GENERAL INSTRUCTIONS FOR TESTING WELDERS UNDER SECTION IX, WELDING AND BRAZING QUALIFICATIONS OF THE ASME BOILER AND PRESSURE VESSEL CODE

Published by the
National Certified Pipe Welding Bureau
1385 Piccard Drive
Rockville, MD 20850

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SIXTH EDITION

By the

National Certified Pipe Welding Bureau

The National Certified Pipe Welding Bureau (NCPWB) gratefully acknowledges the permission from the American Society of Mechanical Engineers (ASME) to use references from the ASME Section IX, Boiler and Pressure Vessel Code in this publication.

GENERAL INSTRUCTIONS FOR TESTING WELDERS

Qualification tests of welders to perform work in accordance with Welding Procedure Specifications of the National Certified Pipe Welding Bureau shall conform to the following:

Supervision of Testing: Each local chapter shall arrange for and coordinate the testing of the welders employed by its member contractors. All qualifications shall follow a Welding Procedure Specifications issued by the national office and as adopted by the member contractor. Chapter secretaries shall ensure that the welders being tested are under the supervision and control of a member contractor and that an independent witness is available to monitor the conduct of the qualification test. Chapter technical representative and chapter secretaries shall be familiar with the latest revision of Section IX, Welding and Brazing Qualifications, ASME Boiler and Pressure Vessel Code. The chapter secretary shall provide three (3) copies of the Welder Performance Qualification Test (NCPWB Form QW-484) Form or the appropriate WPQT Form when a standard test is being used to the testing location for each welder being tested.

Initial Welder Qualification: Each performance qualification test of a welder or welding operator shall be done under the full supervision and control of a contractor. The contractor who provides this supervision and control shall sign the original Welder/Operator Performance Qualification Record (QW-484 Form), a copy of which shall be in the NCPWB Chapter files.

Witnessing Test Welding: Welder qualification test welding is to be witnessed by a qualified independent observer who may be:

a. A member of the National Board of Boiler and Pressure Vessel Inspectors.
b. A representative of an ASME approved Quality Control System.
c. A qualified representative of the owner for whom the work is being done.
d. A representative of an independent testing laboratory.
e. An independent technical consultant whose credentials have been reviewed and approved by the Board of Trustees of the National Bureau or their authorized representative.

Personnel witnessing the test shall:

1. Verify the identification of the welder.
2. Record the WPS number which is to be followed.
3. Verify that the correct filler metal or electrode is being used.
4. Verify that the test coupon is the correct size and wall thickness.
5. Verify that the top of the test coupon is marked.
6. Verify that the progression of welding was uphill or downhill.
7. Visually examine the completed test coupon for cracks, incomplete penetration and full fusion.
8. Verify that the name of the independent witness is recorded on the QW-484 form.

Testing of Specimens: Qualification specimens and radiographs are to be evaluated by a qualified independent observer, who may be a member of the National Board of Boiler and Pressure Vessel Inspectors, a representative of an ASME

approved Quality Control System, a qualified representative of the owner for whom the work is being done, a technical consultant, or a representative of a recognized testing laboratory. This individual may also be a technical consultant whose credentials have been reviewed and approved by the Board of Trustees of the National Bureau or their authorized representative.

Procedure: The Welding Procedure Specification (WPS), under which the welder is to be qualified, shall be followed in every respect when making test welds to qualify a welder except when performance qualification is done in accordance with a WPS that requires postweld heat treatment; in such cases postweld heat treatment may be omitted. Paragraph QW-350 of Section IX provides information on welding variables for welders. It specifically states that a welder shall be requalified whenever there is a change made in one or more of the essential variables listed for each welding process. Where a combination of welding processes is required, for production welding, the welder shall be qualified using each process in either a single test coupon using more than one process or in individual test coupons using the processes separately. The applicable essential variables for each of the welding processes are listed in para QW-350 with further reference to specific paragraphs in Article IV, Welding Data. As an example, any change to the following essential variables for performance qualification with shielded metal-arc welding (SMAW) will require requalification.

QW-402.4	The deletion of the backing in single-welded groove welds. Double-welded groove welds are considered welding with backing.

