Sub-Arc Systems Inc. WELDI			DERS' QI	JALIFICATI API 650		Exhibit 8, Rev A				
				1		LIMITATIONS			_	
WELDER NAME	WELDER SYMBOL	DATE QUALIF.	QUALIFICATION PROCEDURE	PROCESS	ELECTRODE	POSITION	THICKNESS	DIAMETER RANGE	REMARKS	
MATT TURMEL	M.Tu.	07,26,17		SAW	F1A6	26	14"		XRAY 62575	
QC (PRINT) SIGN:				DA	ГЕ (уууу-ММ-	dd):				
QA (PRINT) ROBERT HOFFMAN				DAT	DATE (yyyy-MM-dd):					

2017, 07,28

Revision 1 March 1, 2017

SIGN: Rust 1

4605-47 Street Vermillion, AB, T9X 1L6 780-608-9589

QUALITY CONTROL MANUAL

Sub-Arc Systems Inc. WELDER					JALIFICATION API 650		Exhibit 8, Rev A		
						LIMITATIONS			
WELDER NAME	WELDER SYMBOL	DATE QUALIF.	QUALIFICATION PROCEDURE	PROCESS	ELECTRODE	POSITION	THICKNESS RANGE	DIAMETER RANGE	REMARKS
JOEL DUERGAUND	J.0V	07,26,17		SAW	F7AO	26	14"		× RAY # 6 2574
QC (PRINT) SIGN:				DA	ТЕ (уууу-ММ-	-dd):			
QA (PRINT) Roll SIGN: Rust		FMAN		140	TE (yyyy-MM-	·dd):			

Sub-Arc Systems Inc.	WELDERS' QUALIFICATION RECORD API 650	Exhibit 8, Rev

WELDER NAME	WELDER	DATE				LIMITATIONS			I
	SYMBOL		QUALIFICATION PROCEDURE	PROCESS	ELECTRODE	POSITION	THICKNESS RANGE	DIAMETER RANGE	REMARKS
KEUN WHIEHT	K.WR	07,26,17	SAS 1	Sman	F3. F4	26	141		X-RAY G 2572
	K.WR	07,26,17	3AS 1	SMAN	F3, F4	36	, 411		x-RAY 62572
	K, wR.	-	545 I	SMAW	F3 F4	46	141		x-RAY 62572
	K. wR	07,26,17		5AW	F746	26	141		X-RAY 62572
									1
- 2									
- 3									
						-			

QC (PRINT)	DATE (yyyy-MM-dd):
SIGN:	
QA (PRINT) ROBERT HOFFMAN	DATE (yyyy-MM-dd):
SIGN: RUSHIE	2017, 07,28

	WELDERS' QUALIFICATION RECORD	
Sub-Arc Systems Inc.	API 650	Exhibit 8, Rev A

	WELDER		DATE QUALIFICATION QUALIF. PROCEDURE		LIMITATIONS				
WELDER NAME				PROCESS	ELECTRODE	POSITION	THICKNESS RANGE	DIAMETER RANGE	REMARKS
TYLER MONERIES	T. MO	07,26,17	5AS 1	Sman	F3. F4	26	1411		x Ray # 62571
	T. ma	07,26,17	545 1	SMAW	F3. F4	36	11/411		XRM # EasTL
	T. mo	07.26.17	545 1	SMAW	F3 F4	46	114"		x Ray # 6 2571.
									-

QC (PRINT)	DATE (yyyy-MM-dd):	
SIGN:		
QA (PRINT) ROBERT HOFFMAN	DATE (yyyy-MM-dd):	
SIGN: RUS H	2017, 07,28	

Sub-Arc Systems Inc.	WELDERS' QUALIFICATION RECORD API 650	Exhibit 8, Rev A

				LIMITATIONS					
WELDER NAME	WELDER SYMBOL	QUALIF.	QUALIFICATION PROCEDURE	PROCESS	ELECTRODE	POSITION	THICKNESS RANGE	DIAMETER RANGE	REMARKS
CHRIS JARUES	C.JA	06,21,17	5AS 1	SMAW	F3. F4	26.	1 14"		X-Ray 62339
	C. JA.	06,21,17	5AS I	5 m Aw	F3, F4	36	14"		x-RAY 6 2339
	C. 3A.	06,21,17	3AS 1	SMAW	F3, F4	44	14"		x-Rry 62339
					•				7
					-				

QC (PRINT)	DATE (yyyy-MM-dd):	
SIGN:		
QA (PRINT) ROBERT HOFFMAN	DATE (yyyy-MM-dd):	
SIGN: RESHER	2017,06,23	

Sub-Arc Systems Inc.	WELDERS' QUALIFICATION RECORD API 650	Exhibit 8, Rev A

WELDED MAKE	WELDED								
WELDER NAME	WELDER SYMBOL	DATE QUALIF.	QUALIFICATION PROCEDURE	PROCESS	ELECTRODE	POSITION	THICKNESS RANGE	DIAMETER RANGE	REMARKS
JOEL OUEREARD	J.01	06,21,17	5AS 1	SMAW	F3. F4	26.	1 14"		X-RAY 62340
	J.0V	06,21,17	545 1	5 m Aw	F3, F4	36	14"		x-RAY 6 2340
	I.OV	06,21,17	546 1	SMAW	F3, F4	44	(4"		X-RA 6-2340
					,				7
			,						

