

COMPANY NAME RJV Gasfield Service Ltd DATE May - 30 -95  
 WELDING PROCEDURE SPEC. No. RJV-107  
 REVISION No. \_\_\_\_\_ DATE \_\_\_\_\_ SUPPORT PQR No.(S) RJV-107A  
 WELDING PROCESS(ES) GMAW/SMAW/SAW as Welded 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)  (NO)   
 BACKING MATERIAL (TYPE) Weld metal where applicable  
 METAL  NONFUSING METAL  
 NONMETALLIC  OTHER

**ALBERTA  
LABOUR  
BOILERS & PRESSURE VESSELS ACT  
WELDING PROCEDURE**

Reg. No. WP. 13122  
 Spec No. RJV-107  
 Weld Process GMAW/SMAW/SAW  
 Matl. Gr. P No. 1 Gr 2 to P No. 1 Gr 2  
 Elec. Gr. F No. 6+4+6 A No. 1  
 Th. Qual. For. 38.1mm PWHT NO  
 MIN. TH. QUAL 15.9mm FOR CVN -46c  
 Yr. 95 Mo. 6 Day 15 Signed RK  
**R. ROSEBERG, 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 \_\_\_\_\_  
 OR  
 CHEM. ANALYSIS AND MECH. PROP. \_\_\_\_\_  
 TO CHEM. ANALYSIS AND MECH. PROP. \_\_\_\_\_  
**THICKNESS RANGE:**  
 BASE METAL GROOVE WITH IMPACT 15.875mm to 38.0mm FILLET All thickness  
WITHOUT IMPACT 5.0mm to 38.0mm  
 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	38.0mm	38.0mm
FILLET	All thickness	All thickness	All thickness
ELECTRODE - FLUX (CLASS)			
FLUX TRADE NAME			Lincolmweld 880M (NEUTRAL)
CONSUMABLE INSERT			

**QW - 482 (back)**

WPS No. RJV-107

REVISION No.

<b>POSITIONS (QW - 405)</b> POSITIONS OF GROOVE <u>Flat</u> WELDING PROGRESSION UP <u>Forward</u> DOWN _____ POSITIONS OF FILLET <u>Flat</u>	<b>POSTWELD HEAT TREATMENT (QW - 407)</b> TEMPERATURE RANGE <u>N/A</u> TIME RANGE _____ <b>GAS (QW - 408)</b> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td></td> <th colspan="3">PERCENT COMPOSITION</th> </tr> <tr> <td></td> <th>GAS(ES)</th> <th>MIXTURE</th> <th>FLOW RATE</th> </tr> <tr> <td>SHIELDING</td> <td><u>Argon/CO2</u></td> <td><u>75/25</u></td> <td><u>20 - 30 cufthr</u></td> </tr> <tr> <td>TRAILING</td> <td><u>N/A</u></td> <td></td> <td></td> </tr> <tr> <td>BACKING</td> <td><u>N/A</u></td> <td></td> <td></td> </tr> </table>		PERCENT COMPOSITION				GAS(ES)	MIXTURE	FLOW RATE	SHIELDING	<u>Argon/CO2</u>	<u>75/25</u>	<u>20 - 30 cufthr</u>	TRAILING	<u>N/A</u>			BACKING	<u>N/A</u>		
	PERCENT COMPOSITION																				
	GAS(ES)	MIXTURE	FLOW RATE																		
SHIELDING	<u>Argon/CO2</u>	<u>75/25</u>	<u>20 - 30 cufthr</u>																		
TRAILING	<u>N/A</u>																				
BACKING	<u>N/A</u>																				
<b>PREHEAT (QW - 406)</b> PREHEAT TEMP. <u>100°F min.</u> INTERPASS TEMP. MAX. <u>600°F</u> PREHEAT MAINTENANCE <u>Continuous by Gas or Electric</u> (CONTINUOUS OR SPECIAL HEATING SHOULD BE RECORDED)																					

**ELECTRICAL CHARACTERISTICS (QW 409)**

CURRENT Direct POLARITY Reverse AMP. Range 90 - 650 VOLTS Range 18 - 32

TUNGSTEN ELECTRODE SIZE AND TYPE N/A  
PURE TUNGSTERN 2% THORISTED, ETC.

