QW - 482

COMPANY NAME RJV Gasfield Service Ltd

'LDING PROCEDURE SPEC. No. RJV-108 DATE May - 30 -95

'SION No. _____ DATE _____ SUPPORT PQR No.(S) RJV-108A

VELDING PROCESS(ES) GMAW/SMAW/SAW PWHT TYPE(S) GMAW (Semi-auto) SMAW (Manual) SAW (Automatic)
(AUTOMATIC, MANUAL, MACHINE OR SEMI-AUTO.)

JOINTS (QW - 402)

JOINT DESIGN Vee-Groove and all ASME joint design

BACKING (YES) X (NO) X

BACKING MATERIAL (TYPE) Weld metal where applicable

☐ METAL ☐ NONFUSING METAL

☐ NONMETALLIC ☐ OTHER

ALBERTA
LABOUR
BOILERS & PRESSURE VESSELS ACT
WELDING PROCEDURE
Reg. No. WP 1312.2
Spec No. RJV-108
Weld Process GMAW/SMAW/SAW
Matl. Gr. P No. 1 Gr 2 to P No. 1 Gr 2
Elec. Gr. F No. 4+4+6 A No. 1
Th. Qual. For 203mm PWHT YES
IMPACT RANGE 15.9 to 57mm CVN-46°C.
Yr. 95 Mo. 6 Day 15 Signed
R. ROSSBERG, P. ENG.
WELDING SPECIALIST

BASE METALS (QW-403)

P-No. 1 GROUP No. 2 TO P-No. 1 GROUP No. 2

OR

SPECIFICATION TYPE AND GRADE _____

SPECIFICATION TYPE AND GRADE _____

OR

CHEM. ANALYSIS AND MECH. PROP. _____

TO CHEM. ANALYSIS AND MECH. PROP. _____

THICKNESS RANGE:

BASE METAL GROOVE WITH IMPACT 15.875mm to 57.0mm FILLET All thickness

WITHOUT IMPACT 5.0mm to 203mm

PIPE DIA. RANGE GROOVE All diameter FILLET All diameter

OTHER Maximum deposited per layer = GMAW (3.3mm) SMAW (10.0mm) SAW (12.0mm)

FILLER METALS (QW-404)

SPECIFICATION No. (SFA)	5.18	5.1	5.17
AWS No. (CLASS)	ER70S-2/-6	E7018-1	F7A6-EM14K
F-No.	F6	F4	F6
A-No. OR CHEMICAL ANALYSIS	1	1	1
SIZE OF FILLER METALS	0.035"	5/32",3/16",1/4"	1/8", 5/32"
DEPOSITED WELD METAL THICKNESS RANGE			
GROOVE	3.3mm	203mm	203mm
FILLET	All thickness	All thickness	All thickness
ELECTRODE - FLUX (CLASS)			
FLUX TRADE NAME			Lincolnweld 880M (NEUTRAL)
CONSUMABLE INSERT			

PREHEAT
P-No. 1 Groups 1,2 and 3

1. Welds joining pressure parts or attachments shall be preheated to not less than the minimum preheat temperature stated in item 6.
2. The preheat temperature shall be maintained until welding is completed.
3. If welding in interrupted, the weld joint and adjacent areas shall be reheated to the minimum preheat temperature specified in item 6.
4. The preheated area shall not be less then 50.8 mm (2.0") wide on each side of the weld.
5. Preheat temperatures shall be checked by the welder or inspector, using temperature indicating crayons or other reputable methods.
6. Minimum preheating temperatures shall be as follows:

Pressure Vessels in accordance with ASME BPVC Section VIII, Division I.