QC (PRINT)	DATE (yyyy-MM-dd):	
SIGN:		
QA (PRINT) ROBERT HOFFMAN	DATE (yyyy-MM-dd):	
SIGN: RONHE	2017,00,23	

4605-47 Street Vermillion, AB, T9X 1L6 780-608-9589

QUALITY CONTROL MANUAL

Sub-Arc Systems Inc.	WELDERS' QUALIFICATION RECORD API 650	Exhibit 8, Rev A

WELDED	NAME	WELDED				LIMITATIONS				
WELDER NAME	NAME	WELDER SYMBOL	QUALIF.	QUALIFICATION PROCEDURE	PROCESS	ELECTRODE	POSITION	THICKNESS RANGE	DIAMETER RANGE	REMARKS
MITCH CO	OULICEP	M. GO	06,21,17	5AS 1	5 MAW	F3, F4	26.	1 4"		X-RAY 62341
		W. 60	06,21,17	SAS 1	5 m Aw	F3, F4	36	14"		x-Ray 62341
		M.60	06,21,17	5A5 1	SMAW	F3, F4	44	14"	***************************************	x- RAY 6234,
										3

QC (PRINT)	DATE (yyyy-MM-dd):	
SIGN:		
QA (PRINT) ROBERT HOFFMAN	DATE (yyyy-MM-dd):	
SIGN: RESIDENTIAL	2017,06,23.	

Sub-Arc Systems Inc.	WELDERS' QUALIFICATION RECORD API 650	Exhibit 8, Rev A

WELDED NAME	WELDED					LIMITATIONS			
WELDER NAME	WELDER SYMBOL	DATE QUALIF.	QUALIFICATION PROCEDURE	PROCESS	ELECTRODE	POSITION	THICKNESS RANGE	DIAMETER RANGE	REMARKS
MATT TURMEL	M.Tu	06,21,17	SAS 1	SMAW	F3. F4	26.	1 4"		X-Ray 62342
	м.та	06,21,17	545 1	5 m Aw	F3 F4	34	14"		x-RAY 6 2342
	M.TU	06,21,17	SAS 1	SMAW	F3, F4	44	14"		x-224 G2342
									X-EA G 2542

QC (PRINT)	DATE (yyyy-MM-dd):
SIGN:	
QA (PRINT) ROBERT HOFFMAN	DATE (yyyy-MM-dd):
SIGN: RONG	2017,06,23

Sub-Arc Systems Inc.	WELDERS' QUALIFICATION RECORD API 650	Exhibit 8, Rev A

	I				LIMITATIONS					
WELDER NAME	WELDER SYMBOL	DATE QUALIF.	QUALIFICATION PROCEDURE	PROCESS	ELECTRODE	POSITION	THICKNESS RANGE	DIAMETER RANGE	REMARKS	
MATTI MACKENZIE	M. MA	06,21,17	SAS 1	SMAW	F3. F4	26.	1 14"		X-RAY 6 2343	
	M. MA	06,21,17	SAS 1	SMAW	F3, F4	36	14"		x-RAY 6-2343	
	M. MA.	06,21,17	SAS 1	SMAW	F3, F4	44	14"		x- RAY G 2343	
									7 2 27-13	
									177/2/	

QC (PRINT)	DATE (yyyy-MM-dd):	
SIGN:		
QA (PRINT) ROBERT HOFFMAN	DATE (yyyy-MM-dd):	
SIGN: RESIDENT	2017,06,23	

Sub-Arc Sys	WELI	DERS' QL	JALIFICATI API 650	ON RECO	RD		Exhibit 8, Rev A		
WELDER NAME	WELDER	DATE	CHALIFICATION			LIMITATIONS			
WEEDER NAME	SYMBOL	QUALIF.	QUALIFICATION PROCEDURE	PROCESS	ELECTRODE	POSITION	THICKNESS RANGE	DIAMETER RANGE	REMARKS
QUITON POTTS	Q.P0	06,21,17	SAS 1	SMAW	F3. F4	26.	1 14"		X-Ray 62344
	Q. 80	06,21,17	5AS 1	SMAW	F3, F4	36	144"		x-RAY 62344
	Q. PD	06,21,17	SAS 1	SMAW	F3, F4	44	14"		x-RAY 62344
							•		20031
									1230
QC (PRINT)				DAT	Е (уууу-ММ-	dd):			

Revision 1 March 1, 2017

QA (PRINT) ROBERT HOFFMAN

SIGN:

SIGN:

Page 31 of 46

DATE (yyyy-MM-dd):

4605-47 Street Vermillion, AB, T9X 1L6 780-608-9589

QUALITY CONTROL MANUAL

Sub-Arc Sys	items Inc		WELDEF	RS' QUALIFICATION RECORD API 650	Exhibit 8, Rev A
WEI DER NAME	WELDER	DATE	QUALIFICATION .	LIMITATIONS	

