PACIFIC GAS AND ELECTRIC COMPANY
GAS OPERATIONS
GAS SYSTEM DESIGN DEPARTMENT

STANDARD PROCEDURE FOR TESTING WELDERS WHO ARE LIMITED TO WORK ON LINES OPERATING AT HOOP STRESSES OF LESS THAN 20% OF THE SPECIFIED MINIMUM YIELD STRENGTH IN ACCORDANCE WITH CALIFORNIA PUBLIC UTILITIES COMMISSION GENERAL ORDER 112

1. GENERAL

1.1 Each welder shall be required to demonstrate his ability to make sound welds in order to maintain quality construction for all piping systems operating at hoop stresses of less than 20% of the specified minimum yield strength. Welder qualification or re-qualification tests shall be made in accordance with the following procedures.

1.2 Employees who have not previously demonstrated their ability to weld, shall satisfactorily pass a qualification test before being allowed to weld on pipe or fittings that are or will become a part of transmission or distribution systems. 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.

1.3 For men who have previously demonstrated their ability to weld, re-qualifying tests shall be required as a result of any one of the following conditions:

1.3.1 A period of one year has elapsed since the previous qualification test.

1.3.2 A welder has not worked at the particular class of welding for a period of three months or more.

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

1.3.4 A change is made from one welding process to another welding process.

1.3.5 A change is made in the base material to be welded.

1.3.6 A change is made in the class of welding rod or electrode to be used.

1.4 After testing the specimens in accordance with the Qualification Tests, the "Weld and Solder Test Report" (Page 4) shall be prepared.

1.5 The district offices are to keep two years of test reports on file.

1.6 The 4" or 6" testing spools in $4\frac{1}{2}$" lengths with $37\frac{1}{2}$" bevels on one end are available from Central Warehouse, Code 022579 for 4", and 022580 for 6".

1.7 The 3/4" x 4.5" EH Pipe Nipples BOE are also available from Central Warehouse, Code 022578.

2. WELD QUALIFICATION TESTS

2.1 The guided bend test shall be used to determine the degree of soundness of the test specimen welds.

2.2 The test weld shall be made on 4" or 6" pipe of not less than .188" wall thickness in the horizontal fixed position. In the horizontal fixed position, the pipe axis is horizontal and the welding is done without rotating the pipe.

2.3 Four test specimens shall be cut from the test weld and subjected to the root bend test. If no more than one specimen is rejected, the weld is to be considered as acceptable.

2.4 The test jig shall consist of a plunger and die member adequate to bend the test specimen 180° on a 3/4" radius, see MS 10001.

2.5 The specimen shall be placed on the die of the test jig with the weld at mid-span. The side of the specimen placed toward the gap of the jig shall be the root of the weld. The specimen shall be forced into the die by applying a load on the plunger until the curvature of the specimen is such that a 1/32" diameter wire cannot be inserted between the die and the specimen.

2.6 Satisfactory test specimens are those that bend without breaking and have no cracks or other open defects exceeding 1/8" measured in any direction on the convex side after bending. Cracks that occur on the corners of the specimen during testing shall not be considered unless there is definite evidence that they result from incomplete fusion or other internal defects.

2.7 For welders who are to make welded service connections to mains, an additional knock-off test is required. This test is prepared by welding a 3/4" x 4.5" long EH pipe nipple beveled on one end to a pipe having a minimum diameter of 2", as shown on Page 5. The test fitting shall be welded in the same typical position as a field installation. The weld should be rejected if it shows serious undercutting or if it has rolled edges. The weld is tested by hammering the nipple with at least an 8-pound sledge hammer until either the nipple breaks off the pipe or there is visible distortion of the main. The test shall be rejected if the nipple breaks or tears in the weld or at the junction of the weld and base metal because of incomplete fusion, overlap, or poor penetration.

3. SOLDER QUALIFICATION TEST

Personnel who are to work on copper piping shall satisfactorily demonstrate their ability to make sound soldered joints by passing the following test. A copper joint, soldered in accordance with SP 701, shall be made on 1/2"

or 1" copper pipe with the axis of the pipe stationary in the horizontal fixed position. Bonding must take place in 95% of the total telescoped surfaces. All unbonded surfaces must lie in small isolated pockets.

