



October 21, 2014

Co. Code: **RJVGA1**

Mr. Joel Girard, ing. P. Eng.
Metex Consulting Inc.
7345 du Mousquet
Quebec, QC, G2K 1Y4

Dear Mr. Girard:

RE: ALTERNATE WPS FOR RJV GAS FIELD SERVICES (W47.1)

Your recent submission has been reviewed by the Canadian Welding Bureau. Our comments are as follows:

GMAW: GMAW-STEEL, Rev 0 / 1401 (pages 1 through 47); Stamped accepted.

For the most current list of CWB certified consumables please access the following link:
<http://eng.cwbgroup.org/Certification/Pages/ConsumablesSearch.aspx>.

For complimentary information on the Canadian welding standards, requirements and regulations and how they support public safety, please visit www.weldquality.org.

If you have any questions relating to the above comments, please do not hesitate to contact me or the CWB area representative.

Thank you for your cooperation.

Yours very truly,
CANADIAN WELDING BUREAU

Ashiqur Khan, M.Eng., P.Eng.
Procedures and Electrodes

Canadian Welding Bureau
8260 Parkhill Drive, Milton, ON L9T 5V7

Ashiqur.Khan@cwbgroupp.org

www.cwbgroup.org

Tel: 1 (800) 844-6790, ext. 217

Fax: 1 (905) 542-1318

c: Wes Markowsky, RJV Gas Field Services
c: Scott Wilson, CWB



8260 Parkhill Drive, Milton, Ontario L9T 5V7
Tel: 1.800.844.6790 info@cwbgroupp.org
Fax: 905.542.1318 www.cwbgroup.org



October 27, 2014

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RJV GAS FIELD SERVICES LTD.

Welding Procedure Specification

in accordance with

ASME Sections VIII, IX, B31.1 & B31.3

WPS No.: 100 Revision 3
Supporting PQR No. (s): 100-1, 100-B, 100-C, 100-D
Qualified for

Process(es):	<u>SMAW / SMAW</u>	Position(s):	<u>All</u>
Filler Metal F-No.:	<u>F-3 / F-4</u>	A-No.:	<u>A-1 / A-1</u>
AWS Class.:	<u>E6010 / E7018-1</u>	Weld Type(s):	<u>Groove, Fillet</u>
Base Metal:	<u>P-1 Group 1 or 2</u>	To:	<u>P-1 Group 1 or 2</u>
Typical Materials P-1 Gr. 1:	<u>SA-36, SA-53, SA-106 A/B, SA-234 WPB, SA-350 LF1, SA-516 60/65, SA-CSA G40.21 Gr. 38W / 44W</u>		
P-1 Gr. 2:	<u>SA-106, SA-106 C, SA-234 WPC, SA-350 LF2, SA-516 70, SA-537 Cl. 1, SA-660 WCB / WCC</u>		
Diameter Range:	<u>All</u>	Condition(s):	<u>As Welded</u>
Thickness Range:	<u>0.062" to 1.00"</u>	<u>Normal and Sour Service</u>	
	<u>0.125" to 1.00"</u>	<u>Low Temperature Service to -46° C (-50°F)</u>	

Revision 3: Addition of PQR's for low temperature service and editorial review and update to the current edition of the ASME codes.

Provincial Registration

ALBERTA BOILERS SAFETY ASSOCIATION
PROVINCE OF ALBERTA
SAFETY CODES ACT
WELDING PROCEDURE

Reg. No. WP 1312.2
Spec No. 100 (REV. 3)
Weld Process SMAW
Matl. Gr. P No. 1 Gr. 1 & 2 to P No. 1 Gr. 1 & 2
Elec. Gr. F No. 3 & 4 A No. 1
Th. Qual. For 25.4 mm PWHT NO
Min Th. Qual 3.1 mm, CVN -46°C

Yr 02 Mo 08 Day 01 Signed R. ROSEBERG, P.ENG.
WELDING SPECIALIST

WELDING PROCEDURE SPECIFICATION (WPS) QW-482
(Section IX, ASME Boiler and Pressure Vessel Code)

Company Name: RJV Gas Field Services Ltd. Date: September 08, 1987
WPS No.: 100 Revision Date: July 08, 2002
Revision No.: 3
Supporting PQR's: 100-1, 100-B, 100-C, 100-D
Welding Process(es): SMAW / SMAW Type(s): Manual / Manual

JOINTS QW-402		Joint Details	
Joint Design:	Butt, Tee, Lap, Corner, etc.	All ASME joint designs. Reference construction	
Backing:	F-3 SMAW electrodes with or without backing F-4 SMAW electrodes with backing only.	drawings for joint details. Where joint details are not specified, refer to typical joint detail sheet provided.	
Backing Material (Type): Similar base or weld metal as required. No Retainers.			
BASE METALS QW-403			
P-No:	<u>1</u>	Group No:	<u>1 or 2</u>
OR		to P-No:	<u>1</u>
Spec. type & grade:	<u>N/A</u>	to Spec. type & grade:	<u>N/A</u>
OR			
Chem. Analysis & Mech. Prop.:	<u>N/A</u>	to Chem. Analysis & Mech. Prop.:	<u>N/A</u>
Base Metal Thickness Range			
Groove: <u>0.062" to 1.00" – Normal and Sour Service</u>			Fillet: <u>All</u>
Groove: <u>0.125" to 1.00" – Low Temperature Service to -46° C (-50°F)</u>			
Pipe Dia Range: <u>Unlimited</u>			Fillet: <u>All</u>
Other: <u>Maximum thickness of any weld layer shall not exceed 0.500"</u>			
FILLER METALS QW-404			
Process:	SMAW	SMAW	
Spec No. (SFA):	5.1	5.1	
AWS No. (Class):	E6010	E7018-1	
F-No.:	F-3	F-4	
A-No.:	A-1	A-1	
Size of Filler Metals:	3/32", 1/8", 5/32", 3/16"	3/32", 1/8", 5/32", 3/16", 1/4"	
Weld Thickness - Groove:	0.157" max. (0.150" for Low Temperature)	0.853" max. (0.850" for Low Temperature)	
- Fillet:	unlimited	unlimited	
Electrode-Flux (Class):	N/A	N/A	
Flux Trade Name:	N/A	N/A	
Consumable Insert:	N/A	N/A	
Other:	Covered Electrode	Covered Electrode	

Revision 3: Addition of PQR's for low temperature service and editorial review and update to the current edition of the ASME codes.

WELDING PROCEDURE SPECIFICATION (WPS) QW-482
(Section IX, ASME Boiler and Pressure Vessel Code)

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Supporting PQR's: 100-1, 100-B, 100-C, 100-D
Welding Process(es): SMAW / SMAW Type(s): Manual / Manual

JOINTS QW-402		Joint Details	
Joint Design:	<u>Butt, Tee, Lap, Corner, etc.</u>	All ASME joint designs. Reference construction	
Backing:	<u>F-3 SMAW electrodes with or without backing</u> <u>F-4 SMAW electrodes with backing only.</u>	drawings for joint details. Where joint details are not specified, refer to typical joint detail sheet provided.	
Backing Material (Type): <u>Similar base or weld metal as required. No Retainers.</u>			
BASE METALS QW-403			
P-No:	<u>1</u>	Group No:	<u>1 or 2</u>
OR		to P-No:	<u>1</u>
Spec. type & grade:	<u>N/A</u>	to Spec. type & grade:	<u>N/A</u>
OR			
Chem. Analysis & Mech. Prop.:	<u>N/A</u>	to Chem. Analysis & Mech. Prop.:	<u>N/A</u>
Base Metal Thickness Range			
Groove:	<u>0.062" to 1.00" - Normal and Sour Service</u>	Fillet:	<u>All</u>
Groove:	<u>0.125" to 1.00" - Low Temperature Service to -46° C (-50°F)</u>	Fillet:	<u>All</u>
Pipe Dia Range:	<u>Unlimited</u>		
Other:	<u>Maximum thickness of any weld layer shall not exceed 0.500"</u>		
FILLER METALS QW-404			
Process:	<u>SMAW</u>	<u>SMAW</u>	
Spec No. (SFA):	<u>5.1</u>	<u>5.1</u>	
AWS No. (Class):	<u>E6010</u>	<u>E7018-1</u>	
F-No.:	<u>F-3</u>	<u>F-4</u>	
A-No.:	<u>A-1</u>	<u>A-1</u>	
Size of Filler Metals:	<u>3/32", 1/8", 5/32"</u>	<u>3/32", 1/8", 5/32", 3/16", 1/4"</u>	
Weld Thickness - Groove:	<u>0.157" max. (0.150" for Low Temperature)</u>	<u>0.853" max. (0.150" for Low Temperature)</u>	
- Fillet:	<u>unlimited</u>	<u>unlimited</u>	
Electrode-Flux (Class):	<u>N/A</u>	<u>N/A</u>	
Flux Trade Name:	<u>N/A</u>	<u>N/A</u>	
Consumable Insert:	<u>N/A</u>	<u>N/A</u>	
Other:	<u>Covered Electrode</u>	<u>Covered Electrode</u>	

Revision 3: Addition of PQR's for low temperature service and editorial review and update to the current edition of the ASME codes.

WELDING PROCEDURE SPECIFICATION (WPS) QW-482 (Section IX, ASME Boiler and Pressure Vessel Code)

WPS # 100 Revision 3

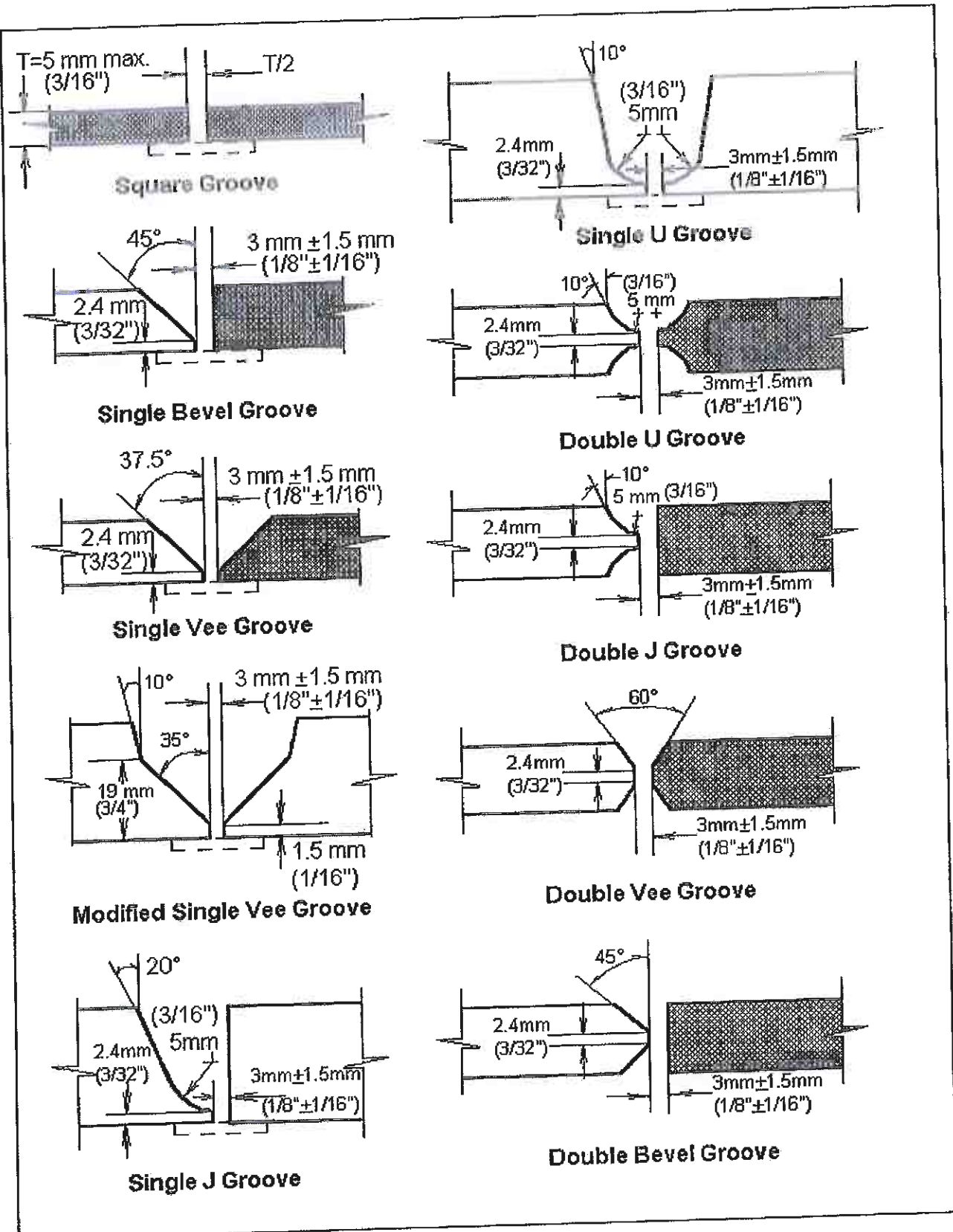
POSITIONS QW-405 Position(s) of Groove: All Welding Progression: Up: F-4 Electrodes Up or Down: F-3 Electrodes Position(s) of Fillet: All			POSTWELD HEAT TREATMENT QW-407 Temperature Range: N/A Time Range: N/A			
PREHEAT QW-406 Preheat Temp Min: 50°F Interpass Temp Max: 600°F Interpass Temp Min: 50°F Monitor using pyrometer tempilstiks or other suitable method.			GAS QW-408 Shielding Gas(es): N/A Composition: N/A Flow Rate: N/A Gas Backing: N/A Trailing Shielding Gas Composition: N/A			
ELECTRICAL CHARACTERISTICS QW-409						
Max Heat Input:	Current Type:	SMAW (F-3) Direct Current (DC)	SMAW (F-4) Direct Current (DC)			
	Polarity:	SMAW (F-3) Reverse (EP)	SMAW (F-4) Reverse (EP)			
	Amps (Range):	SMAW (F-3) 60 - 180	SMAW (F-4) 70 - 360			
	Volts (Range):	SMAW (F-3) 20 - 32	SMAW (F-4) 18 - 32			
	0.125" - 0.500"	SMAW (F-3) 28 080 J/in	SMAW (F-4) 59 800 J/in			
	0.500" - 1.00"	SMAW (F-3) 22 080 J/in	SMAW (F-4) 72 450 J/in			
Electrode Wire feed speed range: N/A Tungsten Electrode Size & Type: N/A Mode of Metal Transfer for GMAW: N/A						
TECHNIQUE QW-410						
String or Weave Bead: Either. Weave size shall be controlled to prevent exceeding maximum heat input.						
Orifice or Gas Cup Size: N/A						
Initial Cleaning: Base material must be thoroughly cleaned of grease, rust, mill scale, dirt, etc., at least 1" back on each side of the joint prior to welding.						
Interpass Cleaning: Perform by power brushing, grinding, etc. after each weld layer.						
Back Gouging: Arc air, gouge, grind, etc. to clean metal if required.						
Oscillation: N/A						
Contact Tube to Work Distance: Not Applicable						
Multiple or Single pass (per side): Single or Multiple for F-4 electrodes.						
Multiple or Single Electrodes: Single						
Travel Speed (Range): 2 - 16 IPM						
Peening: Not allowed						
TYPICAL WELDING PARAMETERS						
Process	Filler Metal		Current		Volt Range	Travel Speed (IPM)
	AWS Classification	Diameter (in)	Type & Polarity	Amp Range		
SMAW	E6010	3/32	DC RP	60 - 100	20 - 26	2 - 12
SMAW	E6010	1/8	DC RP	80 - 150	20 - 28	3 - 14
SMAW	E6010	5/32	DC RP	90 - 180	22 - 32	4 - 16
SMAW	E7018-1	3/32	DC RP	70 - 130	18 - 24	2 - 10
SMAW	E7018-1	1/8	DC RP	90 - 150	20 - 24	4 - 12
SMAW	E7018-1	5/32	DC RP	120 - 190	20 - 26	5 - 14
SMAW	E7018-1	3/16	DC RP	150 - 270	22 - 28	6 - 16
SMAW	E7018-1	1/4	DC RP	180 - 360	24 - 32	8 - 16
Notes:	1) Number of weld layers and size of filler metal may vary with thickness of base material and position of weld. 2) 3/16" & 1/4" E7018 electrodes limited to flat (1G) position only.					

Revision 3:

Addition of PQR's for low temperature service and editorial review and update to the current edition of the ASME codes.

Typical Joint Details QW-482

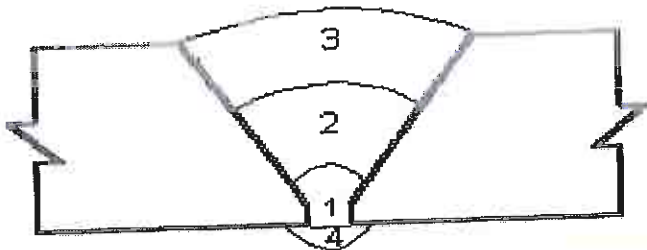
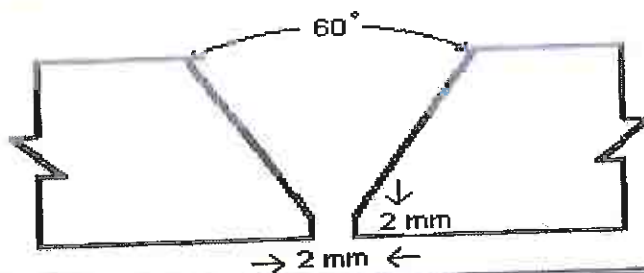
Prepared by: Qualimet



PROCEDURE QUALIFICATION RECORD (PQR) QW-483 (Section IX, ASME Boiler and Pressure Vessel Code)

Company Name: RJV Gas Field Services Ltd. Date: July 08, 2002
PQR No.: 100-C Revision Date: -----
Revision No.: -----
WPS No.: 100 Revision 3
Welding Process(es): SMAW / SMAW
Types: Manual / Manual

JOINTS QW-402



BASE METALS QW-403 Material Spec.: <u>SA-516</u> to <u>SA-516</u> Type or Grade: <u>Grade 60</u> <u>Grade 70</u> P-No. <u>P1 Group 1</u> <u>P-1 Group 2</u> Thickness of Test Coupon: <u>0.249" Plate</u> Other: Heat No.: <u>22648-015071-2</u> C.E.: <u>0.37</u>		POSTWELD HEAT TREATMENT QW-407 Temperature: <u>N/A</u> Time: <u>N/A</u> Other: <u>N/A</u>																									
FILLER METALS QW-404 <table border="1"> <tr> <td>Process</td> <td><u>SMAW</u></td> <td><u>SMAW</u></td> </tr> <tr> <td>SFA Spec:</td> <td><u>5.1</u></td> <td><u>5.1</u></td> </tr> <tr> <td>AWS Class.:</td> <td><u>E6010</u></td> <td><u>E7018-1</u></td> </tr> <tr> <td>F-No:</td> <td><u>F-3</u></td> <td><u>F-4</u></td> </tr> <tr> <td>A-No:</td> <td><u>A-1</u></td> <td><u>A-1</u></td> </tr> <tr> <td>Filler Metal Size:</td> <td><u>1/8"</u></td> <td><u>1/8"</u></td> </tr> <tr> <td>Deposited Metal:</td> <td><u>0.075"</u></td> <td><u>0.174"</u></td> </tr> <tr> <td>Other:</td> <td><u>Covered Electrode</u></td> <td><u>Covered Electrode</u></td> </tr> </table>		Process	<u>SMAW</u>	<u>SMAW</u>	SFA Spec:	<u>5.1</u>	<u>5.1</u>	AWS Class.:	<u>E6010</u>	<u>E7018-1</u>	F-No:	<u>F-3</u>	<u>F-4</u>	A-No:	<u>A-1</u>	<u>A-1</u>	Filler Metal Size:	<u>1/8"</u>	<u>1/8"</u>	Deposited Metal:	<u>0.075"</u>	<u>0.174"</u>	Other:	<u>Covered Electrode</u>	<u>Covered Electrode</u>	GAS QW-408 Type or Gas(es): <u>N/A</u> Composition: <u>N/A</u> Flow Rate: <u>N/A</u> Gas Backing Rate: <u>N/A</u> Other: <u>N/A</u>	
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POSITION QW-405 Position of Groove: <u>3G</u> Weld Progression: <u>Vertical Up</u> Other: <u>N/A</u>		ELECTRICAL CHARACTERISTICS QW-409 <table border="1"> <tr> <td>Current:</td> <td><u>F-3: Direct (DC)</u></td> <td><u>F-4: Direct (DC)</u></td> </tr> <tr> <td>Polarity:</td> <td><u>F-3: Reverse(EP)</u></td> <td><u>F-4: Reverse(EP)</u></td> </tr> <tr> <td>Amps:</td> <td><u>F-3: 65 - 80</u></td> <td><u>F-4: 70 - 100</u></td> </tr> <tr> <td>Volts:</td> <td><u>F-3: 23 - 36</u></td> <td><u>F-4: 20 - 23</u></td> </tr> <tr> <td>Heat Input:</td> <td><u>F-3: 28 080 J/in</u></td> <td><u>F-4: 59 800 J/in</u></td> </tr> <tr> <td>Other:</td> <td colspan="2"><u>N/A</u></td> </tr> </table>		Current:	<u>F-3: Direct (DC)</u>	<u>F-4: Direct (DC)</u>	Polarity:	<u>F-3: Reverse(EP)</u>	<u>F-4: Reverse(EP)</u>	Amps:	<u>F-3: 65 - 80</u>	<u>F-4: 70 - 100</u>	Volts:	<u>F-3: 23 - 36</u>	<u>F-4: 20 - 23</u>	Heat Input:	<u>F-3: 28 080 J/in</u>	<u>F-4: 59 800 J/in</u>	Other:	<u>N/A</u>							
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Other:	<u>N/A</u>																										
PREHEAT QW-406 Preheat Temp Min.: <u>50° F</u> Interpass Temp Max.: <u>500° F</u> Interpass Temp Min.: <u>50° F</u> Other: <u>Temperature monitored using Templistiks</u>		TECHNIQUE QW-410 Travel Speed: <u>F-3: 2 - 7.0 ipm</u> <u>F-4: 2.5 - 4.1 ipm</u> String or Weave Bead: <u>String and weave</u> Oscillation: <u>N/A</u> Multiple or Single Pass: <u>Multiple + single per side</u> Single or Multiple Electrodes: <u>Single</u> Other: <u>N/A</u>																									

PROCEDURE QUALIFICATION RECORD (PQR) QW-483
(Section IX, ASME Boiler and Pressure Vessel Code)

PQR # 100-C

Tensile Test
QW 462

Specimen No.	Width in	Thickness in	Area in ²	Ultimate Total Load lb	Ultimate Unit Stress psi	Type of Failure & Location
			Not Applicable			

Guided Bend Tests
QW462

Type and Figure No.	Result
Not Applicable	

Toughness Tests
QW 170

Specimen No.	Notch Location	Notch Type	Test Temp	Impact Values	Lateral Exp % Shear	Mils	Drop Weight Break	No Brk
			See Attached Report					

Other Tests
Not Applicable

Type of Test:	
Other:	

Welder's Name: Marvin Boe ABSA No.: W-6943 Stamp ID: KX
 Tests Conducted By: Qualimet Inc. Lab. Test No.: 664-02001

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

Manufacturer: RJV Gas Field Services Ltd.

Date: July 08, 2002

By: Dale Laniuk

CHARPY V-NOTCH IMPACT TEST RESULTS

For Procedure Qualification Report # 100-C

Client:	RJV Gas Field Services Ltd.	Job Number:	664-02001
Address:	4901-47 street Vegreville, Alberta	Date:	July 08, 2002
Materials:	SA-516 Grade 60 to 70	Condition:	As Welded
Size:	0.2495" wt plate machined		
Specimen Type:	5.0 mm Charpy V Notch impact specimens		
Specification:	ASTM A-370, ASME Section VIII UG-84		
Qualification Temp.:	-46°C (-50°F)		

Sample Set	Sample Number	Impact ft-lb	Energy (Joule)	Converted Full Size Impact Energy (J)	% Shear
Weld Zone	1	47	64	85	60
	2	55	75	99	60
	3	58	79	105	70
	Average:	53	72	96	63
Heat Affected Zone SA-516 Gr. 60	1	66	89	119	80
	2	70	95	127	80
	3	65	88	118	90
	Average:	67	91	121	83
Heat Affected Zone SA-516 Gr. 70	1	86	117	155	90
	2	78	106	141	90
	3	71	96	128	85
	Average:	78	106	142	88

Remarks: These Charpy v-notch impact test results exceed the minimum requirements of ASME Section VIII and E31.3 Codes for -46°C; or CSA Z662-99 Codes for -46°C.

We certify that the statements in this record are acceptable, in accordance with the requirements of ASME Section IX.

TEST RESULTS CERTIFIED BY:

M. Spinnu

Qualimet



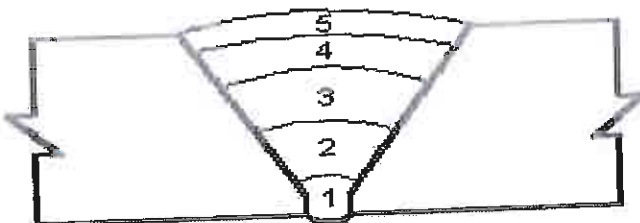
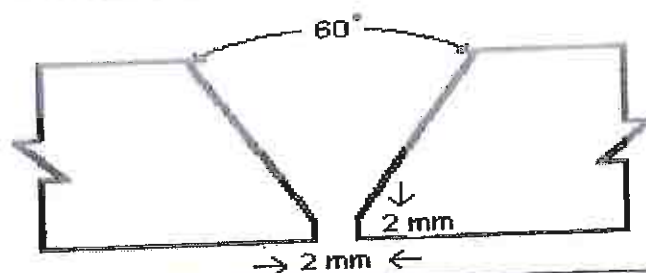
An Alberta Company
Certified by the Canadian Welding Bureau & Alberta Boilers Safety Association;
Registered as an Alberta Professional Engineering consulting firm
with engineers registered in Alberta and British Columbia
Visit us at our website: www.qualimetinc.com
"Your source of Quality Materials Engineering"



PROCEDURE QUALIFICATION RECORD (PQR) QW-483 (Section IX, ASME Boiler and Pressure Vessel Code)

Company Name: RJV Gas Field Services Ltd. Date: July 08, 2002
PQR No: 100-D Revision Date: -----
Revision No.: -----
WPS No: 104 Revision 2
Welding Process(es): SMAW / SMAW
Types: Manual / Manual

JOINTS QW-402



BASE METALS QW-403 Material Spec.: <u>SA-516</u> to <u>SA-516</u> Type or Grade: <u>Grade 60</u> <u>Grade 70</u> P-No.: <u>P1 Group 1</u> <u>P-1 Group 2</u> Thickness of Test Coupon: <u>0.500" plate</u> Other: <u>Heat No.: 94030-54885 C.E.: 0.38</u>		POSTWELD HEAT TREATMENT QW-407 Temperature: <u>N/A</u> Time: <u>N/A</u> Other: <u>N/A</u>																									
FILLER METALS QW-404 <table border="1"> <tr> <td>Process</td> <td><u>SMAW</u></td> <td><u>SMAW</u></td> </tr> <tr> <td>SFA Spec:</td> <td><u>5.1</u></td> <td><u>5.1</u></td> </tr> <tr> <td>AWS Class.:</td> <td><u>E6010</u></td> <td><u>E7018-1</u></td> </tr> <tr> <td>F-No:</td> <td><u>F-3</u></td> <td><u>F-4</u></td> </tr> <tr> <td>A-No:</td> <td><u>A-1</u></td> <td><u>A-1</u></td> </tr> <tr> <td>Filler Metal Size:</td> <td><u>1/8"</u></td> <td><u>1/8"</u></td> </tr> <tr> <td>Deposited Metal:</td> <td><u>0.075"</u></td> <td><u>0.425"</u></td> </tr> <tr> <td>Other:</td> <td><u>Covered Electrode</u></td> <td><u>Covered Electrode</u></td> </tr> </table>		Process	<u>SMAW</u>	<u>SMAW</u>	SFA Spec:	<u>5.1</u>	<u>5.1</u>	AWS Class.:	<u>E6010</u>	<u>E7018-1</u>	F-No:	<u>F-3</u>	<u>F-4</u>	A-No:	<u>A-1</u>	<u>A-1</u>	Filler Metal Size:	<u>1/8"</u>	<u>1/8"</u>	Deposited Metal:	<u>0.075"</u>	<u>0.425"</u>	Other:	<u>Covered Electrode</u>	<u>Covered Electrode</u>	GAS QW-408 Type or Gas(es): <u>N/A</u> Composition: <u>N/A</u> Flow Rate: <u>N/A</u> Gas Backing Rate: <u>N/A</u> Other: <u>N/A</u>	
Process	<u>SMAW</u>	<u>SMAW</u>																									
SFA Spec:	<u>5.1</u>	<u>5.1</u>																									
AWS Class.:	<u>E6010</u>	<u>E7018-1</u>																									
F-No:	<u>F-3</u>	<u>F-4</u>																									
A-No:	<u>A-1</u>	<u>A-1</u>																									
Filler Metal Size:	<u>1/8"</u>	<u>1/8"</u>																									
Deposited Metal:	<u>0.075"</u>	<u>0.425"</u>																									
Other:	<u>Covered Electrode</u>	<u>Covered Electrode</u>																									
POSITION QW-405 Position of Groove: <u>3G</u> Weld Progression: <u>Vertical Up</u> Other: <u>N/A</u>		ELECTRICAL CHARACTERISTICS QW-409 <table border="1"> <tr> <td>Current:</td> <td>F-3: <u>Direct (DC)</u></td> <td>F-4: <u>Direct (DC)</u></td> </tr> <tr> <td>Polarity:</td> <td>F-3: <u>Reverse(EP)</u></td> <td>F-4: <u>Reverse(EP)</u></td> </tr> <tr> <td>Amps:</td> <td>F-3: <u>70 - 80</u></td> <td>F-4: <u>70 - 100</u></td> </tr> <tr> <td>Volts:</td> <td>F-3: <u>20 - 23</u></td> <td>F-4: <u>20 - 23</u></td> </tr> <tr> <td>Heat Input:</td> <td>F-3: <u>22 080 J/in</u></td> <td>F-4: <u>72 450 J/in</u></td> </tr> <tr> <td>Other:</td> <td colspan="2"><u>N/A</u></td> </tr> </table>		Current:	F-3: <u>Direct (DC)</u>	F-4: <u>Direct (DC)</u>	Polarity:	F-3: <u>Reverse(EP)</u>	F-4: <u>Reverse(EP)</u>	Amps:	F-3: <u>70 - 80</u>	F-4: <u>70 - 100</u>	Volts:	F-3: <u>20 - 23</u>	F-4: <u>20 - 23</u>	Heat Input:	F-3: <u>22 080 J/in</u>	F-4: <u>72 450 J/in</u>	Other:	<u>N/A</u>							
Current:	F-3: <u>Direct (DC)</u>	F-4: <u>Direct (DC)</u>																									
Polarity:	F-3: <u>Reverse(EP)</u>	F-4: <u>Reverse(EP)</u>																									
Amps:	F-3: <u>70 - 80</u>	F-4: <u>70 - 100</u>																									
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Heat Input:	F-3: <u>22 080 J/in</u>	F-4: <u>72 450 J/in</u>																									
Other:	<u>N/A</u>																										
PREHEAT QW-406 Preheat Temp Min.: <u>50° F</u> Interpass Temp Max.: <u>500°F</u> Interpass Temp Min.: <u>50° F</u> Other: <u>Temperature monitored using Tempilstiks</u>		TECHNIQUE QW-410 Travel Speed: <u>F-3: 5.0 - 6.0 ipm F-4: 2.0 - 3.5 ipm</u> String or Weave Bead: <u>String and weave</u> Oscillation: <u>N/A</u> Multiple or Single Pass: <u>Multiple</u> Single or Multiple Electrodes: <u>Single</u> Other: <u>N/A</u>																									

PROCEDURE QUALIFICATION RECORD (PQR) QW-483
(Section IX, ASME Boiler and Pressure Vessel Code)

PQR # 100-D

Tensile Test
QW 462

Specimen No.	Width in	Thickness in	Area in ²	Ultimate Total Load lb	Ultimate Unit Stress psi	Type of Failure & Location
			Not Applicable			

Guided Bend Tests
QW462

Type and Figure No.	Result
Not Applicable	

Toughness Tests
QW 170

Specimen No.	Notch Location	Notch Type	Test Temp	Impact Values	Lateral Exp % Shear	Mils	Drop Weight Break	No Brk
				See Attached Report				

Other Tests
Not Applicable

Type of Test:	
Other:	

Welder's Name: Marvin Boe ABSA No.: W-6943 Stamp ID: KZ
 Tests Conducted By: Qualimet Inc. Lab. Test No.: 664-02001

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

Manufacturer: RJV Gas Field Services Ltd.

