



SSTD-8070-0039-WELD
Revision C
November 2023

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

COMPLIANCE IS MANDATORY

John C. Stennis Space Center ASME GTAW & SMAW Weld Procedure for Carbon Steel Pipe - Maximum 1-Inch Material Thickness

Approved by:

<u>Scott Olive</u> NASA SSC Center Operations Directorate Facilities Engineering Test Complex Support	<u>11-20-23</u> Date
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Concurrence by:

<u>Todd Mannion</u> NASA SSC Center Operations Directorate Facility Services	<u>12-4-23</u> Date
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<u>Harry Ryan</u> NASA SSC Engineering & Test Directorate	<u>11-21-23</u> Date
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<u>Son Le</u> NASA SSC Safety & Mission Assurance	<u>12-7-23</u> Date
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Issued by

<u>ISSUED CEF</u> Central Engineering Files	<u>12-7-23</u> Date
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Document History Log

Revision\	Date	Originator/ Phone	Description
Basic	10/16/08	Steve Rathbun x8-3572	Initial release. Supersedes SSC Standard 34-108-MI.
A	1/15/2014	D. Dike 8- 2803	Regular five year review. Updated references.
B	10/29/2018	D. Dike 8-2803	Five-year review. Revised document title and related references within the document; replacing “2-Inch Material Thickness” with “1-Inch Material Thickness.” Updated cover sheet to include concurrence by Safety & Mission Assurance. Updated references and acronyms. Minor administrative revisions. Updated WPS attachment to Form SSC-937.
C	11/29/2023	Benny McGrath 8-2969	Five-year review. Updated Directorate titles as necessary throughout document. Updated references and acronyms. 5.0-b: Added “and in accordance with ASME Boiler and Pressure Vessel Codes, Section IX, requirements.”

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1.0 SCOPE

This John C. Stennis Space Center (SSC) standard (SSTD) provides for a qualified American Society of Mechanical Engineers (ASME) weld procedure for Gas Tungsten Arc Welding (GTAW) and Shielded Metal Arc Welding (SMAW) of carbon steel pipe up to a maximum of 1-inch wall thickness.

2.0 APPLICABILITY

This SSTD applies to all National Aeronautics and Space Administration (NASA) John C. Stennis Space Center (SSC) contractor and subcontractor personnel involved in the GTAW and SMAW welding of carbon steel pipe.

3.0 REFERENCED AND APPLICABLE DOCUMENTS

Referenced documents shall be the latest version unless otherwise specified.

ASME Boiler and Pressure Vessel Codes, Section II, *Materials*

ASME Boiler and Pressure Vessel Codes, Section V, *Nondestructive Examination*

ASME Boiler and Pressure Vessel Codes, Section VIII Division 1, *Rules for Construction of Pressure Vessels*

ASME Boiler and Pressure Vessel Codes, Section IX, *Welding, Brazing, and Fusing Procedures*

SPR 1440.1, *Records Management Program Requirements*

SPR 8715.1, *Safety and Health Procedural Requirements*

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

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

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

4.0 RESPONSIBILITIES

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 SSC Standard SSTD-8070-0005-CONFIG and the applicable documents referenced therein.

5.0 REQUIREMENTS AND PROCEDURES

- a. All procedures shall be performed in compliance with applicable requirements in SPR 8715.1, *Safety and Health Procedural Requirements*. If ever there is a conflict between this SSTD and the Stennis Procedural Requirement (SPR), the SPR shall take precedence.
- b. Items denoted as essential variables in the attached WPS shall not be altered when using the WPS. An alternate WPS may be used only if approved prior to use by the NASA SSC Center Operations Directorate Facilities Engineering Test Complex Support, the NASA SSC

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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.

