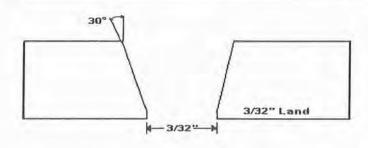
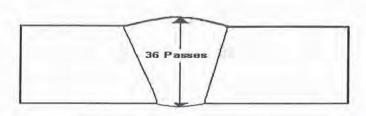
Company Name:	Sub Arc Systems		
PQR No:	SAS-1-1	Date:	January 4, 2002
Revision No.:	****	Revision Date:	Nova
WPS No:	SAS-1	- WANTED	
Welding Process(es):	SMAW/ SMAW/ SAW		
Types:	Manual/ Manual/ Machine		

JOINTS QW-402





BASE MI	ETALS QW-403	POSTWELD HEAT TR	EATMENT QW-407
Material Spec.: SA-516 Type or Grade: Grade 6 P-No.: P-1 Gro Thickness of Test Coupon: Diameter of Test Coupon: Other: Carbon Equiva	up 1 P-1 Group 2	Temperature: Time: Other:	Not Applicable
PREH	EAT QW-406	SHIELDING G	AS QW-408
Preheat & Interpass Min.: Interpass Max.:	175 °F 600°F Temperature monitored using Tempilstick	Shielding Gas: N/A Composition: N/A Flow Rate: N/A	
	FILLER MET		
Process	SMAW	SMAW	SAW
SFA Spec No:	5.1	5.1	5.17
AWS Class, No:	E6010	E7018-1	EM12K
F-No:	F-3	F-4	F-6
A-No:	A-1	A-1	A-1
Size of Filler Metal:	1/8"	1/8"	3/32"
Deposited Metal:	0.250"	0,750"	0.750"
Flux Class:	N/A	N/A	F7A6 (Neutral)
Other:	Covered Electrode	Covered Electrode	Coiled Solid Wire
			(Lincoln L61/882)
	ELECTRICAL CHARA	ACTERISTICS QW-409	
Process:	SMAW	SMAW	SAW
Current:	Direct (DC)	Direct (DC)	Direct (DC)
Polarity:	Reverse (EP)	Reverse (EP)	Reverse (EP)
Volts:	21	21	31
Amps:	110	125	450
Heat Input (J/in):	69 300	63 000	73 636
	TECHNIQ	UE QW-410	
Process:	SMAW	SMAW	SAW
Position:	3G	3G	2G
Progression:	Vertical Up	Vertical Up	Horizontal
Travel Speed (ipm):	2.5	2.25	16
String or Weave:	String	String and Weave	String
Oscillation:	N/A	N/A	N/A
Single / Multi Pass:	Multiple	Multiple	Multiple
Single / Multi Electrodes:	Single	Single	Single
Wire Feed Rate:	N/A	N/A	80 ipm

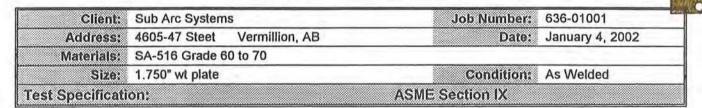
				Tensile 1		PQR#		SAS-1
				QW-46				
Specimer No.	n Widt	h Th	ickness In	Area in²	Ultimate Total Loa Lb		ress	Type of Failure & Location
			See	Attached Re	port			
			-					
			G	uided Bend QW-46	The second second second			
	Type an	d Figure No),			Result		
			See	Attached Re	port			
				1				
			1	oughness QW-170				
Specimen No.	Notch Location	Notch	Test	Impact Values	Latera % Shear	l Exp Mils	Drop Weight Break No Bri	
NO.	Location	Туре	Temp	values	% Silear	IVIIIS	Бтеак	NO BIK
			See	Attached R	enort			1
			000	- Attached It	Jon			
			F	Fillet-Weld				
Result-Satis Macro-Resu		Yes	No		n. Into Parent M	Material: Yes		No
				04				
				Other Tes	its			
Type of Tes			s Test to NA	CE MR01				
Deposit Ana	iysis:	N/A						
Welder's Na		Kolman		ck No.: W		Stamp ID	_	04004
Tests Condu	icted By:	Qualimet	inc.		La	b. Test No.:	636 -	01001
					and that the IX of the AS		vere pre	pared, we
			Manufa	cturer: Su	b Arc Systems		00	



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MECHANICAL TEST REPORT

for Procedure Qualification Record # SAS-1-1



Tensile Tests QW - 462.1(a)

Sample Identification:	CCT1	CCT2	
Sample Size - Inch:(W × T)	1.723 x 0.753	1.717 x 0.759	
Least X-Sect, Area - in2:	1.30	1.30	
Ultimate Load +lbs:	102 526	104 116	
Ult. Ten. Strength - ksi:	72.3	71.6	
Character of Failure:	Ductile	Ductile	
Location of Failure:	Base Metal 516 Gr.60 Side	Base Metal 516 Gr.60 Side	
Reg'd Tensile Strength - ksi:	60.0	60.0	
Pass or Fail:	Passed	Passed	
Remarks:			

*Bend Test QW - 462.2

Sample Identification:	CCB1	CCB2	CCB3	CCB4
Type of Bend Test;	TSB	TSB	TSB	TSB
Pass or Fail:	Pass	Pass	Pass	Pass
Remarks:				

Types of Bend Tests
TSB, TFB, TRB = transverse side, face or root bend

LSB, LFB, LRB = longitudinal side, face or root bend

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

TEST RESULTS CERTIFIED BY:

A Jann

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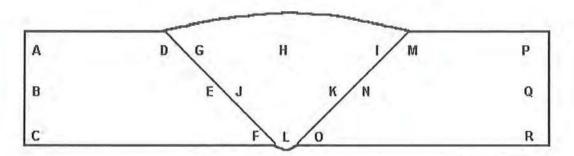


HARDNESS TEST REPORT

for Procedure Qualification Record # SAS-1-1



Client;	Sub Arc Systems	Jab Number: 636-01001				
Address;	4605-47 Steet Vermillion, Alberta T9X-1L6	Date: January 4, 2002				
Materials:	SA-516 Grade 60 to 70					
Size:	1.750" wt plate	Condition: As Welded				
Гest Method:	Hardness testing performed in accordance with a with a 10 kg load. (HV10)	ASTM E-92 using a Vickers Hardness Tester				
Equipment:	Matsuzawa Seiki Co. Ltd. Vickers Hardness Tester S/N: 7193M					
Calibration;	Test Block: 197 ± 6 DPH	Act. Reading: 197 DPH				



Hardness Values

Α	177	D	198	G	205	J	210	M	189	Р	178
В	182	E	205	Н	103	K	207	N	196	Q	181
С	173	F	201	1	208	L	202	0	194	R	179

These hardness values do not exceed 248 HV10 (HRC 22).

We certify that the statements in this record are acceptable, in accordance with the requirements of ASME Section IX and NACE MR01

Test Results Certified by:

QUALIMET INC.



30 Yours

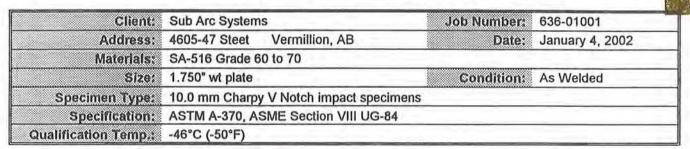


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CHARPY V-NOTCH IMPACT TEST RESULTS

For Procedure Qualification Report # SAS-1



Sample Set	Sample Number	Impact Ft-Ib	Energy (Joule)	Converted Full Size Impact Energy (J)	% Shear
Weld Zone - Root	1	14	19	24	20
Includes Both	2	48	65	81	20
SMAW Processes	3	38	51	64	20
	Average;	33	45	57	20
Weld Zone – Fill	1	58	79	79	10
	2	45	61	61	20
	3	88	119	119	40
	Average:	64	86	86	23
Heat Affected Zone	1	18	24	24	20
SA-516 Gr. 70	2	122	165	165	60
	3	101	137	137	70
	Average:	80	109	109	50
Heat Affected Zone	1	98	133	133	40
SA-516 Gr. 70	2	132	179	179	100
	3	86	117	117	40
	Average:	105	143	143	60

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:

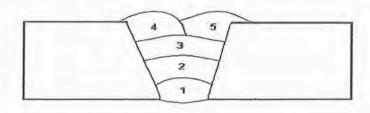
QUALIMET INC.