Date: July 08, 2002 By: Dale Laniuk

• 7817 CORONET ROAD, EDMONTON, AB T6E 4N7 (780) 469-5870 • FAX (780) 465-5829
• CALGARY (403) 273-9862 • 1-800-621-8979

CHARPY V-NOTCH IMPACT TEST RESULTS

For Procedure Qualification Report # 100-D

Client:	RJV Gas Field Services Ltd.	Job Number:	664-02001
Address:	4901-47 street Vegreville, Alberta	Date:	July 08, 2002
Materials:	SA-516 Grade 60 to 70	Condition:	As Welded
Size:	0.500" wt.		
Specimen Type:	10.0 mm Charpy V Notch impact specimens		
Specification:	ASTM A-370, ASME Section VIII UG-84		
Qualification Temp.:	-46°C (-50°F)		

Sample Set	Sample Number	Impact Energy		% Shear
		ft-lb	(Joule)	
Weld Zone	1	56	76	45
	2	47	64	25
	3	52	71	35
	Average:	51	70	25
Heat Affected Zone SA-516 Gr. 60	1	101	137	75
	2	111	151	90
	3	94	128	65
	Average:	102	138	77
Heat Affected Zone SA-516 Gr. 70	1	109	148	80
	2	119	162	88
	3	114	155	80
	Average:	114	155	83

Remarks: These Charpy v-notch impact test results exceed the minimum requirements of ASME Section VIII and B31.3 Codes for -46°C; or CSA Z662-99 Codes for -46°C.

We certify that the statements in this record are acceptable, in accordance with the requirements of ASME Section IX.

Test Results Certified By:

M. J. Pannu

Qualimet



An Alberta Company
Certified by the Canadian Welding Bureau & Alberta Boilers Safety Association;
Registered as an Alberta Professional Engineering consulting firm
with engineers registered in Alberta and British Columbia
Visit us at our website: www.qualimetinc.com
"Your source of Quality Materials Engineering"



PROCEDURE QUALIFICATION RECORD

R.J.V. Gasfield Service Ltd, 4901 Bruce Rd., Box 295, Vegreville, Alberta T0B 4L0

PROCEDURE QUALIFICATION RECORD NUMBER 100-1 DATE September 2, 1981

WELDING PROCEDURE SPECIFICATION NUMBER 100 (Rev. 2)

WELDING PROCESS(ES) SMAW TYPES Manual

JOINTS (QW-402)

Type Butt: single vee

BASE METALS (QW-403)

Material Spec. SA 106 Type or Grade Grade B

P-No. 1 to P-No. 1 Thickness 12.7mm (1/2 in.)

Diameter 219.1mm (8.625 in.) Other

FILLER METALS (QW-404)

SFA Specification 5.1 5.1

AWS Classification E6010 E7018

Filler Metal F-No. 3 4

Weld Metal Analysis A-No. 1 1

Size of Filler Metal See sketch next page

Deposited Weld Metal Thickness F3: 2.0mm F4: 10.7mm

Other No single pass with over 1/2" (12.7mm) of deposited metal

POSITION (QW-405)

Position of Groove 1G Weld Progression

PREHEAT (QW-406)

Preheat Temp. None Interpass Temp. None

POSTWELD HEAT TREATMENT (QW-407)

Temperature None Time

GAS (QW-408)

Type of Gas(es) N/A Composition of Mixtures

Other

ELECTRICAL CHARACTERISTICS (QW-409)

Current Direct Polarity Reverse

Amps See sketch next page Volts

Other

TECHNIQUE (QW-410)

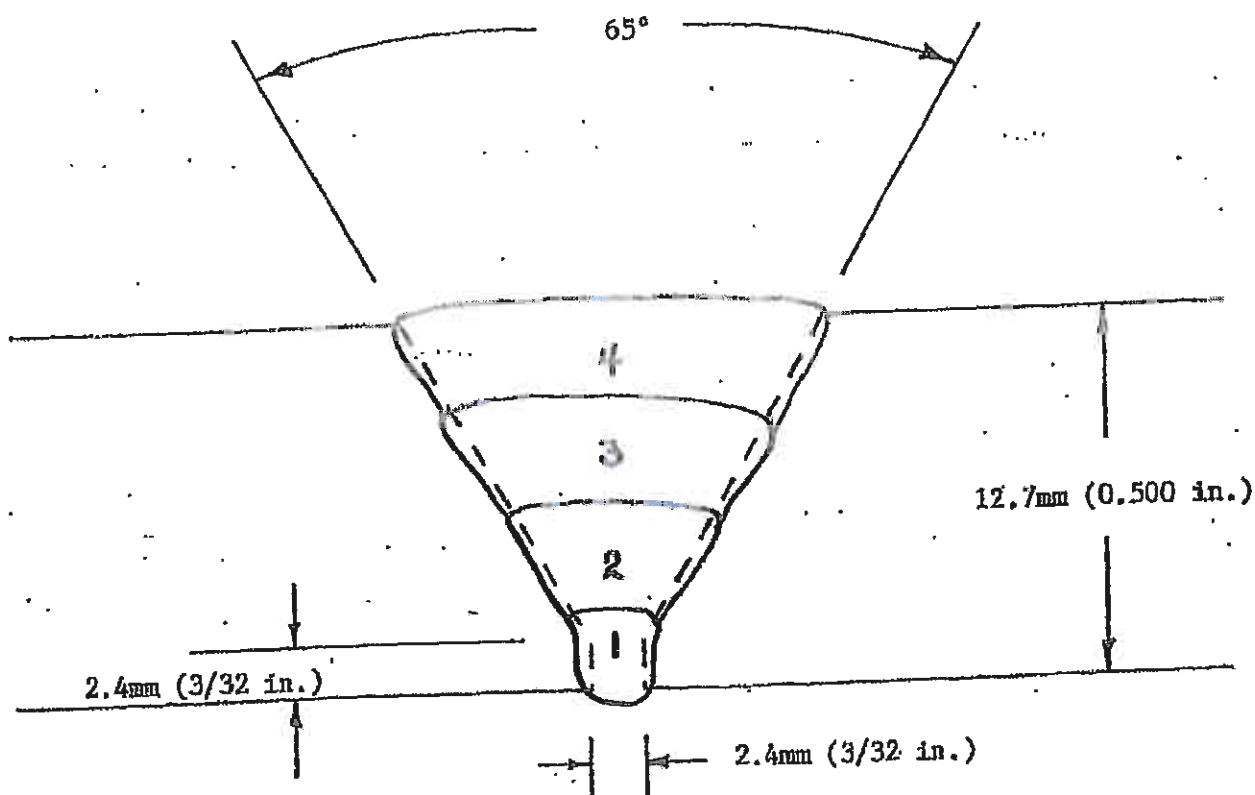
Travel Speed

Multipass or Single Pass (per side) Multipass

Single or Multiple Electrodes Single

String or Weave Bead Both

Other



Root: 3.2mm (1/8 in.), E6010, 110 amps, 24 volts.

2 Fill: 4.0mm (5/32 in.), E7018, 140-200 amps, 24 volts.

Cap: 5.0mm (3/16 in.), E7018, 245 amps, 24 volts.

TENSILE TEST

Specimen Number	Width mm. (in.)	Thick. mm. (in.)	Area sq. mm. (sq. in.)	Ultimate Load N (lbs.)	Ultimate Stress MPa (psi)	Character & Location of Failure
T-1	18.67 (.735)	11.43 (.450)	213.4 (.331)	101,500 (22,800)	476 (68,900)	Parent metal
T-2	18.67 (.735)	11.43 (.450)	213.4 (.331)	103,000 (23,100)	482 (69,800)	Parent metal

GUIDED-BEND TEST

Type and Figure Number	Result	Type and Figure Number	Result
Face	Pass	Root	Pass
Face	Pass	Root	Pass

HARDNESS TEST

Type of Test: _____
Weld Zone: _____
Heat Affected Zone: _____

Welders Name: Dale Janiak

Certificate Number: W-6597

Tests Conducted By: Hanson Material Engineering (Western) Ltd.

Per: Gilles Perreault, C.E.T.

Laboratory Test Number: B81-8-1061

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 Boiler and Pressure Vessel Code.

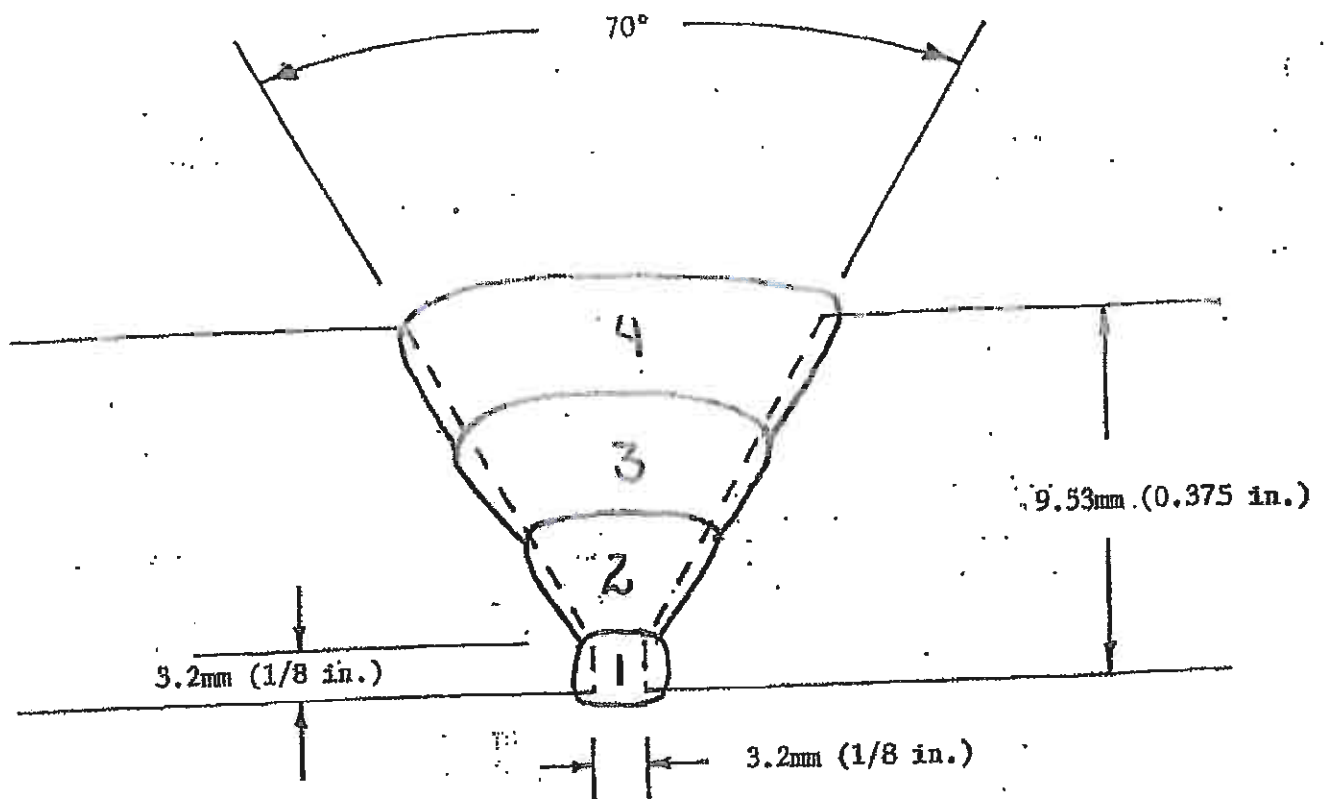
Signed R. J. V. Gasfield Service Ltd.

Date November 24, 1982

By 

PROCEDURE QUALIFICATION RECORD

PROCEDURE QUALIFICATION RECORD NUMBER 100-B DATE August 3, 1987
 WELDING PROCEDURE SPECIFICATION NUMBER 100-(Rev. 2)
 WELDING PROCESS(ES) SMAW TYPES Manual
 JOINTS (QW-402)
 Type Butt: single vee
 BASE METALS (QW-403)
 Material Spec. SA 516 Type or Grade Grade 70N
 P-No. 1 Grp. 2 to P-No. 1 Grp. 2 Thickness 9.53mm (0.375 in.)
 Diameter _____ Other _____
 FILLER METALS (QW-404)
 SFA Specification 5.1 5.1
 AWS Classification E6010 E7018
 Filler Metal F-No. 3 4
 Weld Metal Analysis A-No. 1 1
 Size of Filler Metal See attached sketch next page
 Deposited Weld Metal Thickness F3: 2mm F4: 7.53mm
 Other No single pass with over 1/2" (12.7mm) of deposited metal
 POSITION (QW-405)
 Position of Groove 1G Weld Progression _____
 PREHEAT (QW-406)
 Preheat Temp. 20°C (70°F) Interpass Temp. Weld build up
 POSTWELD HEAT TREATMENT (QW-407)
 Temperature None Time _____
 GAS (QW-408)
 Type of Gas(es) N/A Composition of Mixtures _____
 Other _____
 ELECTRICAL CHARACTERISTICS (QW-409)
 Current Direct Polarity Reverse
 Amps See attached sketch Volts _____
 Other _____
 TECHNIQUE (QW-410)
 Travel Speed _____
 Multipass or Single Pass (per side) F3: Single; F4: Multiple
 Single or Multiple Electrodes Single
 String or Weave Bead Both
 Other _____



- Pass #1: 3.2mm (1/8 in.), E6010, DCRP, 90-120 amps, 24-28 volts.
- Pass #2: 4.0mm (5/32 in.), E7018, DCRP, 180-210 amps, 24-26 volts.
- Pass #3: 5.0mm (3/16 in.), E7018, DCRP, 240-280 amps, 24-28 volts.
- Pass #4: 6.0mm (1/4 in.), E7018, DCRP, 340-380 amps,

TENSILE TEST

Specimen Number	Width mm. (in.)	Thick. mm. (in.)	Area sq. mm. (sq.in.)	Ultimate Load N (lbs.)	Ultimate Stress MPa (psi)	Character & Location of Failure
T-1	38.4 (1.51)	8.90 (.350)	342 (.530)	191,600 (43,100)	561 (81,300)	Partial cup & cone Weld metal
T-2	38.4 (1.51)	8.90 (.350)	342 (.530)	189,100 (42,500)	553 (80,300)	Partial cup & cone Weld metal

GUIDED-BEND TEST

Type and Figure Number	Result	Type and Figure Number	Result
Side S-1	Pass	Side S-3	Pass
Side S-2	Pass	Side S-4	Pass

HARDNESS TEST

Type of Test: Brinell

Weld Zone: (cap) 161, 162

Heat Affected Zone: (root) 163, 166

Welders Name: Ernie Bullock

Certificate Number: W-9101

Tests Conducted By: Ludwig's Welding Consulting Ltd.

Per: Vic Lukey, C.E.T.

Laboratory Test Number: LWC-9701-816E

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 Boiler and Pressure Vessel Code.

Signed R. J. V. Gasfield Service Ltd.

By [Signature]

Date September 24, 1987

WPS NUMBER 101 (Rev. 2)

PQR NUMBER 101A

QUALIFIED FOR

MATERIAL (TYPICAL): P1 to P1 (SA 105, SA 106, SA 516, etc.)

PROCESS: GMAW, SMAW JOINT DESIGN: Groove & Fillet

POSITION: A11 DIAMETER: A11

AWS CLASSIFICATION: ER70S-X, E7018, E7018-1

BASE METAL THICKNESS RANGE QUALIFIED:

AS WELDED: 4.8 to 24.5mm (3/16 to 1.0 in.)

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

Reg. No. WP 1312.2
Spec No. # 101 (REV 2)
Weld Process GMAW / SMAW
Matl. Gr. P No. 1 to P No. 1
Elec. Gr. F No. 6.4 A No. 1
Th. Qual. For 25.4mm Position ALL
..... A.W.

Yr 88 Mo 3 Day 3 Signed *R. Rosererg*
R. ROSEBERG, P. ENG.
WELDING SPECIALIST

Boilers Branch Registration

WELDING PROCEDURE SPECIFICATION

R.J.V. Gasfield Service Ltd. 4901 - Bruce Rd., Box 295, Vegreville, Alberta T0B 4L0

WELDING PROCEDURE SPECIFICATION NUMBER 101 (Rev. 2) DATE September 23, 1987

REVISIONS #1 July 31, 1984

#2 Add "t"

SUPPORTING PQR NUMBERS(S) 101A

WELDING PROCESS(ES) GMAW, SMAW TYPES Semi-automatic, Manual

JOINTS (QW-402)

Joint Design See attached sketches, figures 1 to 15

Backing Other

BASE METALS (QW-403)

P-Number 1 to P-Number 1

Thickness Range: Groove 4.8 to 25.4mm (3/16 to 1.0 in.)

Fillet All

Pipe Diameter Ranges: Groove All

Fillet All

Other

FILLER METALS (QW-404)

Specification No. (SFA) 5.18 5.1

AWS No. (Class) ER70S-X E7018, E7018-1

F-No. F6 F4

A-No. 1 1

Size See table next page

Deposited Weld Metal Thickness Range: No single pass with over $\frac{1}{2}$ " (12.7mm) of deposited metal

Groove F6 "t" = 22mm; F4, E7018 "t" = 22mm

Fillet

Electrode - Flux (Class)

Other

POSITION (QW-405)

Position of Groove All Weld Progression Vertical up when applicable

PREHEAT (QW-406)

Preheat Temp. Min. 10°C (50°F) Interpass Temp. Max. Weld build up

Preheat Maintenance

POSTWELD HEAT TREATMENT (PW-407)

Temperature N/A Time Range

uA5 (QW-408)

Shielding Gas(es) Carbon Dioxide

Flow Rate 20 cfm

Other _____

ELECTRICAL CHARACTERISTICS (QW-409)

Current Direct Polarity Reverse

Amps See table below Volts _____

Tungsten Electrode Size and Type _____

Mode of Metal Transfer GMAW: Short circuiting arc

Electrode Wire Feed Speed Range _____

Other

TECHNIQUE (QW-410)

String or Weave Both Travel Speed (Range)

Initial and Interpass Cleaning Brushing, chipping, grinding

Method of Back Gouging _____ Air carbon arc when required _____

Multiple or Single Pass (per side) Multiple

Multiple or Single Electrodes Single

Other _____

WELD LAYER	PROCESS	FILLER METAL		CURRENT		VOLTAGE RANGE	T/S RANGE mm/min. (ipm)	OTHER
		CLASS.	DIAMETER mm. (in.)	TYPE POLAR.	AMP RANGE			
1 or 2	GMAW	ER70S-X	.76 (.030)	DCRP	40-80	19-30	30-300 (1.5-12)	Size of electrode, number of passes, amperage, voltage and travel speed will differ with position, thickness and joint configuration.
1 or 2	GMAW	ER70S-X	.9 (.035)	DCRP	60-120	20-32	38-350 (1.5-14)	
1 or 2	GMAW	ER70S-X	1.14 (.045)	DCRP	130-210	21-20	50-350 (2-14)	
Remaining	SMAW	E7018 E7018-1	2.4 (3/32)	DCRP	60-110	19-24	38-300 (1.5-12)	
Remaining	SMAW	E7018 E7018-1	3.2 (1/8)	DCRP	90-160	20-25	38-350 (1.5-14)	
Remaining	SMAW	E7018 E7018-1	4.0 (5/32)	DCRP	125-200	21-26	100-400 (4-16)	
Remaining	SMAW	E7018 E7018-1	5.0 (3/16)	DCRP	200-310	21-27	125-400 (5-16)	
Remaining	SMAW	E7018 E7018-1	6.0 (1/4)	DCRP	280-380	22-30	175-350 (7-14)	

GROOVE DESIGN

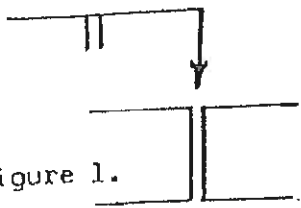


Figure 1.

Single Square Butt

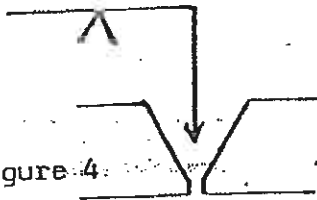


Figure 4.

Single Vee Butt

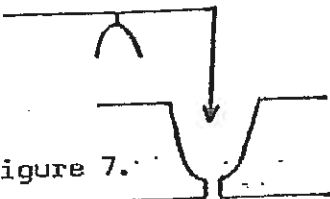


Figure 7.

Single U Butt

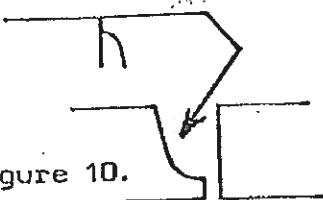


Figure 10.

Single J Butt

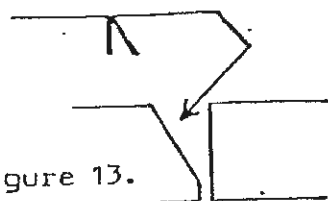


Figure 13.

Single Bevel Butt

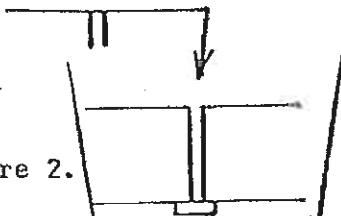


Figure 2.

Single Square Butt with Backing Strip

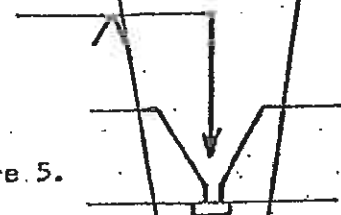


Figure 5.

Single Vee Butt With Backing Strip

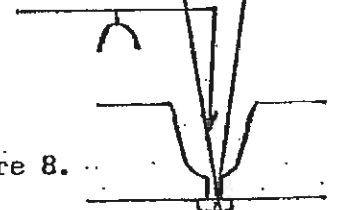


Figure 8.

Single U Butt With Backing Strip

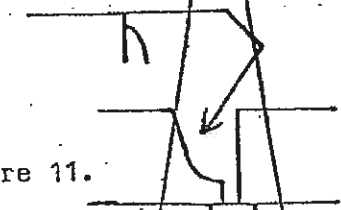


Figure 11.

Single J Butt With Backing Strip

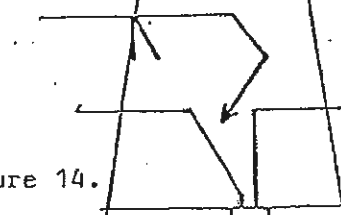


Figure 14.

Single Bevel Butt With Backing Strip

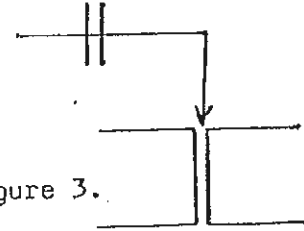


Figure 3.

Double Square Butt

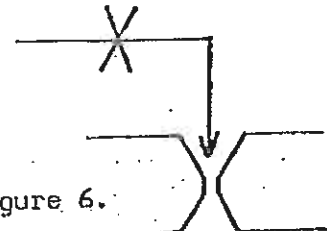


Figure 6.

Double Vee Butt

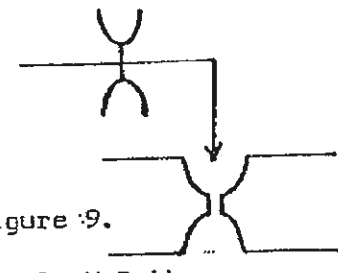


Figure 9.

Double U Butt

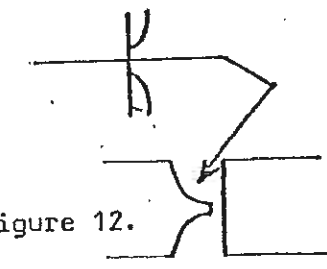


Figure 12.

Double J Butt

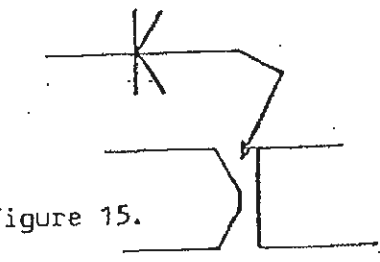


Figure 15.

Double Bevel Butt

PROCEDURE QUALIFICATION RECORD

R.J.V. Gasfield Service Ltd., 4901 - Bruce Rd., Box 295, Vegreville, Alberta T0B 4T0

PROCEDURE QUALIFICATION RECORD NUMBER 101A DATE July 14, 1983

WELDING PROCEDURE SPECIFICATION NUMBER 101 (Rev. 2)

WELDING PROCESS(ES) GMAW, SMAW TYPES Semi-Automatic, Manual

JOINTS (QW-402)

Type: Butt: single vee

BASE METALS (QW-403)

Material Spec. SA 106 Type or Grade Grade B

P-No. 1 to P-No. 1 Thickness 12.7mm (.500 in.)

Diameter 219.1mm (8.625 in.) Other

FILLER METALS (QW-404)

SFA Specification 5.18 5.1

WFS Classification ER70S-6 E7018

Filler Metal F-No. 6 4

Weld Metal Analysis A-No. 1 1

Size of Filler Metal See sketch next page

Deposited Weld Metal Thickness F6 = 2.0mm; F4 = 11.0mm

Other No single pass with over 1/2" (12.7mm) of deposited metal

POSITION (QW-405)

Position of Groove 6G Weld Progression Vertical up

PREHEAT (QW-406)

Preheat Temp. 15°C (60°F) Interpass Temp. Weld build up

POSTWELD HEAT TREATMENT (QW-407)

Temperature None Time

GAS (QW-408)

Type of Gas(es) Carbon Dioxide Composition of Mixtures 99.985%

Other

ELECTRICAL CHARACTERISTICS (QW-409)

Current Direct Polarity Reverse

Amps 160-390 Volts

Other

TECHNIQUE (QW-410)

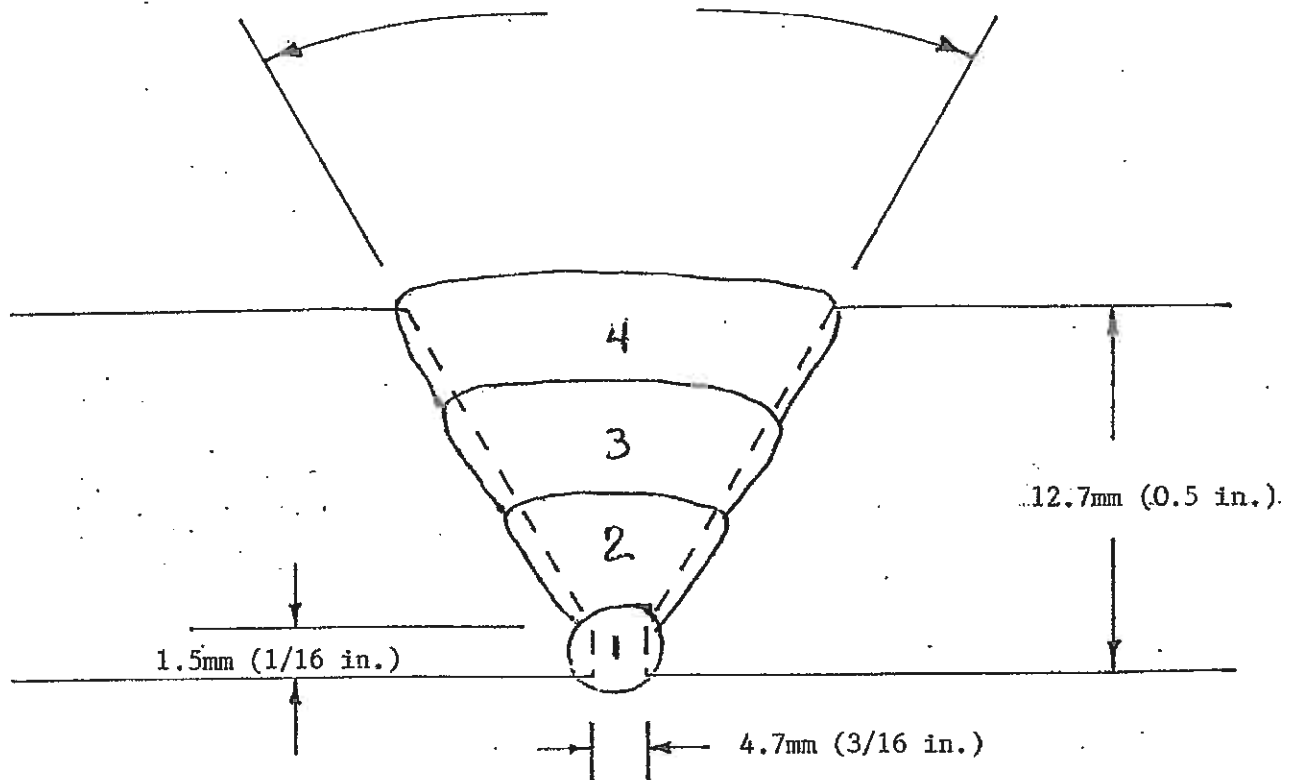
Travel Speed

Multipass or Single Pass (per side) Multipass

Single or Multiple Electrodes Single

Stringing or Weave Bead Both

Other



WPS NUMBER 102 (Rev. 2)

PQR NUMBER 102A

QUALIFIED FOR

MATERIAL (TYPICAL): P1 to P1 (SA 105, SA 106, SA 516, etc.)

PROCESS: FCAW JOINT DESIGN: Groove & Fillet

POSITION: All DIAMETER: All

AWS CLASSIFICATION: E70T-1

BASE METAL THICKNESS RANGE QUALIFIED:

AS WELDED: 4.8 to 38.1mm (3/16 to 1.5 in.)

ALBERTA LABOUR	
BOILERS & PRESSURE VESSELS ACT WELDING PROCEDURE	
Reg. No. WP	1312.2
Spec No.	#102 (REV. 2)
Weld Process	FCAW
Matt. Gr. P No.	1 to P No. 1
Elec. Gr. F No.	6 A No. 1
Th. Qual. For	38.2 mm Position All
	A.W.
Yr 88 Mo 3 Day 3	Signed R. Roseberg
	R. ROSEBERG, P. ENG. WELDING SPECIALIST

Boilers Branch Registration

WELDING PROCEDURE SPECIFICATION

R.J.V. Gasfield Service Ltd., 4901 - Bruce Rd. Box 295, Vegreville, Alberta T0B 4L0

WELDING PROCEDURE SPECIFICATION NUMBER 102 (Rev. 2) DATE September 23, 1987

REVISIONS "1" July 31, 1981

#2 - re-write to latest addenda - 9/87

SUPPORTING PQR NUMBERS(S) 102A

WELDING PROCESS(ES) FCAW TYPES Semi-automatic

JOINTS (QW-402)

Joint Design See attached sketches

Backing Other

BASE METALS (QW-403)

P-Number 1 to P-Number 1

Thickness Range: Groove 4.8 to 38.1mm (3/16 to 1.5 in.)

Fillet All

Pipe Diameter Ranges: Groove > 50.8mm (2.0 in.)

Fillet > 50.8mm (2.0 in.)

Other

FILLER METALS (QW-404)

Specification No. (SFA) 5.20

AWS No. (Class) E70T-1

F-No. F6

A-No. 1

Size See table next page

Deposited Weld Metal Thickness Range: No single pass with over $\frac{1}{2}$ " (12.7mm) of deposited metal

Groove F6 = 38.1mm (1.50 in.)

Fillet All

Electrode - Flux (Class)

Other

POSITION (QW-405)

Position of Groove All Weld Progression Vertical up when applicable

PREHEAT (QW-406)

Preheat Temp. Min. 93°C (200°F) > 19mm Interpass Temp. Max. Weld build up

Preheat Maintenance 10°C (50°F) < 19mm

POSTWELD HEAT TREATMENT (QW-407)Temperature N/A Time Range _____GAS (QW-408)Shielding Gas(es) Carbon DioxideFlow Rate 15 - 25 litres/min.. (30 - 50 cfh)Other 99.985% pureELECTRICAL CHARACTERISTICS (QW-409)Current Direct Polarity ReverseAmps See table below Volts _____Tungsten Electrode Size and Type N/AMode of Metal Transfer N/A

Electrode Wire Feed Speed Range _____

Other _____

TECHNIQUE (QW-410)String or Weave Both Travel Speed (Range) _____Initial and Interpass Cleaning Brushing, chipping, grindingMethod of Back Gouging Air carbon arc when requiredMultiple or Single Pass (per side) MultipleMultiple or Single Electrodes Single

Other _____

WELD LAYER	PROCESS	FILLER METAL		CURRENT		VOLTAGE RANGE	T/S RANGE mm/min. (ipm)	OTHER
		CLASS.	DIAMETER mm. (in.)	TYPE POLAR.	AMP RANGE			
A11	FCAW	E70T-1	1.14 (.045)	DCRP	120-230	23-28	75-400 (3-16)	Size of electrode, number of passes, amperage and voltage and travel speed will differ with thickness and joint configuration.
A11	FCAW	E70T-1	1.6 (1/16)	DCRP	200-360	25-36	125-750 (5-30)	
A11	FCAW	E70T-1	2.0 (5/64)	DCRP	240-400	26-34	125-750 (5-30)	
A11	FCAW	E70T-1	2.4 (3/32)	DCRP	300-500	26-34	175-750 (7-30)	

GROOVE DESIGN

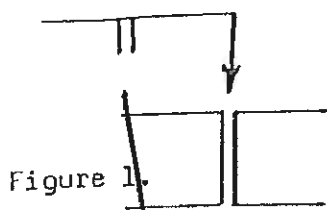


Figure 1.

Single Square Butt

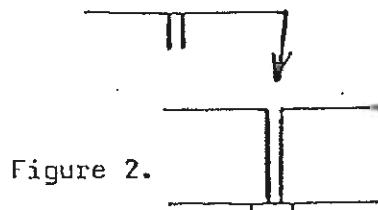


Figure 2.

Single Square Butt with Backing Strip

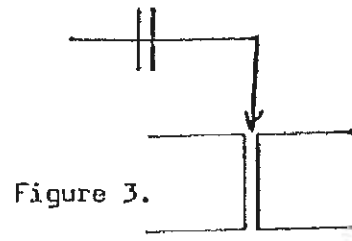


Figure 3.

Double Square Butt

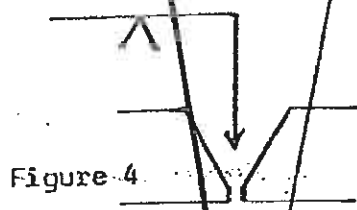


Figure 4.