4. PREPARATION OF TEST SPECIMENS

4.1 Four guided bend test specimens shall be prepared for each qualification test. They shall be removed from the top, the bottom, and each of the two sides, as shown in the drawing on Page 5.

4.2 After welding, the test specimens should be flame cut to size for the guided bend test. The specimen width shall be 1" and the length shall be 6" minimum. The weld reinforcement (weld bead above the plate) shall be removed flush with the surface of the specimen by grinding.

4.3 The soldered test joint shall be sawed open longitudinally at the top of the pipe, spread apart and the tubing peeled from the coupling for examination, as shown on Page 5, the top being the uppermost point on the circumference at the time the joint is soldered.

5. QUALIFICATION RETESTS

5.1 Employees who fail to meet the requirements for a qualification test may be retested immediately. In such a case, he shall make two welds of each type on which he was failed. For the guided root bend test, satisfactory welds will be indicated if no more than one specimen out of each weld is rejected (see 2.3). In addition, rejection of specimens from both welds at the same specimen position shall be cause for rejection. For the knock-off test, both specimens must pass.

5.2 If a horizontal fixed position solder joint fails to show adequate bonding, immediate retest may be made by preparing two soldered joints, both of which must pass the test requirements.

5.3 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.

APPROVED: [redacted]

Vice President - Gas Operations

WELD AND SOLDER TEST REPORT - _____ DIVISION

FOR WELDERS ON PIPING SYSTEMS OPERATING AT HOOP STRESSES OF LESS THAN 20% OF THE SPECIFIED MINIMUM YIELD STRENGTH

(Check Appropriate Boxes)

Code Mark_____ ARC ☐ PASSED ☐

Name_____ ACETYLENE ☐ FAILED ☐

Classification_____ Date of Test_____

Town_____ Date of Weld_____

Date of Original Qualification_____

TYPE TEST ROOT BEND	PENETRATION	FUSION	POROSITY	SLAG INCLUSION	REMARKS	TEST RESULTS (P) (F)
B						
S						
T						
S						
Knock Off						

SOLDER TEST	% OF LENGTH OF JOINT SOCKETED	% OF JOINT BONDED	REMARKS	TEST RESULTS (P) (F)

KEY: P = Pass F = Fail

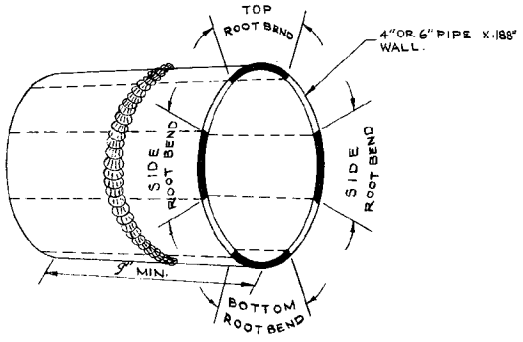
Use following in PENETRATION, FUSION, POROSITY, and SLAG INCLUSION columns, IF BEND TEST IS FAILED:

E = Excellent G = Good B = Barely satisfactory U = Unsatisfactory

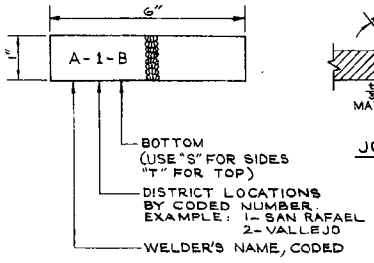
Use following in REMARKS section, as applicable:

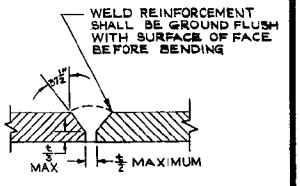
1 = Undercutting
2 = Overlapping
3 = Excessive weld reinforcement
4 = Insufficient weld reinforcement
5 = Excessively deep wash lines
6 = Burn through