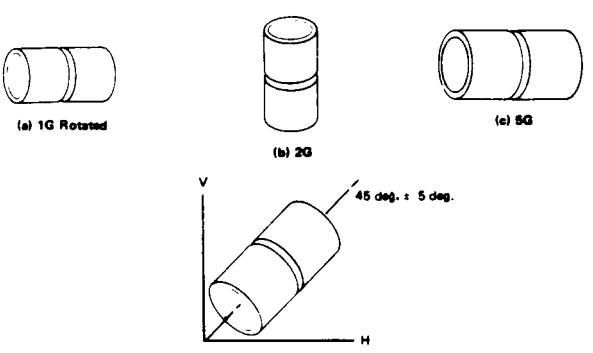
QW-403. 16	A change in the pipe diameter beyond the range qualified in QW-452, except as otherwise permitted in QW-303.1 and QW-303.2.
QW-403. 18	A change from one P-Number to any other P-Number or to a base metal not listed in QW-422, except as permitted in QW-423, and in Appendix C (for S-Numbers).
QW44.11	Qualification with an F-No. 4 X nickel or nickel alloy filler metal shall qualify to weld with any other F-No. 4X filler metal.
QW-404.15	A change from one F-Number in QW-432 to any other F-Number or to any other filler metal, except qualification under any F-Number up to and including F-No. 4, shall qualify a welder for all lower F-Numbers.
QW-404.30	A change in deposited weld metal thickness beyond the range qualified in QW-451 for procedure qualification or QW-452 for performance qualification, except as otherwise permitted in QW-303.1. When a welder is qualified using radiography, the thickness ranges of QW-452.1 apply.
QW-405. 1	The addition of other welding positions than those already qualified. See QW-120, QW-130, and QW-303.
QW-405.3	A change from upward to downward, or from downward to upward, in the progression specified for any pass of a vertical weld, except that the cover or wash pass may be up or down. The root pass may also be run either up or down when the root pass is removed to sound weld metal in the preparation for welding the second side.

Please refer to the total content in the latest addition of Section IX for each QW reference above. The description of the Essential Variables above is for the purpose of this illustration.

Preparation: The pipe nipples should be beveled according to the joint detail shown on the Welding Procedure Specification. For the carbon steels, the bevel is normally 37 1/2 degrees +/- 2 1/2 degrees with a 1/16 inch root face. Care should be taken to tack the joint to comply with the root opening shown in the procedure. A good practice would be to use two or more plates beveled in the same manner to set the welding machine to insure the root pass is penetrating fully before beginning on the pipe qualification weld.

Welding Materials: Welding electrodes and filler metals shall be the electrodes and filler metals which are specified on the WPS which is being followed. EXX18 electrodes should be used from an unopened can or from a temperature controlled oven to insure that the coatings have not absorbed excess moisture.

Position of Test Welds: QW-122 defines the test positions which are used during welding of the test coupon. These



QW-461.4 GROOVE WELDS IN PIPE-TEST POSITIONS

positions are illustrated in QW-461.4. Qualifications for pipe welding are usually done in the 6G or in both 2G and 5G positions. Successful testing in these positions qualified the welder for all positions. Bureau welders are expected to be qualified to weld in all positions.

Diameter of Test Coupon: The diameter of the pipe on which the welder must be tested depends on the diameter of the pipe which he will weld in production. Table QW-452.3 is used to determine the minimum diameter pipe which a welder may weld in production based on the diameter of the pipe on which he was tested. Examination of the table shows that if a welder has to make groove welds on pipe which is over 2 7/8" OD (2 1/2 NPS) in production, a test on any size over 2 7/8" OD qualified the welder to weld on any diameter down to 2 7/8" OD. Note that there is no upper limit on the diameter which this welder may weld in production; he may even weld on plate. The Pipe Welding Bureau recommends that pipe 6 5/8" OD (6 NPS) be used for tests where welders are only required to make groove welds which are over 2 7/8 "OD.

QW-452.3
GROOVE WELD DIAMETER LIMITS 1,2

Outside Diameter of Test Coupon, in.	Outside Diameter Qualified, in.	
	Minimum	Maximum
Less than 1	Size Welded	Unlimited
1 to less than 2-7/8	1	Unlimited
2-7/8 and over	2-7/8	Unlimited

1. Type and number of tests required shall be in accordance with QW-452. 1.
2. 2-7/8 in. OD is the equivalent of NPS 2-1/2.

In order for the welder to be permitted to groove weld on pipe smaller than 2 7/8" OD, he must demonstrate that he is capable of welding on pipe smaller than 2 7/8" OD. This is done by welding pipe smaller than 2 7/8" OD. The Pipe Welding Bureau recommends that 2 3/8 OD (2 NPS) pipe be used for this test. A test on 2 NPS pipe qualifies the welder to groove weld down to 1" OD (3/4 NPS) pipe with no upper limit on the larger diameters which he may weld.

In order for the welder to make production welds smaller than 1" OD, he must test on test coupons at least as small as that which he will weld in production.

Thickness Qualified: Table QW-452. 1 of Section IX (shown on page 12) shows the wall thickness of the test coupon the welder would use in qualification and the corresponding thickness of weld metal that the welder is qualified to deposit in production welds. When the thickness of the test coupon is up to but less than 3/4" thick the welder is qualified to weld up to 2 times the thickness of the sample weld except for GMAW-S. For wall thickness of 3/4" or greater, the welder is qualified to an unlimited thickness. This Table also shows the number of test specimens required to be examined for qualification.

Fillet Welds: Welders who successfully pass qualification tests by welding of a groove weld test coupon are also qualified to make fillet welds. Table QW-452.6 shows the qualification test limits, and these limits are very generous. By this table, a welder who successfully passes a groove weld qualification test is qualified to make fillet welds on all thicknesses of base metal and on all sizes of pipe and tube, and he may make fillet welds of any size. In practical terms, this means that a welder who passes a groove weld test using a 6 NPS pipe as the test coupon may make socket welds using 1 NPS pipe fittings (or smaller!) without having to requalify.

