[Signature]*  
 Piping Products, Inc.

SMITHCO ENGINEERING, INC.  
 QUALITY CONTROL

APPROVED BY *[Signature]*  
 DATE 4-22-04

# Piping Products, Inc.

**NEW REMIT TO ADDRESS**  
 5814 Harvey Wilson Dr., Houston, TX 77020  
 Phone: 713-675-5374, 800-775-5374, Fax: 713-675-7910

## \*\*\* MILL TEST REPORT \*\*\*

S MATTSO  
 O PO BOX 2925  
 L  
 D TULSA, OK 74101

S MATTSO  
 H 5740 E. ADMIRAL PL.  
 I  
 P TULSA, OK 74135

### ITEMS

CUST #: MAT01  
 DATE: 01/15/03  
 PPI S/O #: 203025  
 TAG #:

ITEM	DESCRIPTION
90	12 600 WN RF XH
110	1 150 TH RF
120	3 150 WN RF 160
130	4 300 WN RF 160

### CHEMICAL PROPERTIES

ITEM	HEATNO.	C	SIL	MN	PHOS	SUL	GR	NI	MO	N	CO	CU	Y	AL	NB	C/EG
90	BKHJ	0.170	0.160	0.820	0.001	0.007	0.050	0.060	0.014	0.000	0.000	0.120	0.002	0.000	0.000	0.332
110	BFPO	0.240	0.170	0.760	0.030	0.018	0.018	0.005	0.010	0.000	0.000	0.007	0.010	0.000	0.010	0.375
120	BKME	0.210	0.270	0.840	0.004	0.014	0.060	0.090	0.020	0.000	0.000	0.210	0.003	0.000	0.000	0.387
130	BTJA	0.180	0.220	0.860	0.009	0.025	0.110	0.080	0.020	0.000	0.000	0.180	0.021	0.000	0.000	0.371

### PHYSICAL PROPERTIES

ITEM	YIELD STRENGTH	TENSILE STRENGTH	ELONG. % IN 2"	RED. AREA	BHN	CHARPY TEST	LAT. EXPAN	SHEAR FRAC.	TEST TEMP
90	50,800	72,100	31.10	6.60	149-149			0.00	
110	40,420	73,240	35.20	65.72	149			0.00	
120	53,000	75,900	30.50	58.10	172-172			0.00	
130	51,900	78,300	27.70	51.90	171-171			0.00	

### ITEM NOTES

90 NORM @ 1675F 4.0 HRS AIR

### ORDER NOTES

#### Additional Notes or Comments:

We hereby certify that all test results and process information contained herein are correct and true as contained in the records of the company.

SMITHCO ENGINEERING, INC.  
 QUALITY CONTROL

Piping Products, Inc.

*Wanda A. Taylor*

APPROVED BY *W*

DATE

To: SMITHCO ENGINEERING QTY: 1

Line#: 4

04/16/2004 From: MATTSO SUPPLY CO.  
 Our #: 00403  
 To: SMITHCO ENGINEERING  
 CPO #: J19599

04/16/2004 From: MATTSCO SUPPLY CO.

To: SMITHCO ENGINEERING

Our# :00403

Line# :4

QTY: :1

To: :SMITHCO ENGINEERING

CPO# :J19599



**GALPERTI, INC.**  
 160 SOUTHBELT INDUSTRIAL DR.  
 HOUSTON, TEXAS 77047  
 PH.# 713-433-0700  
 FAX# 713-433-1022



Certificate No. 110391

SOLD TO <b>MATTSCO SUPPLY</b>	
CUSTOMER'S ORDER NO	322-S-03
GR S/O# 0006151	DATE 1/31/2003

THIS PRODUCT HAS NOT COME IN DIRECT CONTACT WITH MERCURY OR ANY OF ITS COMPOUNDS, NOR WITH ANY MERCURY CONTAINING DEVICE EMPLOYING A SINGLE BOUNDARY OF CONTAINMENT. THERE HAS BEEN NO REPAIR BY WELDING ON THIS MATERIAL.

**MATERIAL TEST REPORT**

ITEM	QUANTITY	DESCRIPTION	MATERIA	HEAT COD
4	15	3 150 RF WN S/160 FLANGE  MATL I.A.W. NACE MR0175	A/SA105	H38613

**CHEMICAL COMPOSITION**

	C	Mn	P	S	Si	Cr	Mo	Ni	Cu	V	Cb	CE=
LADLE	0.185	1.010	0.008	0.020	0.230	0.080	0.010	.06	0.180	0.004	0.001	0.388
PRODUC												

**MECHANICAL COMPOSITION**

	TENSILE PSI	YIELD PSI	ELONG %	RA%	BHN
MILL	76,000	45,832	34	65	163
PRODUC					159

WE CERTIFY THAT THE MATERIAL FURNISHED ON THIS ORDER COMPLIES IN ALL RESPECTS WITH THE SPECIFICATIONS AS STATED AND THAT THIS CORRECT INFORMATION IS AS CONTAINED IN OUR RECORDS.