Single Vee Butt

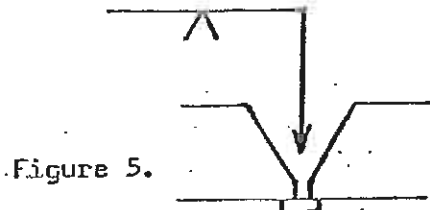


Figure 5.

Single Vee Butt With Backing Strip

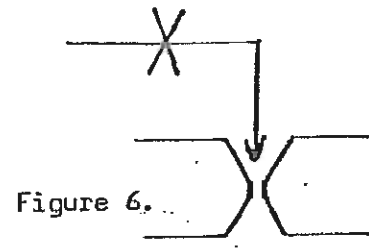


Figure 6.

Double Vee Butt

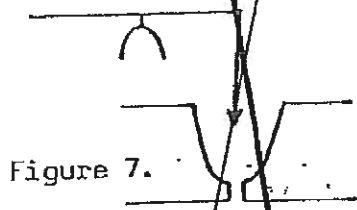


Figure 7.

Single U Butt

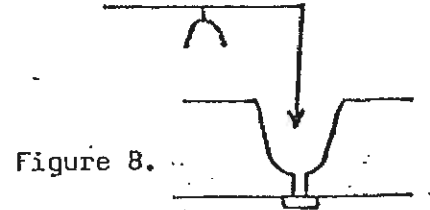


Figure 8.

Single U Butt With Backing Strip

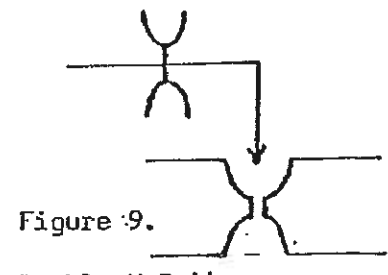


Figure 9.

Double U Butt

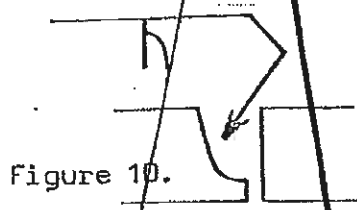


Figure 10.

Single J Butt

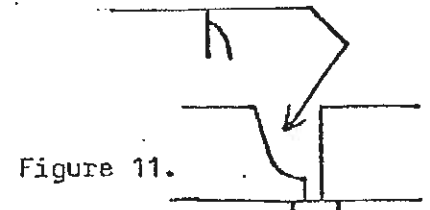


Figure 11.

Single J Butt With Backing Strip

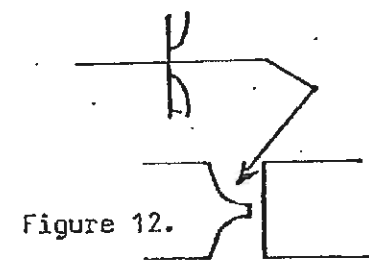


Figure 12.

Double J Butt

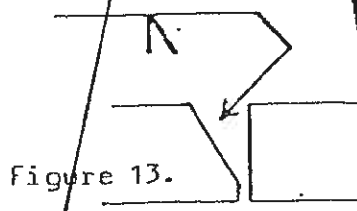


Figure 13.

Single Bevel Butt

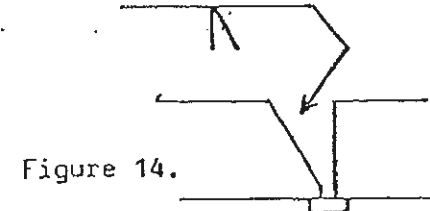


Figure 14.

Single Bevel Butt With Backing Strip

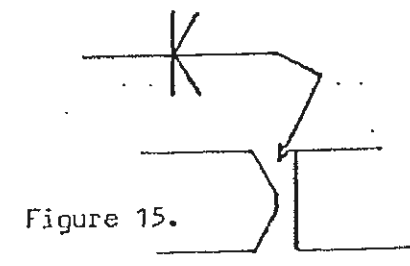


Figure 15.

Double Bevel Butt

PROCEDURE QUALIFICATION RECORD

R.J.V. Gasfield Service Ltd., 4901 - Bruce Rd., Box 295, Vegreville, Alberta T0B 4L0

PROCEDURE QUALIFICATION RECORD NUMBER 102A DATE July 14, 1983

WELDING PROCEDURE SPECIFICATION NUMBER 102 (Rev. 2)

WELDING PROCESS(ES) FCAW TYPES Semi-automatic

JOINTS (QW-402)

Type Butt: single vee

BASE METALS (QW-403)

Material Spec. SA 516 Type or Grade Grade 70

P-No. 1 to P-No. 1 Thickness 19.05 (.750 in.)

Diameter _____ Other Plate

FILLER METALS (QW-404)

SFA Specification 5.20

AWS Classification E70T-1

Filler Metal F-No. 6

Weld Metal Analysis A-No. 1, 1

Size of Filler Metal 2.0mm

Deposited Weld Metal Thickness No single pass with over 1/2" (12.7mm) of deposited metal

Other _____

POSITION (QW-405)

Position of Groove 1G Weld Progression Forward

PREHEAT (QW-406)

Preheat Temp. 15°C (60°F) Interpass Temp. Weld build up

POSTWELD HEAT TREATMENT (QW-407)

Temperature None Time _____

GAS (QW-408)

Type of Gas(es) Carbon Dioxide Composition of Mixtures 99.985%

Other _____

ELECTRICAL CHARACTERISTICS (QW-409)

Current Direct Polarity Reverse

Amps See sketch next page Volts _____

Other _____

TECHNIQUE (QW-410)

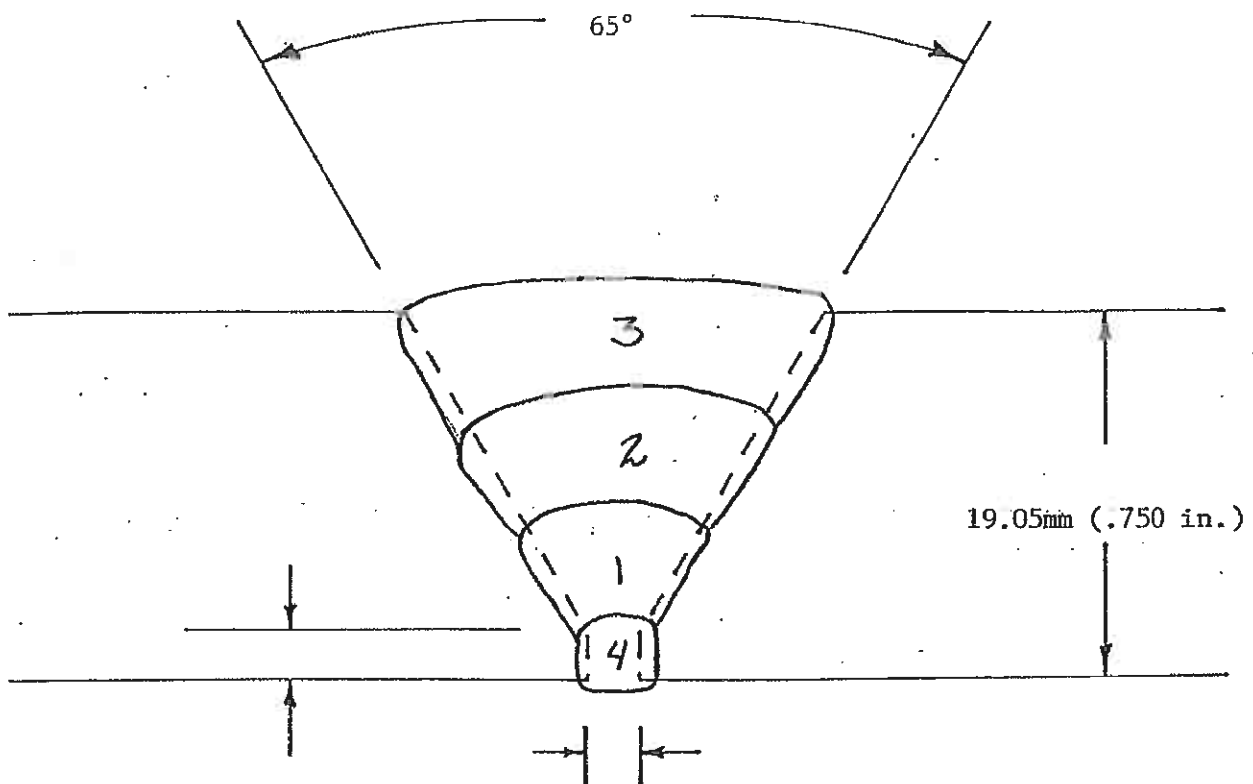
Travel Speed _____

Multipass or Single Pass (per side) Multipass

Single or Multiple Electrodes Single

Stringing or Weave Bead Both

Other _____



Pass #1: 2mm (5/64 in.), E70T-1, DCRP, 280-310 amps, 20-22 volts.

Pass #2 - #4: 2mm (5/64 in.), E70T-1, DCRP, 320-360 amps, 23-26 volts.

TENSILE TEST

Specimen Number	Width mm (in.)	Thick. mm (in.)	Area sq.mm (sq.in.)	Ultimate Load N (lbs.)	Ultimate Stress MPa (psi)	Character & Location of Failure
T-1	26.9	18.8	507	267,100	527	Base metal
	(1.061)	(.741)	(.786)	(60,100)	(76,400)	
T-2	26.9	19.1	514	271,300	528	Base metal
	(1.059)	(.750)	(.794)	(61,050)	(76,900)	

GUIDED BEND TEST

Type and Figure Number	Result	Type and Figure Number	Result
TSB S-1	PASS	TSB S-3	PASS
TSB S-2	PASS	TSB S-4	PASS

Welder's Name Dale LanuikCertificate Number W-6537Tests Conducted by Hanson Materials Engineering (Western) Ltd.Per: Gilles Perreault, C.E.T.Laboratory Test Number E84-5-645

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 Boiler and Pressure Vessel Code.

Signed R.J.V. Gasfield Service Ltd.Date June 14, 1983By 

WPS NUMBER 104 (Rev. 1)

PQR NUMBER 104A

104B

QUALIFIED FOR

MATERIAL (TYPICAL): P1 to P1 (SA 516, SA 105, SA 106, etc.)

PROCESS: SMAW JOINT DESIGN: Groove & Fillet

POSITION: All DIAMETER: All

AWS CLASSIFICATION: E6010, E6011, E7018, E7018-1, E7018-A1

BASE METAL THICKNESS RANGE QUALIFIED:

P.W.H.T.: 1.6 to 50.8mm (1/16 to 2.0 in.)

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

Reg. No. WP 13122
Spec No. #104 (REV. 1)
Weld Process SMAW
Matl. Gr. P. No. 1 to P No. 1
Elec. Gr. F No. 3+4 A No. 1
Th. Qual. For 50.8mm Position ... All
..... P.W.H.T.

Yr. 88 Mo. 3 Day 3 Signed R. Roseberg
R. ROSEBERG, P. ENG.
WELDING SPECIALIST

Boilers Branch Registration

WELDING PROCEDURE SPECIFICATION

R.J.V. Gasfield Service Ltd., 4901 - Bruce Rd., Box 295, Vegreville, Alberta T0B 4L0

WELDING PROCEDURE SPECIFICATION NUMBER 104 (Rev. 1) DATE September 8, 1987

REVISIONS add PQR 104B

SUPPORTING PQR NUMBERS(S) 104A, 104B

WELDING PROCESS(ES) SMAW TYPES Manual

JOINTS (QW-402)

Joint Design See attached sheet, figures 1 to 15

Backing Other

BASE METALS (QW-403)

P-Number 1 to P-Number 1

Thickness Range: Groove 1.6 to 50.8mm (1/16 to 2.0 in.)

Fillet All

Pipe Diameter Ranges: Groove All

Fillet All

Other

FILLER METALS (QW-404)

Specification No. (SFA) 5.1, 5.5

AWS No. (Class) E6010, E6011, E7018, E7018-1, E7018-A1

F-No. F3, F4

A-No. 1, 2

Size 2.4 to 6mm (3/32 to 1/4 in.)

Deposited Weld Metal Thickness Range: No single pass with over $\frac{1}{2}$ " (12.7mm) of deposited metal

Groove F3 "t" = 4mm (5/32 in.); F4 "t" = 46mm (1.81 in.)

Fillet All

Electrode - Flux (Class)

Other

POSITION (QW-405)

Position of Groove All Weld Progression Uphill when applicable

PREHEAT (QW-406)

Preheat Temp. Min. See attached section Interpass Temp. Max. Weld build up

Preheat Maintenance

POSTWELD HEAT TREATMENT (QW-407)

Temperature _____ See attached section _____ Time Range _____ See attached page _____

GAS (QW-408)

Shielding Gas(es) _____ N/A _____

Flow Rate _____

Other _____

ELECTRICAL CHARACTERISTICS (QW-409)

Current _____ Direct _____ Polarity _____ Reverse _____

Amps _____ See table below _____ Volts _____

Tungsten Electrode Size and Type _____ N/A _____

Mode of Metal Transfer _____ N/A _____

Electrode Wire Feed Speed Range _____

Other _____

TECHNIQUE (QW-410)

String or Weave _____ Both _____ Travel Speed (Range) _____

Initial and Interpass Cleaning _____ Brushing, chipping, gouging, grinding _____

Method of Back Gouging _____ Air carbon arc when required _____

Multiple or Single Pass (per side) _____ Multiple _____

Multiple or Single Electrodes _____ single _____

Other _____

WELD LAYER	PROCESS	FILLER METAL		CURRENT		VOLTAGE RANGE	T/S RANGE mm/min. (ipm)	OTHER
		CLASS.	DIAMETER mm. (in.)	TYPE POLAR.	AMP RANGE			
	SMAW	E6010	2.4	DCRP	40-80	18-24	38-300	Size of electrode, number of passes, amperage, voltage and travel speed will differ with position, thickness and joint configuration.
	SMAW	E6011	(3/32)	DCRP	70-140	19-26	(1.5-12)	
	SMAW	as above	3.2	DCRP	100-160	20-28	38-350	
	SMAW	as above	(1/8)	DCRP	60-110	18-24	(1.5-14)	
	SMAW	as above	4.0	DCRP	90-150	19-26	50-400	
	SMAW	E7018	(5/32)	DCRP	110-220	21-28	(2-16)	
	SMAW	E7018-1	2.4	DCRP	160-320	22-30	38-300	
	SMAW	as above	(3/32)	DCRP	260-350	23-32	(1.5-14)	
	SMAW	as above	3.2	DCRP	300-400	23-32	38-350	
	SMAW	as above	(1/8)	DCRP			(1.5-14)	
	SMAW	as above	4.0	DCRP			50-400	
	SMAW	as above	(5/32)	DCRP			(2-16)	
	SMAW	as above	5.0	DCRP			75-500	
	SMAW	as above	(3/16)	DCRP			(3-20)	
	SMAW	as above	5.5	DCRP			125-500	
	SMAW	as above	(7/32)	DCRP			(5-20)	
	SMAW	as above	6.35	DCRP			125-550	
	SMAW	as above	(1/4)	DCRP			(5-22)	

GROOVE DESIGN

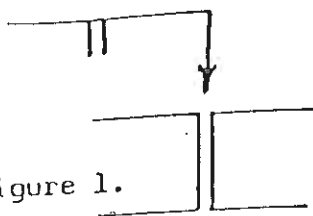


Figure 1.

Single Square Butt

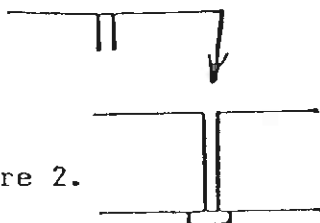


Figure 2.

Single Square Butt with Backing Strip

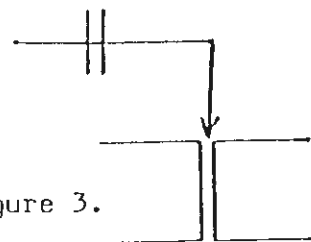


Figure 3.

Double Square Butt

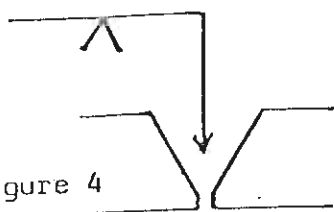


Figure 4

Single Vee Butt

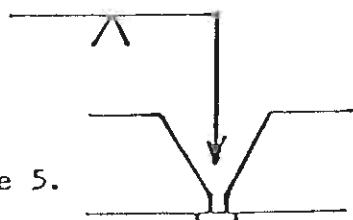


Figure 5.

Single Vee Butt With Backing Strip

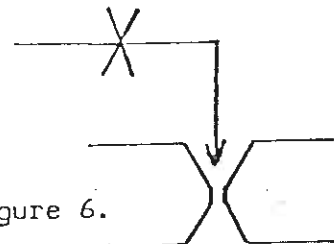


Figure 6.

Double Vee Butt

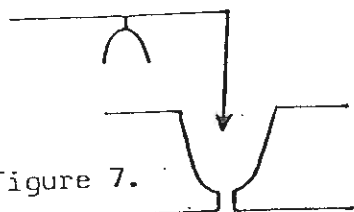


Figure 7.

Single U Butt

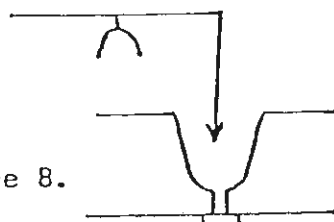


Figure 8.

Single U Butt With Backing Strip

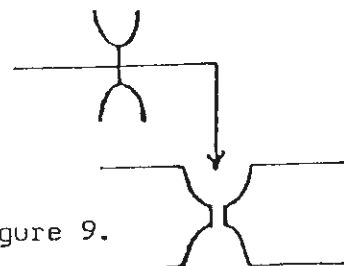


Figure 9.

Double U Butt

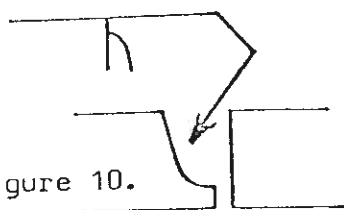


Figure 10.

Single J Butt

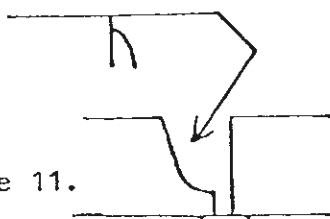


Figure 11.

Single J Butt With Backing Strip

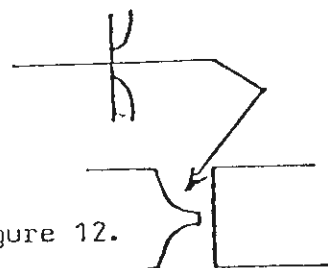


Figure 12.

Double J Butt

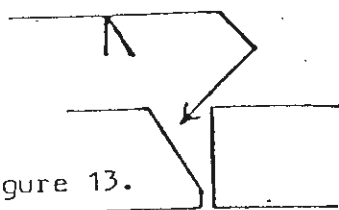


Figure 13.

Single Bevel Butt

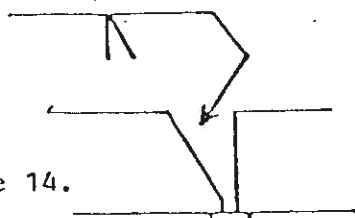


Figure 14.

Single Bevel Butt With Backing Strip

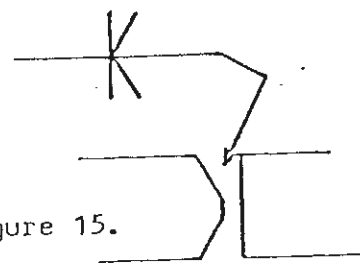


Figure 15.

Double Bevel Butt

PREHEAT

1. Welds joining pressure parts or attachments shall be preheated to not less than the minimum preheat temperature stated in 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 re-heated to the minimum preheat temperature specified in 6.
4. The preheated area shall not be less than 50.8mm (2.0 in.) 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:

PRESSURE VESSELS

THICKNESS

MINIMUM PREHEATING TEMPERATURES

0 to 31.75mm (0 to 1 1/4 in.)

24°C (75°F)

Over 31.75 to 203mm (1 1/4 to 8 in.)

80°C (175°F)

PRESSURE PIPING

THICKNESS

MINIMUM SPECIFIED TENSILE STRENGTH, BASE METAL MPa (Ksi)

MINIMUM PREHEATING TEMPERATURE

Less than 25.4mm (1.0 in.)

≤490 (71)

24°C (75°F)

Greater than 25.4mm (1.0 in.)

All

80°C (175°F)

All

>490 (71)

80°C (175°F)

POSTWELD HEAT TREATMENT

P-No.1 Groups 1, 2 & 3

Pressure Vessels in accordance with ASME BPVC Section VIII, Division 1

1. All postweld heat treatment shall be done in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, UW-40 & UCS-56, 1986 edition.
2. Postweld heat treatment temperatures and minimum holding times are as follows:

NOMINAL THICKNESS	HEAT TREATMENT TEMPERATURE		HOLDING TIME
	°C	(°F)	
Up to 50.8 mm (2.0 in.)	595	(1100) minimum	1 hr./25.4 mm (inch), 15 minutes minimum
Over 50.8 mm (2.0 in.)	595	(1100) minimum	2 hours plus 15 minutes for each additional 25.4 mm (inch) over 50.8 mm (2.0 in.)

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

1. All postweld heat treatment shall be done in accordance with Table 331.1.1 of ANSI B31.3-1984.
2. Postweld heat treatment temperatures and minimum holding times as follows:

NOMINAL THICKNESS	HEAT TREATMENT TEMPERATURE		HOLDING TIME
	°C	(°F)	
All	595 - 650	(1100 - 1200)	1 hour/25.4 mm (inch), 1 hour minimum

Power Piping in accordance with ANSI B31.1

1. All postweld heat treatments shall be done in accordance with Table 132 of ANSI B31.1-1983 edition.
2. Postweld heat treatment temperatures and minimum holding times are as follows:

NOMINAL THICKNESS	HEAT TREATMENT TEMPERATURE		HOLDING TIME
	°C	(°F)	
Up to 50.8 mm (2.0 in.)	595 - 650	(1100 - 1200)	1 hr./25 mm (inch), 15 minutes minimum
Over 50.8 mm (2.0 in.)	595 - 650	(1100 - 1200)	2 hr. plus 15 min. for each additional 25 mm (inch) over 50.8 mm (2.0 in.)

PROCEDURE QUALIFICATION RECORD

R.J.V. Gasfield Service Ltd., 4901 - Bruce Rd., Box 295, Vegreville, Alberta T0B 4L0

PROCEDURE QUALIFICATION RECORD NUMBER 104A DATE June 1, 1984

WELDING PROCEDURE SPECIFICATION NUMBER 104 (Rev. 1)

WELDING PROCESS(ES) SMAW TYPES Manual

JOINTS (QW-402)

Type

BASE METALS (QW-403)

Material Spec. SA 516 Type or Grade Grade 70

P-No. 1 to P-No. 1 Thickness 25.4mm (1.0 in.)

Diameter Other

FILLER METALS (QW-404)

SFA Specification 5.1

AWS Classification E6010, E7018

Filler Metal F-No. 3, 4

Weld Metal Analysis A-No. 1

Size of Filler Metal

Deposited Weld Metal Thickness No single pass with over $\frac{1}{2}$ " (12.7mm) of deposited metal

Other

SITUATION (QW-405)

Position of Groove 1G (Flat) Weld Progression

PREHEAT (QW-406)

Preheat Temp. 10°C (50°F) Interpass Temp. 260°C (500°F)

POSTWELD HEAT TREATMENT (QW-407)

Temperature 1150°F Time 1 hour

GAS (QW-408)

Type of Gas(es) N/A Composition of Mixtures

Other

ELECTRICAL CHARACTERISTICS (QW-409)

Current Direct Polarity Reverse

Amps 90-150 Volts 18-28

Other

TECHNIQUE (QW-410)

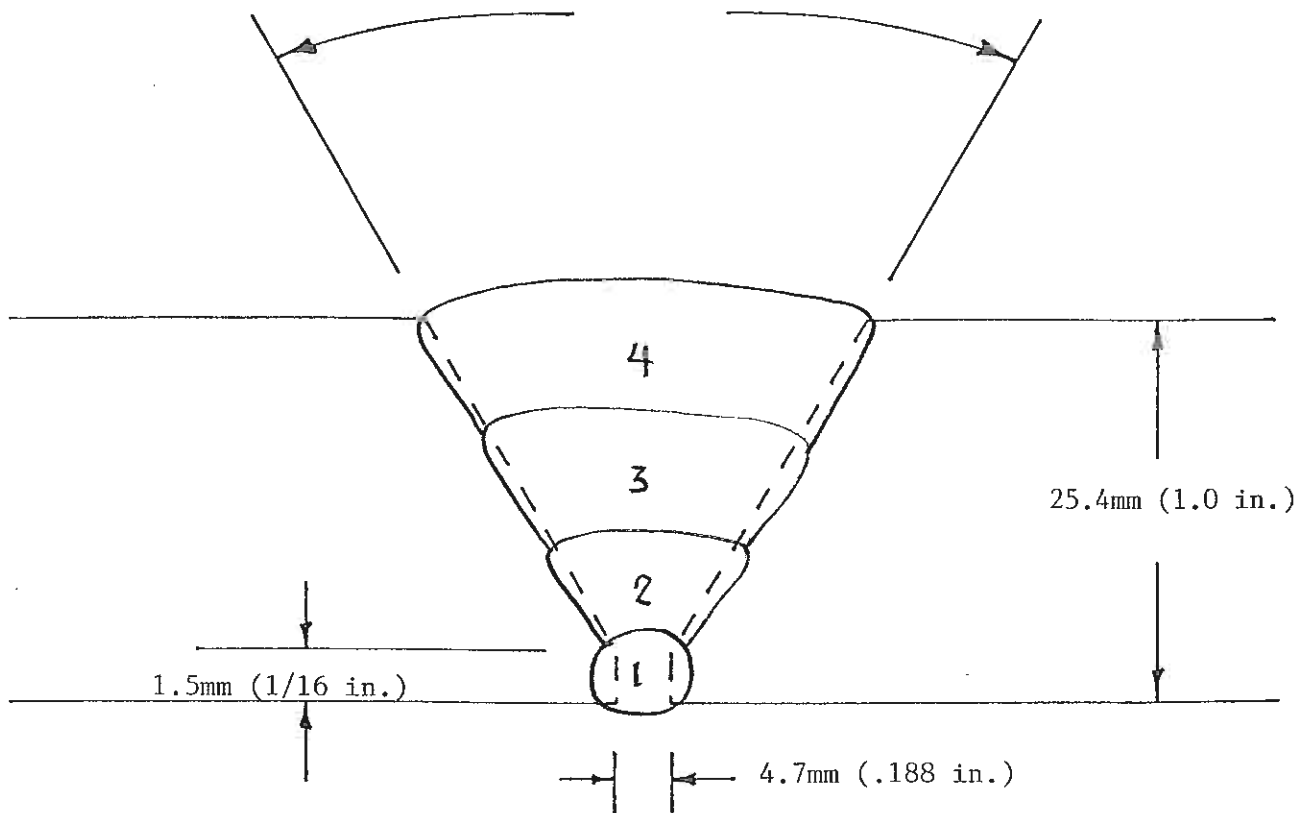
Travel Speed

Multipass or Single Pass (per side) Multipass

Single or Multiple Electrodes Single

String or Weave Bead Both

Other



TENSILE TEST

Specimen Number	Width in.	Dia-meter in.	Area sq.in.	Ultimate Load lbs.	Ultimate Stress psi	Character & Location of Failure
2		0.502	0.198	14,000	70,700	Weld
5		0.505	0.200	14,100	70,400	Weld

GUIDED BEND TEST

Type and Figure Number	Result	Type and Figure Number	Result
Side bend as per QW 462.2a	All 4 passed		

Welder's Name Dale LaniukCertificate Number W-6537Tests Conducted by Hanson Materials Engineering (Western) Ltd.Per: Gilles Perreault, C.E.T.Laboratory Test Number E83-7-717

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 Boiler and Pressure Vessel Code.

Signed R.J.V. Gasfield Service Ltd.Date June 14, 1983By 

PROCEDURE QUALIFICATION RECORD

B.J.V. Gasfield Service Ltd., 4901 - Bruce Rd., Box 295, Vegreville, Alberta T0B 4H0

PROCEDURE QUALIFICATION RECORD NUMBER 104-B DATE August 3, 1987

WELDING PROCEDURE SPECIFICATION NUMBER 104-(Rev. 1)

WELDING PROCESS(ES) SMAW TYPES Manual

JOINTS (QW-402)

Type Butt: single vee

BASE METALS (QW-403)

Material Spec. SA 516 Type or Grade Grade 70N

P-No. 1 Grp. 2 to P-No. 1 Grp. 2 Thickness 9.53mm (0.375 in.)

Diameter _____ Other _____

FILLER METALS (QW-404)

SFA Specification 5.1 5.1

AWS Classification E6010 E7018

Filler Metal F-No. 3 4

Weld Metal Analysis A-No. 1 1

Size of Filler Metal See attached sketch next page

Deposited Weld Metal Thickness F3: 2mm F4: 7.53mm

Other No single pass with over 1/2" (12.7mm) of deposited metal

POSITION (QW-405)

Position of Groove 1G Weld Progression _____

PREHEAT (QW-406)

Preheat Temp. 20°C (70°F) Interpass Temp. Weld build up

POSTWELD HEAT TREATMENT (QW-407)

Temperature 607°C (1125°F) Time 90 minutes

GAS (QW-408)

Type of Gas(es) N/A Composition of Mixtures _____

Other _____

ELECTRICAL CHARACTERISTICS(QW-409)

Current Direct Polarity Reverse

Amps See attached sketch Volts _____

Other _____

TECHNIQUE (QW-410)

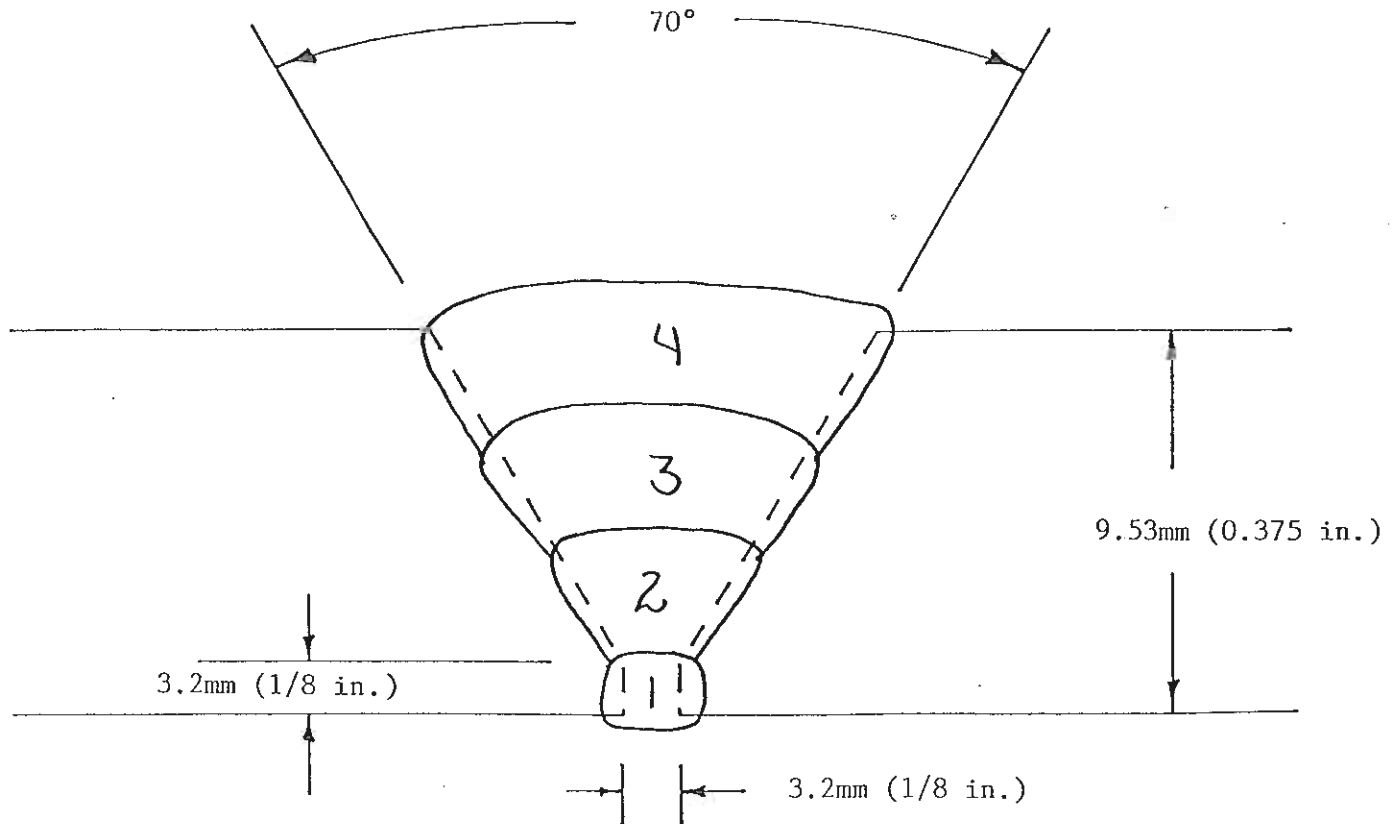
Travel Speed _____

Multipass or Single Pass (per side) F3: Single; F4: Multiple

Single or Multiple Electrodes Single

String or Weave Bead Both

Other _____



Pass #1: 3.2mm (1/8 in.), E6010, DCRP, 90-120 amps, 24-28 volts.

