

Engineering Procedure

SAEP-1105

29 October, 2003

Welding Test Supplement S05
for SMAW, Nickel, Single Sided

Document Responsibility: Inspection Department

Saudi Aramco DeskTop Standards

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Previous Issue: 30 April, 2000 Next Planned Update: 1 November, 2008

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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 welding stainless steel and nickel-based alloy pipe (limited application - refer to the restrictions in paragraph 3.9).

2 Applicable Documents

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

2.1 Saudi Aramco References

Saudi Aramco Engineering Procedures

[SAEP-321](#)

*Performance Qualification Testing and
Certification of Saudi Aramco Welders*

[SAEP-1101](#)

*Welding Test Supplement S01 for SMAW, Carbon
and Low Alloy Steel Pipe, Uphill*

2.2 Industry Code(s) and Standards(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	Yes *

CRWMO	Yes *
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* See restrictions in paragraph 3.9

3.7 Testing and Inspection Requirements

Time Limit of Test	Two (2) hours maximum
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Radiography	100% (ASME QW-191)
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Visual Inspection	See paragraph 6.1.3 of SAEP-321
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3.8 Qualification Limits

Material Form	Plate or pipe
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Joint Type	Groove welds with backing and fillet welds
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Base Material	Nickel alloys (P4X) to themselves and to carbon steels. Dissimilar metal welds include: Ni-based alloys to carbon steels, low alloy steels, stainless steels, nickel and monel alloys; monel alloys joined to carbon steels; nickel joined to stainless steels; stainless steels to carbon steels.
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Process	SMAW
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Filler Metal	Ni-based (A5.11)
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Base Metal Thickness	Unlimited
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Diameter Range	2.5" NPS and greater
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Positions	All
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Vertical Progression	Uphill
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3.9 Restrictions

(A) Piping - root pass welding is only permitted:

- (1) when the backside of the root is accessible for back grinding and back welding, or
- (2) when the piping to be welded is a gravity drain, or a vent operating at atmospheric pressure.

(B) Pipelines - nickel-based SMAW welding electrodes shall not be used for root pass welding when welding stainless steel fittings (i.e., COSASCO

fittings) to pipelines (root pass welds must be made with the GTAW process which requires a Test Supplement S08 certification).

- (C) Pressure Vessels and Tanks - limited to single sided full penetration welds with backing, double sided full penetration welds (second side back gouged or back ground to sound metal prior to welding), fillet welds and CRWMO welding [see (E) below].
- (D) Dissimilar Metal Welding (Piping, Pressure Vessels, Tanks, Pipelines) - nickel-based electrodes shall be used to weld ferritic steels to austenitic stainless steels, duplex stainless steels, and nickel based alloys.
- (E) Corrosion-Resistant Weld Metal Overlay - welders with valid certifications can be allowed to perform corrosion-resistant overlay welding provided a CRWMO Ability Performance Test is performed and passed (refer to Section 6.5.1 of [SAEP-321](#)).

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)

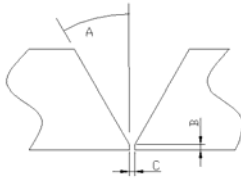
WPS S05

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Procedure Qualification Record (PQR): <u>None</u>	Welding Process: <u>SMAW, manual</u>
Scope: <u>For welder qualification only</u>	Prior Qualification Requirements: <u>S01</u>

BASE MATERIAL (QW-403)	POST WELD HEAT TREATMENT (QW-407)
Test coupon type: <u>Pipe</u>	Temperature: <u>None</u>
Material Spec, type or Grade: <u>Carbon Steel</u>	Time: _____
Diameter of test coupon: <u>8" NPS</u>	Other: _____
Thickness of test coupon: <u>0.812"</u>	
To Material spec. type or grade: <u>Carbon Steel</u>	
Tack Welds: <u>Four made by the welder and</u> <u>Incorporated into the root pass</u>	
FILLER METALS (QW-404)	GAS (QW-408)
Weld Metal Analysis Number: <u>NA</u>	
Filler Metal F No.: <u>F-4.3</u>	Gas: <u>None</u>
AWS specification: <u>A 5.11</u>	Composite: _____
AWS Classification: <u>ENiCrFe-3</u>	Flow (CFH) _____
POSITION (QW-405)	TECHNIQUE
Position of Groove: <u>6G</u>	String or weave: <u>Stringer or Weave</u>
Weld Progression: <u>Uphill</u>	Oscillation: _____
PREHEAT (QW 406)	Multiple or Single pass per side: <u>Multiple</u>
Preheat Temperature: <u>10°C</u>	Single or multiple electrode: <u>Single</u>
Interpass temperature: <u>177°C</u>	Other: _____
Other: _____	



Joint Design: Single Vee

A = 30° +/- 2.5°
B = 1.6 +/- 0.8mm
C = 3.2 +/- 0.8mm

		WELDING PROCEDURE SPECIFICATION (WPS)				WPS S05 Rev. 0 Page 2 of 2	
WELD LAYER	PROCESS	FILLER METAL		CURRENT		VOLTAGE	TRAVEL SPEED (cm/min)
		Class	Dia. (mm)	Polarity	Amps.		
Root	SMAW	ENiCrFe-3	3.2/4.0	DCEP	80-140	19-25	3.8-8.9
Hot	SMAW	ENiCrFe-3	3.2/4.0	DCEP	70-100	19-25	3.8-10.2
Fill	SMAW	ENiCrFe-3	3.2/4.0	DCEP	90-160	22-28	3.8-14
Cap	SMAW	ENiCrFe-3	3.2/4.0	DCEP	90-160	22-28	5.0-15.2