



SSTD-8070-0039-WELD

Revision A
January 2014

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 2-Inch Material Thickness

Original signed by

NASA SSC Center Operations Directorate
Project Management Division

1-9-14

Date

NASA SSC Engineering & Test
Directorate

1-21-14

Date

NASA SSC Center Operations Directorate
Operations & Maintenance Division

2/9/14

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.

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1.0 SCOPE

This standard 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 2-inch wall thickness.

2.0 APPLICABILITY

This Standard 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 Section II, *Materials*

ASME Section V, *Nondestructive Examination*

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

ASME Section IX, *Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators*

SPR 1440.1, *Records Management Program Requirements*

SPR 8715.1, *SSC Safety and Health Procedural Requirements*

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

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

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

4.0 RESPONSIBILITIES

Responsibilities for the use and control of this standard and for the review and approval of revisions or cancellation of this standard 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, *SSC Safety and Health Procedural Requirements*. If ever there is a conflict between this Standard and the 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

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Operations Directorate Project Management Division, the NASA SSC Engineering and Test Directorate (E&TD), and the NASA SSC Safety and Mission Assurance (S&MA) Office.

- c. The attached PQR is for the original WPS in this standard. 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 standard 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

ACCEPTED BY JACOBS TECHNOLOGY, INC
SER 7-26-08

QW-482 (Back) WPS No. 34-108-M1 Rev.

POSITIONS (QW-405) Positions of Groove <u>ALL</u> Welding Progression: Up <u>YES</u> Down <u>NOT ALLOWED</u> Positions of Fillet <u>ALL</u>	POSTWELD HEAT TREATMENT (QW-407) Temperature Range <u>NOT REQUIRED</u> Time Range _____																		
PREHEAT (QW-406) Preheat Temp. Min. <u>50°F</u> Interpass Temp. Max. <u>NOT REQUIRED</u> Preheat Maintenance <u>NOT REQUIRED</u> (Continuous or special heating where applicable should be recorded)	GAS (QW-408) <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">Percent Composition</th> <th rowspan="2">Flow Rate</th> </tr> <tr> <th>Gas(es)</th> <th>Mixture</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td><u>ARGON</u></td> <td><u>99.998%</u></td> <td><u>15-30CFH</u></td> </tr> <tr> <td>Trailing</td> <td><u>NOT REQUIRED</u></td> <td></td> <td></td> </tr> <tr> <td>Backing</td> <td><u>NOT REQUIRED</u></td> <td></td> <td></td> </tr> </tbody> </table>		Percent Composition		Flow Rate	Gas(es)	Mixture	Shielding	<u>ARGON</u>	<u>99.998%</u>	<u>15-30CFH</u>	Trailing	<u>NOT REQUIRED</u>			Backing	<u>NOT REQUIRED</u>		
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ELECTRICAL CHARACTERISTICS (QW-409) <u>GTAW-STRAIGHT</u> Current AC or DC <u>DIRECT</u> Polarity <u>SMAW-REVERSE</u> Amperage (Range) <u>50-300</u> Volts (Range) <u>10-30</u> <small>(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.)</small> Tungsten Electrode Size and Type <u>3/32" TO 1/8" 2% THORIATED</u> <small>(Pure Tungsten, 2% Thoriated, etc.)</small> Mode of Metal Transfer for GMAW <u>NOT APPLICABLE</u> <small>(Spray arc, short circuiting arc, etc.)</small> Electrode Wire feed speed range <u>NOT APPLICABLE</u>																			
TECHNIQUE (QW-410) String or Weave Bead <u>STRINGER (ROOTPASS); STRINGER OR WEAVE FILLER & COVER</u> Orifice or Gas Cup Size <u>#4 TO #7</u> Initial and Interpass Cleaning (Brushing, Grinding, etc.) <u>CHIPPING MANUAL OR PNEUMATIC; BRUSHING OR GRINDING</u> Method of Back Gouging <u>GRINDING OR ARC GOUGING FOLLOWED BY GRINDING</u> Oscillation <u>NOT APPLICABLE</u> Contact Tube to Work Distance <u>NOT APPLICABLE</u> Multiple or Single Pass (per side) <u>SINGLE - NO PASS GREATER THAN 1/2"</u> Multiple or Single Electrodes <u>SINGLE</u> Travel Speed (Range) <u>NOT REQUIRED</u> Peening <u>NOT ALLOWED</u> Other <u>REPAIR - ARC GOUGE OR GRIND DEFECTIVE AREA(S) WELD REPAIR USING THIS PROCEDURE, OR REPAIR AS DIRECTED BY ENGINEERING.</u>																			

