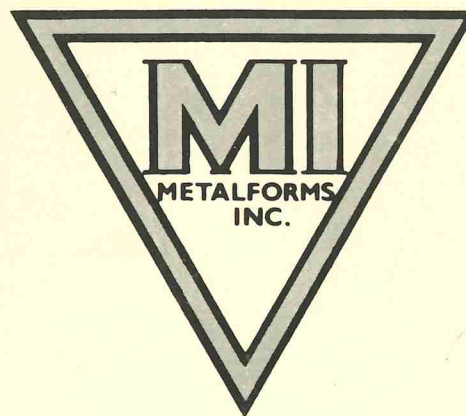


Replace In-kind During 2008 TA

2308021

MANUFACTURER'S

DATA REPORT



METALFORMS, INC.

160 GARTH ROAD
GARTH INDUSTRIAL PARK
P. O. BOX 20118
BEAUMONT, TEXAS 77720

BEAUMONT	PRIMARY FAX	ENGINEERING FAX
(409) 842-1626	(409) 842-1503	(409) 842-0207

CUSTOMER: EQUISTAR CHEMICALS LP

PO# 4400856922

ITEM# E-1530

MANUFACTURER'S S/N: 17410

Metalforms, Inc

**160 Garth Road
Beaumont, Texas 77705
(409) 842-1626**

DATA REPORT

CUSTOMER: Equistar Chemicals LP

PO#: 4400856922

ITEM#: E-1530

SERIAL/JOB#: 17410

METALFORMS, INC. DATA REPORT

TABLE OF CONTENTS

CUSTOMER: Equistar Chemicals LP JOB NUMBER: 17410

P.O. NUMBER: 4400856922 ITEM NUMBER: E-1530

	<u>APPLICABLE</u>	<u>NONAPPLICABLE</u>
COVER PAGE	☒	☐
TABLE OF CONTENTS	☒	☐
MANUFACTURER'S DATA REPORT	☒	☐
NAMEPLATE FACSIMILE	☒	☐
INSPECTION REPORTS:		
A) HYDRO TEST REPORTS	☒	☐
B) HYDRO TEST CHARTS	☒	☐
C) HELIUM TEST REPORTS	☐	☒
D) P.M.I. TEST REPORTS	☐	☒
E) PWHT CHARTS	☐	☒
F) SUPPORT PAD TEST REPORTS	☐	☒
G) HARDNESS TEST REPORTS	☒	☐
H) AIR SOAP TEST REPORTS	☐	☒
I) AIR TEST REPORTS	☐	☒
J) OTHER: <u>Chloride Report</u>	☒	☐
NDT REPORTS:		
A) P.T. EXAMINATION	☒	☐
B) M.T. EXAMINATION	☐	☒
C) R.T. EXAMINATION	☒	☐
D) U.T. EXAMINATION	☐	☒
E) V.T. EXAMINATION	☐	☒
F) OTHER: <u>UT Thickness Report</u>	☒	☐
BILL OF MATERIAL	☒	☐
MATERIAL TEST REPORTS	☒	☐
DESIGN CALCULATION	☐	☒
DRAWINGS	☒	☐
OTHER: <u>WPS/PQR</u>	☒	☐

JOB # 17410

MANUFACTURER'S NAME: METALFORMS, INC., 160 GARTH ROAD
CHEEK, TEXAS 77705

ENGINEERING CONTRACTOR: METALFORMS, INC., P.O. BOX 20118
BEAUMONT, TEXAS 77702

AUTHORIZED INSPECTION AGENCY: HARTFORD STEAM BOILER
INSURANCE & INSPECTION
COMPANY

PURCHASE ORDER NUMBER: 4400856922

PLANT LOCATION: 3510 GULF STATES Rd.
Beaumont, TX USA 77704

EQUIPMENT NAME: Rear Channel

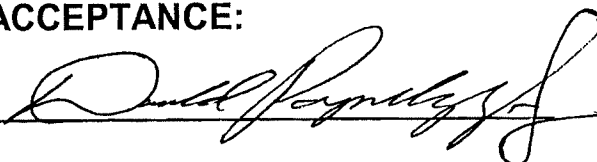
ITEM NUMBER: E-1530

FABRICATION SHOP ORDER/SERIAL NUMBER: 17410

NATIONAL BOARD NUMBER: N/A

CODE OF CONSTRUCTION: ASME SEC VIII DIV.1 2007 & TEMA

INSPECTOR'S SIGNATURE OF ACCEPTANCE:



1. Manufactured and certified by		Metalfarms, Inc., 160 Garth Road, Cheek, TX 77705	
		(Name and address of Manufacturer)	
2. Manufactured for		Equistar Chemicals LP, 3510 Gulf States Road, Beaumont, TX 77704	
		(Name and address of Purchaser)	
3. Location of installation		Equistar Chemicals LP, 3510 Gulf States Road, Beaumont, TX 77704	
		(Name and address)	
4. Type:		Channel	17410
		(Description of vessel part (shell, two-piece head, tube bundle))	(Mfr.'s serial No.)
		-----	-----
		17410	2008
		(Nat'l. Bd. No.)	(Drawing No.)
5. ASME Code, Section VIII, Div. 1		2007	-----
		(Edition and Addenda (date))	(Code Case No.)
			(Special Service per UG-120(d))

6. Shell (a) No. of course(s): (b) Overall length (ft & in.):

[illegible]

7. Heads: (a) ----- (b) -----
(Mat'l Spec. No., Grade or Type) (H.T. — Time & Temp.) (Mat'l Spec. No., Grade or Type) (H.T. — Time & Temp.)

[illegible]

If removable, bolts used (describe other fastening) _____

8. Type of jacket _____ Jacket closure _____
(Describe as ogee & weld, bar, etc.)

If bar, give dimensions If bolted, describe or sketch.

9. MAWP $\frac{\text{----}}{\text{(internal)}}$ $\frac{\text{----}}{\text{(external)}}$ psi at max. temp. $\frac{\text{----}}{\text{(internal)}}$ $\frac{\text{----}}{\text{(external)}}$ °F. Min. design metal temp. $\frac{\text{----}}{\text{(internal)}}$ °F at $\frac{\text{----}}{\text{(external)}}$ psi.

10. Impact test _____ at test temperature of _____ °F.
(Indicate yes or no and the component(s) impact tested)

11. Hydro., pneu., or comb. test press. _____ Proof test _____

Items 12 and 13 to be completed for tube sections.

12. Tubesheet:	----- [Stationary (Mat'l Spec. No.)]	----- [Dia., in. (subject to press.)]	----- [Nom. thk., in.]	----- [Corr. Allow., in.]	----- [Attachment (welded or bolted)]
	----- [Floating (Mat'l Spec. No.)]	----- [Dia., in.]	----- [Nom. thk., in.]	----- [Corr. Allow., in.]	----- [Attachment]

13. Tubes:	-----	-----	-----	-----	-----
	(Mat'l Spec. No., Grade or Type)	(O.D., In.)	(Nom. thk., In. or gauge)	(Number)	(Type (Straight or U))

Items 14-18 Incl. to be completed for inner chambers of jacketed vessels or channels of heat exchangers.

14. Shell (a) No. of course(s) 0 (b) Overall length (ft & in.): 2'0.312" F/H

[illegible]

FORM U-2 (Back)

15. Heads: (a) SA-516-70 (b)
(Mat'l Spec. No., Grade or Type) (H.T. — Time & Temp.) (Mat'l Spec. No., Grade or Type) (H.T. — Time & Temp.)

	Location (Top, Bottom, Ends)	Thickness		Radius		Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure		Category A		
		Min.	Corr.	Crown	Knuckle					Convex	Concave	Type	Full, Spot, None	Eff.
(a)	END	.375N	----	27	5.1	2:1	----	----	----	----	YES	----	----	----
(b)	----	----	----	----	----	----	----	----	----	----	----	----	----	----

If removable, bolts used (describe other fastening)
(Mat'l Spec. No., Grade, Size, No.)

16. MAWP psi at max. temp. °F. Min. design metal temp. °F at psi.
(internal) (external) (internal) (external)

17. Impact test No at test temperature of °F.
(Indicate yes or no and the component(s) impact tested)

18. Hydro., pneu., or comb. test press. Hydro @ 200 psi Proof test

19. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Flange Type	Material		Nozzle Thickness		Reinforcement Material	How Attached		Location (Insp. Open.)
				Nozzle	Flange	Nom.	Corr.		Nozzle	Flange	
UNKNOWN	1	8"150#	RFWN	SA106B	SA105	0.500	----	Weld	d	Welded	Channel
----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----
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----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----

20. Identification of part(s)

Name of Part	Quantity	Line No.	Mfr's. Identification No.	Mfr's. Drawing No.	CRN	National Board No.	Year Built
----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----

21. Supports: Skirt No Lugs ---- Legs ---- Others ----- Attached -----
(Yes or no) (No.) (No.) (Describe) (Where and how)

22. Remarks: Designed by others
Forming in accordance with UCS-79(d) & UG-81

Customer Item No = E-1530

CERTIFICATE OF SHOP/FIELD COMPLIANCE

We certify that the statements made in this report are correct and that all details of material, construction, and workmanship of this pressure vessel part conform to the ASME Code for Pressure Vessels, Section VIII, Division 1.

U Certificate of Authorization No. 18405 Expires 06/04/2010

Date 4-7-2008 Name Metalforms, Inc. Signed *John W. Hursey*
(Manufacturer) (Representative)

CERTIFICATE OF SHOP/FIELD INSPECTION

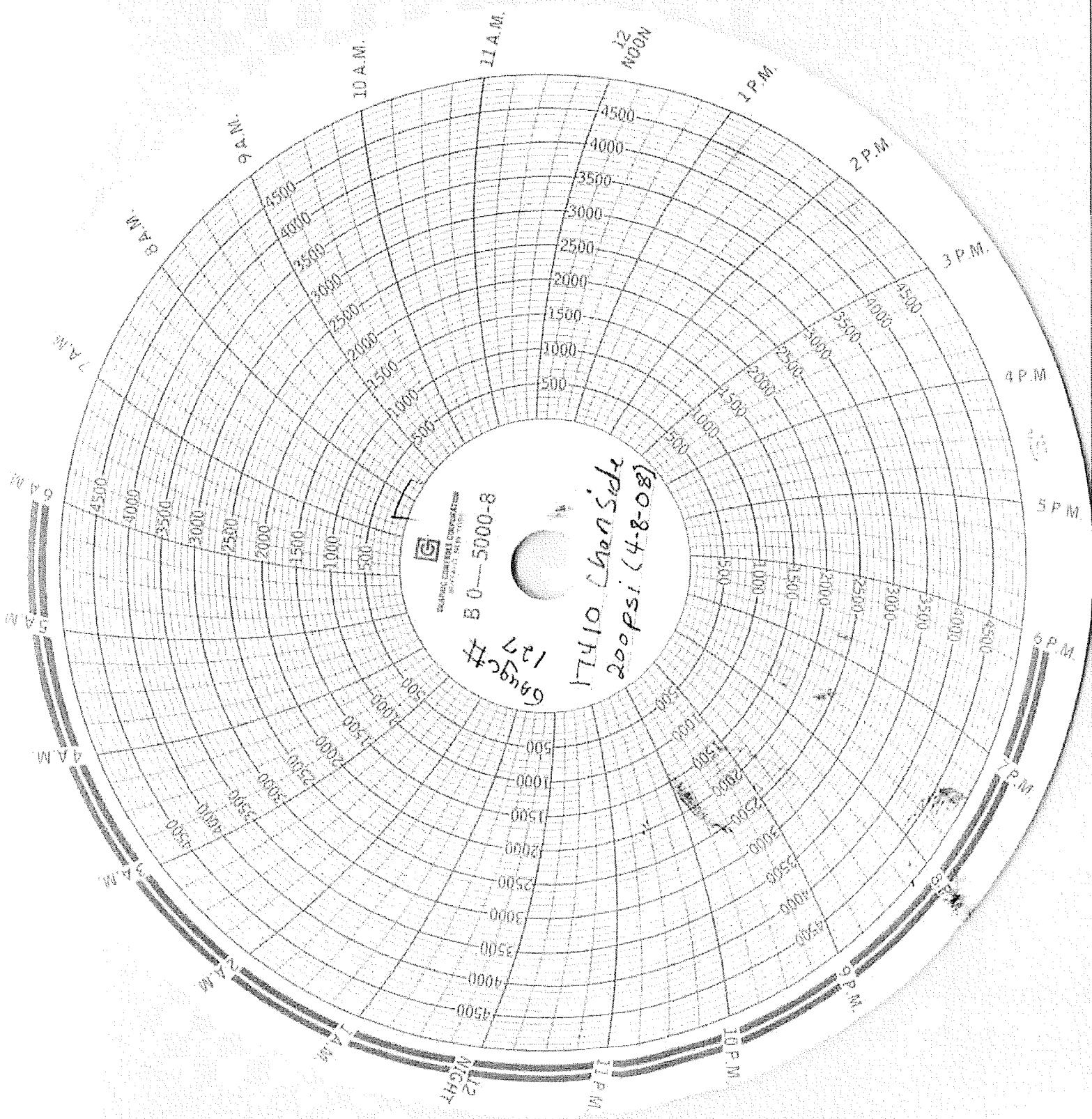
I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of Texas and employed by H.S.B.C.T. of Hartford, CT

have inspected the pressure vessel part described in this Manufacturer's Data Report on 4-7-2008 and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel part 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 part 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 a loss of any kind arising from or connected with this inspection.