MATL I.A.W NACE MR-0175

HEAT TREATMENT

NORMALIZED@1650°F FOR 1 HR PER INCH OF THK AIR COOLED

SMITHCO ENGINEERING, INC.  
 QUALITY CONTROL

BY \_\_\_\_\_  
 QUALITY ASSURANCE/CONTROL DEPARTMENT  
 DATE 1/31/2003

APPROVED BY [Signature]  
 DATE 4-22-04

# Piping Products, Inc.

**NEW REMIT TO ADDRESS**  
**5814 Harvey Wilson Dr., Houston, TX 77020**  
 Phone: 713-675-5374, 800-775-5374, Fax: 713-675-7910

## \*\*\* MILL TEST REPORT \*\*\*

S MATSCO  
 O PO BOX 2925  
 L  
 D TULSA, OK 74101

S MATSCO  
 H 5740 E. ADMIRAL PL.  
 I  
 P TULSA, OK 74135

### ITEMS

ITEM	HEAT NO.	DESCRIPTION	SA105	125-250	AARH
30	3	150 BL RF	SA105	125-250	AARH
30	3	150 BL RF	SA105	125-250	AARH
210	1	1/2 150 WN RF XXH	SA105	125-250	AARH
530	1	300 WN RF XXH	SA105	125-250	AARH

### CHEMICAL PROPERTIES

ITEM	HEAT NO.	C	SIL	MN	PHOS	SUL	CR	NI	MO	N	CO	CU	Y	AL	NB	CEQ
30	BEMA	0.200	0.280	0.860	0.007	0.026	0.050	0.090	0.018	0.000	0.000	0.260	0.003	0.000	0.000	0.381
30	BHOJ	0.190	0.220	1.010	0.010	0.020	0.100	0.060	0.010	0.000	0.000	0.170	0.001	0.000	0.000	0.396
210	BMZH	0.180	0.240	0.890	0.007	0.013	0.060	0.080	0.017	0.000	0.000	0.220	0.002	0.000	0.000	0.364
530	BIGS	0.180	0.240	0.890	0.007	0.013	0.060	0.080	0.017	0.000	0.000	0.220	0.002	0.000	0.000	0.364

### PHYSICAL PROPERTIES

ITEM	YIELD STRENGTH	TENSILE STRENGTH	ELONG. % IN 2"	RED. AREA	BHN	CHARPY TEST	LAT. EXPAN	SHEAR FRAC.	TEST TEMP
30	56,372	79,804	29.70	62.50	180-180			0.00	
30	44,540	76,290	31.00	60.00	163-165			0.00	
210	54,300	79,600	29.50	54.70	171-171			0.00	
530	54,300	79,600	29.50	54.70	171-171			0.00	

### ITEM NOTES

### ORDER NOTES

#### Additional Notes or Comments:

We hereby certify that all test results and process information contained herein are correct and true as contained in the records of the company.

SMITHCO ENGINEERING, INC.  
 QUALITY CONTROL

Piping Products, Inc.

*Marcelo Aguiar*

APPROVED BY *MD*

DATE 4-22-04

04/16/2004 From: MATSCO SUPPLY CO.  
 Our#: 00403  
 To: SMITHCO ENGINEERING  
 CPO#: J19599

To: SMITHCO ENGINEERING  
 Line#: 7  
 QTY: 2



# MATERIAL TEST REPORT

Sold To: 2170000  
 SMITHCO ENGINEERING CO.  
 6211 S. 39TH WEST AVENUE  
 TULSA OK 74131 US

3781

Ship To: 2170000  
 SMITHCO ENGINEERING CO.  
 6211 S. 39TH WEST AVENUE  
 TULSA OK 74131 US

Purchase Order: J19221  
 Sales Order: 55189  
 Material: A13010000830 A/SA 214/178-A ERW 10000D 083M ✓  
 Delivery: 80075823

Description: ASTM/ASME A/SA 214-96A(01)/178-A-02 ERW

Test: NDT ELECTRIC TESTED TO ASTM A450 OR A1016 & APPLICABLE TEST METHOD E309 OR E426.  
 FLANGE TEST PASSED. FLATTENING TEST PASSED. REVERSE FLATTENING TEST PASSED.

Heat Number: B34118

CARBON	Idl	0.090
MANGANESE	Idl	0.410
PHOSPHORUS	Idl	0.008
SULFUR	Idl	0.009
SILICON	Idl	0.006
NICKEL	Idl	0.010
CHROMIUM	Idl	0.020
MOLYBDENUM	Idl	0.006
COPPER	Idl	0.027
ALUMINUM	Idl	0.040

Ultimate (PSI )  
 Yield (PSI )  
 Elongation (%)  
 Hardness (RB ) 58 / 58

Webco Industries, Inc. certifies that the material described was manufactured and tested and/or inspected in accordance with the specification and fulfills requirements in such respect.  
 Made with Pride in the U.S.A.

