

Samuel Pressure Vessel Group



Welding Procedure Specification (WPS)

WPS: PV002 Date: 10/2/2017 Rev.: F Date: 2/2/2018 Page: 1 of 2
 By: Chapman Date Signed: 12/19/2019

Supporting PQR's: 011 [1], 65 [1], 15-1PED [2]

Welding Process(es) / Type(s): (1) SAW / Machine (2) SAW / Machine

Joints (QW-402)

Joint Design: Groove and fillet welds

Joint Type	Backing	Root Opening	Groove Angle	Root Face	Groove Radius
Single-V groove	No backing	3/16" max	50 deg min	1/8" max	-
Single bevel	No backing	3/16" max	45 deg min	1/8" max	-
Single-V groove	Gouged & back welded	1/4" max	50 deg min	3/16" max	-
Double bevel	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Double-V groove	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Square groove	T-joint	1/32" max	-	-	-
Square groove	No backing	3/32" max	-	-	-

Fillet Welds: All fillet sizes on all base metal thicknesses and all diameters.

Retainers: None

Backing if used shall be either ceramic, copper bar, or weld metal.

WELD JOINT DESCRIPTIONS SHOWN ARE NOT INCLUSIVE OF ALL THOSE FOUND ON A JOB. WELD JOINT DESIGN REFERENCE IN AN ENGINEERING SPECIFICATION OR A DESIGN DRAWING SHALL TAKE PRECEDENCE OVER WELD JOINTS SHOWN IN THIS WPS.

Base Metals (QW-403)

Thickness Range (in.): 0.0625 to 1.0000 (1,2)
 P-No.: 8
 to P-No.: 8 Thickness Range (in.): 0.1875 to 1.0000 (PED)

Filler Metals (QW-404)

Spec. No. (SFA): (1 & 2) 5.9

AWS No. (Class): (1 & 2) ER316L / ER308L

F No.: (1 & 2) 6 A No.: (1 & 2) 8

Weld Metal Thickness Range: (1) 0.7500" max , (2) 1.0000" max No Pass Greater Than 1/2" Allowed

Flux Type: (1 & 2) Neutral / Neutral

Flux Trade Name: (1) Lincoln Electric / Lincoln Electric (2) Avesta / Avesta

Consumable Insert: N/A

Other: _____

Supplemental Filler Metal: (1 & 2) None Used

Recrushed Slag: (1 & 2) None Used

Strip Thickness or Width (in.): N/A

Samuel Pressure Vessel Group
Welding Procedure Specification (WPS)

WPS No.: PV002 Date: 10/2/2017 Rev.: F Date: 12/19/2019 Page: 2 of 2

Positions (QW-405) Position of Joint: <u>(1 & 2) Flat only</u> Weld Progression: <u>(1 & 2) N/A</u>	Postweld Heat Treatment (QW-407) Type: <u>No PWHT will be performed</u> Temperature Range: <u>None</u> °F Time Range: <u>None</u>
Preheat (QW-406) Preheat Temp. Min.: <u>50</u> °F Interpass Temp. Max.: <u>300</u> °F Preheat Maintenance: <u>Maintain Above Minimum Temperature</u>	Gas (QW-408) Gas Composition / Flow Rate Shielding: <u>N/A</u> Trailing: <u>N/A</u> Backing: <u>N/A</u>
Electrical Characteristics (QW-409) Current Type / Polarity: <u>(1 & 2) DCEP (reverse)</u> Tungsten Electrode Type and Size: <u>(1 & 2) N/A</u> Mode of Metal Transfer for GMAW(FCAW): <u>(1 & 2) N/A</u> Max. Heat Input (J/in): <u>N/A</u>	
Technique (QW-410) Thermal Processes: <u>(1 & 2) No</u> String or Weave Bead: <u>(1 & 2) Stringer bead</u> Initial and Interpass Cleaning: <u>With Stainless steel brush clean 2 inches (50 mm) on both sides of weld joint</u> Method of Back Gouging: <u>Grind until all defects are removed.</u> Oscillation: <u>(1 & 2) N/A</u> Contact Tube to Work Distance: <u>(1) 3/4" - 1" (2) 3/4"-1"</u> Single or Multiple Passes (per side): <u>(1) Single or multipass (2) Single or multipass</u> Single or Multiple Electrodes: <u>(1 & 2) Single electrode</u> Peening: <u>(1 & 2) None</u> Electrode Spacing: <u>(1 & 2) N/A</u>	