Pass #2: 4.0mm (5/32 in.), E7018, DCRP, 180-210 amps, 24-26 volts.

Pass #3: 5.0mm (3/16 in.), E7018, DCRP, 240-280 amps, 24-28 volts.

Pass #4: 6.0mm (1/4 in.), E7018, DCRP, 340-380 amps,

TENSILE TEST

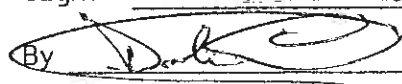
Specimen Number	Width mm (in.)	Thick. mm (in.)	Area sq.mm (sq.in.)	Ultimate Load N (lbs.)	Ultimate Stress MPa (psi)	Character & Location of Failure
T-1	38.55	8.80	339	179,600	530	Partial cup & cone
	(1.52)	(.346)	(.526)	(40,400)	(76,800)	Weld metal
T-2	38.4	9.00	346	182,100	527	Partial cup & cone
	(1.51)	(.354)	(.536)	(41,000)	(76,400)	Weld metal

GUIDED BEND TEST

Type and Figure Number	Result	Type and Figure Number	Result
Side S-1	Pass	Side S-3	Pass
Side S-2	Pass	Side S-4	Pass

Welder's Name Ernie BullockCertificate Number W-9101Tests Conducted by Ludwig's Welding Consulting Ltd.Per: V. Lukey, C.E.T.Laboratory Test Number LWC-9702-816E

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 Boiler and Pressure Vessel Code.

Signed R.J.V. Gasfield Service Ltd.Date September 24, 1987By 

RJV GAS FIELD SERVICES LTD.

Welding Procedure Specification

in accordance with

ASME Sections VIII, IX, B31.1 & B31.3

WPS No.: 104 Revision 2

Supporting PQR No. (s): 104A, 104B, 104C, 104D

Qualified for

Process(es): SMAW / SMAW

Position(s): All

Filler Metal F-No.: F-3 / F-4

A-No.: A-1 / A-1

AWS Class.: E6010 / E7018-1

Weld Type(s): Groove, Fillet

Base Metal: P-1 Group 1 or 2

To: P-1 Group 1 or 2

Typical Materials P-1 Gr. 1: SA-36, SA-53, SA-106 A/B, SA-234 WPB, SA-350 LF1, SA-516 60/65, SA-CSA G40.21 Gr. 38W / 44W

P-1 Gr. 2: SA-105, SA-106 C, SA-234 WPC, SA-350 LF2, SA-516 70, SA-537 Cl. 1, SA-660 WCB / WCC

Diameter Range: All

Condition(s): Postweld Heat Treated

Thickness Range: 0.062" to 2.00"

Normal and Sour Service

0.125" to 1.00"

Low Temperature Service to -46° C (-50°F)

Revision 2: Addition of PQR's for low temperature service and editorial review and update to the current edition of the ASME codes.

Provincial Registration

ALBERTA BOILERS SAFETY ASSOCIATION

PROVINCE OF ALBERTA

SAFETY CODES ACT

WELDING PROCEDURE

Reg. No. WP 1312.2

Spec No. 104 (REV 2)

Weld Process SMAW

Matl. Gr. P No. 1 Gr. 1 & 2 to P No. 1 Gr. 1 & 2

Elec. Gr. F No. 314 A No. 1

Th. Qual. For 50.8 mm PWHT YES

IMPACT 3.1 to 25.4 mm (CVN -46°C)

Yr 02 Mo 08 Day 01 Signed [Signature]

R. ROSEBERG, P.ENG.
WELDING SPECIALIST

WELDING PROCEDURE SPECIFICATION (WPS) QW-482
(Section IX, ASME Boiler and Pressure Vessel Code)

Company Name: RJV Gas Field Services Ltd.
WPS No.: 104 Date: September 08, 1987
Revision No.: 2 Revision Date: July 08, 2002
Supporting PQR's: 104A, 104B, 104C, 104D
Welding Process(es): SMAW / SMAW Type(s): Manual / Manual

JOINTS QW-402		Joint Details	
Joint Design:	Butt, Tee, Lap, Corner, etc.	All ASME joint designs. Reference construction	
Backing:	F-3 electrodes with or without backing F-4 electrodes with backing only.	drawings for joint details. Where joint details are not specified, refer to typical joint detail sheet provided.	
Backing Material (Type): Similar base or weld metal as required. No Retainers.			
BASE METALS QW-403			
P-No:	<u>1</u>	Group No:	<u>1 or 2</u>
OR		P-No:	<u>1</u>
Spec. type & grade:		<u>N/A</u>	to Spec. type & grade:
OR		to Spec. type & grade:	
Chem. Analysis & Mech. Prop.:		<u>N/A</u>	to Chem. Analysis & Mech. Prop.:
Base Metal Thickness Range		<u>N/A</u>	
Groove:		<u>0.0625" to 2.00" – Normal and Sour Service</u>	Fillet: <u>All</u>
Groove:		<u>0.125" to 1.00" – Low Temperature Service to -46° C (-50°F)</u>	Fillet: <u>All</u>
Pipe Dia Range:		<u>Unlimited</u>	Fillet: <u>All</u>
Other: Maximum thickness of any weld layer shall not exceed 0.500"			
FILLER METALS QW-404			
Process:	SMAW	SMAW	
Spec No. (SFA):	5.1	5.1	
AWS No. (Class):	E6010	E7018-1	
F-No.:	F-3	F-4	
A-No.:	A-1	A-1	
Size of Filler Metals:	3/32", 1/8", 5/32"	3/32", 1/8", 5/32", 3/16", 1/4"	
Weld Thickness - Groove:	0.157" max. (0.150" for Low Temperature)	0.853" max. (0.850" for Low Temperature)	
- Fillet:	unlimited	unlimited	
Electrode-Flux (Class):	N/A	N/A	
Flux Trade Name:	N/A	N/A	
Consumable Insert:	N/A	N/A	
Other:	Covered Electrode	Covered Electrode	

Revision 2: Addition of PQR's for low temperature service and editorial review and update to the current edition of the ASME codes.

WELDING PROCEDURE SPECIFICATION (WPS) QW-482
(Section IX, ASME Boiler and Pressure Vessel Code)

Company Name: RJV Gas Field Services Ltd.
WPS No.: 104 Date: September 08, 1987
Revision No: 2 Revision Date: July 08, 2002
Supporting PQR's: 104A, 104B, 104C, 104D
Welding Process(es): SMAW / SMAW Type(s): Manual / Manual

JOINTS QW-402		Joint Details	
Joint Design:	Butt, Tee, Lap, Corner, etc.	All ASME joint designs. Reference construction	
Backing:	F-3 electrodes with or without backing	drawings for joint details. Where joint details are not	
	F-4 electrodes with backing only.	specified, refer to typical joint detail sheet provided.	
Backing Material (Type): Similar base or weld metal as required. No Retainers.			
BASE METALS QW-403			
P-No:	<u>1</u>	Group No:	<u>1 or 2</u>
OR		to P-No:	<u>1</u>
Spec. type & grade:	<u>N/A</u>	to Spec. type & grade:	<u>N/A</u>
OR			
Chem. Analysis & Mech. Prop.:	<u>N/A</u>	to Chem. Analysis & Mech. Prop.:	<u>N/A</u>
Base Metal Thickness Range			
Groove:	<u>0.0625" to 2.00" – Normal and Sour Service</u>	Fillet:	<u>All</u>
Groove:	<u>0.125" to 1.00" – Low Temperature Service to -46° C (-50°F)</u>		
Pipe Dia Range:	<u>Unlimited</u>	Fillet:	<u>All</u>
Other:	<u>Maximum thickness of any weld layer shall not exceed 0.500"</u>		
FILLER METALS QW-404			
Process:	<u>SMAW</u>	<u>SMAW</u>	
Spec No. (SFA):	<u>5.1</u>	<u>5.1</u>	
AWS No. (Class):	<u>E6010</u>	<u>E7018-1</u>	
F-No.:	<u>F-3</u>	<u>F-4</u>	
A-No.:	<u>A-1</u>	<u>A-1</u>	
Size of Filler Metals:	<u>3/32", 1/8", 5/32"</u>	<u>3/32", 1/8", 5/32", 3/16", 1/4"</u>	
Weld Thickness - Groove:	<u>0.157" max. (0.150" for Low Temperature)</u>	<u>0.853" max. (0.150" for Low Temperature)</u>	
- Fillet:	<u>unlimited</u>	<u>unlimited</u>	
Electrode-Flux (Class):	<u>N/A</u>	<u>N/A</u>	
Flux Trade Name:	<u>N/A</u>	<u>N/A</u>	
Consumable Insert:	<u>N/A</u>	<u>N/A</u>	
Other:	<u>Covered Electrode</u>	<u>Covered Electrode</u>	

Revision 2: Addition of PQR's for low temperature service and editorial review and update to the current edition of the ASME codes.

WELDING PROCEDURE SPECIFICATION (WPS) QW-482
(Section IX, ASME Boiler and Pressure Vessel Code)

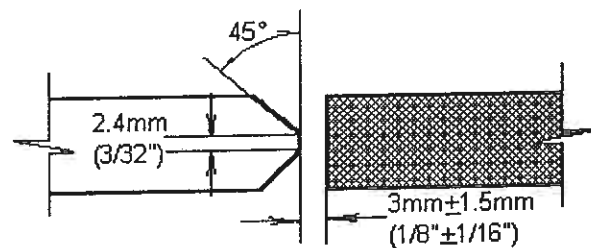
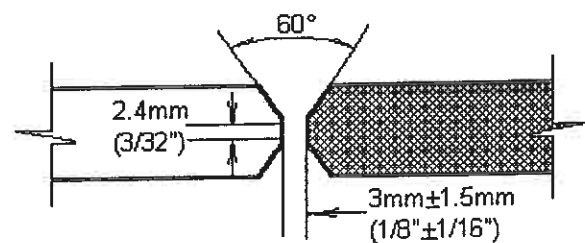
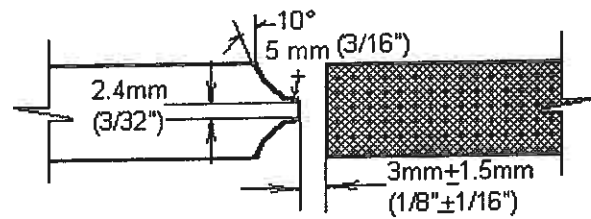
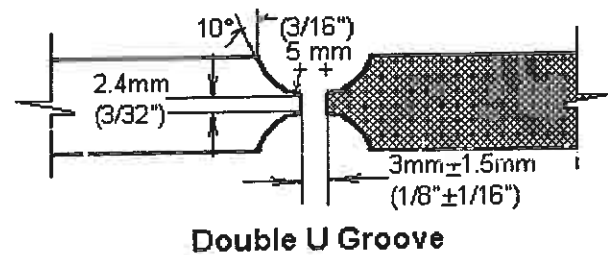
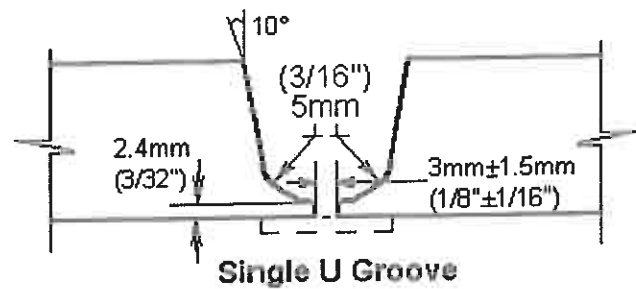
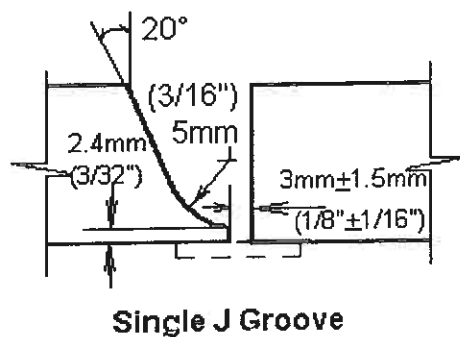
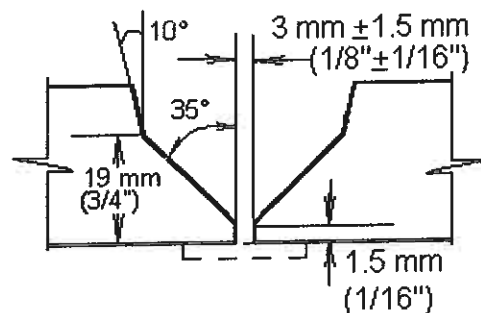
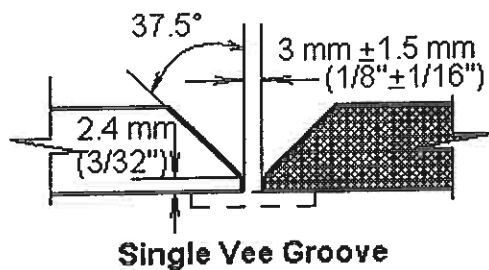
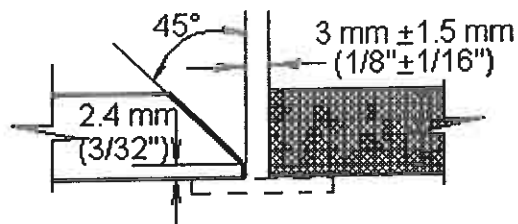
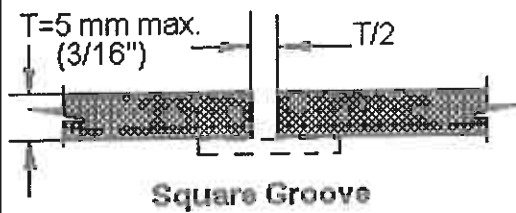
WPS # 104 Revision 2

POSITIONS QW-405		POSTWELD HEAT TREATMENT QW-407				
Position(s) of Groove:	All	Temperature Range:	1100 °F minimum			
Welding Progression:	Up: F-4 Electrodes	Time Range:	1 hour per inch thickness to 2 inches.			
	Up or Down: F-3 Electrodes	2 plus 15 minutes per inch over 2 inches. Heating and				
Position(s) of Fillet:	All	cooling rates as per ASME codes.				
PREHEAT QW-406		GAS QW-408				
Preheat Temp Min:	$t \leq 1" \text{ } 50^{\circ}\text{F}, t > 1" \text{ } 175^{\circ}\text{F}$	Shielding Gas(es):	N/A			
Interpass Temp Max:	600°F	Composition:	N/A			
Interpass Temp Min:	$t \leq 1" \text{ } 50^{\circ}\text{F}, t > 1" \text{ } 175^{\circ}\text{F}$	Flow Rate:	N/A			
	Monitor using pyrometer tempilstiks or other suitable method.	Gas Backing:	N/A			
		Trailing Shielding Gas Composition:	N/A			
ELECTRICAL CHARACTERISTICS QW-409						
Current Type:	SMAW (F-3) Direct Current (DC)	SMAW (F-4) Direct Current (DC)				
Polarity:	SMAW (F-3) Reverse (EP)	SMAW (F-4) Reverse (EP)				
Amps (Range):	SMAW (F-3) 60 – 180	SMAW (F-4) 70 – 360				
Volts (Range):	SMAW (F-3) 20 – 32	SMAW (F-4) 18 – 32				
Max Heat Input:	0.125" – 0.500" SMAW (F-3) 28 080 J/in	SMAW (F-4) 59 800 J/in				
	0.500" – 1.00" SMAW (F-3) 22 080 J/in	SMAW (F-4) 72 450 J/in				
Electrode Wire feed speed range:	N/A					
Tungsten Electrode Size & Type:	N/A					
Mode of Metal Transfer for GMAW:	N/A					
TECHNIQUE QW-410						
String or Weave Bead:	Either. Weave size shall be controlled to prevent exceeding maximum heat input.					
Orifice or Gas Cup Size:	N/A					
Initial Cleaning:	Base material must be thoroughly cleaned of grease, rust, mill scale, dirt, etc., at least 1" back on each side of the joint prior to welding.					
Interpass Cleaning:	Perform by power brushing, grinding, etc. after each weld layer.					
Back Gouging:	Arc air, gouge, grind, etc. to clean metal if required.					
Oscillation:	N/A					
Contact Tube to Work Distance:	Not Applicable					
Multiple or Single pass (per side):	Single or Multiple for F-4 electrodes.					
Multiple or Single Electrodes:	Single					
Travel Speed (Range):	2 – 16 IPM					
Peening:	Not allowed					
TYPICAL WELDING PARAMETERS						
Process	Filler Metal		Current		Volt Range	Travel Speed (IPM)
	AWS Classification	Diameter (in)	Type & Polarity	Amp Range		
SMAW	E6010	3/32	DC RP	60 - 100	20 - 26	2 - 12
SMAW	E6010	1/8	DC RP	80 - 150	20 - 28	3 - 14
SMAW	E6010	5/32	DC RP	90 - 180	22 - 32	4 - 16
SMAW	E7018-1	3/32	DC RP	70 - 130	18 - 24	2 - 10
SMAW	E7018-1	1/8	DC RP	90 - 150	20 - 24	4 - 12
SMAW	E7018-1	5/32	DC RP	120 - 190	20 - 26	5 - 14
SMAW	E7018-1	3/16	DC RP	150 - 270	22 - 28	6 - 16
SMAW	E7018-1	1/4	DC RP	180 - 360	24 - 32	8 - 16
Notes:	1) Number of weld layers and size of filler metal may vary with thickness of base material and position of weld. 2) 3/16" & 1/4" E7018 electrodes limited to flat (1G) position only.					

Revision 2: Addition of PQR's for low temperature service and editorial review and update to the current edition of the ASME codes.

Typical Joint Details QW-482

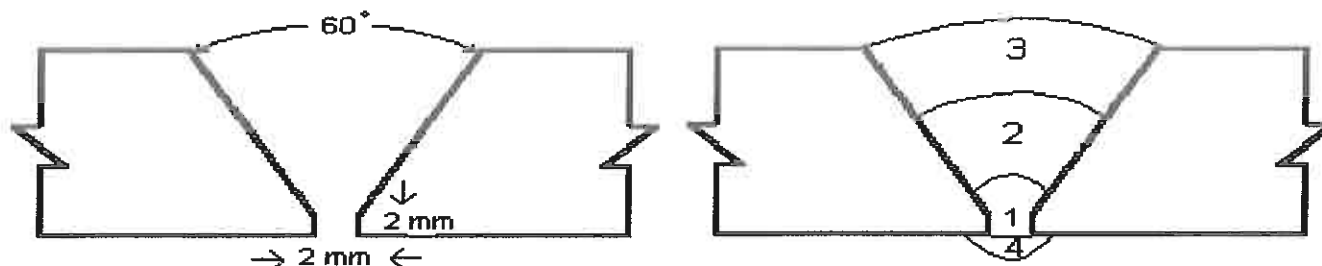
Prepared by: Qualimet



PROCEDURE QUALIFICATION RECORD (PQR) QW-483
(Section IX, ASME Boiler and Pressure Vessel Code)

Company Name:	RJV Gas Field Services Ltd.	
PQR No:	104C	Date: July 08, 2002
Revision No.:	-----	Revision Date: -----
WPS No:	104 Revision 2	
Welding Process(es):	SMAW / SMAW	
Types:	Manual / Manual	

JOINTS QW-402



BASE METALS QW-403		POSTWELD HEAT TREATMENT QW-407	
Material Spec.:	SA-516 to SA-516	Temperature:	1 150°F ±25°F
Type or Grade:	Grade 60 to Grade 70	Time:	2.0 hours
P-No.	P1 Group 1 to P-1 Group 2	Other:	N/A
Thickness of Test Coupon:	0.249" Plate		
Other:	Heat No.: 22648-015071-2 C.E.: 0.37		
FILLER METALS QW-404		GAS QW-408	
Process	SMAW	Type or Gas(es):	N/A
SFA Spec:	5.1	Composition:	N/A
AWS Class.:	E6010	Flow Rate:	N/A
F-No:	F-3	Gas Backing Rate:	N/A
A-No:	A-1	Other:	N/A
Filler Metal Size:	1/8"		
Deposited Metal:	0.075"		
Other:	Covered Electrode		
POSITION QW-405		ELECTRICAL CHARACTERISTICS QW-409	
Position of Groove:	3G	Current:	F-3: Direct (DC) F-4: Direct (DC)
Weld Progression:	Vertical Up	Polarity:	F-3: Reverse(EP) F-4: Reverse(EP)
Other:	N/A	Amps:	F-3: 65 - 80 F-4: 70 - 100
		Volts:	F-3: 23 - 36 F-4: 20 - 23
		Heat Input:	F-3: 28 080 J/in F-4: 59 800 J/in
		Other:	N/A
PREHEAT QW-406		TECHNIQUE QW-410	
Preheat Temp Min.:	50° F	Travel Speed:	F-3: 2 - 7.0 ipm F-4: 2.5 - 4.1 ipm
Interpass Temp Max.:	500°F	String or Weave Bead:	String and weave
Interpass Temp Min.:	50° F	Oscillation:	N/A
Other:	Temperature monitored using Tempilstiks	Multiple or Single Pass:	Multiple + single per side
		Single or Multiple Electrodes:	Single
		Other:	N/A

PROCEDURE QUALIFICATION RECORD (PQR) QW-483
(Section IX, ASME Boiler and Pressure Vessel Code)

PQR # 104C

Tensile Test
QW 462

Specimen No.	Width in	Thickness in	Area in ²	Ultimate Total Load lb	Ultimate Unit Stress psi	Type of Failure & Location
		Not Applicable				

Guided Bend Tests
QW462

Type and Figure No.	Result
Not Applicable	

Toughness Tests
QW 170

Specimen No.	Notch Location	Notch Type	Test Temp	Impact Values	Lateral Exp % Shear	Mils	Drop Weight Break	No Brk
			See Attached Report					

Other Tests
Not Applicable

Type of Test:	
Other:	

Welder's Name: Marvin Boe ABSA No.: W-6943 Stamp ID: KY
 Tests Conducted By: Qualimet Inc. Lab. Test No.: 664-02001

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

Manufacturer: RJV Gas Field Services Ltd.

Date: July 08, 2002

By: Dale Lemluk

CHARPY V-NOTCH IMPACT TEST RESULTS

for Procedure Qualification Record # 104C

Client:	RJV Gas Field Services Ltd.	Job Number:	664 - 02001
Address:	4901 - 47 Street Vegreville, Alberta	Date:	July 08, 2002
Materials:	SA-516 Grade 60 to 70		
Size:	0.2495" wt plate machined	Condition:	Postweld Heat Treated
Specimen Type:	5.0 mm Charpy V Notch impact specimens		
Specification:	ASTM A-370, ASME Section VIII UG-84		
Qualification Temp.:	-46°C (-50°F)		

Sample Set	Sample Number	Impact ft-lb	Energy (Joule)	Converted Full Size Impact Energy (J)	% Shear
Weld Zone	1	23	31	62	55
	2	21	28	57	60
	3	26	35	71	55
	Average:	23	32	63	57
Heat Affected Zone SA-516 Gr. 60	1	34	46	92	70
	2	25	34	68	60
	3	29	39	79	65
	Average:	29	40	80	65
Heat Affected Zone SA-516 Gr. 70	1	41	56	111	90
	2	37	50	100	75
	3	36	49	98	80
	Average:	38	52	103	82

Remarks: These Charpy v-notch impact test results exceed the minimum requirements of ASME Section VIII and B31.3 Codes for -46°C; or CSA Z662-99 Codes for -46°C.

We certify that the statements in this record are acceptable, in accordance with the requirements of ASME Section IX.

TEST RESULTS CERTIFIED BY:

M. Sparr

Qualimet



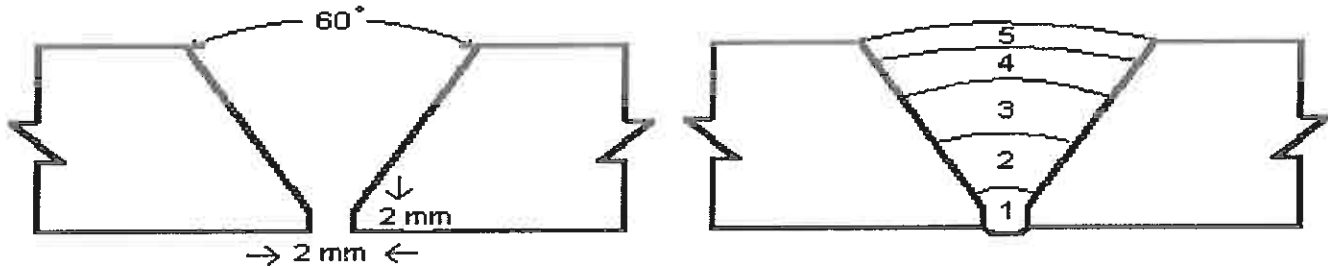
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Certified by the Canadian Welding Bureau & Alberta Boilers Safety Association;
Registered as an Alberta Professional Engineering consulting firm
with engineers registered in Alberta and British Columbia
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"Your source of Quality Materials Engineering"



PROCEDURE QUALIFICATION RECORD (PQR) QW-483
(Section IX, ASME Boiler and Pressure Vessel Code)

Company Name:	RJV Gas Field Services Ltd.	
PQR No:	104D	Date: July 08, 2002
Revision No.:	-----	Revision Date: -----
WPS No:	104 Revision 2	
Welding Process(es):	SMAW / SMAW	
Types:	Manual / Manual	

JOINTS QW-402



BASE METALS QW-403		POSTWELD HEAT TREATMENT QW-407	
Material Spec.:	SA-516 to SA-516	Temperature:	1 150°F ±25°F
Type or Grade:	Grade 60 to Grade 70	Time:	2.0 hours
P-No.:	P1 Group 1 to P-1 Group 2	Other:	N/A
Thickness of Test Coupon: 0.500" plate			
Other: Heat No.: 94030-54885 C.E.: 0.38			
FILLER METALS QW-404		GAS QW-408	
Process	SMAW SMAW	Type or Gas(es):	N/A
SFA Spec:	5.1 5.1	Composition:	N/A
AWS Class.:	E6010 E7018-1	Flow Rate:	N/A
F-No:	F-3 F-4	Gas Backing Rate:	N/A
A-No:	A-1 A-1	Other:	N/A
Filler Metal Size:	1/8" 1/8"		
Deposited Metal:	0.075" 0.425"	ELECTRICAL CHARACTERISTICS QW-409	
Other:	Covered Electrode Covered Electrode	Current:	F-3: Direct (DC) F-4: Direct (DC)
		Polarity:	F-3: Reverse(EP) F-4: Reverse(EP)
		Amps:	F-3: 70 - 80 F-4: 70 - 100
		Volts:	F-3: 20 - 23 F-4: 20 - 23
		Heat input:	F-3: 22 080 J/in F-4: 72 450 J/in
		Other:	N/A
POSITION QW-405		TECHNIQUE QW-410	
Position of Groove:	3G	Travel Speed:	F-3: 5.0 - 6.0 ipm F-4: 2.0 - 3.5 ipm
Weld Progression:	Vertical Up	String or Weave Bead:	String and weave
Other:	N/A	Oscillation:	N/A
PREHEAT QW-406		Multiple or Single Pass:	Multiple
Preheat Temp Min.:	50° F	Single or Multiple Electrodes:	Single
Interpass Temp Max.:	500° F	Other:	N/A
Interpass Temp Min.:	50° F		
Other:	Temperature monitored using Templistiks		

PROCEDURE QUALIFICATION RECORD (PQR) QW-483
(Section IX, ASME Boiler and Pressure Vessel Code)

PQR # 104D

Tensile Test
QW 462

Specimen No.	Width in	Thickness in	Area in ²	Ultimate Total Load lb	Ultimate Unit Stress psi	Type of Failure & Location
			Not Applicable			

Guided Bend Tests
QW462

Type and Figure No.	Result
Not Applicable	

Toughness Tests
QW 170

Specimen No.	Notch Location	Notch Type	Test Temp	Impact Values	Lateral Exp % Shear	Mils	Drop Weight Break	No Brk
			See Attached Report					

Other Tests
Not Applicable

Type of Test:	
Other:	

Welder's Name: Marvin Boe ABSA No.: W-6943 Stamp ID: LA
 Tests Conducted By: Qualimet Inc. Lab. Test No.: 664-02001

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

Manufacturer: RJV Gas Field Services Ltd.

Date: July 08, 2002

By: Dale Laniuk

• 7817 CORONET ROAD, EDMONTON, AB T6E 4N7 (780) 469-5870 • FAX (780) 465-5829
• CALGARY (403) 278-9862 • 1-800-621-8979

CHARPY V-NOTCH IMPACT TEST RESULTS

for Procedure Qualification Record # 104D

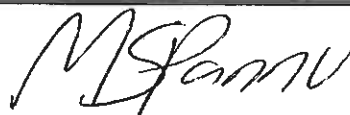
Client:	RJV Gas Field Services Ltd.	Job Number:	664 - 02001
Address:	4901 - 47 Street Vegreville, Alberta	Date:	July 08, 2002
Materials:	SA-516 Grade 60 to 70		
Size:	0.500" wt.	Condition:	Postweld Heat Treated
Specimen Type:	10.0 mm Charpy V Notch impact specimens		
Specification:	ASTM A-370. ASME Section VIII UG-84		
Qualification Temp.:	-46°C (-50°F)		

Sample Set	Sample Number	Impact Energy		% Shear
		ft-lb	(Joule)	
Weld Zone	1	48	65	40
Both SMAW	2	65	88	60
processes	3	57	77	50
	Average:	57	77	50
Heat Affected Zone	1	91	123	85
SA-516 Gr. 60	2	77	104	80
	3	86	117	85
	Average:	85	115	83
Heat Affected Zone	1	66	89	80
SA-516 Gr. 70	2	73	99	90
	3	49	66	70
	Average:	63	85	80

Remarks: These Charpy v-notch impact test results exceed the minimum requirements of ASME Section VIII and B31.3 Codes for -46°C; or CSA Z662-99 Codes for -46°C.

We certify that the statements in this record are acceptable, in accordance with the requirements of ASME Section IX.

TEST RESULTS CERTIFIED BY:



QUALIMET INC.



An Alberta Company
Certified by the Canadian Welding Bureau & Alberta Boilers Safety Association;
Registered as an Alberta Professional Engineering consulting firm
with engineers registered in Alberta and British Columbia

Visit us at our website: www.qualimetinc.com

"Your source of Quality Materials Engineering"



WPS NUMBER 105

PQR NUMBER 105A

QUALIFIED FOR

MATERIAL (TYPICAL): P1 to P1 (SA 105, SA 106, SA 516, etc.)

PROCESS: GMAW, FCAW, SMAW JOINT DESIGN: Groove & Fillet

POSITION: All DIAMETER: All

AWS CLASSIFICATION: ER70S-6, E70T-1, E7018, E7018-1

BASE METAL THICKNESS RANGE QUALIFIED:

P.W.H.T.: 4.8 to 50.8mm (3/16 to 2.0 in.)

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

Reg. No. WP 1312-2
Spec No. #105
Weld Process GMAW / SMAW / FCAW
Mater. Gr. P No. 1 to P No. 1
Elec. Gr. F No. 6+4+6 A No. 1
Th. Qual. For 50.8mm Position 1G
..... PWHT

Yr. 88 Mo. 3 Day 3 Signed R. Roseberg
R. ROSEBERG, P. ENG.
WELDING SPECIALIST

Boilers Branch Registration

WELDING PROCEDURE SPECIFICATION

R.J.V. Gasfield Service Ltd., 4901 - Bruce Rd., Box 295, Vegreville, Alberta T0B 4L0

WELDING PROCEDURE SPECIFICATION NUMBER 105 DATE September 8, 1987

REVISIONS _____

SUPPORTING PQR NUMBERS(S) 105A

WELDING PROCESS(ES) GMAW, FCAW, SMAW TYPES Semi-Automatic, Manual, Semi-Auto.

JOINTS (QW-402)

Joint Design See attached sketches, figures 1 to 15

Backing Weld metal where applicable Other _____

BASE METALS (QW-403)

P-Number 1 to P-Number 1

Thickness Range: Groove 4.8 to 50.8mm (3/16 to 2.0 in.)