QW-452.6
FILLET QUALIFICATION BY GROOVE-WELD TESTS

Type of Joint	Thickness of Test Coupon as Welded. in.	Range Qualified	Type end Number of Tests Required
Any groove	All thicknesses	All base material thicknesses, fillet sizes. and diame-ters	Fillet welds arc qualified when a groove weld is qualified in ac-cordance with either QW-452. 1 or QW-452.2

Contractors should keep in mind, however, that the code is only a minimum requirement, and that not all welders are of equal skill. The Pipe Welding Bureau recommends that welders who will make production socket welds on pipe sizes smaller than 1 NPS or on pipe thinner than 3/16" thick demonstrate that they are capable of making such welds correctly by making a sample weld, sectioning it and examining it for penetration in the root and for excessive burn through inside the pipe. This recommendation is for the information of the contractor, and it is only recommended when the contractor is not thoroughly familiar with the skill of the welder.

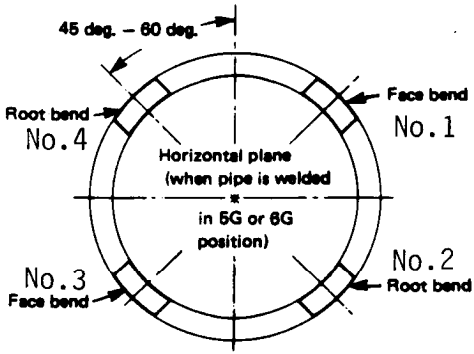
Penetration and Fusion Requirements: Before specimen are cut from the welded coupon, the completed weld must be examined for penetration and fusion. The fact that the weld was examined and was acceptable for penetration and fusion shall also be documented on the welder qualification form. See Notes (8) and (9) on Table QW-452. 1 (page 12).

Number of Guided Bend Specimens Required: The number of specimens required by QW-302. 3 and Table QW-452. 1 is dependent on position of welding:

6G Position	Two face and two root bend specimens or four side bend specimens are required.
5G Position	Two face and two root bend specimens or four side bend specimens are required.
2G Position	One face and one root bend specimen or two side bend specimens are required.

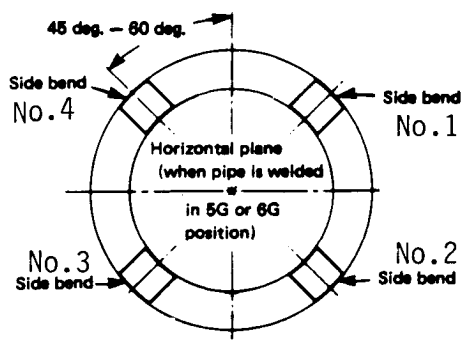
Termination of Performance Tests: It is noted that the performance tests may be terminated at any stage of the testing procedure, whenever it becomes apparent to the supervisor conducting the tests that the welder or welding operator does not have the required skill to produce satisfactory results (QW-301.2). Also if visual inspection of the completed qualification weld reveals unacceptable weld defects, the test may be terminated without removing and testing specimens.

Removal of Specimens from Test Welds: QW-463.2(d) and (e) show the location for the removal of side bend and root and face bend specimens. This illustrates the removal pattern to be used with pipe welded in the 5G or 6G Position. For wall thickness of 0.432" the side bend specimens are more practical. It is recommended that the specimens be numbered as shown below.



Pipes - 1/16 up to 3/4" thickness

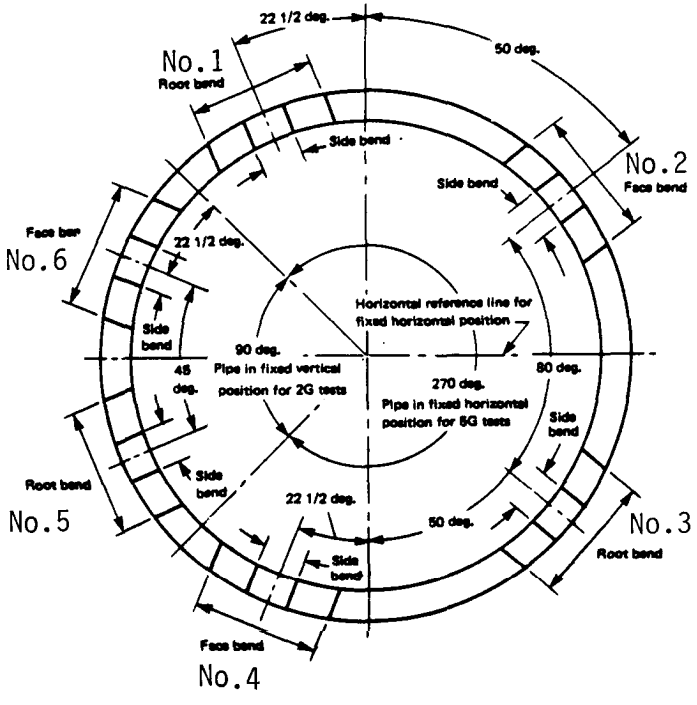
QW-463.2(d) PERFORMANCE QUALIFICATION



Pipes - 3/4" and over thickness and alternate from 3/8" but less than 3/4" thickness

QW-463.2(e) PERFORMANCE QUALIFICATION

The sketch below, taken from QW-463.2(g) outlines the removal of face and root specimens from a 6" or 8" test assembly in which a portion of the test coupon is welded in the 2G position and another portion is welded in the 5G position. It is recommended that the specimens be numbered as shown below.