WELDER NAME	WELDER	DATE			7	LIMITATIONS			
	WELDER SYMBOL	DATE QUALIF.	QUALIFICATION PROCEDURE	PROCESS	ELECTRODE	POSITION	THICKNESS RANGE	DIAMETER RANGE	REMARKS
SUSTIN ZUBACH	D.24	06,21,17	54S 1	SMAW	F3. F4	26.	1 14"		X-RAY 62345
	D.24	06,21,17	SAS 1	5 m Aw	F3, F4	36	14"		K-RAY 62345
	b. 24	06,21,17	545 I	SMAW	F3, F4	45	(4)		X- PAL 62345
					•		•		7 3 7 4 3
					-				

QC (PRINT)	DATE (yyyy-MM-dd):	
SIGN:		
QA (PRINT) ROBERT HOFFMAN	DATE (yyyy-MM-dd):	
SIGN: RESIDENCE	2017,06,23	

Item 4 – Inspector Qualification

Contents

1. CWB Inspector Qualifications for NDE Testing

CWB Inspector Certification - Pierre Dostie



est un Inspecteur en soudage certifié de Niveau3 et satisfait aux exige de la norme CSA W178.2 « Qualification des inspecteurs en soudage ».

Valide jusqu'au

février 16, 2018

CSA W47.1/W59 ASMEMII-1 IX ASME B31.3 CSA W47.2/W59.2

Cette certification est valide pour le(s) code(s) et/ou la norme(s) sulvant(es) : Valide jusqu'en août 2020 Valide jusqu'en novembre 2021 Valide jusqu'en août 2020 Valide jusqu'en novembre 2021

Conditions

- La possession de cette carte ne signifie nullement que son détenteur représente un organisme d'inspection certifiée en vertu de la norme CSA W178.1 et ayant du personnel et des procédures approuvées par le Bureau canadien de soudage.
- 2. Cette carte demeure la propriété du Bureau et peut être rappelée en tout temps.
- 3. L'usage de la présente carte à des fins frauduleuses peut entraîner son annulation.

Pour toute question concernant cette qualification, veuillez communiquer avec :

1-800-844-6790 | www.cwbgroup.org









CWB Inspector Certification - Sylvain Germain



Conditions

- La possession de cette carte ne signifie autiement que son détenteur représente un organisme d'inspection certifiée en vertu de la norme CSA W178.1 et ayant du personnel et des procédures approuvées par le Bureau canadien de soudage.
- 2. Cette carte demeuve la propriété du Bureau et peut être rappelée en tout temps.
- L'usage de la présente carte à des fins frauduleuses peut entraîner son annutation.
 Pour loute question concernant cette qualification, veuillez communiquer avec :

1-800-844-6790 | www.cwbgroup.org









Item 5 – Weld Procedures

Contents

1. Approved Weld Procedures

SUB-ARC SYSTEMS INC.

Welding Procedure Specification

in accordance with

ASME Section IX

Welding Procedure	Specification No.:	SAS-1 Revision 1 ¹					
Supp	orting PQR No. (s):	SAS-1-1, SAS-1-2, SAS-1-3 Revision 1, SAS-1-4					
	C	Qualified f	or				
Process(es):	SMAW / SMAW /	SAW	Position(s):	All / All / Flat or Horizontal ²			
Filler Metal F-No.:	F-3 / F-4 / F-6	3	A-No.:	A-1 / A-1 / A-1			
AWS Classification:	E6010 / E7018-1 / F7A	6-EM12K	Weld Type(s):	Groove, Fillet, Weld buildup			
Base Metal:	P-1 Group 1	or 2	To:	P-1 Group 1 or 2			
Typical Materials:			•	in Table QW-422 of ASME Section			
				s are not required, and P-1 Group 1 phness properties are required.			
Diameter Range:	All diameters	_	Condition(s):	As welded			
		Normal Servi	ice	Impact Tested to -50°F			
Thickness Range:	ASME Section IX	0.062" to 1.50	00"	0.125" to 1.500"			
	ASME Section VIII	0.062" to 1.50	00"	0.125" to 1.500"			
	ASME B31.1	0.062" to 0.75	50"	0.125" to 0.750"			
	ASME B31.3	0.062" to 0.75	50"	0.125" to 0.750"			

<u>Pr</u>	ovincial Registration
SAFETY COD	ES ACT - PROVINCE OF ALBERTA ELDING FROCEDURE
Weld Process	3389. 2 SAS-I (RCVI) SMAW / SMAW / SAW Gr I + 2 to P No. 1 Gr I + 2 31 4 4 6 A No. I Blumm PW.H.T. NO L. 3.2mm, CVN - 46°C Day 5 Signed JASON REINHART, P.ENG, WELDING SPECIALIST

<u>Provincial Registration</u>

¹Revision 1: Revision to accommodate revision of PQR SAS-1-3 as well as the addition PQR SAS-1-4 to expand the base metal thickness range where proven notch toughness properties are required at -50°F.

²SAW position limited by process usability.