OU PHONE

Company Name:	Sub Arc Systems		
PQR No:	SAS-1-2	Date:	January 4, 2002
Revision No.:		Revision Date:	
WPS No:	SAS-1		
Welding Process(es):	SMAW/ SMAW/ SAW		
Types:	Manual/ Manual/ Machine		

30° 3/32" Land -3/32"-H



BASE META	LS QW-403	POSTWELD HEAT TH	REATMENT QW-407
Material Spec.: SA-516	To SA-516	Temperature:	
Type or Grade: Grade 60	Grade 70	Time:	
P-No.: P-1 Group 1	P-1 Group 2	Other:	Not Applicable
Thickness of Test Coupon:	0.375" wt.		
Diameter of Test Coupon:	Plate		
Other: Carbon Equivalent (
PREHEA"	F QW-406	SHIELDING G	AS QW-408
Preheat & Interpass Min.: 5	0 °F	Shielding Gas: N/A	
Interpass Max.: 6	00°F	Composition: N/A	
Ten	perature monitored using Tempilstick	Flow Rate: N/A	
	FILLER MET	TALS QW-404	
Process	SMAW	SMAW	SAW
SFA Spec No:	5.1	5.1	5.17
AWS Class. No:	E6010	E7018-1	EM12K
F-No:	F-3	F-4	F-6
A-No:	A-1	A-1	A-1
Size of Filler Metal:	1/8"	3/32"	3/32"
Deposited Metal:	0.100"	0.125"	0.150"
Flux Class:	N/A	N/A	F7A6 (Neutral)
Other:	Covered Electrode	Covered Electrode	Coiled Solid Wire
			(Lincoln L61/882)
46.00	ELECTRICAL CHARA	ACTERISTICS QW-409	
Process:	SMAW	SMAW	SAW
Current:	Direct (DC)	Direct (DC)	Direct (DC)
Polarity:	Reverse (EP)	Reverse (EP)	Reverse (EP)
Volts:	21	21	30
Amps:	110	110	425
Heat Input (J/in):	39 610	55 428	36 428
	TECHNIQ	UE QW-410	
Process:	SMAW	SMAW	SAW
Position:	3G	3G	2G
Progression:	Vertical Up	Vertical Up	Horizontal
Travel Speed (ipm):	3.5	2.5	21
String or Weave:	String	String and Weave	String
Oscillation:	N/A	N/A	N/A
Single / Multi Pass:	Multiple	Multiple	Multiple
Single / Multi Electrodes:	Single	Single	Single
Wire Feed Rate:	N/A	N/A	83 ipm

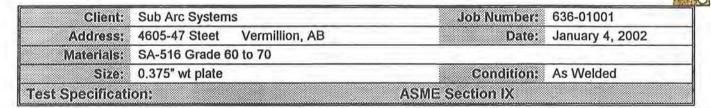
				Tensile 7	Test	QR#	SAS-1-	
Specimer No.	ı Widt	th Th	ickness In	QW-46 Area In ²	Ultimate Total Load Lb	Ultimate Unit Stress psi	Type of Failure & Location	
			See	Attached R	eport			
			G	uided Bene QW-46				
	Type an	d Figure No),			Result		
			See	Attached Re	port			
					T- 44			
				Foughness QW-170)			
Specimen No.	Notch Location	Notch Type	Test Temp	Impact Values	Lateral % Shear	The state of the s	Drop Weight Break No Brk	
1101	Locution	Турс	Tomp	Values	70 Gricui	Milio Di	TO BIK	
			See	Attached R	eport			
Result-Satis Macro-Resu	and the second s	Yes	_ No	Fillet-Weld Not Applica Pe		laterial: Yes	No	
				Other Tes	sts			
Type of Test Deposit Ana	-	ers Hardnes N/A	s Test to NA	CE MR01				
Welder's Nar Tests Condu		Kolman Qualimet		ock No.: _W		The second secon	CD 636 – 01001	
					and that the in IX of the ASI		e prepared, we	
			Manufa	acturer: Su	b Arc Systems	1 100		
						. \ / / / \		



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MECHANICAL TEST REPORT

for Procedure Qualification Record # SAS-1-2



Tensile Tests QW - 462.1(a)

Sample Identification:	CDT1	CDT2
Sample Size - inch:(W x T)	0.7300 x 0.3600	0.7200 x 0.380
Least X-Sect. Area - In2:	0.263	0.360
Ultimate Load – Ibs:	22 340	22 408
Ult. Ten. Strength – ksi:	85.0	86.4
Character of Failure:	Ductile	Ductile
Location of Failure:	Base Metal SA-516 Gr.60 Side	Base Metal SA-516 Gr.60 Side
Req'd Tensile Strength - ksi:	60.0	60.0
Pass or Fail:	Passed	Passed
Remarks:		

Bend Test QW - 462.2

Sample Identification:	CDB1	CDB2	CDB3	CDB4
Type of Bend Test:	TSB	TSB	TSB	TSB
Pass or Fail:	Pass	Pass	Pass	Pass
Remarks:				

Types of Bend Tests
TSB, TFB, TRB = transverse side, face or root bend

LSB, LFB, LRB = longitudinal side, face or root bend

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

TEST RESULTS CERTIFIED BY:

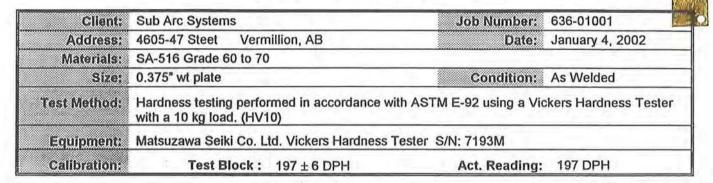
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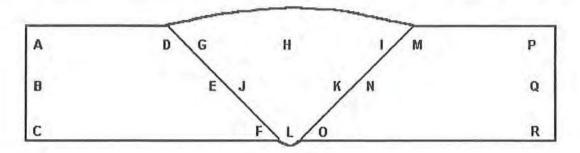




HARDNESS TEST REPORT

for Procedure Qualification Record # SAS-1-2





Hardness Values

A	198	D	208	G	215	J	212	M	204	P	193
В	195	E	203	Н	211	K	215	N	202	Q	189
С	196	F	206		210	L	209	0	207	R	195

These hardness values do not exceed 248 HV10 (22 HRC).

We certify that the statements in this record are acceptable, in accordance with the requirements of ASME Section IX and NACE MR01

Test Results Certified by:

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CHARPY V-NOTCH IMPACT TEST RESULTS

For Procedure Qualification Report # SAS-1-2



Client:	Sub Arc Systems	Job Number:	636-01001			
Address:	4605-47 Steet Vermillion, AB	Date:	January 4, 2002			
Materials:	SA-516 Grade 60 to 70					
Size:	0.375" wt plate	Condition:	As Welded			
Specimen Type:	8.5 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-Ib	Energy (Joule)	Converted Full Size Impact Energy (J)	% Shear
	1	10	14	16	20
Weld	2	12	16	19	20
	3	24	33	38	20
	Average:	15	21	24	20
	.,			,,	
Heat Affected Zone	1	82	111	131	70
SA516 Gr. 60	2	106	144	169	80
	3	146	198	233	100
	Average:	111	151	178	83
Heat Affected Zone	1 1	98	133	166	40
SA516 Gr. 70	2	132	179	224	100
	3	86	117	146	40
	Average:	105	143	179	60

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.

