



National Aeronautics and
Space Administration

John C. Stennis Space Center
Stennis Space Center, MS
39529-6000

SSTD-8070-0038-WELD
Rev. B
DECEMBER 2023

COMPLIANCE IS MANDATORY

John C. Stennis Space Center **ASME Procedure for Welding Nitronic 40** **Stainless Steel Alloy to 300 Series** **Austenitic Stainless Steel**

Approved by:

<u>Craig Chandler</u>	<u>1-8-2024</u>
NASA SSC Center Operations	Date
Directorate Facilities Engineering	
Test Complex Support	

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<u>Todd Mannion</u>	<u>12-22-23</u>
NASA SSC Center Operations	Date
Directorate Facility Services	

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NASA SSC Engineering & Test Directorate	Date

<u>Son Le</u>	<u>1-7-2024</u>
NASA SSC Safety & Mission Assurance	Date

Issued by

<u>ISSUED CEF</u>	<u>1-8-2024</u>
Central Engineering Files	Date

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Document History Log

Change/ Revision	Change Date	Originator/ Phone	Description
Basic	09.20.2013	Doug Dike, Ext. 8-2803	Initial release, superseding SSC STD 34-050.
A	10.29.2018	Doug Dike, Ext. 8-2803	Five-year review. Updated cover sheet to include concurrence by Safety & Mission Assurance. Updated references and acronyms. Minor administrative revisions. Section 6.0: Revised to delete requirement to maintain original, signed hardcopy of this SSTD in CEF upon its electronic approval. Updated WPS attachment to Form SSC-937.
B	10.29.2023	Benny McGrath 8-2969	Five-year review. Updated Directorate titles as necessary throughout document. Updated references and acronyms. Added “and in accordance with ASME Boiler and Pressure Vessel Codes, Section IX, requirements.” Updated WPS 34-050/N40-304SS.

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1.0 PURPOSE

This John C. Stennis Space Center (SSC) standard (SSTD) outlines the qualified Gas Tungsten Arc Welding (GTAW) procedure for use in welding Nitronic 40 Stainless Steel Alloy to 300 Series Austenitic Stainless Steel at SSC.

2.0 APPLICABILITY

This SSTD applies to all contractor and subcontractor personnel involved with the welding of Nitronic 40 to Austenitic Stainless Steel at SSC.

3.0 REFERENCES

All references are assumed to be the latest version unless otherwise indicated.

ASME Boiler and Pressure Vessel Codes, Section IX, *Welding, Brazing, and Fusing Procedures*
 ASTM A167, *Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip*

ASTM A182, *Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service*

ASTM A213, *Standard Specification for Seamless Ferritic and Austenitic Alloy Steel Boiler, Superheater, and Heat Exchanger Tubes*

ASTM A240, *Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications*

ASTM A249, *Standard Specification for Welded Austenitic Steel Boiler, Superheater, Heat Exchanger, and Condenser Tubes*

ASTM A269, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service*

ASTM A270, *Standard Specification for Seamless and Welded Austenitic and Ferritic/Austenitic Stainless Steel Sanitary Tubing*

ASTM A276, *Standard Specification for Stainless Steel Bars and Shapes*

ASTM A312, *Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*

ASTM A313, *Standard Specification for Stainless Steel Spring Wire*

ASTM A314, *Standard Specification for Stainless Steel Billets and Bars for Forging*

ASTM A320, *Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service*

ASTM A336, *Standard Specification for Alloy Steel Forgings for Pressure and High-Temperature Parts*

ASTM A358, *Standard Specification for Electric-Fusion-Welded Austenitic Chromium-Nickel Stainless Steel Pipe for High-Temperature Service and General Applications*

ASTM A368, *Standard Specification for Stainless Steel Wire Strand*

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ASTM A376, *Standard Specification for Seamless Austenitic Steel Pipe for High-Temperature Service*

ASTM A403, *Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings*

ASTM A409, *Standard Specification for Welded Large Diameter Austenitic Steel Pipe for Corrosive or High-Temperature Service*

ASTM A473, *Standard Specification for Stainless Steel Forgings*

ASTM A478, *Standard Specification for Chromium-Nickel Stainless Steel Weaving and Knitting Wire*

ASTM A479, *Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels*

ASTM A492, *Standard Specification for Stainless Steel Rope Wire*

ASTM A493, *Standard Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging*

ASTM A511, *Standard Specification for Seamless Stainless Steel Mechanical Tubing and Hollow Bar*