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

Co	mpany N	lame: Sub-A	Arc Systems Inc.	İ	By: Gary Kohlm	nan
	WPS	No: SAS-	1	Da	te: January 4,	2002
	Revision			Revision Da	ite: July 15, 20	14
	orting Po		1-1, SAS-1-2, SAS-1-3 Revision W / SMAW / SAW		(a). Manual / M	anual / Machine
weiding	Process	s(es): SIVIA	VV / SIVIAVV / SAVV	Type	(S). Nanuai / IVI	anuai / iviaci iiile
	JO	INTS QW	/-402	Jo	oint Details	
Joint Design:		ee, Lap, Corn		All ASME joint designs.		uction
Backing:			ithout backing.	drawings for joint details. \		
_	F-4 SN	/IAW with back	king only.	specified, refer to typical jo		
	SAW v	vith backing or	nly.			
Backing Material (Type):	Similar base	or weld metal or backwelding a	s required. No Retainers.		
			BASE METALS	QW-403		
P-No. : P	<u>'-1</u>	Group No.:	*1 or 2 to P-N	o.: P-1	Group No.:	*1 or 2
OR						
Spec. type & grade	e:		Not Applicable to S	pec. type & grade:	Not A	Applicable
OR						
Chem. Analysis &	Mech. P	rop.:	Not Applicable to C	hem. Analysis & Mech. Pro	p.:	Not Applicable
Thickne	ess Rang	je				
			Normal Service	Impact Tested to -		
Base Metal: Groov	/e:	Section IX	0.062" to 1.500"	0.125" to 1.500"	Fillet:	All
		Section 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
Pipe Dia Range: G		All diameter		NII.	Fillet:	All
			veld layer shall not exceed 0.500			
"LIMI	ted to P-	Group 1 or 2	only when proven notch toughn	· · ·		
		_ 1	FILLER METALS	QW-404		
Sma.	alfiantia.	Process: n No. (SFA):	SMAW 5.1	SMAW 5,1		SAW 5.17
•		ication No.:	E6010	E7018-1		EM12K
		F-No.:	F-3	F-4		F-6
		A-No.:	A-1	A-1		A-1
•	Size of F	iller Metals:	3/32", 1/8", 5/32"	3/32", 1/8", 5/32, 3/16",	1/4" 3/32",	1/8", 5/32", 3/16"
Weld Metal	Thicknes	ss - Groove:	0.250" max.	1.500" max.		1.500" max.
		- Fillet:	Unlimited	Unlimited		Unlimited
Ele	ctrode-F	lux (Class):	Not Applicable	Not Applicable	F7.	A6-EM12K-H8
	Ма	nufacturer:	Not Applicable	Not Applicable	Li	ncoln Electric
	-	Tradename:	Not Applicable	Not Applicable		LA-61
	Flux T	rade Name:	Not Applicable	Not Applicable	Lir	ncoln 882 Flux
		Alloy Flux:	Not Applicable	Not Applicable		Neutral
		able Insert:	Not Applicable	Not Applicable		lot Applicable
Suppler		iller Metals:	Not Applicable	Not Applicable		lot Applicable
	Pro	oduct Form: Other:	Covered Electrode	Covered Electrode	l .	iled Solid Wire
		J.11011	E6010 limited to root pass only	when proven noton toughne	ss properties are	requireu.

¹Revision 1: Revision to accommodate revision of PQR SAS-1-3 as well as the addition PQR SAS-1-4 to expand the base metal thickness range where proven notch toughness properties are required at -50°F.