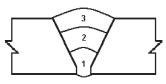
Test Results Certified By:

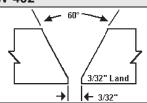
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30 Yevun

Company Name:	Sub Arc Systems	Ву:	Gary Kohlman
PQR No.:	SAS-1-3	Date:	January 4, 2002
Revision No.:	1 ¹	Revision Date:	July 15, 2014
Welding Process(es):	SMAW / SMAW / SAW	Types:	Manual / Manual / Machine

JOINTS QW-402





				3/32 Edita			
				→ ← 3/32"			
BASE M	ETAL:	S QW-403	POST\	NELD HEAT T	REATMENT	QW-407	
Material Spec.:	SA-516	SA-516	Temperature:				
Grade/Type/Class:	Gr. 60	Gr. 70	Time:				
P-No. Group No.:	P-1 Gr		Heating:				
Heat No.:	Not Re				(Not Applicable)		
ASME C.E.:	Not Re		Cooling:				
CSA C.E.:	Not Re						
Thickness & Diameter:		thick plate (machined)					
Max Weld Deposit:	<0.500	" per pass	Other:				
PREH	IEAT	QW-406		POSITION	S QW-405		
Preheat Temp. Min.:	50°F		Process:	F-3 SMAW	F-4 SMAW	SAW	
Interpass Temp. Max.:	600°F		Position:	3-G	3-G	2-G	
Interpass Temp. Min.:	50°F		Progression:	Vertical Up	Vertical Up	Horizontal	
Other:	Tempe	erature monitored by tempilstiks	Other:	Not Applicable	Not Applicable	Not Applicable	
		FILLER ME	TALS QW-	404			
Pro	cess:	SMAW		SMAW	S	AW	
SFA Specification		5.1		5.1		5.17	
AWS Classification		E6010	Е	7018-1		Л12K	
	F-No.:	F-3		F-4		F-6	
A-No.:		A-1		A-1		A-1	
Size of Filler Metal:		1/8"		3/32"	3	/32"	
Deposited Weld Metal:		0.050"		0.075"		125"	
Electrode-Flux (Class):		Not Applicable	Not Applicable			7A6	
Flux Trade Name:		Not Applicable		Not Applicable		weld 882	
Alloy Element/Flux:		Not Applicable		Applicable		lone	
Manufacturer:		Not Recorded		Recorded	Lincol	n Electric	
Trade Name:		Not Recorded	Not	Not Recorded		61	
Heat Nu	mber:	Not Recorded	Not Recorded		Not R	ecorded	
Product I	Form:	Covered Electrode	Covered Electrode		Coiled Metal Cored Wire		
		SHIELDING	GAS QW-	408			
Shielding	Gas.	02230	1	100			
Compos							
-	Rate:	(Not Applicable)	(Not	Applicable)	(Not A	oplicable)	
Trailing / Backing		()	(Not Applicable)		(11017)	-pcu.o.;	
	Rate:						
		ELECTRICAL CHAR	ACTERISTIC	S QW-409			
Cu	rrent:	Direct (DC)		rect (DC)	Dire	ct (DC)	
	larity:	Reverse (EP)		verse (EP)		rse (EP)	
	Volts:	21	Reverse (EP)			30	
	Amps:	110		105		125	
Travel Speed		5.5		4.3		24	
Maximum Heat Input		25 200		29 640		6 428	
Wire Feed Speed	` '	Not Applicable		Applicable		82	
	Mode of Metal Transfer: Not Applicable			Applicable		pplicable	
		TECHNIC			113171		
Ctring or Mi	loava.					tring	
String or W Oscill		String Not Applicable		g & Weave Applicable		tring	
		Not Applicable				pplicable from one side	
Single / Multi		Single Pass from one side		ss from one side		from one side	
Single / Multi Electr Thermal Proc		Single Not Applicable		Single Applicable		pplicable	
Wire Stick		Not Applicable Not Applicable		Applicable Applicable			
						Not Recorded Not Applicable	
Nozzle / Cup	Size:	Not Applicable	INOT	Applicable	NOT A	ppiicable	

¹ Revision 1: Revision to correct editorial error.

PROCEDURE QUALIFICATION RECORD (PQR) QW-483

(Section IX, ASME Boiler and Pressure Vessel Code)

PQR # SAS-1-3 Revision 1

Tensile Test

QW-462

Specimen No.	Width in	Thickness in	Area in²	Ultimate Total Load Lb	Ultimate Unit Stress ksi	Type of Failure & Location
			(Not Applicable)			

Guided Bend Tests

QW-462

Specimen No.	Туре	Figure	Result
	(Not App	olicable)	

Toughness Tests

QW-170

Specimen No.	Notch Location	Notch Type	Test Temp	Full Size	% Shear	Lateral Exp		Veight
CE-1	Weld	V-Notch		Values (ft-lbs)	20	Inches	Break	No Brk
CE-2			-50°F	/6	80	Not Recorded	N/A	N/A
	Weld	V-Notch	-50°F	92	80	Not Recorded	N/A	N/A
CE-3	Weld	V-Notch	-50°F	100	100	Not Recorded	N/A	N/A
CE-4	HAZ (Grade 60)	V-Notch	-50°F	56	40	Not Recorded	N/A	N/A
CE-5	HAZ (Grade 60)	V-Notch	-50°F	72	40	Not Recorded	N/A	N/A
CE-6	HAZ (Grade 60)	V-Notch	-50°F	52	30	Not Recorded	N/A	N/A
CE-7	HAZ (Grade 70)	V-Notch	-50°F	82	40	Not Recorded	N/A	N/A
CE-8	HAZ (Grade 70)	V-Notch	-50°F	74	40	Not Recorded	N/A	N/A
CE-9	HAZ (Grade 70)	V-Notch	-50°F	72	40	Not Recorded	N/A	N/A

Fillet-Weld Tests

Result-Satisfactory: Macro-Results:	Yes	_ No	Pen. into Parent Material: Yes No
			Other Tests Not Applicable
Type of Test:			Not Applicable
Other:			
		-	
Welder's Name:	Gary Kohlman		Reg. No.: _W-2368 Stamp ID: CE
Tests Conducted By:			Lab. Test No.: 100-14010
Revisions By:	Qualimet		

We hereby recertify that the statements in this record have been revised in accordance with paragraph QW-200.2 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: Sub Arc Systems

Original Cert. Date:	January 4, 2002	Certified By:	Gary Kohlman
Recertification Date:	1	0.45.15	Asoll
Recertification Date:	JULY 16.14	Certified By:	XXX

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REVISED CHARPY IMPACT TEST REPORT**

for Procedure Qualification Record # SAS-1-3

Client:	Sub-Arc Systems Inc.	Job Number:	636-01001
Address:	4605-47 Street, Vermillion AB, T9X 1L6	Date:	January 4, 2002
Materials:	SA-516 Grade 60/70 to SA-516 Grade 60/70	Revision Date:	July 15, 2014
Size:	0.249" w.t. Plate (machined)	Condition:	As Welded
Test Specification:	ASME Section VIII UG-84, ASTM A-370		
Test Equipment:	Satec Model S1-10, S/N: 1164		

Specimen Type:	Charpy V-Notch		
Qualification Temperature:	-50.0°F	Test Temperature:	-50.0°F

Specimen Size (mm): 5

Sample Set	Sample Number	Actual Impact Energy (ft-lb)	Full Size (ft-lb)	Shear (%)	Lat. Exp. (in.)
	1	38	76	80	Not Recorded
Weld	2	46	92	80	Not Recorded
(Includes all processes)	3	50	100	100	Not Recorded
	Average:	45	89	87	Not Recorded

We certify that the statements in this record are acceptable and that the specimen(s) were prepared and tested in accordance with the requirements of the current edition of ASTM A370, ASTM E23 and their latest editions.

**Revision of test report to correct editorial error.

TEST RESULTS CERTIFIED BY:

Qualimet

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REVISED CHARPY IMPACT TEST REPORT**

for Procedure Qualification Record # SAS-1-3

Sub-Arc Systems Inc.	Job Number:	636-01001
4605-47 Street, Vermillion AB, T9X 1L6	Date:	January 4, 2002
SA-516 Grade 60/70 to SA-516 Grade 60/70	Revision Date:	July 15, 2014
0.249" w.t. Plate (machined)	Condition:	As Welded
ASME Section VIII UG-84, ASTM A-370		
Satec Model S1-10, S/N: 1164	4	
	Sub-Arc Systems Inc. 4605-47 Street, Vermillion AB, T9X 1L6 SA-516 Grade 60/70 to SA-516 Grade 60/70 0.249" w.t. Plate (machined) ASME Section VIII UG-84, ASTM A-370 Satec Model S1-10, S/N: 1164	4605-47 Street, Vermillion AB, T9X 1L6 SA-516 Grade 60/70 to SA-516 Grade 60/70 0.249" w.t. Plate (machined) ASME Section VIII UG-84, ASTM A-370

Specimen Type:	Charpy V-Notch		
Qualification Temperature:	-50.0°F	Test Temperature:	-50.0°F

Sample Set	Sample Number	Actual Impact Energy (ft-lb)	Full Size (ft-lb)	Shear (%)	Lat. Exp. (in.)
	1	28	56	40	Not Recorded
HAZ (Grade 60)	2	36	72	40	Not Recorded
	3	26	52	30	Not Recorded
	Average:	30	60	37	Not Recorded

We certify that the statements in this record are acceptable and that the specimen(s) were prepared and tested in accordance with the requirements of the current edition of ASTM A370, ASTM E23 and their latest editions.