Process Welding Parameters

Weld Layer(s) and/or Pass(es)	Process	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)	Wire Feed Speed Range
		Class	Diameter (in.)	Type / Polarity	Amperage Range			
Any (1)	SAW	ER316L	3/32	DCEP (reverse)	250-600	26-36	10-25	N/A
Any (1)	SAW	ER316L	1/8	DCEP (reverse)	300-700	28-38	10-25	N/A
Any (1)	SAW	ER308L	3/32	DCEP (reverse)	250-600	26-36	10-25	N/A
Any (1)	SAW	ER308L	1/8	DCEP (reverse)	300-700	28-38	10-25	N/A
Any (2)	SAW	ER316L	3/32	DCEP (reverse)	250-600	26-36	10-25	N/A
Any (2)	SAW	ER316L	1/8	DCEP (reverse)	300-700	28-38	10-25	N/A
Any (2)	SAW	ER308L	3/32	DCEP (reverse)	250-600	26-36	10-25	N/A
Any (2)	SAW	ER308L	1/8	DCEP (reverse)	300-700	28-38	10-25	N/A

Northland Stainless Inc.
1119A Bridge St.

Procedure Qualification Record (PQR)

PQR No.: **011** WPS No.: **PV002** Date: **8/17/2017** Page: **1 of 2**

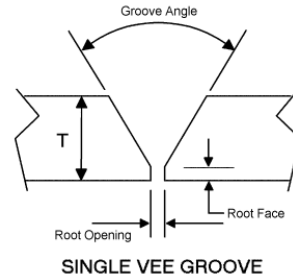
Welding Process(es) / Type(s): SAW / Machine**Joints (QW-402)**

Weld Type: Groove weld
Single-V groove

Backing: Back-gouged and back welded

Root Opening: 0 in. Root Face: 0.25 in.

Groove Angle: 60 °



Base Metals (QW-403)

Material Spec., Type or Grade: SA-240, Type 316L to SA-240, Type 316L
P-No.: 8 Group No.: 1 to P-No.: 8 Group No.: 1
Thickness of Test Coupon (in.): 0.375

Postweld Heat Treatment (QW-407)

Type: No PWHT performed
 Temperature: None °F
 Time: None hr

Filler Metals (QW-404)

SFA Specification:	5.9
AWS Classification:	ER316L
Filler Metal F-No:	6
Weld Metal Analysis A-No:	8
Size of Filler Metal (in.):	3/32
Weld Deposit 't' (in.):	0.375
Pass Greater Than 1/2":	No
Supplemental Filler Metal:	None Used
Flux Trade Name / Type:	Lincoln Electric P2000 / Neutral
Recrushed Slag:	None Used

Gas (QW-408)

Gas Composition / Flow Rate

Shielding: N/A

Trailing: N/A

Backing: N/A

Electrical Characteristics (QW-409)

Current / Polarity: DCEP (reverse)
Amps: 475-530
Volts: 29.5-32.5
Tungsten Type / Size: N/A
Wire Feed Speed: N/A
Heat Input: 60794 J/in

Positions (QW-405)

Position of Joint: 1G - Flat

Weld Progression: N/A

Technique (QW-410)

Travel Speed (in/min):	17-24
Thermal Processes:	(1)No
String/Weave Bead:	Stringer bead
Oscillation:	N/A
Multi./Single Pass (per side):	Single and multipass
Multi./Single Electrode:	Single electrode
Electrode Spacing:	N/A
Contact Tube to Work Dist.:	1"

Preheat (QW-406)