- c. The attached PQR is for the original WPS in this SSTD. When performing new qualifications, a new, approved PQR shall be completed showing all pertinent data and results of the weld procedure qualification.
- d. Welders shall be qualified in accordance with SSTD-8070-0014-WELD, *Qualifying Welders and Welding Procedures*.
- e. Inspection methods for welds shall be in accordance with SSTD-8070-0013-WELD, *Classes of Welding Inspection*.

6.0 RECORDS AND FORMS


Records and forms required by the procedures of this SSTD shall be maintained in accordance with SSC Procedural Requirement SPR 1440.1, *Records Management Program Requirements*. 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.

7.0 ACRONYMS AND ABBREVIATIONS


ASME	American Society of Mechanical Engineers
E&TD	Engineering and Test Directorate
GTAW	Gas Tungsten Arc Welding
NASA	National Aeronautics and Space Administration
PQR	Procedure Qualification Record
S&MA	Safety and Mission Assurance
SMAW	Shielded Metal Arc Welding
SPR	John C. Stennis Space Center Procedural Requirement
SSC	John C. Stennis Space Center
SSTD	John C. Stennis Space Center Standard
WPS	Weld Procedure Specification

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ATTACHMENT A.1 - WPS WELD PROCEDURE 34-108-MI

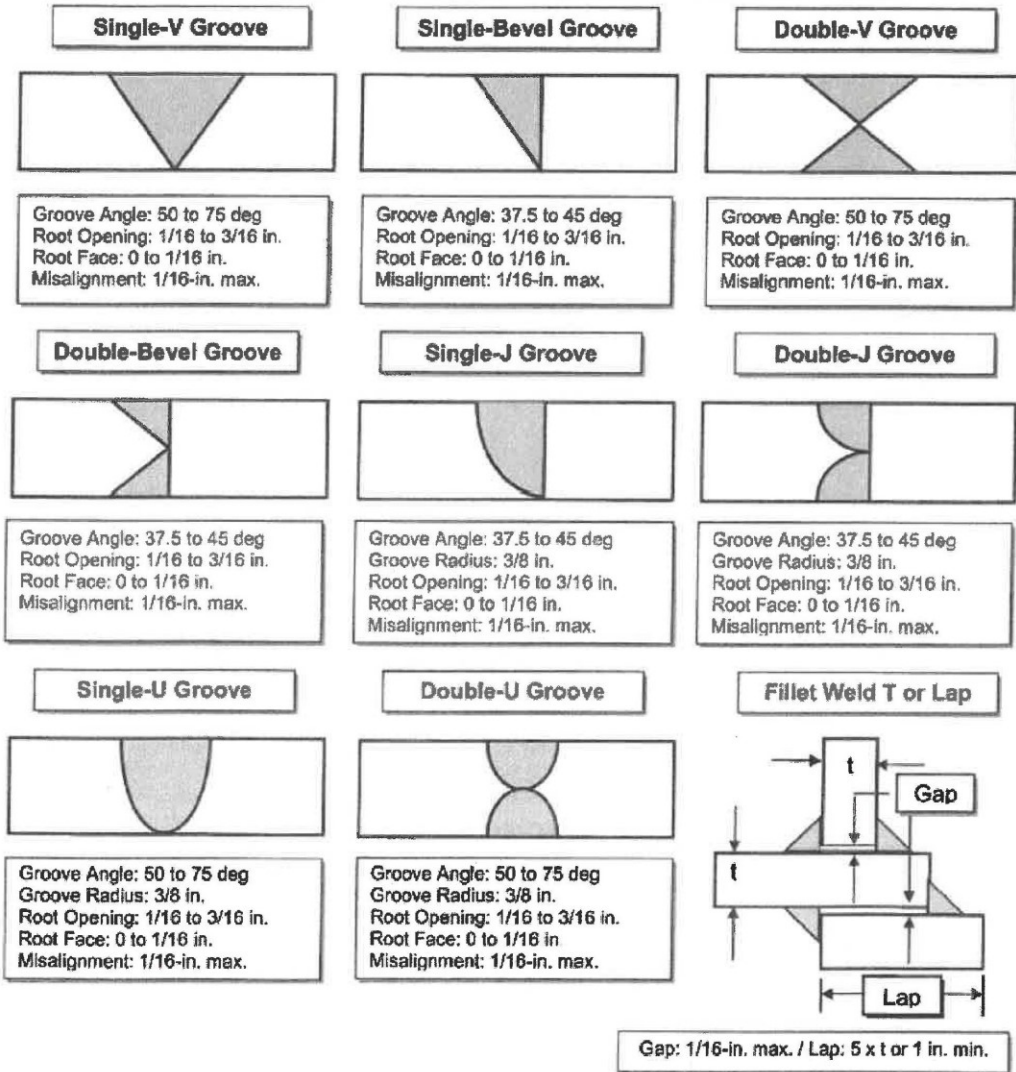
 National Aeronautics and Space Administration John C. Stennis Space Center Stennis Space Center, MS 39529-6000		ASME - WELDING PROCEDURE SPECIFICATIONS (WPS)	
Welding Procedure Specification Record Number 34-108-M1		Date 9/21/2018	Revision Number C
Qualified To ASME Boiler and Pressure Vessel Code		Company Name Syncom Space Services	
Supporting PQR(s) 34-108-M1 Appendix A		Reference Docs. N/A	
Scope See Notes *.		Joint Single/Double V/U Groove and All Fillets (See Notes **.)	
BASE METALS (QW-403)		THICKNESS RANGE QUALIFIED	