Date: 03/30/2004

*M. D. Goodenough*  
 Releasing Analyst

SMITHCO ENGINEERING, INC.  
 QUALITY CONTROL

APPROVED BY JKO

DATE 4-19-04

# TSI Heat Treating Certification

Order No.: 80993

Date: 05/19/2004

Entry Date: 05/19/2004

Page: 1 of 1

**To:**

SMITHCO ENGINEERING, INC.  
P.O. BOX 571330

Purchase Order No.: J19601

Packing List No.:

TULSA

OK 74157

1

FURNACE NUMBER: 26 RECORDER: HLW CALIBRATION DATE: April. 26, 2004

CHART DIVISION: 15 minutes

APPROVED BY: *Chris Loomis*

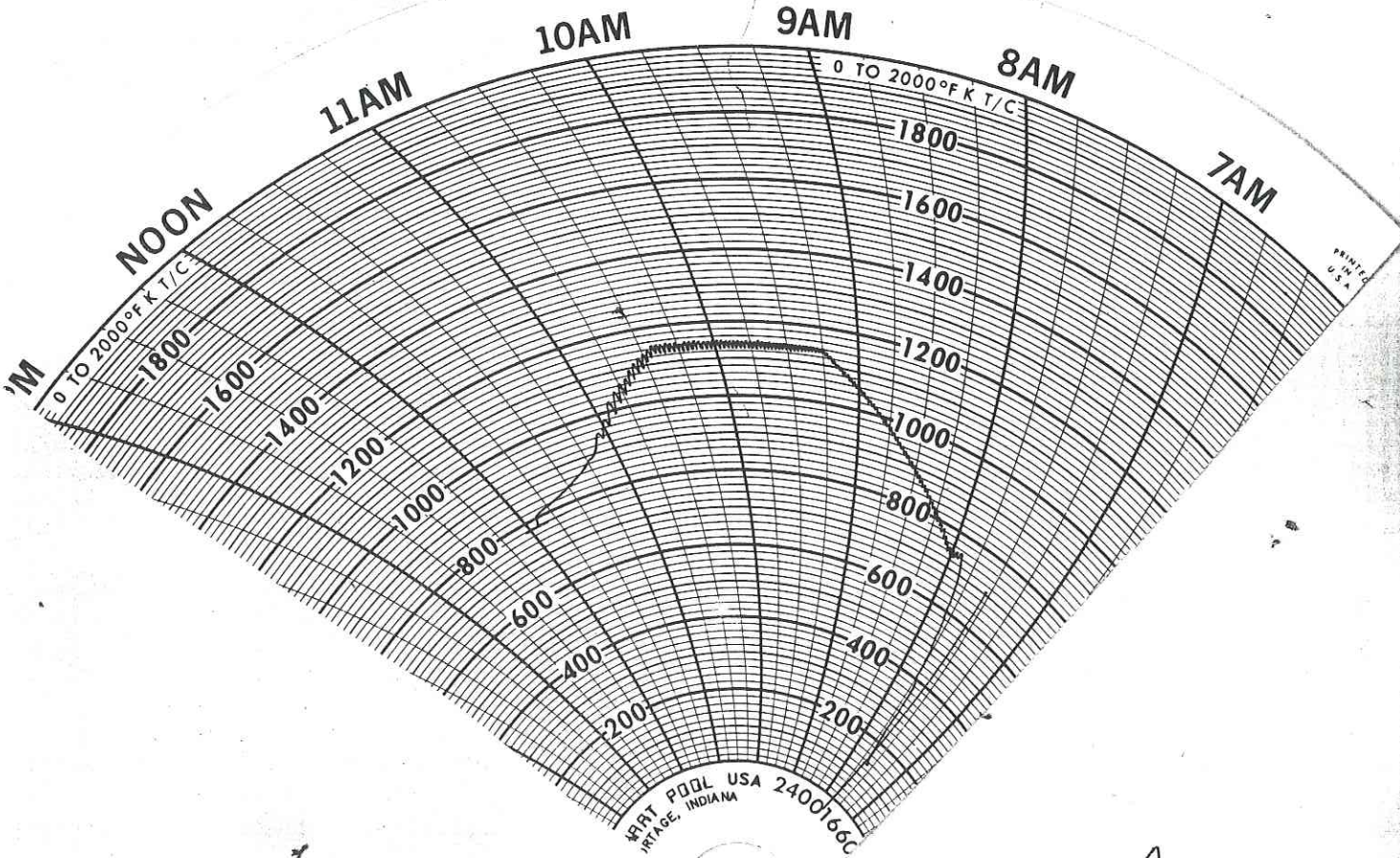
DATE: 5-19-04

SMITHCO ENGINEERING, INC.  
QUALITY CONTROL

Quantity	Part Number / Part Name / Part Description	Pounds
1	HEADER B3781-AF	1371
1	HEADER B3781-AB	1371

APPROVED BY: *YC*

DATE: MAY 19 2004



*Chris Loomis*





# TULSA GAMMA RAY, INC.

1127 SOUTH LEWIS AVENUE  
 TULSA, OKLAHOMA 74104-3900  
 918 / 585-3228 • FAX 918 / 584-5598  
 1 - 800 - 625-9288  
 www.tulsagammaray.com