**Revision of test report to correct editorial error.

TEST RESULTS CERTIFIED BY:

Qualimet

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REVISED CHARPY IMPACT TEST REPORT**

for Procedure Qualification Record # SAS-1-3

Client:	Sub-Arc Systems Inc.	Job Number:	636-01001
Address:	4605-47 Street, Vermillion AB, T9X 1L6	Date:	January 4, 2002
Materials:	SA-516 Grade 60/70 to SA-516 Grade 60/70	Revision Date:	July 15, 2014
Size:	0.249" w.t. Plate (machined)	Condition:	As Welded
Test Specification:	ASME Section VIII UG-84, ASTM A-370		
Test Equipment:	Satec Model S1-10, S/N: 1164		

Specimen Type:	Charpy V-Notch	
Qualification Temperature:	-50.0°F	Test Temperature: -50.0°F

Specimen Size (mm): 5

Sample Set	Sample Number	Actual Impact Energy (ft-lb)	Full Size (ft-lb)	Shear (%)	Lat. Exp. (in.)
	1	41	82	40	Not Recorded
HAZ (Grade 70)	2	37	74	40	Not Recorded
	3	36	72	40	Not Recorded
	Average:	38	76	40	Not Recorded

We certify that the statements in this record are acceptable and that the specimen(s) were prepared and tested in accordance with the requirements of the current edition of ASTM A370, ASTM E23 and their latest editions.

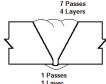
**Revision of test report to correct editorial error.

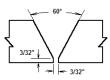
TEST RESULTS CERTIFIED BY:

Qualimet

Company Name:	Sub-Arc Systems Inc.	By:	Gary Kohlman
PQR No.:	SAS-1-4	Date:	July 15, 2014
Revision No.:	0	Revision Date:	
Welding Process(es):	SMAW / SMAW /SAW	Type(s):	Manual / Manual / Machine

JOINTS QW-402





	1 Layer				
BASE M	ETALS QW-403	POSTWE	LD HEAT TR	EATMENT	QW-407
Material Spec.:	SA-516 SA-516	Temperature:			
Grade/Type/Class:	Grade 60/70 Grade 6	70/70 Time:			
P-No. Group No.:	P-1 Group 1/2 to P-1 Group	up 1/2 Heating :	(/\	lone – As Welde	ed)
Heat No.:	E3D260 E3D260	Cooling:			-
Carbon Equivalent (ASME):	0.42 0.42	Other:			
Carbon Equivalent (CSA):	0.42 0.42				
Thickness & Diameter:	0.500" w.t. Plate				
Max Weld Deposit:	<0.500" per pass				
PREH	EAT QW-406		POSITIONS	QW-405	
Preheat Temp. Min.:	50°F	Process:	F-3 SMAW	F-4 SMAW	SAW
Interpass Temp. Max.:	600°F	Position:	3-G	3-G	2-G
Interpass Temp. Min.:	50°F	Progression:	Vertical Up	Vertical Up	Horizontal
Other:	Temperature monitored using te	•	N/A	N/A	N/A
	FILLER M				
Process:	SMAW	SMAW		SAW	
SFA Specification No.:	5.1	5.1		5.17	
AWS Classification No.:	E6010	E7018-1		EM12K	-H8
F-No.:	F-3	F-4		F-6	
A-No.:	A-1	A-1		A-1	
Size of Filler Metal:	1/8"	3/32"		3/32"	
Deposited Weld Metal:	0.125"	0.125"		0.250"	
Manufacturer:	Lincoln Electric	ESAB		Lincoln El	
Trade Name:	Fleetweld 5P+	OK55		LA-6	
Heat / Lot Number:	ED511111	SB248224		50034	
Electrode-Flux (Class):	Not Applicable	Not Applicable		F7A6-EM1	
Flux Tradename:	Not Applicable	Not Applicable		Lincolnweld	
Flux Heat / Lot Number.:	Not Applicable	Not Applicable		12R1	
Product Form:	Covered Electrode	Covered Electro	ae	Coiled Soli	a vvire
01:11:	SHIELDIN	IG GAS QW-408			
Shielding Gas:	(Net Assettents)	(1) - (1	1-1	(Al - (A II	
Composition:	(Not Applicable)	(Not Applicable	e)	(Not Appli	саріе)
Flow Rate:					
Backing Gas:					
	ELECTRICAL CITA	ADACTEDICTION OVA	1 400		
Current	ELECTRICAL CHA		/-409	Direct (20)
Current:	Direct (DC)	Direct (DC)		Direct (I	
Polarity:	Direct (DC) Reverse (EP)	Direct (DC) Reverse (EP)		Reverse	
Polarity: Volts:	Direct (DC) Reverse (EP) 22	Direct (DC) Reverse (EP) 22		Reverse 30	
Polarity: Volts: Amps:	Direct (DC) Reverse (EP) 22 80	Direct (DC) Reverse (EP) 22 80 - 90		Reverse 30 420	(EP)
Polarity: Volts: Amps: Travel Speed (ipm):	Direct (DC) Reverse (EP) 22 80 5.9	Direct (DC) Reverse (EP) 22 80 - 90 4.9 - 5.7		Reverse 30 420 21.8	(EP)
Polarity: Volts: Amps: Travel Speed (ipm): Maximum Heat Input (J/in):	Direct (DC) Reverse (EP) 22 80 5.9 18 040	Direct (DC) Reverse (EP) 22 80 - 90 4.9 - 5.7 23 704		Reverse 30 420 21.8 34 65	(EP) 0
Polarity: Volts: Amps: Travel Speed (ipm): Maximum Heat Input (J/in): Tungsten Electrode:	Direct (DC) Reverse (EP) 22 80 5.9 18 040 Not Applicable	Direct (DC) Reverse (EP) 22 80 - 90 4.9 - 5.7 23 704 Not Applicable		Reverse 30 420 21.8 34 65 Not Appli	(EP) 0 cable
Polarity: Volts: Amps: Travel Speed (ipm): Maximum Heat Input (J/in):	Direct (DC) Reverse (EP) 22 80 5.9 18 040 Not Applicable Not Applicable	Direct (DC) Reverse (EP) 22 80 - 90 4.9 - 5.7 23 704 Not Applicable Not Applicable		Reverse 30 420 21.8 34 65	(EP) 0 cable
Polarity: Volts: Amps: Travel Speed (ipm): Maximum Heat Input (J/in): Tungsten Electrode: STT Program Settings:	Direct (DC) Reverse (EP) 22 80 5.9 18 040 Not Applicable Not Applicable	Direct (DC) Reverse (EP) 22 80 - 90 4.9 - 5.7 23 704 Not Applicable Not Applicable		Reverse 30 420 21.8 34 65 Not Appli	(EP) 0 cable cable
Polarity: Volts: Amps: Travel Speed (ipm): Maximum Heat Input (J/in): Tungsten Electrode: STT Program Settings:	Direct (DC) Reverse (EP) 22 80 5.9 18 040 Not Applicable Not Applicable TECHN String	Direct (DC) Reverse (EP) 22 80 - 90 4.9 - 5.7 23 704 Not Applicable Not Applicable String		Reverse 30 420 21.8 34 65 Not Applii Not Applii	(EP) 0 cable cable
Polarity: Volts: Amps: Travel Speed (ipm): Maximum Heat Input (J/in): Tungsten Electrode: STT Program Settings: String or Weave: Oscillation:	Direct (DC) Reverse (EP) 22 80 5.9 18 040 Not Applicable Not Applicable TECHN String Not Applicable	Direct (DC) Reverse (EP) 22 80 - 90 4.9 - 5.7 23 704 Not Applicable Not Applicable String Not Applicable		Reverse 30 420 21.8 34 65 Not Applii Not Applii String	(EP) 0 cable cable cable
Polarity: Volts: Amps: Travel Speed (ipm): Maximum Heat Input (J/in): Tungsten Electrode: STT Program Settings: String or Weave: Oscillation: Single / Multi Pass:	Direct (DC) Reverse (EP) 22 80 5.9 18 040 Not Applicable Not Applicable TECHN String Not Applicable Single Pass from one side	Direct (DC) Reverse (EP) 22 80 - 90 4.9 - 5.7 23 704 Not Applicable Not Applicable String Not Applicable Multiple Passes from		Reverse 30 420 21.8 34 65 Not Applie Not Applie String Not Applie	(EP) 0 cable cable cable cable rom one side
Polarity: Volts: Amps: Travel Speed (ipm): Maximum Heat Input (J/in): Tungsten Electrode: STT Program Settings: String or Weave: Oscillation:	Direct (DC) Reverse (EP) 22 80 5.9 18 040 Not Applicable Not Applicable TECHN String Not Applicable	Direct (DC) Reverse (EP) 22 80 - 90 4.9 - 5.7 23 704 Not Applicable Not Applicable String Not Applicable	e e e e e e e e e e e e e e e e e e e	Reverse 30 420 21.8 34 65 Not Applii Not Applii String	(EP) 0 cable cable cable rom one side

