Prepared by: [redacted]

WELDER QUALIFICATION FOR UNDER 20% OF SMYS

D-30

Department: Gas Distribution and Technical Services **Section:** Gas Engineering and Planning

Approved by: [redacted] **Date:** 05-12-99

Rev. #00: This document replaces PG&E Drawings 084496 and 282917. For a description of the changes, see Page 6.

Purpose and Scope

This standard is used to determine the ability of the welder to make sound welds in order to maintain quality construction for all piping systems operating under 20% SMYS.

Acronyms

API:	American Petroleum Institute
ASTM:	American Society for Testing and Materials
BOE:	beveled on one end
EH:	extra heavy
G.O.:	General Order
MAOP:	maximum allowable operating pressure
OD:	outside diameter
SMYS:	specified minimum yield strength
WT:	wall thickness

References

	Gas Standard
Oxy-Acetylene Weld Procedure	D-20
Arc Welding Procedure Requirement – All Stress Levels	D-22
Oxy-Acetylene Welder Qualification for Over 20% of SMYS	D-30.1
Arc Welder Qualification for Working on Pipelines that Operate at Over 20% of SMYS	D-30.2
Standards of Acceptability for Welding Non-destructive and Destructive Testing	D-31
Weld Inspection	D-40
Guided Bend Testing Jig for Testing Welders Under 20%	M-25

General Information

Welder qualification or requalification tests shall be made in accordance with the following procedures.

1. Employees shall pass a qualification test before being allowed to weld on pipe or fittings that are or will be a part of a natural gas piping system. Trainees who have successfully completed the Apprentice Fitter Primary Shop Training will only be allowed to perform welding on pipe sizes in which they have qualified until subsequent qualification testing of these welders complies with qualification test requirements in this standard.
2. Qualification and requalification tests shall be performed under the supervision of a qualified welding inspector. This inspector shall not leave the immediate area while qualification and requalification testing is being performed. For the purpose of this standard, a qualified welding inspector is a designated employee that has the experience and knowledge to judge the quality of welds (see Gas Standard D-40). The supervisor shall not designate a welding inspector without the prior approval of the weld inspection and testing group. The inspector need not be present when the welder performs the weld for the six-month verification test. The supervisor must verify that the test specimen was performed by the welder.
3. For employees who have previously qualified, requalifying tests shall be required as a result of any one of the following conditions.
   A. A period of one year plus or minus one month has elapsed since the previous qualification test. A welder must be requalified within the period from the month preceding to the month following his last annual anniversary requalification.

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B. A welder has not worked at the particular welding process for a period of six months or more.

C. There is specific reason to question the ability of the welder to make sound welds.

D. There is a change in the welding process from gas to shielded arc welding or vice versa, from one gas or one arc welding process to another gas or another arc welding process, from manual to semi-automatic or automatic.

E. There is a change in pipe material from ASTM or API Standard 5L and 5LX grade X42 groups to API Standard 5LX groups in excess of grade X42 and vice versa.

F. There is a change in position for butt welds only, a change from vertical to horizontal or vice versa.

4. After testing the specimens in accordance with Gas Standard D-31, prepare the report forms (Pages 5 and 6).

5. The district offices are to retain all test reports in order to verify that the welder has maintained qualification. Alternatively, test reports may be retained centrally by the weld inspection and testing group.

6. The 4" or 6" testing spools in 4-1/2" lengths with 37-1/2° bevels on both ends are available, Code 022579 for 4" x .156" WT (oxyacetylene qualification) and Code 022580 for 6" x .156 WT (arc welder qualification).

7. The 3/4" x 4.5"-long EH BOE pipe nipples are also available, Code 022578.

8. The 4" sleeve assembly for the sleeve weld test is available, Code 022059.

Welder Qualification and Requalification Tests

9. Arc Welder Qualification

A. The following tests are required for arc welder qualification.

(1) Make a butt weld with 6" diameter x 4.5" minimum length spools (.156" WT recommended).

(2) Make a sleeve on 4" pipe (fillet welds), sleeve – .250 WT x 3" L, pipe – .156" WT x 9" long.

(3) Make a branch connection, 3/4" x 4.5" long EH nipple on 2", 3" or 4" pipe.