## CUSTOMER DATA

NAME Smithco  
 ADDRESS \_\_\_\_\_  
 PHONE \_\_\_\_\_ ATTN: \_\_\_\_\_  
 W.O. # \_\_\_\_\_ P.O. # \_\_\_\_\_  
 JOB LOCATION Smithco  
 DESCRIPTION Spot Header MATERIAL TYPE: SA-516

## TECHNIQUE/INSPECTION REPORT

DATE 5-14-04 DAY Fri

### DEFECT CODE

AB - ARC BURN  
 AI - ALIGNED INDICATION  
 BT - BURN THROUGH  
 CON - CONCAVITY  
 CRACK - CRACK  
 HB - HOLLOW BEAD  
 IF - INADEQUATE FUSION  
 IP - INCOMPLETE PENETRATION  
 MA - MISALIGNMENT  
 POR - POROSITY

SLI - SLAG INCLUSION  
 SLL - SLAG LINE  
 SURF - SURFACE INDICATION  
 UCE - UNDERCUT EXTERNAL  
 UCI - UNDERCUT INTERNAL

### ABBREVIATED TERMS

SOD = SOURCE TO OBJECT DISTANCE  
 OFD = SOURCE SIDE OF OBJECT TO FILM DISTANCE  
 OD = OUTER DIAMETER  
 WT = WELD THICKNESS  
 WR = WELD REINFORCEMENT  
 REP = REPAIR  
 RES = RESHOOT  
 RET = RETAKE  
 BM = BASE MATERIAL

WELD/FILM NUMBER	JOB NUMBER	OD	BM	WR	WT	WITHIN STD'S		# FILM	FILM SIZE / MFG / TYPE	SOD	OFD	IQI SE	# EXP	DEFECT LOCATION
						YES	NO							
1-2	3781 AF	N/A	.625	.14	.085	✓			3 1/2 x 8 1/2	9/16	.08	1B	1	
2-3			L	L	L	✓			Fuji 80	L	L	L	L	
4	EB		.5	.18	.68	✓			3 1/2 x 17	12.22	1B	1	4-5 2	
5									Fuji 80					
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														

METHOD <u>Rt</u>	SOURCE SIZE DIAG. <u>.157</u>	ISOTOPE <u>IR192</u>	NO. CURIES <u>95ci</u>	DEV. TIME <u>5min</u>	DEV. TEMP <u>68°F</u>	DENSITY <u>2.0-4.0</u>
NO. OF WELDS <u>2</u>	FT. LONG SEAMS	STANDARDS <u>ASME</u>	NO. OF FILM <u>3</u>	FILM/ CASSETTE <u>1</u>	EXPOSURE: DBL WALL <input checked="" type="checkbox"/>	S. WALL <input checked="" type="checkbox"/>
TRUCK NO. / SHOP <u>Smithco</u>	REPORT NO. OF	PAGE NO. <u>1 OF 1</u>	TECH. HOURS	ASST. HOURS	VIEWING: DBL WALL <input checked="" type="checkbox"/>	S. WALL <input checked="" type="checkbox"/>
FILM INTERPRETER <u>[Signature]</u>	ASST. NAME <u>Billy Smith</u>	ASNT LEVEL <u>2</u>	SIGNATURE <u>[Signature]</u>		TRAVEL HOURS	TOTAL HOURS
COMPANY REPRESENTATIVE <u>[Signature]</u>	NDT TECHNICIAN <u>[Signature]</u>	ASNT LEVEL <u>III</u>	SIGNATURE <u>[Signature]</u>		MILEAGE	

SIGNATURE CERTIFIES TIME & MATERIALS CORRECT

SIGNATURE





# TULSA GAMMA RAY, INC.

1127 SOUTH LEWIS AVENUE  
 TULSA, OKLAHOMA 74104-3900  
 918 / 585-3228 • FAX 918 / 584-5598  
 1 - 800 - 625-9288  
 www.tulsagammaray.com

## CUSTOMER DATA

NAME Smithco  
 ADDRESS \_\_\_\_\_  
 PHONE \_\_\_\_\_ ATTN: \_\_\_\_\_  
 W.O. # \_\_\_\_\_ P.O. # \_\_\_\_\_  
 JOB LOCATION Smithco  
 DESCRIPTION Spot headers MATERIAL TYPE: SA516-70

## TECHNIQUE/INSPECTION REPORT

DATE 5/18/04 DAY Tuesday

DEFECT CODE										ABBREVIATED TERMS									
AB - ARC BURN			HB - HOLLOW BEAD			SLI - SLAG INCLUSION				SOD = SOURCE TO OBJECT DISTANCE									
AI - ALIGNED INDICATION			IF - INADEQUATE FUSION			SLL - SLAG LINE				OFD = SOURCE SIDE OF OBJECT TO FILM DISTANCE									
BT - BURN THROUGH			IP - INCOMPLETE PENETRATION			SURF - SURFACE INDICATION				OD = OUTER DIAMETER			REP = REPAIR			RET = RETAKE			
CON - CONCAVITY			MA - MISALIGNMENT			UCE - UNDERCUT EXTERNAL				WT = WELD THICKNESS			RES = RESHOOT						
CRACK - CRACK			POR - POROSITY			UCI - UNDERCUT INTERNAL				WR = WELD REINFORCEMENT			BM = BASE MATERIAL						
WELD/FILM NUMBER	JOB NUMBER	OD	BM	WR	WT	WITHIN STD'S		# FILM	FILM SIZE / MFG / TYPE	SOD	OPD	IQI	# EXP	DEFECT LOCATION					
						YES	NO												
1-2	3781 AB	NA	.25	.18	.80	✓		1	3 1/2 x 8 1/2 - 80	8.45	.80	1B	1	106					
2-3	✓	✓	✓	✓	✓	✓		1	✓	✓	✓	✓	✓						
3-5	✓	✓	.50	✓	.68	✓		1	3 1/2 x 17 - 80	12.32	1.68	✓	✓	3392					
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																			