ASTM A554, *Standard Specification for Welded Stainless Steel Mechanical Tubing*

ASTM A580, *Standard Specification for Stainless Steel Wire*

ASTM A632, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small Diameter) for General Service*

ASTM A666, *Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar*

ASTM A688, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Feedwater Heater Tubes*

ASTM A774, *Standard Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures*

ASTM A778, *Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products*

ASTM A793, *Standard Specification for Rolled Floor Plate, Stainless Steel*

ASTM A813, *Standard Specification for Single- or Double-Welded Austenitic Stainless Steel Pipe*

ASTM A814, *Standard Specification for Cold-Worked Welded Austenitic Stainless Steel Pipe*

MIL-S-23196, *Steel Plate, Corrosion Resistant, Austenitic (UNS S30400, S30403, S31600, S34700, and S34800)*

SAE J405, *Chemical Compositions of SAE Wrought Stainless Steels*

SPR 1440.1, *SSC Records Management Program Requirements*

SPR 8715.1, *Safety and Health Program Requirements*

SSTD-8070-0005-CONFIG, *SSC Preparation, Review, Approval, and Release of SSC Standards*

SSTD-8070-0013-WELD, *Classes of Welding Inspection*

SSTD-8070-0014-WELD, *Qualifying Welders and Weld Procedures*

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4.0 RESPONSIBILITIES

- a. Users of this SSTD shall comply with its requirements, ensure use of the correct version of this SSTD and the documents it references, and inform the appropriate organization of needed changes in accordance with SSTD-8070-0005-CONFIG.
- b. Responsibilities for the use and control of this SSTD and for the review and approval of revisions or cancellation of this SSTD shall be as specified in SSTD-8070-0005-CONFIG and the applicable documents referenced therein.

5.0 REQUIREMENTS AND PROCEDURES

- a. This procedure shall be used for welding any UNS S21900, S21903, and S21904 (Nitronic 40) base metals that meet one or more of the following specifications:
 - AMS 5561, 5562, 5595, 5656
 - ASTM A182, A269, A276, A312, A314, A336, A473, A479, A666, A813, A814
 - ASME SA-182, SA-312, SA-336, SA-412, SA-479, SA-813.
- b. The 300 series austenitic stainless steel to be welded shall meet one or more of the following specifications:
 - AMS 5501, 5511, 5513, 5560, 5563, 5564, 5565, 5566, 5567, 5639, 5647, 5697, 7228, 7243
 - ASME SA-213, SA-240, SA-249, SA-312, SA-320, SA-336, SA-351, SA-358, SA-376, SA-403, SA-409, SA-430, SA-451
 - ASTM A167, A182, A213, A240, A249, A269, A270, A271, A276, A312, A313, A314, A320, A336, A358, A368, A376, A403, A409, A430, A473, A478, A479, A492, A493, A511, A554, A580, A632, A666, A688, A774, A778, A793, A813, A814, A851
 - SAE J405
- c. Items denoted as essential variables in the attached weld procedure specifications (WPS) shall not be altered when using the WPS. An alternate WPS may be used only if approved prior to use by the National Aeronautics and Space Administration (NASA) SSC Center Operations Directorate Facilities Engineering Test Complex Support, the NASA SSC Engineering and Test Directorate (E&TD), the NASA SSC Safety and Mission Assurance (S&MA) Office, and in accordance with ASME Boiler and Pressure Vessel Codes, Section IX, requirements.

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- d. The attached Procedure Qualification Records (PQR), No. 34-N40-304SS/GTAW is the PQR for the original qualification of WPS qualification in this SSTD. When performing new qualifications, a new PQR should be filled out showing all pertinent data and results of the weld procedure qualification.
- e. The minimum service temperature for weldments produced under a WPS shall not be lower than the minimum test temperature of toughness tests (per QW-170) shown on the PQR or PQRs corresponding to the respective WPS.
- f. Welders shall be qualified in accordance with SSTD-8070-0014-WELD, *Qualifying Welders and Welding Procedures*.
- g. Inspection methods for welds shall be in accordance with SSTD-8070-0013-WELD, *Classes of Welding Inspection*.
- h. All procedures shall be performed in compliance with applicable requirements in SPR 8715.1, *SSC Safety and Health Program Requirements*. If ever there is a conflict between this SSTD and the Stennis Procedural Requirement (SPR), the SPR shall superseded this SSTD.