_____
Test Inspector



SPECIMEN SELECTION

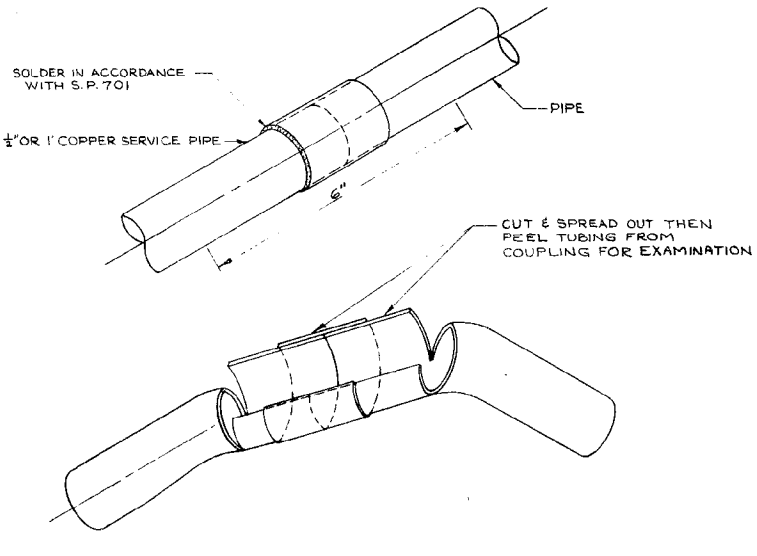




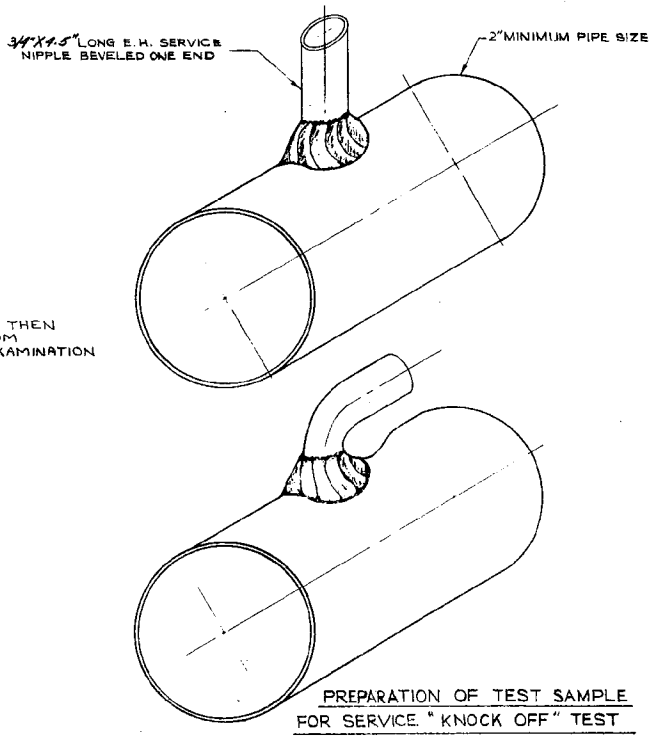
JOINT DETAIL

TEST SAMPLE MARKING
NOTE: USE "KADO" FELT MARKING PEN FOR MARKING

PREPARATION OF WELD SPECIMENS



PREPARATION FOR SOLDER JOINTS IN 1/2" OR 1" COPPER SERVICE PIPE



PREPARATION OF TEST SAMPLE FOR SERVICE "KNOCK OFF" TEST

CHG.	DATE	DESCRIPTION	APPRD.	CHG.	DATE	DESCRIPTION	APPRD.
2	11-22-63	Changed Note on Solder Joint	J.L.L.				
1	9-25-62	Changed Dimensions	J.L.L.				

APPROVED [redacted]

BY G. S. D. D.
DR. [redacted] TR.
CH.
O. K.
DATE 9-18-61
SCALE

GAS STANDARD

WELD AND SOLDER TEST SAMPLES FOR WELDERS WORKING ON PIPE LINES OPERATING AT HOOP STRESSES OF LESS THAN 20% OF THE SPECIFIED MINIMUM YIELD STRESSES

PACIFIC GAS AND ELECTRIC COMPANY
SAN FRANCISCO, CAL.

SUPERSEDES
SUPERSEDED BY
SHEET NO. SHEETS
DRAWING NUMBER 282917
CHANGE 2