MODE OR METAL TRANSFER FOR GMAW Short circuiting arc  
SPRAY ARC, SHORT CIRCUITING ARC, ETC.

ELECTRODE WIRE FEED SPEED RANGE 120 to 200 inches per minute

**TECHNIQUE (QW - 410)**

STRING OR WEAVE BEAD String & Weave

ORIFICE OR GAS CUP SIZE 1/2" to 1.0"

INITIAL AN INTERPASS CLEANING (BRUSHING, GRINDING, ETC.) Grind all tie in on stop and start to a feather edge on the root.  
Grind to sound metal for interpass welding.

METHOD OF BACK GOUGING Arc-Air when required, then grind to sound metal.

OSCILLATION 1.56 mm past each side of bevel

CONTACT TUBE TO WORK DISTANCE 1.56mm

MULTIPLE OR SINGLE PASS (PER SIDE) Multi

MULTIPLE OR SINGLE ELECTRODES Single

TRAVEL SPEED (RANGE) As per Table below

PEENING Not permitted

OTHER Depending on the thickness of material being welded, different diameter of electrode for SMAW should be used  
care must be taken not to exceed the maximum Heat Input permitted.  
Heat Input = Amp. X Volt X 60 = Joules  
Inches travel per minute  
GMAW = (26,000 Joules) SMAW = (52,000 Joules) SAW = (26,400 Joules)

WELD LAYERS	PROCESS	FILLER METAL		CURRENT		VOLT RANGE	TRAVEL SPEED RANGE
		CLASS	DIAMETER	TYPE	AMP. RANGE		
1	GMAW	ER70S-2/6	0.035"	DC Rev	90 - 150	18 - 22	3.0" to 8.0" per minute
2-3-4	SMAW	E7018-1	5/32"	DC Rev	125 - 210	20 - 25	4.0" to 16.0" per minute
2-3-4	SMAW	E7018-1	3/16"	DC Rev	200 - 310	21 - 26	5.0" to 16.0" per minute
2-3-4	SMAW	E7018-1	1/4"	DC Rev	280 - 390	22 - 30	7.0" to 14.0" per minute
3 - & others	SAW	LA-71/880M	1/8"	DC Rev	350 - 650	27 - 32	30.0" to 48.0" per minute
	SAW	LA-71/880M	5/32"	DC Rev	350 - 650	27 - 32	30.0" to 48.0" per minute

**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 is 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 than 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 specified maximum carbon content in excess of 0.30%	80°C (175°F)
All others	10°C (50°F)

# CERTIFICATE OF CONFORMANCE

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

*Attn: Graham*

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



TYPICAL VALUES ONLY

This is to certify that Lincoln <sup>®</sup> 800M Flux-A-71 Electrode combination, classification E70C-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)	45
Current (amps) DC+	550
Voltage (volts)	28
Travel Speed (in./min)	16

Electrical Stickout (in)	1/4"
Passes/Layers	10/8
Preheat Temp. (°F)	270
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	
		Requirements	Analysis
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	
		(900, 110, 110)	

%	E70C-19 ELECTRODE		DEPOSIT	
	Requirements	Analysis	Requirements	Analysis
C	.06-.19	.10	.08	.08
Mn	.90-1.40	1.29	1.32	1.32
Si	.35-.75	.54	.50	.50
S	.025 max	.003	.003	.003
P	.025 max	.007	.010	.010
Cu (total)	.35 max	.21	.18	.18
Ti	.03-.17	.08	.02	.02

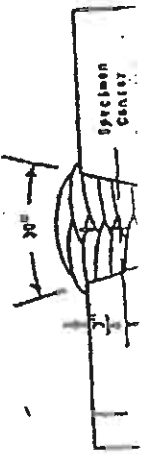
Diffusible Hydrogen (1)	5.62"
(AWS A4.3-93): ml/100 g	3.3

Radio-graphic Test: Met requirements.  
Test assembly constructed of ASIN A36 steel.

Test atmospheric condition of 25 % Relative Humidity at 65 °f.

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

*Donald J. Bell*  
DONALD J. BELL  
CERTIFICATION SUPERVISOR



CUSTOMER PURCHASE ORDER NUMBER M20824-1010	ENTRY DATE OCT 17/94	SHIP DATE 94-11-23	TALLY NUMBER 237143	SHIPPERS NUMBER 02-	CARRIER DWC	PAGE 1	MILL ORDER 12294
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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 MCCOSHANS  
 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 REQ'T S20  
 & S21 - CU .20 MAX, NI .25 MAX, CR .25 MAX, MO .08 MAX (CU + NI + CR + MO) = .70 MAX - PUQ - 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.I.E.