Fillet All

Pipe Diameter Ranges: Groove All

Fillet All

Other _____

FILLER METALS (QW-404)

Specification No. (SFA) 5.18 5.20 5.1

AWS No. (Class) ER70S-6 E70T-1 E7018, E7018-1, E7018-A1

F-No. F6 F6 F4

A-No. 1 1 1

Size See table next page

Deposited Weld Metal Thickness Range: No single pass with over $\frac{1}{2}$ " (12.7mm) of deposited metal

Groove GMAW: 4.4mm; SMAW: 16mm; FCAW: 48mm

Fillet All

Electrode - Flux (Class) _____

Other _____

POSITION (QW-405)

Position of Groove 1G Weld Progression _____

REHEAT (QW-406)

Preheat Temp. Min. See attached section Interpass Temp. Max. Weld build up

Preheat Maintenance _____

POSTWELD HEAT TREATMENT (QW-407)

Temperature See attached section Time Range

GAS (QW-408)

Shielding Gas(es) Carbon DioxideFlow Rate 10 - 25 litres/min. (20 - 50 cfh)Other 99.9%

ELECTRICAL CHARACTERISTICS (QW-409)

Current Direct Polarity ReverseAmps See table below Volts Tungsten Electrode Size and Type N/AMode of Metal Transfer GMAW: Short circuit; FCAW: GlobularElectrode Wire Feed Speed Range Other

TECHNIQUE (QW-410)

String or Weave Both Travel Speed (Range) Initial and Interpass Cleaning Brushing, chipping, grindingMethod of Back Gouging Air carbon arc when requiredMultiple or Single Pass (per side) MultipleMultiple or Single Electrodes SingleOther

WELD LAYER	PROCESS	FILLER METAL		CURRENT		VOLTAGE RANGE	T/S RANGE mm/min. (ipm)	OTHER
		CLASS.	DIAMETER mm. (in.)	TYPE POLAR.	AMP RANGE			
	GMAW	ER70S-X	0.9 (.035)	DCRP	90-150	18-22	100-600 (5-25)	Size of electrode, number of passes, amperage voltage and travel speed will differ with thickness and joint configuration.
	SMAW	E7018	3.2 (1/8)	DCRP	90-160	20-25	38-350 (1.5-14)	
	SMAW	E7018-1						
	SMAW	E7018-A1						
	SMAW	As above	4.0 (5/32)	DCRP	125-200	21-26	100-400 (4-16)	
	SMAW	As above	5.0 (5/16)	DCRP	200-310	21-27	125-400 (5-16)	
	SMAW	As above	6.0 (1/4)	DCRP	280-380	22-30	175-350 (7-14)	
	FCAW	E70T-1	1.6 (1/16)	DCRP	200-300	24-28		
	FCAW	As above	2.0 (5/64)	DCRP	250-400	24-28		
	FCAW	As above	2.4 (3/32)	DCRP	350-500	26-32		

GROOVE DESIGN

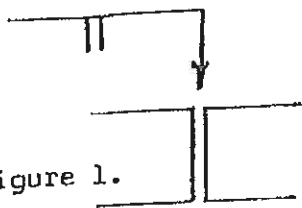


Figure 1.

Single Square Butt

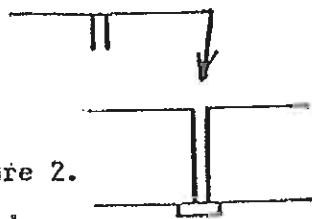


Figure 2.

Single Square Butt with Backing Strip

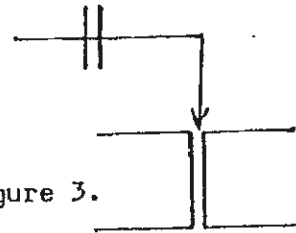


Figure 3.

Double Square Butt

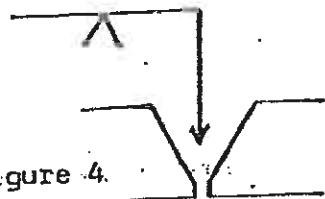


Figure 4.

Single Vee Butt

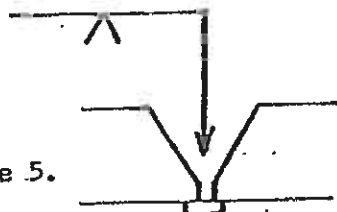


Figure 5.

Single Vee Butt With Backing Strip

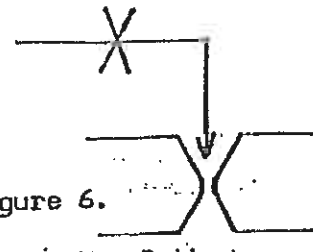


Figure 6.

Double Vee Butt

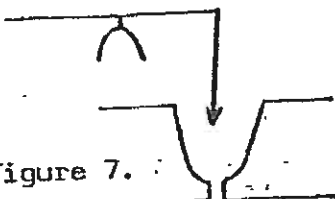


Figure 7.

Single U Butt

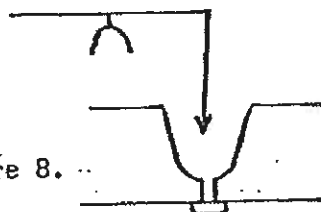


Figure 8.

Single U Butt With Backing Strip

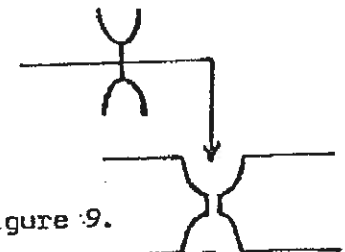


Figure 9.

Double U Butt

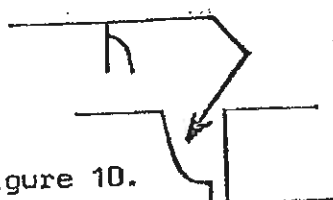


Figure 10.

Single J Butt

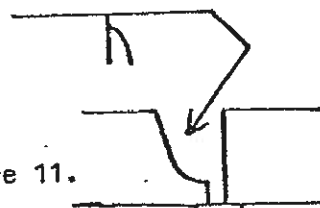


Figure 11.

Single J Butt With Backing Strip

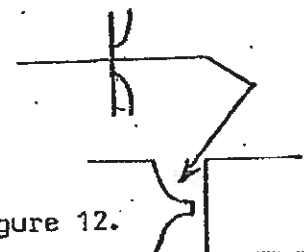


Figure 12.

Double J Butt

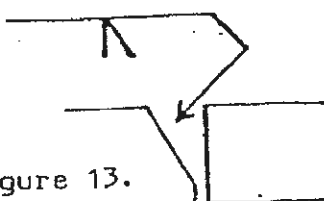


Figure 13.

Single Bevel Butt

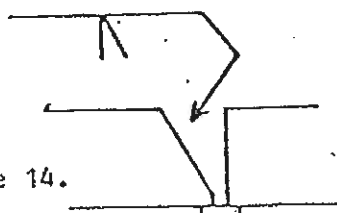


Figure 14.

Single Bevel Butt With Backing Strip

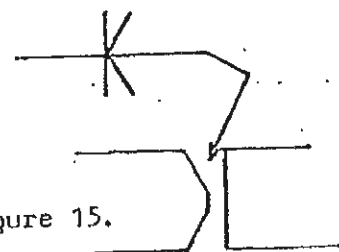


Figure 15.

Double Bevel Butt

PREHEAT

1. Welds joining pressure parts or attachments shall be preheated to not less than the minimum preheat temperature stated in 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 re-heated to the minimum preheat temperature specified in 6.
4. The preheated area shall not be less than 50.8mm (2.0 in.) 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:

PRESSURE VESSELS

<u>THICKNESS</u>	<u>MINIMUM PREHEATING TEMPERATURES</u>
0 to 31.75mm (0 to 1 1/4 in.)	24°C (75°F)
Over 31.75 to 203mm (1 1/4 to 8 in.)	80°C (175°F)

PRESSURE PIPING

<u>THICKNESS</u>	<u>MINIMUM SPECIFIED TENSILE STRENGTH, BASE METAL MPa (Ksi)</u>	<u>MINIMUM PREHEATING TEMPERATURE</u>
Less than 25.4mm (1.0 in.)	≤490 (71)	24°C (75°F)
Greater than 25.4mm (1.0 in.)	A11	80°C (175°F)
A11	>490 (71)	80°C (175°F)

POSTWELD HEAT TREATMENT

P-No.1 Groups 1, 2 & 3

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

1. All postweld heat treatment shall be done in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division I, UW-40 & UCS-56, 1986 edition.
2. Postweld heat treatment temperatures and minimum holding times are as follows:

NOMINAL THICKNESS	HEAT TREATMENT TEMPERATURE		HOLDING TIME
	°C	(°F)	
Up to 50.8 mm (2.0 in.)	595	(1100) minimum	1 hr./25.4 mm (inch), 15 minutes minimum
Over 50.8 mm (2.0 in.)	595	(1100) minimum	2 hours plus 15 minutes for each additional 25.4 mm (inch) over 50.8 mm (2.0 in.)

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

1. All postweld heat treatment shall be done in accordance with Table 331.1.1 of ANSI B31.3-1984.
2. Postweld heat treatment temperatures and minimum holding times as follows:

NOMINAL THICKNESS	HEAT TREATMENT TEMPERATURE		HOLDING TIME
	°C	(°F)	
All	595 - 650	(1100 - 1200)	1 hour/25.4 mm (inch), 1 hour minimum

Power Piping in accordance with ANSI B31.1

1. All postweld heat treatments shall be done in accordance with Table 132 of ANSI B31.1-1983 edition.
2. Postweld heat treatment temperatures and minimum holding times are as follows:

NOMINAL THICKNESS	HEAT TREATMENT TEMPERATURE		HOLDING TIME
	°C	(°F)	
Up to 50.8 mm (2.0 in.)	595 - 650	(1100 - 1200)	1 hr./25 mm (inch), 15 minutes minimum
Over 50.8 mm (2.0 in.)	595 - 650	(1100 - 1200)	2 hr. plus 15 min. for each additional 25 mm (inch) over 50.8 mm (2.0 in.)

PROCEDURE QUALIFICATION RECORD

R.J.V. Gasfield Service Ltd., Box 295, 4901 - Bruce Rd., Vegreville, Alberta T0B 4L0

PROCEDURE QUALIFICATION RECORD NUMBER 105-A DATE August 3, 1987

WELDING PROCEDURE SPECIFICATION NUMBER 105

WELDING PROCESS(ES) GMAW, SMAW, FCAW TYPES Semi-automatic, Manual, Semi-automatic

JOINTS (QW-402)

Type Butt: single vee

BASE METALS (QW-403)

Material Spec. SA 516 Type or Grade Grade 70N

P-No. 1 Grp. 2 to P-No. 1 Grp. 2 Thickness 38.1mm (1.50 in.)

Diameter Other

FILLER METALS (QW-404)

SFA Specification 5.18 5.1 5.20

AWS Classification ER70S-6 E7018 E70T-1

Filler Metal F-No. 6 4 6

Weld Metal Analysis A-No. 1 1 1

Size of Filler Metal See sketch next page

Deposited Weld Metal Thickness GMAW: 4mm SMAW: 8mm FCAW: 24mm

Other No single pass with over 1/2" (12.7mm) of deposited metal

POSITION (QW-405)

Position of Groove 1G Weld Progression

PREHEAT (QW-406)

Preheat Temp. 80°C (175°F) Interpass Temp. Weld build up

POSTWELD HEAT TREATMENT (QW-407)

Temperature 607°C (1125°F) Time 90 minutes

GAS (QW-408)

Type of Gas(es) Carbon Dioxide Composition of Mixtures Welding grade

Other Flow Rate: 18 litres/min. (35 cfh)

ELECTRICAL CHARACTERISTICS (QW-409)

Current Direct Polarity Reverse

Amps See sketch next page Volts

Other

TECHNIQUE (QW-410)

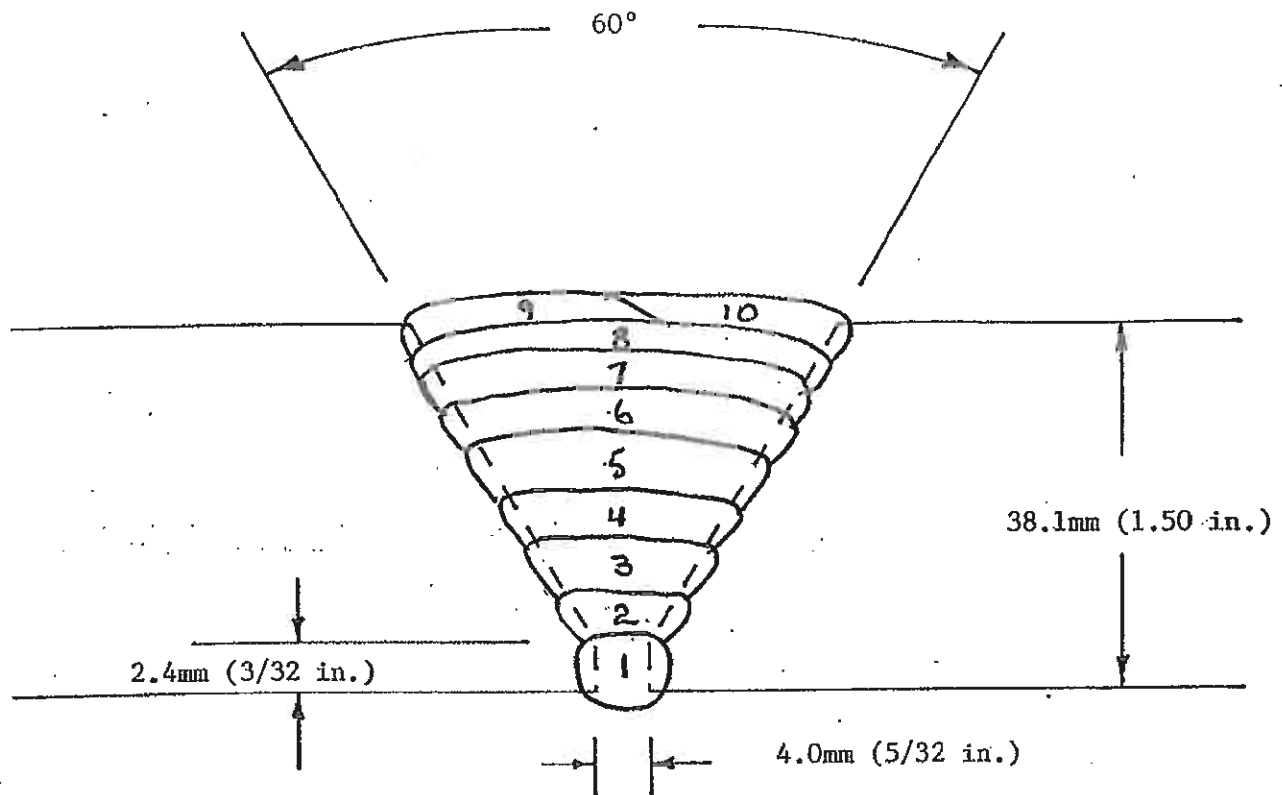
Travel Speed

Multipass or Single Pass (per side) Multipass

Single or Multiple Electrodes Single

Backing or Weave Bead Both

Other



Pass #1: .89mm (0.035 in.), ER70S-6, DCRP, 95-105 amps, 20 volts, short circuiting transfer.

Pass #2: .89mm (0.035 in.), ER70S-6, DCRP, 190-195 amps, 30 volts, globular transfer.

Pass #3: 6.0mm (1/4 in.), E7018, DCRP, 340-380 amps, 24-28 volts.

Pass #4 - #8: 2.4mm (3/32 in.), E70T-1, DCRP, 400-425 amps, 29-30 volts.

Pass #9 & #10: 6.0mm (1/4 in.), E7018, DCRP, 340-380 amps, 24-28 volts.

TENSILE TEST

Specimen Number	Width mm (in.)	Thick. mm (in.)	Area sq.mm (sq.in.)	Ultimate Load N (lbs.)	Ultimate Stress MPa (psi)	Character & Location of Failure
T-1	19.65	37.0	727	380,600	524	Partial cup & cone
	(.774)	(1.46)	(1.13)	(85,600)	(75,900)	Weld metal
T-2	19.2	36.2	695	364,700	525	Partial cup & cone
	(.756)	(1.43)	(1.08)	(82,100)	(76,100)	Parent metal

GUIDED BEND TEST

Type and Figure Number	Result	Type and Figure Number	Result
Side S-1	Pass	Side S-3	Pass
Side S-2	Pass	Side S-4	Pass

Welder's Name Ernie BullockCertificate Number W-9190Tests Conducted by Ludwig's Welding Consulting Ltd.Per: V. Lukey, C.E.T.Laboratory Test Number LWC-9703-816E

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 Boiler and Pressure Vessel Code.

Signed R.J.V. Gasfield Service Ltd.Date September 24, 1987By 

RJV GAS FIELD SERVICES LTD.**4901 - 47 STREET****VEGREVILLE AB T9C 1C3**

WELDING PROCEDURE SPECIFICATION NO.

RJV106

PROCEDURE QUALIFICATION RECORD NO.

RJV106(PQR)**QUALIFIED FOR:**BASE METAL (TYPICAL): AISI 4130 "TO" P1-GROUP1PROCESS(ES): SMAW WELD TYPE(S): MANUALPOSITION(S): ALLFILLER METAL(S): E8010G, E10018-D2BASE METAL THICKNESS RANGE(S) QUALIFIED: .0625" TO .674"PROCEDURAL DETAILS: PREHEAT = 400°F MINIMUMPWHT = 1225F (+/-) 25F
(1 HOUR PER INCH)BRINELL HARDNESS SURVEY

Application-

Weld Procedure #RJV 106 to be used on

Nutron N1 angle body chokes

CRN# 0C0078.2

ALBERTA BOILERS SAFETY ASSOCIATION

PROVINCE OF ALBERTA

SAFETY CODES ACT

WELDING PROCEDURE

RESTRICTED APPLICATION *

Reg. No. WP 1312.2 Spec. No. RJV 106Weld Process SMAWMatl. No. AISI 4130 to Matl. No. P1Elec. Gr. F No. 3+4 A No. 1Th. Qual. For 17.1 mm P.W.H.T. YES* Limited To: NUTRON N1 ANGLE BODY
CHOKES (CRN # 0C0078.2)Yr. 02 Mo. 02 Day 22 Signed [Signature]

BOILER BRANCH REGISTRATION

Company Name: RJV GAS FIELD SERVICES LTD. **By:** DALE LANIUK
Welding Proc. Spec. No.: RJV106 **Date:** 23-SEPT-94 **PQR(s):** RJV106(PQR)
Revision No.: Rev. 1 **Date:** 06-Feb.-02
Welding Process(es): SMAW **Type(s):** MANUAL
 (Automatic, Manual, Machine, or Semi-Auto.)

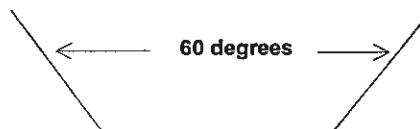
JOINTS: (QW-402)

(ASME JOINT DESIGNS)

Joint Design GROOVE, FILLET, REPAIR
Backing (Yes) X (No) X
Backing Material Type WELD METAL WHERE APPLICABLE
 (Refer to both backing and retainers)

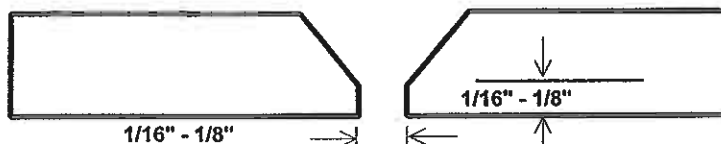
For Joint Details: See attached sheet.

☒ Metal ☐ Nonfusing Metal
☐ Nonmetallic ☐ Other

NO RETAINERS

Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of the weld groove may be specified.

(At the option of the Manufacturer, sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g. for notch toughness procedures, for multiple process procedures, etc.)

**BASE METALS: (QW-403)**

P - No. UNASSIGNED **Group No.** AISI 4130 **"TO"** P1 **Group No.** 1

OR

Specification type and grade
 to Specification type and grade

OR

Chem. Analysis and Mech. Prop.
 to Chem. Analysis and Mech. Prop.

Thickness Range:

Base MetalGroove	<u>.0625" TO .674"</u>	Fillet	<u>ALL</u>
Pipe Dia. RangeGroove	<u>ALL</u>	Fillet	<u>ALL</u>
Other	<u>No single pass to exceed 1/2".</u>		

FILLER METALS: (QW-404)

Spec. No. (SFA)	<u>5.1</u>	<u>5.5</u>
AWS No. (Class)	<u>E8010G</u>	<u>E10018-D2</u>
F - No.	<u>F3</u>	<u>F4</u>
A - No.	<u>A1</u>	<u>A11</u>
Size of Filler Metal	<u>3/32", 1/8"</u>	<u>3/32", 1/8", 5/32"</u>
Weld Metal		
Thickness:		
Groove	<u>.250" Max.</u>	<u>.424" Max.</u>
Fillet	<u>ALL</u>	<u>ALL</u>
Electrode Flux (Class)	<u>NA</u>	<u>NA</u>
Flux Trade Name	<u>NA</u>	<u>NA</u>
Consumable Insert	<u>NA</u>	<u>NA</u>
Other	<u>NA</u>	<u>NA</u>

[illegible]

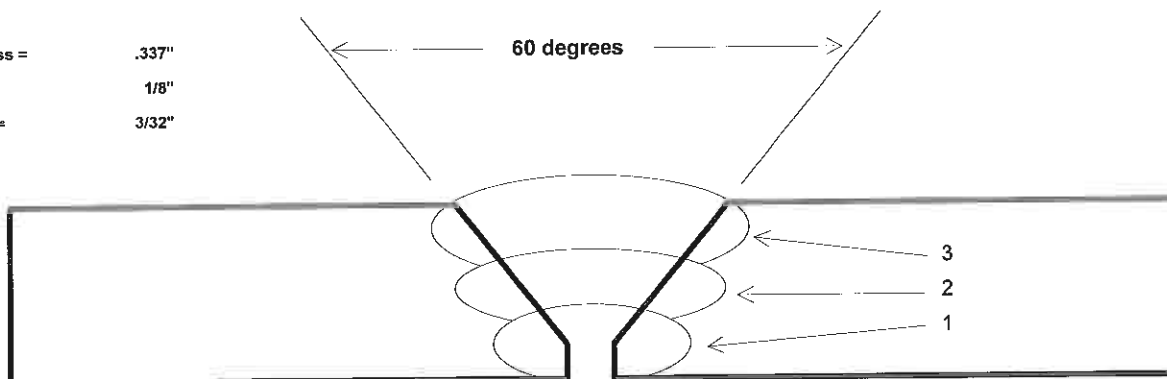
PROCEDURE QUALIFICATION RECORD (PQR)

PG: 3

Company Name: RJV GAS FIELD SERVICES LTD.
Procedure Qualification Record No.: RJV106(PQR) **Date:** 23-SEPT-94
WPS No.: RJV106
Welding Process(es): SMAW
Type(s): (Manual, Automatic, Machine, or Semi-Auto.) MANUAL

JOINTS: (QW-402)

Coupon Thickness = .337"
Root Opening = 1/8"
Land Thickness = 3/32"



Groove Design of the First Coupon

(For combination qualification, the deposit weld metal thickness will be recorded for each filler metal or process used.)

BASE METALS: (QW-403)

Material Spec. AISI 4130 TO SA106-gr.B
Type and Grade _____
P - No. AISI 4130 **"TO"** P - No. P1 - Gr.1
Thickness of Test Coupon .337"
Diameter of Test Coupon 4.50" OD
Carbon Equivalent NA
Heat Number NA
Other No single pass exceed 1/2"

POSTWELD HEAT TREATMENT: (QW-407)

Temperature 1225F (+/-) 25F
Time 1 HR SOAK MINIMUM
Other _____

FILLER METAL: (QW-404)

SFA Spec.	5.1	5.5
AWS Class.	E8010G	E10018-D2
F - No.	F3	F4
A - No.	A1	A11
Filler Metal Size	1/8"	3/32", 1/8", 5/32"
Other		
Thickness of Weld Metal	.125"	.212"

GAS: (QW-408)

	% Composition		
	Gas(es)	Mixture	Flow Rate
Shielding	NA	NA	NA
Trailing	NA	NA	NA
Backing	NA	NA	NA

ELECTRICAL CHARACTERISTICS: (QW-409)

Current DC
Polarity REVERSE
Amps SEE PAGE 5 **Volts** SEE PAGE 5
Tungsten Electrode Size NA
Other NA

POSITION: (QW-405)

Position of Groove 1G
Weld Progression (Uphill, Downhill) UPHILL
Other _____

PREHEAT: (QW-406)

Preheat Temperature 400F MINIMUM
Interpass Temperature 650F MAXIMUM
Other ALLOW TO COOL AS REQUIRED

TECHNIQUE: (QW-410)

Travel Speed 2-10 IPM
String or Weave Bead STRING
Oscillation NA
Multipass or Single Pass (per side) MULTIPASS
Multiple or Single Electrodes SINGLE
Other _____

TENSILE TEST: (QW-150)

Specimen No.	Width (in)	Thickness (in)	Area (sq.in.)	Ultimate Total Load (lb)	Ultimate Unit Stress (psi)	Type and Location of Failure
1	0.740	0.324	0.240	19,000	79,200	Ductile in parent A106
2	0.743	0.309	0.230	18,400	80,100	Ductile in parent A106

GUIDED BEND TESTS: (QW-160)

Type and Figure No.	Results
2 Face Bends	Both passed.
2 Root Bends	Both passed.

TOUGHNESS TESTS: (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temperature	Impact Values	Lateral Expansion		Drop Weight	
					% Shear	Mils	Break	No Break

FILLET - WELD TEST: (QW-180)

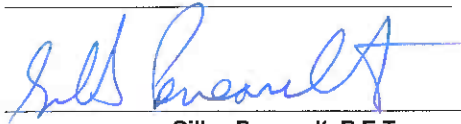
Satisfactory Results: Yes _____ No _____ Penetration: Yes _____ No _____
Macro - Results: _____

OTHER TESTS

Type(s) of Test(s): _____ Hardness Survey - See attached report #94-09-2178
Deposit Analysis: _____
Other: _____

Welder's Name: Mark Reithmeyer Clock No. W11550 Stamp No. _____

Test Conducted by: CANSPEC GROUP INC. Laboratory Test No. 94-09-2178



Gilles Perreault, R.E.T.
Manager, Laboratory Services

Manufacturer: RJV GAS FIELD SERVICES LTD.

By: 

Date: SEP 26 1994

PG: 5

Date: SEPT 22/94

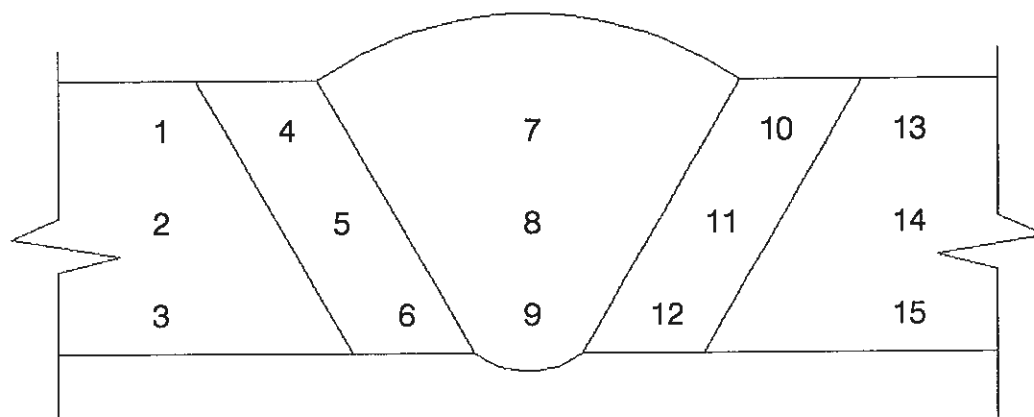
[illegible][illegible]

Name of Witness

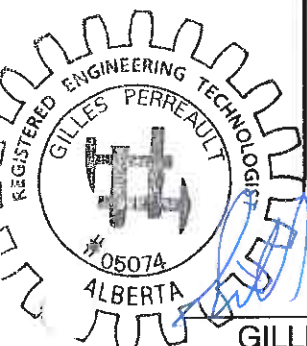
HARDNESS TEST REPORT**CUSTOMER:** RJV Gas Field Services Ltd.**ADDRESS:** 4901 - 47 Street, Vegreville, AB**ATTENTION:** Dale Laniuk**MATERIAL DESCRIPTION:** Weld Procedure RJV-106

4" OD STD Welded Pipe, PWHT at 1225°F for 1 hour

ASME SA106 Grade B to AISI 4130

PURCHASE ORDER NO.: N/A**DATE TESTED:** September 23, 1994**CANSPEC JOB NO.:** 94-09-2178

LOCATION	HRB	LOCATION	HRB
1	89.0	9	90.0
2	91.5	10	75.0
3	91.0	11	78.0
4	97.0	12	75.0
5	98.5	13	73.0
6	95.0	14	75.0
7	98.0	15	75.0
8	98.5		



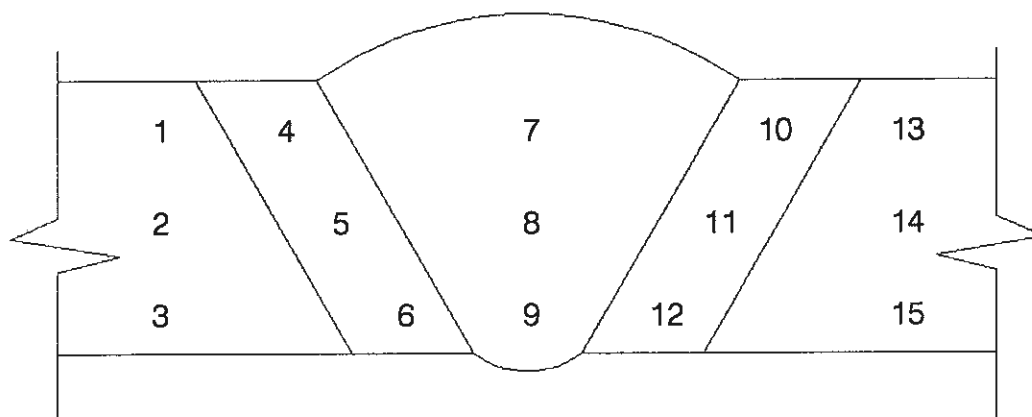
GILLES PERREULT, R.E.T.
MANAGER, LABORATORY SERVICES

CANSPEC GROUP INC.

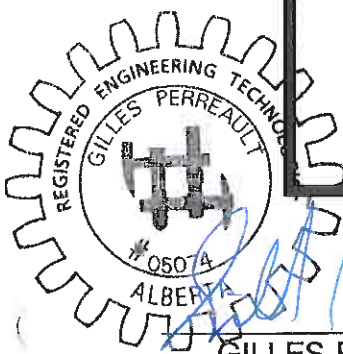
HARDNESS TEST REPORT**CUSTOMER:** RJV Gas Field Services Ltd.**ADDRESS:** 4901 - 47 Street, Vegreville, AB**ATTENTION:** Dale Laniuk**MATERIAL DESCRIPTION:** Weld Procedure RJV-106

4" OD STD Welded Pipe, PWHT at 1225°F for 1 hour

ASME SA106 Grade B to AISI 4130

PURCHASE ORDER NO.: N/A**DATE TESTED:** September 23, 1994**CANSPEC JOB NO.:** 94-09-2178

LOCATION	HRB	LOCATION	HRB
1	89.0	9	90.0
2	91.5	10	75.0
3	91.0	11	78.0
4	97.0	12	75.0
5	98.5	13	73.0
6	95.0	14	75.0
7	98.0	15	75.0
8	98.5		



GILLES PERREAULT, R.E.T.
MANAGER, LABORATORY SERVICES

CANSPEC GROUP INC.

COMPANY NAME RJV Gasfield Service Ltd

WELDING PROCEDURE SPEC. No. RJV-107 DATE May - 30 -95

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) 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. 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 R. ROSEBERG

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.

POSITIONS (QW - 405) POSITIONS OF GROOVE <u>Flat</u> WELDING PROGRESSION UP <u>Forward</u> DOWN _____ POSITIONS OF FILLET <u>Flat</u>	POSTWELD HEAT TREATMENT (QW - 407) TEMPERATURE RANGE <u>N/A</u> TIME RANGE _____ GAS (QW - 408) <table style="width:100%; border-collapse: collapse;"> <tr> <th colspan="4">PRECENT COMPOSITION</th> </tr> <tr> <th></th> <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>		
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>																				
PREHEAT (QW - 406) 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 <u>Direct</u>	POLARITY <u>Reverse</u>	AMP. Range <u>90 - 650</u>	VOLTS Range <u>18 - 32</u>
TUNGSTEN ELECTRODE SIZE AND TYPE <u>N/A</u>		<small>PURE TUNGSTERN 2% THORISTED, ETC.</small>	
MODE OR METAL TRANSFER FOR GMAW <u>Short circuiting arc</u>		<small>SPRAY ARC, SHORT CIRCUITING ARC, ETC.</small>	
ELECTRODE WIRE FEED SPEED RANGE <u>120 to 200 inches per minute</u>			

TECHNIQUE (QW - 410)	
STRING OR WEAVE BEAD <u>String & Weave</u>	
ORIFICE OR GAS CUP SIZE <u>1/2" to 1.0"</u>	
INITIAL AN INTERPASS CLEANING (BRUSHING, GRINDING, ETC.) <u>Grind all tie in on stop and start to a feather edge on the root.</u>	
<u>Grind to sound metal for interpass welding.</u>	
METHOD OF BACK GOUGING <u>Arc-Air when required, then grind to sound metal.</u>	
OSCILLATION <u>1.56 mm past each side of bevel</u>	
CONTACT TUBE TO WORK DISTANCE <u>1.56mm</u>	
MULTIPLE OR SINGLE PASS (PER SIDE) <u>Multi</u>	
MULTIPLE OR SINGLE ELECTRODES <u>Single</u>	
TRAVEL SPEED (RANGE) <u>As per Table below</u>	
PEENING <u>Not permitted</u>	
OTHER <u>Depending on the thickness of material being welded, different diameter of electrode for SMAW should be used</u>	
<u>care must be taken not to exceed the maximum Heat Input permitted.</u>	
<u>Heat Input = Amp. X Volt X 60 = Joules</u>	
<u>Inches travel per minute</u>	
<u>GMAW = (26,000 Joules) SMAW = (52,000 Joules) SAW = (26,400 Joules)</u>	

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:

Attention: *Sharon*

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

LINCOLN
ELECTRIC

TYPICAL VALUES ONLY

This is to certify that Lincoln 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) 7/16"
Passes/Layers 18/8
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:

	AVS/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)

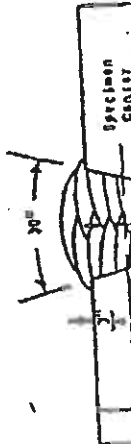
%	E70C-14K ELECTRODE		DEPOSIT	
	REQUIREMENTS	Analysis	REQUIREMENTS	Analysis
C	.06-.19	.10	.08	.08
Mn	.90-1.40	1.29	1.32	1.32
Si	.35-.75	.54	.50	.50
S	.025 max	.003	.003	.003
P	.025 max	.007	.010	.010
Cu (total)	.35 max	.21	.18	.18
Ti	.03-.17	.08	.02	.02

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

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

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

Donald J. Bell
DONALD J. BELL
CERTIFICATION SUPERVISOR



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

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 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

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.