6.0 RECORDS AND FORMS

Records and forms required by the procedures of this SSTD shall be maintained in accordance with SPR 1440.1. All records and forms are assumed to be the latest edition unless otherwise indicated. Forms may be obtained from the SSC Electronic Forms repository or from the NASA SSC Forms Management Officer. Quality Records are identified in the SSC Master Records Index.

The original, signed WPSs and PQRs (copies of which are provided in Attachments A and B of this SSTD) shall be maintained in CEF.

7.0 ACRONYMS AND ABBREVIATIONS

AMS	Alpha Magnetic Spectrometer
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
E&TD	Engineering & Test Directorate
GTAW	Gas Tungsten Arc Welding
MIL	Military
NASA	National Aeronautics and Space Administration
PQR	Procedure Qualification Record
S&MA	Safety & Mission Assurance

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SAE	Society of Automotive Engineers
SSC	John C. Stennis Space Center
SSTD	John C. Stennis Space Center Standard
SPR	Stennis Procedural Requirements
WPQ	Welder Performance Qualification
WPS	Weld Procedure Specifications

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ATTACHMENT A: WELDING PROCEDURE SPECIFICATIONS (WPS)

 National Aeronautics and Space Administration John C. Stennis Space Center Stennis Space Center, MS 39529-6000		ASME - WELDING PROCEDURE SPECIFICATIONS (WPS)																																			
Welding Procedure Specification Record Number 34-050/N40-304SS		Date November 3, 2023	Revision Number C																																		
Qualified To ASME Boiler and Pressure Vessel Code		Company Name Syncom Space Services																																			
Supporting PQR(s) 34-N40-304SS/1625		Reference Docs. N/A																																			
Scope Welding Nitronic 40 SS Alloy to 300 Series Austenitic SS		Joint Single J Groove, Single V Groove																																			
BASE METALS (QW-403) Type Nitronic 40 P-no. 8 Grp-no. 3 Welded To Stainless steel P-no. 8 Grp-no. 1 Backing NONE P-no. Grp-no. Retainers NONE Notes See Notes *.		THICKNESS RANGE QUALIFIED <table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">As-welded</th> <th colspan="2">With PWHT</th> </tr> <tr> <th>Min.</th> <th>Max.</th> <th>Min.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>Complete Pen.</td> <td>0.188"</td> <td>2.74"</td> <td></td> <td></td> </tr> <tr> <td>Complete Pen.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Impact Tested</td> <td>.625"</td> <td>2.74"</td> <td></td> <td></td> </tr> <tr> <td>Impact Tested</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Fillet Welds</td> <td>No Min</td> <td>No Max</td> <td></td> <td></td> </tr> </tbody> </table>			As-welded		With PWHT		Min.	Max.	Min.	Max.	Complete Pen.	0.188"	2.74"			Complete Pen.					Impact Tested	.625"	2.74"			Impact Tested					Fillet Welds	No Min	No Max		
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FILLER METALS (QW-404) Process SFA Classification F-no. A-no. Chemical Analysis or Trade Name GTAW 5.14 ERNiCrMo3 43 Cons. Insert Flux N/A N/A N/A N/A N/A		THICKNESS RANGE QUALIFIED <table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">As-welded</th> <th colspan="2">With PWHT</th> </tr> <tr> <th>Min.</th> <th>Max.</th> <th>Min.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>Nominal Pipe Size</td> <td>1"</td> <td>No Max</td> <td></td> <td></td> </tr> </tbody> </table>			As-welded		With PWHT		Min.	Max.	Min.	Max.	Nominal Pipe Size	1"	No Max																						
	As-welded		With PWHT																																		
	Min.	Max.	Min.	Max.																																	
Nominal Pipe Size	1"	No Max																																			
WELDING PROCEDURE																																					
Welding Process	GTAW																																				
Type	Manual																																				
Minimum preheat/interpass temperature (°F)	6C°F																																				
Maximum interpass temperature (°F)	325°F																																				
Tungsten Size	3/32" - 5/32"																																				
Tungsten Type	THORIATED EWTH02																																				
Filler Metal Size (in.)	2.4 - 4.0 mm																																				
Layer Number	BUTTERING, ROOT, FILL AND CAP																																				
Position of Groove	ALL																																				
Weld Progression	UP OR DOWN																																				
Current/Polarity	DCEN (-)																																				
Amperes	60 - 200																																				
Volts	8 - 28																																				
Travel Speed (in./min)	5-8 ipm																																				
Maximum Heat Input (kJ/in)	28																																				
DC Pulsing Current	DC																																				
Shielding: Gas Type	ARGON 99.99%																																				
Flow Rate (cfh)	10 - 45																																				
Trailing: Gas Type	NCNE																																				
Flow Rate (cfh)	NCNE																																				
Backing: Gas Type	Argon 99.99%																																				
Flow Rate (cfh)	10 - 40																																				
String or Weave	STRING BEAD, NO MORE THAN 3	TIMES WELD WIRE DIAMETER																																			
Orifice/Gas Cup Size	4 - 8																																				
Multi/Single Pass per Side	MULTIPLE																																				
Weld Deposit Chemistry																																					
Notes	See Notes **.																																				

