Prepared by: [redacted]

WELDER QUALIFICATION FOR IN-SERVICE WELDING

D-30.4

Asset Type: Gas Transmission and Distribution

Function: Design and Construction

Issued by: [redacted] Original Signed By

Date: 04-14-09

Rev. #02: This document replaces Revision #01. For a description of the changes, see Page 3.

Purpose and Scope

This numbered document provides the required qualifications for welders who conduct welding in accordance with Numbered Documents D-23 and D-23.1.

Acronyms

API:	American Petroleum Institute
GMAW:	gas metal arc welding
gpm:	gallons per minute
kJ/inch	kilojoules per inch
OD:	outside diameter
psig:	pounds per square inch gauge
SMAW:	shielded metal arc welding
SMYS:	specified minimum yield strength
WT:	wall thickness

References	Document
In-Service Welding	D-23
Direct Deposition Welding	D-23.1
Arc Welder Qualification for Working on Pipelines That Operate at Over 20% of SMYS	D-30.2
Weld Inspection	D-40
Welding of Pipelines and Related Facilities	API 1104

General Information

1. A welder qualified under this numbered document may perform in-service welding within the limitations of his/her qualifications as established in Numbered Document D-30.2. Separate qualifications exist for in-service welding when using the controlled-heat-input and temper-bead techniques.
2. To be qualified to perform direct deposition welding on pressurized pipelines, welders shall successfully complete the qualification test for temper-bead welding, and the direct deposition, mock-up test, as described in this numbered document.

Qualification for Controlled-Heat-Input Welding

1. This test may be given for either SMAW or GMAW.
2. The welder shall make a sleeve weld on an X-42, 12” nominal OD, or larger pipe with a 1/2” thick by 12” long A242 or A572 sleeve. The welder shall make one circumferential weld and one longitudinal seam weld with backing strip. The test coupon shall be in the 5G position.
3. The welder shall make a branch connection weld on an X-42, 12” nominal OD, or larger pipe with a 6” nominal OD, 0.280 WT, or larger branch pipe.
4. The test pipe shall be filled with water flowing at a minimum rate of 10 gpm while the test is conducted.
5. During deposition of the circumferential weld on the sleeve and the fillet weld on the branch, the welder shall demonstrate the ability to maintain a minimum heat input of 40 kJ/inch for SMAW and 25 kJ/inch for GMAW.

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Welder Qualification for In-Service Welding

6. For SMAW, the heat input shall be verified by measuring the "run-out ratio" during welding.

$$Run-Out\ Ratio = \frac{Weld\ Length}{Original\ Electrode\ Length - Stub\ Length}$$

7. The run-out ratio for XX18-type electrodes with a minimum heat input of 40 kJ/inch is 0.38 for 1/8" and 0.23 for 3/32"electrodes.
8. For GMAW, the heat input shall be calculated after measuring the amperage, arc voltage, and travel speed.

$$Heat\ Input\ (kJ/inch) = \frac{Amperage \times Voltage \times 60}{Travel\ Speed\ (inch/minute)}$$

9. Four nick-break specimens shall be removed from the circumferential weld and the branch weld on the completed assemblies and be tested per API 1104 Appendix B.
10. One tensile, one nick-break, one root bend, and one face bend shall be removed from the longitudinal seam weld and be tested per API 1104 Appendix B.
11. The weld shall meet the visual inspection requirements of Numbered Document D-40.

Qualification for Temper-Bead Welding

1. This test may be given for either SMAW or GMAW.
2. The welder shall make a sleeve weld on an X-42, 12" nominal OD, or larger pipe with a 1/2" thick by 12" long A242 or A572 sleeve. The welder shall make one circumferential weld. The test coupon shall be in the 5G position.
3. The test pipe shall be filled with water flowing at a minimum rate of 10 gpm while the test is conducted.
4. During deposition of the circumferential weld, the welder shall demonstrate the ability to deposit and properly position weld beads in the proper sequence and at the minimum heat-input levels described in the welding procedure.
5. Four nick-break specimens shall be removed from the circumferential weld on the completed assembly and be tested per API 1104 Appendix B.
6. The weld shall meet the visual inspection requirements of Numbered Document D-40.