Date 4-7-08 Signed *David R. Yeh* Commissions TX1794
(Authorized Inspector) (Nat'l Board Incl. endorsement, State, Province and No.)

	 METALFORMS, INC. CHEEK, TEXAS	
	CERTIFIED BY	
	SHELL SIDE	TUBE SIDE
MAWP	= PSI AT = °F	= PSI AT = °F
MIN. DMT	= °F AT = PSI	= °F AT = PSI
TEST	= PSI NEW	200 PSI NEW
MFG S.N. 17410		YEAR BUILT 2008
P.O. NO. 4400856922		ITEM NO. E-1530
NEW CHANNEL ONLY		
DESIGNED BY OTHERS		

JM
 HSBC
 4-7-08



160 GARTH ROAD – GARTH INDUSTRIAL PARK – BEAUMONT, TEXAS 77705
(409) 842-1626 ANSWERED 24 HOURS
EMAIL ADDRESS: webmaster@metalformsinc.com

Witnessed By: _____

GAUGE NO.: 127

METALFORMS, INC.

160 GARTH ROAD — GARTH INDUSTRIAL PARK — BEAUMONT, TEXAS 77705
(409) 842-1626 ANSWERED 24 HOURS

P.O. BOX 20118
BEAUMONT, TEXAS 77720
PRIMARY FAX (409) 842-1503
ENGINEERING FAX (409) 842-0207



BRIDGE CITY
(409) 735-2851

CERTIFICATE OF CALIBRATION

This certifies the calibration of the following equipment using a dead weight tester as approved by the National Bureau of Standards.

NBS Test Report No.: 47238001

Instrument Type : Pressure

Range: B-400

Manufacturer: USG

<u>% Scale</u>	<u>As Found</u>	<u>Left</u>
<u>0</u>	<u></u>	<u>0</u>
<u>25</u>	<u></u>	<u>100</u>
<u>50</u>	<u></u>	<u>200</u>
<u>75</u>	<u></u>	<u>300</u>
<u>100</u>	<u></u>	<u>400</u>

Comments: Cleaned

Calibration Performed By Metalforms, Inc.

Date: 2/18/02

Signed: M. L. [Signature]

160 GARTH ROAD — GARTH INDUSTRIAL PARK — BEAUMONT, TEXAS 77705
(409) 842-1626 ANSWERED 24 HOURS
E-MAIL ADDRESS: webmaster@metalformsinc.com

PRIMARY FAX (409) 842-1503
ENGINEERING FAX (409) 842-0207



DATE: 4.2.08

JOB NO.: 17410

CUSTOMER: Equistar Chem.

PERFORMED BY: John Insley

MF-203/REVISED 10/87

METALFORMS, INC.

160 GARTH ROAD — GARTH INDUSTRIAL PARK — BEAUMONT, TEXAS 77705
(409) 842-1626 ANSWERED 24 HOURS

P.O. BOX 20118
BEAUMONT, TEXAS 77720
PRIMARY FAX (409) 842-1503
ENGINEERING FAX (409) 842-0207

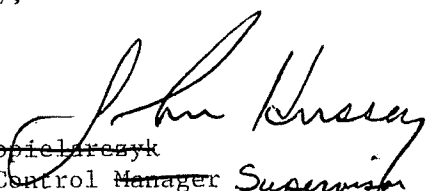


BRIDGE CITY
(409) 735-2851

4-7, 2008

The average chloride level found as per HACH Company Chloride Test Kit Model
8-P for the Day of 4-7-2008 was 45 mg/L (ppm).

Sincerely,


~~Donald Popielarczyk~~
Quality Control Manager *Supervisor*

DP/cc

METALFORMS, INC.

160 GARTH ROAD - GARTH INDUSTRIAL PARK - BEAUMONT, TEXAS 77705
(409) 842-1626 ANSWERED 24 HOURS
EMAIL ADDRESS: webmaster@metalformsinco.com

P.O. BOX 20118
BEAUMONT, TEXAS 77720



PRIMARY FAX (409) 842-1503
ENGINEERING FAX (409) 842-0207

LIQUID PENETRANT TEST INSPECTION REPORT

Client : Equistar Chemicals,LP Date : 3.28.08
Time : day
P.O.# 4400856922 Job# : 17410
M.F. NDE Procedure# LP-1-86.4 Item# : E-1530
Penetrant: SKL-WP Dwell Time: 15 minutes
Developer: SKD-S2 Dwell Time: 10 minutes
Material: SA-105-N Thickness ----- Lighting: Dorcy

Ref. Code Std.: ASME Sec. VIII Div. 1 Appdx. 8 & Sec. V Art. 6, Art. 24 SE-165

Examination of: Back of flange surface and outer surface of hub

FLG# 5

RESULTS OF INSPECTION:

ACCEPTABLE

Customer Inspector: _____

Authorized Inspector: _____

Metalforms PT-Level II:



JOHN W. HUSSEY
CWI 06020091
QC1 EXP. 02/09

METALFORMS, INC

P.O. BOX 20118
BEAUMONT, TX 77720

CUSTOMER

Equistar Chemicals

DATE 4-2-08

4-2-08

PART NO

RADIOGRAPHIC PROCEDURE NO.

V-81-1

SERIAL NO. 17410

17410

CODE SPEC.

ASME Sect. VIII Div. 1 UW-52

SUBASSEMBLY		SERIAL NO	MATERIAL	THICK- NESS	TYPE WELD		TYPE EXPOSURE		NO OF EXPOSURES
Channel		17410	C/S	3/8"	Butt		Single Wall		1
RADIOGRAPHIC TECHIQUE									
CURIES	ISOTOPE	FOCAL SPOT	TIME	PENETRA- METER	VIEW	F. DIST TO SOURCE	SOURCE TO OBJECT	FILM TYPE	SET UP TECHNIQUE POSITION
25	Ir192	168	4 min	ASME 25	1-2	15"	14 5/8"	Fuji 80	3

FILM USED

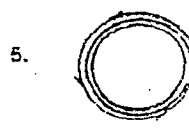
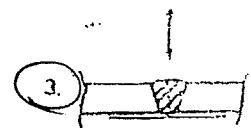
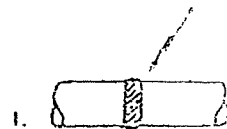
3-1/2 X 10

4-1/2 X 17

4-1/2 X 10

[illegible]

SET UP



CUSTOMER INSPECTOR

AUTHORIZED INSPECTOR

METALFORMS RT-LEVEL II

DATE _____

DATE 4-7-08

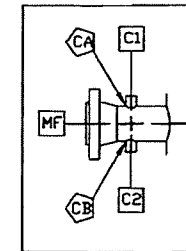
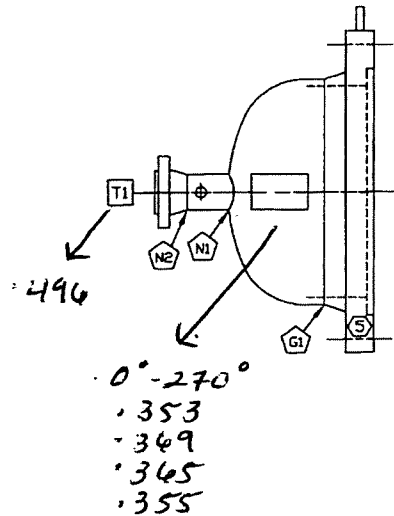
DATE 4-2-08

METALFORMS JOB ORDER 17410

As Built Thickness

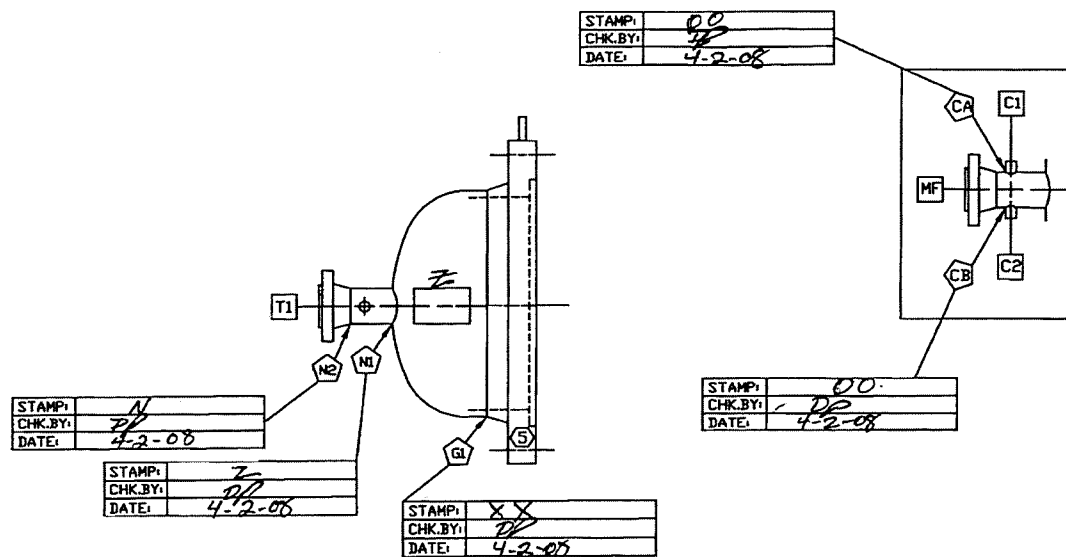
SHOP INSPECTOR 02/27/08

<u>NDE LEGENDS</u>	
NO:	DESCRIPTION
A	RT
B	100% ULTRASONIC TEST
C	MT TEST
D	PT TEST
E	BHN
F	VISUAL EXAMINATION
G	WFMP T TEST
H	AFTER STRESS NDE
I	SOAP & AIR TEST
J	HELIUM TEST
K	
L	
M	
N	
O	
P	

[illegible]

REV.	REVISION DESCRIPTION					BY	CHK	DATE	
 METALFORMS, INC. P.O. BOX 20118 BEAUMONT, TEXAS 77720									
TITLE: CHANNELSIDE NDE MAP									
BUNDLING DATE: CR 2/21/08	CHG MS	DATE: 2/22/08	CHK-DATE: WKL 2/22/08	APRV. DATE: LAW 2/26/08	DWG. NO.: 17410	SHT. SKZ:			

© NDESKI

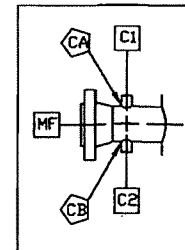
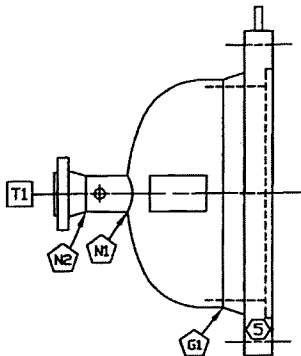


ASSEMBLY LUGS	<u>2</u>	<u>DP</u>							
HK	STAMP	CHK.BY	DATE	STAMP	CHK.BY	DATE	STAMP	CHK.BY	DATE

REV.	REVISION DESCRIPTION					BY	CHK	DATE	
 METALFORMS, INC. P.O. BOX 20118 BEAUMONT, TEXAS 77720									
TITLE: CHANNELSIDE WELD STENCIL MAP									
DOWNL. DATE:	CHK:	DATE:	CHK:	DATE:	APPR. DATE:	DWG. NO.:	SH:		SK:
CR 2/21/08	MS	2/22/08	WKL	2/22/08	LAW 2/26/08	17410			