PQR # SAS-1-4 Rev.0

Tensile Test

QW-462

Specimen No.	Width (in)	Thickness (in)	Area (in²)	Ultimate Total Load (lbs)	Ultimate Unit Stress (ksi)	Type of Failure & Location
			(Not A	pplicable)		

Guided Bend Tests

QW-462

Specimen No.	Туре	Figure	Result
		(Not Applicable)	
		(Not Applicable)	

Toughness Tests QW-170

Specimen No.	Notch Location	Notch Type	Qual. Temp	Full Size Values (ft-lbs)	% Shear	Lateral Exp Inches	Drop \ Break	Weight No Brk
DG-1	Weld	V-Notch	-50°F	56	30	0.040		
DG-2	Weld	V-Notch	-50°F	58	40	0.041		
DG-3	Weld	V-Notch	-50°F	66	40	0.044		
DG-4	HAZ	V-Notch	-50°F	56	**	**		
DG-5	HAZ	V-Notch	-50°F	28	30	0.019		
DG-6	HAZ	V-Notch	-50°F	89	**	**		

^{**}Shear and Lateral Expansion not recorded - specimen did not break

Fillet-Weld Tests

			Not Applicable			
Result-Satisfactory: Macro-Results:	Yes	No	Pen. into	Parent Material:	Yes	No
			Other Tests			
Type of Test:	Not Applicable					
Other:	Not Applicable					
Welder's Nam Tests Conducted E We certify that the statem accordance with the requ	nents in this recor	d are correct a	Reg. No.: W-	Lab. Test No		4010
_	Sub-Arc Systems I July 15, 2014	nc.	Certified By:	Gary Kohlman	AKI	RL

40th Anniversary

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CHARPY IMPACT TEST REPORT

for Procedure Qualification Record # SAS-1-4

Sub-Arc Systems Inc.	Job Number:	100-14010
4605-47 Street, Vermillion AB, T9X 1L6	Date:	July 15, 2014
SA-516 Grade 60/70 to SA-516 Grade 60/70		
0.500" w.t. Plate	Condition:	As Welded
ASME Section VIII UG-84, ASTM A-370		
Satec Model S1-10, S/N: 1164		
	Sub-Arc Systems Inc. 4605-47 Street, Vermillion AB, T9X 1L6 SA-516 Grade 60/70 to SA-516 Grade 60/70 0.500" w.t. Plate ASME Section VIII UG-84, ASTM A-370 Satec Model S1-10, S/N: 1164	4605-47 Street, Vermillion AB, T9X 1L6 SA-516 Grade 60/70 to SA-516 Grade 60/70 0.500" w.t. Plate Condition: ASME Section VIII UG-84, ASTM A-370

Specimen Type:	Charpy V-Notch		
Qualification Temperature:	-50.0°F	Test Temperature:	-50.0°F

Specimen Size (mm):

10

Sample Set	Sample Number	Actual Impact Energy (ft-lb)	Full Size (ft-lb)	Shear (%)	Lateral Expansion Inches
	DG-1	56	56	30	0.040
Weld	DG-2	58	58	40	0.041
(includes all processes)	DG-3	66	66	40	0.044
	Average:	60	60	37	0.042

We certify that the statements in this record are acceptable and that the specimen(s) were prepared and tested in accordance with the requirements of the current edition of ASTM A370, ASTM E23 and their latest editions.

T	EST	R	ESI	JL	TS	CEF	₹Т	ΊF	IED	BY:	

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CHARPY IMPACT TEST REPORT

for Procedure Qualification Record # SAS-1-4

Client:	Sub-Arc Systems Inc.	Job Number:	100-14010
Address:	4605-47 Street, Vermillion AB, T9X 1L6	Date:	July 15, 2014
Materials:	SA-516 Grade 60/70 to SA-516 Grade 60/70		
Size:	0.500" w.t. Plate	Condition:	As Welded
Test Specification:	ASME Section VIII UG-84, ASTM A-370		
Test Equipment:	Satec Model S1-10, S/N: 1164		

Specimen Type:	Charpy V-Notch		
Qualification Temperature:	-50.0°F	Test Temperature:	-50.0°F

Specimen Size (mm):

10

Sample Set	Sample Number	Actual Impact Energy (ft-lb)	Full Size (ft-lb)	Shear (%)	Lateral Expansion Inches
	DG-4	56	56	**	**
HAZ	DG-5	28	28	30	0.019
	DG-6	89	89	**	**
	Average:	58	58	**	**

^{**}Shear and Lateral Expansion not recorded – specimen did not break

We certify that the statements in this record are acceptable and that the specimen(s) were prepared and tested in accordance with the requirements of the current edition of ASTM A370, ASTM E23 and their latest editions.

TEST RESULTS CERTIFIED BY:

Qualimet

SUB-ARC SYSTEMS INC.

Welding Procedure Specification

in accordance with

ASME Section IX

Welding Procedure	e Specification No.:	SAS-2 Revision 2 ¹			
Supp	orting PQR No. (s):	SAS-2-1 Revision 1, SAS-2-2 Revision 1, SAS-2-3 Revision 1, SAS-2-4 Revision 1			
	G	Qualified fo	r		
Process(es):	SAW (Leading) / SAW	(Trailing)	Position(s):	Flat, Horizontal	
Filler Metal F-No.:	F7A6-EM12K -H8 / F7A6	-EM12K-H8	A-No.:	A-1 / A-1	
AWS Classification:	F-6 / F-6		Weld Type(s):	Groove, Fillet, Weld buildup	
Base Metal:	P-1 Group 1	or 2	To:	P-1 Group 1 or 2	
Typical Materials:	IX for applications where	proven notch toug	hness properties	in Table QW-422 of ASME Section are not required, and P-1 Group 1 thness properties are required.	
Diameter Range:	All diameters	-	Condition(s):	As Welded	
		Normal Service)	Impact Tested to -50°F	
Thickness Range:	ASME Section IX	0.062" to 1.500"		0.125" to 1.500"	
	ASME Section VIII	0.062" to 1.500"		0.125" to 1.500"	
	ASME B31.1 0.062" to 0. ASME B31.3 0.062" to 0.		50"	0.125" to 0.750"	
			e e e e e e e e e e e e e e e e e e e	0.125" to 0.750"	

	Provincial Registration
SAFETY	CODES ACT - PROVINCE OF ALBERTA WELDING PROCEDURE
Weld Proc Matl. Gr. P Elect Gr. F Th. Qual F	NP 2389.2 SAS-2 (Rev 2) Sess SAW No. 16r 1+2 to P No. 1 Gr 1+2 No. 6 A No. 1 OUAL 3.2 mm, CVN -46°C JASON REINHART, PENG. WELDING SPECIALIST

Provincial Registration

¹Revision 2: Review and update to the current edition of the ASME code.