#### CUST USE VESSEL STOCK

\*\*\*\*\* 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				
0732S 43969							

PLATE NUMBER	SAMPLE GAUGE	TEST COND. N	TEST METH. CVN	TEST DIR. L	TEST YIELD KSI	TENSILE KSI	% ELONG	TEST COUPON SHAPE	TEMP. -50F	FULLSIZE FTLB	ENERGY FTLB
0732S 43969	1.7500	N	.2	T	55	81	2" 8"	FULL		72	68
0732S 43969	1.7500	N	.32	.19	.18	.05	.032	MO	ALT	ALS	CB



CONTINUED ON NEXT PAGE

\*\*\* WARNING \*\*\* THE TEST RESULTS AND VALUES REPORTED HEREIN INDICATE ONLY THAT (1) THE PARTICULAR STEEL FOR WHICH THIS CERTIFICATE IS ISSUED MEETS THE MINIMUM SPECIFIED YIELD STRENGTH AND (2) THE CHEMICAL ANALYSIS AND PHYSICAL PROPERTIES OF SUCH STEEL ARE IN CONFORMANCE WITH THE REQUIREMENTS OF THE SPECIFICATION INDICATED. THE RESULTS OR VALUES REPORTED HEREIN CAN NOT BE USED TO QUALIFY THE STEEL FOR ANY SPECIFICATION OTHER THAN THE ONE INDICATED AND CAN NOT BE RELIED UPON FOR ANY PURPOSE (INCLUDING DESIGN OR CALCULATIONS) AS REPRESENTING THE ACTUAL STRENGTH OF SUCH STEEL.

13/4 0732S-43969

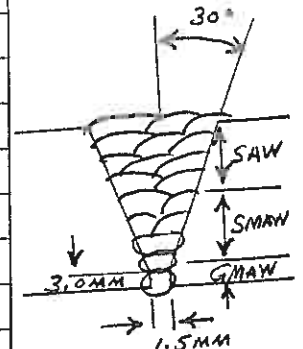
**QW - 483**

COMPANY NAME RJV Gasfield Services Ltd  
 PROCEDURE QUALIFICATION RECORD No. RJV-107-A DATE May - 30 - 95  
 WPS No. RJV-107  
 WELDING PROCESS(ES) GMAW/SMAW/SAW as Welded  
 WELDING TYPES (MANUAL, AUTOMATIC, SEMI-AUTO) GMAW ( Semi-Auto ) SMAW ( Manual ) SAW ( Automatic )

**JOINTS (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  
 THICKNESS OF TEST COUPON 45.0mm  
 DIAMETER OF TEST COUPON 200mm by 914mm Plate  
 OTHER \_\_\_\_\_

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

TEMPERATURE N/A  
 TIME \_\_\_\_\_  
 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

**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 \_\_\_\_\_

**POSITION (QW - 405)**

POSITION OF GROOVE 1 G  
 WELD PROGRESSION (UP OR DOWNHILL) Forward  
 OTHER \_\_\_\_\_

**TECHNIQUE (QW - 410)**

TRAVEL SPEED 152mm to 1016mm per minute  
 STRING OR WEAVE BEAD String & Weave  
 OSCILLATION 1.56mm pass each side of bevel  
 MULTIPASS OR SINGLE PASS (PER SIDE) Multi  
 SINGLE OR MULTIPLE ELECTRODES Single  
 OTHER \_\_\_\_\_

**PREHEAT (QW - 406)**

PREHEAT TEMP. 200°F  
 INTERPASS TEMP. 600°F  
 OTHER \_\_\_\_\_

**QW - 483 (back)**

PQR No. RJV-107A

**TENSILE TEST (QW - 150)**

SPECIMEN NO.	WIDTH	THICKNESS	AREA	ULTIMATE TOTAL	ULTIMATE UNIT	TYPE OF FAILURE
# 5 Top	0.750"	0.781"	0.586 Sq In	49,600 Lb	84,700 psi	Ductile/Weld.
# 5 Bottom	0.753"	0.799"	0.602 Sq In	49,850 Lb	82,900 psi	Ductile/Weld.
# 6 Top	0.745"	0.734"	0.547 Sq In	46,750 Lb	85,500 psi	Ductile/Weld.
# 6 Bottom	0.750"	0.780"	0.585 Sq In	48,750 Lb	83,300 psi	Ductile/Weld