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Welding Procedure Specification Record Number 34-050/N40-304SS		Date November 3, 2023	Revision Number C
Qualified To ASME Boiler and Pressure Vessel Code		Company Name Syncom Space Services	
BASE METALS (QW-403)			
Peening	Not used with this procedure.		
Surface Preparation	See Notes **.		
Initial/Interpass Cleaning			
Back Gouging Method	Thermal or Mechanical if required. (Grind 1/16 if thermal).		
NOTES			
Tack welds removed during root pass.			
Oscillation not used with this procedure.			
*Pipe Diameter Range: Groove (2.875") and larger. Fillet same as groove range. No pass greater than 1/2" thick.			
**Buttering required on stainless steel bevel side prior to welding butt weld joints.			
**Initial and Interpass Cleaning - Wipe with a solvent moistened clean lint-free rag, brush with virgin SS brush. 2" both sides of weld joint, use only brushes and grinding wheels not used on carbon steel when base metal being brushed or ground is stainless or special alloy.			
Repair: Grind, followed by brushing with SS brush. Tack welds removed during root pass. Refer to MRB. For grinding, use aluminum oxide grinding wheel not previously used on carbon steel. High flow rate of shielding gas flow over molten puddle is required to eliminate nitrogen absorption from atmosphere.			
Signature 1		Signature 2	
Engineer Name Richard "Rick" Grimstead	Signature 	Quality Name Richard Ladner	Signature 
Date 11-21-23		Date 11-22-23	
Signature 3		Signature 4	
Customer Reviewer Name Benjamin McGrath	Signature 	Customer Name	Signature
Date 11-21-23		Date	

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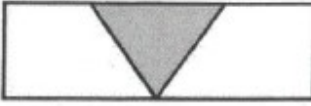

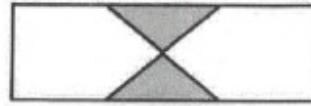
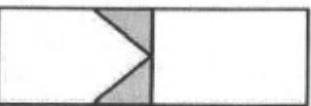

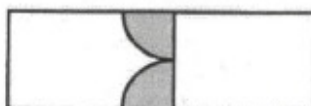
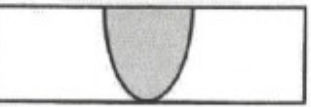
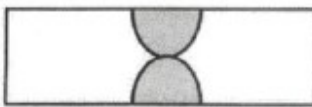
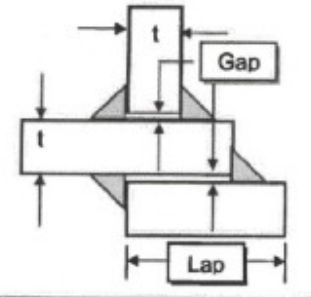
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Space Administration
John C. Stennis Space Center
Stennis Space Center, MS 39529-6000

ASME - WELDING PROCEDURE SPECIFICATIONS (WPS)

Welding Procedure Specification Record Number 34-050/N40-304SS	Date November 3, 2023	Revision Number C
Qualified To ASME Boiler and Pressure Vessel Code	Company Name Syncom Space Services	