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

Company N		rc Systems Inc.	Ву	
	No.: SAS-2	5	Date	
Revision		A Basisian A GAG G G Basisia	Revision Date	
Supporting Po Welding Process		2-1 Revision 1, SAS-2-2 Revision		
Welding Process	s(es). SAVV	SAVV	Type(s)	. Wacrime / Wacrime
JOI	NTS QW	-402	Joir	nt Details
Joint Design: Butt, To	ee, Lap, Corne	r, etc.	All ASME joint designs. Re	eference construction
Backing: F-6 SA	W (Leading) w	ith or without backing	drawings for joint details. Wh	ere joint details are not
F-6 SA	W (Trailing) wit	th backing only	specified, refer to typical joint	detail sheet provided.
Backing Material (Type):	Similar base	or weld metal or backwelding as	required. No Retainers.	
		BASE METALS	QW-403	
P-No.: P-1	Group No.:	*1 or 2 to P-No	o.: P-1 G	Froup No.: *1 or 2
OR				
Spec. type & grade:	Not Applicab	le to Sp	pec. type & grade:	Not Applicable
OR				
Chem. Analysis & Mech. Pr	•	Not Applicable to CI	hem. Analysis & Mech. Prop.:	Not Applicable
Thickness Rang	е	Named Camiles	Instruct Tested to 500	95
Danie Matale Communication		Normal Service	Impact Tested to -50°	The second secon
Base Metal: Groove:		Section IX 0.062" to 1.500"	0.125" to 1.500"	Fillet: All
	56	ection VIII 0.062" to 1.500"	0.125" to 1.500"	Fillet: All
		B31.1 0.062" to 0.750"	0.125" to 0.750"	Fillet: All
		B31.3 0.062" to 0.750"	0.125" to 0.750"	Fillet: All
	All diameters			Fillet: All
		only when proven notch toughne	ess properties are required.	
Maximum thick	tness of any we	eld layer shall not exceed .500"		
	· · · · · · · · · · · · · · · · · · ·	FILLER METALS	QW-404	
	Process:	SAW (Leading	j)	SAW (Trailing)
Specification	No. (SFA):	5.17		5.17
AWS Classifi	ication No.:	F7A6-EM12K		F7A6-EM12K
	F-No.:	F-6		F-6
	A-No.:	A-1		A-1
Size of Fi	ller Metals:	3/32", 1/8", 5/32", 3	3/16"	3/32", 1/8", 5/32", 3/16"
Weld Metal Thicknes	s - Groove:	1.000"		1.000"
	- Fillet:	Unlimited		Unlimited
Electrode-F	lux (Class):	F7A6-EM12K-H	18	F7A6-EM12K-H8
Ma	nufacturer:	Lincoln Electric	С	Lincoln Electric
7	radename:	LA-61		LA-61
Flux Ti	rade Name:	Lincoln 882 Flu	IX	Lincoln 882 Flux
	Alloy Flux:	Neutral		Neutral
Consum	able Insert:	Not Applicable		Not Applicable
Supplemental Fi	ller Metals:	Not Applicable		Not Applicable
Pro	duct Form:	Coiled Solid Wi	re	Coiled Solid Wire

¹Revision 2: Review and update to the current edition of the ASME code.

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

WPS # SAS-2 Rev.2

	PO	SITIONS	QW-405		POSTWELD HEAT	TREATMEN	NT QW-407
Positio	n(s) of Groove	: All			Temp. Range:		
Weldin	g Progression	: F-6 SAW (L	eading) Flat or Hori	zontal only.	Time Range:	(None -	- As Welded)
		The second second second	railing) Flat or Horiz				
Posit	tion(s) of Fillet	: All	<u> </u>	,	Cooling:		
		and the same of th	QW-406		GAS		
Ton	nperature Min.		QVV-100		Shielding Gas(es):		
	ss Temp. Max.		(See Next Page)		Composition:		
	Interpass Min.		(See Next Fage)			(Not	Applicable)
			ng tempilstiks, pyror	motor or	in the second se		
Fiellea	t Maintenance	other suitab		neter or	Gas Backing:		
			LECTRICAL C	HADACTED	Other: ISTICS QW-409		
		Currer				railing): Dire	ct - DC
		Polarit	504 Francisco 5004 FTG		se - EP F-6 SAW (T		erse - EP
Amps (Range):				<u> </u>			- 750
Volts (Range):							
Travel Speed (Range): F-6 SAW (Leading): 4 - 35 F-6 SAW (Trailing): 4 - 35							
Maximu		0.125" to 0.625		<u> </u>			40 J/in
maximu		0.625" to 1.500					40 J/in
Ele		ed speed rang		g/. 00 L !!	1 0 0/11/(1	runnig).	
	Tungsten Electrode Size & Type: Not Applicable						
		nsfer for GMAV					
		Othe			y only when proven notch to	ughness is regu	ired
		0			QW-410	agririoso io roqu	
	String	or Weave Bea			shall be controlled to prever	nt exceeding ma	eximum heat inputs
		or Gas Cup Siz		ave. vveave size	Shall be controlled to preven	it exoceding file	zamam neut inpute.
	0111100	or one one or		must be thoroug	phly cleaned of all foreign ma	terial (scale rus	st oil grease paint
		Initial Cleanin	g: tar, etc.) at lea	st 1" back on ea	ich side of the joint prior to we ree from notches, slag, fins a	elding. All surfa	
	Inte	erpass Cleanin		The second secon	g hammer, power brushing,		ter each weld laver.
		f Back Gougin			d to clean metal where thern		
		Oscillatio				'	*
С	ontact Tube to	Work Distanc					
	Ele	ectrode Spacin					
Mul	Itiple or Single	Pass (per side	Single or multi required.	ple passes per s	side, multiple only when prov	en notch tough	ness properties are
Multiple or	r Single Electr	odes & Spacin		ple, multiple onl	y when proven notch toughn	ess properties a	re required.
maniferanto • Investor	•	Peenin					
			TYPICAL V	WELDING PA	ARAMETERS		
		Filler Me	tal		Current		
		AWS	Diameter	Type &	Amp.	Volt	Travel Speed
Process	Old	ssification	(in)	Polarity	Range	Range	(IPM)
SAW		A6-EM12K	3/32				
SAW		A6-EM12K	1/8	DC EP	250 - 750	22 - 38	4 - 35
SAW		A6-EM12K A6-EM12K	5/32 3/16	2000			
Notes:				v vany with thick	ness of base material and po	nsition of weld	
110103.	THUTTIDET OF WE	ia layora ana an	Le or filler filetai fila	y vary with tiller	ness of base material and po	John Of Weld.	

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

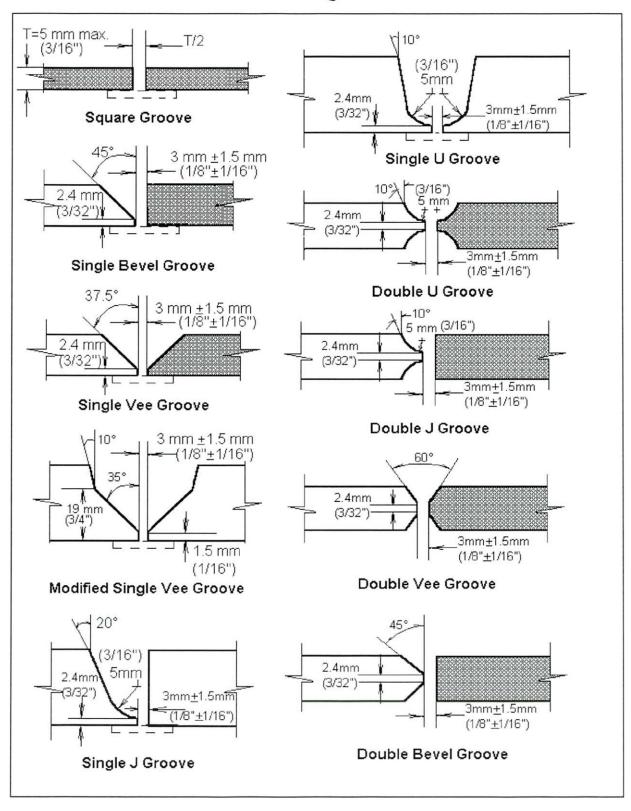
WPS # SAS-2 Rev.2

PREHI	PREHEAT & INTERPASS TEMPERATURE MINIMUM AND MAXIMUM				
Section VIII:	50°F minimum for all P-1 materials except as listed below:				
	175°F if the joint thickness exceeds 1.000" and the specified carbon content exceeds 0.30%				
1	200°F if the joint thickness is 1.250" to 1.500"				
B31.1:	50°F minimum for all P-1 materials except as listed below:				
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	175°F if the joint thickness exceeds 1.00" and the specified carbon content exceeds 0.30%				
B31.3:	50°F for all P-1 materials except as listed below:				
	175°F if the specified minimum tensile strength of the base material exceeds 71 ksi				
,	175°F if the nominal wall thickness exceeds 1"				
Max. Interpass Temp.:	650°F for normal service, 550°F for applications where proven notch toughness is required				

Reference to relevant construction codes is mandatory prior to production welding to determine any supplementary restrictions.