B. A welder passing the tests specified in Paragraph 9A above is qualified to arc weld pipe and fittings on all systems with a design pressure stress level of less than 20% SMYS and 12" diameter and smaller. See Gas Standard D-30.2 for qualification requirements for higher stress levels.

10. Oxyacetylene Welder Qualification

A. The following tests are required for oxyacetylene qualification.

(1) A butt weld with a 4" diameter x 4.5" minimum length spools (0.156" WT recommended). This part of the test may be satisfied by successfully completing the 2" butt weld requirement for oxyacetylene qualification on pipe over 20% SMYS, provided an additional two coupons are subjected to root band tests (refer to Gas Standard D-30.1). G.O. 112 (latest revision) requires that three of four coupons pass root band tests for qualification of welders on low stress level pipe.

Perform a butt weld test on one end of the sleeve weld test specimen.

(2) A sleeve on 4" pipe. (Same as arc weld qualification.)

(3) A branch connection – 3/4" x 4.5" long EH nipple on 2", 3" or 4" pipe. (Same as arc weld qualification.)

B. A welder passing the test specified in Paragraph 10A above is qualified to oxyacetylene weld pipe and fittings for 4" and smaller pipe and service connections on pipe 8" and smaller for all systems with a design pressure stress level of less than 20% SMYS. See Gas Standard D-30.1 for qualifying on butt welds at over 20% SMYS.

11. Test Weld Procedure

A. Arc welds are performed using the methods outlined in Gas Standard D-22. Oxyacetylene welds are performed using the methods outlined in Gas Standard D-20.

B. The butt welds and sleeve welds are made with the pipe in the horizontal fixed position. The branch connection is made with the header in the horizontal fixed position and the branch not more than 45° from the top of the header. For all test welds, no movement or rotation of the pipe is allowed during welding.

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Welder Qualification for Under 20% of SMYS

12. Test Weld Inspection Requirements
    A. All test welds shall be visually inspected. Sleeve welds require visual inspection only. Welds shall be free of cracks, inadequate penetration, unrepaired burn through (as applicable) and other defects. The weld bead and adjacent area shall present a neat, workman-like appearance. Arc burn due to striking an arc out of the weld groove is not allowed. Any weld not meeting these requirements shall be failed without performing any destructive tests.
    B. Butt welds which pass the visual inspection shall be destructively tested. Take samples as shown in Figure 4 and Figure 5 on Page 5.
    C. Four root bend samples are required. Three of the four samples must pass in order for the welder to qualify. See Gas Standard D-31 for specimen tests and requirements.
    D. A knock-off test shall be performed on branch connections which have passed the visual inspection.
13. A requalification test shall be performed in the same manner as the initial test as outlined in the "Arc Welder Qualification" and "Oxyacetylene Welder Qualification" sections, Paragraphs 9 and 10, on Page 2.

Qualification Tests

14. Employees who fail to meet the requirements for a qualification test may be retested immediately. In such a case, the employee shall make two welds of each type that failed to meet the requirements. For the guided root bend test, satisfactory welds will be indicated if no more than one specimen out of each weld is rejected (see the "Test Weld Inspection Requirements" section, Paragraph 12.) In addition, rejection of specimens from both weld tests at the same specimen position shall be cause for rejection. For the knock-off test, both specimens must pass.
15. The qualification test may be terminated at any point when it becomes apparent to the welding inspector that the welder lacks the skills necessary to produce satisfactory results.
16. Employees who fail to meet the requirements for a qualification test shall be required to have further training or practice. In such a case, a complete retest shall be made subsequent to such training or practice.

Records

Records for all welders who have been qualified under this standard shall be retained as outlined below.

17. All Employee Qualification and Requalification records must be retained for a minimum duration of five years.
18. The record shall be made by filling out the forms reproduced in Attachments A and B.
19. Use a separate test report for each qualification or verification. Do not combine a qualification and verification test on a single test report.