NOMINAL WALL THICKNESS	MINIMUM PREHEAT TEMPERATURE
0 TO 31.8 mm (0 to 1.25")	10°C (50°F)
Over 31.8 mm (over 1.25")	93°C (200°F)
Over 25.4 mm (1.0") and a specified maximum carbon content in excess of 0.30%	80°C (175°F)

Chemical Plant & Petroleum Refinery Piping in accordance with ANSI B31.3

NOMINAL WALL THICKNESS	MINIMUM SPECIFIED TENSILE STRENGTH, BASE METAL	MINIMUM PREHEAT TEMPERATURE
< 25.4 mm (1.0")	≤ 490 MPa (71 Ksi)	10°C (50°F)
≥ 25.4 mm (1.0")	All	80°C (175°F)
All	>490 MPa (71 Ksi)	80°C (175°F)

Power Piping in accordance with ANSI B31.1

NOMINAL WALL THICKNESS	MINIMUM PREHEAT TEMPERATURE
Over 25.4 mm (1.0") and a speified maximum carbon content in excess of 0.30%	80°C (175°F)
All others	10°C (50°F)

Attn: Graham

CERTIFICATE OF CONFORMANCE

(APPLIES ONLY TO U.S. PRODUCTS)
SUPPLIED TO:

THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Avenue
Cleveland, Ohio 44117-1199

LINCOLN® ELECTRIC

TYPICAL VALUES ONLY

This is to certify that *Lincolnweld® 880M Flux/LA-71 Electrode* combination, classification *F7A6-EM14K*, supplied on the above order number is of the same classification, manufacturing process and material requirements as the flux and electrode used for this annual test, concluded on *March 13, 1995.* All tests required by *AWS A5.17-89* and *ASME SFA-5.17* were performed in conformance with these specifications and the above material met all requirements. Joint configuration and pass sequence are shown at lower right.

Operating Settings:
(5/32" Electrode)

Wire Feed Speed (in/min)	415
Current (amps) DC+	350
Voltage (volts)	29
Travel Speed (in/min)	16

Electrical Stickout (in)	1-1/4
Passes/Layers	16/8
Preheat Temp. (°F)	70
Interpass Temp. (°F)	300

Mechanical Properties of the weld deposit (in the as-welded condition) and Chemical analyses of the weld deposit and electrode were as follows:

	AWS/ASME REQUIREMENTS	Deposit
Tensile Strength (psi)	70-95,000	84,700
Yield Strength (psi)	58,000 min.	76,300
Elongation, % in 2"	22 min.	31
Hardness, Rockwell B (avg)	Not Required	90
Impact Properties (Charpy V-notch) ft-lbs at -60 °F	20 min.	107 (100, 110, 110)

%	EM14K ELECTRODE REQUIREMENTS	EM14K ELECTRODE Analysis	DEPOSIT REQUIREMENTS	DEPOSIT Analysis
C	.06-.19	.10	---	.08
Mn	.90-1.40	1.29	---	1.32
Si	.35-.75	.54	---	.50
S	.025 max	.003	Not	.003
P	.025 max	.007	Required	.010
Cu (total)	.35 max	.21	---	.18
Ti	.03-.17	.08	---	.02

Diffusible Hydrogen (1) (AWS A4.3-93): ml/100 g	5/32"
	3.3

Radiographic Test: Met requirements.
Test assembly constructed of ASTM A36 steel.

(1) Test atmospheric condition of 25 % Relative Humidity at 65 °F.

NOTARY PUBLIC
STATE OF OHIO, COUNTY OF CUYAHOGA
SUBSCRIBED AND SWORN TO BEFORE ME THIS
15th DAY OF March, 1995

Donald L. Bill
DONALD L. BILL
CERTIFICATION SUPERVISOR

ALGOMA STEEL INC.