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

WPS # SAS-1 Rev.1

	POSITIONS	QW-405		FUSIVAL	LD HEAT TF	/ L \(\tal \)	QW-407	
Position(s) of					o. Range:			
Welding Prog		V Vertical Up or Do	wn	Time Range:				
		Vertical Up or Do			Heating:	(None – As	one – As Welded)	
		Flat or Horizontal ¹						
Position(s)					Cooling:			
, ,	PREHEAT	QW-406			GAS	QW-408		
Temperat	Temperature Min.:			Shielding		<u> </u>		
Interpass Ten		(See Next Pag	re)	_	position:			
•	ass Min.:	(***********	-,		ow Rate:	(Not App	licable)	
Preheat Main		ing tempilstiks, pyr	ometer or		Backing:	(*******	,	
		ble methods.			Other:			
	-	ELECTRICAL	CHARACTER	ISTICS OV	V - 409			
	Currer		Direct - DC	F-4 SMAW:	Direct - DC	F-6 SAW:	Direct - DC	
	Polarit	y: F-3 SMAW:	Reverse - EP	F-4 SMAW:	Reverse - EP	F-6 SAW:	Reverse - EP	
	Amps (Range		50 - 180	F-4 SMAW:	50 - 360	F-6 SAW:	250 - 750	
	Volts (Range		18 - 34	F-4 SMAW:	18 - 34	F-6 SAW:	22 - 38	
	Travel Speed (Range	•	1 - 16	F-4 SMAW:	1 - 20	F-6 SAW:	4 - 35	
Maximum Heat	Input: 0.125" to 0.625		25 200 J/in	F-4 SMAW:	29 640 J/in	F-6 SAW:	36 428 J/in	
	0.625" to 1.500		69 300 J/in	F-4 SMAW:	63 000 J/in	F-6 SAW:	73 636 J/in	
Electrode \	Wire feed speed rang					• •		
	Electrode Size & Typ		9					
	tal Transfer for GMA							
	Othe		it input mandatory	only when prove	n notch toughne	ess is required.		
			•			· ·		
		1 - (CHNIQUE ()W-410				
	String or Weave Be			W-410 shall be control	led to prevent e	vceeding maxim	um heat innuts	
	String or Weave Bo	ead: String and w	veave. Weave size		led to prevent e	xceeding maxim	num heat inputs.	
	String or Weave Bo Orifice or Gas Cup S	ead: String and will be string a	veave. Weave size	shall be control				
	•	ize: String and was Not Applicate Base materi paint, tar, et	veave. Weave size	shall be control ghly cleaned of a	Ill foreign materi	ial (scale, rust, c o welding. All su	oil, grease,	
	Orifice or Gas Cup S	ize: String and w ize: Not Applicat Base materi paint, tar, et welded shall	veave. Weave size ble al must be thorou c.) at least 1" back	shall be control ghly cleaned of a con each side or rm and free from	Ill foreign materi the joint prior to notches, slag,	ial (scale, rust, c o welding. All su fins and burrs.	oil, grease, Irfaces to be	
N	Orifice or Gas Cup S	ize: Not Applicat Base materi paint, tar, et welded shall Perform by	veave. Weave size ole al must be thoroug c.) at least 1" back I be smooth, unifo	ghly cleaned of a c on each side or rm and free from g hammer, pow	Ill foreign materi the joint prior to notches, slag, er brushing, grir	ial (scale, rust, co o welding. All su fins and burrs. nding, etc. after	oil, grease, irfaces to be each weld layer.	
N	Orifice or Gas Cup S Initial Clean Interpass Clean	ize: Not Applicat Base materi paint, tar, et welded shall ing: Perform by v ing: Arc air, goug	veave. Weave size ole al must be thoroug c.) at least 1" back I be smooth, unifor wire brush, chippinge, grind, etc., grin	ghly cleaned of a c on each side or rm and free from g hammer, pow	Ill foreign materi the joint prior to notches, slag, er brushing, grir	ial (scale, rust, co o welding. All su fins and burrs. nding, etc. after	oil, grease, irfaces to be each weld layer.	
	Orifice or Gas Cup S Initial Clean Interpass Clean Iethod of Back Goug Oscillat	ize: Not Applicate Base materi paint, tar, et welded shall ing: Perform by ting: Arc air, goug Not Applicate	veave. Weave size ole ial must be thoroug c.) at least 1" back I be smooth, unifor wire brush, chippir ge, grind, etc., grin ole	ghly cleaned of a c on each side or rm and free from g hammer, pow	Ill foreign materi the joint prior to notches, slag, er brushing, grir	ial (scale, rust, co o welding. All su fins and burrs. nding, etc. after	oil, grease, irfaces to be each weld layer.	
Contac	Orifice or Gas Cup S Initial Clean Interpass Clean Nethod of Back Goug	ize: Not Applicate Base materi paint, tar, et welded shall perform by v ing: Arc air, goug ion: Not Applicate 1/4" to 1 1/4 Single or mu	veave. Weave size ole ial must be thoroug c.) at least 1" back I be smooth, unifor wire brush, chippir ge, grind, etc., grin ole	shall be control ghly cleaned of a con each side or rm and free from g hammer, pow id to clean metal	ill foreign materi the joint prior to notches, slag, er brushing, grir where thermal	ial (scale, rust, co o welding. All su fins and burrs. nding, etc. after processes are u	bil, grease, irfaces to be each weld layer. ised if required.	
Contact Multiple c	Orifice or Gas Cup S Initial Clean Interpass Clean Method of Back Goug Oscillat t Tube to Work Distan	ize: Not Applicate Base matering: paint, tar, et welded shall Perform by a Arc air, goughion: Not Applicate 1/4" to 1 1/4 Single or murequired.	veave. Weave size to ble lal must be thorouge. It least 1" back I be smooth, unifor wire brush, chippinge, grind, etc., grind ble laltiple passes per state.	e shall be control ghly cleaned of a c on each side or rm and free from g hammer, pow d to clean metal side, multiple on	ill foreign materi the joint prior to notches, slag, er brushing, grin where thermal	ial (scale, rust, co welding. All sufins and burrs. Inding, etc. after processes are unotch toughness	bil, grease, urfaces to be each weld layer. used if required. s properties are	
Contact Multiple o	Orifice or Gas Cup S Initial Clean Interpass Clean Method of Back Goug Oscillat t Tube to Work Distan or Single Pass (per si	ize: Not Applicate Base materi paint, tar, et welded shall Perform by varies. Not Applicate Arc air, goughton: Not Applicate 1/4" to 1 1/4 Single or murequired. Single or Multiple of Mul	veave. Weave size to ble all must be thorough c.) at least 1" back I be smooth, unifor wire brush, chippinge, grind, etc., grind ble " ultiple passes per sultiple, multiple onl	e shall be control ghly cleaned of a c on each side or rm and free from g hammer, pow d to clean metal side, multiple on	ill foreign materi the joint prior to notches, slag, er brushing, grin where thermal	ial (scale, rust, co welding. All sufins and burrs. Inding, etc. after processes are unotch toughness	bil, grease, urfaces to be each weld layer. used if required. s properties are	
Contact Multiple c	Orifice or Gas Cup S Initial Clean Interpass Clean Method of Back Goug Oscillat t Tube to Work Distal or Single Pass (per si	ize: Not Applicate Base materi paint, tar, et welded shall Perform by Ming: Arc air, gouç Not Applicate 1/4" to 1 1/4 Single or murequired. Single or Mure Base materi paint, tar, et welded shall Perform by Ming: Arc air, gouç Not Applicate 1/4" to 1 1/4 Single or murequired. Single or Mure Base Mure Bas	veave. Weave size to ble all must be thorough c.) at least 1" back I be smooth, unifor wire brush, chippinge, grind, etc., grind ble " ultiple passes per sultiple, multiple onl	e shall be control ghly cleaned of a c on each side or m and free from g hammer, pow id to clean metal side, multiple on y when proven r	Ill foreign materi the joint prior to notches, slag, er brushing, grir where thermal by when proven otch toughness	ial (scale, rust, co welding. All sufins and burrs. Inding, etc. after processes are unotch toughness	bil, grease, urfaces to be each weld layer. used if required. s properties are	
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¹SAW position limited by process usability.