Qualification Using Direct Deposition Mock-Up

1. This test may be given for SMAW only.
2. The test coupon shall be created from a 6" nominal OD, or larger pipe with a wall thickness of 0.250" maximum. Grind or machine a 3" long by 4" wide minimum area to a maximum remaining wall thickness of 0.156" to simulate corrosion damage.
3. The test coupon shall be positioned so that the simulated corrosion is in the overhead position. The test coupon shall be pressurized with 100 psig of air.
4. While repairing the corroded area, the welder shall demonstrate an understanding of the requirements of the repair procedure, and an ability to deposit weld metal in the proper sequence and at the desired heat-input levels.
5. Any burn-through during welding of the mock-up shall constitute a test failure.
6. The completed weld shall be visually inspected in accordance with Numbered Document D-40.

Retesting and Records

1. Welders who fail a qualification test shall undergo further training or practice before retesting. The extent of training or practice required shall be determined by the qualification test administrator.
2. Records of all welders qualified under this numbered document shall be retained as outlined below:
   A. All "Employee Qualification and Requalification" records must be retained for a minimum of 5 years.
   B. All "Employee Qualification and Requalification" records must be retained through temporary lapses in a welder's qualification.

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C. The record shall be created by filling out Form FD-30.4-A, "Arc Welder Qualification Test for In-Service Welding on Piping Systems."

Revision Notes

Revision 02 has the following changes:

1. Added the hyperlinks to all references.
2. Revised Items 2, 5, 7, and 9 in the "Qualification for Controlled-Heat-Input Welding" section.
3. Revised the API references in Item 9 of the "Qualification for Controlled-Heat-Input Welding" section and Item 5 of the "Qualification for Temper-Bead Welding" section on Page 2.
4. Added Items 3 and 10 to the "Qualification for Controlled-Heat-Input Welding" section.
5. Revised the form reference in Item 2C in the "Retesting and Records" section above.
6. This document is part of Change 61.

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Pacific Gas and Electric Company

Arc Welder Qualification Test
for In-Service Welding on Piping Systems

Gas T&D
4/09
FD-30.4-A

☐ Passed Date Last Tested _____ Date _____

☐ Failed Further Training Required _____

Welder _____ S.S. No. (last 4 digits) _____

Pipe Dia. _____ Pipe Spec. _____ Grade _____ Wall Thickness _____

☐ Exx10 ☐ Micro Wire ☐ Branch Test Administrator _____

☐ Exx18 ☐ Sleeve Sleeve Thickness: Weld Position _____

Electrode Material **Electrical** **Welding**

Bead	Manufacturing and AWS Class	Diameter	Polarity	Amps	Volts	Direction
1st Bead			DCEP			
2nd Bead			DCEP			
Other Bead			DCEP			

Tensile Tests

Specimen	Width	Thickness	Area – Sq. In.	Load - Pounds	Stress - psi	Remarks
1						

Face Bend or Side Bend

Specimen	Location	No. Cracks	Max. Dimension	Location	Remarks
1					

Root Bend or Side Bend

Specimen	Location	No. Cracks	Max. Dimension	Location	Remarks
1					

Nick Break

Specimen		Gas Pockets			Slag Inclusion				Remarks
No.	Location	No.	Max. Size	Between	No.	Length	Between	Fusion	
1									
2									
3									
4									
5									
6									

Branch Dia.: _____ Pipe Spec.: _____ Grade: _____ Wall Thickness: _____

Nick Break

No.	Location	No.	Max. Size	Between	No.	Length	Between	Fusion	Remarks
1									
2									
3									
4									

[redacted] [redacted]

Material Redacted GTR0118070