Type	SA-36 P-no. 1 Grp-no. 1or 2	Min. As-welded	Max. With PWHT
Welded To	SA-36 P-no. 1 Grp-no. 1or 2	Complete Pen. .188" 1"	N/A N/A
Backing	NONE P-no. Grp-no.	Complete Pen.	
Retainers		Impact Tested	
Notes		Impact Tested	
		Fillet Welds	
		DIAMETER RANGE QUALIFIED	
		Min. As-welded	Max. With PWHT
		Nominal Pipe Size No Min. No Max.	N/A N/A
FILLER METALS (QW-404)		THICKNESS RANGE QUALIFIED	
Process	SFA Classification F-no. A-no. Chemical Analysis or Trade Name	Min. As-welded	Max. With PWHT
GTAW	5.18 ER70S-3 6 1 NOT REQUIRED	3/32" 1/4"	N/A N/A
SMAW	5.1 E7018 4 1 NOT REQUIRED	3/32" 3/4"	N/A N/A
Cons. Insert	NOT USED		
Flux	NOT REQUIRED		
WELDING PROCEDURE			
Welding Process	GTAW	SMAW	
Type	Manual	Manual	
Minimum preheat/interpass temperature (°F)	50°F Min.	50°F Min.	
Maximum interpass temperature (°F)	NOT REQUIRED	NOT REQUIRED	
Tungsten Size	1/16" - 1/8"	NOT REQUIRED	
Tungsten Type	2% THORIATED	NOT REQUIRED	
Filler Metal Size (in.)	1/16" - 1/8"	1/16" - 3/16"	
Layer Number	1 - 2 LAYERS	REMAINDER	
Position of Groove	ALL	ALL	
Weld Progression	UPHILL(Downhill Not Allowed)	UPHILL(Downhill Not Allowed)	
Current/Polarity	DC/Straight Polarity	DC/Reverse Polarity	
Amperes	60 - 200	50 - 180	
Volts	10 - 30	10 - 40	
Travel Speed (in./min)	2 - 5 IPM	5 - 15 IPM	
Maximum Heat Input (kJ/in)			
DC Pulsing Current	Not Used	Not Used	
Shielding: Gas Type	ARGON 99.99%	NOT REQUIRED	
Flow Rate (cfh)	15 - 40	NOT REQUIRED	
Trailing: Gas Type	NOT REQUIRED	NOT REQUIRED	
Flow Rate (cfh)	NOT REQUIRED	NOT REQUIRED	
Backing: Gas Type	NOT REQUIRED	NOT REQUIRED	
Flow Rate (cfh)	NOT REQUIRED	NOT REQUIRED	
String or Weave	Stringer (Root/Hot Pass)	Stringer or Weave (Fill/Cap pass)	
Orifice/Gas Cup Size	4 - 8	NOT REQUIRED	
Multi/Single Pass per Side	(See Notes ***)	SINGLE	
Weld Deposit Chemistry			
Notes			

