

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATIONS (WPS)
(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

Company Name AXTON INCORPORATED By: FELIPE NAMOCATCAT
Welding Procedure Specification No. AX-33S Date 1/16/2008 Supporting PQR No.(s) 126
Revision No. 0 Date 01/16/2008
Welding Processes SAW Type(s) MACHINE
(Automatic, Manual, machine, or Semi-Auto.)

JOINTS (QW-402)

Joint Design CORROSION RESISTANT WELD METAL OVERLAY

Details

Backing (Yes) YES (No) _____

Backing Material (Type) BASE AND/OR WELD METAL

(Refer to both backing and retainers)

☒ Metal ☐ Nonfusing Metal

☐ Nonmetallic ☐ Other

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

- Project No.: 30056H006/ 0810-002

- Code No.: 3P03

- Item/Tag No.: 206C-104

- Axton Serial No.: 69647

- Revision Number: 2

- Notes: WELD OVERLAY WPS.

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

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

P- No. 1 Group No. - to P- No. - Group No. -

OR

Specification type and grade _____

to Specification type and grade _____

OR

Chem Analysis and Mech. Prop. _____

to Chem Analysis and Mech. Prop. _____

Thickness Range:

Base Metal: Groove 0.375" TO NO MAX.

Fillet N/A

Pipe Dia. Range: Groove N/A

Fillet N/A

Other _____

***FILLER METALS (QW-404)**

LAYER 1

LAYER 2

Spec. No. (SFA) _____

5.9

5.9

AWS No. (Class) _____

ER309L

ER308L

F-No. _____

6

6

A-No. _____

8

8

Size of Filler Metals _____

0.063"

0.063"

Weld Metal _____

0.093" Min.

0.093" Min.

Thickness Range:

0.250" Max.

0.250" Max.

Groove _____

N/A

N/A

Fillet _____

N/A

N/A

Electrode-Flux (Class) _____

N/A

N/A

Flux Trade Name _____

SOUDOKAY RECORD IN

SOUDOKAY RECORD IN

Consumable Insert _____

N/A

N/A

Other _____

Bare (solid) filler metal to be used. Change greater than 10% in volume of supplemental filler metal is not

permitted. Change in the welding procedure leading to changes in important alloying elements not permitted.

*Each base metal-filler metal combination should be recorded individually.

DOCUMENT CONTROL			
CODE	DESCRIPTION	SIGN	DATE
1	Revise and resubmit. Do not commence fabrication.		
2	To be issued as final provided comments are incorporated		
3	No comment. Final Issue.		

Feb 04 2008
3eh

Note: Technip's review of this document does not release the vendor from their responsibility for its accuracy. A detail check has not been conducted by Technip.

SUNCOR ENERGY	
DWG No.: <u>VP206-C-246-1</u>	
TITLE: <u>WPS / PQR</u>	
EQUIP No.: <u>206C-104</u>	
SAP No.: <u>03-00041-HY-06-00</u>	
P.O. No.: <u>30056H006</u> REVISION No.: <u>1A</u>	
TECHNIP MR100002-55 ISSUE 1	

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATIONS (WPS)
(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

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Welding Procedure Specification No. **AX-33S** Date **1/16/2008** Supporting PQR No.(s) **126**
Revision No. **0** Date **01/16/2008**
Welding Processes **SAW** Type(s) **MACHINE**
(Automatic, Manual, machine, or Semi-Auto.)

JOINTS (QW-402)

Details

Joint Design **CORROSION RESISTANT WELD METAL OVERLAY**
Backing (Yes) **YES** (No) _____
Backing Material (Type) **BASE AND/OR WELD METAL**
(Refer to both backing and retainers)
☒ Metal ☐ Nonfusing Metal
☐ Nonmetallic ☐ Other
Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.