**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	130 Joules	96 ft/lb
2	Weld zone Top	198 Joules	146 ft/lb
3	Weld zone Top	61 Joules	45 ft/lb
4	Heat zone	52 Joules	38 ft/lb
5	Heat zone	99 Joules	73 ft/lb
6	Heat zone	146 Joules	108 ft/lb
7	Weld zone	33 Joules	24 ft/lb
8	Weld zone	20 Joules	15 ft/lb
9	Weld zone	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 Hardness Test see Test Report Sheet ( File #95-315)

DEPOSIT ANALYSIS \_\_\_\_\_

OTHER \_\_\_\_\_

WELDER'S NAME Albert Welin

STAMP NO. W-11912

TESTS CONDUCTED BY: Alfor Metallurgical Comp. Ltd

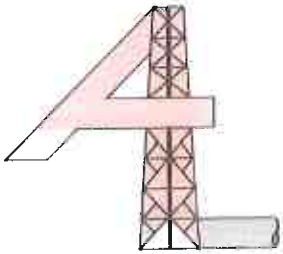
LAB TEST NO. File # 95-315

*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 Gasfield Services Ltd

DATE May - 30 - 95

BY 



# ALFOR METALLURGICAL COMPANY LTD.

CONSULTING ENGINEERS

FILE #95-315

PQR #RJV-107A

June 1, 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; as-welded 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.

<b>Results:</b>	<u>Sample 5 Top</u>	<u>Sample 5 Bottom</u>	<u>Sample 6 Top</u>	<u>Sample 6 Bottom</u>
Width:	0.750 in.	0.753 in.	0.745 in.	0.750 in.
Thickness:	0.781 in.	0.799 in.	0.734 in.	0.780 in.
Area:	0.586 sq. in.	0.602 sq. in.	0.547 sq. in.	0.585 sq. in.
Ultimate Load:	49 600 lb	49 850 lb	46 750 lb	48 750 lb
Tensile Strength:	84 700 psi	82 900 psi	85 500 psi	83 300 psi
Break Character:	Ductile	Ductile	Ductile	Ductile
Break Location:	Weld Material	Weld Material	Weld Material	Weld Material

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

Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

**PERMIT TO PRACTICE**  
ALFOR METALLURGICAL COMPANY LTD.

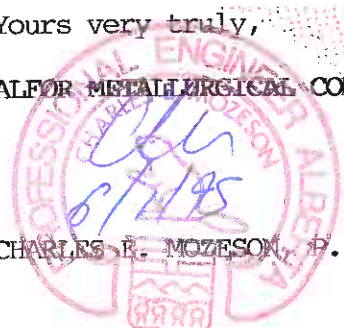
Signature *[Signature]*

Date June 1, 1995

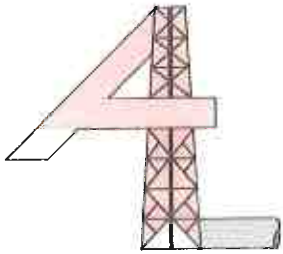
**PERMIT NUMBER: P 2753**

The Association of Professional Engineers,  
Geologists and Geophysicists of Alberta

CHARLES E. MOZESON, P. Eng.







# ALFOR METALLURGICAL COMPANY LTD.

CONSULTING ENGINEERS

FILE #95-315

PQR #RJV-107A

June 1, 1995

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

## CHARPY V-NOTCH IMPACT TEST RESULTS

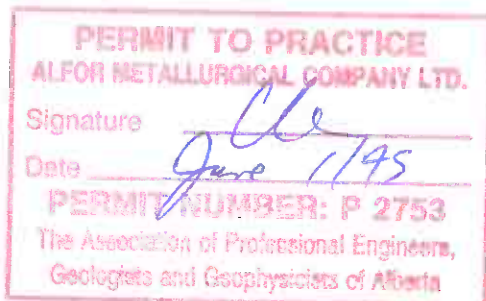
**Material Description:** ASME SA-516, Grade 70; 1.750"-thick normalized plate;  
GMAW/SMAW/SAW welded; as-welded condition.