Preheat Temp.:	<u>50</u>	°F
Interpass Temp.:	<u>300</u>	°F
Preheat Maintenance:	Maintain above minimum temperature	

Northland Stainless Inc.
Procedure Qualification Record (PQR)

PQR No.: **011**

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Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in ²)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
1	0.738	0.368	0.272	23920	88100	Ductile - BM
6	0.735	0.364	0.268	23250	86900	Ductile - BM

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.3(a) Face bend	Acceptable	QW-462.3(a) Root bend	Acceptable
QW-462.3(a) Face bend	Acceptable	QW-462.3(a) Root bend	Acceptable
None		None	

Hardness Test - Vickers hardness

Location	Readings								
	1	2	3	4	5	6	7	8	9
SA-240, Type 316L BM (Cap ~1.0mm)	172	165							
SA-240, Type 316L HAZ (Cap ~1.0mm)	185	185	187	181	185	183			
Weld metal (Cap ~1.0mm)	172	172	171						
SA-240, Type 316L BM (Middle)	169	168							
SA-240, Type 316L HAZ (Middle)	186	180	184	180	184	183			
Weld metal (Middle)	147	176							
SA-240, Type 316L BM (Root ~1.0mm)	169	166							
SA-240, Type 316L HAZ (Root ~1.0mm)	172	179	183	182	179	182			
Weld metal (Root ~1.0mm)	148	165	182						

Macro-Examination Test: Acceptable

Visual Examination: Acceptable

Liquid Penetration Test: Acceptable

Welder's Name: Clayton Reindl

ID: 2246

Stamp: 2246

PQR was done and welding of

coupon was witnessed by: Northland Stainless Inc.

Tests Conducted By: St. Louis Testing Laboratories

Test ID.: 17p-4406

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 Welding of the ASME Code.

Prepared By: Clayton Reindl

12/7/2017 12:53 PM Welding Engineer

Clayton Reindl

Date



**Northland
Stainless**

a division of **SAMUEL**

Northland Stainless

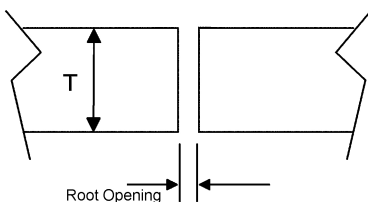
1119A bridge St.

Tomahawk, WI 54487

Procedure Qualification Record (PQR)

PQR No.: 65 WPS No.: 65 Date: 5/8/1997 Page: 1 of 2

Welding Process(es) / Type(s): SAW / Machine

Joints (QW-402) Weld Type: <u>Groove weld</u> <u>Square groove</u> Backing: <u>Back welded</u> Root Opening: <u>.0625</u> in.		 SQUARE GROOVE	
Base Metals (QW-403) Material Spec., Type or Grade: <u> , Type 304</u> to <u>SA-240, Type 304</u> P-No.: <u>8</u> Group No.: <u>1</u> to P-No.: <u>8</u> Group No.: <u>1</u> Thickness of Test Coupon (in.): <u>0.375</u>		Postweld Heat Treatment (QW-407) Type: <u>No PWHT performed</u> Temperature: <u>None</u> °F Time: <u>None</u> hr	
Filler Metals (QW-404) SFA Specification: <u>5.9</u> AWS Classification: <u>ER316L</u> Filler Metal F-No: <u>6</u> Weld Metal Analysis A-No: <u>8</u> Size of Filler Metal (in.): <u>0.093</u> Weld Deposit 't' (in.): <u>0.375</u> Pass Greater Than 1/2": <u>No</u> Supplemental Filler Metal: <u>ER316L</u> Flux Trade Name / Type: <u>Avesta 217 / Neutral</u> Recrushed Slag: <u>NA</u>		Gas (QW-408) Gas Composition / Flow Rate Shielding: <u>N/A</u> Trailing: <u>N/A</u> Backing: <u>N/A</u>	
Positions (QW-405) Position of Joint: <u>1G - Flat</u> Weld Progression: <u>N/A</u>		Electrical Characteristics (QW-409) Current / Polarity: <u>DCEP (reverse)</u> Amps: <u>350</u> Volts: <u>36</u> Tungsten Type / Size: <u>N/A</u> Wire Feed Speed (in/min): <u>140</u> Heat Input: <u>N/R</u>	
Preheat (QW-406) Preheat Temp.: <u>75</u> °F Interpass Temp.: <u>300</u> °F Preheat Maintenance: <u>Maintain between Pre & Inter Temp</u>		Technique (QW-410) Travel Speed (in/min): <u>-</u> Thermal Processes: <u>(1)No</u> String/Weave Bead: <u>Stringer bead</u> Oscillation: <u>None</u> Mult./Single Pass (per side): <u>Single pass</u> Mult./Single Electrode: <u>Single electrode</u> Electrode Spacing: <u>N/A</u>	