© WMBLK

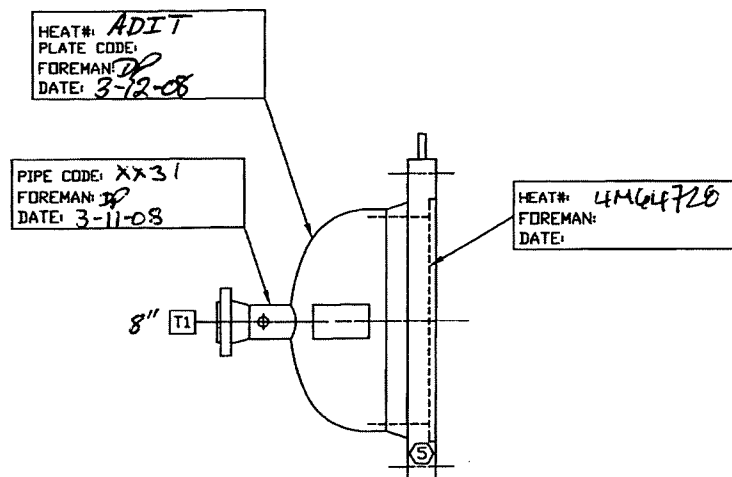
<u>NDE LEGENDS</u>	
NO:	DESCRIPTION
A	RT - 3
B	100% ULTRASONIC TEST
C	MT TEST
D	PT TEST
E	BHN
F	VISUAL EXAMINATION
G	WFMP TEST
H	AFTER STRESS NDE
I	SOAP & AIR TEST
J	HELIUM TEST
K	
L	
M	
N	
O	
P	

[illegible]

REV.	REVISION DESCRIPTION					BY	CHK	DATE	
 METALFORMS, INC. P.O. BOX 20118 BEAUMONT, TEXAS 77720									
TITLE: CHANNELSIDE NDE MAP									
DWNLD DATE: CR 2/21/08		CHKD MS		DATE: 2/22/08		CHKD DATE: WKL 2/22/08		APPRV. DATE: LAV 2/26/08	
						DWG NO.: B7410		SHT NO.: SKG	

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©

METALFORMS, INC.		INSPECTION & TESTING PLAN FRONT SHEET																	
PLAN LIST No. QCP-2001		Sheet No. 0 OF 3		Revision No. 0															
Requisition No.		P/ORDER No. 4400856922 JOB No. 17410																	
VENDOR: Metalforms, Inc., Beaumont, TX SUBCONTRACTOR:																			
PROJECT/ITEM DETAILS:		FIRST EFFECT REBOILER																	
JOB DESCRIPTION/SCOPE: Fabricate, construct, inspect and test One(1) B Type Channel in accordance with ASME Code Section VIII, Div.1, 2007, TEMA Standards, Class B, latest edition, Lyondell Engineering Specification & Metalforms, Inc. Quality Assurance Manual. Perform shop inspection and examinations throughout all phases of shop fabrication in accordance with Lyondell/Equistar requirements, and Engineering Standards 200, 220, 223, 322, 340, 360, API660, QAP070, IS123, & IS601. <table> <tr> <td>Customer:</td> <td>Equistar Chemicals, L.P.</td> </tr> <tr> <td>Location:</td> <td>Beaumont, TX PD Glycol</td> </tr> <tr> <td>Item #:</td> <td>E-1530</td> </tr> <tr> <td>P.O. #:</td> <td>4400856922</td> </tr> <tr> <td>Service:</td> <td>First Effect Reboiler</td> </tr> <tr> <td>MI Job#</td> <td>17410</td> </tr> <tr> <td>Equip. #:</td> <td>23-08-021</td> </tr> </table>						Customer:	Equistar Chemicals, L.P.	Location:	Beaumont, TX PD Glycol	Item #:	E-1530	P.O. #:	4400856922	Service:	First Effect Reboiler	MI Job#	17410	Equip. #:	23-08-021
Customer:	Equistar Chemicals, L.P.																		
Location:	Beaumont, TX PD Glycol																		
Item #:	E-1530																		
P.O. #:	4400856922																		
Service:	First Effect Reboiler																		
MI Job#	17410																		
Equip. #:	23-08-021																		
DRAWINGS:																			
KEY: S = SURVEILLANCE		A POINT WHERE THOSE SPECIFIED MUST CARRY OUT THE REQUIRED ACTIVITY.																	
V = VERIFY BY INSPECTION		A RANDOM MONITORING OF THE QUALITY CHARACTERISTICS BY THOSE SPECIFIED TO VERIFY CONFORMANCE.																	
W = WITNESS		A POINT WHERE THOSE SPECIFIED CARRY OUT AN ACTUAL INSPECTION TO VERIFY CONFORMANCE.																	
H = HOLD		A POINT BEYOND WHICH WORK MAY NOT PROCEED WITHOUT COMPLETION OF THE ACTION.																	
R = REVIEW		A REVIEW OF DOCUMENTATION BY THOSE SPECIFIED TO VERIFY CONFORMANCE.																	
REV.	REMARKS	DATE	Initiated by	Complete	Distributed														
0	Initial Issue	2/26/2008	KL																

METALFORMS INC.	INSPECTION & TESTING QCP-2001	JOB No.17410	Item # E-1530 P/ORDER No. 4400856922				
ACTIVITY		RELEVANT PROCEDURES/ SPECIFICATIONS	VENDOR Metalforms, Inc.	SIGN	CUST. REP.	SIGN	VERIFYING DOCUMENT
2.0 General Requirements							
2.1	Check materials against certified material test reports and design requirements.	1, 3, 4 (6.3)(d)(e), 6 (3.6.2.7), 8 (3.0), 14, UG4, UG77, UG90, UG93, UG94	H,R	<i>[Signature]</i>			
2.2	Check material test reports for all materials.	1, 4 (6.3)(d) (7.1.5)(e), 6 (3.6.2.7)	H,R	<i>[Signature]</i>			
2.3	Check welding procedure specifications and supporting procedure qualification records prior to fabrication for approval.	1, 4 (6.2.2), 5 (6.2.2) (9.5.6.2)(9.5.6.3), 10	H	<i>[Signature]</i>			
2.4	Check welder performance qualification records for approval prior to fabrication start.	1, 4(10.1.5)(a), 5(3.2.3)(9.5.6.2)(9.5.6.3),10	H,R	<i>[Signature]</i>			
2.5	Check N.D.E. procedures and technician qualification documentation.	1, 3, 5 (9.5.6.3), 6 (7.4.2) (7.4.17), 10 (11.3-4) (12.1-2), 11 (5.2.1-2) (5.2.4-5) (5.3.3-5) (5.4.1-4), UG90 (B)(15)	H,R	<i>[Signature]</i>			
2.6	Check hydrostatic pressure gauge calibration and certification documentation.	1, 3, 6 (3.6.2.6), 11 (4.4) (5.3.3-5), UG102	H,R	<i>[Signature]</i>			
8.0 Bottom Channel Assembly							
8.1	Check channel cover heat number stamping I.D. for traceability.	1, 3, 4 (6.3)(d), 6 (3.6.2.7), UG77, UG93, UG94	H,R	<i>[Signature]</i>			
8.2	Check channel cover for roundness and dimensional tolerance before welding.	2 ___, 3, 6 (6.1.1), UG80	H	<i>[Signature]</i>			
8.3	Check circumferential weld joint preparations and fit up.	2 ___, 3, 10 (7.1-2) (7.5), UG80	H	<i>[Signature]</i>			
	G' / ' (Body flange-to-Bottom Head)		H	<i>[Signature]</i>			
8.4	Check welding consumables.	1, 2 ___, 3, 10 (6.16) (6.16.1-3), WPS, UG9	S	<i>[Signature]</i>			
JOB DESCRIPTION/SCOPE: B TYPE CHAN. ONLY			PLAN No. QCP-2001		SHT No. 1/3	REV. 0	

METALFORMS INC.		INSPECTION & TESTING QCP-2001		Item # E-1530			
		JOB No.17410		P/ORDER No. 4400856922			
ACTIVITY		RELEVANT PROCEDURES/ SPECIFICATIONS	VENDOR Metalforms, Inc.	SIGN	CUST. REP.	SIGN	VERIFYING DOCUMENT
8.5	Surveillance during welding.	1, 5 (9.5.6.3), 6 (7.4.5-7) (7.4.11) (7.4.17)(7.4.20-21)(7.6), 8(3.0), 11(5.2.1-4) (5.5.1), 12(5.2.1)(5.3.1), WPS	S	<i>[Signature]</i>			
8.6	Check completed circumferential weld seam welder I.D. stamping.	1, 11 (5.5.1)	S	<i>[Signature]</i>			
8.7	Check NDE results completed circumferential weld joints.	4 (10.2)	H,R	<i>[Signature]</i>			
	G '1' (Body flange-to-Bottom Head)		S	<i>[Signature]</i>			
8.8	Check orientation of inlet/outlet nozzles prior to cutting openings.	2, 6 (6.1.1)	H	<i>[Signature]</i>			
8.9	Check nozzle weld joint preparations and fit ups.	1, 2, 10 (7.1-2) (7.5)	H	<i>[Signature]</i>			
	Nozzle '1' ()		H	<i>[Signature]</i>			
	Coupling 'C1' ()		H	<i>[Signature]</i>			
	Coupling 'C2' ()		H	<i>[Signature]</i>			
8.10	Check welding consumables.	1, 3, 10 (6.16) (6.16.1-3), WPS, UG9	H,R	<i>[Signature]</i>			
8.11	Surveillance during welding.	1, 5 (9.5.6.3), 6 (7.4.5-7) (7.4.11) (7.4.17)(7.4.20-21)(7.6), 8(3.0), 11(5.2.1-4) (5.5.1), 12 (5.2.1) (5.3.1), WPS	S	<i>[Signature]</i>			
8.12	Check completed nozzle-to-channel welds for welder I.D. stamping and overall workmanship quality.	1, 3, 11 (5.5.1), UW29 (C), UW37 (F)	S	<i>[Signature]</i>			
	Nozzle '1' ()		S	<i>[Signature]</i>			
	Coupling 'C1' ()		S	<i>[Signature]</i>			
	Coupling 'C2' ()		S	<i>[Signature]</i>			
11.0 Final Inspection							
11.1	Check vessel for final dimensions, overall workmanship quality, and cleanliness prior to final closure of exchanger and hydrostatic pressure testing.	1, 3, 7, 8 (3.0), UG97	H	<i>[Signature]</i>			
JOB DESCRIPTION/SCOPE: B TYPE CHAN. ONLY		PLAN No. QCP-2001		SHT No. 2/3		REV.	

METALFORMS INC.	INSPECTION & TESTING QCP-2001	JOB No.17410	Item # E-1530 P/ORDER No. 4400856922				
ACTIVITY		RELEVANT PROCEDURES/ SPECIFICATIONS	VENDOR Metalforms, Inc.	SIGN	CUST. REP.	SIGN	VERIFYING DOCUMENT
12.0 Hydrostatic Pressure Testing							
12.1	Check test water purity. Alloys only - Chloride content not to exceed 50 ppm.	1, 4 (10.3.4), 5 (10.3.4), 6 (7.7.5)	H	<i>ph</i>	<i>AK</i>		
12.2	Check test water temperature.	1, 6 (7.7.2), Hydrostatic Test Pressure	H	<i>ph</i>	<i>AK</i>		
12.3	Tube bundle air under water bubble test.	2 ___, Eng. Spec.	H	<i>ph</i>	<i>AK</i>		
12.4	Check hydrostatic test pressure and charting.	1. 3. 4(10.3). 5 (10.3.3)(10.3.5)	H	<i>ph</i>	<i>AK</i>		
200 Tube Side - psig			H	<i>ph</i>	<i>AK</i>		
12.5	Verify pressure gauge test range and calibration. Range 1.5 - 4.0 times press. calibration - annually.	1, 3, 6 (3.6.2.6), 11 (4.4) (5.3.3-5), UG102 (B) (C)	H	<i>ph</i>	<i>AK</i>		
13.0 Nameplate Stamping and Reports							
13.1	Verify nameplate stamping and manufacturer's data report for conformance.	1, 3, 6 (1.3), 6 (3.2.10.8), UG115 through UG120	H	<i>ph</i>	<i>AK</i>		
14.0 Sandblasting and Painting							
14.1	Check external shell and surfaces for cleanliness and preparation after sandblasting and before painting.	9, SSPC Std's, NACE	H	<i>ph</i>	<i>AK</i>		
14.2	Check paint coats for conformance.	9	H				
15.0 Equipment Stenciling							
15.1	Check PWHT, purchase order number, plant record number, and weight stenciling check approximate center of gravity.	2 ___ notes, 4 (11.2)(11), 6 (9.1-3)	H	<i>ph</i>	<i>AK</i>		
16.0 Shipping Preparations							
16.1	Check shipping preparations for conformance with PO# 4400856922	2 ___ notes, 4(11.0), 5(11.0), 6 (8.0) (9.0), 8 (3.7), 13 (7.0)	H	<i>ph</i>	<i>AK</i>		
JOB DESCRIPTION/SCOPE: B TYPE CHAN. ONLY		PLAN No. QCP-2001		SHT No. 3/3		REV.	

ITEM 1 THROUGH 14

[illegible]



OKLAHOMA FORGE, INC.