Typical Joint Details QW-482

Prepared by: Qualimet



PROCEDURE QUALIFICATION RECORD (PQR) QW-483

Company Name:	Sub-Arc Systems Inc.		By:	Gary Kohlman		
PQR No.:	SAS-2-1		Date:	June 4, 2010		
Revision No.:	11	Revisi	on Date:	October 3, 2014		
Welding Process(es):	SAW / SAW		Types:	Machine / Machin	е	
			_			
	JOINTS	QW-402				
			£ 60)° —	7	
Į	\ 1 /	Į			Ļ	
7	\ /	7 3/3	2",		1	
			\Rightarrow			
			1	→ 1/8"		
BASE META				T TREATMEN	NT QW-407	
	-516 SA-516	Temperatu	-			
	ade 70 Grade 70		ne:			
	Group 2 to P-1 Group 2	Heati		(Not Ap	olicable)	
	9 0934K-54 9 0.39	Cooli				
	9	Oth	er:			
	TANK DESIGNATION OF THE PROPERTY OF THE PROPER		-			
	500" per pass		DOOL	TIONIO OVALA	05	
PREHEA			POSIT			
Preheat Temp. Min.: 50°F		Proce		W (Leading)	SAW (Trailing)	
Interpass Temp. Max.: 550° Interpass Temp. Min.: 50°F		Position		2-G Horizontal	2-G Horizontal	
	perature monitored by tempilsticks	Progression Oth		ot Applicable	Not Applicable	
Other. Telli	FILLER METAI			ot Applicable	140t Applicable	
Process:	SAW (Leading)	L3 QVV-40	+	SAW (Tra	iling\	
SFA Specification No.:	5.17			5.17		
AWS Classification No.:	EM12K-H8			EM12K-		
F-No.:	F-6			F-6	110	
A-No.:				A-1		
Size of Filler Metal:				3/32"		
				3/32"	,	
Deposited Weld Metal:	3/32" 0.125"			3/32" 0.125		
Deposited Weld Metal: Manufacturer:	3/32"				"	
•	3/32" 0.125"			0.125	rric Co.	
Manufacturer:	3/32" 0.125" Lincoln Electric Co.			0.125 Lincoln Elec	tric Co.	
Manufacturer: Trade Name:	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8			0.125 Lincoln Elec LA-6' Not Reco F7A6-EM1	" tric Co. rded 2K-H8	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename:	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux			0.125 Lincoln Elec LA-6° Not Reco F7A6-EM1 Lincolnweld 8	rric Co. 1 orded 2K-H8 882 Flux	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename: Flux Heat / Lot Number.:	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux Not Recorded			0.125 Lincoln Elec LA-6 Not Reco F7A6-EM1 Lincolnweld 8 Not Reco	" tric Co. 1 rded 2K-H8 882 Flux rded	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename: Flux Heat / Lot Number.: Product Form:	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux Not Recorded Coiled Solid Wire			0.125 Lincoln Elec LA-6 Not Reco F7A6-EM1 Lincolnweld & Not Reco Coiled Soli	" tric Co. 1 rded 2K-H8 882 Flux rded d Wire	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename: Flux Heat / Lot Number.:	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux Not Recorded Coiled Solid Wire Recrushed Slag Not Perm	nitted		0.125 Lincoln Elec LA-6 Not Reco F7A6-EM1 Lincolnweld & Not Reco Coiled Soli Recrushed Slag N	" tric Co. 1 rded 2K-H8 882 Flux rded d Wire	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename: Flux Heat / Lot Number.: Product Form: Other:	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux Not Recorded Coiled Solid Wire Recrushed Slag Not Perm	nitted	QW-409	0.125 Lincoln Elec LA-6* Not Reco F7A6-EM1 Lincolnweld & Not Reco Coiled Soli Recrushed Slag N	iric Co. If Irded 2K-H8 882 Flux Irded d Wire Not Permitted	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename: Flux Heat / Lot Number.: Product Form: Other:	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux Not Recorded Coiled Solid Wire Recrushed Slag Not Perm ELECTRICAL CHARAC SAW (Leading)	nitted		0.125 Lincoln Elec LA-6* Not Reco F7A6-EM1 Lincolnweld & Not Reco Coiled Soli Recrushed Slag N SAW (Tra	iric Co. If Irded 2K-H8 882 Flux Irded d Wire Not Permitted	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename: Flux Heat / Lot Number.: Product Form: Other: Process: Current:	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux Not Recorded Coiled Solid Wire Recrushed Slag Not Perm ELECTRICAL CHARAC SAW (Leading) Direct - DC	nitted		0.125 Lincoln Elec LA-6 Not Reco F7A6-EM1 Lincolnweld & Not Reco Coiled Soli Recrushed Slag N SAW (Tra Direct -	tric Co. 1 rded 2K-H8 882 Flux rded d Wire Not Permitted illing)	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename: Flux Heat / Lot Number.: Product Form: Other: Process: Current: Polarity:	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux Not Recorded Coiled Solid Wire Recrushed Slag Not Perm ELECTRICAL CHARAC SAW (Leading) Direct - DC Reverse - EP	nitted		0.125 Lincoln Elec LA-6 Not Reco F7A6-EM1 Lincolnweld & Not Reco Coiled Soli Recrushed Slag N SAW (Tra Direct - Reverse	tric Co. 1 rded 2K-H8 882 Flux rded d Wire Not Permitted illing)	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename: Flux Heat / Lot Number.: Product Form: Other: Process: Current: Polarity: Volts:	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux Not Recorded Coiled Solid Wire Recrushed Slag Not Perm ELECTRICAL CHARAC SAW (Leading) Direct - DC Reverse - EP	nitted		0.125 Lincoln Elec LA-6 Not Reco F7A6-EM1 Lincolnweld 8 Not Reco Coiled Soli Recrushed Slag N SAW (Tra Direct - Reverse 27	tric Co. 1 rded 2K-H8 882 Flux rded d Wire Not Permitted iling) DC - EP	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename: Flux Heat / Lot Number.: Product Form: Other: Process: Current: Polarity: Volts: Amps:	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux Not Recorded Coiled Solid Wire Recrushed Slag Not Perm ELECTRICAL CHARAC SAW (Leading) Direct - DC Reverse - EP 27 400	nitted		0.125 Lincoln Elec LA-6' Not Reco F7A6-EM1 Lincolnweld & Not Reco Coiled Soli Recrushed Slag N SAW (Tra Direct - Reverse 27 300	tric Co. 1 rded 2K-H8 882 Flux rded d Wire Not Permitted iling) DC - EP	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename: Flux Heat / Lot Number.: Product Form: Other: Process: Current: Polarity: Volts:	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux Not Recorded Coiled Solid Wire Recrushed Slag Not Perm ELECTRICAL CHARAC SAW (Leading) Direct - DC Reverse - EP	nitted		0.125 Lincoln Elec LA-6 Not Reco F7A6-EM1 Lincolnweld 8 Not Reco Coiled Soli Recrushed Slag N SAW (Tra Direct - Reverse 27	tric Co. 1 rded 2K-H8 882 Flux rded d Wire Not Permitted illing) DC - EP	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename: Flux Heat / Lot Number.: Product Form: Other: Process: Current: Polarity: Volts: Amps: Travel Speed (ipm):	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux Not Recorded Coiled Solid Wire Recrushed Slag Not Perm ELECTRICAL CHARAC SAW (Leading) Direct - DC Reverse - EP 27 400 20.0 - 26.0	nitted		0.125 Lincoln Elec LA-6 Not Reco F7A6-EM1 Lincolnweld 8 Not Reco Coiled Soli Recrushed Slag N SAW (Tra Direct - Reverse 27 300 20.0 - 2	tric Co. 1 rded 2K-H8 882 Flux rded d Wire Not Permitted iling) DC - EP	
Manufacturer: Trade Name: Heat / Lot Number: Electrode-Flux (Class): Flux Tradename: Flux Heat / Lot Number.: Product Form: Other: Process: Current: Polarity: Volts: Amps: Travel Speed (ipm): Maximum Heat Input (J/in):	3/32" 0.125" Lincoln Electric Co. LA-61 Not Recorded F7A6-EM12K-H8 Lincolnweld 882 Flux Not Recorded Coiled Solid Wire Recrushed Slag Not Perm ELECTRICAL CHARAC SAW (Leading) Direct - DC Reverse - EP 27 400 20.0 - 26.0 32 400	nitted		0.125 Lincoln Elec LA-6* Not Reco F7A6-EM1 Lincolnweld & Not Reco Coiled Soli Recrushed Slag N SAW (Tra Direct - Reverse 27 300 20.0 - 2 24 30	tric Co. 1 rded 2K-H8 882 Flux rded d Wire Not Permitted iling) DC - EP 4.0 0 cable	

TECHNIQUE

String

Not Applicable

1/4" to 1 1/4" Not Recorded

Not Recorded

QW-410

Single Pass Per Side Multiple Electrodes

String or Weave: Oscillation:

Wire Stick Out:

Single / Multi Pass: Single / Multi Electrodes:

> **Electrode Spacing:** Nozzle / Cup Size:

String

Not Applicable

1/4" to 1 1/4"

Not Recorded

Not Recorded

¹Revision 1: Review and update to the current edition of the ASME code.

