



SSTD-8070-0039-WELD
Revision C-1
SEPTEMBER 2024

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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Stennis Standard	SSTD-8070-0039-WELD	C-1
	<i>Number</i>	<i>Rev.</i>
	Effective Date:	September 25, 2024
	Review Date:	November 29, 2028
Responsible Office: NASA SSC Center Operations Directorate		
SUBJECT: ASME GTAW & SMAW Weld Procedure for Carbon Steel Pipe - Maximum 1-Inch Material Thickness		

-1

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.”
C-1	09/25/2024	Carol Wolfram Ext. 8-1620	Administrative change to remove Controlled Unclassified Information (CUI) information from the PQR, Appendix A-2.

Stennis Standard	SSTD-8070-0039-WELD	C-1
	<i>Number</i>	<i>Rev.</i>
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SUBJECT: ASME GTAW & SMAW Weld Procedure for Carbon Steel Pipe - Maximum 1-Inch Material Thickness		

-1

Table of Contents

1.0	SCOPE	4
2.0	APPLICABILITY.....	4
3.0	REFERENCED AND APPLICABLE DOCUMENTS	4
4.0	RESPONSIBILITIES	4
5.0	REQUIREMENTS AND PROCEDURES	4
6.0	RECORDS AND FORMS.....	5
7.0	ACRONYMS AND ABBREVIATIONS.....	5
	ATTACHMENT A.1 - WPS WELD PROCEDURE 34-108-MI	6
	ATTACHMENT A.2 - PQR WELD PROCEDURE 34-108-MI	9

Stennis Standard	SSTD-8070-0039-WELD	C-1
	<i>Number</i>	<i>Rev.</i>
	Effective Date: September 25, 2024	
	Review Date: November 29, 2028	
Page 4 of 10		
Responsible Office: NASA SSC Center Operations Directorate		
SUBJECT: ASME GTAW & SMAW Weld Procedure for Carbon Steel Pipe - Maximum 1-Inch Material Thickness		

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

Stennis Standard	SSTD-8070-0039-WELD	C-1
	<i>Number</i>	<i>Rev.</i>
	Effective Date: September 25, 2024	
	Review Date: November 29, 2028	
Page 5 of 10		
Responsible Office: NASA SSC Center Operations Directorate		
SUBJECT: ASME GTAW & SMAW Weld Procedure for Carbon Steel Pipe - Maximum 1-Inch Material Thickness		

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

Stennis Standard	SSTD-8070-0039-WELD	C-1
	Number	Rev.
	Effective Date: September 25, 2024	
	Review Date: November 29, 2028	
Page 6 of 10		
Responsible Office: NASA SSC Center Operations Directorate		
SUBJECT: ASME GTAW & SMAW Weld Procedure for Carbon Steel Pipe - Maximum 1-Inch Material Thickness		

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


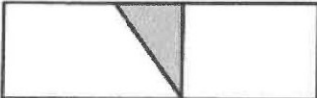

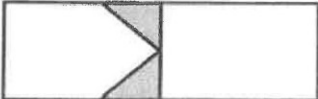

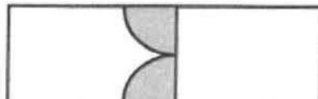

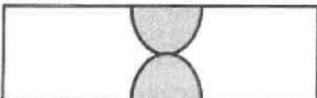
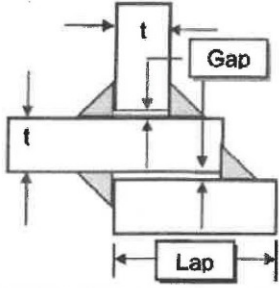
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Welding Procedure Specification Record Number 34-108-M1		Date 9/21/2018	Revision Number C																																								
Qualified To ASME Boiler and Pressure Vessel Code		Company Name Syncom Space Services																																									
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) Type <u>SA-36</u> P-no. <u>1</u> Grp-no. <u>1or 2</u> Welded To <u>SA-36</u> P-no. <u>1</u> Grp-no. <u>1or 2</u> Backing <u>NONE</u> P-no. _____ Grp-no. _____ Retainers _____ Notes _____		THICKNESS RANGE QUALIFIED <table border="1"> <thead> <tr> <th></th> <th>Min. As-welded</th> <th>Max.</th> <th>Min. With PWHT</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>Complete Pen.</td> <td>.188"</td> <td>1"</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>Complete Pen.</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Impact Tested</td> <td>_____</td> <td>_____</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>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table> DIAMETER RANGE QUALIFIED <table border="1"> <thead> <tr> <th></th> <th>Min. As-welded</th> <th>Max.</th> <th>Min. With PWHT</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>Nominal Pipe Size</td> <td>No Min.</td> <td>No Max.</td> <td>N/A</td> <td>N/A</td> </tr> </tbody> </table>			Min. As-welded	Max.	Min. With PWHT	Max.	Complete Pen.	.188"	1"	N/A	N/A	Complete Pen.	_____	_____	_____	_____	Impact Tested	_____	_____	_____	_____	Impact Tested	_____	_____	_____	_____	Fillet Welds	_____	_____	_____	_____		Min. As-welded	Max.	Min. With PWHT	Max.	Nominal Pipe Size	No Min.	No Max.	N/A	N/A
	Min. As-welded	Max.	Min. With PWHT	Max.																																							
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	Min. As-welded	Max.	Min. With PWHT	Max.																																							
Nominal Pipe Size	No Min.	No Max.	N/A	N/A																																							
FILLER METALS (QW-404) Process SFA Classification F-no. A-no. Chemical Analysis or Trade Name GTAW 5.18 ER70S-3 6 1 NOT REQUIRED SMAW 5.1 E7018 4 1 NOT REQUIRED Cons. Insert _____ NOT USED Flux _____ NOT REQUIRED		THICKNESS RANGE QUALIFIED <table border="1"> <thead> <tr> <th></th> <th>Min. As-welded</th> <th>Max.</th> <th>Min. With PWHT</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>GTAW</td> <td>3/32"</td> <td>1/4"</td> <td>N/A</td> <td>N/A</td> </tr> <tr> <td>SMAW</td> <td>3/32"</td> <td>3/4"</td> <td>N/A</td> <td>N/A</td> </tr> </tbody> </table>			Min. As-welded	Max.	Min. With PWHT	Max.	GTAW	3/32"	1/4"	N/A	N/A	SMAW	3/32"	3/4"	N/A	N/A																									
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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																																											