GENERAL NOTE:
When side bend tests are made in accordance with QW-452.1 and QW-452.3, they shall be removed as shown in QW-463.2(g) in place of the face and root bends.

QW-463.2(g) ORDER OF REMOVAL OF TEST SPECIMENS FOR PERFORMANCE QUALIFICATION - 2G AND 5G POSITIONS - USING A 6" OR 8" DIAMETER PIPE TEST ASSEMBLY

QW-452.1
TRANSVERSE-BEND TESTS

Type of Joint	Thickness of Test Coupon welded, in. [Notes (1), (8),(9)]	Thickness t of Deposited Weld Metal Qualified, in. [Note (2)] (See QW-310.1) Max.	Type and Number of Tests Required Guided-Bend Tests) [Notes (3),(4)] Side Bend QW-462.2	Face Bend QW-462.3(a)	Root Bend [Note (5)] QW-462.3(a)
Groove	Up to 3/8, incl.	2t	Note (6)	1	1
Groove	Over 3/8 but less than 3/4	2t	Note (7)	1	1
Groove	3/4 and over	Max. to be welded	2	. . .	. . .

NOTES:

(1) When using one, two, or more welders, the thickness t of the deposited weld metal for each welder with each process shall be determined and used individually in the Thickness column.

(2) Two or more pipe test coupons of different thicknesses may be used to determine the deposited weld metal thickness qualified and that thickness may be applied to production welds to the smallest diameter for which the welder is qualified in accordance with QW-452.3.

(3) Thickness of test coupon of 3/4 in. or over shall be used for qualifying a combination of three or more welders each of which may use the same or a different welding process.

(4) A total of four specimens is required to qualify for position 5G and 6G as prescribed in QW-302.3.

(5) Face- and root-bend tests may be used to qualify a combination test of:
   (a) one welder using two welding processes; or
   (b) two welders using the same or a different welding process.

(6) For a 3/8 in. thick coupon, two side-bend tests may be substituted for the required face- and root-bend tests.

(7) Two side-bend tests may be substituted for the required face- and root-bend tests.

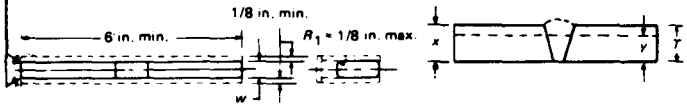
(8) For plate, the groove shall exhibit complete joint penetration with complete fusion of weld metal and base metal, except in areas designated "discard".

(9) For pipe, the groove shall exhibit complete joint penetration with complete fusion of weld metal and base metal.

Preparation of Specimens: Notes (6) and (7) of QW-452. 1 (page 8) state that side bend specimens maybe substituted for the required face and root bend specimens when the thickness of the test coupon is 3/8 to 3/4 inches.

Side Bend Specimens: Side bend specimens are prepared as shown in figure QW-462.2. Grinding or machining should be done transverse to the weld direction. Deep grinding marks from coarse grinding wheels should be avoided. Finish polishing of the surface which will be on the convex side of the bend test using a sanding wheel or belt of 100 grit or finer is also a good practice. The specimen shall not be less than the required thickness, normally 3/8 inches, after all preparation is complete.

For performance qualification of all materials in QW-422, if the surfaces of side bend tests are gas cut, any resulting roughness shall be dressed by machining or grinding.



T, in.	y, in.	w (in.)	
		P-No. 23, F-No. 23, or P-No. 35	All other metals
3/8 to 1-1/2, incl.	T	1/8	3/8
> 1-1/2	[Note (1)]	1/8	3/8

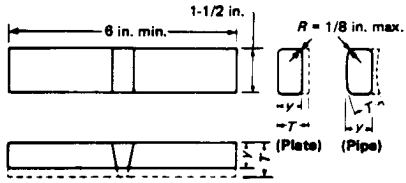
GENERAL NOTE: Weld reinforcement and backing strip or backing ring, if any, may be removed flush with the surface of the specimen. Thermal cutting, machinging, or grinding may be employed. Cold straightening is permitted prior to removal of the reinforcement.

NOTE: When specimen thickness T exceeds 1-1/2 in., use one of the following:

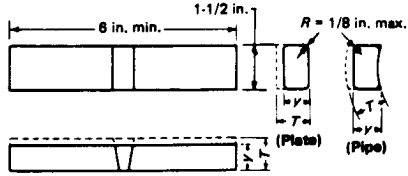
(a) Cut specimen into multiple test specimens y of approximately equal dimensions (3/4 in to 1-1/2 in.).
y = tested specimen thickness when multiple specimens are taken from one coupon.