OPEN DIE FORGINGS

Certification of Analysis and Tests

FOR INVOICE

Number: 108-51729
Date: 3/25/08

Toll Free (866)909-5553 Web Site ~ www.oklahomaforge.com P.O. Box 701500
Local (918)446-5553 FAX (918)446-4150 e:Mail ~ sales@oklahomaforge.com Tulsa, Oklahoma 74170-1500

Sold To	Your Purchase Order	Sales Order
METALFORMS P.O. BOX 20118 BEAUMONT, TX 77720 USA	Number 88459 ✓ By JEFF GRIFFIN Dated 2/25/08	Number 108-39127 Shipped VIA CHRIS Date Shipped 3/25/08

Line Item No	PART DESCRIPTION					Quantity
	Your Part Number	Shop Order Number	Shape	Dimensions		
		Supplier	Heat Number	Material Specifications		
	Chemical Analysis					
	Physical Properties			Charpy Impact (Ft.Lbs.)		

1	17410 ✓	108-39127-01	RING	35.125 OD x 30.000 ID x 3.437 TH	1												
		MACSTEEL	4M64728 ✓	SA105-04 NORMALIZED													
✓C	✓Mn	✓P	✓S	✓Si	✓Ni	✓Cr	✓Cu	✓Mo	✓V	Cb	Al	Pb	Ce	Other			
.19	1.02	.010	.012	.18	.08	.16	.17	.02	.015	.002	.025		.42	SN-.012			
Yield Lb/Sq In		Tensile Strength Lb/Sq In		Elong%in 2In		Red of Area%		Brinell	Rckwl C	Bend Test	Grain Size	Type	Temp	Average	#1	#2	#3
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C	Mn	P	S	Si	Ni	Cr	Cu	Mo	V	Cb	Al	Pb	Ce	Other		
Yield Lb/Sq In	Tensile Strength Lb/Sq In		Elong%in 2In		Red of Area%		Brinell	Rckwl C	Bend Test	Grain Size	Type	Temp	Average	#1	#2	#3

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Notes:
✓ UT REPORT ATTACHED

MTR OK QAB J# 17410 PC #1
PO# 88459
3-27-08

Page 1 of 1

I CERTIFY THAT THERE IS A TRUE COPY OF THE ORIGINAL TEST SHEET NOW ON FILE AT THE OFFICE OF OKLAHOMA FORGE, INC. AND THAT THIS MATERIAL WAS MANUFACTURED IN THE UNITED STATES OF AMERICA.

BY

Anneal by heating to 1450-1550 degrees for one hour/inch of thinnest section. Slow cool in furnace to 700 degrees F then air cool by opening door. Normalize by heating to 1650 degrees F, Hold at 1650 degrees F for one hour/inch of thinnest section and air cool. Solution Anneal by heating to 2000-2050 degrees F and Water quenching.

ADVANCED INSPECTION TECHNOLOGIES

P.O. Box 27726
Tulsa, Oklahoma 74149-0726
Phone: 918-584-4677

CUSTOMER DATA	
NAME	Oklahoma Forge
ADDRESS	Tulsa
PURCHASE ORDER	2965
ATTENTION	
DAY	Tues
DATE	3-25-08

ULTRASONIC INSPECTION REPORT

INSPECTION DESCRIPTION: WELD _____
LAMINAR REFLECTOR ☒ _____
PIPE _____
OTHER _____

APPLICABLE CODE: ASME Sec IV art 23 SA-388

EQUIPMENT MANUFACTURER: Sonotest

MODEL NUMBER: Site Scan 240 SERIAL NUMBER: I000170

TRANSDUCERS: LONGITUDINAL MHz 1) 1.0 /2) _____

SIZE 1) 1" /2) _____

SINGLE X DUAL _____

ANGLE 1) 45 /2) _____

SHEAR: MHz 1) 1.0 /2) _____

SIZE 1) 1" /2) _____

SURFACE: MHZ 1) _____ /2) _____

SIZE 1) _____ /2) _____

CALIBRATION: LONGITUDINAL - REFERENCE LEVEL 40 (db) SCANNING LEVEL 46 (db)

SHEAR - BLOCK TYPE IIW Type I

REFERENCE LEVEL 60 (db) SCANNING LEVEL 66 (db)

COUPLANT: CELLULOSE ☒ GLYCERIN _____ OIL _____ WATER _____ OTHER _____

SCANNING: CONTACT ☒ IMMERSION _____ MANUAL _____ ☒ AUTOMATIC _____

SPEED 46" per sec

100% OF SURFACE ☒ GRID OR SPOT (SIZE) _____

SURFACE - INSIDE _____ OUTSIDE ☒

VERTICLE _____ HORIZONTAL ☒

DIRECTIONS - PARALLEL _____ PERPENDICULAR _____ OPPOSING ☒

PART IDENTIFICATION: _____

SO# 39127-01

1- 35.125 X 30.000 X 3.437

material: A105

HT# 4M64728

RESULTS: NO Relevant indications were found of rejectable size.
UT is acceptable per ASA-388

TECHNICIAN HOURS _____ ASST HOURS _____ TRAVEL HOURS _____ MILEAGE _____ PERDIEM _____

TECHNICIAN: M. S. Busby LEVEL II

ASSISTANT: _____ LEVEL _____

CUSTOMER REPRESENTATIVE: _____ TOTAL TIME 1 Ring

COVER SHEET

BOTH CHAN COVER HEAD

NUCORP.O.Box 279
Winton, NC 27986
(252) 356-3700

PLATE MILL

Mill Test Report

Page 1

**NUCOR**
It's our Nature.

Issuing Date : 11/22/2007

B/L No. : 182636

Load No. : 184482

Our Order No. : 58029/1

Cust. Order No. : 8074

Vehicle No: LW 62014

Sold To: RANGER STEEL SERVICES LP

Ship To: RANGER STEEL

Specification: 0.3750" x 96.000" x 480.000"

1225 NORTH LOOP W. STE 650

C/O KINDERMORTEK

ASTM A516 70-06/ASME SA516 70-90 PVQ 2007 Normalized Tests at
1650 F 30 min. minimum

HOUSTON, TX 77008

9640 CLINTON DRIVE

ZONE 23 TRACK 415

HOUSTON, TX 77245

Marking :

Heat No	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al	V	Nb	Ti	N	Ca	B	Sn	CEQ	PCM
7108492	0.19	1.04	0.011	0.001	0.25	0.24	0.07	0.09	0.02	0.031	0.004	0.001	0.002		0.0019	0.0002	0.008	0.41	0.27
7108493	0.19	1.05	0.014	0.004	0.18	0.25	0.07	0.08	0.02	0.037	0.003	0.001	0.001		0.0020	0.0001	0.008	0.41	0.27

-ADIT

Tensile Test								Charpy Impacts											
Plate Serial No	Pieces	Tons	Dir.	(psi) Yield	(psi) Tensile	Elongation % in 2"	Elongation % in 8"	Dir.	1	(%) shear	2	(%) shear	3	(%) shear	Ave.	(%) shear	Size	Temp	Min Ave.
7108492-03	2	4.90	T	56,400	81,900		22.5												
7108492-04	6	14.70	T	56,400	82,500		23.2												
7108492-05	6	14.70	T	56,800	82,400		23.0												
7108492-06✓	6	14.70	T	58,500	81,800✓		23.0												
7108492-07	6	14.70	T	61,600	81,100		24.0												
7108492-08	3	7.35	T	52,500	72,600		17.3												
7108492-03	2	4.90	T	42,300	76,200		17.8	N											
7108492-04	6	14.70	T	45,600	70,200		17.9	N											
7108492-05	6	14.70	T	45,800	70,300		17.6	N											
7108492-06	6	14.70	T	48,800	73,200		25.3	N											
7108492-07	6	14.70	T	45,300	70,400		17.8	N											
7108492-08	3	7.35	T	45,700	70,500		17.5	N											
7108493-01	5	12.25	T	49,800	76,400		26.1												
			T	47,800	71,400		24.3	N											

ADIT

Test coupons only, normalized 30 minutes per inch of thickness at 1650 F ± 25 F. Hold 30 minutes minimum.

RANGER STEEL
Q.C. APPROVED

Manufactured to fully killed fine grain practice by Electric Arc Furnace. Welding or weld repair was not performed on this material.

Mercury has not been used in the direct manufacturing of this material. Produced as continuous cast as-rolled discrete plate.

Yield by 0.5EUL method unless otherwise specified. $C_{eq} = C + (Mn/5) + ((Cr + Mo + V)/5) + ((Cu + Ni)/15)$ $P_{cm} = C + (Si/30) + (Mn/20) + (Cu/20) + (Nb/50) + (Cr/20) + (Mo/15) + (V/10) + B$

Melted and manufactured in the USA. ISO 9001-2000 certified (#12443-0) by SRI Quality System Registrar (#0985-09). PED 97/23/EC 7/2 Annex 1, Para. 4.3 Compliant.

DIN 50049 3.1.B/EN 10204 3.1.B(2004). DIN EN 10204 3.1(2005) compliant. For ABS grades only, Quality Assurance certificate No. 03-MMPQA-182

We hereby certify that the contents of this report are accurate and correct. All test results and operations performed by the material manufacturer are in compliance with the applicable specifications.

T.A. Depretis

T. A. Depretis, Metallurgist

11/26/2007 10:11:02 AM

P-14155 Q.C. By J.D.



160 Southbelt Industrial Drive
Houston, Texas 77047
PH. 713-433-0700 - FAX 713-433-6580
Email: galpmal@galperti-am.com

LYNCO FLANGE & FITTING, INC.

P.O. BOX 926226
HOUSTON TX 77292-6226

TEST/CERTIFICATE	EN 10204	INTERNATIONAL JOB
3.1B		080407

CERTIFICATE N.	DATE	YOUR P.O.	DATE
001122/B	02/08/2008	H-012808-S	01/30/2008

ITEM	DESCRIPTION				QUANTITY	B/P	MATERIAL	HEAT N°		#
008/008	8"	150 WN RF XS	A105	B1 F	30	B	ASTM A/SA105N 03c	TZK		A
009/009	6"	150 WN RF XS	A105	B1 F	55	B	ASTM A/SA105N 03c	4461/02		B
025/025	4"	150 WN RF XS	A105	B1 F	50	B	ASTM A/SA105N 03c	9854/02		C
029/029	4"	150 WN RF 120	A105	B1 F	10	B	ASTM A/SA105N 03c	257032		D

#		CHEMICAL ANALYSIS																	
		C %	MN %	SI %	P %	S %	CR %	NI %	MO %	CU %	V %	SN %	AL %	NB %	TI %	N %	CB%		FL%
A		0.210	0.870	0.230	0.020	0.018	0.150	0.070	0.023	0.270	0.003						0.002		0.41
A	C	0.200	0.890	0.210	0.023	0.021	0.160	0.080	0.013	0.260	0.003						0.002		0.40
B		0.170	1.120	0.190	0.004	0.005	0.110	0.180	0.049	0.200	0.001	0.017		0.0001		0.008	0.0001		0.41
B	C	0.160	1.100	0.210	0.007	0.002	0.120	0.170	0.059	0.210	0.001	0.017		0.0001		0.008	0.0001		0.40
C		0.170	1.120	0.210	0.003	0.005	0.073	0.130	0.040	0.200	0.009		0.020	0.0010			0.0010		0.39
C	C	0.160	1.140	0.230	0.006	0.002	0.083	0.140	0.050	0.190	0.004		0.040	0.0010			0.0010		0.39
D		0.190	0.880	0.180	0.014	0.014	0.130	0.080	0.016	0.280	0.002			0.0010			0.0010		0.39
D	C	0.180	0.900	0.200	0.017	0.017	0.140	0.090	0.026	0.290	0.002			0.0010			0.0010		0.38

NOTES
FL-Carbon Equivalent Long Formula

C - CHECK ANALYSIS

#	MECHANICAL PROPERTIES										CHARPY TEST			
	TENSILE										VALUES			
	TYPE	Ø DIAMETER mm.	AREA mm²	LENGHT mm.	TEMP. F	TENSILE PSI	YIELD PSI	ELONG %	REDUCT. %	TYPE	TEMP.	VALUES		HB HARDNESS (AVERAGE)
A S		12.50	122.70	50.00	68	70,000	36,000	22.0	30.0					187
A O		12.50	122.70	50.00	68	78,183	47,499	29.6	70.0					165
B S		12.50	122.70	50.00	68	70,000	36,000	22.0	30.0					187
B O		12.50	122.70	50.00	68	78,663	47,527	26.4	69.6					160
C S		12.50	122.70	50.00	68	70,000	36,000	22.0	30.0					187
C O		12.50	122.70	50.00	68	77,522	46,611	27.5	68.5					164
D S		12.50	122.70	50.00	68	70,000	36,000	22.0	30.0					187
D O		12.50	122.70	50.00	68	78,436	47,686	28.0	69.0					155