METHOD <u>RT</u>	SOURCE SIZE DIAG. <u>.157</u>	ISOTOPE <u>IR-192</u>	NO. CURIES <u>90 ci</u>	DEV. TIME <u>5:00</u>	DEV. TEMP <u>680F</u>	DENSITY <u>2.0-4.0</u>
NO. OF WELDS <u>2</u>	FT. LONG SEAMS	STANDARDS <u>ASME</u>	NO. OF FILM <u>3</u>	FILM/CASSETTE <u>1</u>	EXPOSURE: DBL WALL _____ S. WALL <u>✓</u>	MPR SCREENS <u>3/16</u>
TRUCK NO. / SHOP <u>Smithco</u>	REPORT NO. OF	PAGE NO. OF <u>1</u>	TECH. HOURS	ASST. HOURS	TRAVEL HOURS	TOTAL HOURS
FILM INTERPRETER <u>[Signature]</u>	COMPANY REPRESENTATIVE <u>[Signature]</u>	ASST. NAME <u>Billy Smith</u>	NDT TECHNICIAN <u>[Signature]</u>	ASNT LEVEL <u>II</u>	ASNT LEVEL <u>II</u>	

SIGNATURE CERTIFIES TIME & MATERIALS CORRECT

SIGNATURE

TULSA GAMMA RAY, INC. ASSUMES NO RESPONSIBILITY FOR LOSSES OF ANY KIND DUE TO INTERPRETATION

No. 47142

**TULSA GAMMA RAY, INC.**  
 1127 SOUTH LEWIS  
 TULSA, OKLAHOMA 74104  
 (918)585-3228

**RADIOGRAPHIC TECHNIQUE SHEET (RTS)**

CUSTOMER <div style="font-size: 2em; font-family: cursive;">Smithco</div>		<b>WELD IDENTIFICATION</b>		
<b>RADIOGRAPHIC STANDARDS/PARAMETERS</b>		JOB/ CONTRACT/ PART NO. <span style="font-size: 1.2em;">3781-AF, AB</span>		
RADIOGRAPHIC STANDARD <div style="font-size: 1.5em; font-family: cursive;">ASME Sec. IV Article 2</div>		DRAWING NUMBER		
RADIOGRAPHIC COVERAGE 100% INSPECTION _____ CRITICAL AREAS ONLY _____ OTHER <input checked="" type="checkbox"/>		DESCRIPTION <span style="font-size: 1.2em;">Header</span> BASE MATERIAL TYPE <span style="font-size: 1.2em;">SA516-70</span> THICKNESS <span style="font-size: 1.2em;">.625/.50</span>		
ACCEPTANCE STANDARD <div style="font-size: 1.5em; font-family: cursive;">ASME Sec. VIII-UW-52</div>		CONDITION WHEN RADIOGRAPHED <span style="font-size: 1.2em;">AS WELDED</span> <input checked="" type="checkbox"/> ROUGH MACHINED _____ MACHINED _____ AFTER REPAIR _____		
		CLASS	SEVERITY LEVEL	GRADE
RADIOGRAPH VIEW (S)	SOURCE TYPE	SOURCE SIZE	SOURCE CURIES/ KILOVOLTAGE	SOURCE TO FILM DISTANCE
DISTANCE FROM SOURCE SIDE OF OBJECT TO FILM	SOURCE TO OBJECT DISTANCE	WELD THICKNESS	WELD REINFORCEMENT	PENETRATOR SIZE
PENETRATOR BLOCK SIZE	PENETRATOR MATERIAL GROUP	FILM SIZE AND QUANTITY	FILM TYPE	SCREEN Pk THICKNESS- FRONT BACK
FILTER (S)	RADIOGRAPHIC TECHNIQUE A: SINGLE WALL EXPOSURE/ VIEW. B: DOUBLE WALL EXPOSURE/ SINGLE WALL VIEW. C: DOUBLE WALL EXPOSURE / VIEW.		COMPOSITE OR SINGLE VIEW.	GEOMETRICAL UNSHARPNESS (UG)
RADIOGRAPHIC QUALITY LEVEL				
PROCESSING:	MANUAL - TIME <span style="font-size: 1.2em;">5.0</span> TEMPERATURE <span style="font-size: 1.2em;">68°F</span>		AUTOMATIC - TIME _____ TEMPERATURE _____	
RTS APPROVED BY:	LEVEL <span style="font-size: 1.2em;">II</span> DATE _____	RTS NO. <span style="font-size: 1.2em;">TGR-3781-F, B</span>		
RTS APPROVED BY:	LEVEL _____ DATE _____	AMENDMENT: <span style="font-size: 1.2em;">0</span>	REV. <span style="font-size: 1.2em;">A</span>	PAGE <span style="font-size: 1.2em;">1</span> OF <span style="font-size: 1.2em;">2</span>