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

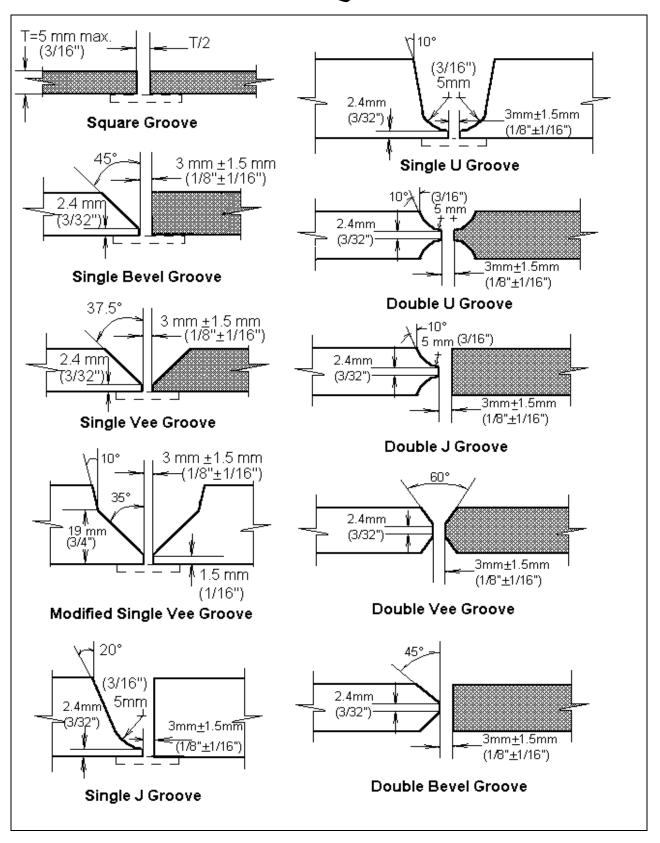
WPS # SAS-1 Rev.1

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%				
	200°F if the joint thickness is 1.250" to 1.500"				
B31.1 :	50°F minimum for all P-1 materials				
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				
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

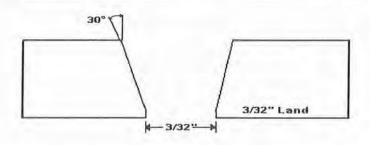
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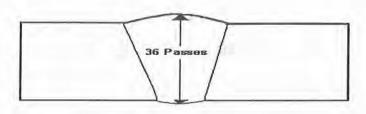


PROCEDURE QUALIFICATION RECORD (PQR) QW-483 (Section IX, ASME Boiler and Pressure Vessel Code)

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

JOINTS QW-402





BASE M	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	60 to Grade 70 P-1 Group 2	Temperature:	Not Applicable	
PREH		SHIELDING G	AS QW-408	
Preheat & Interpass Min.: Interpass Max.:	175 °F 600°F Temperature monitored using Tempilstic	Shielding Gas: N/A Composition: N/A Flow Rate: N/A		
	FILLER M	ETALS 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"	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 CHA	RACTERISTICS 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	
	TECHNI	QUE 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	
Oscillation:			N/A	
Single / Multi Pass:	Multiple	N/A Multiple	Multiple	
Single / Multi Electrodes:	Single	Single	Single	
Wire Feed Rate:	N/A	N/A	80 ipm	

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

				Tensile	Test	PQR#	1	SAS-1-
Specimen No.	n Widt	h Th	ickness In	QW-46 Area in²	Ultimate Total Loa	ad Unit	mate Stress	Type of Failure & Location
			See	Attached R	eport			
			G	uided Ben				
	Type an	d Figure No),			Result		
			See	Attached Re	port			
			1	oughness QW-17				
Specimen No.	Notch Location	Notch Type	Test Temp	Impact Values	Latera % Shear	al Exp Mils	Dro _l Break	P Weight No Brk
*			See	Attached R	eport			
Result-Satis //acro-Resu		Yes	F No	Fillet-Weld Not Applica Pe		Material: Y	es	_ No
				Other Tes	sts			
ype of Test eposit Ana		ers Hardnes N/A	s Test to NA	CE MR01				
/elder's Nar ests Condu		Kolman Qualimet		ck No.: _W		Stamp ab. Test No	ID: <u>CC</u>	- 01001
					and that the n IX of the AS			epared, we
			Manufa		b Arc Systems	5 1/2 h.) an	
ate: Janua	ary 4, 2002			By: Ga	ry Kolman (Mary 1	1010	>

