

Engineering Procedure

SAEP-1114

29 October, 2003

Welding Test Supplement S14 for
SMAW, Carbon and Low Alloy Steel Plate

Document Responsibility: Inspection Department

Saudi Aramco DeskTop Standards

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1 Scope

This welder performance qualification Test Supplement shall govern the testing of welders with the Shielded Metal Arc Welding (SMAW) process, welding progression vertical up, for carbon and low alloy steel plate.

2 Applicable Documents

The requirements contained in the following documents apply to the extent specified in this procedure.

2.1 Saudi Aramco Reference(s)

Saudi Aramco Engineering Procedure

[SAEP-321](#)

*Performance Qualification Testing and
Certification of Saudi Aramco Welders*

2.2 Industry Code(s) and Standard(s)

American Society of Mechanical Engineers

ASME SEC IX

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

3 Instructions

Conduct the Performance qualification testing of welders following the requirements of [SAEP-321](#) as supplemented by the subsequent instructions.

3.1 Applications

Piping Yes *

Pipelines Yes *

Pressure Vessels Yes *

Tanks Yes *

Structural Yes *

Dissimilar Metals No

* See restrictions in paragraph 3.9

|| 3.7 Testing and Inspection Requirements

Time Limit of Test	Six (6) hours maximum
Radiography	100% (ASME QW-191)
Visual Inspection	See paragraph 6.1.3 of SAEP-321
Miscellaneous	The welder shall also be given a bead-on-plate test (2G, 3G, 4G) using E6010. The test shall consist of welding five (5) overlapping stringer beads on each groove weld test plate (one (1) inch from and parallel to the groove weld). Bead straightness, overlap, and uniformity are the only acceptance criteria.

3.8 Qualification Limits

Material Form	Plate
Joint Type	Groove welds with or without backing (must be back gouged) and fillet welds
Base Material	Carbon steel (P1) and low alloy steels (P3, P4, P5, P9, P11) to themselves and to each other
Process	SMAW
Filler Metal:	
Root	EXX10/11 (A5.1, A5.5) or EXX15/16/18 (A5.1, A5.5)
Fill/Cap	EXX15/16/18 (A5.1, A5.5)
Base Metal Thickness	Unlimited
Diameter Range	Refer to 3.9 for restrictions
Positions	All
Vertical Progression	Uphill except that the root pass can be run uphill or downhill

3.9 Restrictions

- (A) Piping - limited to circumferential seams and branch connections greater than 24" in diameter (must be welded from both sides) and attachment welds of nonpressure parts (saddles, shoes, clips, etc.) to pressure parts.
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- (B) Pipelines - all welding on external surfaces (repair sleeves, patches, weld buildup, etc.) is permitted.
- (C) Pressure Vessels, Tanks and Structural
 - (1) The root pass of double sided welds welded in the vertical position, can be welded in the downhill or uphill progression using E6010 or E7018 electrodes, provided the backside of the root is back gouged to sound metal prior to welding of the second side.
 - (2) The root pass of vertical fillet welds (structural attachments) can be welded with either E6010 or E7018 using the uphill or downhill progression.

Revision Summary

29 October, 2003

Minor revision to convert the text statements into a form layout (ASME SEC IX format).
Revised the "Next Planned Update".



WELDING PROCEDURE SPECIFICATION (WPS)

WPS S14

Rev. 0

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Procedure Qualification Record (PQR): <u>None</u>	Welding Process: <u>SMAW</u>
Scope: <u>For welder qualification only</u>	Prior Qualification Requirements: <u>None</u>

BASE MATERIAL (QW-403)		POST WELD HEAT TREATMENT (QW-407)																	
Test coupons type: <u>Plate</u> Material Spec, type or Grade: <u>Carbon Steel</u> Plate Size: <u>8" X 4" (two per position)</u> Thickness of test coupon: <u>0.750"</u> To Material spec. type or grade: <u>Carbon Steel</u> Tack Welds: <u>Welder to fit up and tack weld test plates together at run off tabs</u>		Temperature: <u>NONE</u> Time: _____ Other: _____																	
FILLER METALS (QW-404)		GAS (QW-408)																	
Weld Metal Analysis Number: <u>1</u> Filler Metal F No.: <u>E6010-3, E7018-4</u> AWS specification: <u>A 5.1</u> AWS Classification: <u>See Below</u>		<table border="1"> <thead> <tr> <th></th> <th>Gas</th> <th>Composite</th> <th>Flow (CFH)</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td><u>None</u></td> <td></td> <td></td> </tr> <tr> <td>Backing</td> <td><u>None</u></td> <td></td> <td></td> </tr> <tr> <td>Trailing</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Gas	Composite	Flow (CFH)	Shielding	<u>None</u>			Backing	<u>None</u>			Trailing			
	Gas	Composite	Flow (CFH)																
Shielding	<u>None</u>																		
Backing	<u>None</u>																		
Trailing																			
POSITION (QW-405)		TECHNIQUE																	
Position of Groove: <u>2G, 3G & 4G</u> Weld Progression: Root: <u>Uphill or Downhill</u> <u>(can be deposited with E6010 or E7018 welding electrodes)</u> Fill (Side 1): <u>Uphill</u> Cap (Side1): <u>Uphill</u> Fill (Side 2): <u>Uphill (shall be arc gouged to sound metal prior to the start of welding)</u> Cap (Side 2): <u>Uphill</u>		String or weave: <u>Stringer or Weave</u> Oscillation: _____ Multiple or Single pass per side: <u>Multiple</u> Single or multiple electrode: <u>Single</u> Other: _____																	
PREHEAT (QW 406)																			
Preheat Temperature: <u>50°C</u> Interpass temperature: <u>315°C</u> Other: _____																			

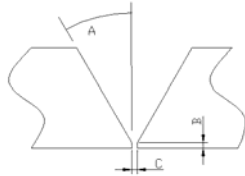


WELDING PROCEDURE SPECIFICATION (WPS)

WPS S14

Rev. 0

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Joint Design: Single Vee

A = 30° +/- 2.5°

B = 3.2 +/- 1.6mm

C = 3.2 +/- 1.6mm

WELD LAYER	PROCESS	FILLER METAL		CURRENT		VOLTAGE	TRAVEL SPEED (cm/min)
		Class	Dia. (mm)	Polarity	Amps.		
Root	SMAW	E6010/7018	4.8/3.2	DCEP	80-140	19-25	3.8-8.9
Hot	SMAW	E7018	3.2/4.0	DCEP	70-100	19-25	3.8-10.2
Fill	SMAW	E7018	3.2/4.0	DCEP	90-160	22-28	3.8-14
Cap	SMAW	E7018	3.2/4.0	DCEP	90-160	22-28	5.0-15.2