**TULSA GAMMA RAY, INC.**  
**RADIOGRAPHIC SHOOTING SKETCH (RSS)**

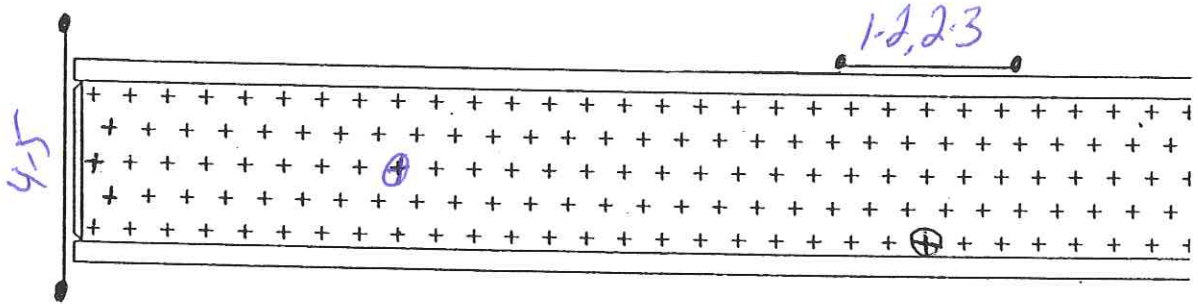
VIEWS

1-2, 2-3, 4-5

LEGEND

⊕ = FOCAL SPOT LOCATION

● ————— ● = FILM LOCATION



SKETCH SHOWS ;  
 FINISHED \_\_\_ AS CAST \_\_\_  
 NO \_\_\_ DIMENSIONS.

RSS NO.  
 TGR- 3781-F, B

REV.  
 A

PAGE 2 OF 2



SMITHCO

MAGNETIC PARTICLE TESTING  
PLATE EDGES/PRE-WELD

CUSTOMER: Matrix DATE: 4/30/04

SERIAL NUMBER: 04B 3781 AFAB

APPLICABLE CODE: ASME SECTION V ARTICLE 7  
ASME SECTION V ARTICLE 25, SE-709  
ASTM E-709  
ASME SECTION VIII, DIV. 1, APPENDIX 6

EXAMINATION MEDIUM: DRY POWDER

COLOR OF POWDER: RED

EQUIPMENT MANUFACTURE: PARKER RESEARCH CORPORATION

MODEL NUMBER: B-100

MAGNETIZING CURRENT: AC  DC

DEMAGNETIZING REQUIRED: YES  NO

ACCEPTED  REJECTED

ACCEPTANCE CRITERIA: ABOVE REFERENCED CODES AND STANDARDS

WITNESSED OR ACCEPTED BY: [Signature]

LEVEL OR CERTIFICATION: II



SMITHCO

MAGNETIC PARTICLE TESTING

CUSTOMER: Matrix ROOT: 5-118-104  
NOZZLE OPENING: 5-118-104  
FINAL DATE: 5-12-04

SERIAL NUMBER: 04B3781AFAB

APPLICABLE CODE: ASME SECTION V ARTICLE 7  
ASME SECTION V ARTICLE 25, SE-709  
ASTM E-709  
ASME SECTION VIII, DIV. 1, APPENDIX 6

EXAMINATION MEDIUM: DRY POWDER

COLOR OF POWDER: RED

EQUIPMENT MANUFACTURE: PARKER RESEARCH CORPORATION

MODEL NUMBER: B-100

MAGNETIZING CURRENT: AC  DC

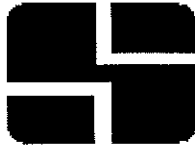
DEMAGNETIZING REQUIRED: YES  NO

ACCEPTED  REJECTED

ACCEPTANCE CRITERIA: ABOVE REFERENCED CODES AND STANDARDS

WITNESSED OR ACCEPTED BY: Shawn Asher

LEVEL OR CERTIFICATION: II



SMITHCO

MAGNETIC PARTICLE TESTING  
PLATE EDGES/POST-WELD  
ALL PRESSURE RETAINING WELDS

CUSTOMER: Matrix DATE: 5/20/04

SERIAL NUMBER: 04B 3781 AFAB

APPLICABLE CODE: ASME SECTION V ARTICLE 7  
ASME SECTION V ARTICLE 25, SE-709  
ASTM E-709  
ASME SECTION VIII, DIV. 1, APPENDIX 6

EXAMINATION MEDIUM: DRY POWDER

COLOR OF POWDER: RED

EQUIPMENT MANUFACTURE: PARKER RESEARCH CORPORATION  
MODEL NUMBER: B-100  
MAGNETIZING CURRENT: AC  DC   
DEMAGNETIZING REQUIRED: YES  NO