Weld Joint Designs

Attachment #1

Single-V Groove	Single-Bevel Groove	Double-V Groove
		
Groove Angle: 50 to 75 deg Root Opening: 1/16 to 3/16 in. Root Face: 0 to 1/16 in. Misalignment: 1/16-in. max.	Groove Angle: 37.5 to 45 deg Root Opening: 1/16 to 3/16 in. Root Face: 0 to 1/16 in. Misalignment: 1/16-in. max.	Groove Angle: 50 to 75 deg Root Opening: 1/16 to 3/16 in. Root Face: 0 to 1/16 in. Misalignment: 1/16-in. max.
Double-Bevel Groove	Single-J Groove	Double-J Groove
		
Groove Angle: 37.5 to 45 deg Root Opening: 1/16 to 3/16 in. Root Face: 0 to 1/16 in. Misalignment: 1/16-in. max.	Groove Angle: 37.5 to 45 deg Groove Radius: 3/8 in. Root Opening: 1/16 to 3/16 in. Root Face: 0 to 1/16 in. Misalignment: 1/16-in. max.	Groove Angle: 37.5 to 45 deg Groove Radius: 3/8 in. Root Opening: 1/16 to 3/16 in. Root Face: 0 to 1/16 in. Misalignment: 1/16-in. max.
Single-U Groove	Double-U Groove	Fillet Weld T or Lap
		
Groove Angle: 50 to 75 deg Groove Radius: 3/8 in. Root Opening: 1/16 to 3/16 in. Root Face: 0 to 1/16 in. Misalignment: 1/16-in. max.	Groove Angle: 50 to 75 deg Groove Radius: 3/8 in. Root Opening: 1/16 to 3/16 in. Root Face: 0 to 1/16 in. Misalignment: 1/16-in. max.	Gap: 1/16-in. max. / Lap: 5 x t or 1 in. min.

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ATTACHMENT B: WELDING PROCEDURE QUALIFICATION RECORD (PQR)

QW-483 SUGGESTED FORMAT FOR WELDING PROCEDURE QUALIFICATION RECORD (PQR) (See QW-201.2, Section IX, ASME Boiler and Pressure Vessel Code)

Record Actual Conditions Used to Weld Test Coupon

Company Name Johnson Controls World Services Inc.
 Procedure Qualification Record No 34-N40-304SS/1625 Date 5/22/99
 WPS No. 34-050/N40-304SS/1625
 Welding Process(es) GTAW
 Types (Manual, Automatic, Semi-Auto) Manual

JOINTS (QW-402) 													
BASE METALS (QW-403) Material Spec. <u>UNS 21904 to UNS 30400</u> Type or Grade <u>Nitronic 40 (XM-11) to Type 304 S/S</u> P-No. <u>8</u> to P-No. <u>8</u> Thickness of Test Coupon <u>34.8mm (1.37") minimum to 37.0mm (1.46") maximum</u> Diameter of Test Coupon <u>323.9mm (12.75")</u> Other _____	POSTWELD HEAT TREATMENT (QW-407) Temperature <u>NOT APPLICABLE</u> Time _____ Other _____												
FILLER METALS (QW-404) SFA Specification <u>5.14</u> AWS Classification <u>ERNiCrMo-3</u> Metal F-No. <u>43</u> Weld Metal Analysis A-No. _____ Size of Filler Metal <u>2.4mm (3/32") - 4.0mm (5/32")</u> Other _____ Deposited Weld Metal _____	GAS (QW-408) <table border="1"> <thead> <tr> <th colspan="3">Percent Composition</th> </tr> <tr> <th>Gas(es)</th> <th>(Mixture)</th> <th>Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td>ARGON 99.99%</td> <td>0.566m³/h (20 to 35 CFH)</td> </tr> <tr> <td colspan="3">and Backing</td> </tr> </tbody> </table> Trailing <u>N/A</u>	Percent Composition			Gas(es)	(Mixture)	Flow Rate	Shielding	ARGON 99.99%	0.566m ³ /h (20 to 35 CFH)	and Backing		
Percent Composition													
Gas(es)	(Mixture)	Flow Rate											
Shielding	ARGON 99.99%	0.566m ³ /h (20 to 35 CFH)											
and Backing													
POSITION (QW-405) Position of Groove <u>6G</u> Weld Progression (Uphill, Downhill) <u>UPHILL</u> Other _____	ELECTRICAL CHARACTERISTICS (QW-409) Current <u>DC</u> Polarity <u>DCEN (-)</u> Amps <u>60 - 140</u> volts <u>12 - 20</u> Tungsten Electrode Size <u>2.4mm (3/32")</u> Other _____												
PREHEAT (QW-406) Preheat Temp. <u>60° F Minimum</u> Interpass Temp. <u>325° F Maximum</u> Other _____	TECHNIQUE (QW-410) Travel Speed <u>127 - 203mm/min (5 - 8 i.p.m.)</u> String or Weave Bead <u>String Bead (3 times weld wire diameter)</u> Oscillation <u>Not Applicable</u> Multipass or Single Pass (per side) <u>Multiple</u> Single or Multiple Electrodes <u>Single</u> Other _____												