Algoma Steel Inc. P.O. Box 1400
Sault Ste. Marie, Ontario, Canada P6A 5P2

CUSTOMER PURCHASE ORDER NUMBER	ENTRY DATE	SHIP DATE	TALLY NUMBER	SHIPPER'S NUMBER	CARRIER		PAGE	MILL ORDER
M20824-1010	OCT 17/94	94-11-23	237143	02-	DWC	-606447	1	12294

CHARGE TO CUSTOMER NAME AND ADDRESS

EDMONTON EXCHANGER & MANUFACTURING LTD
5545 - 89TH STREET
EAST EDMONTON, ALBERTA
T6E 5W9

SHIP TO CUSTOMER NAME AND ADDRESS

EDMONTON EXCHANGER & MANUFACTURING LTD.
C/O MCCOSHAMS
EDMONTON, ALBERTA

MILL TEST REPORTS

ALGOMA STEEL INC. HEREBY CERTIFIES THAT THE MATERIAL HEREIN DESCRIBED WAS MADE AND TESTED IN ACCORDANCE WITH THE RULES OF THE SPECIFICATION SHOWN HEREIN AND AS CONTAINED IN THE COMPANY RECORDS.

A. Riutta
MANAGING METALLURGIST

CUSTOMER SPECIFICATION

HR MULTIPLE CERTIFIED PLATE - CARBON - ASME SA 516 70 (1992) - CVNL 15/12 FT LBS AT -50 F - C 0.22 MAX - CE .49 MAX (AIM .42 MAX) PER SA 20, SUPP REQT S20 & S21- CU .20 MAX, NI .25 MAX, CR .25 MAX, MO .08 MAX (CU + NI + CR + MO) = .70 MAX - PVQ - NORMALIZED - FLAME CUT - ALSO CERTIFIED TO ASME SA 537 CL 1 AND ASTM A572-50

SUPPLEMENTARY INSTRUCTIONS

MARK ON B/L FOR TRUCK DELIVERY TO EDMONTON EXCHANGER 5545-89TH ST., EAST EDMONTON - FAX COPY OF B/L TO MCCOSHANS 403-425-0387- FAX SM/TR TO 403-466-5155 ATTN: BEV RICHARDSON

INSP T/R TEST REPORTS REQ'D - INCL C.E.

CUST USE VESSEL STOCK

1 3/4" 07325-43969

PRODUCT SHIPPED

CUSTOMER ITEM 4 OUR ITEM 004 DIMENSIONS 1.750 X 96 X 480 "

PLATES NORMALIZED FOR A MINIMUM OF 15 MINUTES @ 1650F.

PLATE NUMBER	HEAT	NO. PIECES	WEIGHT	PLATE NUMBER	HEAT	NO. PIECES	WEIGHT
43969	0732S 53	1	22870				

MECHANICAL PROPERTIES

HEAT	PLATE NUMBER	SAMPLE GAUGE	TEST COND.	TEST METH.	TEST DIR.	YIELD KSI	TENSILE KSI	% ELONG 2"	% ELONG 8"
0732S	43969	1.7500	N	.2	T	55	81	30	

IMPACT TESTS

HEAT	PLATE NUMBER	SAMPLE GAUGE	TEST COND.	TEST METH.	TEST DIR.	COUPON SHAPE	TEST TEMP.	FULLSIZE ENERGY FTLB	FTLB	FTLB	AVG.
0732S	43969	1.7500	N	CVN	L	FULL	-50F	72	68	55	65

MTR APPROVED
EDMONTON EXCHANGER

CHEMICAL PROPERTIES

HEAT	C	MN	S	P	SI	CR	NI	CU	MO	ALT	ALS	CB	V	B	TI	N	D.O.
0732S 53	.20	1.09	.008	.008	.32	.19	.19	.18	.05	.032	.030	<.008	.025				.46

CONTINUED ON NEXT PAGE

QW - 483

COMPANY NAME: RJV Gasfield Services Ltd

PROCEDURE QUALIFICATION RECORD No.: RJV-108-A DATE: May - 30 - 95

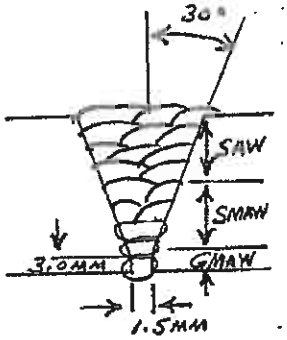
'S No.: RJV-108

LDING PROCESS(ES): GMAW/SMAW/SAW PWHT

PES (MANUAL, AUTOMATIC, SEMI-AUTO): GMAW (Semi-Auto) SMAW (Manual) SAW (Automatic)