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	Travel Speed Range	Other <small>(e.g., Remarks, Comments, Hot Wire Addition, Technique, Torch Angle, Etc.)</small>
		Class	Dia.	Type Polar.	Amp. Range			
1 - 2	GTAW	ER70S-3	3/32"-1/8"	STRAIGHT	80-140	20-40	2-5IPM	
REMAINDER	SMAW	E7018	3/32"-1/4"	REVERSE	110-300	15-30	5-15IPM	

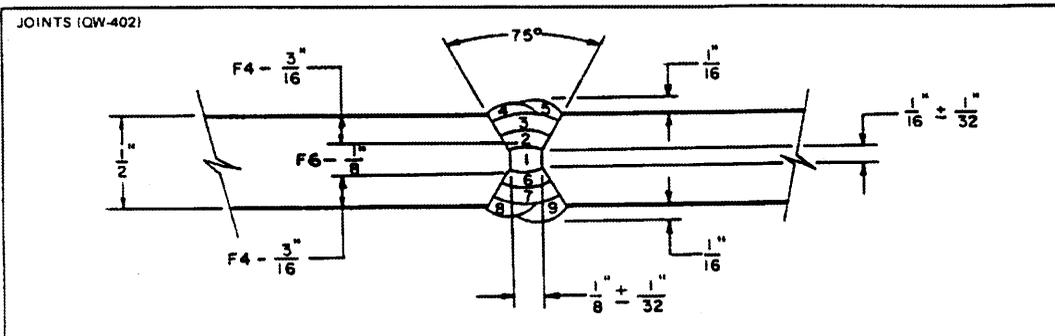
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ATTACHMENT A.2 - PQR WELD PROCEDURE 34-108-MI

Accepted by Jacobs Technology, Inc. *George E. Smith 6/30/2014*
Ben McIntosh 6-30-14

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



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 36 TO SA 36</u> Type or Grade <u>NOT APPLICABLE</u> P.No. <u>1</u> to P.No. <u>1</u> Thickness of Test Coupon <u>1/2"</u> Diameter of Test Coupon <u>NOT APPLICABLE</u> Other _____		POSTWELD HEAT TREATMENT (QW-407) Temperature <u>NOT APPLICABLE</u> Time _____ Other _____																																								
FILLER METALS (QW-404) <table border="1"> <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><u>F6 3/32"</u></td> <td></td> </tr> <tr> <td>Other</td> <td><u>F4</u></td> <td><u>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	<u>F6 3/32"</u>		Other	<u>F4</u>	<u>1/8"</u>	Deposited Weld Metal	<u>GTAW</u>	<u>SMAW</u>	GAS (QW-408) <table border="1"> <thead> <tr> <th rowspan="2">Shielding Gas</th> <th colspan="2">Percent Composition</th> <th rowspan="2">Flow Rate</th> </tr> <tr> <th>(Mixture)</th> <th></th> </tr> </thead> <tbody> <tr> <td>Shielding FG</td> <td><u>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>		Shielding Gas	Percent Composition		Flow Rate	(Mixture)		Shielding FG	<u>ARGON</u>	<u>99.998%</u>	<u>35 CFH</u>	Trailing	<u>NOT USED</u>			Backing	<u>NOT USED</u>		
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PREHEAT (QW-406) Preheat Temp. <u>73°F</u> Interpass Temp. <u>NOT REQUIRED</u> Other _____		TECHNIQUE (QW-410) Travel Speed <u>F6 2IPM / F4 6IPM</u> String or Weave Bead <u>F6 STRING / F4 WEAVE / STRINGER</u> Oscillation <u>NOT APPLICABLE</u> Multipass or Single Pass (per side) <u>SINGLE</u> Single or Multiple Electrodes <u>SINGLE</u> Other _____																																								

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Accepted by Jacobs Technology, Inc. *Angie E. Smith 6/30/2014*
Ben McBeth 6-30-14

QW-483 (Back)

APPENDIX A

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-Bend 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. 427-94-7139 Stamp No. 19
 Tests conducted by: OIS 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.

Manufacturer PAN Am World Services, INC.

Date 10-2-87

By Richard J. Nyberg

(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.)