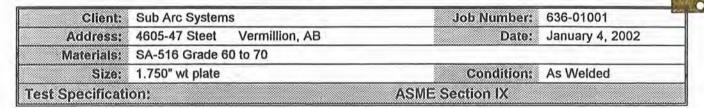


7817 CORONET BOAD, EDMONTON, AB. T6E 4N7 - (780) 469-5870 - FAX (780) 465-5829
 CALDARY (403) 278-9862 - 1-800-621-8979 - www.quallimatinc.com

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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	
Req'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:



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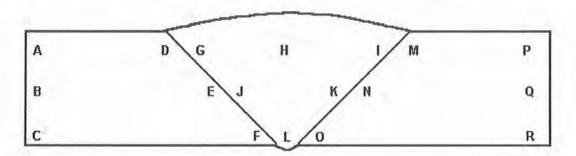
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HARDNESS TEST REPORT

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
Test Method:	Hardness testing performed in accordance with a 10 kg load. (HV10)	rith 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

A	177	D	198	G	205	J	210	M	189	Р	178
В	182	E	205	Н	103	K	207	N	196	Q	181
C	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.



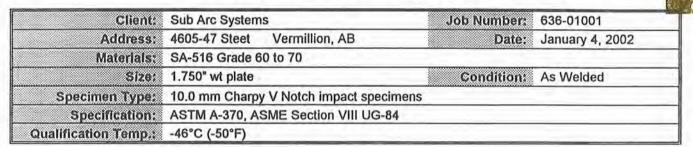


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CHARPY V-NOTCH IMPACT TEST RESULTS

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.

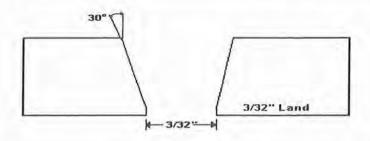
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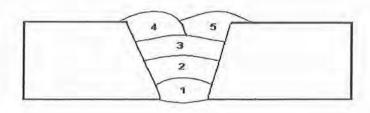
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PROCEDURE QUALIFICATION RECORD (PQR) QW-483 (Section IX, ASME Boiler and Pressure Vessel Code)

Company Name:	Sub Arc Systems		
PQR No:	SAS-1-2	Date:	January 4, 2002
Revision No.:	1.00	Revision Date:	
WPS No:	SAS-1		
Welding Process(es):	SMAW/ SMAW/ SAW		
Types:	Manual/ Manual/ Machine		





BASE META	LS QW-403	POSTWELD HEAT TR	EATMENT QW-407
Material Spec.: SA-516	_ SA-516	Temperature:	
Type or Grade: Grade 60	To 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 (C.E): 0.38		
PREHEAT	QW-406	SHIELDING G	AS QW-408
Preheat & Interpass Min.: 50	o °F	Shielding Gas: N/A	
Interpass Max.: 60	00°F	Composition: N/A	
Tem	perature monitored using Tempilsti	ck Flow Rate: N/A	
	FILLER M	ETALS QW-404	and the second second
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)
	ELECTRICAL CHA	RACTERISTICS QW-409	and the second second
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
	TECHN	IQUE 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

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

				Tensile 7	Test	PQR #	SAS-1-
Specimen No.				QW-46 Area In²	Ultimate Total Loa		
			See	Attached R	eport		
			G	uided Bene QW-46			
	Type and	d Figure No),			Result	
			See	Attached Re	port		
				Foughness QW-170			
Specimen No.	Notch Location	Notch Type	Test Temp	Impact Values	Lateral % Shear		Drop Weight Break No Brk
140.	Location	Туре	Temp	values	70 Sileai	Wills D	HEAR NO DIK
			See	Attached R	eport		
			ŀ	Fillet-Weld Not Applica			
Result-Satis	the state of the s	Yes	No		n. Into Parent M	laterial: Yes	No
Macro-Resu	its:						
				Other Tes	sts		
Type of Test	t: Vicke	ers Hardnes	s Test to NA	CE MR01			
Deposit Ana	lysis:	N/A					
Velder's Nar Tests Condu		Kolman Qualimet		ock No.: _W		Stamp ID: _ b. Test No.: _	CD 636 – 01001
					and that the IX of the AS		re prepared, we
			Manufa	acturer: Su	b Arc Systems		
							K -

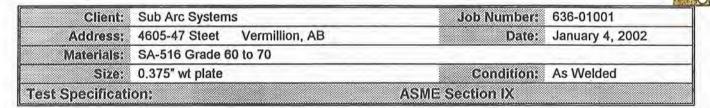


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MECHANICAL TEST REPORT

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 – In ² :	0.263	0.360
Ultimate Load – lbs:	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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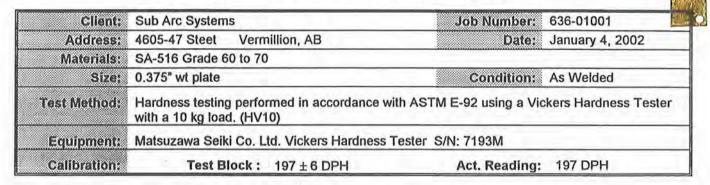