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Weld Joint Designs

Attachment #1

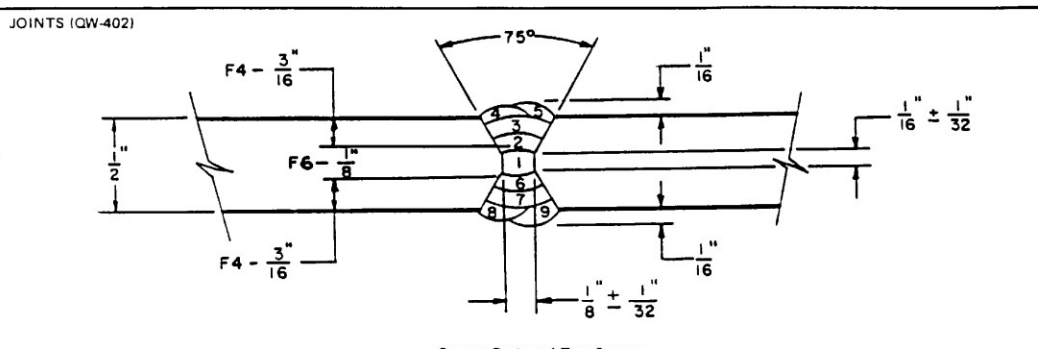


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ATTACHMENT A.2 - PQR WELD PROCEDURE 34-108-MI

QW-483 SUGGESTED FORMAT FOR 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 PAN AM WORLD SERVICES, INC.
 Procedure Qualification Record No. 34-108-MI APPENDIX A Date _____
 WPS No. 34-108-M1
 Welding Process(es) GAS TUNGSTEN ARC (GTAW) AND SHIELDED METAL ARC (SMAW)
 Types (Manual, Automatic, Semi-Auto.) MANUAL