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

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

P- No. **1** Group No. **-** to P- No. **-** Group No. **-**
OR
Specification type and grade _____
to Specification type and grade _____
OR
Chem Analysis and Mech. Prop. _____
to Chem Analysis and Mech. Prop. _____
Thickness Range:
Base Metal: Groove **0.375" TO NO MAX.** Fillet **N/A**
Pipe Dia. Range: Groove **N/A** Fillet **N/A**
Other _____

***FILLER METALS (QW-404)**

LAYER 1

LAYER 2

Spec. No. (SFA)	5.9	5.9
AWS No. (Class)	ER308L	ER309L
F-No.	6	6
A-No.	8	8
Size of Filler Metals	0.063"	0.063"
Weld Metal	0.093" Min.	0.093" Min.
Thickness Range:	0.250" Max.	0.250" Max.
Groove	N/A	N/A
Fillet	N/A	N/A
Electrode-Flux (Class) ...	N/A	N/A
Flux Trade Name	SOUDOKAY RECORD IN	SOUDOKAY RECORD IN
Consumable Insert	N/A	N/A
Other	Bare (solid) filler metal to be used. Change greater than 10% in volume of supplemental filler metal is not permitted. Change in the welding procedure leading to changes in important alloying elements not permitted.	

*Each base metal-filler metal combination should be recorded individually.

[Signature]
1/17/2018

POSITIONS (QW-405) Positions of Groove FLAT Welding Progression: Up N/A Down N/A Positions of Fillet ALL	POSTWELD HEAT TREATMENT (QW-407) Temperature Range N/A Time Range GAS (QW-408) <table style="width: 100%; border-collapse: collapse;"> <tr> <th></th> <th style="text-align: center;">Gas(es)</th> <th style="text-align: center;">Percent Composition (Mixture)</th> <th style="text-align: center;">Flow Ratio</th> </tr> <tr> <td>Shielding</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">N/A</td> </tr> <tr> <td>Trailing</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">N/A</td> </tr> <tr> <td>Backing</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">N/A</td> </tr> </table>		Gas(es)	Percent Composition (Mixture)	Flow Ratio	Shielding	N/A	N/A	N/A	Trailing	N/A	N/A	N/A	Backing	N/A	N/A	N/A
	Gas(es)	Percent Composition (Mixture)	Flow Ratio														
Shielding	N/A	N/A	N/A														
Trailing	N/A	N/A	N/A														
Backing	N/A	N/A	N/A														
PREHEAT (QW-406) Preheat Temp. Min. 50-60 F Interpass Temp. Max. 350 F Preheat Maintenance N/A (Continuous or special heating where applicable should be recorded)																	

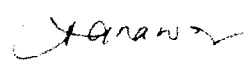
ELECTRICAL CHARACTERISTICS (QW-409)	
Current AC or DC DC	Polarity EP (REVERSE)
Amps (Range) 210-230	Volts (Range) 31-33
(Amps and volts range should be recorded for each electrode size, position, and thickness, etc. This information may be listed in a tabular form similar to that shown below.)	
Tungsten Electrode Size and Type	N/A (Pure Tungsten, 2% Thoriated, etc.)
Mode of Metal Transfer for GMAW	N/A (Spray arc, short circuiting arc, etc.)
Electric Wire feed speed range	260"-300"/MIN.

TECHNIQUE (QW-410)	
String or Weave Bead	STRING
Orifice or Gas Cup Size	N/A
Initial and Interpass Cleaning (Brushing, Grinding, etc.)	STAINLESS STEEL BRUSH CLEANING/GRINDING
Method of Back Gouging	N/A
Oscillation	N/A
Contact Tube to Work Distance	1/2" TO 1"
Multiple or Single Pass (per side)	MULTIPASS/LAYER, MULTI LAYER WELD OVERLAY
Multiple or Single Electrodes	SINGLE
Travel Speed (Range)	26"-30" /MIN.
Peening	NOT ALLOWED
Other	ALL CLEANING AND CHIPPING TOOLS SHALL BE DEDICATED TO STAINLESS STEEL WORK.