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Stennis Standard	SSTD-8070-0038-WELD B
	<i>Number</i> <i>Rev.</i>
	Effective Date: December 29, 2023
	Review Date: December 29, 2028
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Responsible Office: NASA SSC Center Operations Directorate	
SUBJECT: ASME Procedure for Welding Nitronic 40 Stainless Steel Alloy to 300 Series Austenitic Stainless Steel	

QW-483 (Back)

Tensile Test (QW-150)

Specimen No.	Diameter in.	Area sq. in.	Ultimate Total Load lb.	Ultimate Unit Stress psi	Character of Failure & Location
T 1C (Cap)	0.505	0.2003	19,200	96,000	Base
T 1R (Root)	0.503	0.1987	17,900	89,800	Base
T2C (Cap)	0.500	0.1963	18,400	93,700	Base
T2R (Root)	0.503	0.1987	19,600	98,500	Base

Guided Bend Tests (QW-160)

Type and Figure No.	Result
SIDE BEND QW 462.2 1	Satisfactory
SIDE BEND QW 462.2 2	Satisfactory
SIDE BEND QW 462.2 3	Satisfactory
SIDE BEND QW 462.2 4	Satisfactory

Toughness Tests (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temp.	Impact Values	Lateral	Exp.	Drop	Weight
					% Shear	Mils	Break	No Break
08102.3 - weld 1 Cap	Weld	Charpy V	-320°F	72 ft-lbs	75	59		
08102.3 - weld 2 Cap	Weld	Charpy V	-320°F	88 ft-lbs	85	75		
08102.3 - weld 3 Cap	Weld	Charpy V	-320°F	62 ft-lbs	70	56		
08102.3 - weld 1 Root	Weld	Charpy V	-320°F	47 ft-lbs	40	42		
08102.3 - weld 2 Root	Weld	Charpy V	-320°F	48 ft-lbs	40	37		
08102.3 - weld 3 Root	Weld	Charpy V	-320°F	47 ft-lbs	40	44		
08102.3 - HAZ 1 N40	HAZ	Charpy V	-320°F	Invalid Test				
08101.3 - HAZ 2 N40	HAZ	Charpy V	-320°F	Invalid Test				
08102.3 - HAZ 3 N40	HAZ	Charpy V	-320°F	Invalid Test				
08102.3 - HAZ 1 304SS	HAZ	Charpy V	-320°F	123 ft-lbs	90	70		
08102.3 - HAZ 2 304SS	HAZ	Charpy V	-320°F	88 ft-lbs	85	53		
08102.3 - HAZ 3 304SS	HAZ	Charpy V	-320°F	128 ft-lbs	95	67		

FILLET WELD TEST (QW-180)

Result - Satisfactory _____ Penetration into Parent Metal
Yes, No Yes, No

Type and Character of Failure _____ Macro-Results


Welder's Name Mark Corr Clock No. 2394 Stamp No. 34

Tests conducted by: Materials Technology, Inc. Laboratory Test No. 90702, P.O. No. L-R200179377
per: ASME Section IX and ASTM A 370

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.