ACCEPTED  REJECTED

ACCEPTANCE CRITERIA: ABOVE REFERENCED CODES AND STANDARDS

WITNESSED OR ACCEPTED BY: St. Asher

LEVEL OR CERTIFICATION: II



**SMITHCO ENGINEERING, INC.**

SERVING THE INDUSTRY SINCE 1952 MEMBER HTRI &ACHEMA

P.O. BOX 571330  
 6312 S. 39TH W. AVE.  
 TULSA, OK 74157  
 PHONE: (918) 446-4406  
 FAX: (918) 446-6785

DATE: S-27-04 SERIAL #: 04B37819 (PUSH)  
 SHEAR PIN INSPECTOR: *[Signature]*

**RECORD OF BRINELL HARDNESS TEST\***

HEADER ID	LONG SEAM		LONG SEAM		ENDWELD		ENDWELD		NOZ WELD		NOZ WELD	
	WELD	BASE	H/AZ	H/AZ	WELD	BASE	H/AZ	H/AZ	WELD	BASE	H/AZ	H/AZ
AF	LS1 176	156	169	176	EB1				NOZ1			
	LS2 176	163	169	169	EB2	182	169	176	NOZ2	176	169	169
	LS3 169	163	176	176								
	LS4 176	163	169	163		182	163	182	NOZ2	182	169	182
AB	LS1 182	163	187	187	EB1				NOZ1			
	LS2 176	163	182	187		N/A			NOZ2	187	169	187
	LS3 176	169	176	182	EB2				NOZ2	187	169	187
	LS4 176	163	182	182		N/A			NOZ2	187	169	187
									NOZ2	187	169	187
									NOZ2	187	169	187
									NOZ2	187	169	187
									NOZ2	187	169	187



SMITHCO

CUSTOMER: Matrix

SMITHCO SERIAL NO.: 2004B3791A

TEST GAUGE NO.: 54

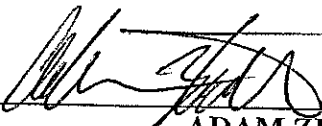
RANGE: 0-1000 psi

DATE CAL.: 11-18-03

TEST PRESSURE: 316 psi

DATE TESTED: 5-27-04

WE CERTIFY THE ABOVE REFERENCED AIR COOLED HEAT EXCHANGER WAS SUCCESSFULLY HYDROSTATICALLY TESTED FOR ONE (1) HOUR MINIMUM AND THE TEST GAUGE WAS CALIBRATED AS STATED.