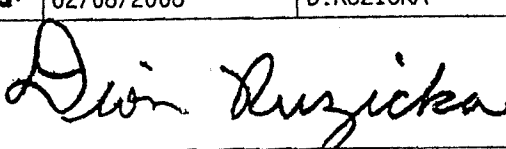
NOTES

O - OBTAINED
S - STANDARD

#	HEAT TREATMENTS	GENERAL NOTES
A	Normalized at 900 dgr.C for 1.172 h.-Cooling from 900 dgr.C in still air	ROUGHNESS F - STOCK FINISH 125-250 microinch STANDARD B1 - ASME B16.5
A		
B	Normalized at 900 dgr.C for 1 h.-Cooling from 900 dgr.C in still air	
B		
C	Normalized at 900 dgr.C for 1 h.-Cooling from 900 dgr.C in still air	
C		
D	Normalized at 900 dgr.C for 1 h.-Cooling from 900 dgr.C in still air	
D		

Material I.A.W. Nace MR-0175
MTR OKOW J17410
PORT# 88497 3-1-08

PL# 3 Nozz "T1" FLANGE

TRADE MARK	INT. INSPECT DATE	INT. INSPECTOR
	02/08/2008	D. RUZICKA
SPECTION AUTHORITY		
		



981



V & M STAR **Seamless Tubular Products**

Certified Test Report
06/26/2007

29371

CUSTOMER: DIXIE PIPE SALES
SLN: W50399 **GRADE:** API 5L X42/B PSL 2 Rev. October 4, 2004
OD: 8.625 **WALL:** 0.500 **LBS/FT:** 43.43 **DESC:** SEAMLESS HOT ROLLED
COMMENT: Melted and Manufactured in the USA
This pipe is also manufactured to: ASTM A106B/C Rev.06 ASTM A53B Rev.06 ASME SA106B/C Rev.04 ASME SA53B Rev.04 V&M Star's QA program meets the requirements of DIN EN 10204/Rev.2004 Type 3.1. Satisfies NACE MR0103-2005.
CUSTOMER ORDER NUMBER: 3890
MILL ORDER NO: 81929
W/O NO:
LOT NO:

MECHANICAL PROPERTIES:							LONGITUDINAL		STRENGTH KSI		ELONGATION		SUPPLEMENTAL REQUIREMENT	
SPECIMEN CROSS SECTION							YIELD		TENSILE		GAGE LENGTH		HARDNESS: 80 HRBW AVG	
	WIDTH(IN)	THICK(IN)	AREA(SOIN)										FLATTENING: PASSED	
1)	1.520	0.535	0.8181				50.7		71.9		2		NACE TEST: MRO175/ISO 15156-2 Clause A.2.1.1	
2)	0.000	0.000	0.0000				0.0		0.0		0		GRAIN SIZE:	
3)	0.000	0.000	0.0000				0.0		0.0		0		OTHER:	
4)	0.000	0.000	0.0000				0.0		0.0		0		COLLAPSE:	
5)	0.000	0.000	0.0000				0.0		0.0		0		8D MIN:	

INSPECTION:

HYDROSTATIC TEST (psi): 3650 for a 5 second minimum

Q/T:

AF: 0

TF: 0

DRIFT PLUG SIZE: INCHES

Required CE Max of 0.43

CHEMICAL ANALYSIS: 61 Ultrasonic Inspection. Reference Standard was a test joint with 10% ID and OD Longitudinal and Transverse notches.																			
	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Sn	Nb	V	Al	Ca	B	Ti	N	CE	
HEAT	0.20	0.76	0.007	0.003	0.22	0.16	0.07	0.07	0.01	0.008	0.001	0.001	0.039	0.0025	0.0001	0.001	0.0070	0.35	
PRODUCT 1)	0.20	0.76	0.007	0.003	0.22	0.15	0.06	0.07	0.01	0.008	0.001	0.001	0.038	0.0021	0.0001	0.001	0.0067	0.36	
PRODUCT 2)	0.21	0.76	0.007	0.003	0.22	0.15	0.06	0.07	0.01	0.007	0.001	0.001	0.039	0.0023	0.0001	0.001	0.0066	0.37	
PRODUCT 3)	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.0000	0.0000	0.000	0.0000	0.00	
PRODUCT 4)	0.00	0.00	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.0000	0.0000	0.000	0.0000	0.00	

CHARPY IMPACT TESTING Notch: V

	DIRECTION	SIZE	TEMP(Deg.F)	FTLBS 1	FTLBS 2	FTLBS 3	AVG	SHEAR 1	SHEAR 2	SHEAR 3	AVG
TEST #1	TRANS	FULL	32	36	44	56	45.00	30	30	30	30
TEST #2				0	0	0	0.00	0	0	0	0
TEST #3				0	0	0	0.00	0	0	0	0

This material has been produced and tested in accordance with the requirements of applicable specifications unless otherwise listed below. We hereby certify that the above test results are representative of those contained in the records of the company. Any modification to this certification as provided by V & M STAR without the expressed written consent of V & M STAR negates the validity of the test report. V & M STAR is not responsible for the inability of the material to meet specific applications.

SIGNED:

Name: JOE DOLAK **Title:** PRODUCT
DATE APPROVED: 06/26/2007

MTR-OK DOW PIPE CODE
P.O.# 87275 XX31
Starke
11/6/07

MILL TEST REPORTS
FOR PO#
DIXIE PIPE SALES, L.P

Pct 4 8' Nozzle pipe "71"



BONNEY FORGE
U.S. ROUTE 522 SOUTH
P.O. BOX 330
MOUNT UNION, PA 17086
(814) 542-2545 (800) 345-7546
FAX (814) 542-9877 TELEX 910-240-9091

CERTIFIED MILL TEST REPORT

LYNCO FLANGE AND FITTING, INC.

11/01/07

LOT NO.	CHEMICAL ANALYSIS, PHYSICAL PROPERTIES, REMARKS
---------	---

3869 ✓ 3/4" 6M A105 Coupling Threaded

C	0.190	MN	1.110	P	0.007	S	0.021	SI	0.220
NI	0.020	CR	0.030	MO	0.010	CU	0.080	CO	0.002
V	0.000	AL	0.031	NE	0.013				
CE (LONG FORMULA) = 0.390									
T/S 79350 Y/S 50881 EL 33.000 RA 63.000									
BRINELL HARDNESS: 143									

1. THE MATERIAL SUPPLIED MEETS THE REQUIREMENTS OF NACE MRO175-2002 AND MRO103-2005
- ✓ 2. THE MATERIAL SUPPLIED WAS INSPECTED AND MANUFACTURED IN ACCORDANCE WITH EN DIN 10204 3.1.B.
3. CERTIFYING ASTM A105-05 / ASME SA105-04 EDITION

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Metalforms, Inc.
160 Garth Road
Cheek, TX 77705

Welding Procedure Specification (WPS)

WPS No.: A-4

Date: 12/7/1982

Rev. No.: 5

Date: 2/27/2002

Page 1 of 2

Supporting PQR(s): A-4

Welding Process(es)/Type(s): (1) SMAW / Manual (2) SAW / Machine

Joint Design (QW-402)

Weld Type: Groove and fillet welds

Joint Type	Backing	Root Opening	Groove Angle	Root Face	Groove Radius
Single-V groove	gouged & back welded	0 - 5/32"	42.5 Deg. - 47.5 D	0 - 1/8"	

Fillet Welds: All (QW-451.4)

Retainers: None

See Detail Drawings.

WELD JOINT DESCRIPTIONS SHOWN ARE NOT INCLUSIVE OF ALL THOSE FOUND ON A JOB. WELD JOINT DESIGN REFERENCE IN AN ENGINEERING SPECIFICATION OR A DESIGN DRAWING SHALL TAKE PRECEDENCE OVER WELD JOINTS SHOWN IN THIS WPS.

Base Metals (QW-403)

P-No. 1 Thickness Range: 0.1875 in. to 1.5000 in.

to P-No. 1

Flat position only with SAW

Preheat (QW-406)

Minimum Preheat Temperature: 60 °F

Maximum Interpass Temperature: 400 °F

Preheat Maintenance: None

Postweld Heat Treatment (QW-407)

PWHT Type: No PWHT will be performed

PWHT Temperature: None °F

PWHT Holding Time: None

Initial and Interpass Cleaning: With wire brush, clean 1" both sides of weld joint.

Method of Back Gouging: When required, grind until all defects are removed.

Minimum preheat must be maintained during thermal cutting, tacking, and welding operations.

Welds shall be cleaned between each pass. When completed, remove all slag and projections.

Maximum heat input in case of impact: SMAW - 44850 J/in &
SAW - 70714 J/in.

No recrushed slag will be used.

We certify that the statements in this specification are correct and in accordance with the requirements of Section IX of the ASME Code.

Prepared By:

[Signature]

2/27/2002

Date

QC MANAGER

Accepted By:

[Signature]

Date

QC Manager

Welding Procedure Specification (WPS)

WPS No.: A-4

Rev. No.: 5

Page 2 of 2

First Process:	SMAW	Type:	Manual
Filler Metal (QW-404)			
Weld Deposit Limits:	0.0000 in. to 0.2500 in.	No Pass Greater Than 1/2" Allowed	
AWS Classification:	E7018	SFA Specification:	5.1 F-No.: 4
A-No. or Chemical Composition:	1	Filler Metal Trade Name:	N/R
Position (QW-405)		Technique (QW-410)	
Position of Joint:	All Positions (see notes)	Stringer or Weave Bead:	Stringer bead
Weld Progression:	Vertical up	Peening:	None
Notes:	Flat position only with SAW		
Electrical Characteristics (QW-409)			
Current Type and Polarity:	DCEP (reverse)		
Max. Heat Input (J/in):	None		

No peening done with this procedure, No retainers will be used.

No pass greater than 1/2" allowed.

No supplementary filler metal will be used with this procedure.

Base metal thickness range in case of impact: 5/8" to 1-1/2".

Group 2 materials only in case of impact.

No vertical uphill progression in case of impact.

Preheat to 175F if "T" > 1" and C > 0.3%; To 200F if T > 1-1/4".

First Process Welding Parameters

Layer(s) and/or Pass(es)	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)
	AWS Classification	Size (in.)	Type and Polarity	Amperage Range		
Any	E7018	1/8	DCEP (reverse)	130	23	4-8
Any	E7018	5/32	DCEP (reverse)	130-220	22-25	3-8

Second Process:	SAW	Type:	Machine
Filler Metal (QW-404)			
Weld Deposit Limits:	0.0000 in. to 1.2500 in.	No Pass Greater Than 1/2" Allowed	
AWS Classification:	EM12K	SFA Specification:	5.23 F-No.: 6
A-No. or Chemical Composition:	1	Flux Type:	Neutral
Flux Trade Name:	Lincoln 860		
Supplemental Filler Metal:	None		
Flux from Recrushed Slag:	None		
Position (QW-405)		Technique (QW-410)	
Position of Joint:	Flat only	Stringer or Weave Bead:	Stringer bead
Notes:	Flat position only with SAW		
Electrical Characteristics (QW-409)		Oscillation:	None
Current Type and Polarity:	DCEP (reverse)	Peening:	None
Max. Heat Input (J/in):	None	Contact Tube to Work Distance:	1-1/4" B.S.O. - SAW
		Multiple or Single Electrode(s):	Single electrode
		Electrode Spacing:	N/A
		Multiple / Single Pass (per side):	Multipass

Second Process Welding Parameters

Layer(s) and/or Pass(es)	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)
	AWS Classification	Size (in.)	Type and Polarity	Amperage Range		
Any	F7A2-EM12K	3/32	DCEP (reverse)	405-495	25-31	12-15
Any	F7A2-EM12K	5/32	DCEP (reverse)	495-505	32-34	12-15



Metalforms, Inc.