(b) The specimen may be bent at full width. See requirements on jib width in QW-466.1.

QW-462.2 SIDE BEND



Face-bend specimen — Plate and Pipe



Root-bend specimens — Plate and pipe

	y, in.	
T, in.	P-No.23,F-No.23, or P-No. 35	All other metals
1/16 < 1/8	T	T
1/8-3/8	1/8	T
>3/8	1/8	3/8

NOTES:

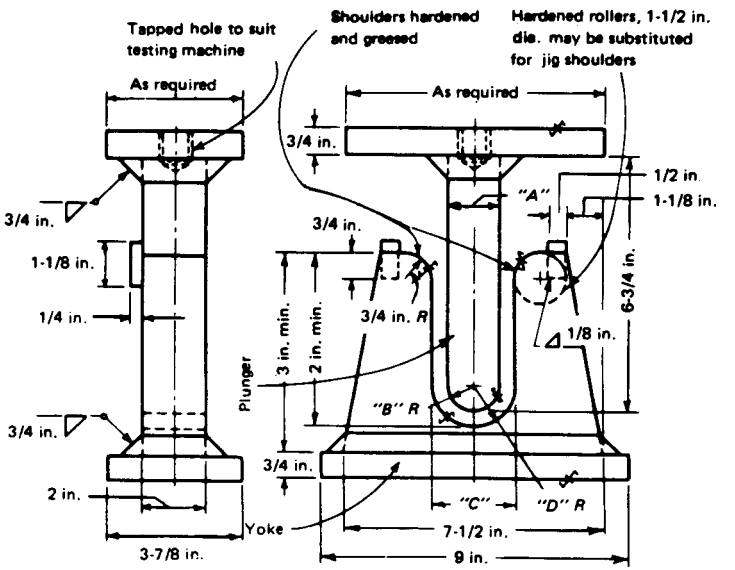
(1) Weld reinforcement and backing strip or backing ring, if any, shall be removed flush with the surface of the specimen. If a recessed ring is used, this surface of the specimen may be machined to a depth not exceeding the depth of the recess to remove the ring, except that in such cases the thickness of the finished specimen shall be that specified above. Do not flame-cut nonferrous material.

(2) If the pipe being testes is 4 in. nominal diameter or less, the width of the bend specimen may be 3/4 in. for pipe diameters 2 in. to and including 4 in. The bend specimen width may be 3/8 in. for pipe diameters less than 2 in. down to and including 3/8 in. and as an alternative, if the pipe being tested is equal to or less than 1 in. nominal pipe size (1.315 in. O.D.), the width of the bend specimens may be that obtained by cutting the pipe into quarter sections, less an allowance for saw cuts or machine cutting. These specimens cut into quarter sections are not required to have one surface machined flat as shown in QW-462.3(a). Bend specimens taken from tubing of comparable sizes may be handled in a similar manner.

QW-462.3(a) FACE AND ROOT BENDS - TRANSVERSE

Face and Root Bend Specimens - Transverse: Face and root specimens are prepared as shown in figure QW-462.3(a).

Note that weld reinforcement or backing ring shall be removed flush with the surface of the specimen. Grinding or machining should be done transverse to the weld direction. Deep grinding marks from coarse grinding wheels should be avoided. Finish polishing of the surface which will be on the convex side of the bend test using a sanding wheel or belt of 100 grit or finer is also a good practice. The specimen shall not be less than the required thickness, normally 3/8", after all preparation is complete.



QW-466.1 GUIDED-BEND JIG

Guided Bend Tests: Guided bend specimens, whether face, root or side bends, are bent in test jig as shown in figure QW-466.1. While most test jigs in use are for 3/8" specimen

Material	Thickness of Specimen, in.	A, in.	B, in.	C, in.	D,in.
P-No. 23 to P-No. 2X; P-No. 2X with F-No. 23; P-No. 35	1/8 t=1/8 or less	2-1/16 16-1/2t	1-1/32 8-1/4t	2-3/8 18-1/2t+1/16	1-3/16 9-1/4t+1/32
P-No. 11: P-No. 25 to P-No. 21 or P-No. 22 or P-No. 25	3/8 t=3/8 or less	2-1/2 6-2/3t	1-1/4 3-1/3t	3-3/8 8-2/3t+1/8	1-11/16 4-1/3t+1/16
P-No. 51	3/8 t=3/8 or less	3 8t	1-1/2 4t	3-7/8 10t+1/8	1-15/16 5t+1/16
P-No. 52, P-No. 61, P-No. 62	3/8 t=3/8 or less	3-3/4 10t	1-7/8 5t	4-5/8 12t+1/8	2-5/16 6t+1/16
All others	3/8 t=3/8 or less	1-1/2 4t	3/4 2t	2-3/8 6t+1/8	1-3/16 3t+1/16

GENERAL NOTES:

(a) For P-Numbers, see QW-422; for F-Numbers, see QW-432.

(b) For base metals whether or not a P-Number is assigned, the dimensions of the test jig, except as otherwise allowed in the table, shall be such as to give the bend test specimen a calculated outer fiber elongation.