  
ADAM ZLATA  
ASSEMBLY INSPECTOR



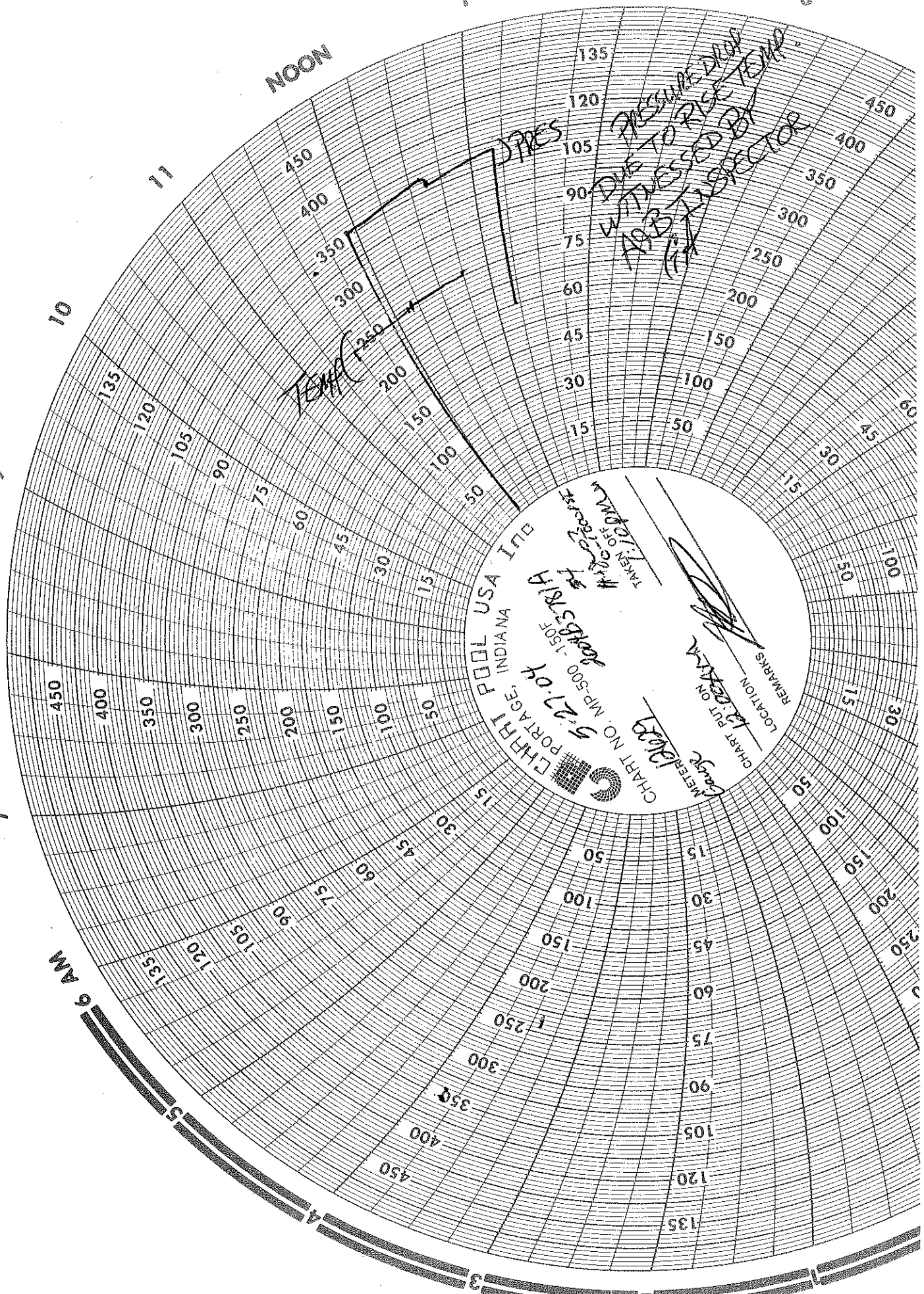


CHART NO. MP-500-150F  
 PORTAGE, INDIANA  
 5-27-04  
 TAKEN OFF 2:30 PM  
 12:00 AM  
 METER 12129  
 CHART FIT ON 12:00 AM  
 REMARKS  
 LOCATION  
 POOL USA ILLI  
 INDIANA

DIPRES  
 PRESSURE DROP  
 DUE TO RISE TEMP  
 W/ DUE TO RISE OF  
 TEMP  
 H2O IN SYSTEM  
 100% HUMIDITY

NOON

10

11

9

8

7

6 AM

5

4

3

2

1

2

3

1

NB 9650

CERTIFIED BY  
SMITHCO ENGINEERING, INC.  
TULSA, OKLAHOMA



FT

150 255

-20 150

2004B3781 A 2004

316N8C 150-X-107

CONDENSER

PS-15

CORR. ALLOWANCE - .1250

STRESS RELIEVE - 1100 DEGREE F. FOR 60 MIN.

RT - SPOT

WAMP CORRODED - 190 PSIG AT 255 DEG. F.



SERVING THE INDUSTRY SINCE 1952  
MEMBER HTRI

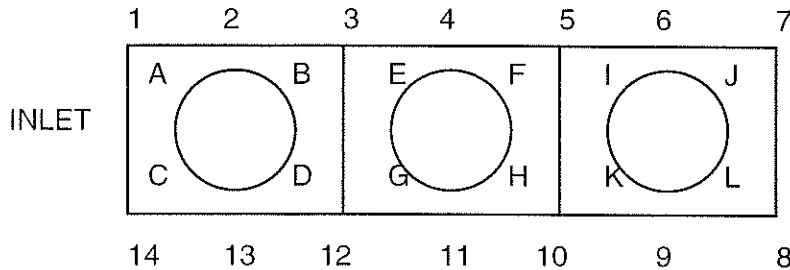
SMITHCO ENGINEERING, INC.

P.O.Box 571330  
Tulsa, Oklahoma 74157  
Phone: (918)446-4406  
Fax: (918)445-2857

SHOP RUN IN INSPECTION REPORT

Start 11:35 AM  
Stop 11:49 AM Temp 85°

Job No. 04B378 Customer: MATRIX ENGINEERING



Displacement Readings (mils) Not to exceed 6 mils.

1. <u>.9</u>	6. <u>1.1</u>	11. <u>.8</u>
2. <u>.8</u>	7. <u>.9</u>	12. <u>1.5</u>
3. <u>1.4</u>	8. <u>1.0</u>	13. <u>.9</u>
4. <u>.9</u>	9. <u>.8</u>	14. <u>.8</u>
5. <u>.9/1.1</u>	10. <u>.9/2.0</u>	

Amperage Readings

Rated Amperage

1 <sup>st</sup> Motor	1. <u>30.2</u>	2. <u>29.6</u>	3. <u>30.4</u>	<u>29</u>
2 <sup>nd</sup> Motor	1. <u>30.1</u>	2. <u>29.4</u>	3. <u>31.3</u>	<u>29</u>
3 <sup>rd</sup> Motor	1. <u>30.7</u>	2. <u>32.1</u>	3. <u>31.6</u>	<u>29</u>

SOUND LEVEL DATA SHEET

Noise Levels (dBA)

A. _____	E. _____	I. _____
B. _____	F. _____	J. _____
C. _____	G. _____	K. _____
D. _____	H. _____	L. _____

Max Noise Level (When specified) \_\_\_\_\_ (dBA)

Distance from: Fan (ft) \_\_\_\_\_ Grade (ft) \_\_\_\_\_

Comments: \_\_\_\_\_

Smithco Quality Control

Date

Customer Representative

Date

6/2/04

6/2/04