VESSEL STOCK

*** ** ** ** ** ** ** ** ** ** ** ** ** ** ** ** * P R O D U C T S H I P P E D * * * * *
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				

*** ** ** ** * M E C H A N I C A L P R O P E R T I E S * * * * *
HEAT 0732S 43969 SAMPLE GAUGE 1.7500 TEST COND. METH. DIR. T TEST YIELD TENSILE KSI 81 * % ELONG *
2" 8" 30

IMPACT TESTS

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

*** ** ** ** * C H E M I C A L P R O P E R T I E S * * * * *
HEAT 0732S 53 C MN S P SI CR NI CU MO ALT ALS CB V B TI N D.O.
.20 1.09 .008 .008 .32 .19 .19 .18 .05 .032 .030 .008 .025

D.O.
.46

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

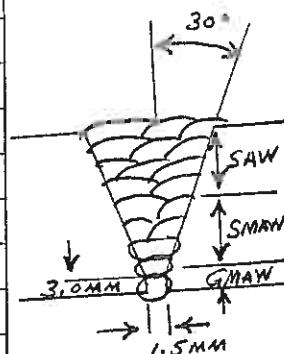
QW - 483

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		
WELD 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
DIMETER 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		

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 WEAWE 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
ER	

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

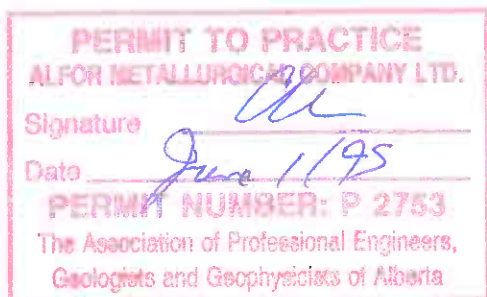
METAL TEST REPORT

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.

Results:	Sample 5 Top	Sample 5 Bottom	Sample 6 Top	Sample 6 Bottom
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

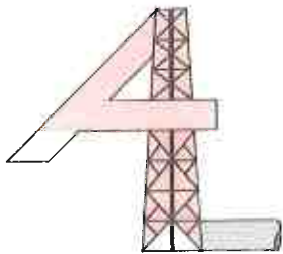
Guided side bend samples 1, 2, 3, and 4: Pass Tests.



Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

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

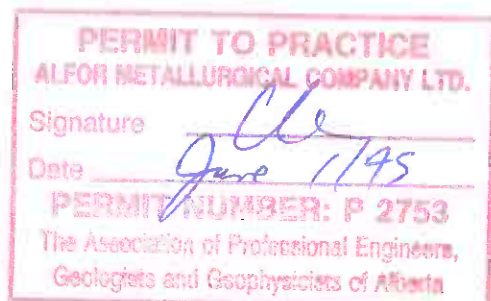
Material Description: ASME SA-516, Grade 70; 1.750"-thick normalized plate;
GMAW/SMAW/SAW welded; as-welded condition.

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

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

Results:

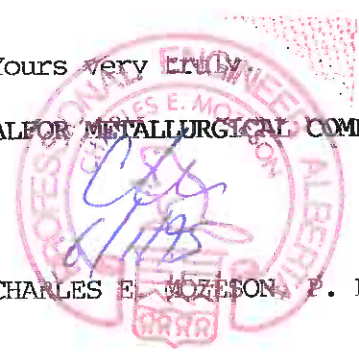
Weld zone (Top of weldment):	96 ft-lb (130 Joules);
	146 ft-lb (198 Joules);
	45 ft-lb (61 Joules).
Heat-affected zone:	38 ft-lb (52 Joules);
	73 ft-lb (99 Joules);
	108 ft-lb (146 Joules).
Weld zone (Bottom of weldment):	24 ft-lb (33 Joules);
	15 ft-lb (20 Joules);
	24 ft-lb (33 Joules).



Yours very truly,

ALFOR METALLURGICAL COMPANY LTD.

CHARLES E. MOZESON, P. Eng.





ALFOR METALLURGICAL COMPANY LTD.

CONSULTING ENGINEERS

FILE #95-315

PQR #RJV-107A

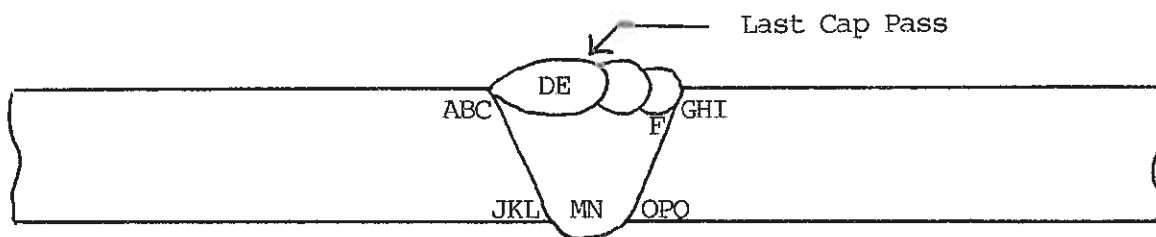
June 1, 1995

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

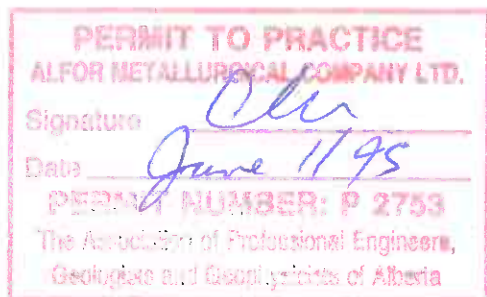
VICKERS HARDNESS TESTING OF STEEL WELDMENT

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.

POSITIONS (QW - 405) POSITIONS OF GROOVE <u>Flat</u> WELDING PROGRESSION UP <u>Forward</u> DOWN <u> </u> POSITIONS OF FILLET <u>Flat</u>	POSTWELD HEAT TREATMENT (QW - 407) TEMPERATURE RANGE <u>1150°F</u> TIME RANGE <u>1 hour per inches</u> GAS (QW - 408) <table style="width:100%; border-collapse: collapse;"> <tr> <th colspan="4">PRECENT COMPOSITION</th> </tr> <tr> <th></th> <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><u> </u></td> <td><u> </u></td> </tr> <tr> <td>BACKING</td> <td><u>N/A</u></td> <td><u> </u></td> <td><u> </u></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>	<u> </u>	<u> </u>	BACKING	<u>N/A</u>	<u> </u>	<u> </u>
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>	<u> </u>	<u> </u>																		
BACKING	<u>N/A</u>	<u> </u>	<u> </u>																		
PREHEAT (QW - 406) PREHEAT TEMP. <u>100°F</u> INTERPASS TEMP. MAX. <u>600°F</u> PREHEAT MAINTENANCE <u>Continuous by Gas or Electric</u> (CONTUNUOUS OR SPECIAL HEATING SHOULD BE RECORDED)																					

ELECTRICAL CHARACTERISTICS (QW 409)			
CURRENT <u>Direct</u>	POLARITY <u>Reverse</u>	AMP. Range <u>90 - 650</u>	VOLTS Range <u>18 - 32</u>
TUNGSTEN ELECTRODE SIZE AND TYPE <u>N/A</u>		<small>PURE TUNGSTERN 2% THORISTED, ETC.</small>	
MODE OR METAL TRANSFER FOR GMAW <u>Short circuiting arc</u>		<small>SPRAY ARC, SHORT CIRCUITING ARC, ETC.</small>	
ELECTRODE WIRE FEED SPEED RANGE <u>120 to 200 inches per minute</u>			

TECHNIQUE (QW - 410)	
STRING OR WEAWE BEAD <u>String & Weave</u>	
ORIFICE OR GAS CUP SIZE <u>1/2" to 1.0"</u>	
INITIAL AN INTERPASS CLEANING (BRUSHING, GRINDING, ETC.) <u>Grind all tie in on stop and start to a feather edge on the root.</u>	
<u>Grind to sound metal for interpass welding.</u>	
METHOD OF BACK GOUGING <u>Arc-Air when required, then grind to sound metal.</u>	
OSCILLATION <u>1.56 mm pass each side of bevel</u>	
CONTACT TUBE TO WORK DISTANCE <u>1.56mm</u>	
MULTIPLE OR SINGLE PASS (PER SIDE) <u>Multi</u>	
MULTIPLE OR SINGLE ELECTRODES <u>Single</u>	
TRAVEL SPEED (RANGE) <u>As per Table below</u>	
PEENING <u>Not permitted</u>	
OTHER <u>Depending on the thickness of material being welded, different diameter of electrode for SMAW should be used</u>	
<u>care must be taken not to exceed the maximum Heat Input permitted.</u>	
<u>Heat Input = Amp. X Volt X 60 = Joules</u>	
<u>Inches travel per minute</u>	
<u>GMAW = (26,000 Joules) SMAW = (52,000 Joules) SAW = (26,400 Joules)</u>	

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)

COMPANY NAME RJV Gasfield Service LtdWELDING PROCEDURE SPEC. No. RJV-108DATE May - 30 -95

WELDING No.

DATE

SUPPORT PQR No.(S)

RJV-108AWELDING PROCESS(ES) GMAW/SMAW/SAW PWHTTYPE(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 designBACKING (YES) X (NO) XBACKING MATERIAL (TYPE) Weld metal where applicable☐

METAL

☐

NONFUSING METAL

☐

NONMETALLIC

☐

OTHER

ALBERTA
LABOUR
BOILERS & PRESSURE VESSELS ACT
WELDING PROCEDUREReg. No. WP. 1312.2
Spec No. RJV-108
Weld Process GMAW / SMAW / SAW
Mati. 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 203mm PWHT YES
IMPACT RANGE 15.9 to 57mm CVN 46°C
Yr. 95 Mo. 6 Day 15 Signed R. ROSEBERGR. ROSEBERG, P. ENG.
WELDING SPECIALIST

BASE METALS (QW-403)

- 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 203mmPIPE DIA. RANGE GROOVE All diameter FILLET All diameterOTHER 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
- 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
RODE - FLUX (CLASS)			
TRADE NAME			Lincolmweld 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.
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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:

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

Attn: Graham

LINCOLN
ELECTRIC

TYPICAL VALUES ONLY

This is to certify that Lincoln Electrode 70-95,000 combination, classification E70-18, 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 12, 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:

Wire Feed Speed (in/min) 45
Current (amps) 550
Voltage (volts) 28
Travel Speed (in/min) 16

Electrical Stickout (in) 1-1/4
Passes/Layers 10/10
Preheat Temp. (°F) 270
Interpass Temp. (°F) 300

Mechanical Properties of the weld deposit and electrode were as follows:

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

EM14K ELECTRODE REQUIREMENTS	Analysis	REQUIREMENTS	DEPOSIT Analysis
C	.10	.15	.08
Mn	1.29	.50	1.32
Si	.54	.003	.50
S	.003	.007	.003
P	.007	.025 max	.010
Cu (total)	.21	.25 max	.18
Fe	.08	.03-17	.02

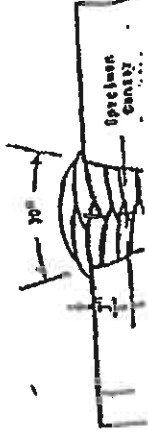
Radiographic Test: Met requirements.
Test assembly constructed of ASTM A36 steel.

Diffusible Hydrogen (l)
(AWS A4.3-93): ml/100 g 5.2
3.3

(1) 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



ALGOMA STEEL INC.

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

CUSTOMER PURCHASE ORDER NUMBER M20824-1010	ENTRY DATE OCT 17/94	SHIP DATE 94-11-23	TALLY NUMBER 237143	SHIPPER'S 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

CUSTOMER SPECIFICATION

HR MULTIPLE CERTIFIED PLATE - CARBON - ASME SA 516 70 (1992) - CUNL 15/12 FT
LBS AT -50 F - C 0.22 MAX CE .49 MAX (A1M .42 MAX) PER SA 20, SUPP REAT S20
& S21 - CU .20 MAX, NI .25 MAX, CR .25 MAX, MO .08 MAX, NI + CR +
MO) = .70 MAX - PUG - 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 7/R TEST REPORTS REQ'D - INCL C.E.

CUSTOMER VESSEL STOCK

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	07325 53	1	22870				

PLATE NUMBER	SAMPLE GAUGE	TEST COND.	TEST METH.	TEST DIR.	YIELD KSI	TENSILE KSI	% ELONG
07325 43969	1.7500	N	.2	T	55	81	30

IMPACT TESTS

PLATE NUMBER	SAMPLE GAUGE	TEST COND.	TEST METH.	TEST DIR.	COUPON SHAPE	TEST TEMP.	FTLB	FTLB AVG.
07325 43969	1.7500	N	CVN	L	FULL	-50F	72	68

HEAT	C	MN	S	P	SI	CR	NI	CU	MO	ALT	ALS	CB	V	B	TI	N	D.O.
07325 53	.20	1.09	.008	.008	.32	.19	.19	.18	.05	.032	.030	.008	.025				.46



*** 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.

CONTINUED ON NEXT PAGE

A. Riutta
MANAGING METALLURGIST

QW - 483

COMPANY NAME RJV Gasfield Services Ltd

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

'S No. RJV-108

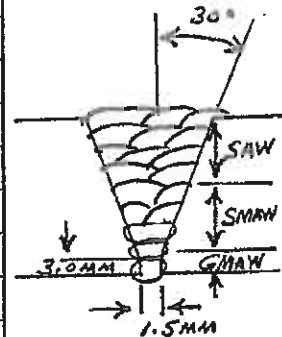
WELDING PROCESS(ES) GMAW/SMAW/SAW PWHT

WELDING POSITIONS (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/Mln 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 1150°F

TIME 105 minutes

OTHER _____

FILLER METALS (QW - 404)

WFA SPECIFICATION	5.18	5.1	5.17
WFS 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			

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 past 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

ER _____

QW - 483 (back)

PQR No. RJV-108A

TENSILE TEST (QW - 150)

SPECIMEN 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	Ductile/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 Hardness Test see Vickers Test Report (File #95-317)

DEPOSIT ANALYSIS _____

OTHER _____

WELDER'S NAME Albert Welin

STAMP NO. W-11912

TESTS CONDUCTED BY: Alfor Metallurgical Comp. Ltd

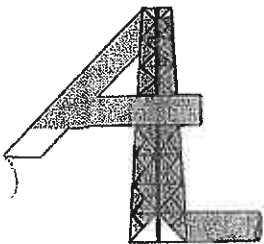
LAB TEST NO. File #95-317

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 Gasfield Services Ltd

BY [Signature]

DATE May - 30 - 95



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.

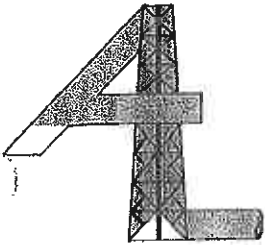
Results:	Sample 5 Top	Sample 5 Bottom	Sample 6 Top	Sample 6 Bottom
Width:	0.745 in.	0.743 in.	0.742 in.	0.746 in.
Thickness:	0.798 in.	0.816 in.	0.807 in.	0.824 in.
Area:	0.595 sq. in.	0.606 sq. in.	0.599 sq. in.	0.615 sq. in.
Ultimate Load:	49 350 lb	48 550 lb	50 550 lb	49 800 lb
Tensile Strength:	83 000 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.

CHARLES E. VOZNESON, 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/SAW welded; PWHT condition.

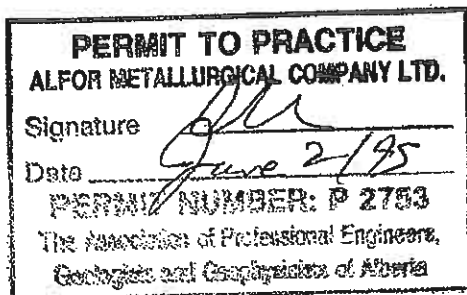
Specimen Type: Charpy V-notch full-sized weld zone and heat-affected zone impact specimen, as per Part UG-84 of the ASME Code.

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

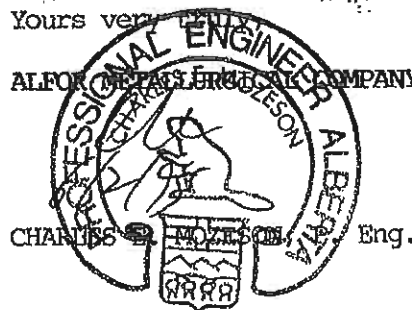
Results: Weld zone (Top of weldment): 153 ft-lb (207 Joules);
100 ft-lb (136 Joules);
146 ft-lb (198 Joules).

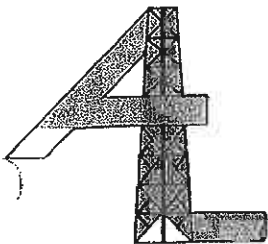
Heat-affected zone: 53 ft-lb (72 Joules);
73 ft-lb (99 Joules);
45 ft-lb (61 Joules).

Weld zone (Bottom of weldment): 19 ft-lb (26 Joules);
32 ft-lb (43 Joules);
24 ft-lb (33 Joules).



Yours very truly,
ALFOR METALLURGICAL COMPANY LTD.





ALFOR METALLURGICAL COMPANY LTD.

CONSULTING ENGINEERS

FILE #95-317

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

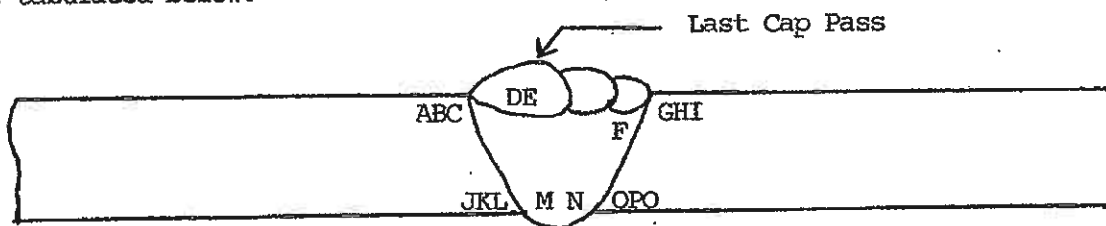
PQR #RJV-108A

June 2, 1995

VICKERS HARDNESS TESTING OF STEEL WELDMENT

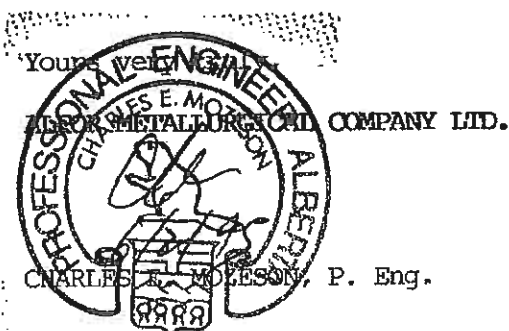
Material Description: ASME SA-516, Grade 70; 1.759"-thick normalized plate;
GMAW/SMAW/SAW welded; PWHT condition.

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.



<u>Location</u>	<u>HV1</u>	<u>Location</u>	<u>HV1</u>	<u>Location</u>	<u>HV1</u>
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 [Signature]
Date June 2/95
PERMIT NUMBER: P 2753
The Association of Professional Engineers,
Geologists and Geophysicists of Alberta



QW - 482

COMPANY NAME RJV Gas Field Service Ltd.WELDING PROCEDURE SPEC. No. RJV-109DATE September 20, 1995

WELDING No. _____ DATE _____

SUPPORT PQR No. (S) RJV-109WELDING PROCESS(ES) GTAW/SAWTYPE(S) Manual as-welded

(AUTOMATIC, MANUAL, MACHINE OR OTHER)

JOINTS (QW - 402)

JOINT DESIGN Vee-Groove and all ASME joint designsBACKING (YES) X (NO) XBACKING MATERIAL (TYPE) Weld metal where applicable (no retainers)☐ METAL ☐ NONFUSING METAL☐ NONMETALLIC ☐ OTHER

ALBERTA BOILERS SAFETY ASSOCIATION

PROVINCE OF ALBERTA
SAFETY CODES ACT

WELDING PROCEDURE

Reg. No. WP 1312.2Spec No. RJV-109Weld Process GTAW/SAWMatl. Gr. P No. 8 to P No. 8Elec. Gr. F No. 6+5 A No. 8Th. Qual. For 17mm PWHT NOYr. 95 Mo. 9 Day 25 Signed R. RosebergR. ROSEBERG, P. ENG.
WELDING SPECIALIST

BASE METALS (QW-403)

No. 8

GROUP No. _____

TOP No. 8

GROUP No. _____

OR

SPECIFICATION TYPE AND GRADE _____

SPECIFICATION TYPE AND GRADE _____

OR

CHEM. ANALYSIS AND MECH. PROP. _____

CHEM. ANALYSIS AND MECH. PROP. _____

THICKNESS RANGE:

BASE METAL

GROOVE

WITH IMPACT

FILLET

WITHOUT IMPACT 1.58mm to 17mm

All thickness

PIPE DIA. RANGE

GROOVE

All diameter

FILLET

All thickness

OTHER Maximum thickness per layer for GTAW = 6mm SMAW = 11mm

FILLER METALS (QW-404)

SPECIFICATION No. (SFA)

5.8

5.4

AWS No. (CLASS)

ER3XXL

E3XXL-15/16

No.

F8

F5

A. No. OR CHEMICAL ANALYSIS

8

8

TYPE OF FILLER METALS

1/16", 3/32", 1/8"

5/64", 3/32", 1/8", 5/32"

POSITIONED WELD METAL THICKNESS RANGE

GROOVE

Up to 6mm

Up to 11mm

FILLET

All thickness

All thickness

RODS FLUX (CLASS)

N/A

TRADE NAME

N/A

CONSUMABLE INSERT

N/A

QW - 482 (back)

WPS No. RJV-109

REVISION No.

POSITIONS(QW - 405)

POSITIONS OF GROOVE All positions
 WELDING PROGRESSION UP Up DOWN
 POSITIONS OF FILLET All positions

PREHEAT(QW - 406)

PREHEAT TEMP. 100°F
 INTERPASS TEMP. MAX. 400°F
 REHEAT MAINTENANCE Continuous with Gas/Electric.
 (CONTINUOUS OR SPECIAL HEATINGS SHOULD BE RECORDED)

POSTWELD HEAT TREATMENT(QW - 407)

TEMPERATURE RANGE N/A
 TIME RANGE

GAS (QW - 408)

	PERCENT COMPOSITION		
	GAS(ES)	MIXTURE	FLOW RATE
SHIELDING	Argon	99.9%	12-15 cfm.
TRAILING	N/A		
BACKING	Argon	99.9%	12-30 cfm.

ELECTRICAL CHARACTERISTICS(QW 409)

CURRENT Direct POLARITY GTAW-SP SMAW-RP AMP. Range 30 - 140 VOLTS Range 9 - 24
 TUNGSTEN ELECTRODE SIZE AND TYPE 3/32" (2.5mm), 1/8" (3.2mm) 2% Thoriated
 (PURE TUNGSTEN 2% THORIATED, ETC.)
 MODE OR METAL TRANSFER FOR GMAW N/A
 (SPRAY ARC, SHORT CIRCUITING ARC, ETC.)
 ELECTRODE WIRE FEED SPEED RANGE N/A

TECHNIQUE(QW - 410)

STRING OR WEAVE BEAD String & Weave
 ORIFICE OR GAS CUP SIZE 1/4" (6.3mm) to 1" (25.4mm)
 ITALIAN INTERPASS CLEANING (BRUSHING, GRINDING ETC.) Grind all tie in on stop and start to a feather edge, grind and brush to sound metal between each interpass with stainless steel disc and brush
 METHOD OF BACK GOUGING Grind to sound metal
 SCILLATION 1.5mm past each side of bevel
 CONTACT TUBE TO WORK DISTANCE N/A
 MULTIPLE OR SINGLE PASS (PER SIDE) Multi
 MULTIPLE OR SINGLE ELECTRODES Single
 TRAVEL SPEED (RANGE) As per table below
 TACKENING Not permitted
 OTHER

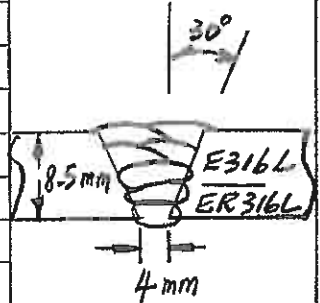
WELD LAYERS	PROCESS	FILLER METAL		CURRENT		VOLT RANGE	TRAVEL SPEED RANGE
		CLASS	DIAMETER	TYPE	AMP. RANGE		
1-2	GTAW	ER3XXL	1/16"	DC Straight	30 - 50	9 - 12	2" - 4" per minute
1-2	GTAW	ER3XXL	3/32"	DC Straight	40 - 100	9 - 12	2" - 5" per minute
# 1-2	GTAW	ER3XXL	1/8"	DC Straight	60 - 135	9 - 12	3" - 6" per minute
2 &	SMAW	E3XXL	5/64"	DC Reverse	30 - 55	18 - 23	2" - 4" per minute
etc.	SMAW	E3XXL	3/32"	DC Reverse	50 - 95	19 - 24	3.5" - 5" per minute
	SMAW	E3XXL	1/8"	DC Reverse	75 - 110	20 - 24	4" - 8" per minute
	SMAW	E3XXL	5/32"	DC Reverse	110 - 140	18 - 24	5.5" - 9" per minute

Maximum of 36 000 Joules is permitted with ER3XXL
 Maximum of 39 085 Joules is permitted with E3XXL

QW - 483

COMPANY NAME	RJV Gas Field Service Ltd.		
PROCEDURE QUALIFICATION RECORD No.	RJV-109	DATE	September 20, 1995
WELDING PROCESS (ES)	GTAW/SMAW		
WELDING TYPES (MANUAL, AUTOMATIC, SEMI-AUTO)	Manual		

JOINTS (QW - 402)		GROOVE DESIGN OF TEST COUPON						
Layer	Process	Filler	Size	Amp.	Volt	mm/Min Travel	Deposit	Joules
1	GTAW	ER316L	3/32"	75 - 85	10 - 12	50mm	1.5mm	30 600
2	GTAW	ER316L	3/32"	75 - 85	10 - 12	76mm	1.5mm	20 400
3	SMAW	E316L	3/32"	80 - 90	19 - 22	89mm	2.5mm	33 942
4	SMAW	E316L	3/32"	80 - 90	19 - 22	89mm	3.0mm	33 942
5	SMAW	E316L	3/32"	80 - 90	12 - 22	101mm	Cap	29 700



BASE METALS (QW - 403)		
MATERIAL SPEC.	SA312	
TYPE OR GRADE	316L	
W. 8	to P - No. 8	
THICKNESS OF TEST COUPON	8.5mm	
DIAMETER OF TEST COUPON	104mm	
OTHER		

POSTWELD HEAT TREATMENT (QW - 407)		
TEMPERATURE	N/A	
TIME		
OTHER		

FILLER METALS (QW - 404)		
SFA SPECIFICATION	5.9	5.4
AWS CLASSIFICATION	ER316L	E316L
FILLER METAL F - No.	F6	F5
WELD METAL AWS. A - No.	8	8
SIZE OF FILLER METAL	3/32"	3/32"
OTHER		
DEPOSITED WELD METAL	3mm	5.5mm

GAS (QW - 408)		
	GAS	MIXTURE
SHIELDING	Argon	99.9%
TRAILING	N/A	
BACKING	Argon	99.9%
		FLOW RATE
		12 cfm.
		15 cfm.

ELECTRICAL CHARACTERISTICS (QW - 409)		
CURRENT	Direct	
POLARITY	GTAW - Straight SMAW - Reverse	
AMPS.	75 - 90	VOLTS 10 - 22
TUNGSTEN ELECTRODE SIZE	1/8" (3.2mm)	
OTHER		

POSITION (QW - 405)	
POSITION OF GROOVE	6G
WELD PROGRESSION (UP OR DOWN HILL)	Uphill
OTHER	

TECHNIQUE (QW - 410)	
TRAVEL SPEED	2" to 5" per minute
STRING OR WEAVE BEAD	String & Weave
OSCILLATION	1.5mm past each side of bevel
MULTIPASS OR SINGLEPASS (PER SIDE)	Multi
SINGLE OR MULTIPLE ELECTRODES	Single
OTHER	

PREHEAT (QW - 406)	
PREHEAT TEMP.	100°F
RPS TEMP.	400°F
OTHER	

QW - 483 (back)

PQR No. RJV-109

TENSILE TEST (QW - 150)

SPECIMEN NO.	WIDTH	THICKNESS	AREA	ULTIMATE TOTAL	ULTIMATE UNIT	TYPE OF FAILURE
5	0.740 in.	0.326 in.	0.241 sq.in.	22 500 lb	93 300 psi	Ductile/Parent
6	0.750 in.	0.320 in.	0.240 sq.in.	22 350 lb	93 100 psi	Ductile/Parent

GUIDED BEND TESTS (QW - 160)

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

TOUGHNESS TEST (QW - 170)

TEST TEMPERATURE _____
 NOTCH TYPE _____

SPECIMEN NO.	NOTCH LOCATION	IMPACT TEST	
		JOULES	FOOT/Lb.

FILLET-WELD TEST (QW - 180)

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

MACRO RESULTS _____

OTHER TESTS

ELDER'S NAME Mike Hyndman STAMP NO. W-4359

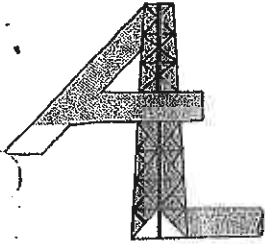
TESTS CONDUCTED BY: Alfor Metallurgical Company Ltd. LAB TEST NO. # 95-516

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.

MANUFACTURED BY RJV Gas Field Service Ltd.

DATE September 20, 1995

BY [Signature]



ALFOR METALLURGICAL COMPANY LTD.

CONSULTING ENGINEERS

FILE #95-516

PQR #RJV-109

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

September 20, 1995

METAL TEST REPORT

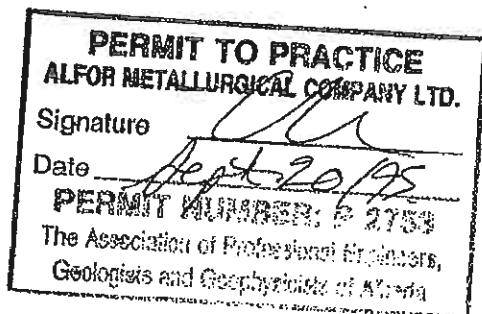
Material Description: ASME SA-312, Grade TP316L; NPS4 X 0.337" W.T. pipe; GTAW Root + SMAW Fill & Cap; as-welded condition.

Specimen Type: Reduced-section tensile, as per Figure QW-462.1(b) of the ASME Code; guided face and root bend, as per Figure QW-462.3(a) of the ASME Code.

Results:	Sample 5	Sample 6
Width:	0.740 in.	0.750 in.
Thickness:	0.326 in.	0.320 in.
Area:	0.241 sq. in.	0.240 sq. in.
Ultimate Load:	22 500 lb	22 350 lb
Ultimate Tensile Strength:	93 300 psi	93 100 psi
Fracture Character:	Ductile	Ductile
Fracture Location:	Parent	Parent

Guided face bend samples 2 and 4: Pass Tests;

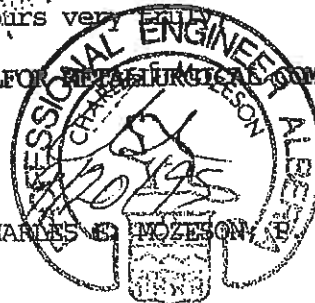
Guided root bend samples 1 and 3: Pass Tests.



Yours very truly

ALFOR METALLURGICAL COMPANY LTD.

CHARLES G. MOZESON, P. Eng.