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	Travel Speed Range	Other (e.g. Remarks, Comments, Hot Wire Addition, Technique, Torch Angle, etc.)
		Class	Dia.	Type Polarity	Amp. Range			
1	SAW	ER308L	.063"	DCEP	210-230	31-33	26"-30"/MIN	AMPERAGE AND VOLTAGE RANGE MAY VARY BY +/- 10 %.
2	SAW	ER309L	.063"	DCEP	210-230	31-33	26"-30"/MIN	

Size of electrode, size of fillermetal, no. of passes, amperage, voltage, and travel speed will differ with position, thickness & joint configuration.

QA Manager – Axton Incorporated

Name	Signature
Felipe Namocatcat	
Date	
17-Jan-08	

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORDS (PQR)
 (See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
 Record Actual Conditions Used to Weld Test Coupon

Company Name **AXTON INCORPORATED**

Procedure Qualification Record No. **126**

Date **01/16/2008**

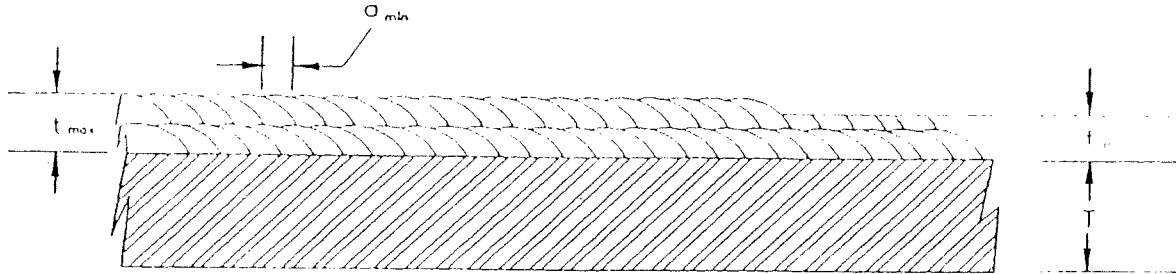
WPS No. **AX-33S**

Welding Processes **SAW**

Types (Manual, Automatic, Semi-Auto) **AUTOMATIC**

JOINTS (QW-402)

T = 0.375" min, no max.
 t_{max} = no max.
 t_{min} = 1/8"
 α = 50 % min.



Groove Design of Test Coupon

(For continuous qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

BASE METALS (QW-403) Material Spec. SA-516 Type GRADE 70 P-No. 1 to P-No. - Thickness of Test Coupon 0.375" Diameter of Test Coupon N/A Other N/A		POSTWELD HEAT TREATMENT (QW-407) Temperature N/A Time N/A Other N/A																						
		GAS (QW-408) <table border="1"> <thead> <tr> <th></th> <th>Gas(es)</th> <th>Percent Composition (Mixture) %</th> <th>Flow rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>Trailing</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>Backing</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> </tr> </tbody> </table>			Gas(es)	Percent Composition (Mixture) %	Flow rate	Shielding	N/A	N/A	N/A	Trailing	N/A	N/A	N/A	Backing	N/A	N/A	N/A					
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FILLER METALS (QW-404) <table border="1"> <thead> <tr> <th>SFA Specification</th> <th>5.9</th> <th>5.9</th> </tr> </thead> <tbody> <tr> <td>AWS Classification</td> <td>ER309L</td> <td>ER308L</td> </tr> <tr> <td>Filler Metal F-No.</td> <td>6</td> <td>6</td> </tr> <tr> <td>Weld Metal Analysis A-No.</td> <td>8</td> <td>8</td> </tr> <tr> <td>Size of Filler Metal</td> <td>0.063"</td> <td>0.063"</td> </tr> <tr> <td>Other</td> <td></td> <td></td> </tr> <tr> <td>Weld Metal Thickness</td> <td>0.093"</td> <td>0.093"</td> </tr> </tbody> </table>		SFA Specification	5.9	5.9	AWS Classification	ER309L	ER308L	Filler Metal F-No.	6	6	Weld Metal Analysis A-No.	8	8	Size of Filler Metal	0.063"	0.063"	Other			Weld Metal Thickness	0.093"	0.093"	ELECTRICAL CHARACTERISTICS (QW-409) Current DC Polarity ELECTRODE POSITIVE (REVERSE) Amps 220 Volts 32 Tungsten Electrode Size N/A Other	
SFA Specification	5.9	5.9																						
AWS Classification	ER309L	ER308L																						
Filler Metal F-No.	6	6																						
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Other																								
Weld Metal Thickness	0.093"	0.093"																						
POSITION (QW-406) Position of Groove FLAT (1G) Weld Progression (Uphill, Downhill) N/A Other		TECHNIQUE (QW-410) Travel Speed 26 "/MIN String or Weave Bead STRING Oscillation N/A Multipass or Single Pass (per side) MULTIPASS Single or Multiple Electrodes SINGLE Other																						
PREHEAT (QW-406) Preheat Temp 60 F Interpass Temp 350 F max Other																								