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Welder Qualification for Under 20% of SMYS

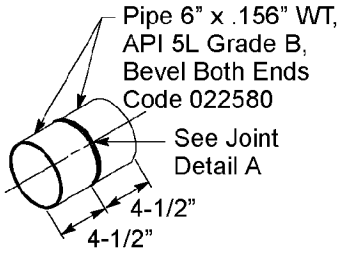


Figure 1
Arc Butt Weld Test
Two Spools Required

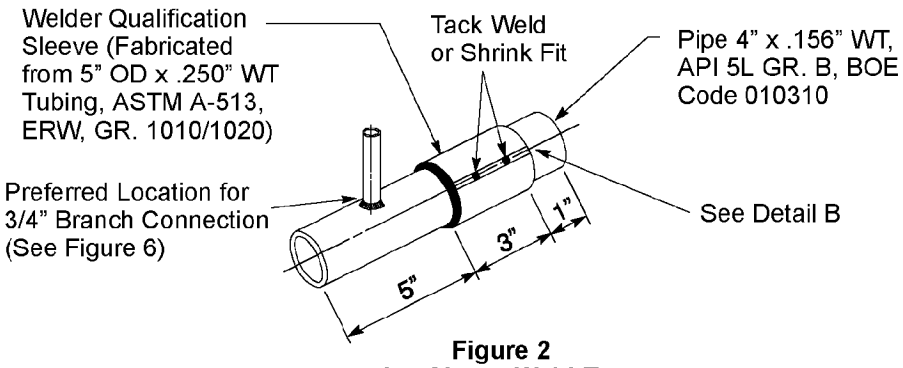


Figure 2
Arc Sleeve Weld Test
Sleeve Tack Welded or Shrink Fit to Pipe.
Welder Performs all Welds for Visual Inspection.
Complete Sleeve Assembly Code 022059

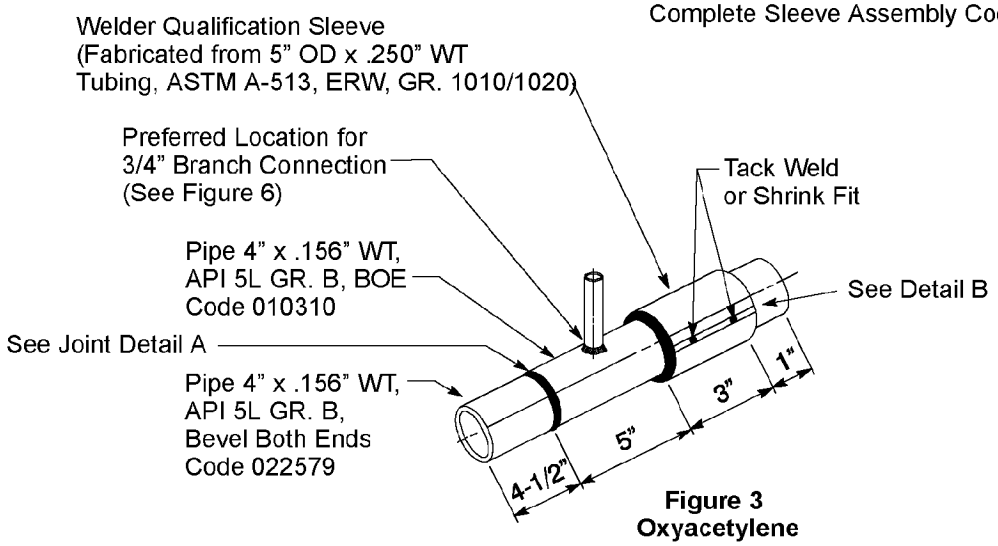
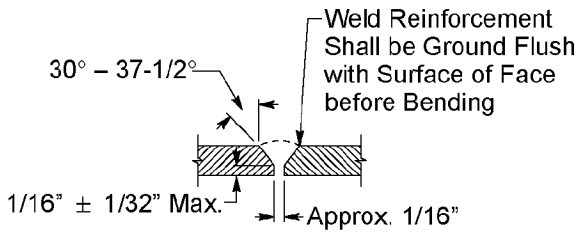
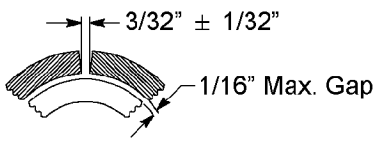


Figure 3
Oxyacetylene
Butt and Sleeve Weld Test
Perform Butt Weld Test on One End of Sleeve Weld Test Specimen. Complete Sleeve Assembly Code 022059.
4" Pipe, 4-1/2" Long, Code 022579.