Stennis Standard	SSTD-8070-0039-WELD	C-1
	Number	Rev.
	Effective Date: September 25, 2024	
	Review Date: November 29, 2028	
Page 8 of 10		
Responsible Office: NASA SSC Center Operations Directorate		
SUBJECT: ASME GTAW & SMAW Weld Procedure for Carbon Steel Pipe - Maximum 1-Inch Material Thickness		

 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
Qualified To ASME Boiler and Pressure Vessel Code	Company Name Syncom Space Services	

Weld Joint Designs

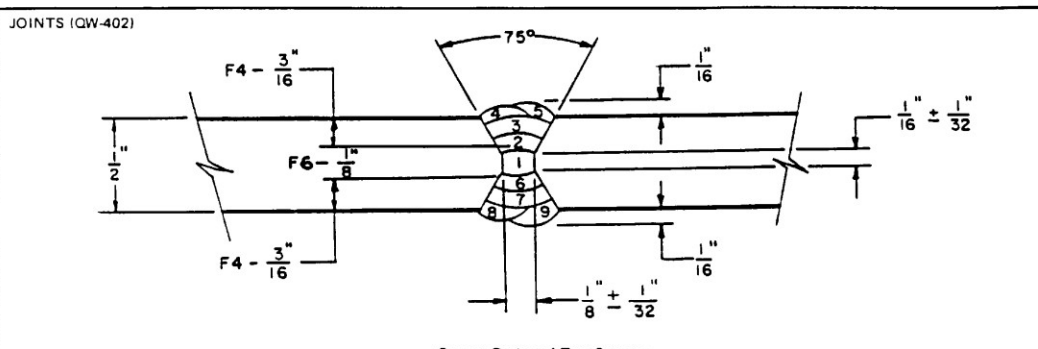
Attachment #1

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	Filet 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.

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.)

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 style="width:100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">SFA Specification <u>5.18</u></td> <td style="width: 50%;">5.1</td> </tr> <tr> <td>AWS Classification <u>ER 70S-3</u></td> <td>E 7018</td> </tr> <tr> <td>Filler Metal F-No. <u>6</u></td> <td>4</td> </tr> <tr> <td>Weld Metal Analysis A-No. <u>1</u></td> <td>1</td> </tr> <tr> <td>Size of Filler Metal _____</td> <td>_____</td> </tr> <tr> <td>Other <u>F6 3/32"</u></td> <td>_____</td> </tr> <tr> <td><u>F4</u></td> <td><u>1/8"</u></td> </tr> <tr> <td>Deposited Weld Metal <u>GTAW</u></td> <td><u>SMAW</u></td> </tr> </table>	SFA Specification <u>5.18</u>	5.1	AWS Classification <u>ER 70S-3</u>	E 7018	Filler Metal F-No. <u>6</u>	4	Weld Metal Analysis A-No. <u>1</u>	1	Size of Filler Metal _____	_____	Other <u>F6 3/32"</u>	_____	<u>F4</u>	<u>1/8"</u>	Deposited Weld Metal <u>GTAW</u>	<u>SMAW</u>	GAS (QW-408) <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 30%;">Gas(es)</th> <th style="width: 20%;">(Mixture)</th> <th style="width: 20%;">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)	(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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Backing	<u>NOT USED</u>																																
POSITION (QW-405) Position of Groove <u>1G FLAT</u> Weld Progression (Uphill, Downhill) <u>UPHILL</u> Other <u>DOWNHILL NOT ALLOWED</u>	ELECTRICAL CHARACTERISTICS (QW-409) Current <u>DIRECT</u> Polarity <u>GTAW-STRAIGHT / SMAW-REVERSE</u> Amps. <u>F6 80-125 / F4 145-160</u> Volts <u>F6 20-32 / F4 18-28</u> Tungsten Electrode Size <u>3/32"</u> Other _____																																
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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	Number	Rev.
	Effective Date: September 25, 2024	
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Page 10 of 10		
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QW-483 (Back)

APPENDIX

PQR No. 34-108-M1

Tensile Test (QW-150)

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 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.

Manufacturer PAN AM World Services, Inc.
 By Richard J. Nyberg (Signature)
 Date 10-2-87
 (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.)

UNCLASSIFIED - APPROVED FOR RELEASE BY NSA ON 05-08-2014