SEP 09 2013

ABSA

WELDING PROCEDURE SPECIFICATION NO.: 115 (Rev.1)

WELDING PROCEDURE QUALIFICATION RECORD NO.(S): 115-1, 115-2, 115-3

QUALIFIED FOR

Base Metal (Typical): P1 Groups 1 & 2 to P1 Groups 1 & 2
(SA 333 Gr.6, SA 350 Gr.LF2, SA 420 WPL6, SA 516 Gr.70 etc.)
Process(es): SMAW Weld Types: GROOVE & FILLET
Position: ALL POSITIONS Diameter: ALL DIAMETERS
Filler Metal: E6010, E7018-1

BASE METAL CONDITIONS & GROOVE THICKNESS RANGE QUALIFIED:

NOTCH TOUGHNESS APPLICATIONS TO -46°C AS WELDED

BASE METAL THICKNESS RANGE 3.2 to 44.4 mm (0.125 to 1.750 in.) inclusive

COMBINED DEPOSITED WELD METAL THICKNESS

ASME B31.1 19.1 mm (0.750 in.) maximum

ASME B31.3 19.1 mm (0.750 in.) maximum

ASME SECTION VIII, DIVISION 1 38.1 mm (1.50 in.) maximum

ABSA

SAFETY CODES ACT - PROVINCE OF ALBERTA
WELDING PROCEDURE

Reg. No. WP 1312.2
Spec. No. 115 (REV.1)
Weld Process SMAW
Matl. Gr. P No. 1 Gr.1+2 WP No. 1 Gr.1+2
Elec. Gr. P No. 3+4 A No. 1
Th. Qual. For 3.2 to 44.4 mm P.W.M.T. NO
CVN -46°C

Yr. 13 Mo. 9 Day 18 signed **R. ROSEBERG, P.ENG.**
WELDING SPECIALIST

PROVINCIAL REGISTRATION

QW-482 WELDING PROCEDURE SPECIFICATION (WPS)

Company Name R.J.V. GASFIELD SERVICES
Welding Procedure Specification No. 115 Date August 16, 2013
Supporting PQR No.(s) 115-1, 115-2, 115-3
Welding Process(es) Shielded Metal-Arc Welding (SMAW)

JOINTS (QW-402)

Joint Design All ASME groove & fillet, reference construction drawing for joint details.
Where joint details are not specified, refer to figures 1 to 15 attached
Root Opening As per attached typical groove designs, see figures 1 to 15 attached
Backing With or without Retainers Not required

BASE METALS (QW-403)

P-Number P1 Groups 1 & 2 To P-Number P1 Groups 1 & 2
Thickness Range: Groove See cover page for thickness qualified by governing code (1)
(1) Reference ASME B31.3 Table 323.3.1 Impact Testing
Requirement for Metals, thickness limitations for Tests on
Welds in Fabrication or Assembly
Fillet All base metal thicknesses
Pipe Diameter Ranges: Groove All diameters
Fillet All diameters
Deposited Weld Metal (Per Pass) E6010: 3.2 mm (0.125 in.) maximum
E7018-1: 4.8 mm (0.188 in.) maximum

FILLER METALS (QW-404)

	SMAW	SMAW
Specification No. (SFA)	<u>SFA 5.1</u>	<u>SFA 5.1</u>
AWS No. (Class)	<u>E6010</u>	<u>E7018-1</u>
F-No.	<u>F3</u>	<u>F4</u>
A-No.	<u>A1</u>	<u>A1</u>
Size	<u>3/32 to 3/16 in. inclusive</u>	<u>3/32 to 1/4 in. inclusive</u>
Deposited Weld Metal Thickness Range:		
Groove	<u>4.8 mm (0.188 in.) max. (1)</u>	<u>38.1 mm (1.50 in.) max. (1)</u>
Fillet	<u>All fillet sizes</u>	<u>All fillet sizes</u>

(1) Combined deposited weld metal thickness shall not exceed 19.1 mm (0.750 in.)
for ASME B31.1, B31.3 and 38.1 mm (1.50 in.) for ASME Section VIII, Division 1

POSITION (QW-405)

Position of Groove All positions Position of Fillet All positions
Weld Progression F3: Vertical up or down F4: Vertical up

PREHEAT (QW-406)

Preheat Temperature (Minimum) See attached preheat sheet prior to welding.
Interpass Temperature (Maximum) 288°C (550°F)
Preheat Maintenance See attached preheat sheet prior to welding. Preheat maintenance is
not required if welding is interrupted or after the completion of welding
unless required by the code of construction.

POSTWELD HEAT TREATMENT (QW-407)Temperature Range N/A Time Range N/A**ELECTRICAL CHARACTERISTICS (QW-409)**Current Direct Polarity Reverse, electrode positive
Amps See Table #1 Volts See Table #1**Maximum Heat Input**

Base Metal Thickness Range	E6010 Electrode	E7018-1 Electrode
0.125 - 0.499 in.	33,730 J/in.	40,460 J/in.
0.50 - 0.624 in.	39,550 J/in.	53,500 J/in.
0.625 - 1.750 in.	32,430 J/in.	74,550 J/in.

TECHNIQUE (QW-410)Manual or Automatic Manual
Multiple or Single Pass Per Side F3: Either F4: Multiple
String or Weave Either
Travel Speed See Table #1
Initial & Interpass Cleaning Brushing, chipping or grinding as required
Method of Back Gouging Air carbon arc, back-grind as required
Peening Not permitted
Use of Thermal Process N/A**TABLE 1 - WELDING PARAMETERS**

Process	Filler Metal	Diameter mm (in.)	Current Type & Polarity	Amperage Range	Voltage Range	Travel Speed mm/min (i.p.m.)
SMAW	E6010	2.4 (3/32)	DCRP	50 - 100	18 - 34	35 - 300 (1.4 - 12)
SMAW	E6010	3.2 (1/8)	DCRP	60 - 140	19 - 34	44 - 350 (1.7 - 14)
SMAW	E6010	4.0 (5/32)	DCRP	115 - 250	21 - 34	93 - 400 (3.7 - 16)
SMAW	E6010	5.0 (3/16)	DCRP	120 - 300	21 - 34	97 - 460 (3.8 - 18)
SMAW	E7018-1	2.4 (3/32)	DCRP	60 - 110	18 - 26	22 - 300 (0.9 - 12)
SMAW	E7018-1	3.2 (1/8)	DCRP	90 - 170	19 - 28	35 - 350 (1.4 - 14)
SMAW	E7018-1	4.0 (5/32)	DCRP	110 - 220	20 - 30	45 - 400 (1.8 - 16)
SMAW	E7018-1	5.0 (3/16)	DCRP	160 - 320	20 - 30	65 - 500 (2.6 - 20)
SMAW	E7018-1	6.4 (1/4)	DCRP	275 - 360	21 - 32	118 - 550 (4.6 - 22)

Note: Welding parameters shall be adjusted to insure that the maximum heat input value specified in QW-409 above is not exceeded.
Heat Input (joules per inch) = (Amperage X Voltage X 60) / Travel Speed (inches per minute)

TYPICAL JOINT DESIGNS

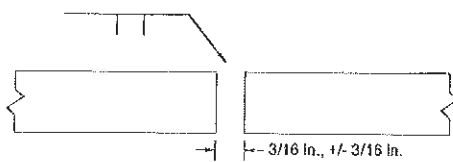


Figure 1
Single Square Butt

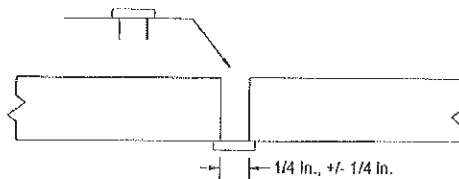


Figure 2
Single Square Butt with Backing Strip

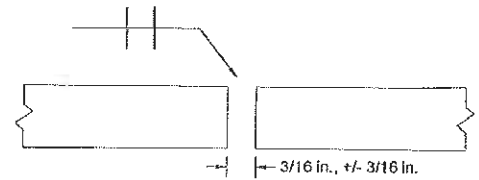


Figure 3
Double Square Butt

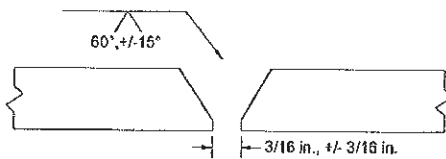


Figure 4
Single Vee Butt

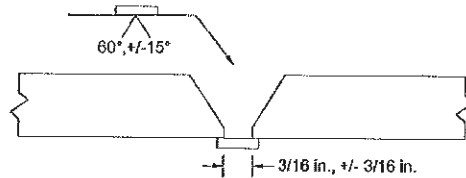


Figure 5
Single Vee Butt with Backing Strip

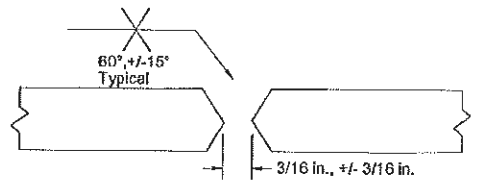


Figure 6
Double Vee Butt

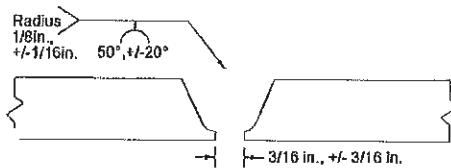


Figure 7
Single U Butt

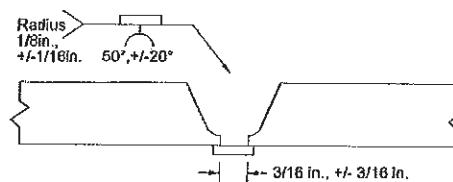


Figure 8
Single U Butt with Backing Strip

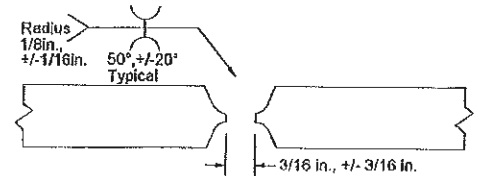


Figure 9
Double U Butt

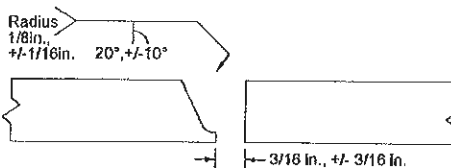


Figure 10
Single J Butt

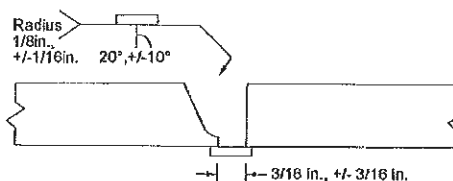


Figure 11
Single J Butt with Backing Strip

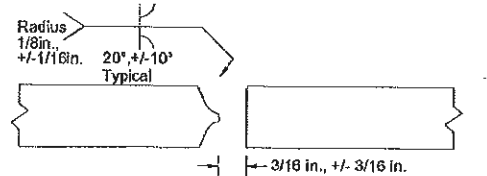


Figure 12
Double J Butt

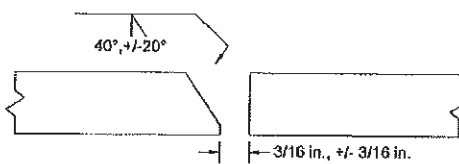


Figure 13
Single Bevel Butt

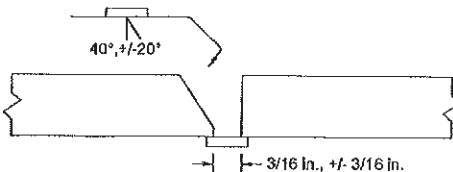


Figure 14
Single Bevel Butt with Backing Strip

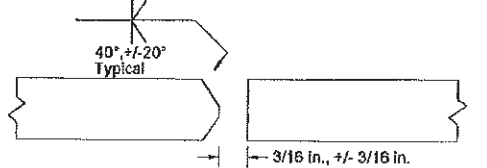


Figure 15
Double Bevel Butt

Additional joint designs and internal misalignment on circumferential welds shall be within the dimensional limits stated on the approved construction drawing and/or the engineering design.

PREHEAT**P-No. 1**

1. Welds joining pressure parts or attachments shall be preheated to not less than the minimum preheat temperatures stated in paragraph 5.
2. The preheat temperature shall be maintained during welding.
3. If welding is interrupted, the weld joint and adjacent areas shall be reheated to the minimum preheat temperature stated in paragraph 5, prior to the start of welding.
4. Preheat temperatures shall be checked by the welder or inspector, using temperature indicating crayons or other reputable methods.
5. Minimum preheating temperatures shall be as follows:

PRESSURE VESSELS IN ACCORDANCE WITH ASME SECTION VIII, DIV. 1

NOMINAL WALL THICKNESS	MINIMUM PREHEAT TEMPERATURE
0 to 32 mm (0 to 1.25 in.)	10°C (50°F)
Over 32 mm (Over 1.25 in.)	95°C (200°F)
Over 25 mm (1.0 in.) & specified maximum carbon content in excess of 0.30%.	79°C (175°F)

- The conditions of UW-30 shall apply for base metal temperatures below 0°C (32°F).
- The preheat zone shall extend at least 50 mm (2.0 in.) beyond each edge of the weld.

PROCESS PIPING IN ACCORDANCE WITH ASME B31.3

NOMINAL WALL THICKNESS	MINIMUM SPECIFIED BASE METAL TENSILE STRENGTH	MINIMUM PREHEAT TEMPERATURE
< 25 mm (1.0 in.)	≤ 490 MPa (71 ksi)	10°C (50°F)
≥ 25 mm (1.0 in.)	All	79°C (175°F)
All	> 490 MPa (71 ksi)	79°C (175°F)

- The preheat zone shall extend at least 25 mm (1.0 in.) beyond each edge of the weld.
- The interruption of welding shall be subject to the requirements of paragraph 330.2.4.

POWER PIPING IN ACCORDANCE WITH ASME B31.1

NOMINAL WALL THICKNESS	MINIMUM PREHEAT TEMPERATURE
Over 25 mm (1.0 in.) & specified maximum carbon content in excess of 0.30%.	80°C (175°F)
All others	10°C (50°F)

- The preheat zone shall extend beyond each edge of the weld for at least 76.2 mm (3.0 in.) or 1.5 times the base metal thickness (as defined in paragraph 131.4.1), whichever is greater.

QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

Company Name R.J.V. GASFIELD SERVICES
Procedure Qualification Record No. 115-1 Date August 9, 2013
Welding Procedure Specification No. 115
Welding Process(es) Shielded Metal-Arc Welding (SMAW)

JOINTS (QW-402)

Type Butt joint, single vee groove, see next page

BASE METALS (QW-403)

Material Specification No. SA 333 to SA 350 Type or Grade Gr.6 to Gr.LF2
P-No. P1 Grp.1 To P-No. P1 Grp.2 Thickness 6.32 mm (0.249 in.)
Heat Number 81183 to 12/32057 Carbon Equivalent (1) 0.22 to 0.37
Diameter 168.3 mm (6.625 in.) O.D. Other Schedule 40 m/c to 0.249 in.
Deposited Weld Metal (Per Pass) Did not exceed 2.4 mm (0.094 in.) for E6010,
and 3.2 mm (0.125 in.) for E7018-1

(1) Per CSA Z662 Carbon Equivalent formula. See attached chemical composition product analysis material test report

FILLER METALS (QW-404)

Specification No. (SFA)	<u>SFA 5.1</u>	<u>SFA 5.1</u>
AWS No. (Class)	<u>E6010 (1)</u>	<u>E7018-1 (2)</u>
Filler Metal F-No.	<u>F3</u>	<u>F4</u>
Filler Metal A-No.	<u>A1</u>	<u>A1</u>
Size of Electrode	<u>See attached sketch</u>	
Deposited Weld Metal Thickness	<u>2.38 mm (0.094 in.)</u>	<u>3.94 mm (0.155 in.)</u>

(1) Lincoln Electric Company: Lincoln Fleetweld 5P+
(2) Air Liquide Canada Inc.: LA 18 Plus

POSITION (QW-405)

Position of Groove 5G Weld Progression Vertical up

PREHEAT (QW-406)

Preheat Temperature 10°C (50°F) Interpass Temp. (Max.) 232°C (450°F)

POSTWELD HEAT TREATMENT (QW-407)

Temperature N/A Time N/A

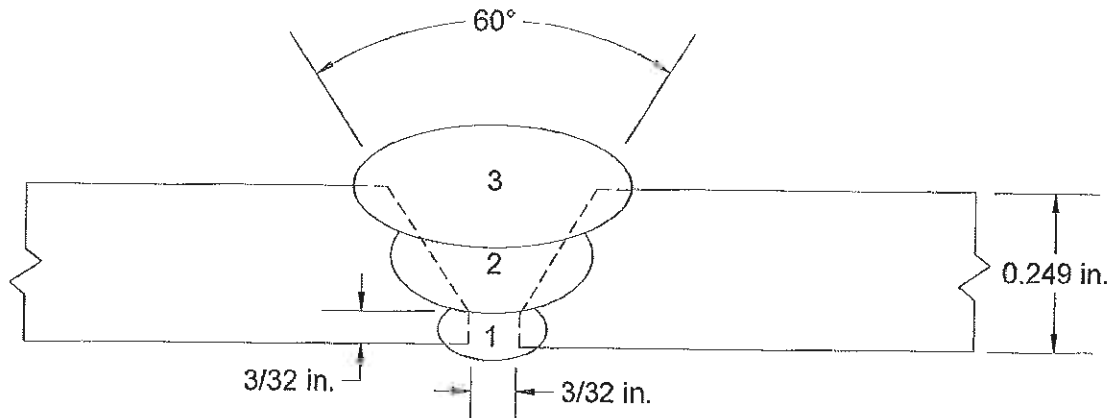
ELECTRICAL CHARACTERISTICS (QW-409)

Current	<u>Direct</u>	Polarity	<u>Reverse, electrode positive</u>
Amps	<u>See next page</u>	Volts	<u>See next page</u>
Heat Input	<u>F3: 33,700 J/in. maximum</u>		<u>F4: 40,460 J/in. maximum</u>

TECHNIQUE (QW-410)

Manual or Automatic	<u>Manual</u>	
Multiple or Single Pass Per Side	<u>F3: Single</u>	<u>F4: Multiple</u>
String or Weave	<u>Root: String</u>	<u>Remainder: Weave</u>
Travel Speed	<u>See next page</u>	
Use of Thermal Process	<u>N/A</u>	

PQR NO. 115-1



Pass	Process	Filler Metal	Diameter mm (in.)	Current & Polarity	Amperage Range	Voltage Range	Travel Speed mm/min (i.p.m.)
1	SMAW	E6010	3.2 (1/8)	DCRP	82 - 86	24 - 26	95 (3.7)
2	SMAW	E7018-1	2.4 (3/32)	DCRP	80 - 84	21 - 22	126 (5.0)
3	SMAW	E7018-1	2.4 (3/32)	DCRP	80 - 84	21 - 22	65 (2.0)

PQR NO. 115-1**TENSILE TEST (QW-150)**

Specimen No.	Width mm (in.)	Thickness mm (in.)	Area Sq. mm (Sq. in.)	Ultimate Load N (lbs.)	Ultimate Stress MPa (psi)	Character & Fracture Location
T1	19.3 (0.760)	5.06 (0.199)	97.7 (0.151)	50 250 (11,300)	515 (74,600)	Partial Cup & Cone Parent Metal (SA 333 Gr.6)
T2	19.3 (0.760)	5.21 (0.205)	101 (0.156)	51 608 (11,600)	513 (74,400)	Partial Cup & Cone Parent Metal (SA 333 Gr.6)

GUIDED BEND TEST (QW-160)

Type & Figure No.	Result	Type & Figure No.	Result
QW-462.3a, TRB - R1	Pass	QW-462.3a, TFB - F1	Pass
QW-462.3a, TRB - R2	Pass	QW-462.3a, TFB - F2	Pass

NOTCH-TOUGHNESS TEST

Type of Test Charpy V-Notch Orientation Transverse
 Test Temperature -48° C (-55° F) Specimen Size 10 X 5 mm

Specimen No.	Notch Location	Impact Values J (ft. lbs)
D2.1	Weld Metal	18.7 (13.8)
D2.2	Weld Metal	20.1 (14.8)
D2.3	Weld Metal	28.2 (20.8)
D3.1	P1 Grp.1 - HAZ	>141 (>104)
D3.2	P1 Grp.1 - HAZ	40.7 (30.0)
D3.3	P1 Grp.1 - HAZ	>141 (>104)
D4.1	P1 Grp.2 - HAZ	59.9 (44.2)
D4.2	P1 Grp.2 - HAZ	35.3 (26.0)
D4.3	P1 Grp.2 - HAZ	48.8 (36.0)

OTHER TESTS

Vickers Hardness - see attached laboratory test report

Welders Name Bernie Sorbora Certificate File No. W-6819
 Tests Conducted By SGS Ludwig Associates Ltd.
 Laboratory Test No. E13-551.1

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

Manufacturer R.J.V. GASFIELD SERVICES

Date _____ Signed _____

QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

Company Name R.J.V. GASFIELD SERVICES
Procedure Qualification Record No. 115-2 Date August 9, 2013
Welding Procedure Specification No. 115
Welding Process(es) Shielded Metal-Arc Welding (SMAW)

JOINTS (QW-402)

Type Butt joint, single vee groove, see next page

BASE METALS (QW-403)

Material Specification No. SA 516 to SA 516 Type or Grade Gr.60 to Gr.70
P-No. P1 Grp.1 To P-No. P1 Grp.2 Thickness 12.7 mm (0.50 in.)
Heat Number 354638 to 354638 Carbon Equivalent (1) 0.38 to 0.38
Diameter N/A Other Plate Product Form
Deposited Weld Metal (Per Pass) Did not exceed 2.4 mm (0.094 in.) for E6010,
and 3.2 mm (0.125 in.) for E7018-1

(1) Per CSA Z662 Carbon Equivalent formula. See attached chemical composition product analysis material test report

FILLER METALS (QW-404)

Specification No. (SFA)	<u>SFA 5.1</u>	<u>SFA 5.1</u>
AWS No. (Class)	<u>E6010 (1)</u>	<u>E7018-1 (2)</u>
Filler Metal F-No.	<u>F3</u>	<u>F4</u>
Filler Metal A-No.	<u>A1</u>	<u>A1</u>
Size of Electrode	<u>See attached sketch</u>	
Deposited Weld Metal Thickness	<u>2.38 mm (0.094 in.)</u>	<u>10.3 mm (0.406 in.)</u>
(1)	<u>Lincoln Electric Company: Lincoln Fleetweld 5P+</u>	
(2)	<u>Air Liquide Canada Inc.: LA 18 Plus</u>	

POSITION (QW-405)

Position of Groove 3G Weld Progression Vertical up

PREHEAT (QW-406)

Preheat Temperature 10°C (50°F) Interpass Temp. (Max.) 260°C (500°F)

POSTWELD HEAT TREATMENT (QW-407)

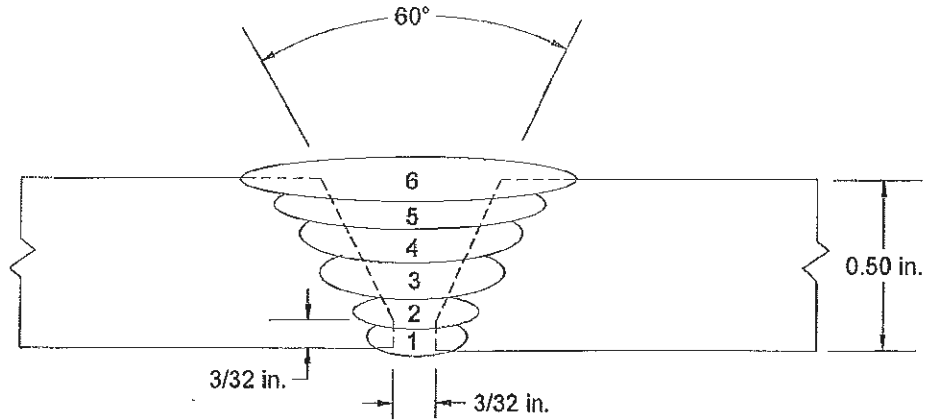
Temperature N/A Time N/A

ELECTRICAL CHARACTERISTICS (QW-409)

Current	<u>Direct</u>	Polarity	<u>Reverse, electrode positive</u>
Amps	<u>See next page</u>	Volts	<u>See next page</u>
Heat Input	<u>F3: 39,550 J/in. maximum</u>		<u>F4: 53,500 J/in. maximum</u>

TECHNIQUE (QW-410)

Manual or Automatic	<u>Manual</u>	
Multiple or Single Pass Per Side	<u>F3: Single</u>	<u>F4: Multiple</u>
String or Weave	<u>Root: String</u>	<u>Remainder: Weave</u>
Travel Speed	<u>See next page</u>	
Use of Thermal Process	<u>N/A</u>	



Pass	Process	Filler Metal	Diameter mm (in.)	Current & Polarity	Amperage Range	Voltage Range	Travel Speed mm/min (i.p.m.)
1	SMAW	E6010	3.2 (1/8)	DCRP	76 - 80	23 - 25	72 (3.8)
2	SMAW	E7018-1	2.4 (3/32)	DCRP	81 - 85	21 - 22	73 (2.9)
3	SMAW	E7018-1	2.4 (3/32)	DCRP	85 - 89	21 - 22	81 (3.2)
4	SMAW	E7018-1	2.4 (3/32)	DCRP	84 - 88	21 - 22	88 (3.5)
5	SMAW	E7018-1	2.4 (3/32)	DCRP	84 - 88	21 - 22	95 (3.7)
6	SMAW	E7018-1	2.4 (3/32)	DCRP	84 - 88	21 - 22	51 (2.0)

PQR NO. 115-2

NOTCH-TOUGHNESS TEST

Type of Test Charpy V-Notch Orientation Transverse
Test Temperature -46° C (-50° F) Specimen Size 10 X 10 mm

Specimen No.	Notch Location	Impact Values J (ft. lbs)
E2.1	Weld Metal	79.2 (58.4)
E2.2	Weld Metal	54.8 (40.4)
E2.3	Weld Metal	102 (75.0)
E3.1	P1 Grp.1 - HAZ	>141 (>104)
E3.2	P1 Grp.1 - HAZ	114 (84.0)
E3.3	P1 Grp.1 - HAZ	118 (87.0)
E4.1	P1 Grp.2 - HAZ	132 (97.2)
E4.2	P1 Grp.2 - HAZ	>141 (>104)
E4.3	P1 Grp.2 - HAZ	104 (76.4)

OTHER TESTS

Vickers Hardness - see attached laboratory test report

Welders Name Bernie Sorbora Certificate File No. W-6819
Tests Conducted By SGS Ludwig Associates Ltd.
Laboratory Test No. E13-551.2

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

Manufacturer R.J.V. GASFIELD SERVICES

Date _____ Signed _____

QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

Company Name R.J.V. GASFIELD SERVICES
Procedure Qualification Record No. 115-3 Date August 9, 2013
Welding Procedure Specification No. 115
Welding Process(es) Shielded Metal-Arc Welding (SMAW)

JOINTS (QW-402)

Type Butt joint, single vee groove, see next page

BASE METALS (QW-403)

Material Specification No. SA 516 to SA 516 Type or Grade Gr.60 to Gr.70
P-No. P1 Grp.1 To P-No. P1 Grp.2 Thickness 22.2 mm (0.875 in.)
Heat Number 365803 to 365803 Carbon Equivalent (1) 0.39 to 0.39
Diameter N/A Other Plate Product Form
Deposited Weld Metal (Per Pass) Did not exceed 2.4 mm (0.094 in.) for E6010,
and 3.2 mm (0.125 in.) for E7018-1

(1) Per CSA Z662 Carbon Equivalent formula. See attached chemical composition product analysis material test report

FILLER METALS (QW-404)

Specification No. (SFA)	<u>SFA 5.1</u>	<u>SFA 5.1</u>
AWS No. (Class)	<u>E6010 (1)</u>	<u>E7018-1 (2)</u>
Filler Metal F-No.	<u>F3</u>	<u>F4</u>
Filler Metal A-No.	<u>A1</u>	<u>A1</u>
Size of Electrode	<u>See attached sketch</u>	
Deposited Weld Metal Thickness	<u>2.38 mm (0.094 in.)</u>	<u>19.8 mm (0.781 in.)</u>

(1) Lincoln Electric Company: Lincoln Fleetweld 5P+
(2) Air Liquide Canada Inc.: LA 18 Plus

POSITION (QW-405)

Position of Groove 3G Weld Progression Vertical up

PREHEAT (QW-406)

Preheat Temperature 10°C (50°F) Interpass Temp. (Max.) 260°C (500°F)

POSTWELD HEAT TREATMENT (QW-407)

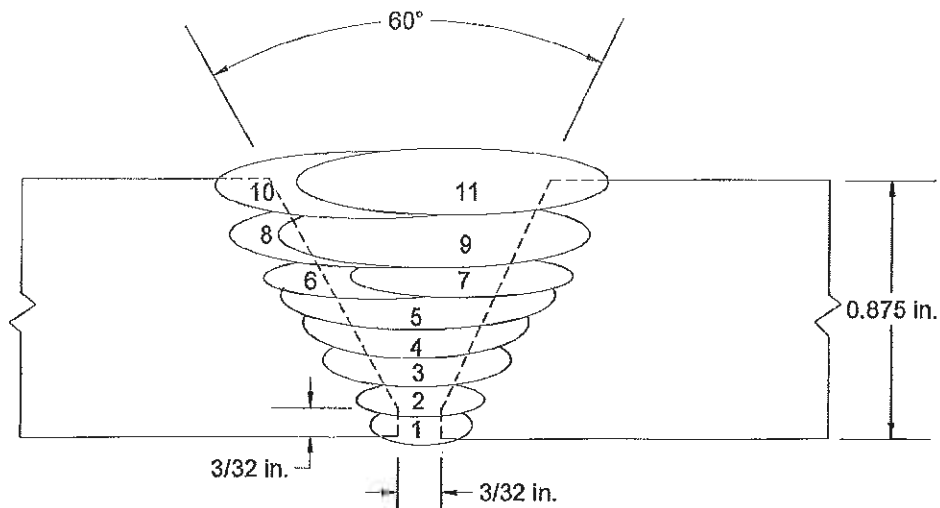
Temperature N/A Time N/A

ELECTRICAL CHARACTERISTICS (QW-409)

Current	<u>Direct</u>	Polarity	<u>Reverse, electrode positive</u>
Amps	<u>See next page</u>	Volts	<u>See next page</u>
Heat Input	<u>F3: 32,430 J/in. maximum</u>		<u>F4: 74,550 J/in. maximum</u>

TECHNIQUE (QW-410)

Manual or Automatic	<u>Manual</u>	
Multiple or Single Pass Per Side	<u>F3: Single</u>	<u>F4: Multiple</u>
String or Weave	<u>Root: String</u>	<u>Remainder: Weave</u>
Travel Speed	<u>See next page</u>	
Use of Thermal Process	<u>N/A</u>	



Pass	Process	Filler Metal	Diameter mm (in.)	Current & Polarity	Amperage Range	Voltage Range	Travel Speed mm/min (i.p.m.)
1	SMAW	E6010	3.2 (1/8)	DCRP	84 - 88	24 - 26	101 (4.0)
2	SMAW	E7018-1	2.4 (3/32)	DCRP	88 - 92	21 - 22	81 (3.2)
3	SMAW	E7018-1	2.4 (3/32)	DCRP	92 - 96	21 - 22	74 (2.9)
4	SMAW	E7018-1	3.2 (1/8)	DCRP	118 - 122	21 - 22	71 (2.8)
5	SMAW	E7018-1	3.2 (1/8)	DCRP	116 - 120	21 - 22	51 (2.0)
6	SMAW	E7018-1	3.2 (1/8)	DCRP	119 - 123	21 - 22	122 (4.8)
7	SMAW	E7018-1	3.2 (1/8)	DCRP	119 - 123	21 - 22	114 (4.5)
8	SMAW	E7018-1	3.2 (1/8)	DCRP	119 - 123	21 - 22	122 (4.8)
9	SMAW	E7018-1	3.2 (1/8)	DCRP	115 - 119	21 - 22	121 (4.8)
10	SMAW	E7018-1	3.2 (1/8)	DCRP	115 - 119	21 - 23	92 (3.6)
11	SMAW	E7018-1	3.2 (1/8)	DCRP	115 - 119	21 - 23	77 (3.0)

PQR NO. 115-3**TENSILE TEST (QW-150)**

Specimen No.	Width mm (in.)	Thickness mm (in.)	Area Sq. mm (Sq. in.)	Ultimate Load N (lbs.)	Ultimate Stress MPa (psi)	Character & Fracture Location
T1	19.0 (0.748)	20.6 (0.811)	391 (0.606)	205 772 (46,300)	526 (76,300)	Partial Cup & Cone Parent Metal (SA 516 Gr.60)
T2	19.1 (0.752)	20.3 (0.799)	388 (0.601)	207 (46,700)	535 (77,600)	Partial Cup & Cone Parent Metal (SA 516 Gr.60)

GUIDED BEND TEST (QW-160)

Type & Figure No.	Result	Type & Figure No.	Result
QW-462.2, TSB - S1	Pass	QW-462.2, TSB - S3	Pass
QW-462.2, TSB - S2	Pass	QW-462.2, TSB - S4	Pass

NOTCH-TOUGHNESS TEST

Type of Test Charpy V-Notch Orientation Transverse
 Test Temperature -46° C (-50° F) Specimen Size 10 X 10 mm

Specimen No.	Notch Location	Impact Values J (ft. lbs)
F2.1	Weld Metal	92.5 (68.2)
F2.2	Weld Metal	16.8 (12.4)
F2.3	Weld Metal	52.1 (38.4)
F3.1	P1 Grp.1 - HAZ	>141 (>104)
F3.2	P1 Grp.1 - HAZ	107 (79.0)
F3.3	P1 Grp.1 - HAZ	>141 (>104)
F4.1	P1 Grp.2 - HAZ	21.7 (16.0)
F4.2	P1 Grp.2 - HAZ	>141 (>104)
F4.3	P1 Grp.2 - HAZ	89.5 (66.0)

OTHER TESTS

Vickers Hardness - see attached laboratory test report

Welders Name Bernie Sorbora Certificate File No. W-6819
 Tests Conducted By SGS Ludwig Associates Ltd.
 Laboratory Test No. E13-551.3

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

Manufacturer R.J.V. GASFIELD SERVICES

Date _____ Signed _____



LUDWIG

TENSILE / BEND TEST

Customer: R.J.V. Gasfield Services
4901 Bruce Road
Vegreville, Alberta
T9C 1G3

Laboratory Test No.: E13-551.1
Date: August 20, 2013

Attention: Dale Laniuk

PQR No.: 115-1
Material: SA 333 Gr. 6 to SA 350 Gr. LF2
Size: 168.3 mm (6.625 in.) O.D. x 6.32 mm (0.249 in.) w.t.
Thermal Condition: As Welded

Heat No.: 81183 to 12/32057

Governing Spec.: ASME Section IX, 2011a edition and latest addenda

SAMPLE NO.(QW-150)	T1	T2
WIDTH mm (in.)	19.3 (0.760)	19.3 (0.760)
THICKNESS mm (in.)	5.06 (0.199)	5.21 (0.205)
AREA sq. mm (sq. in.)	97.7 (0.151)	101 (0.156)
ULTIMATE LOAD N (lbf)	50 250 (11,300)	51 608 (11,600)
ULTIMATE STRESS MPa (psi)	515 (74,600)	513 (74,400)
FRACTURE TYPE	Partial Cup & Cone	Partial Cup & Cone
FRACTURE LOCATION	Parent Metal (SA 333 Gr. 6)	Parent Metal (SA 333 Gr. 6)

Note: Imperial values calculated by direct conversion.