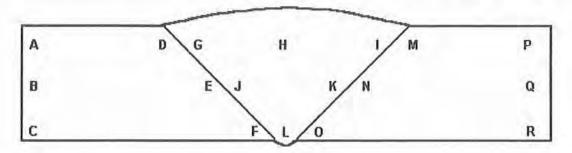


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HARDNESS TEST REPORT

for Procedure Qualification Record # SAS-1-2





Hardness Values

Α	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	1	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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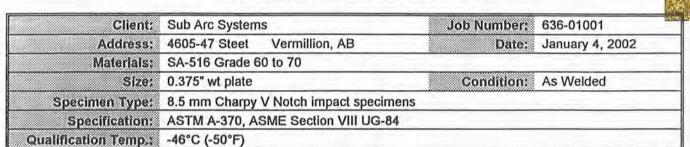


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CHARPY V-NOTCH IMPACT TEST RESULTS

For Procedure Qualification Report # SAS-1-2



Sample Number	Impact Ft-Ib	·	Converted Full Size Impact Energy (J)	% Shear
1	10	14	16	20
2	12	16	19	20
3	24	33	38	20
Average:	15	21	24	20
			,	
1	82	111	131	70
2	106	144	169	80
3	146	198	233	100
Average:	111	151	178	83
1	98	133	166	40
2	132	179	224	100
3	86	117	146	40
Average:	105	143	179	60
	Number 1 2 3 Average: 1 2 3 Average: 1 2 3 Average:	Number Ft-lb 1 10 2 12 3 24 Average: 15 1 82 2 106 3 146 Average: 111 1 98 2 132 3 86	Number Ft-lb (Joule) 1 10 14 2 12 16 3 24 33 Average: 15 21 1 82 111 2 106 144 3 146 198 Average: 111 151 1 98 133 2 132 179 3 86 117	Number Ft-Ib (Joule) Impact Energy (J) 1 10 14 16 2 12 16 19 3 24 33 38 Average: 15 21 24 1 82 111 131 2 106 144 169 3 146 198 233 Average: 111 151 178 1 98 133 166 2 132 179 224 3 86 117 146

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.

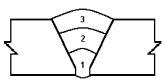


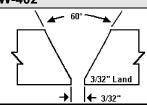
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PROCEDURE QUALIFICATION RECORD (PQR) QW-483 (Section IX, ASME Boiler and Pressure Vessel Code)

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





		_	→						
BASE METALS QW-403			POSTWELD HEAT TREATMENT QW-407						
Material Spec.:	SA-516	SA-516	Temperature:						
Grade/Type/Class:	Gr. 60	Gr. 70	Time:	,					
P-No Group No :	P-1 Gro	oup 1 to P-1 Group 2	Heating:	ing:					
Heat No.:	Not Re	corded Not Recorded				t Applicable)			
ASME C.E.:	Not Re	corded Not Recorded	Cooling:						
CSA C.E.:	Not Re	corded Not Recorded							
Thickness & Diameter:	0.249"	thick plate (machined)							
Max Weld Deposit:	<0.500	" per pass	Other:						
PREHEAT 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:	Progression: Vertical Up		Horizontal			
Other:	Tempe	erature monitored by tempilstiks	Other:	Not Applicable	Not Applicable	Not Applicable			
FILLER METALS QW-404									
Process: SMAW			SMAW SAW						
SFA Specification	n No.:	5.1	5.1		5.17				
AWS Classification 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 Weld I	Metal:	0.050"		0.075"		0.125"			
Electrode-Flux (Class):		Not Applicable	Not	Not Applicable		F7A6			
Flux Trade N	Name:	Not Applicable	Not	Not Applicable		Lincolnweld 882			
Alloy Element/Flux:		Not Applicable	Not Applicable		None				
Manufacturer:		Not Recorded	Not	Not Recorded		Lincoln Electric			
Trade Name:		Not Recorded		Not Recorded		L-61			
Heat Number:		Not Recorded		Not Recorded		Not Recorded			
Product Form:		Covered Electrode	Cover	ed Electrode	Coiled Metal Cored Wire				
		SHIELDING	GAS QW-	408					
Shielding Gas:									
Composition:									
Flow Rate:		(Not Applicable)	(Not Applicable)		(Not Applicable)				
Trailing / Backing Gas:									
Flow Rate:									
ELECTRICAL CHARACTERISTICS QW-409									
Current:		Direct (DC)	Direct (DC)		Direct (DC)				
Polarity:		Reverse (EP)	Rev	Reverse (EP)		Reverse (EP)			
Volts:		21		20		30			
	Amps:	110		105		425			
Travel Speed	` '	5.5	4.3		24				
Maximum Heat Input		25 200	29 640		36 428				
Wire Feed Speed		Not Applicable	Not Applicable			82			
Mode of Metal Tra	nster:	Not Applicable	Not Applicable		Not Ap	Not Applicable			
TECHNIQUE QW-410									
String or W		String	String & Weave		String				
Oscill	<u> </u>	Not Applicable	Not Applicable		Not Applicable				
Single / Multi		Single Pass from one side	Single Pass from one side		Single Pass from one side				
Single / Multi Electr		Single	Single		Single				
Thermal Proc	L	Not Applicable		Not Applicable		Not Applicable			
Wire Sticl		Not Applicable	Not Applicable		Not Recorded				
Nozzle / Cup Size:		Not Applicable	Not Applicable		Not Applicable				

¹ Revision 1: Revision to correct editorial error.