Northland Stainless
Procedure Qualification Record (PQR)

PQR No.: 65

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Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in ²)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
T1	0.994	0.374	0.372	35670	95887	Ductile - WM
T6	0.982	0.373	0.366	35280	96393	Ductile - WM

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.3(a) Face bend	Passed	QW-462.3(a) Root bend	Passed
QW-462.3(a) Face bend	Passed	QW-462.3(a) Root bend	Passed
None		None	

Hardness Test - Vickers hardness

Location	Readings								
	1	2	3	4	5	6	7	8	9
SA-240, Type 304 BM	149								
SA-240, Type 304 HAZ	152								
Weld metal	149								

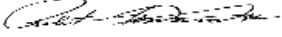
Weld Metal Ferrite FN Number - 4.8

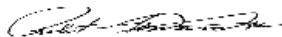
Welder's Name: Reich, John ID: N255 Stamp: N255

PQR was done and welding of
coupon was witnessed by: Northland Stainless Inc.

Tests Conducted By: Maxim Tech. Test ID.: 3404-71-1229

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.

Prepared By:  5/17/2017 Quality Assurance
Bob Soward Date

Accepted By:  5/17/2017 Quality Assurance
Bob Soward Date

	Bureau Veritas UK Limited	Procedure Qualification Records (PQR) For ASME Section IX Meeting Combined Equivalent Testing of EN-15614-1:2004+A2(2012)		PED PQR
Reference Specifications: 2014/68/EU Directive, ASME Section IX & EN-15614-1				Page: 1 of 2
Record Actual Conditions Used to Weld Test Coupon				

Company Name <u>SPVG Marinette</u>	
Procedure Qualification Record No. <u>15-1PED</u>	Date <u>09/02/2010</u>
WPS No. <u>15-1</u>	
Welding Process(es) <u>SAW</u>	Type(s) <u>Machine</u>
(Automatic, Manual, Machine, or Semi-Automatic)	