OINTS (QW - 402) GROOVE DESIGN OF TEST COUPON

Layer	Process	Filler	Size	Amp.	Volt	mm/Min Travel	Deposit	Joules
1	GMAW	ER70S-2	.035"	120 - 130	20	152mm	3.0mm	26,000
2	SMAW	E7018-1	5/32"	165- 175	20 - 25	254mm	3.0mm	26,250
3	SMAW	E7018-1	3/16"	255 - 265	21 - 26	266mm	5.0mm	39,371
4	SMAW	E7018-1	1/4"	335 - 350	21 - 26	266mm	3.5mm	52,000
5	SMAW	E7018-1	1/4"	335 - 350	21 - 26	266mm	3.5mm	52,000
6	SMAW	E7018-1	1/4"	335 - 350	21 - 26	266mm	4.0mm	52,000
7	SAW	LA-71/880M	5/32"	500 - 550	27 - 32	1016mm	6.0mm	26,400
8	SAW	LA-71/880M	5/32"	500 - 550	27 - 32	1016mm	6.0mm	26,400
9	SAW	LA-71/880M	5/32"	500 - 550	27 - 32	1016mm	6.0mm	26,400
10	SAW	LA-71/880M	5/32"	500 - 550	27 - 32	1016mm	5.0mm	26,400



BASE METALS (QW - 403)

MATERIAL SPEC.: SA 516

TYPE OR GRADE: 70 MT

P - No.: P1 Gr2 to P - No.: P1Gr2

CKNESS OF TEST COUPON: 45.0mm

METER OF TEST COUPON: 200mm by 914mm Plate

OTHER:

FILLER METALS (QW - 404)

SFA SPECIFICATION	5.18	5.1	5.17
AWS CLASSIFICATION	ER70S-2	E7018-1	*
FILLER METAL F - No.	F6	F4	F6
WELD METAL ANS. A - No.	1	1	1
SIZE OF FILLER METAL	.035"	5/32to1/4	5/32"
OTHER	* F7A6-EM14K		
	Lincolmweld 880M Flux		
DEPOSITED WELD METAL	3.0mm	19.0mm	23.0mm

POSITION (QW - 405)

POSITION OF GROOVE: 1 G

WELD PROGRESSION (UP OR DOWNHILL): Forward

OTHER:

PREHEAT (QW - 406)

PREHEAT TEMP.: 200'F

NTERPASS TEMP.: 600'F

ER:

POSTWELD HEAT TREATMENT (QW - 407)

TEMPERATURE: 1150'F

TIME: 105 minutes

OTHER:

GAS (QW - 408)

	GAS	MIXTURE	FLOW RATE
SHIELDING	Argon/CO2	75/25	25cufthr
TRAILING	N/A		
BACKING	N/A		

ELECTRICAL CHARACTERISTICS (QW - 409)

CURRENT: Direct

POLARITY: Reverse

AMPS.: 120 - 550 VOLTS: 21 - 32

TUNGSTEN ELECTRODE SIZE: N/A

OTHER:

TECHNIQUE (QW - 410)

TRAVEL SPEED: 152mm to 1016mm per minute

STRING OR WEAVE BEAD: String & Weave

OSCILLATION: 1.56mm past each side of bevel

MULTIPASS OR SINGLE PASS (PER SIDE): Multi

SINGLE OR MULTIPLE ELECTRODES: Single

OTHER:

QW - 483 (back)

PQR No. RJV-108A

TENSILE TEST (QW - 150)