SAMPLE TYPE(QW-462.3a)	Face Bend	Face Bend	Root Bend	Root Bend
SAMPLE NO.	F1	F2	R1	R2
RESULTS	Pass	Pass	Pass	Pass

Test Conducted By: Nina Laderoute, T.T.

Certified By: 
Karen Koens, R.E.T.

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LUDWIG ASSOCIATES LTD. IS NOW PART OF SGS, THE WORLD'S LEADING INSPECTION, VERIFICATION, TESTING AND CERTIFICATION COMPANY.



LUDWIG

CHARPY V-NOTCH IMPACT TEST

Customer: R.J.V. Gasfield Services
4901 Bruce Road
Vegreville, Alberta
T9C 1C3

Laboratory Test No.: E13-551.1
Date: August 19, 2013

Attention: Dale Laniuk

PQR No.:	115-1	Heat No.:	81183 to 12/32057
Material:	SA 333 Gr. 6 to SA 350 Gr. LF2		
Size:	168.3 mm (6.625 in.) O.D. x 6.32 mm (0.249 in.) w.t.		
Thermal Condition:	As Welded		

Specimen Size:	10 x 5 mm (0.394 x 0.197 in.)	Machine:	Satec SI-1K3, S/N: 1503
Orientation:	Transverse	Capacity:	407 J (300 ft-lbf)
Test Temperature:	-48°C (-55°F)	Verified Range:	3.4-141 J (2.5-104 ft-lbf)
Governing Spec.:	ASME Section VIII, Div. 1, UG-84 – 2011a edition and latest addenda		

Specimen Number	Notch Location	Impact Values	
		Joules	(ft-lbf)
D2.1	Weld Metal within 1/16" of root	18.7	(13.8)
D2.2	Weld Metal within 1/16" of root	20.1	(14.8)
D2.3	Weld Metal within 1/16" of root	28.2	(20.8)
D3.1	Gr. 6 - HAZ	>141	(>104)
D3.2	Gr. 6 - HAZ	40.7	(30.0)
D3.3	Gr. 6 - HAZ	>141	(>104)
D4.1	Gr. LF2 - HAZ	59.9	(44.2)
D4.2	Gr. LF2 - HAZ	35.3	(26.0)
D4.3	Gr. LF2 - HAZ	48.8	(36.0)

Note: Imperial values calculated by direct conversion.

Test Conducted By: Natasha Collier, C.E.T.

Certified By: 

Natasha Collier, C.E.T.

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LUDWIG

HARDNESS TEST

Customer: R.J.V. Gasfield Services
4901 Bruce Road
Vegreville, Alberta
T9C 1C3

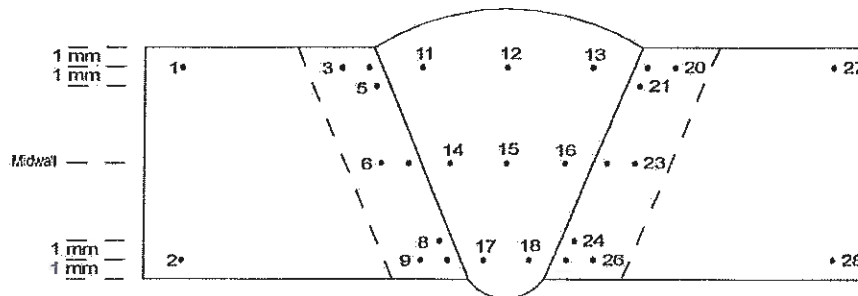
Laboratory Test No.: E13-551.1
Date: August 16, 2013

Attention: Dale Laniuk

PQR No.: 115-1
Material: SA 333 Gr. 6 to SA 350 Gr. LF2
Size: 168.3 mm (6.625 in.) O.D. x 6.32 mm (0.249 in.) w.t.
Thermal Condition: As Welded

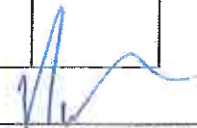
Heat No.: 81183 to 12/32057

Type of Test: Vickers 10kg (HV10)
Instrument: Leco V-100-C1
Governing Spec.: ASTM E384-11e1



SA 350 Gr. LF2				Weld Metal		SA 333 Gr. 6			
Parent Metal		HAZ				HAZ		Parent Metal	
1	191	3	171	11	179	19	164	27	149
2	169	4	178	12	191	20	141	28	157
		5	169	13	184	21	177		
		6	173	14	162	22	180		
		7	178	15	161	23	172		
		8	173	16	172	24	172		
		9	167	17	165	25	170		
		10	177	18	171	26	162		

Test Conducted By: Natashua Collier, C.E.T.

Certified By: 
Natashua Collier, C.E.T.

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LUDWIG

CHARPY V-NOTCH IMPACT TEST

Customer: R.J.V. Gasfield Services
4901 Bruce Road
Vegreville, Alberta
T9C 1C3

Laboratory Test No.: E13-551.2
Date: August 19, 2013

Attention: Dale Laniuk

PQR No.: 115-2
Material: SA 516 Gr. 60 to SA 516 Gr. 70
Thickness: 12.7 mm (0.500 in.)
Thermal Condition: As Welded

Heat No.: 354638 to 354638

Specimen Size: 10 x 10 mm (0.394 x 0.394 in.)

Orientation: Transverse

Test Temperature: -46 °C (-50 °F)

Governing Spec.: ASME Section VIII, Div. I, UG-84 – 2011a edition and latest addenda

Machine: Satec SI-1K3, S/N: 1503

Capacity: 407 J (300 ft-lbf)

Verified Range: 3.4-141 J (2.5-104 ft-lbf)

Specimen Number	Notch Location	Impact Values	
		Joules	(ft-lbf)
E2.1	Weld Metal within 1/16" of root	79.2	(58.4)
E2.2	Weld Metal within 1/16" of root	54.8	(40.4)
E2.3	Weld Metal within 1/16" of root	102	(75.0)
E3.1	Gr. 60 - HAZ	>141	(>104)
E3.2	Gr. 60 - HAZ	114	(84.0)
E3.3	Gr. 60 - HAZ	118	(87.0)
E4.1	Gr. 70 - HAZ	132	(97.2)
E4.2	Gr. 70 - HAZ	>141	(>104)
E4.3	Gr. 70 - HAZ	104	(76.4)

Note: Imperial values calculated by direct conversion.

Test Conducted By: Natashua Collier, C.E.T.

Certified By: 

Natashua Collier, C.E.T.

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SGS

LUDWIG

HARDNESS TEST

Customer: R.J.V. Gasfield Services
4901 Bruce Road
Vegreville, Alberta
T9C 1G3

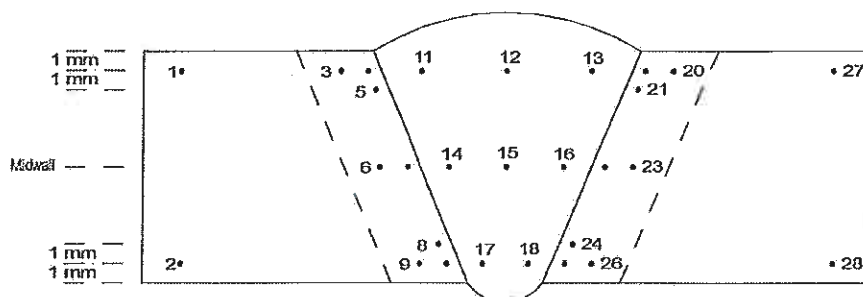
Laboratory Test No.: E13-551.2
Date: August 19, 2013

Attention: Dale Laniuk

PQR No.: 115-2
Material: SA 516 Gr. 60 to SA 516 Gr. 70
Thickness: 12.7 mm (0.500 in.)
Thermal Condition: As Welded

Heat No.: 354638 to 354638

Type of Test: Vickers 10kg (HV10)
Instrument: Buehler 5112
Governing Spec.: ASTM E384-11e1



SA 516 Gr. 70				Weld Metal		SA 516 Gr. 60			
Parent Metal		HAZ				HAZ		Parent Metal	
1	156	3	176	11	180	19	204	27	152
2	155	4	200	12	182	20	180	28	158
		5	189	13	197	21	194		
		6	170	14	176	22	175		
		7	175	15	177	23	161		
		8	192	16	172	24	193		
		9	189	17	189	25	180		
		10	194	18	192	26	178		

Test Conducted By: Karen Koens, R.E.T.

Certified By: 

Karen Koens, R.E.T.

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LUDWIG

TENSILE / BEND TEST

Customer: R.J.V. Gasfield Services
4901 Bruce Road
Vegreville, Alberta
T9C 1C3

Laboratory Test No.: E13-551.3
Date: August 19, 2013

Attention: Dale Laniuk

PQR No.: 115-3
Material: SA 516 Gr. 60 to SA 516 Gr. 70
Thickness: 22.2 mm (0.875 in.)
Thermal Condition: As Welded

Heat No.: 365803 to 365803

Governing Spec.: ASME Section IX, 2011a edition and latest addenda

SAMPLE NO.(QW-150)	T1	T2
WIDTH mm (in.)	19.0 (0.748)	19.1 (0.752)
THICKNESS mm (in.)	20.6 (0.811)	20.3 (0.799)
AREA sq. mm (sq. in.)	391 (0.606)	388 (0.601)
ULTIMATE LOAD N (lbf)	205 772 (46,300)	207 565 (46,700)
ULTIMATE STRESS MPa (psi)	526 (76,300)	535 (77,600)
FRACTURE TYPE	Partial Cup & Cone	Partial Cup & Cone
FRACTURE LOCATION	Parent Metal (SA 516 Gr. 60)	Parent Metal (SA 516 Gr. 60)

Note: Imperial values calculated by direct conversion.

SAMPLE TYPE(QW-462.2)	Side Bend	Side Bend	Side Bend	Side Bend
SAMPLE NO.	S1	S2	S3	S4
RESULTS	Pass	Pass	Pass	Pass

Test Conducted By: Wilson Symington, T.T

Certified By: 
Karen Koens, R.E.T.

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LUDWIG

CHARPY V-NOTCH IMPACT TEST

Customer: R.J.V. Gasfield Services
4901 Bruce Road
Vegreville, Alberta
T9C 1C3

Laboratory Test No.: E13-551.3
Date: August 20, 2013

Attention: Dale Laniuk

PQR No.: 115-3
Material: SA 516 Gr. 60 to SA 516 Gr. 70
Thickness: 22.2 mm (0.875 in.)
Thermal Condition: As Welded

Heat No.: 365803 to 365803

Specimen Size: 10 x 10 mm (0.394 x 0.394 in.)
Orientation: Transverse
Test Temperature: -46°C (-50°F)
Governing Spec.: ASME Section VIII, Div. 1, UG-84 – 2011a edition and latest addenda

Machine: Satec SI-1K3, S/N: 1503
Capacity: 407 J (300 ft-lbf)
Verified Range: 3.4-141 J (2.5-104 ft-lbf)

Specimen Number	Notch Location	Impact Values	
		Joules	(ft-lbf)
F2.1	Weld Metal within 1/16" of root	92.5	(68.2)
F2.2	Weld Metal within 1/16" of root	16.8	(12.4)
F2.3	Weld Metal within 1/16" of root	52.1	(38.4)
F3.1	Gr. 60 - HAZ	>141	(>104)
F3.2	Gr. 60 - HAZ	107	(79.0)
F3.3	Gr. 60 - HAZ	>141	(>104)
F4.1	Gr. 70 - HAZ	21.7	(16.0)
F4.2	Gr. 70 - HAZ	>141	(>104)
F4.3	Gr. 70 - HAZ	89.5	(66.0)

Note: Imperial values calculated by direct conversion.

Test Conducted By: Nina Laderoute, T.T.

Certified By: 

Karen Koens, R.E.T.

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LUDWIG

HARDNESS TEST

Customer: R.J.V. Gasfield Services
4901 Bruce Road
Vegreville, Alberta
T9C 1C3

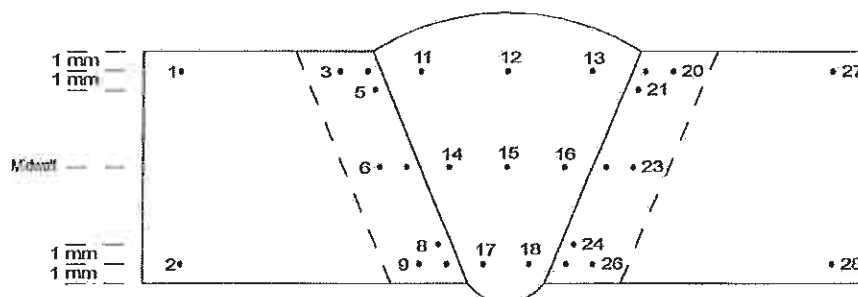
Laboratory Test No.: E13-551.3
Date: August 19, 2013

Attention: Dale Lanluk

PQR No.: 115-3
Material: SA 516 Gr. 60 to SA 516 Gr. 70
Thickness: 22.2 mm (0.875 in.)
Thermal Condition: As Welded

Heat No.: 365803 to 365803

Type of Test: Vickers 10kg (HV10)
Instrument: Buehler 5112
Governing Spec.: ASTM E384-11a



SA 516 Gr. 60				Weld Metal		SA 516 Gr. 70			
Parent Metal		HAZ				HAZ		Parent Metal	
1	157	3	177	11	212	19	212	27	158
2	157	4	225	12	204	20	176	28	159
		5	217	13	205	21	212		
		6	179	14	193	22	178		
		7	188	15	187	23	173		
		8	171	16	194	24	176		
		9	184	17	172	25	197		
		10	180	18	173	26	177		

Test Conducted By: Karen Koens, R.E.T.

Certified By: 

Karen Koens, R.E.T.

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7925 Davies Road Edmonton AB T6E 4N1 t +1 (780) 468-3030 f +1 (780) 468-3032

www.ludwigassociatesltd.com www.sgs.com

Member of the SGS Group (SGS SA)

INSPECTION CERTIFICATE

(35 EN 10204 3.1:2004-ISO 10474 3.1B:1981)

CHONG CHING / CHONG WAI LEE (CALADA) IN - YAN LEE

Manufacturing Process / Processo de Manufatura

RESEARCH ON THE

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AST KASHE AS 333+CSA Z2 1-07 CAT1 SSPSP0037/H+VACE MF01750103+IPRO LP-008

THE JOURNAL OF THE

2011年5月10日

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3. **Reliability**

176-57 MTS

247 kg

10107 1001-1

100

Composition % / Composition %

Heat N° Colado N°		Sample N° Aluente N°		Lot N° Lote N°		Pipe N° Tubo N°		Composition % / Composición %														Ca.1 Ca.2								
								X 1200																						
								C	Mn	Si	Cr	Mo	Al	S	P	Ni	V	Cu	Al	Sn	Pb			Ti	Fe	SO	Co	Bi	Co	B
78/44	1686732	47205	61	102	27	7	4	1	12	33	3	74	21	7	3	22	3	3	3	7	20	22	14	43	2	10	20	22	42	40
78/44	1686732	47205	5	102	24	7	4	1	12	36	2	78	22	3	3	21	3	3	3	7	20	22	11	48	2	10	20	22	42	40
78/44	1590818	47203	5	104	26	3	4	1	12	35	2	80	22	3	3	20	3	3	3	7	20	22	12	49	2	10	20	22	42	40
81/81	1683203	48250	4	104	26	4	4	1	8	27	3	48	17	4	4	18	4	1	1	7	20	22	12	44	3	10	20	22	42	40
81/81	1683204	48300	12	105	23	4	4	1	7	28	2	50	18	6	4	16	4	1	1	7	20	22	14	48	4	10	20	22	42	40
81/83	1683159	48304	8	104	24	4	4	1	9	25	3	43	19	4	4	18	4	1	1	7	20	22	14	44	3	10	20	22	42	40
81/83	1683194	48307	29	105	24	4	4	1	8	26	2	41	20	5	4	17	3	1	1	7	20	22	15	48	6	10	20	22	42	40
81/83	1683162	48306	53	105	24	4	4	1	8	26	2	43	19	5	5	17	4	1	1	7	20	22	14	48	6	10	20	22	42	40
81/83	1683171	48307	76	105	23	4	4	1	8	27	2	45	18	5	5	17	4	1	1	7	20	22	12	49	6	10	20	22	42	40
81/83	1683105	48305	86	105	24	4	4	1	8	27	2	45	18	5	5	17	4	1	1	7	20	22	11	47	4	10	20	22	42	40
81/83	1683191	48307	7	105	23	4	4	1	8	26	3	42	18	6	4	17	3	2	2	7	20	22	10	47	4	10	20	22	42	40
81/83	1683154	48305	6	105	22	4	4	1	9	26	3	45	19	6	4	18	4	1	1	7	20	22	18	48	5	10	20	22	42	40

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Black Mountains of Minnesota

2014/01/24

P- Products / Products

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Elleptopneustes per conchiferos yno hupitico. Conchiferos alternando en distribucion estrata supda a la 1er/.

1. **Introduction**

23081 CESANA RHIANZA, ILQ - Italy
MFG. DATE 78

Tel. +33 031.855417

See also: 0001-0001

94-157-1105

SALA PROVE E ANALISI MATERIALI / MATERIAL TESTS DEPARTMENT

COMPANY WITH
QUALITY SYSTEM
CERTIFIED BY DNV
ISO 9001

CERTIFICADO DE COLAADO SEGUNDO EN 10204 - 3.1 INSPECTION CERTIFICATE	
Certid. N. 5537	Del/Dated 26.11.2012
DDT / Del/Nº N. 4529	Fatura / Invoice N. 3657
	Del/Dated 26.11.2012
SEYBOLD INTERNATIONAL CORP.	Dest.: VAN LEEUWEN

20 Holly Street, Suite 205
TORONTO M4S3B

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K11

2

Page 2 - 11

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NOTE 100% MANUFACTURED IN ITALY
NOTES MANUFACTURING IN ACCORDANCE WITH ORDER AND SPECIFICATION
MATERIAL IN ACCORDANCE WITH NACE LR-01753200 ISO 15185-2000 - SOUR SERVICE
MATERIAL IN ACCORDANCE WITH NACE LR-01632200 - SOUR SERVICE

**UFFICIO CONTROLLO QUALITÀ
QUALITY CONTROL DEPARTMENT**

ENTE UFFICIALE DI COLLAUDO
INSPECTION AUTHORITY

**MARCHIO PRODUZIONE
MANUFACTURER'S SYMBOL**

VL QA Approved





INSPECTION CERTIFICATE 3.1	AS PER EN 10204-2004	A02
A10 Advice of dispatch No./	A08 Manufacturer's order#	C1

INSPECTION CERTIFICATE 3.1.B AS PER EN 10204:1991+A1:1995 + AS PER ISO 10474:1991

378777-02.02.11

ALL INFORMATION IS SUBJECT TO POLICY
DE

AUG 1988

EDMONTON STEEL, EDMON

AD7.1 No. ED19556-J1010-ER

ELMONTON STEEL, EDMONTON A072 No

POZ Steel casting
SA516-50

SA20-SF

B03	Any suppl requirements	ASME-II-A:10 DIL-B0E-1:R28-2010-11-22
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C3D-C39 Firdness 1951

Bid.	B072	BRT.1	BBS	C01	C02/C01	C03	C09	C05	C31	C22
Item No.	Head No.	Polyplast Test No.	Reference Field Treatment			Temp. GRF	Method of Test		Individual Values	Mean Value
01	354638	40932		XI	O	RT	EBW 10/3000	HB 150	.150 .150	1.50

C40-C49 Impact test

Form No.	Sheet No.	Rebuilt Test No.	BOS	Reference (feed)	treatment	C01	C02	C03	C04	C06	C04	C06	C08	C05	C02	Actual values	C03
						Temp.	Time	Width of test piece	Type of test piece	Testing Method	Energy	Inductance	Inductance	Mean			
01	354637	40945				KI	IV	-51	CHP-V			AV 132	180	207	173		
01	354637	40953				KI	IV	-51	CHP-V			AV 109	124	150	128		
01	354638	40850				KI	IV	-51	CHP-V			AV 147	69	126	114		
01	354638	40885				KI	IV	-51	CHP-V			AV 136	125	198	153		
01	354638	40931				KI	IV	-51	CHP-V			AV 132	202	141	125		
01	354638	40932				KI	IV	-51	CHP-V			AV 199	118	122	146		

C70-C99 Chemical composition % - Heat analysis

[illegible]

2012022703 We hereby certify, that the above mentioned materials have been delivered in accordance with the terms of order.

QMS-System: Certification as per ISO 9001

OX
Manufactures
mark

B. BALDWIN

Test House Manager

Inspector's Sign

Date 02.02.77

ଉତ୍ତର

ATB

AG der Dillinger Hüttenwerke
Postfach 1580, D-66748 Dillingen/Saar
Inspection department

Ad:



DILLINGER HÜTTE

Ediltinger Hütte Prüfzettel (Certificate) is valid until 2010. See reverse for explanations (www.ediltinger.de/certificate)

A02 INSPECTION CERTIFICATE 3.1 AS PER EN 10204:2004

INSPECTION CERTIFICATE 3.1.B AS PER EN 10204:1991+A1:1995 + AS PER ISO 10474:1991

MATERIAL TEST REPORT (MTR)

A05 Examined inspecting body

ID#

AS Purchaser

For receiver

EDMONTON STEEL, EDMON

EDMONTON STEEL, EDMON

A07.1 No.

ED10556-J1010-ER

A07.2 No.

SA20-SS

B02 Steel design

SA516-70

B03 Any appl.

ASME-II-A:10

Requirements

DIL-HUT-1-R28-2010-11-22

A10 Advice of dispatch No./

Date of dispatch

378777-02.02.11

A03 Manufacturer's order/

A03 Certificate No.

361518-001

Sheet

3/...

B01 Product

HOT ROLLED PLATES

C30-C39 Hardness test

B07.4

B07.2

Heat No.

354638

Test No.

40932

B05

Reference (per) treatment

KL

O

RT HBW 10/3000

HB 150

150

150

C32

Mean

value

150

C40-C49 Impact test

B07.4

B07.2

Heat No.

354637

Test No.

40946

B05

Reference (per) treatment

KL

LV

-51

CEP-V

AV 132

180

207

173

128

126

158

155

125

141

122

C70-C99 Chemical composition % - Heat analysis

B07.2

Heat No.

354637

Test No.

354638

C70

C

0,170

0,374

1,18

0,008

0,0010

0,0074

0,061

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QM-System: Certification as per ISO:9001

Erklärung: siehe Rückseite/Explications voir au verso/See reverse for explanations (www.dillinger.de/certificate)



DILLINGER HÜTTE

A02 INSPECTION CERTIFICATE 3.1 AS PER EN 10204:2004

INSPECTION CERTIFICATE 3.1.B AS PER EN 10204:1991+A1:1995 + AS PER ISO 10474:1991

MATERIAL TEST REPORT (MTR)

A05 Established inspecting body

A06 Purchaser

DE

Final receiver

EDMONTON STEEL, EDMON
EDMONTON STEEL, EDMON

A07.1 No.

ED10578-J1010-ER

A08 Product

368979-001

HOT ROLLED PLATES

B02 Steel design

SA516-60

SA20-S5

B03 Any suppl.

ASME-III-A:10.

requirements DIL-HOE-2-R31-2010-11-22

A10 Advice of dispatch No./

Date of dispatch

Sheet

405555-20.11.11

A09 Manufacturer's order/

A03 Certificate No.

4/...

C40-C49 Impact test

B14 Item No.	B07.1 Heat No.	B07.1 Rol./plate/ Test No.	B05 Reference (heat) treatment	C01 C02/ C03 Temp. C/F	C41 Width of test piece	C40 Type of test place	C44 Testing method	C46 Energy	C45 C42 Individual values	C43 Mean value
01	365805	97546								
01	365805	97554								

C70-C99 Chemical composition % - Heat analysis

B07.2 Heat No.	C70	C	SI	MN	P	S	N	CU	MO	NI	CR	V	NB	SN	TI
365803	Y	0,175	0,376	1,16	0,008	0,0018	0,0072	0,035	0,012	0,048	0,041	0,000	0,000	0,000	0,001
365805	Y	0,165	0,365	1,14	0,008	0,0009	0,0060	0,035	0,012	0,043	0,035	0,000	0,000	0,001	0,002

C94 Heat analysis Carbon equivalent / Alloying restrictions

B07.2 Heat No.	C94	FO-02=	FO-02=	FO-51=	FO-55=	FO-78=	FO-91=
365803		0,38	0,37	0,000	0,14	0,05	6,6
365805		0,37	0,000	0,13	0,05	6,9	

C95 Ladle treatment

ITEM NO.: 01
HEAT OF THE INDICATED ITEM: VACUUM DEGASSED / SULPHIDE SHAPE CONTROL

ITEM NO.: 01
CALCULUM TREATED

A04

Z01/2012/203 We hereby certify, that the above mentioned materials have been delivered in accordance with the terms of order.



Manufacturers mark

B. BALDAUF
Tost House Manager

AHB

AG der Dillinger Hüttenwerke:
Postfach 1580, D-66748 Dillinger/Saar
Inspection department

Inspector's stamp

Date

21.11.11

pp

1

A01

Entstehungen siehe Rückseite/Explications voir au verso/See reverse for explanations (www.dillingerdelparticipe1.com)



DILLINGER HUTTE

INSPECTION CERTIFICATE 3.1 AS PER EN 10204:2004

MATERIAL TEST REPORT (MTR)
EN 10204:1991+AI:1995 + AS PER ISO 10474:1991

A05:Established inspecting body	A06 Purchaser
DM	

EDMONTON STEEL, EDMON	AO7.1 No.	ED10578-J1010-ER
EDMONTON STEEL, EDMON	AO7.2 No.	

10	Advice of dispatch, No./ Date of dispatch
405555-20.11.11	

• A03 Manufacturer's order
• A03 Certificate No.

Shield

368979-001

41-19

Steel design.
SAS16-7.0

SA20-55

HOT ROLLED PLATES

303	Any suppl. requirements	ASME-IT-A:10 DIL-HDB-2;R31-2010-11-22
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C-10-C99 Chemical composition % - Heat analysis

Item No.	Heat No.	B07.1 Sol. plate Test No.	B05 Reference (heat) treatment	C01 C02 C01	C03 Temp. GRF	C04 Width of test piece	C40 Type of test piece	C44 Testing method	C46 Energy	C45 C42. Individual values AV±FLBF	C43 Mean value
B34	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B35	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B36	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B37	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B38	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B39	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B40	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B41	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B42	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B43	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B44	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B45	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B46	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B47	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B48	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B49	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B50	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B51	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B52	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B53	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B54	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B55	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B56	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B57	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B58	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B59	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B60	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B61	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B62	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B63	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B64	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B65	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B66	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B67	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B68	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B69	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B70	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B71	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43
B72	B07.2	B07.1	B05	C01	C03	C04	C40	C44	C46	C45	C43

C94 Heat analysis Carbon equivalent / Alloying restrictions

[illegible]

C95-Label 1: Treatment

65803	FO-02=	0,38	FO-51=	0,000	FO-55=	0,14	FO-78=	0,05	FO-91=	6,6
65805	FO-02=	0,37	FO-51=	0,000	FO-55=	0,13	FO-78=	0,05	FO-91=	6,9
C951 ladle treatment										

ITEM NO.: 01

FEAT OF THE INDICATED ITEM: VACUUM DEGASSED / SULPHIDE SHAPE CONTROL

For further information about aide retirement


ITEM NO.: 01

CALCULUM TRIPARTITUM

104

with the terms of order.

With the terms of order,



Manufacturers

ॐ नमो भगवते वासुदेवाय

Test-House Manager

Penalties:

AG der Dillinger Hüttenerwerke

Postfach 1580 D-66748 Gillissen

(continued)

AC's

WELDER LOG SHEET

[illegible]

WELDER LOG SHEET

[illegible]

Gauge Number and Pressure

Gauge Number	Gauge Pressure	Calibrated Date	CPW S/N
1,000 psi.			
#1	1,000 psi.	Sept 19,2014	PI-4449
#2	1,000 psi.	Sept 19,2014	PI-4566
#3	1,000 psi.	Nov 20,2014	PI-4568
3,000 psi.			
#22	3,000 psi.	Dec 4,2014	PI-4451
#23	3,000 psi.	June 6,2014	PI-4830
#24	3,000 psi.	June 6,2014	PI-4831
#25	3,000 psi.	June 6,2014	PI-4832
#26	3,000 psi.	June 6,2014	PI-4833
#27	3,000 psi.	June 6,2014	PI-4834
5,000 psi.			
#32	5,000 psi.	Dec 4,2014	PI-4570
#33	5,000 psi.	Dec 4,2014	PI-4569
#34	5,000 psi.	June 4,2014	PI-4814
#35	5,000 psi.	June 4,2014	PI-4815
#36	5,000 psi.	Dec 4,2014	PI-4571
#37	5,000 psi.	April 29,2014	PI-4747
#38	5,000 psi.	April 29,2014	PI-4748
#39	5,000 psi.	April 29,2014	PI-4745
#40	5,000 psi.	April 29,2014	PI-4819
#41	5,000 psi.	June 4,2014	PI-4816
#42	5,000 psi.	June 4,2014	PI-4817
#43	5,000 psi.	April 29,2014	PI-4750
#44	5,000 psi.	June 4,2014	PI-4818
#45	5,000 psi.		
#46	5,000 psi.	Nov 20,2013	PI-4572
10,000 psi.			
#47	10,000 psi.	April 29,2014	PI-4751
#48	10,000 psi.	April 29,2014	PI-4752
#49	10,000 psi.	April 29,2014	PI-4753
#50	10,000 psi.	April 29,2014	PI-4755
15,000 psi.			
#53	15,000 psi.	April 29,2014	PI-4756
#54	15,000 psi.	April 29,2014	PI-4757
20,000 psi.			
#52	20,000 psi.	June 6,2014	PI-4828
#55	20,000 psi.	June 6,2014	PI-4829



FLANGE TORQUE PROCEDURE

The assembly of all piping systems shall be done in accordance with ASME B31.3, 335, 335.1, 335.2, 335.3, and 335.4

Before assembly the gasket surfaces (Flange Face) should be totally cleaned and inspected for damage as per ASME B16.5 Table II-3

The "Bill of Materials" shall be checked to ensure the proper gaskets, grade, size and length of studs and size and grade of nuts are being used.

The torque value used shall be that of the gasket manufacturer, This value will ensure the gasket does not get crushed during tightening.

Listed below is the sequence that shall be followed during the flange torque procedure. All tightening of nuts shall be done with calibrated torque wrenches.

- A. Lubricate bolt and nut threads and nut bearing face (where it contacts the flange).with Jet-Lube "Coper Kote" or equivalent lube.
- B. After flange assembly and all nuts have been run down by hand, start wrench tightening following the sequence of the numbers indicated on the following pages, (marking the number on the flange with a crayon aids in keeping track of the tightening process).
- C. During all of the following steps, keep any gap between flanges even all around the circumference, and nuts made up approximately the same amount on each end of the bolt.
 - 1. First time around just snug the nuts with a hand wrench.
 - 2. Second time around tighten the nuts firmly with the same wrench.
 - 3. Third time around apply approximately 25% recommended torque.
 - 4. Fourth time around apply approximately 50% recommended torque.
 - 5. Fifth time around, apply 100% of recommended torque.



6. If possible, re-torque after 24 hours. Most of any bolt preload loss occurs within 24.
7. The final torque load shall be done in the presence of the shop foreman and representation of the Q.C department and owners inspector.
8. After all the flanged pipe connections have been completed, the "Torque Test Record" shall be filled out and signed by the fitter, shop foreman, Q.C. Manager and the owners inspector indicating compliance with ASME B16.5 and RJV Gas Field Services "Torque Test Procedure".

Revision #2

December 16, 2013



the pressure equipment safety authority

Certificate of Authorization Permit

Quality Management System

Expiry Date: **August 12, 2017**

Reg. No.: **AQP-1129**

RJV GAS FIELD SERVICES LTD.

**4901 BRUCE ROAD
VEGREVILLE, ALBERTA**

having complied with the provisions of the SAFETY CODES ACT, is hereby authorized to perform the activities identified in the following table:

	<u>Construction</u>	<u>Repair</u>	<u>Alter</u>
Pressure Vessels			
ASME Section VIII-1 Pressure Vessels	Shop	Shop/Field	Shop/Field
Miniature Vessels in accordance with CSA B51	Shop	---	---
Indirect Fired Heater Coils			
ASME B31.3 Indirect Fired Heater Coils	Shop	---	---
Pressure Piping			
ASME B31.1 Power Piping	Shop/Field	Shop/Field	Shop/Field
ASME B31.3 Process Piping	Shop/Field	Shop/Field	Shop/Field
Fittings			
Category A,E,H	Shop	---	---

As a condition of this permit, the holder is required to participate in interim audits by a safety codes officer to verify that the quality management system is being maintained in a manner acceptable to a safety codes officer.

Dated at Edmonton, this 8th day of August, 2014



Chief Inspector and Administrator

Certificate No.: 10073