JOINTS (QW-402)																			
Backing ☒ Yes / ☐ No Retainers ☒ Yes / ☐ No		Groove Design of Test Coupon (For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)																	
BASE METALS (QW-403) Material Spec. <u>SA-240 to SA-240</u> Type or Grade <u>Type 304</u> P-No. <u>8</u> to P-No. <u>8</u> Thickness of Test Coupon <u>0.500"</u> Diameter of Test Coupon <u>N/A -- Plate Coupon</u> Other <u>No pass exceeded 0.500"</u>		POSTWELD HEAT TREATMENT (QW-407) Temperature <u>None</u> Time <u>N/A</u> Other _____																	
FILLER METALS (QW-404) SFA Specification <u>5.9</u> AWS Classification <u>ER316L</u> Filler Metal F-No. <u>6</u> Weld Metal Analysis A-No. <u>8</u> Size of Filler Metal <u>0.0937"</u> Other <u>No supplemental filler used</u> Flux Trade Name: <u>Lincoln Electric 882/Neutral</u> Weld Metal Thickness <u>0.500"</u>		GAS (QW-408) <table style="width: 100%; border-collapse: collapse;"> <thead> <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 Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td style="text-align: center;"><u>None</u></td> <td style="text-align: center;"><u>None</u></td> <td style="text-align: center;"><u>None</u></td> </tr> <tr> <td>Trailing</td> <td style="text-align: center;"><u>None</u></td> <td style="text-align: center;"><u>None</u></td> <td style="text-align: center;"><u>None</u></td> </tr> <tr> <td>Backing</td> <td style="text-align: center;"><u>None</u></td> <td style="text-align: center;"><u>None</u></td> <td style="text-align: center;"><u>None</u></td> </tr> </tbody> </table>			Gas(es)	Percent Composition (Mixture)	Flow Rate	Shielding	<u>None</u>	<u>None</u>	<u>None</u>	Trailing	<u>None</u>	<u>None</u>	<u>None</u>	Backing	<u>None</u>	<u>None</u>	<u>None</u>
	Gas(es)	Percent Composition (Mixture)	Flow Rate																
Shielding	<u>None</u>	<u>None</u>	<u>None</u>																
Trailing	<u>None</u>	<u>None</u>	<u>None</u>																
Backing	<u>None</u>	<u>None</u>	<u>None</u>																
POSITION (QW-405) Position of Groove <u>1G - Flat</u> Weld Progression (Uphill, Downhill) <u>N/A</u> Other _____		ELECTRICAL CHARACTERISTICS (QW-409) Current <u>DC</u> Polarity <u>Reverse</u> Amps. <u>350</u> Volts <u>34</u> Tungsten Electrode Size <u>N/A</u> Other _____																	
PREHEAT (QW-406) Preheat Temp. <u>65°F</u> Interpass Temp. <u>650°F</u> Other _____		TECHNIQUE IQW.4101 Travel Speed <u>16 In/Min</u> String or Weave Bead <u>String</u> Oscillation <u>None</u> Multipass or Single Pass per side <u>Multipass</u> Single or Multiple Electrodes <u>Single</u> Other _____ Peering ☐ Yes / ☒ No																	



ASME/PED PQR (Back)

Page 2 of 2
PQR No. 15-1PED

Tensile Test (QW-150)

Specimen No.	Width	Thickness	Area (in ²)	Ultimate Total Load lb	Ultimate Unit Stress psi	Type of Failure & Location
A	0.7580	0.5050	0.3830	34,922	91,200	Ductile - BM
B	0.7570	0.5070	0.3840	34,721	90,400	Ductile - BM

Guided-Bend Tests (QW-160)

Type	Figure No.	Result
Face Bend	QW-462.3	Acceptable
Face Bend	QW-462.3	Acceptable
Root Bend	QW-462.3	Acceptable
Root Bend	QW-462.3	Acceptable

Toughness Tests (QW-170)

Specimen No.	Notch Location	Specimen Size	Test Temp.	Impact Values			Drop Weight Break (Y/N)
				Ft. lbs.	% Shear	Mils	
1	Weld Metal	10mm x 10mm	-50°F	82	100		
2	Weld Metal	10mm x 10mm	-50°F	77	100		
3	Weld Metal	10mm x 10mm	-50°F	83	100		
1	HAZ	10mm x 10mm	-50°F	98	100		
2	HAZ	10mm x 10mm	-50°F	106	100		
3	HAZ	10mm x 10mm	-50°F	102			

Type of test	Performed and Acceptable	Not Required	Type of test	Performed and Acceptable	Not Required
Visual	☒	☐	Fracture	☒	☐
Radiography	☒	☐	Bend	☒	☐
Magnetic particle/ penetrant	☒	☐	Additional Tests*	Impact Testing	
Macro	☒	☐			

Remarks:

Troy Vista
Welder's Name521
Clock No.521
Stamp No.MSI Testing & Engineering, Inc
Laboratory Name.09/02/2010
Date

163939

SPVG Marinette

Date

Test Report No(s).

Organization/Manufacturer

Date

Signature

Bureau Veritas UK Limited (0041)
Inspection Organization

Date

Signature

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. Level of testing is in accordance with EN 15614-1:2004+A2(2012).

