

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
Mett. 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 drawings for joint details. Where joint details are not specified, refer to typical joint detail sheet provided.	
Backing:	F-3 electrodes with or without backing		
	F-4 electrodes with backing only.		
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			
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>	Fillet:	<u>All</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:	<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. (0.850" 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)

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 drawings for joint details. Where joint details are not specified, refer to typical joint detail sheet provided.	
Backing:	F-3 electrodes with or without backing		
	F-4 electrodes with backing only.		
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		to Chem. Analysis & Mech. Prop.:	<u>N/A</u>
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)

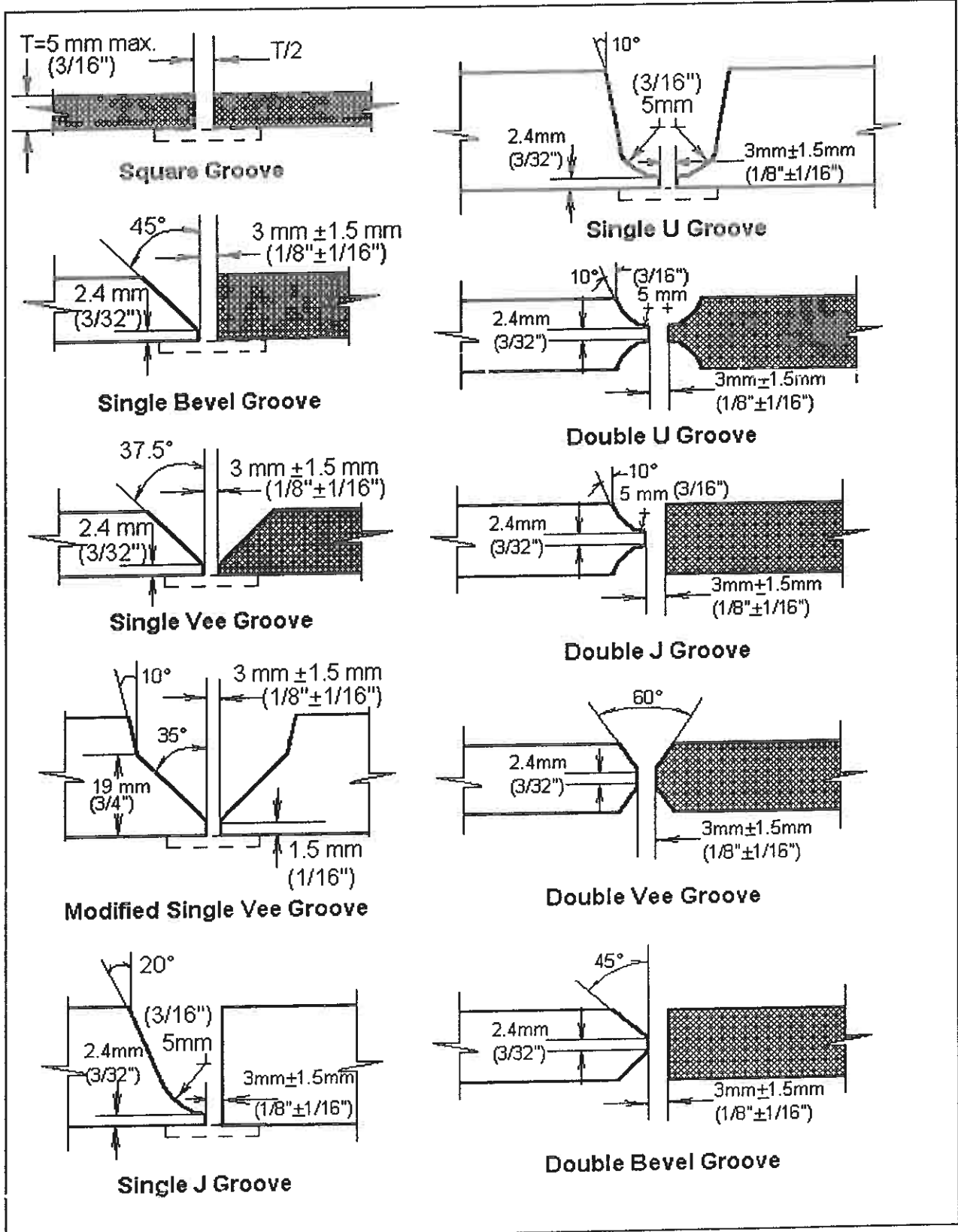
WPS # 104 Revision 2

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 cooling rates as per ASME codes.				
Position(s) of Fillet:	All					
PREHEAT QW-406		GAS QW-408				
Preheat Temp Min:	$t \leq 1" 50^{\circ}\text{F}, t > 1" 175^{\circ}\text{F}$	Shielding Gas(es):	N/A			
Interpass Temp Max:	600°F	Composition:	N/A			
Interpass Temp Min:	$t \leq 1" 50^{\circ}\text{F}, t > 1" 175^{\circ}\text{F}$	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.					