Signed Johnson Controls World Services Inc.
(Manufacturer)

Date 5/22/99

By 

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QW-483 (Back)

Tensile Test (QW-150)

Specimen No.	Diameter in.	Area sq. in.	Ultimate Total Load lb.	Ultimate Unit Stress psi	Character of Failure & Location

Guided Bend Tests (QW-160)

Type and Figure No.	Result
SIDE BEND QW 462.2 1	Test Not Performed
SIDE BEND QW 462.2 2	Test Not Performed
SIDE BEND QW 462.2 3	Test Not Performed
SIDE BEND QW 462.2 4	Test Not Performed

Toughness Tests (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temp.	Impact Values	Lateral	Exp.	Drop	Weight
					% Shear	Mils	Break	No Break
08102.3 - HAZ 1 N40	HAZ	Charpy V	-320°F	44.5 ft-lbs	N/A	25		
08101.3 - HAZ 2 N40	HAZ	Charpy V	-320°F	40.0 ft-lbs	N/A	25		
08102.3 - HAZ 3 N40	HAZ	Charpy V	-320°F	40.0 ft-lbs	N/A	21		

FILLET WELD TEST (QW-180)

Result - Satisfactory _____ Penetration into Parent Metal _____
Yes, No Yes, No

Type and Character of Failure _____ Macro-Results _____

Welder's Name _____ Mark Corr _____ Clock No. 2394 Stamp No. 34

Tests conducted by: Scientific Testing Laboratories Laboratory Test No. 90522; Project No. 16252
per: ASME Section IX and ASTM E 23

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.

Signed Johnson Controls World Services Inc.
(Manufacturer)

Date 5/22/99

By 

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ATTACHMENT C: SUGGESTED FORMAT FOR MANUFACTURING RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS (WPQ)

QW-484 SUGGESTED FORMAT FOR MANUFACTURING RECORD OF WELDER OR WELDING OPERATOR QUALIFICATION TESTS (WPQ) (See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)		
Welder Name	Mark Corr	Check No. 2394 Stamp No. 34
Using WPS No. 34-050/N40-304SS/1625		Rev. Basic Date 5/22/99
the above welder is qualified for the following ranges.		
Variable	Record Actual Values Used in Qualification	Qualification Range
Process	GTAW	GTAW
Process Type	GTAW	GTAW
Backing (metal, weld metal, flux, etc. (QW-402))	N/A	N/A
Material Spec. (QW-403)	UNS 21904 to UNS 30400	UNS 21904 to UNS 30400
Thickness		
Groove	1.370" to 1.460"	0.188" to 2.920"
Fillet	N/A	0.188" to 2.920"
Diameter		
Groove	12.75" O.D.	2.875" and larger
Fillet	N/A	2.875" and larger
Filler Metal (QW-404)		
Spec. No.	AWS (SFA) 5.14	SFA 5.14
Class	ERNiCrMo-3	ERNiCrMo-3
F-No.	43	43
Deposited Weld Metal Thickness		
Groove <input checked="" type="checkbox"/> Fillet <input checked="" type="checkbox"/>	1.370" to 1.460"	0.625" to 2.920"
Position (QW-405)	6G	6G
Weld Progression	Upward	Upward
Gas Type (QW-408)	99.99% Argon	99.99% Argon
Backing Gas (QW-408) <u>99.99% Argon</u>	99% Argon	99% Argon
Electrical Characteristics (QW-409)		
Current	60-140 amps	60 - 140 Amps
Polarity	DCEN (-)	DCEN (-)
Guided Bend Test Results QW-462.2(a), WQ-462.3(a), WQ-462.3(b)		
Type and Fig No.	Result	
Side Bend; Specimen 08102.3-S1	Satisfactory	
Side Bend; Specimen 08102.3-S2	Satisfactory	
Side Bend; Specimen 08102.3-S3	Satisfactory	
Side Bend; Specimen 08102.3-S4	Satisfactory	
Radiographic Test Results (QW-304 & QW-305) For alternative qualification of groove welds by radiography		
Radiographic Results <u>Accept</u>		
Fillet Weld Test Results [See QW-462.4(a), QW-462.4(b)]		
Fracture Test (Describe the location, nature and size of any crack or tearing of the specimen)		
Length and Percent of Defects _____ inches _____ %		
Macro Test--Fusion		
Appearance--Fillet Size (leg) _____ in. X _____ in. Convexity _____ in. or Concavity _____ in.		
Test Conducted By <u>Inspection Specialists, Inc.</u> Laboratory--Test No. <u>90522, Project No. 16252</u>		
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.		
Date <u>5/22/99</u>	Organization <u>Johnson Controls World Services</u>	
	By <u>[Signature]</u>	
(Detail of record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)		
NOTE: Any essential variables in addition to those above shall be recorded.		
(12/86)	This form (E00008) may be obtained from the Order Dept., ASME, 345 E. 47 St., New York, N.Y. 10017	

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