QW-466 TEST JIGS

thickness it should be noted that different dimensions are required for the thinner wall materials and for some of the P-Numbers. (The application of an abrasive cleaner, i.e. Ajax, etc., to the side of the bend specimen in contact with the plunger will prevent lateral movement of the specimen in the bending jig during bending.)

Acceptance Criteria for Guided-Bend Specimens: The weld and the heat-affected zone of a transverse weld bend specimen shall be completely within the bent portion of the specimen after testing. The guided-bend specimens shall have no open defects exceeding 1/8" measured in any direction on the convex surface of the specimen after bending, except that cracks occurring on the comers of the specimen during testing shall not be considered, unless there is definite evidence that they result from slag inclusions or other internal defects. See QW-163.

Radiographic Examination: QW-304 provides for radiographic examination as an alternate to guided-bend tests for performance qualification for welders making groove welds using the shielded metal-arc (SMAW) process, the gas tungsten-arc (GTAW) process or the gas metal-arc (GMAW) process (except short-circuiting mode) or a combination of these processes may be qualified by radiographic examination except for P-No. 2X (Aluminum), P-No. 5X (Titanium) and P-No. 6X (Zirconium) metals. Welders making groove welds in P-No. 2X and P-No. 5X metals with the GTAW process may also be qualified by radiographic examination.

Radiographic Acceptance Criteria: Radiographic acceptance criteria are contained in QW-19.1.2.

Expiration and Renewal of Qualification: (See QW-322)

The performance qualifications of a welder or welding operator shall be affected when one of the following conditions occur:

a. When he has not welded with a process during a period of 6 months or more, his qualifications for that process shall expire.
b. When there is a specific reason to question his ability to make welds that meet the specifications, the qualifications which supports the welding he is doing shall be revoked. All other qualifications not questioned remain in effect.

Renewal of qualification expired under (a) above maybe made for any process by welding a single test coupon of either plate or pipe, of any material, thickness or diameter, in any position, and by testing of that coupon as required by QW-301 and QW-302. A successful test renews the welder or welding operator's previous qualifications for that process for those materials, thicknesses, diameters, positions, and other variables for which he was previously qualified.

Welders and welding operators whose qualifications have been revoked under condition (b) above shall requalify. Qualifications shall utilize a test coupon appropriate to the planned production work. The coupon shall be welded and tested as required by QW-301 and QW-302. Successful test restores the qualification.

PERFORMANCE QUALIFICATION OF WELDERS

In its continuing effort to prepare welders entering the industry, the Technical Committee of the National Certified Pipe Welding Bureau (NCPWB) conducted a survey of its member contractors to determine which welding processes were the most commonly used in the fabrication and erection of piping systems. The information gained from the survey was then matched against the welding processes on the more than 100 Welding Procedure Specifications (WPSs) that NCPWB provides to its members. Of these WPSs, four (4) were identified as containing the most commonly used processes on which every welder should try to achieve qualification. The four WPSs are as follows:

WPS 1-12-1	Shielded Metal Arc Welding (SMAW) of carbon steel using E6010 filler metal for the root pass and E7018 filler metal for the balance of the weld.
WPS 1-5-1	Gas Metal Arc Welding (GMAW) of carbon steel with short circuiting transfer mode using ER70S-2 filler metal.
WPS 1-32-1	Gas Tungsten Arc Welding (GTAW) of carbon steel using ER70S-2 filler metal for the root pass, followed by Shielded Metal Arc Welding (SMAW) for the balance of the weld using E7018 filler metal.
WPS 8:1-32-1	Gas Tungsten Arc Welding (GTAW) of austenitic stainless steel to carbon steel using ER309 filler metal for the root pass followed by Shielded Metal Arc Welding (SMAW) for the balance of the weld using ER309-16 filler metal.

To promote welder training using these welding processes, the NCPWB, in cooperation with the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry (UA), has provided copies of the four WPSs to the Joint Apprenticeship Training Committee (JATC) Schools recommending that all prospective welders train on any one or all of the welding processes represented in the four WPSs before they take their qualification test for their employer.

Welder qualifications are documented on the "Manufacturer's Record of Welder or Welding Operator Qualification Test" Form (QW-484). This record of the qualification test is required to contain actual test data on all essential variables for the welding process involved in accordance with QW-350 or QW-360 (depending on whether the individual is qualifying as a welder or welding operator) and the ranges qualified in accordance with QW-452. Page 22, shows the format for the QW-484 Form used by the NCPWB together with line by line instructions on how to fill out the form.

To facilitate the testing of welders and recording of test results on the QW-484 Form for the processes shown on the four recommended WPSs, the NCPWB developed technique sheets which show the material requirements, typical joint details and welding parameters for each weld layer. In addition, the NCPWB prepared QW-484 Forms which have the entries for each essential variable completed. These Welder Performance Qualification Test (WPQT) forms are available for each type of mechanical test (i.e. root and face-bend or side bend) or radiographic examination as appropriate. The typical technique sheet and WPQT Form for each of the four WPSs together with a summary of the limitations of the performance qualification are shown starting on page 33.