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Typical Joint Details QW-482

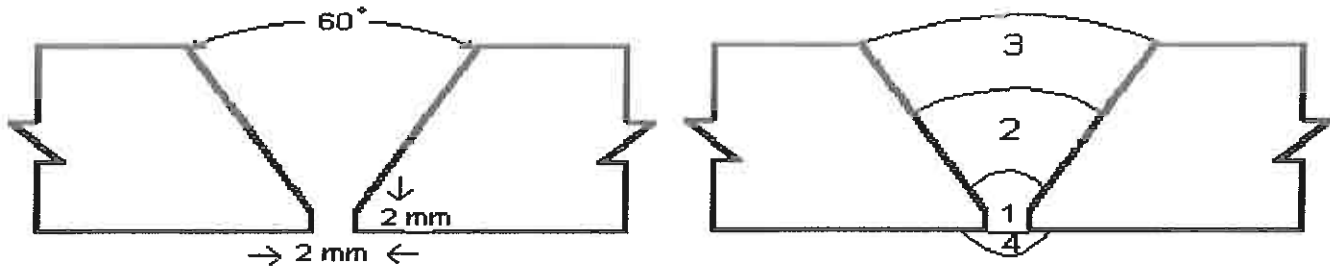
Prepared by: Qualimet



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 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" 0.174"	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: 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
POSITION QW-405		TECHNIQUE QW-410	
Position of Groove:	3G	Travel Speed:	F-3: 2 - 7.0 ipm F-4: 2.5 - 4.1 ipm
Weld Progression:	Vertical Up	String or Weave Bead:	String and weave
Other:	N/A	Oscillation:	N/A
		Multiple or Single Pass:	Multiple + single per side
		Single or Multiple Electrodes:	Single
		Other:	N/A
PREHEAT QW-406			
Preheat Temp Min.:	50° F		
Interpass Temp Max.:	500° F		
Interpass Temp Min.:	50° F		
Other:	Temperature monitored using Templastiks		

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		Drop Weight		
					% Shear	Mils	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:



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

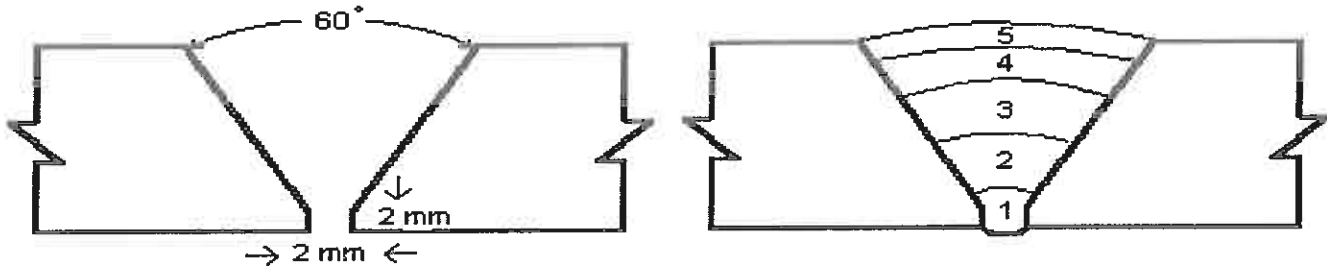
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PROCEDURE QUALIFICATION RECORD (PQR) QW-483
(Section IX, ASME Boiler and Pressure Vessel Code)

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
		Multiple or Single Pass:	Multiple
PREHEAT QW-406		Single or Multiple Electrodes:	Single
Preheat Temp Min.:	50° F	Other:	N/A
Interpass Temp Max.:	500° F		
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		Drop Weight	
					% Shear	Mils	Break	No Brk
See Attached Report								

Other Tests
Not Applicable

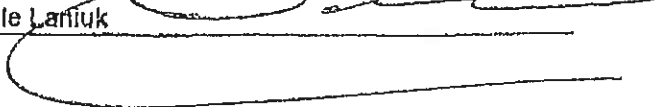
Type of Test: _____
Other: _____

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 Lafiuk 

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 processes	2	65	88	60
	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:



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