Detail A
Joint



Detail B
Joint

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Welder Qualification for Under 20% of SMYS

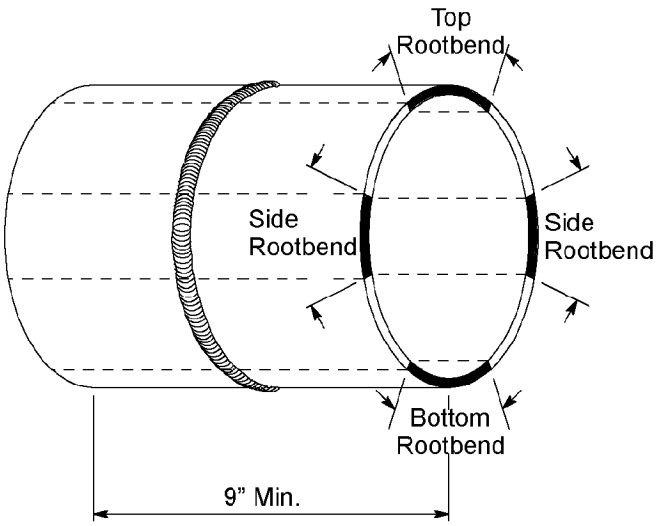

Figure 4
Specimen Selection
Note: Bend Specimens in Guided Bend Jig (Gas Standard M-25)
See Gas Standard D-31 for Weld Quality Requirements.

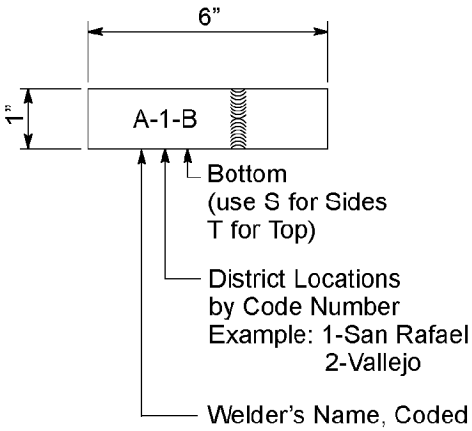

Figure 5
Test Sample Marking
Note: Use "Kado" Felt Marker
Pen for Marking

Preparation of Arc and
Oxyacetylene Butt Weld Specimens

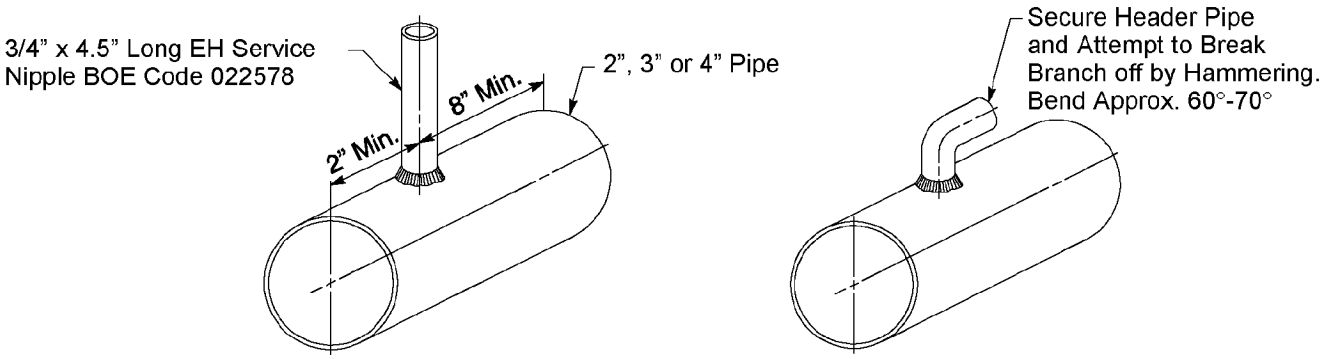

Figure 6
Service "Knock Off" Test

For Welders Working on Pipe Lines with a MAOP or Future Design
Pressure that Produces a Hoop Stress of Less than 20% of SMYS