Signature
 1/17/2008

Tensile Test (QW-150)

Specimen No.	Width	Thickness	Area	Ultimate Total Load (lb)	Ultimate Unit Stress (psi)	Type of Failure and Location
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
S1 SIDE BEND	ACCEPTABLE
S2 SIDE BEND	ACCEPTABLE
S3 SIDE BEND	ACCEPTABLE
S4 SIDE BEND	ACCEPTABLE

Other Tests

LIQUID PENETRANT TEST	SEE ATTACHED REPORT
FERRITE TEST	SEE ATTACHED REPORT
CHEMICAL ANALYSIS	SEE ATTACHED REPORT
HARDNESS TEST	SEE ATTACHED REPORT

Fillet-Weld Test (QW-180)

Result - Satisfactory: Yes N/A No _____Penetration into Parent Metal: Yes N/A No _____Macro — Results N/A

Welder's Name TONY TANG Clock 5423 Stamp No. 17
 Tests conducted by: KEN ARMSTRONG Laboratory Test No. 6041722

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

Manufacturer AXTON INCORPORATEDDate 01/16/2008By FELIPE NAMOCATCAT

(Detail of record tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)



Richmond, BC, Canada V7A 4V4
Phone: (604) 275-3800
Fax: (604) 274-7235

Materials Engineering & Testing
a Rockwood Company

ISO 9001:2000

AXTON INCORPORATED
NEW WESTMINSTER, BC

ATTENTION: FELIPE NAMOCATCAT

WELD OVERLAY, CHEMICAL ANALYSIS,
AND HARDNESS TEST REPORT

JANUARY 16, 2008

SCOPE OF SERVICES: The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren. In no event shall Acuren's liability in respect of the services referred to herein exceed the amount paid for such services.

STANDARD OF CARE: In performing the services provided Acuren uses the degree of care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty expressed or implied is made or intended by Acuren.

**Acuren Group Inc.**

12271 Horseshoe Way
Richmond, BC, Canada V7A 4V4

Phone: (604) 275-3800
Fax: (604) 274-7235

Materials Engineering and Testing
a Rockwood Company

ISO 9001:2000

WELD OVERLAY TEST

AXTON INCORPORATED
441 DERWENT PLACE ANNACIS ISLAND BUSINESS
PARK
NEW WESTMINSTER, BC
V3M 5Y9

Date: January 16, 2008

File No: 6041722

P.O. No: PO 701459

Report No: 1

Attention: **FELIPE NAMOCATCAT**

Sample Description: Corrosion Resistant Weld Overlay Test Plate
Job # 69647

Procedure No:	PQR-126	Welding Process:	SAW
Base Material:	SA516 Grade 70N	Filler Material:	ER309L / ER308L
Test Sample Size:	3/8" Thick Base Plate	Welder ID:	# 17