Samuel Pressure Vessel Group



Welding Procedure Specification (WPS)

WPS: PV011 Date: 6/24/2015 Rev.: 3 Date: 10/17/2018 Page: 1 of 2

By: Chapman Perini Date Signed: 10/17/2018

Supporting PQR's: 143

Welding Process(es) / Type(s): SAW / Machine

Joint Type	Backing	Root Opening	Groove Angle	Root Face	Groove Radius
Single-V groove	No backing	3/16" max	50 deg min	1/8" max	-
Single bevel	No backing	3/16" max	45 deg min	1/8" max	-
Single-V groove	Gouged & back welded	1/4" max	50 deg min	3/16" max	-
Double bevel	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Double-V groove	Gouged & back welded	1/4" max	45 deg min	3/16" max	-
Square groove	T-joint	1/32" max	-	-	-
Square groove	No backing	3/32" max	-	-	-

Fillet Welds: All fillet sizes on all base metal thicknesses and all diameters.

Retainers: None

Backing if used shall be ceramic, weld metal, or gas purge.

WELD JOINT DESCRIPTIONS SHOWN ARE NOT INCLUSIVE OF ALL THOSE FOUND ON A JOB. WELD JOINT DESIGN REFERENCE IN AN ENGINEERING SPECIFICATION OR A DESIGN DRAWING SHALL TAKE PRECEDENCE OVER WELD JOINTS SHOWN IN THIS WPS.

Base Metals (QW-403)

P-No.: 10H Thickness Range (in.): 0.0625 to 0.7500

to P-No.: 10H

2205, LDX 2101, S32304 = ER2209
2507, Zeron 100 = ER2594

Filler Metals (QW-404)

Spec. No. (SFA): 5.9

AWS No. (Class): ER2594 / ER2209

F No.: 6 A No.: None

Weld Metal Thickness Range: 0.7500 in. maximum No Pass Greater Than 1/2" Allowed

Flux Type: N/R

Flux Trade Name: Avesta

Consumable Insert: N/A

Other: _____

Supplemental Filler Metal: N/A

Recrushed Slag: None Used

Strip Thickness or Width (in.): N/A

Samuel Pressure Vessel Group
Welding Procedure Specification (WPS)

WPS No.: PV011 Date: 6/24/2015 Rev.: 3 Date: 10/17/2018 Page: 2 of 2

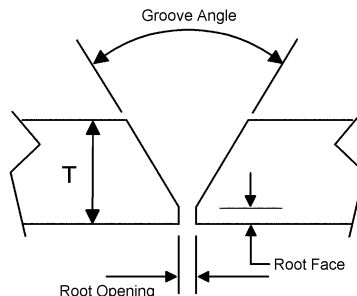
Positions (QW-405) Position of Joint: <u>Flat & Horizontal</u> Weld Progression: <u>N/A</u>	Postweld Heat Treatment (QW-407) Type: <u>No PWHT will be performed</u> Temperature Range: <u>None</u> °F Time Range: <u>None</u>
Preheat (QW-406) Preheat Temp. Min.: <u>50</u> °F Interpass Temp. Max.: <u>250</u> °F Preheat Maintenance: <u>Maintain above minimum temperature</u>	Gas (QW-408) Gas Composition / Flow Rate Shielding: <u>N/A</u> Trailing: <u>N/A</u> Backing: <u>N/A</u>
Electrical Characteristics (QW-409) Current Type / Polarity: <u>DCEP (reverse)</u> Tungsten Electrode Type and Size: <u>N/A</u> Mode of Metal Transfer for GMAW(FCAW): <u>N/A</u> Max. Heat Input (J/in): <u>40,000</u> Energy/Power: <u>N/A</u>	
Technique (QW-410) Thermal Processes: <u>No</u> String or Weave Bead: <u>Stringer bead</u> Initial and Interpass Cleaning: <u>With Stainless steel brush clean 2 inches (50 mm) on both sides of weld joint</u> Method of Back Gouging: <u>Grind until all defects are removed.</u> Oscillation: <u>N/A</u> Contact Tube to Work Distance: <u>3/4" - 1"</u> Single or Multiple Passes (per side): <u>Single and multipass</u> Single or Multiple Electrodes: <u>Single electrode</u> Peening: <u>None</u> Electrode Spacing: <u>N/A</u>	