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

<p>BASE METALS (QW-403)</p> <p>Material Spec. <u>SA 36 TO SA 36</u></p> <p>Type or Grade <u>NOT APPLICABLE</u></p> <p>P-No. <u>1</u> to P-No. <u>1</u></p> <p>Thickness of Test Coupon <u>1/2"</u></p> <p>Diameter of Test Coupon <u>NOT APPLICABLE</u></p> <p>Other _____</p>	<p>POSTWELD HEAT TREATMENT (QW-407)</p> <p>Temperature <u>NOT APPLICABLE</u></p> <p>Time _____</p> <p>Other _____</p>																																					
<p>FILLER METALS (QW-404)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>SFA Specification</td> <td><u>5.18</u></td> <td><u>5.1</u></td> </tr> <tr> <td>AWS Classification</td> <td><u>ER 70S-3</u></td> <td><u>E 7018</u></td> </tr> <tr> <td>Filler Metal F-No.</td> <td><u>6</u></td> <td><u>4</u></td> </tr> <tr> <td>Weld Metal Analysis A-No.</td> <td><u>1</u></td> <td><u>1</u></td> </tr> <tr> <td>Size of Filler Metal</td> <td></td> <td></td> </tr> <tr> <td>Other</td> <td><u>F6 3/32"</u></td> <td><u>F4 1/8"</u></td> </tr> <tr> <td>Deposited Weld Metal</td> <td><u>GTAW</u></td> <td><u>SMAW</u></td> </tr> </table>	SFA Specification	<u>5.18</u>	<u>5.1</u>	AWS Classification	<u>ER 70S-3</u>	<u>E 7018</u>	Filler Metal F-No.	<u>6</u>	<u>4</u>	Weld Metal Analysis A-No.	<u>1</u>	<u>1</u>	Size of Filler Metal			Other	<u>F6 3/32"</u>	<u>F4 1/8"</u>	Deposited Weld Metal	<u>GTAW</u>	<u>SMAW</u>	<p>GAS (QW-408)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <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><u>F6 ARGON</u></td> <td><u>99.998%</u></td> <td><u>35 CFH</u></td> </tr> <tr> <td>Trailing</td> <td><u>NOT USED</u></td> <td></td> <td></td> </tr> <tr> <td>Backing</td> <td><u>NOT USED</u></td> <td></td> <td></td> </tr> </tbody> </table>		Gas(es)	Percent Composition (Mixture)	Flow Rate	Shielding	<u>F6 ARGON</u>	<u>99.998%</u>	<u>35 CFH</u>	Trailing	<u>NOT USED</u>			Backing	<u>NOT USED</u>		
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<p>POSITION (QW-405)</p> <p>Position of Groove <u>1G FLAT</u></p> <p>Weld Progression (Uphill, Downhill) <u>UPHILL</u></p> <p>Other <u>DOWNHILL NOT ALLOWED</u></p>	<p>ELECTRICAL CHARACTERISTICS (QW-409)</p> <p>Current <u>DIRECT</u></p> <p>Polarity <u>GTAW - STRAIGHT / SMAW - REVERSE</u></p> <p>Amps. <u>F6 80-125 / F4 145-160</u> Volts <u>F6 20-32 / F4 18-28</u></p> <p>Tungsten Electrode Size <u>3/32"</u></p> <p>Other _____</p>																																					
<p>PREHEAT (QW-406)</p> <p>Preheat Temp. <u>73°F</u></p> <p>Interpass Temp. <u>NOT REQUIRED</u></p> <p>Other _____</p>	<p>TECHNIQUE (QW-410)</p> <p>Travel Speed <u>F6 - 2IPM / F4 - 6IPM</u></p> <p>String or Weave Bead <u>F6 STRING / F4 WEAVE / STRINGER</u></p> <p>Oscillation <u>NOT APPLICABLE</u></p> <p>Multipass or Single Pass (per side) <u>SINGLE</u></p> <p>Single or Multiple Electrodes <u>SINGLE</u></p> <p>Other _____</p>																																					

(12/86)

This form (E00007) may be obtained from the Order Dept., ASME, 345 E. 47th St., New York, N.Y. 10017

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QW-483 (Back)

APPENDIX

Tensile Test (QW-150)

PQR No. 34-108-M1

Specimen No.	Width	Thickness	Area	Ultimate Total Load lb	Ultimate Unit Stress psi	Type of Failure & Location
T-1	.760	.500	.380	27,000	71,053	OW
T-2	.755	.493	.372	27,500	73,925	OW

Guided-Band Tests (QW-160)

Type and Figure No.	Result
SB # 1 QW 462.2	SATISFACTORY
SB # 2 QW 462.2	SATISFACTORY
SB # 3 QW 462.2	SATISFACTORY
SB # 4 QW 462.2	SATISFACTORY

Toughness Tests (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temp.	Impact Values	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break

Fillet-Weld Test (QW-180)

Result — Satisfactory: Yes _____ No _____ Penetration into Parent Metal: Yes _____ No _____
 Macro—Results _____

Other Tests

Type of Test _____
 Deposit Analysis _____
 Other _____

Welder's Name WALTER C. KING S.S. No. 427-94-7139 Stamp No. 19
 Tests conducted by: QIS MOBILE LAB, INC. Laboratory Test No. P.O. #L-20972
 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 10-2-87 Manufacturer PAN AM WORLD SERVICES, INC.
 By Richard J. Nyberg (Signature)
 (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.)