RECORD OF WELDER/OPERATOR QUALIFICATION TEST

Last Name: [1] First: [2] Init: [3] SS No: [4] Stamp No: [5]

Welding Process(es) used: [6] Type: [7] WPS/Rev. Followed: [8]

Specification of Base material(s) welded: [9] Thickness: [10]

Manual or Semi-automatic Variables for each Process	Acutal Values	Range Qualified
ASME P-Number [11] to ASME P No:	[12]	[13]
Backing (Metal, Weld Metal, Welded from both sides, Flux, etc,):	[14]	[15]
Plate Pipe (enter diameter, if pipe):	[16]	[17]
Filler Metal Specification (SFA): [18] Classification:	[19]	
Filler Metal F-Number:	[20]	[21]
Consumable insert for GTAW or PAW:	[22]	[23]
Weld Deposit Thickness for Each Welding Process:	[24]	[25]
Welding Position (1G,5G,etc):	[26]	[27]
Progression (uphill/downhill):	[28]	[29]
Backing Gas for GTAW, PAW or GMAW, Fuel Gas for OFW:	[30]	[31]
GMAW Transfer Mode:	[32]	[33]
GTAW Welding Current Type/Polarity:	[34]	[35]

Machine Welding Variables for the Process Used	Actual Values	Range Qualified
Direct/Remote Visual Control:	[36]	[37]
Automatic Voltage Control (GTAW):	[38]	[39]
Automatic Joint Tracking:	[40]	[41]
Welding Position (1G,5G,etc):	[42]	[43]
Consumable Insert:	[44]	[45]
Backing (Metal, Weld Metal, Welded from both sides, Flux, etc,):	[46]	[47]

Guided Bend Tests [48] QW-462.2 (Side) [48] QW-462.3(a) (Trans. R&F) [48] QW-462.3(b) (Long. R&F)

Type [49]	Results [50]	Type [49]	Results [50]

Alternative Radiographic Test Results: [51] Root Penetration and Fusion [52]

Fillet Weld - Fracture Test: [53] Length and Percent of Defects: [54] in.

Macro Test Fusion: [55] Fillet Leg Size: [56] in. X [57] in. Concavity/Convexity: [58] in.

Welding Witnessed by: [59] Title: [60] Co: [61] Test Date: [62]

Specimens Evaluated by: [63] Title: [64] Co: [65] Test Number: [66]

We certify that the statements in this record are correct and that the test coupons were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

National Certified Pipe Welding Bureau

By: [71]

Secretary, Chapter No: [72]

Location Code: [73]

Contractor: [67]

By: [68]

Title: [69]

Date: [70]

NCPWB Form QW-484

INSTRUCTIONS FOR COMPLETING WELDER/OPERATOR QUALIFICATION RECORD

Space No.	Information to be Entered into the Numbered Space (set typewriter line spacing to 1-1/2]

1. Enter the Last Name of the Welder or Operator who has been tested.
2. Enter the First Name or Initial of the Welder or Operator who had been tested.
3. Enter the Middle Initial of the Welder or Operator who has been tested.
4. Enter the Welder or Operator's Social Security Number.
5. Enter the Number(s), Letter(s) or Symbol(s) which the Welder or Operator has been assigned to identify his work. (See NCPWB Chapter Guide, Section C, Welder Qualification).
6. Enter the Welding Process or Processes which the Welder used to weld the test coupon. When more than one process on the same process with different tiller metals is used, an acceptable practice is to separate the processes by a slash(i). (e.g. GTAW/SMAW or SMA-W/SMAW). It is also acceptable to continue this practice for other variables which might be different for different processes used in the same test coupon. Enter the Welding Process(es) which the Operator used to weld the test coupon.
7. Enter the Welding Process Type. Types are: Manual (MA), Semi-Automatic (SA), Machine (ME) and Automatic (AU). A person who qualified using manual or semi-automatic welding is a welder. A person who qualified using machine or automatic welding is an operator.

8. Enter the number and/or letters which identify the WPS which the Welder or Operator followed during welding of the test coupon. Include the Revision Number.
9. Enter the Specification, type and grade of the base metal(s) which make up the test coupon.
10. Enter the Thickness of the base metal(s) which makeup the test coupon.

Complete Spaces 11 Through 35 For Welders

11. Enter the P-Number of one of the materials making up the test coupon.
12. Enter the P-Number of the other material making up the test coupon. If either material does not have a P-Number, enter the specification of the material.
13. Enter the P-Number (or the range of P-Numbers) of the materials which are qualified by the test coupon. See QW-423 of Section IX for listing of base metals that are qualified by welding different test coupon metals.
14. Enter the type of backing used. Backing can be a backing strap, nonfusing metal backing (e.g. copper), flux, tape, weld metal deposited by another process. A weld made from two sides of a groove is considered welding on backing, as is a fillet weld test.
15. If backing was used to weld the test coupons, enter **Required.** If backing was not used, enter **Optional.**
16. If Plate was used for the test coupon, mark the box ahead of Plate. If pipe was used, mark the box ahead of Pipe and enter the pipe size in space 16 (i.e. 6“ Sch. 80).
17. Enter **24” & over** if plate was used, unless only the lG Position was qualified, then enter **2-7/8” OD & over.** If Pipe was used, enter the minimum diameter qualified in accordance with QW-452. 3 of Section IX.
18. Enter the Specification (e.g. SFA 5.4) of the filler metal which was used. (Applicable WPS).