PROCEDURE QUALIFICATION RECORD (PQR) QW-483

(Section IX, ASME Boiler and Pressure Vessel Code)

PQR # SAS-2-1 Revision 1

Tensile Test

QW-462

Specimen No.	Width in	Thickness in	Area in²	Ultimate Total Load Lb	Ultimate Unit Stress ksi	Type of Failure & Location
ZB-T1	0.742	0.244	0.181	15 054	83.0	Ductile - Base
ZB-T2	0.746	0.241	0.180	14 656	81.5	Ductile - Base

Guided Bend Tests

QW-462

		Q 11 10Z	
Specimen No.	Type	Figure	Result
ZB-B1	TFB	QW-462.3(a)	Pass
ZB-B2	TFB	QW-462.3(a)	Pass
ZB-B3	TRB	QW-462.3(a)	Pass
ZB-B4	TRB	QW-462.3(a)	Pass

Toughness Tests

OW-170

• .				Q11 170				
Specimen No.	Notch Location	Notch	Test	Impact	% Shear	Lateral Exp		Veight
		Type	Temp	Values (ft-lbs)		Inches	Break	No Brk
ZB-1	Weld	V-Notch	-50°F	49	50	0.040	N/A	N/A
ZB-2	Weld	V-Notch	-50°F	30	40	0.026	N/A	N/A
ZB-3	Weld	V-Notch	-50°F	67	60	0.053	N/A	N/A
ZB-4	HAZ	V-Notch	-50°F	67	60	0.054	N/A	
ZB-5	HAZ	V-Notch	-50°F	75	70	0.056		N/A
ZB-6	HAZ	V-Notch	-50°F				N/A	N/A
	100	V-1401C11	-30 F	123	100	0.065	N/A	N/A

Fillet-Weld Tests

Result-Satisfactory: Macro-Results:	Yes	'	No	Pen	. into Parent Material:	Yes No
				er Tests		
Type of Test: Ha	ardness Tes	sting - See A	Attached Report			
Other:						
Welder's Name: Welder's Name: Tests Conducted By:	Joel Ov Qualin			Reg. No.:		Stamp ID: _ZB No.: 636-10004
Revised By:	Qualin	net				

We hereby recertify that the statements in this record have been revised in accordance with paragraph QW-200.2 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:	Sub-Arc Systems Inc.	_		n of
Original Cert. Date:	June 4, 2010	Ву:	Gary Kohlman	Rose
Recertification Date:	October 3, 2014	By:	Gary Kohlman	MARIE



ZB17 COROHET FOAD, EDMONTON, AB. 188, 1847. * (Z00), 024-5870. * FAX (Z80), 485-5829.
 * CAUGARY + 663, 278-9862. * 1-800-024-8979. * vszw.madimetric.com.

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MECHANICAL TEST REPORT

for Procedure Qualification Record # SAS-2-1

Client:	Sub-Arc Systems Inc. J	ob Number:	636-10004
Address:	4605-47 Street Vermillion AB T9X 1L6	Date:	June 4, 2010
Materials:	SA-516 Grade 70		
Size:	0.249" Plate (machined)	Condition:	As Welded
Test Specification:	ASME Section IX		

Tensile Tests QW-462.1(a)

Sample Identification:	ZB-T1	ZB-T2
Sample Size - inch:(W × T)	0.742 x 0.244	0.746 x 0.241
Least X-Sect. Area - in2:	0.181	0.180
Ultimate Load - Ibs:	15 054	14 656
Ult. Ten. Strength - ksi:	83.0	81.5
Character of Failure:	Ductile	Ductile
Location of Failure:	Base Metal	Base Metal
Req'd Tensile Strength - ksi:	70.0	70.0
Pass or Fail:	Pass	Pass
Remarks:		

Bend Tests QW-462.3 (a)

Sample Identification:	ZB-B1	ZB-B2	ZB-B3	ZB-B4
*Type of Bend Test:	TFB	TFB	TRB	TRB
Pass or Fail:	Pass	Pass	Pass	Pass
Remarks:				

^{*}Types of Bend Tests TSB, TFB, TRB = transverse side, face or root bend LSB, LFB, LRB = longitudinal side, face or root bend

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

TEST RESULTS CERTIFIED BY:

Qualimet



2.3 CONCRIT FORD EDMONDER AND LEG 481. *CONCRETE STR. *12. (20) 465 more *CALCARY DECA 270 mill. * 1 200 mill FORD **CONCRIT VIOLET **CONCR

Your source of Quality Materials Fugius ering



CHARPY IMPACT TEST REPORT

for Procedure Qualification Record # SAS-2-1

Client:	Sub-Arc Systems Inc.	Job Number:	636-10004
Address:	4605-47 Street Vermillion AB T9X 1L6	Date:	June 4, 2010
Materials:	SA-516 Grade 70		
Size:	0.249" Plate (machined)	Condition:	As Welded
Test Specification:	ASME Section IX, ASME Section VIII UG-84, ASTM	A-370	

Specimen Type:	Charpy V-Notch
Qualification Temperature:	-50°F
Test Temperature:	-50°F

Specimen Size (mm):

5.35

Sample Set	Sample Actual Impact Number Energy (ft-lb)		Full Size (ft-lb)	Shear (%)	Lateral Expansion Inches	
	ZB-1	26	49	50	0.040	
Weld Zone	ZB-2	16	30	40	0.026	
	ZB-3	36	67	60	0.053	
	Average:	26	49	50	0.040	

We certify that the statements in this record are acceptable and that the specimen(s) were prepared and tested in accordance with the requirements of the current edition of ASME Section IX and the latest addenda.

TEST RESULTS CERTIFIED BY:

Qualimet



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"Your somes of Quality Visionals Engineering"



CHARPY IMPACT TEST REPORT

for Procedure Qualification Record # SAS-2-1

Client:	Sub-Arc Systems Inc.	Job Number:	636-10004
Address:	4605-47 Street Vermillion AB T9X 1L6	Date:	June 4, 2010
Materials:	SA-516 Grade 70		
Size:	0.249" Plate (machined)	Condition:	As Welded
Test Specification:	ASME Section IX, ASME Section VIII UG-84, ASTM A	N-370	

Specimen Type:	Charpy V-Notch
Qualification Temperature:	-50°F
Test Temperature:	-50°F

Specimen Size (mm):

5.35

Sample Set	Sample Actual Impact Number Energy (ft-lb)		Full Size (ft-lb)	Shear (%)	Lateral Expansion Inches	
	ZB-4	36	67	60	0.054	
HAZ	ZB-5	40	75	70	0.056	
	ZB-6	66	123	100	0.065	
	Average:	47	88	77	0.058	

We certify that the statements in this record are acceptable and that the specimen(s) were prepared and tested in accordance with the requirements of the current edition of ASME Section IX and the latest addenda.

TEST RESULTS CERTIFIED BY:

Qualimet



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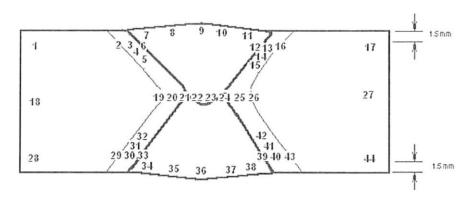
HARDNESS TEST REPORT

for Procedure Qualification Record # SAS-2-1

Client:	Sub-Arc Systems Inc.	Job Number:	636-10004
Address:	4605-47 Street Vermillion AB T9X 1L6	Date:	June 4, 2010
Materials:	SA-516 Grade 70		
Size:	0.249" Plate (machined)	Condition:	As Welded
Test Specification:	NACE R	RP0472	

Test Method: Hardness testing performed in accordance with ASTM E-92 (Vickers Hardness of Metallic

Materials) using a Vickers tester with a 1kg load.



Vickers Hardness Values

1	153	10	190	19	165	28	172	37	193
2	156	11	192	20	171	29	158	38	192
3	169	12	183	21	191	30	189	39	195
4	167	13	183	22	186	31	182	40	176
5	169	14	179	23	204	32	181	41	175
6	182	15	185	24	195	33	206	42	178
7	182	16	163	25	180	34	189	43	172
8	198	17	159	26	169	35	203	44	167
9	179	18	160	27	165	36	203		

We certify that the statements in this record are acceptable, in accordance with the requirements of NACE RP 0472. RP 0472-2005 paragraph 5.3 states "The maximum allowable HAZ hardness shall be 248 HV the maximum weld deposit hardness should be 248 HV and the average weld deposit hardness should not exceed 210 HV"

TEST RESULTS CERTIFIED BY:

Qualimet