ECIMEN NO.	WIDTH	THICKNESS	AREA	ULTIMATE TOTAL	ULTIMATE UNIT	TYPE OF FAILURE
# 5 Top	0.745"	0.798"	0.595 Sq In	49,350 Lb	83,000 psi	Ductile/Weld
# 5 Bottom	0.743"	0.816"	0.606 Sq In	48,550 Lb	80,100 psi	Dctile/Weld
# 6 Top	0.742"	0.807"	0.599 Sq In	50,550 Lb	84,400 psi	Ductile/Parent
# 6 Bottom	0.746"	0.824"	0.615 Sq In	49,800 Lb	81,000 psi	Ductile/Parent

GUIDED BEND TESTS (QW - 160)

TYPE AND FIGURE NO.	RESULT
# 1 side bend	Pass
# 2 side bend	Pass
# 3 side bend	Pass
# 4 side bend	Pass

TOUGHNESS TEST (QW - 170)

TEST TEMPERATURE -50'C (-58'F)

NOTCH TYPE Vee Notch

SPECIMEN NO.	NOTCH LOCATION	IMPACT TEST	
		JOULES	FOOT / Lb.
1	Weld zone Top	207 Joules	153 ft/lb
2	Weld zone Top	136 Joules	100 ft/lb
3	Weld zone Top	198 Joules	146 ft/lb
4	Heat zone	72 Joules	53 ft/lb
5	Heat zone	99 Joules	73 ft/lb
6	Heat zone	61 Joules	45 ft/lb
7	Weld zone Bottom	26 Joules	19 ft/lb
8	Weld zone Bottom	43 Joules	32 ft/lb
9	Weld zone Bottom	33 Joules	24 ft/lb

FILLET-WELD TEST (QW - 180)

RESULTS SATISFACTORY YES _____ NO _____ PENETRATION INTO PARENT METAL YES _____ NO _____

MACRO RESULTS _____

OTHER TESTS

TYPE OF TEST Vickers Harness Test see Vickers Test Report (File #95-317)

DEPOSIT ANALYSIS _____

OTHER _____

ELDER'S NAME Albert Welin STAMP NO. W-11912

ESTS CONDUCTED BY: Alfor Metallurgical Comp. Ltd LAB TEST NO. File #95-317

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 or the ASME Code.

MANUFACTURER ~~RJV Canfield Services Ltd~~

ATE May - 30 - 95 BY _____

ALFOR METALLURGICAL COMPANY LTD.

CONSULTING ENGINEERS

FILE #95-317

PQR #RJV-108A

June 2, 1995

RJV Gasfield Service Ltd.
4901 - 47 Street
Vegreville, Alberta T9C 1C3

METAL TEST REPORT

Material Description: ASME SA-516, Grade 70; 1.750"-thick normalized plate; GMAW/SMAW/SAW welded; PWHT condition.

Specimen Type: Reduced-section tensile, as per Figure QW-462.1(a) of the ASME Code; guided side bend, as per Figure QW-462.2 of the ASME Code.

Results:	Sample 5 Top	Sample 5 Bottom	Sample 6 Top	Sample 6 Bottom
Width:	0.745 in.	0.743 in.	0.742 in.	0.746 in.
Thickness:	0.798 in.	0.816 in.	0.807 in.	0.824 in.
Area:	0.595 sq. in.	0.606 sq. in.	0.599 sq. in.	0.615 sq. in.
Ultimate Load:	49 350 lb	48 550 lb	50 550 lb	49 800 lb
Tensile Strength:	83 000 psi	80 100 psi	84 400 psi	81 000 psi
Break Type/Location:	Ductile/Weld	Ductile/Weld	Ductile/Parent	Ductile/Weld

Guided side bend samples 1, 2, 3, and 4: Pass Tests.

PERMIT TO PRACTICE
ALFOR METALLURGICAL COMPANY LTD.
Signature
Date June 2/95
PERMIT NUMBER: P 2753
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

PROFESSIONAL ENGINEER ALBERTA CHARLES F. MOZESON

CHARLES F. MOZESON, P. Eng.