160 Garth Road

Cheek, TX 77705

Procedure Qualification Record (PQR)

PQR No.: A-4

WPS No.:

Date: 12/7/1982

Page: 1 of 2

Welding Process(es) / Type(s): (1) SMAW / Manual (2) SAW / Machine

Joints (QW-402) Weld Type: <u>Groove weld</u> <u>Single-V groove</u> Backing: <u>Back-gouged and back welded</u> Root Opening: <u>1/16</u> in. Root Face: <u>1/16</u> in. Groove Angle: <u>60</u> °	
Base Metals (QW-403) Material Spec., Type or Grade: <u>SA-515, Grade 70</u> to <u>SA-515, Grade 70</u> P-No.: <u>1</u> Group No.: <u>2</u> to P-No.: <u>1</u> Group No.: <u>2</u> Thickness of Test Coupon (in.): <u>0.7500</u>	Postweld Heat Treatment (QW-407) Type: <u>No PWHT performed</u> Temperature: <u>None</u> °F Time: <u>None</u> hr
Filler Metals (QW-404) SFA Specification: (1) 5.1 (2) 5.17 AWS Classification: (1) E7018 (2) F7A2-EM12K Filler Metal F-No: (1) 4 (2) 6 Weld Metal Analysis A-No: (1 & 2) 1 Size of Filler Metal (in.): (1) 0.1250 (2) 0.1563 Weld Deposit 't' (in.): (1) 0.1250 (2) 0.6250 Pass Greater Than 1/4": (1 & 2) No Filler Metal Trade Name: (2) Lincoln L-61 wire Supplemental Filler Metal: (2) None Flux Trade Name / Type: (2) Lincoln 860 / Neutral Recrushed Slag: (2) None	Gas (QW-408) Gas Composition / Flow Rate Shielding: (1 & 2) N/A Trailing: (1 & 2) N/A Backing: (1 & 2) N/A
Positions (QW-405) Position of Joint: (1 & 2) 1G - Flat Weld Progression: (1 & 2) N/A	Electrical Characteristics (QW-409) Current / Polarity: (1 & 2) DCEP (reverse) Amps: (1) 130 (2) 500 Volts: (1) 23 (2) 33 Tungsten Type / Size: (1 & 2) N/A Heat Input: (1) 44850 J/in (2) 70714 J/in
Preheat (QW-406) Preheat Temp.: <u>60</u> °F Interpass Temp.: <u>400</u> °F Preheat Maintenance: <u>None</u>	Technique (QW-410) Travel Speed (in/min): (1) 4-6 (2) 14 String/Weave Bead: (1 & 2) Stringer bead Oscillation: (1) N/A (2) None Mult./Single Pass (per side): (2) Multipass Mult./Single Electrode: (1) N/A (2) Single electrode Electrode Spacing: (1 & 2) N/A Contact Tube to Work Dist.: (2) 1-1/4"
(1) Peening was not used with this weld test. No Pass > 1/2" t.	

Metallforms, Inc.
Procedure Qualification Record (PQR)

PQR No.: A-4

Page: 2 of 2

Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in ²)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
T-1	1.0000	0.7610	0.7610	60000	78843	Base metal
T-2	1.0000	0.7630	0.7630	59500	77981	Base metal

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory
None		None	

Toughness Test (QW-170)

Specimen Number	Notch Location	Notch Type	Test Temp. (°F)	Impact Value (ft-lb)	Lateral Expansion		Drop Weight Break
					Shear %	Mils	
1	Weld metal	"V"	-20	38	20	23	-
2	Weld metal	"V"	-20	42	20	28	-
3	Weld metal	"V"	-20	65	30	47	-
1	HAZ	"V"	-20	23	50	17	-
2	HAZ	"V"	-20	18	40	11	-
3	HAZ	"V"	-20	23	50	15	-

Hardness Test - Brinell hardness

Location	Readings								
	1	2	3	4	5	6	7	8	9
SA-515-70 BM	169	172	168						
SA-515-70 HAZ	174	168	174						
Weld Metal	196	182	182						

** Laboratory test # for impact : 96518 - Je

Impact test specimen size, 10 mm. X 10 mm.

Editorial Corrections on Feb. 26,2002. Added BM BHN#'s on Aug 19,2005

Welder's Name: G.D.Droddy ID: - Stamp: "A"

PQR was done and welding of coupon was witnessed by: Metallforms, Inc.

Tests Conducted By: Soutwestern Laboratories Test ID.: 2488Jn**

... 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.

Prepared By:  Date: 2/26/2002 QC Manager

Metalforms, Inc.
160 Garth Rd. Cheek, TX 77705
WELDING PROCEDURE SPECIFICATION (WPS)

WPS No.: M-1 Date: 01/05/89 Revision No.: 9 Date: 06/29/00
Supporting PQRs: M-1

BASE METAL (QW-403, QW-405)
P No. 1 to P No.: 1
Thickness range. 0.1875" to 1.5000"
Position(s) All positions (see note)
Progression Vertical Up
notes Vertical down for root pass only

JOINT (QW-402)
Joint design Groove/Fillet (see pg 2)
Backing..... With backing only
Backing Matl Weld metal
Fillet Weld Size All (QW-451.4)
notes _____

PREHEAT (QW-406)
Minimum Temperature. 50 Degrees F.
Max. Interpass Temp. 300 Degrees F.
Preheat Maintenance. :note (n6) below

POSTWELD HEAT TREATMENT (QW-407)
Temperature range None
Time range None
notes _____

Process / type All pass(es)
Process thickness limit. SMAW / manual
1.5000" Max.

None

None

GAS (QW-408)

Shielding Gas / CFH..... N/A / -
Trailing Gas / CFH..... N/A / -
Backing Gas / CFH..... N/A / -

None / -
None / -
None / -

FILLER METAL (QW-404)

AWS classification..... E7018
SFA Spec. No. & F No.... SFA#: 5.1 F#: 4
A No. or Chem. Comp..... 1
Filler metal trade name. n/r
SAW flux trade name/type N/A / -
Elec./Wire size (in) ... 1/8 | 5/32 | -

None
SFA#: None F#: -
None
None
None / -
- | - | -

ELECTRICAL (QW-409)

Welding amperage range.. 90-160 | 130-220 | -
Welding voltage range... 21-23 | 22-23 | -
Travel speed (ipm)..... 4-9 | 4-9 | -
Max. Heat Input (J/in).. None
Tungsten Type/Size..... N/A / -
Current & Polarity..... DCEP (reverse)

- | - | -
- | - | -
- | - | -
None
N/A / -
N/A

TECHNIQUE (QW-410)

String / weave bead..... String Bead
Orifice / gas cup..... N/A
Contact tube to work.... N/A
Oscillation..... None
Mult./Single electrode.. Single Electrode
Other Technique Notes...

N/A
None
None
None
N/A
None

Multiple or Single Pass (per side).... Multiple Passes

(n1) No peening will be done with this procedure.

(n2) No pass greater than 1/2" will be used.

(n3) Preheat to 175 Deg.F if T>1" & C>0.30%; To 200 Deg.F if T> 1-1/4".

(n4) _____

(n5) No backing rings, strips, or retainers will be used.

(n6) No preheat maintenance required after welding.

(n7) Not used for group 2 materials with min. specified tensile > 70 ksi.

WELDING PROCEDURE SPECIFICATION (WPS)

Page 2 of 2

WPS No.: M-1 Date: 01/05/89 Revision No.: 9 Date: 06/29/00

JOINT (QW-402) : See detail drawings also.

Single-V groove

Backing : gouged & back welded
Root Opening: 0 - 5/32"
Groove Angle: 45 +/- 2 1/2 degrees
Root Face : 0 - 1/8"

Double-V groove

Backing : gouged & back welded
Root Opening: 0 - 5/32"
Groove Angle: 45 +/- 2 1/2 degrees
Root Face : 0 - 1/8"

Single/Double Fillet

Backing : with backing
Root Opening: n/a
Weld Size : as required

WELD JOINT DESCRIPTIONS SHOWN ARE NOT INCLUSIVE OF ALL OF THOSE FOUND ON A JOB SITE. WELD JOINT DESIGN REFERENCE IN AN ENGINEERING SPECIFICATION OR DESIGN DRAWING SHALL TAKE PRECEDENCE OVER WELD JOINTS SHOWN IN THIS WPS.

Initial cleaning : See note (c) below.

Method of back gouging : See note (d) below.

- (a) Preheating shall be applied in the same manner during thermal cutting, tacking, gouging, & welding operations.
- (b) Welds shall be cleaned between each pass. When completed, remove all slag and projections.
- (c) Remove rust, scale, grease, oil, & other contaminants from both sides of weld bevel prior to welding.
- (d) Backside of the weld shall be gouged, ground, & then rewelded with SMAW (groove welds only)
- (e) Minimum preheat shall be maintained during welding.

We certify that the statements in this record are correct and in accordance with the requirements of Sections IX and VIII of the ASME Code.

Prepared By: Donald Papulay (06/29/00) QC Manager

Metalforms, Inc.
160 Garth Rd. Cheek, TX 77705
Procedure Qualification Record (PQR)

PQR No.: M-1 Date: 01/06/75 WPS No.: M-1 Rev 9

JOINT DESIGN (QW-402)
WELD JOINT CONFIGURATION
Single-V groove
Back-gouged & back welded
Groove Angle : 60 Degrees
Root Opening : 1/16 Inches
Root Face : 1/16 Inches

BASE METAL (QW-403)
Material form. Pipe / Tube
Material Spec. SA-53-B
To SA-53-B
P No. 1 Gr. 1 to P No. 1 Gr. 1
Thickness (in) 0.8640 Dia. (in) 6.0000

note: _____

POSITION (QW-405)
Position of Joint : 5G - Mult.
Progression: Vertical Up
note: _____

HEAT TREATMENT (QW-406, QW-407)
Preheat Temperature: 50 Degrees F.
Preheat Maintenance: Note (n3) below.
Max. Interpass Temp.: - Degrees F.
PWHT temperature: None Degrees F.
PWHT Holding time (hr): None
note: _____

	All pass(es) SMAW / manual	None	
Weld Process / type			
GAS (QW-408)			
Shielding Gas / CFH.....	N/A / -	None / -	
Trailing Gas / CFH.....	N/A / -	None / -	
Backing Gas / CFH.....	N/A / -	None / -	

FILLER METAL (QW-404)
AWS Classification..... E7018
SFA Spec. No. & F No.... SFA#: 5.1 F#: 4
A No. or Chem. Comp..... 1
Filler Metal Trade Name. n/r
SAW Flux Trade Name/Type N/A / -
Weld Deposit 't' (in).... 0.8640
Elec./Wire Size (in).... 1/8 | 5/32 | -
ELECTRICAL (QW-409)
Amperage USED 130 | 130 | -
Voltage USED 23 | 23 | -
Travel Speed (ipm)..... 2-2.5 | 2-2.5 | -
Max. Heat Input (J/in)..
Tungsten Type & Size.... N/A / -
Current Type/Polarity... DCEP (reverse)

None

SFA#: None F#: -

None

None / -

None

- | - | -

- | - | -

- | - | -

None

N/A / -

N/A

TECHNIQUE (QW-410)
String or Weave Bead.... String Bead
Orifice/Gas Cup Size.... N/A
Contact Tube to Work.... N/A
Oscillation..... N/A
Mult./Single Electrodes. Single Electrode
Other Technique Notes...
Multiple or Single Pass (per side).... Multiple Passes

N/A

None

None

N/A

N/A

None

- (n1) Peening was not used with this weld test.
- (n2) No Pass > 1/2" was used.
- (n3) No preheat maintenance after welding.
- (n4) No retainer was used. No backing strips or rings used.
- (n5) Removed scale, grease, oil, & other contaminants from edges of weld bevel.

Procedure Qualification Record (PQR)

PQR No.: M-1

Page 2 of 2

TENSILE TEST (QW-150)

Specimen No.	Width (in.)	Thick. (in.)	Area (sq.in.)	Ultimate total load (lb)	Ultimate stress (psi)	Type of failure and location
T-1	0.748	0.622	0.465	34700	74600	Ductile - BM
T-2	0.781	0.621	0.485	35400	73000	Ductile - BM

GUIDED BEND TEST (QW-160)

Figure No. and Type	Result	Figure No. and Type	Result
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory

TOUGHNESS TEST (QW-170)

Spec. No.	Notch Location	Notch Type	Test Temp. (°F)	Impact Values (ft-lbs)	Lateral exp.		Drop weight break
					Shear %	Mils	
None							

HARDNESS TEST - Brinell hardness

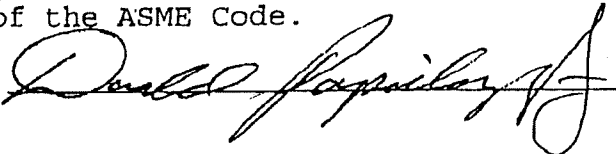
Base metal	-1-	-2-	-3-	HAZ	-1-	-2-	-3-	WM	-1	-2-	-3-
SA-53-B					174	174	174		191	186	168

(Heat Affected Zone=HAZ, Weld Metal=WM)

Notes: Editorial corrections only on October 02, 2000.

Stamp: - Welder's Name: RICKIE BROWN ID: 450-02-4083
 Tests conducted by: Southwestern Labs Laboratory Test No: 2445*
 PQR was done & welding of coupon was witnessed by: Metalfoms, Inc.