Process Welding Parameters

Weld Layer(s) and/or Pass(es)	Process	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)	Wire Feed Speed Range
		Class	Diameter (in.)	Type / Polarity	Amperage Range			
Any	SAW	ER2594	3/32	DCEP (reverse)	200-600	28-36	11-22	N/A
Any	SAW	ER2594	1/8	DCEP (reverse)	300-800	28-38	11-22	N/A
Any	SAW	ER2209	3/32	DCEP (reverse)	200-600	28-36	11-22	N/A
Any	SAW	ER2209	1/8	DCEP (reverse)	300-800	28-38	11-22	N/A

**Northland
Stainless**a division of **SAFARI**Northland Stainless
1119A Bridge St.**Procedure Qualification Record (PQR)**PQR No.: 143 WPS No.: 143 Date: 8/23/2006 Page: 1 of 3Welding Process(es) / Type(s): SAW / Machine**Joints (QW-402)**

Weld Type: Groove weld
Single-V groove
Backing: None
Root Opening: .0625 in. Root Face: .125 in.
Groove Angle: 75 °

**SINGLE VEE GROOVE****Base Metals (QW-403)**

Material Spec., Type or Grade:
SA-240, Grade S32750 to SA-240, Grade S32750
P-No.: 10H Group No.: 1 to P-No.: 10H Group No.: 1
Thickness of Test Coupon (in.): 0.375

Filler Metals (QW-404)

SFA Specification: 5.9
AWS Classification: ER2594
Filler Metal F-No: 6
Weld Metal Analysis A-No: None
Size of Filler Metal (in.): 0.093
Weld Deposit 't' (in.): 0.375
Pass Greater Than 1/2": No
Supplemental Filler Metal: NA
Flux Trade Name / Type: Avesta 805 /
Recrushed Slag: NA

Positions (QW-405)

Position of Joint: 1G - Flat
Weld Progression: N/A

Preheat (QW-406)

Preheat Temp.: 70 °F
Interpass Temp.: 200 °F
Preheat Maintenance: Maintain between Pre & Inter Temp

Postweld Heat Treatment (QW-407)

Type: No PWHT performed
Temperature: None °F
Time: None hr

Gas (QW-408)

Gas Composition / Flow Rate

Shielding: N/A
Trailing: N/A
Backing: N/A

Electrical Characteristics (QW-409)

Current / Polarity: DCEP (reverse)
Amps: 350
Volts: 36.5
Tungsten Type / Size: N/A
Wire Feed Speed: 100-200
Heat Input: 42583 J/in

Technique (QW-410)

Travel Speed (in/min): 18
Thermal Processes: (1)No
String/Weave Bead: Stringer bead
Oscillation: NA
Mult./Single Pass (per side): Multipass
Mult./Single Electrode: Single electrode
Electrode Spacing: N/A
Contact Tube to Work Dist.: NA

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Notes

Charpy Impact Test performed on December 7, 2015 by St. Louis Testing Laboratories Lab No. 15P-6169

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Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in ²)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
T1	0.75	0.38	0.285	36900	129500	Ductile - BM
T6	0.745	0.385	0.2868	36100	125900	Ductile - WM

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.3(a) Face bend	Passed	QW-462.3(a) Root bend	Passed
QW-462.3(a) Face bend	Passed	QW-462.3(a) Root bend	Passed
None		None	

Toughness Test (QW-170)