ALFOR METALLURGICAL COMPANY LTD.

CONSULTING ENGINEERS

FILE #95-317

PQR #RJV-108A

June 2, 1995

RJV Gasfield Service Ltd.
4901 - 47 Street
Vegreville, Alberta T9C 1C3

CHARPY V-NOTCH IMPACT TEST RESULTS

Material Description: ASME SA-516, Grade 70; 1.750"-thick normalized plate; GMAW/SMAW/SAW welded; PWHT condition.

Specimen Type: Charpy V-notch full-sized weld zone and heat-affected zone impact specimen, as per Part UG-84 of the ASME Code.

Testing Temperature: -50 C (-58 F).

Results:

Weld zone (Top of weldment):	153 ft-lb (207 Joules);
	100 ft-lb (136 Joules);
	146 ft-lb (198 Joules).
Heat-affected zone:	53 ft-lb (72 Joules);
	73 ft-lb (99 Joules);
	45 ft-lb (61 Joules).
Weld zone (Bottom of weldment):	19 ft-lb (26 Joules);
	32 ft-lb (43 Joules);
	24 ft-lb (33 Joules).

PERMIT TO PRACTICE
ALFOR METALLURGICAL COMPANY LTD.
Signature
Date June 2/95
PERMIT NUMBER: P 2753
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

PROFESSIONAL ENGINEER ALBERTA CHARLES E. MOZESON

CHARLES E. MOZESON, P. Eng.

ALFOR METALLURGICAL COMPANY LTD.

CONSULTING ENGINEERS

FILE #95-317

PQR #RJV-108A

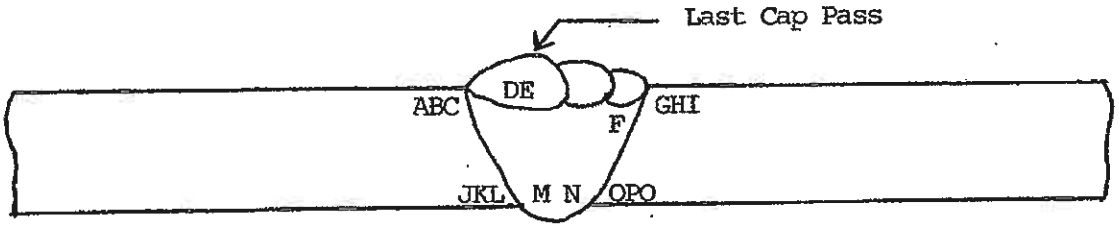
June 2, 1995

RJV Gasfield Service Ltd.
4901 - 47 Street
Vegreville, Alberta T9C 1C3

VICKERS HARDNESS TESTING OF STEEL WELDMENT

Material Description: ASME SA-516, Grade 70; 1.759"-thick normalized plate; GMAW/SMAW/SAW welded; PWHT condition.

Vickers hardness testing at 1 kg mass (HV1) was performed on a prepared cross-section of the weldment, in accordance with ASTM E 92. All tests were performed at 1.5 mm below the surface; the spacing between adjacent tests was 0.5 mm, with heat-affected zone tests initiating at 0.5 mm from the fusion line. The results are tabulated below.



Location	HV1	Location	HV1	Location	HV1
A	217	G	228	M	162
B	223	H	218	N	160
C	223	I	196	O	195
D	221	J	189	P	191
E	222	K	194	Q	189
F	207	L	196		

PERMIT TO PRACTICE
ALFOR METALLURGICAL COMPANY LTD.
Signature
Date June 2/95
PERMIT NUMBER: P 2753
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Yours very truly,
ALFOR METALLURGICAL COMPANY LTD.

PROFESSIONAL ENGINEER ALBERTA CHARLES E. MORESON

CHARLES E. MORESON, P. Eng.

6035 - 88 STREET, EDMONTON, ALBERTA T6E 5T4 PHONE (403) 465-0562