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

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

**Results:**

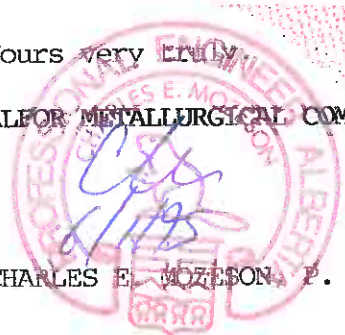
Weld zone (Top of weldment):	96 ft-lb (130 Joules);
	146 ft-lb (198 Joules);
	45 ft-lb ( 61 Joules).
Heat-affected zone:	38 ft-lb ( 52 Joules);
	73 ft-lb ( 99 Joules);
	108 ft-lb (146 Joules).
Weld zone (Bottom of weldment):	24 ft-lb ( 33 Joules);
	15 ft-lb ( 20 Joules);
	24 ft-lb ( 33 Joules).

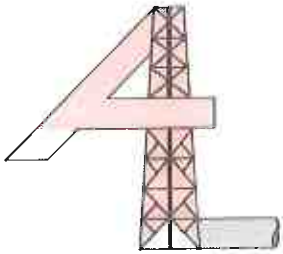


Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

CHARLES E. MOZESON, P. Eng.





# ALFOR METALLURGICAL COMPANY LTD.

CONSULTING ENGINEERS

FILE #95-315

PQR #RJV-107A

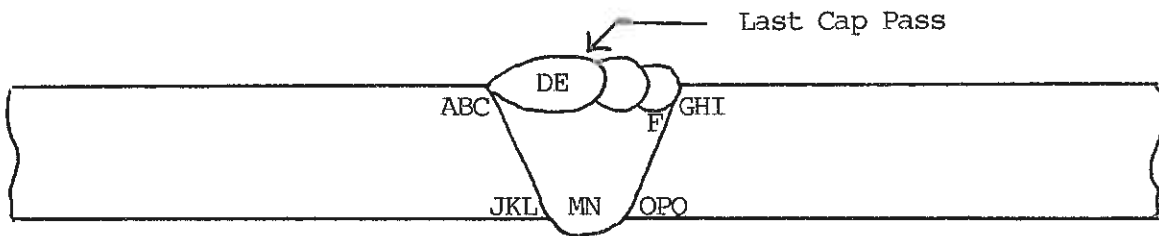
June 1, 1995

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

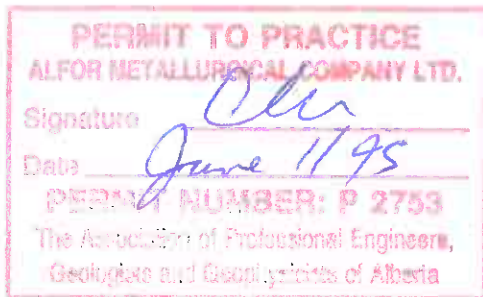
## VICKERS HARDNESS TESTING OF STEEL WELDMENT

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



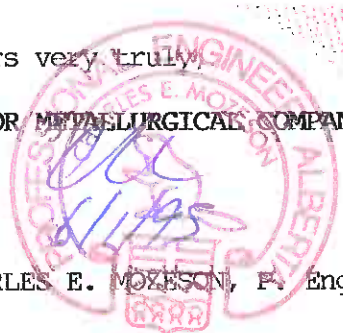
<u>Location</u>	<u>HV1</u>	<u>Location</u>	<u>HV1</u>	<u>Location</u>	<u>HV1</u>
A	226	G	237	M	176
B	245	H	227	N	178
C	244	I	212	O	212
D	213	J	198	P	208
E	215	K	199	Q	199
F	212	L	210		



Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

CHARLES E. MOZESON, P. Eng.