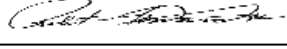
Specimen Number	Notch Location	Notch Type	Test Temp. (°F)	Impact Value (ft-lb)	Lateral Expansion		Drop Weight Break
					Shear %	Mils	
Plate-1	Weld metal	"A"	-50	49	30	0.033	
Plate-2	Weld metal	"A"	-50	60	40	0.047	
Plate-3	Weld metal	"A"	-50	51	40	0.042	
Plate-4	HAZ	"A"	-50	125	60	0.071	
Plate-5	HAZ	"A"	-50	114	60	0.061	
Plate-6	HAZ	"A"	-50	117	60	0.064	

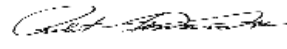
Welder's Name: Reich, John ID: N255 Stamp: N255

PQR was done and welding of
coupon was witnessed by: Northland Stainless Inc.

Tests Conducted By: David Fitterer Test ID.: 06-01592

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.

Prepared By:  12/16/2015 Quality Assurance
Bob Soward Date

Accepted By:  12/16/2015 Quality Assurance
Bob Soward Date

PLANT Muskegon		PROJECT NO.		WORK ORDER NO.	
LOCATION Flammable Tank Farm		BLDG. NO.		MODEL*	
MANUFACTURER*		NO. UNITS 1			
MODEL		WBS ELEMENT		Rev	
1	DIAMETER 11'-6"	HEIGHT *	NOMINAL VOLUME 13000 gallons	TOTAL VOLUME	
2	FIELD ERECTED N	CODE ASME			
3	SP GR PRODUCT 0.919	CODE STAMP U-1			
4	DESIGN PRESSURE 15 psig / FV	RADIOGRAPHY Spot			
5	OPER. PRESSURE 1 psig	SEISMIC LOAD per ASCE-7 *			
6	DESIGN TEMP. 350F	WIND LOAD per ASCE-7 *			
7	OPERATING TEMP. Ambient	OTHER LOADS per ASCE-7 *			
8	HYDRO TEST Y	CORROSION ALLOWANCE 0.031			
9	HYDRO POSITION Vertical				
10	ERECTION WEIGHT *				
11	OPERATING WEIGHT *				
12	TEST WEIGHT *				
13	INSPECTION BY BASF				
14					
15					
16	MATERIALS OF CONSTRUCTION				
17	SHELL 316SS				
18	HEAD 316SS				
19	INTERNAL STEEL 316SS				
20	EXTERNAL STEEL 316SS				
21	INTERNAL PIPING 316SS				
22	NOZZLE NECKS 316SS	NOZZLE FLANGE 316SS			
23	MANHOLE NECKS 316SS	MANHOLE FLANGE 316SS			
24	MANHOLE COVERS 316SS				
25	BODY FLANGE NA	BODY FLANGE COVER NA			
26	FLANGE FACING 316SS				
27	COUPLINGS 316SS				
28	GASKETS Gylon 3510				
29	STUD BOLTS A193, Gr. B7 Cadum Plated	NUTS A194, Gr. 2H Cadum Plated			
30	REINFORCING PADS 316SS	LIFTING LUGS 316SS			
31	SUPPORTS 316SS				
32	INSULATION SUPPORTS 316SS	INSULATION			
33	PAINT				
34	NOZZLES				
35					
36	MK	NO.	SIZE	ANSI RATING	SCH.
37	A1	1	4	150#	40
38	A2	1	2	150#	40
39	B	1	3	150#	40
40	C	1	6	150#	40
41	D	1	3	150#	40
42	L1	1	6	150#	40
43	L2	1	3	150#	40
44	M1	1	24	150#	40
45	M2	1	24	150#	40
46	V1	1	3	150#	40
47	V2	1	6	150#	40
48	V3	1	8	150#	40
49					
50	REMARKS				
51					
52					
53					
SPEC BY DES		BASF Corporation			EQUIP. NO. T-176
CHECKED DES		SERVICE: Dowanol			Vessel Specifications
APP'D DES					
DATE: 9/18/19		Revision Date: A B C			
VENDOR TO COMPLETE ALL INFORMATION MARKED *					SHEET 1 OF 1
					TECH. SPEC. NO.