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Welder Qualification for Under 20% of SMYS

Revision Notes

Revision 00 has the following changes:

1. Converted PG&E Drawings 084496 and 282917 to Gas Standard D-30.
2. Added "Purpose and Scope," "Acronyms," "References" and "Revision Notes" sections.
3. Added a limit for the arc welder qualification for under 20% SMYS to welding on pipes 12" in diameter or smaller.
4. Converted the "Arc Weld Test Report" and "Oxyacetylene Weld Test Report" forms to the Attachments A and B.
5. Modified forms in Attachments A and B.
6. Eliminated two non-applicable conditions requiring requalifying tests (a change in filler metal classification group and change in direction from vertical-down to vertical-up or vice versa).
7. Showed a 3/4" branch connection on pipe portion of sleeve weld assembly.
8. Made general editorial changes throughout the document.
9. This document is part of Change 45.

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Welder Qualification for Under 20% of SMYS

Attachment A

Arc Weld Test Report

For Welders on Piping Systems Operating at Hoop Stresses of Less than 20% of the Specified Minimum Yield Strength

(Check Appropriate Box Below)

Name _____ Passed ☐ Failed ☐ Date _____

Social Security Number _____

Classification _____

Area/Location _____

NOTE: Use a Separate Test Report for Each Qualification or Verification.
Do Not Combine a Qualification and Verification Tests on a Single Test Report.

VISUAL TEST ONLY – 6 Month Verification of Welding in Qualification Process

Butt Weld 6.625" OD Spools

Test Type	Appearance (G) (S) (U)	Remarks (1) – (6)	Test Results (P) (F)
Appearance			

DESTRUCTIVE TEST – For Qualification or Requalification

Butt Weld 6.625" OD Spools

Test Type Root Bend	Penetration (G) (S) (U)	Fusion (G) (S) (U)	Appearance (G) (S) (U)	Remarks (1) – (6)	Test Results (P) (F)
Bottom					
Side					
Top					
Side					

Branch Connection 3/4" on 2", 3" of 4" Run

Knock Off					

Sleeve Weld 4"

Appearance			

Key:

Use these abbreviations in Test Results:

P = Pass F = Fail

Use these abbreviations in Penetration, Fusion and Appearance columns:

G = Good S = Satisfactory U = Unsatisfactory

Use the following in the Remarks column, as applicable:

1 = Inadequate Penetration 3 = Incomplete Fusion 5 = Undercutting
2 = Internal Concavity 4 = Burn Through 6 = Crack in Weld Greater than 1/8"

_____
Test Inspector

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Attachment B

Oxyacetylene Weld Test Report

For Welders on Piping Systems Operating at Hoop Stresses of Less than 20% of the Specified Minimum Yield Strength

(Check Appropriate Box Below)

Name _____ Passed ☐ Failed ☐ Date _____

Social Security Number _____

Classification _____

Area/Location _____

NOTE: Use a Separate Test Report for Each Qualification or Verification.
Do Not Combine a Qualification and Verification Tests on a Single Test Report.

VISUAL TEST ONLY – 6 Month Verification of Welding in Qualification Process

Butt Weld 4.5" OD Spools

Test Type	Appearance (G) (S) (U)	Remarks (1) – (6)	Test Results (P) (F)
Appearance			

DESTRUCTIVE TEST – For Qualification or Requalification

Butt Weld 4.5" OD Spools

Test Type Root Bend	Penetration (G) (S) (U)	Fusion (G) (S) (U)	Appearance (G) (S) (U)	Remarks (1) – (6)	Test Results (P) (F)
Bottom					
Side					
Top					
Side					

Branch Connection 3/4" on 2", 3" of 4" Run

Knock Off					

Sleeve Weld 4"

Appearance			

Key:

Use these abbreviations in Test Results:

P = Pass F = Fail

Use these abbreviations in Penetration, Fusion and Appearance columns:

G = Good S = Satisfactory U = Unsatisfactory

Use the following in the Remarks column, as applicable:

1 = Inadequate Penetration 3 = Incomplete Fusion 5 = Undercutting
2 = Internal Concavity 4 = Burn Through 6 = Crack in Weld Greater than 1/8"

_____
Test Inspector

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