**QW - 482 (back)**

WPS No. RJV-107

REVISION No. \_\_\_\_\_

<b>POSITIONS (QW - 405)</b> POSITIONS OF GROOVE <u>Flat</u> WELDING PROGRESSION UP <u>Forward</u> DOWN _____ POSITIONS OF FILLET <u>Flat</u>	<b>POSTWELD HEAT TREATMENT (QW - 407)</b> TEMPERATURE RANGE <u>1150°F</u> TIME RANGE <u>1 hour per inches</u>																				
<b>PREHEAT (QW - 406)</b> PREHEAT TEMP. <u>100°F</u> INTERPASS TEMP. MAX. <u>600°F</u> PREHEAT MAINTENANCE <u>Continuous by Gas or Electric</u> (CONTINUOUS OR SPECIAL HEATING SHOULD BE RECORDED)	<b>GAS (QW - 408)</b> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td></td> <th colspan="3">PRECENT COMPOSITION</th> </tr> <tr> <td></td> <th>GAS(ES)</th> <th>MIXTURE</th> <th>FLOW RATE</th> </tr> <tr> <td>SHIELDING</td> <td><u>Argon/CO2</u></td> <td><u>75/25</u></td> <td><u>20 - 30 cufthr</u></td> </tr> <tr> <td>TRAILING</td> <td><u>N/A</u></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>BACKING</td> <td><u>N/A</u></td> <td>_____</td> <td>_____</td> </tr> </table>		PRECENT COMPOSITION				GAS(ES)	MIXTURE	FLOW RATE	SHIELDING	<u>Argon/CO2</u>	<u>75/25</u>	<u>20 - 30 cufthr</u>	TRAILING	<u>N/A</u>	_____	_____	BACKING	<u>N/A</u>	_____	_____
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TRAILING	<u>N/A</u>	_____	_____																		
BACKING	<u>N/A</u>	_____	_____																		

**ELECTRICAL CHARACTERISTICS (QW 409)**

CURRENT Direct POLARITY Reverse AMP. Range 90 - 650 VOLTS Range 18 - 32

TUNGSTEN ELECTRODE SIZE AND TYPE N/A  
PURE TUNGSTERN 2% THORISTED, ETC.

MODE OR METAL TRANSFER FOR GMAW Short circuiting arc  
SPRAY ARC, SHORT CIRCUITING ARC, ETC.

ELECTRODE WIRE FEED SPEED RANGE 120 to 200 inches per minute

**TECHNIQUE (QW - 410)**

STRING OR WEAVE BEAD String & Weave

ORIFICE OR GAS CUP SIZE 1/2" to 1.0"

INITIAL AN INTERPASS CLEANING (BRUSHING, GRINDING, ETC.) Grind all tie in on stop and start to a feather edge on the root.  
Grind to sound metal for interpass welding.

METHOD OF BACK GOUGING Arc-Air when required, then grind to sound metal.

OSCILLATION 1.56 mm pass each side of bevel

CONTACT TUBE TO WORK DISTANCE 1.56mm

MULTIPLE OR SINGLE PASS (PER SIDE) Multi

MULTIPLE OR SINGLE ELECTRODES Single

TRAVEL SPEED (RANGE) As per Table below

PEENING Not permitted

OTHER Depending on the thickness of material being welded, different diameter of electrode for SMAW should be used  
care must be taken not to exceed the maximum Heat Input permitted.  
Heat Input = Amp. X Volt X 60 = Joules  
Inches travel per minute  
GMAW = (26,000 Joules) SMAW = (52,000 Joules) SAW = (26,400 Joules)

WELD LAYERS	PROCESS	FILLER METAL		CURRENT		VOLT RANGE	TRAVEL SPEED RANGE
		CLASS	DIAMETER	TYPE	AMP. RANGE		
1	GMAW	ER70S-2/-6	0.035"	DC Rev	90 - 150	18 - 22	3.0" to 8.0" per minute
2-3-4	SMAW	E7018-1	5/32"	DC Rev	125 - 210	20 - 25	4.0" to 16.0" per minute
2-3-4	SMAW	E7018-1	3/16"	DC Rev	200 - 310	21 - 26	5.0" to 16.0" per minute
2-3-4	SMAW	E7018-1	1/4"	DC Rev	280 - 390	22 - 30	7.0" to 14.0" per minute
3 - & others	SAW	LA-71/880M	1/8"	DC Rev	350 - 650	27 - 32	30.0" to 48.0" per minute
	SAW	LA-71/880M	5/32"	DC Rev	350 - 650	27 - 32	30.0" to 48.0" per minute

**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 is 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 than 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 specified maximum carbon content in excess of 0.30%	80°C (175°F)
All others	10°C (50°F)