Test Specification: ASME Section IX: 2007

LIQUID PENETRANT EXAMINATION (QW-195)

Specimen Identification	Acceptance Standards	Examination Result	Remarks
PQR-126	QW-195.2	Acceptable	---

BEND TEST (QW-160)**FERRITE TEST**

Specimen Identification	Type of Bend	Results	Specimen Identification	Test Location	Reading* (% Fe)
S1	Side	Acceptable	PQR-126	Top Surface	7.1
S2	Side	Acceptable			
S3	Side	Acceptable	PQR-126	1/8" From Fusion Line	4.5
S4	Side	Acceptable			

* Average of 10 readings

- Province of British Columbia authorized testing agency for boiler, pressure vessel and pressure piping: No. TA-15.
- Test machine calibrated to ASTM E4 and CSA A23.2-9C specifications.
- Specimens will be disposed of after 30 days unless alternate provisions are made.

Reported by:

David Kwong, CTech

Reviewed by:

Alex Wong, ASCT

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Richmond, BC, Canada V7A 4V4Phone: (604) 275-3800
Fax: (604) 274-7235**Materials Engineering and Testing
a Rockwood Company****ISO 9001:2000****CHEMICAL ANALYSIS REPORT**AXTON INCORPORATED
441 DERWENT PLACE ANNACIS ISLAND BUSINESS
PARK
NEW WESTMINSTER, BC
V3M 5Y9

Date: January 16, 2008

File No: 6041722

P.O. No: PO 701459

Report No: 2

Attention: **FELIPE NAMOCATCAT**Description: Weld Metal Chemical Analysis on Corrosion Resistant Weld Overlay Test Plate
Job # 69647
Base Material: SA516 Grade 70N
Filler Material: ER309L / ER308L
Minimum Qualified Overlay Thickness: 1/8"

Sample ID: PQR-126

Test Method: Direct Reading Optical Spectrometry

TEST RESULTS

Element	Chemical Composition (%)	
	Top Surface	Tested at 1/8" from fusion line
Carbon	0.020	0.022
Manganese	1.10	1.70
Phosphorus	0.02	0.02
Sulphur	0.02	0.02
Silicon	1.22	2.00
Nickel	10.20	11.50
Chromium	20.20	21.60
Molybdenum	0.03	0.04
Copper	0.09	0.10
Aluminium	0.008	0.008

Reported by:

David Kwong, CTech

Reviewed by:

Alex Wong, ASCT

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Richmond, BC, Canada V7A 4V4Phone: (604) 275-3800
Fax: (604) 274-7235**Materials Engineering and Testing**
a Rockwood Company**ISO 9001:2000****HARDNESS TEST REPORT**AXTON INCORPORATED
441 DERWENT PLACE
ANNACIS ISLAND BUSINESS PARK
NEW WESTMINSTER, BC
V3M 5Y9

Date: January 16, 2008

File No: 6041722

P.O. NO: PO 701459

Report No: 3

Attention: **FELIPE NAMOCATCAT**Description: Weld Metal Hardness Test On Corrosion Resistant Weld Overlay Test Plate
Job # 69647
PQR-126
Base Material: SA516 Grade 70N
Filler Material: ER309L / ER308LTest Method: Satec Universal Test Machine, Serial 120 HVL-1164, 3,000 kgf Load with 10 mm Ø Ball
Test Specification: ASTM E10-07e1
Scale: Brinell Hardness Number HBW 10/3000

Specimen Identification	Hardness Reading (HBW)			
	Test 1	Test 2	Test 3	Average
Weld Top Surface	207	197	197	200
1/8" from fusion line	190	185	190	188

- Province of British Columbia authorized testing agency for boiler, pressure vessel and pressure piping: No. TA-15.
- Test machine calibrated to ASTM E4 and CSA A23.2-9C specifications.
- Specimens will be disposed of after 30 days unless alternate provisions are made.

Reported by:

David Kwong, CTech

Reviewed by:

Alex Wong, ASCT

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