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

Certified by:  (01/02/97) QC Manager



Metalforms, Inc.
160 Garth Road
Cheek, TX 77705

COPY

Welding Procedure Specification (WPS)

WPS No.: M-21-N

Date: 11/15/2000

Rev. No.: 9

Date: 2/25/2002

Page 1 of 2

Supporting PQR(s): M-21-N

Welding Process(es) / Type(s): (1) FCAW / Semiautomatic

Joint Design (QW-402)					
Weld Type: <u>Groove and fillet welds</u>					
Joint Type	Backing	Root Opening	Groove Angle	Root Face	Groove Radius
Single-V groove	Gouged & back welded	0 - 1/8"	45 +/- 2 1/2 Deg.	0 - 1/8"	
Double-bevel groove	Gouged & back welded	0 - 1/8"	45 +/- 2 1/2 Deg.	0 - 1/8"	
Fillet Welds: <u>All (QW-451.4)</u>					
Retainers: <u>None</u>					
See note (d) on page 2. See Detail Drawings.					
WELD JOINT DESCRIPTIONS SHOWN ARE NOT INCLUSIVE OF ALL THOSE FOUND ON A JOB. WELD JOINT DESIGN REFERENCE IN AN ENGINEERING SPECIFICATION OR A DESIGN DRAWING SHALL TAKE PRECEDENCE OVER WELD JOINTS SHOWN IN THIS WPS.					
Base Metals (QW-403)					
P-No. <u>1</u> Thickness Range: <u>0.1875 in. to 1.0000 in.</u>					
to P-No. <u>1</u>					
Preheat (QW-406)			Postweld Heat Treatment (QW-407)		
Minimum Preheat Temperature: <u>50</u> °F			PWHT Type: <u>No PWHT will be performed</u>		
Maximum Interpass Temperature: <u>400</u> °F			PWHT Temperature: <u>None</u> °F		
Preheat Maintenance: <u>None</u>			PWHT Holding Time: <u>None</u>		
Initial and Interpass Cleaning: <u>See note (c) below.</u>					
Method of Back Gouging: <u>See note (d) below</u>					
Preheating shall be applied in the same manner during thermal cutting, tacking, gouging, & welding operations.					
Welds shall be cleaned between each pass. When completed, remove all slag and projections.					
Remove rust, scale, grease, oil & other contaminants from both sides of weld bevel prior to welding.					
Backside of the weld shall be gouged, ground, & then rewelded with FCAW (groove welds only)					
N/A for Group 2 materials with min specified tensile strength > 70000 psi					

We certify that the statements in this specification are correct and in accordance with the requirements of Section IX of the ASME Code.

Prepared By: Don Popielarczyk

Don Popielarczyk

2/25/2002

Date

QC Manager

Metalfoms, Inc.

Welding Procedure Specification (WPS)

WPS No.: **M-21-N**

Rev. No.: **9**

Page 2 of 2

First Process:		FCAW	Type:	Semiautomatic
Filler Metal (QW-404)				
Weld Deposit Limits:		0.0000 in. to 1.0000 in.	No Pass Greater Than 1/2" Allowed	
AWS Classification:		E-71T-9	SFA Specification:	5.20 F-No.: 6
A-No. or Chemical Composition:		1	Filler Metal Trade Name: N/R	
Filler Metal Product Form:		Flux cored		
Supplemental Filler Metal:		None		
Position (QW-405)			Technique (QW-410)	
Position of Joint:		All Positions	Stringer or Weave Bead: Stringer bead	
Weld Progression:		Vertical up	Nozzle / Gas Cup Size: 3/8" to 5/8"	
Gas (QW-408)			Peening: None	
Shielding:	75% Argon, 25% CO2	/ 32-42	CFH	Contact Tube to Work Distance: 1"-1.125"
Backing:	None	/ -	CFH	Multiple / Single Pass (per side): Multipass
Trailing:	None	/ -	CFH	
Electrical Characteristics (QW-409)				
Current Type and Polarity:		DCEP (reverse)		
Transfer Mode:		Spray arc		
Max. Heat Input (J/in):		None		
No peening done with this procedure. No pass greater than 1/2" allowed. No backing rings or strips will be used. No retainers will be used. Minimum preheat shall be maintained during welding.				

First Process Welding Parameters

Layer(s) and/or Pass(es)	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)
	AWS Classification	Size (in.)	Type and Polarity	Amperage Range		
Any	E-71T-9	0.045	DCEP (reverse)	170-190	18-20	5-7
Any	E-71T-9	0.045	DCEP (reverse)	190-210	23-27	5-7



Metallforms, Inc.
160 Garth Road
Cheek, TX 77705

Procedure Qualification Record (PQR)

PQR No.: M-21-N

Date: 3/6/1980

WPS No.: -

Page 1 of 2

Welding Process(es) / Type(s): (1) FCAW / Semiautomatic

Joint Design (QW-402) Weld Type: <u>Groove weld</u> Groove Type: <u>Single-V groove</u> Backing: <u>None</u> Root Opening: <u>1/8</u> in. Root Face: <u>1/16</u> in. Groove Angle: <u>60</u> °		Base Metals (QW-403) Specification Type and Grade: <u>SA-516, Grade 70</u> to <u>SA-516, Grade 70</u> P-No. <u>1</u> Group No. <u>2</u> to P-No. <u>1</u> Group No. <u>2</u> Thickness (in.): <u>0.5000</u>	
		Preheat (QW-406) Minimum Preheat Temperature: <u>50</u> °F Preheat Maintenance: <u>None</u> Maximum Interpass Temperature: <u>350</u> °F	
		Postweld Heat Treatment (QW-407) Type: <u>No PWHT performed</u> PWHT Temperature: <u>None</u> °F PWHT Holding Time: <u>None</u> hr.	
First Process: <u>FCAW</u> Filler Metals (QW-404) AWS Classification: <u>E70T-1</u> SFA Specification: <u>5.20</u> F-No.: <u>6</u> A-No. or Chemical Composition: <u>1</u> Filler Metal Trade Name: <u>N/A</u> Filler Metal Product Form: <u>Flux cored</u> Supplemental Filler Metal: <u>None</u> Weld Deposit 't' (in.): <u>0.5000</u> Pass Greater Than 1/4": <u>No</u> Positions (QW-405) Position of Joint: <u>1G - Flat</u> Weld Progression: <u>N/A</u> Gas (QW-408) Shielding: <u>75% Argon, 25% CO2</u> / <u>35</u> CFH Backing: <u>None</u> / <u>-</u> CFH Trailing: <u>None</u> / <u>-</u> CFH		Type: <u>Semiautomatic</u> Electrical Characteristics (QW-409) Current Type and Polarity: <u>DCEP (reverse)</u> Transfer Mode: <u>Spray arc</u> Welding Details. Filler Metal Size (in.): <u>0.045</u> <u>0.045</u> <u>-</u> Amperage Used: <u>180</u> <u>200</u> <u>-</u> Voltage Used: <u>18</u> <u>27</u> <u>-</u> Travel Speed (in/min): <u>6</u> <u>6</u> <u>-</u> Max. Heat Input (J/in): <u>None</u> Technique (QW-410) Stringer or Weave Bead: <u>Stringer bead</u> Nozzle / Gas Cup Size: <u>5/8" I.D.</u> Contact Tube to Work Distance: <u>1"-1.125"</u> Multiple / Single Pass (per side): <u>Multipass</u>	
Peening was not used with this weld test. No preheat maintenance after welding. No retainer was used with this weld test. No backing strips or rings used with this weld test. Removed scale, grease, oil, & other contaminants from edges of weld bevel.			

Metalfoms, Inc.

Procedure Qualification Record (PQR)

PQR No.: M-21-N

Page 2 of 2

Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in ²)	Ultimate Total Load (lb)	Ultimate Unit Stress (PSI)	Failure Type and Location
T-1	1.0580	0.5200	0.5501	50600	91973	Ductile - BM
T-2	1.0820	0.5270	0.5702	51000	89442	Ductile - BM

Guided Bend Tests (QW-160)

Type and Figure No.	Result	Type and Figure No.	Result
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory

Hardness Test - Brinell hardness

Location	Readings							
SA-516-70 BM	168							
SA-516-70 HAZ	179							
Weld Metal	192							

Editorial corrections only on June 30,2000 & Feb. 25 2002.

Welder's Name: David Sharp I.D.: - Stamp No.: "S"

PQR was done and welding of coupon was witnessed by: Metalfoms, Inc.

Test conducted by: Soutwestern Laboratories Lab Test No.: 95083

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.

Prepared By: Don Popielarczyk

Don Popielarczyk

2/25/2002

Date

QC Manager

METALFORMS, INC.**JOB RELEASE**

JOB NO.: 17410 P.O. NO.: PO# 4400856922 ITEM NO.: E-1630
 CUSTOMER: EQUISTAR CHEMICALS, LP CONTACT: HUNG MAI PHONE: (409) 654-9189
 DWG.: 1/6 RELEASE DATE: 02/26/2008 BY: jaw SHIP DUE: 04/04/2008

JOB DESCRIPTION

1. FABRICATE ONE (1) REAR CHANNEL.
2. ITP FORM APPLIES.
3. CHLORIDE SURFACE PREPARATION TEST REQ'D. PER LYONDELL STD. #340, PARA. 7.1.8.
4. TEST COVER TO STAY IN HOUSE.

TUBE WELD: N/A SPARE GSKTS: N/A
 PMI: N/A SB & PAINT: 1 Coat
 STACKING: N/A NAT'L BOARD: N/A

*James Reed 654-9145 pgr. 800-224-6599
 or Jay Telser
 466-9024
 X-Rays, Dims, Hydro*

CUST. INSP.: Yes
 CODE STAMP: U-2

SHELL SIDE	X-RAY N/A	HEAT TREAT N/A	SERVICE N/A	HYDRO @ N/A	psig
TUBE SIDE	X-RAY Spot	HEAT TREAT None	SERVICE Normal	HYDRO @ 200	psig

Tubes: N/A

Del. Date:

REVISION RECORD

Rev. Date By Description

SHIP TO: EQUISTAR CHEMICALS, LP

3510 GULF STATES ROAD
 BEAUMONT, TX USA 77704

GROSS DRY WT: 450 (LBS)

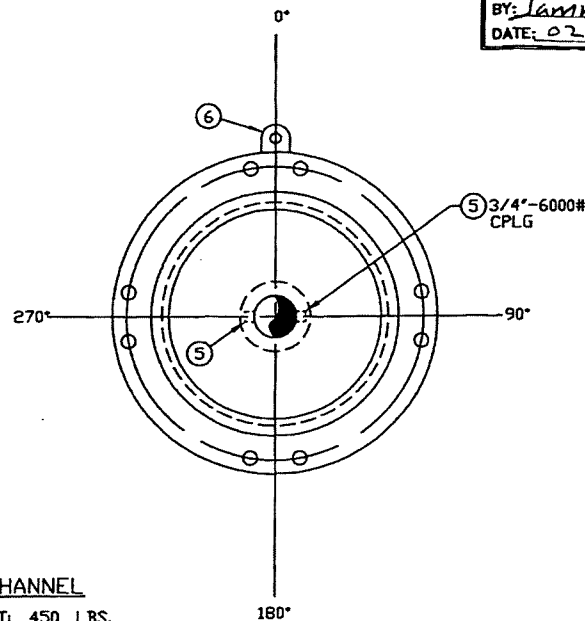
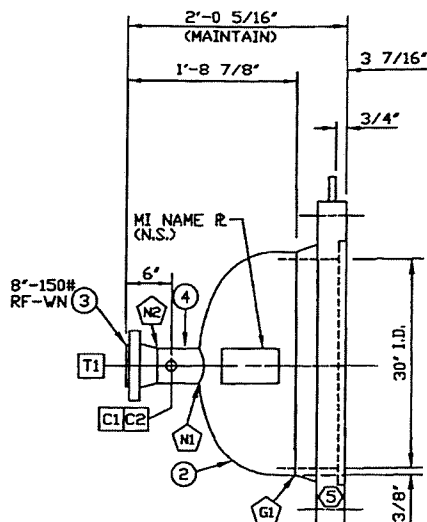
LENGTH: 2'-1"

WIDTH: 3'-0"

HEIGHT: 3'-0"

SCOPE OF WORK:**FABRICATE ONE (1) REAR CHANNEL [FULL PRESSURE HYDROTEST]**

FABRICATED & STAMPED IN ACCORDANCE
WITH ASME CODE, SECT. VIII, DIV. 1
2007 & TEMA "B".
**CERTIFIED CORRECT
FOR FABRICATION**
BY: *Samuel Kantar*
DATE: 02/27/2008

**REAR CHANNEL**

DRY WEIGHT: 450 LBS.

X-RAY : RT-3

■ USE E71T-9 WIRE

NAME R	M-19	
ASSEMBLY LUG	M-21-N.9	
CPLG'S	M-19	
N2	M-21-N.9	
N1	M-21-N.9	
G1	A-45	
PK	VPS CHANNEL SIDE	NOTE
C1	---	3/4"-6000# CPLG W/PLUG (2 REQ'D)
C2	---	3/8"
T1	---	8"-150# RF-WN 1/2"
HK	SERVICE	DESCRIPTION
		NOZZLE WELD
		STD. DETAIL

NOTES:

- SEE STANDARD DETAIL DWG. SHT. # 4 FOR WELD DETAILS.
- PAINT: NEAR WHITE SAND BLAST PER SSPC-SP10 & PRIME
W/ (1) ONE COAT CARBOLINE CARBOZINC #11 2-3 MILS D.F.T.
- ALL BOLT HOLES TO STRADDLE C'S

CUSTOMER: EQUSTAR CHEMICALS, LP
LOCATION: BEAUMONT, TX PD GLYCOL
PD #: 4400856922
ITEM #: E-1530
EQUIP. #: 23-08-021
SHIP WT: 450 LBS
SHIP DIMS: 35 1/2" O.D. X 2'-1" LG.
SERVICE: FIRST EFFECT REBOILER

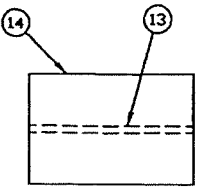
**METALFORMS, INC.**

P.O. BOX 20118

BEAUMONT, TEXAS 77720

TITLE: REAR CHANNEL DETAIL

REV.	REVISION DESCRIPTION	BY	CHK	DATE	DWG. DATE	CHK. DATE	CHK. DATE	APPR. DATE	DWG. NO.	SHT.
					CR 2/21/08	MS 2/22/08	WKL 2/22/08	LAW 2/26/08	17410	1



ALL WELDS TO BE C.V.



MI

CHEEK, TEXAS

TUBE SIDE

PSI AT °F

	PSI	AT	°F
1	100	10	100
2	100	10	100
3	100	10	100
4	100	10	100
5	100	10	100
6	100	10	100
7	100	10	100
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R BUILT **2008**

ITEM NO. E-1530

(DESIGNED BY OTHERS)

CUSTOMER: EQUISTAR CHEMICALS, LP
LOCATION: BEAUMONT PD GLYCOL
PD #: 4400856922
ITEM #: E-1530
EQUIP. #: 23-08-021
SERVICE: FIRST EFFECT REBOILER.



BEAUMONT, TEXAS 77720

TITLE:	NAME PLATE DETAIL
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REV.

REVISION DESCRIPTION

BY

CHK

DATE _____

UPDATE:	
CR	2/21/08

CHK:	DATE:
MS	2/22/0

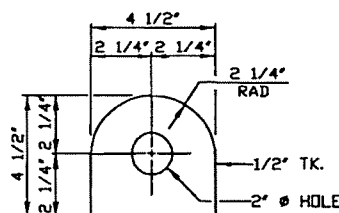
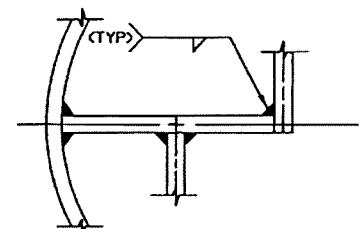
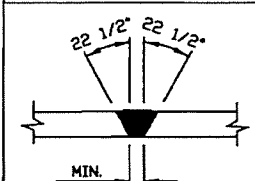
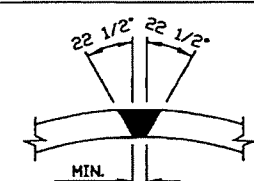
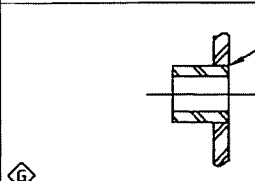
CHK. DATE:	
WKL	2/22/08

APRV.	DATE:
LAV	2/26/0

DWG. NO.
08 17410

SHT.	3
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NAME PLATO

ATTACH WITH 1/4" MIN. CONT. F.V.  ASSEMBLY LUG DETAIL DO NOT LIFT ASSEMBLED EXCHANGER BY ASSEMBLY LUGS. THEY ARE FOR FIT UP USE ONLY.	 PASS PARTITION WELD DETAIL	 TYP. ROUND SEAM (DOUBLE WELD)  TYP. LONG SEAM (DOUBLE WELD)	 NOZZLE & COUPLING WELD DETAIL ■ USE FILLET WELD SIZE INDICATED ON WELD MAP.																									
GRINDING NOTES: 1. DO NOT GRIND WELDS FLUSH UNLESS INDICATED ON WELD MAP.																												
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%;">REV.</th> <th style="width: 50%;">REVISION DESCRIPTION</th> <th style="width: 10%;">BY</th> <th style="width: 10%;">CHK</th> <th style="width: 10%;">DATE</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>				REV.	REVISION DESCRIPTION	BY	CHK	DATE																				
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CUSTOMER: EQUISTAR CHEMICALS, LP LOCATION: BEAUMONT PD GLYCOL PD #: 4400856922 ITEM #: E-1530 EQUIP #: 23-08-021 SERVICE: FIRST EFFECT REBOILER.  METALFORMS, INC. P.O. BOX 20118 BEAUMONT, TEXAS 77720 TITLE: STANDARD DETAIL <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <th style="width: 15%;">DRAWN DATE:</th> <th style="width: 15%;">CHKD DATE:</th> <th style="width: 15%;">CHKD DATE:</th> <th style="width: 15%;">APPRV DATE:</th> <th style="width: 15%;">DWG NO:</th> <th style="width: 10%;">SHT.</th> </tr> <tr> <td>CR 2/21/08</td> <td>MS 2/22/08</td> <td>VKL 2/22/08</td> <td>LAV 2/26/08</td> <td>17410</td> <td>4</td> </tr> </table>				DRAWN DATE:	CHKD DATE:	CHKD DATE:	APPRV DATE:	DWG NO:	SHT.	CR 2/21/08	MS 2/22/08	VKL 2/22/08	LAV 2/26/08	17410	4													
DRAWN DATE:	CHKD DATE:	CHKD DATE:	APPRV DATE:	DWG NO:	SHT.																							
CR 2/21/08	MS 2/22/08	VKL 2/22/08	LAV 2/26/08	17410	4																							

NOTES:

1. NOTIFY CUSTOMER'S INSPECTOR (S) WORKING DAYS PRIOR TO START OF FABRICATION.
2. NOTIFY CUSTOMER'S INSPECTOR OF THE DATE FOR REQ'D INSPECTION POINTS & FINAL INSPECTION.
3. BACKING STRIPS SHALL NOT BE USED.
4. MATCH MARKS OR DOVELS SHALL BE PROVIDED TO PREVENT MISASSEMBLY OF THE FOLLOWING BOLTED JOINTS: GROOVED CHANNEL COVER TO CHANNEL, CHANNEL TO TUBESHEET.
5. LIQUID PENETRANT TEST OF THE PRODUCTION WELDS SHALL BE PERFORMED USING THE SAME METHOD AND CRITERIA USED FOR THE QUALIFICATION TESTING.

SHIPPING:

1. MACHINED SURFACES SHALL BE WELL GREASED.
2. THOROUGHLY CLEAN THE UNIT BEFORE SHIPMENT.
3. BOLTS & NUTS SHALL BE COATED WITH A SUITABLE THREAD LUBRICANT TO PREVENT GALLING OR CORROSION DURING TRANSPORT & OUTDOOR STORAGE. THE LUBRICANT SHALL BE REMOVABLE WITH MINERAL SPIRITS OR A SOLVENT. COPPER CONTAINING THREAD LUBRICANTS SHALL NOT BE USED.
4. CHANNEL SHALL BE CLEARLY IDENTIFIED BY PAINTING THE ORDER # AND ITEM # IN A CONSPICUOUS LOCATION ON THE CHANNEL HEAD ALSO INCLUDE WEIGHT.
5. ALL BOXES, CRATES, OR PACKAGES SHALL BE IDENTIFIED WITH THE PURCHASER'S ORDER # AND THE EQUIPMENT ITEM #.
6. UNIT SHALL NOT BE RELEASED FOR SHIPMENT WITHOUT CUSTOMER'S APPROVAL.
7. ALL CHANNEL OPENINGS SHALL BE COVERED FOR SHIPMENT.

INSPECTION:

1. HARDNESS OF BASE MATERIALS & WELDS IN THEIR FINAL CONDITION SHALL HAVE HARDNESS NOT EXCEEDING:

"215 RHIN." FOR P1, P3, & P4 MATERIALS:

HARDNESS READINGS SHALL BE TAKEN AS FOLLOWS:

- a) ONE READING ON EACH GIRTH SEAM AND EACH LONG SEAM.
- b) ONE READING ON EACH NOZZLE WELD AND THE ADJACENT BASE METAL.
- c) ALL READING ON THE INSIDE & OUTSIDE OF THE VESSEL, WHERE POSSIBLE.

2. SPOT RADIOGRAPHY SHALL BE PERFORMED AS FOLLOWS:

- a) AT LEAST ONE (1) SPOT X-RAY SHALL BE MADE OF EACH CATEGORY A & B JOINT AS DEFINED BY SECT. VIII, DIV. 1, OF ASME CODE (NOZ. WELDS EXCLUDED FROM THIS SPEC.).
- b) SPOT RADIOGRAPHS SHALL INCLUDE EACH START & STOP OF WELDS MADE BY THE AUTOMATIC SUBMERGED-ARC WELDING PROCESS.
- c) RADIOGRAPH THE JUNCTIONS OF LONG AND GIRTH SEAMS WELDED BY SUBMERGED ARC METHOD.
- d) SPOT RADIOGRAPHS SHALL BE AT LEAST 10 INCHES LONG OR SHALL BE FULL LENGTH WHERE THE WELD IS LESS THAN 10 INCHES LONG.
- e) SPOT RADIOGRAPHS NOT TO EXCEED POROSITY STANDARDS OF SECT. VIII, DIV. 1, ASME CODE FOR FULL RADIOGRAPHY.

3. (1) AN U.T. EXAMINATION SHALL BE DONE TO DETERMINE THE "NEW" AS BUILT THICKNESS OF THE MATERIALS:

- A) FOUR (4) READINGS DIVIDED BY 90° AROUND THE CIRCUMFERENCE ON EACH SHELL SECTION AND HEAD.
 - B) ONE (1) READING ON EACH NOZZLE.
- (11) HEAD THICKNESS SHALL BE VERIFIED BY ULTRASONIC READINGS OF AT LEAST EIGHT POINTS ON EACH QUARTER LINE.

4. NDE REPORTS ARE REQ'D.**5. NDE SHALL BE PERFORMED IN ACCORDANCE WITH IS 601 AND ALL WRITTEN PROCEDURES SHALL BE SUBMITTED TO & APPROVED BY LYONDELL.****6. ALL NDE EXCEPT HARDNESS SHALL BE PERFORMED BY PERSONNEL CERTIFIED IN ACCORDANCE WITH ASNT SNT-TC-1A, LEVEL II OR EQUIVALENT.****7. DIMENSIONAL TOLERANCES SHALL BE USED PER: ES-220, FIG. 142.****8. MINIMUM HYDROTEST FOR (1) HOUR WITH MIN. 50°F WATER TEMP. (CHARTS REQ'D)****9. HYDROTEST WATER SHALL BE DRAINED IMMEDIATELY AFTER COMPLETION OF THE HYDROTEST, AND THE VESSEL THOROUGHLY DRIED & SEALED. HOT AIR DRYING IS NOT PERMITTED. IF COMPLETE DRAINING IS NOT POSSIBLE, THE AREA SHALL BE FLUSHED WITH LOW-CHLORIDE WATER. (<5 PPM CHLORIDE)****10. PT MATERIALS SHALL MEET THE REQUIREMENTS OF (ASME BOILER & PRESSURE VESSEL CODE, SECTION VIII, PARA. T-641) FOR SULFUR AND HALOGEN CONTENT AND FREE OF CHLORIDES REGARDLESS OF TYPE OF MATERIAL TO BE EXAMINED. (PROOF OF CERTIFICATION IS REQ'D.****11. THE FLATNESS TOLERANCE (MAX. DEVIATION FROM THE PLANE) ON PERIPHERAL GASKET SURFACE SHALL BE 1/32". FINAL MACHINING TO BE PERFORMED AFTER ALL WELDING AND DIALED IN.****12. ALL LIFTING LUG TO VESSEL ATTACHMENT WELDS SHALL BE (L.P) EXAMINED AT THE ROOT PASS AND FINAL WELD SURFACE.**

CUSTOMER: EQUISTAR CHEMICALS, LP
 LOCATION: BEAUMONT PD GLYCOL
 PD #: 4400856922
 ITEM #: E-1530
 EQUIP #: 23-08-021
 SERVICE: FIRST EFFECT REBOILER.

**METALFORMS, INC.**

P.O. BOX 20118

BEAUMONT, TEXAS 77720

TITLE: NOTES

REV.	REVISION DESCRIPTION	BY	CHK	DATE	OWNR DATE	CHK DATE	CHK DATE	APPR DATE	DWG NO	SHT
					CR 2/21/08	MS 2/22/08	WKL 2/22/08	LAW 2/26/08	17410	5

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