19. Enter the Classification (e.g. E309-16) of the filler metal which was used. (Applicable WPS).
20. Enter the F-Number of the filler metal. (See QW-432 of Section IX or Applicable WPS).
21. Enter the F-Number or range of F-Number filler metals with which the welder is qualified to weld. See Section IX, QW-404. 11 for nickel alloys, QW-404. 15 for all SMAW, QW-404. 16 for aluminum alloys, and QW-404.28 for OFW, GMAW, GTAW and PAW.
22. This item only applies to GTAW or PAW processes. If a consumable insert was used in the root pass, enter Used; if an insert was not used, enter None. Leave blank (or enter "NA) if the Process is not GTAW or PAW.
23. **This item only applies to GTAW or PAW processes.** If an insert was used during the qualification test, enter Required. If none was used, enter Not Permitted. Leave blank (or enter "NAN) if the Process is not GTAW or PAW.
24. Enter the approximate deposit thickness for each welding process. If more than one process or variation on a process (e.g. E601O root/E7018 balance) is used, enter both of the approximate deposit thicknesses. Normally a root pass thickness of 0.094 is used with balance being wall thickness minus root pass thickness.
25. Enter the maximum thickness of weld metal which the welder is qualified to deposit for each process qualified. See QW-404.32 for GMAW and QW-452. 1 for the other processes.
26. Enter the position in which the test coupon was welded. These are lG, 3G, 6G, 3F, etc. See QW-461.
27. Enter the welding positions in which the welder may weld. These are Flat (F), Vertical (V), Horizontal (H), Overhead (OH) and All. Use Table QW-461.9 to determine the positions qualified.

28. Enter the progression **(Uphill, Downhill)** if the test coupon was welded in the 3G, 5G, 6G, 3F or SF Positions. Enter nothing (or else enter "NA") if welding was **not done** in one of these positions.
29. Enter the same data (Uphill, Downhill, or nothing (or enter “NAN) as in space #28. Welders are generally limited to welding in the progression in which they test.
30. Enter Used if backing gas was used. Enter **None** if no gas backing was used. Leave blank (or enter “NA”) if the process is not GMAW, GTAW or PAW.
31. If gas backing was used, enter Required. If gas backing was not used, enter Optional. If space #30 is blank (or “NA”), enter nothing (or “NAN), respectively.
32. Enter Spray (SP), Globular (G), Pulsed (P), or Short Circuiting (SC) if the process used is GMAW. Leave blank (or enter “NA”) if the process is not GMAW (Note: GMAW also includes FCAW, and the FCAW transfer mode is either Spray or Globular when using fluxcore wise (as opposed to metal-core wire).
33. Enter Spray, Globular and Pulsed (SP, G, P) if any of these were entered in space#31. Enter Short Circuiting (SC) if this was entered in space #31. Leave blank (or enter “NA”) if the process is not GMAW (Note: GMAW also included FCAW).
34. Enter the current type (AC or DC), and if DC, enter the polarity (Straight (SP) or Reverse (RP). Leave blank (or enter “NA”) if the process is not GTAW.
35. Enter the same information in this space as is in space #34.

Complete spaces 36 through 47 for “operator” only. Otherwise enter N/A (not applicable).

36. If the operator controlled the machine by direct visual control, enter Direct. If the operator controlled the machine using **fiber optics, TV monitor or other remote observation device, enter** Remote.

37. Enter the same data in this space as in space #36.
38. Enter Used if Automatic Voltage Control (AVC) was used during the qualification test. Enter **None** if AVC was not used. Leave blank (or enter "NAN) if the process is not GTAW.
39. Enter the same data in this space as in space #38.
40. Enter Used if Automatic Joint Tracking was used during the qualification test. Enter **None** if Automatic Joint Tracking was not used.
41. Enter the same data in this space as in space #40.
42. Enter the position in which the test coupon was welded. These are lG, 3G, 6G, 3F, etc.
43. Enter the welding positions in which the welder may weld. These are Flat (F), Vertical (V), Horizontal (H), Overhead (OH) and All. Use Table QW-461.9 to determine the positions qualified.
44. If a consumable insert was used in the root pass, enter Used; if an insert was not used, enter **None.** Leave blank (or enter "NAN) if the Process is not GTAW or PAW.
45. If an insert was used during the qualification test, enter Required. If none was used, enter Not Permitted. Leave blank (or enter "NAN) if the Process is not GTAW or PAW.
46. Enter the type of backing used. Backing can be a backing strop, nonfusing metal backing (e.g. copper), flux, tape, weld metal deposited by another process. A weld made from two sides of a groove is considered welding on backing, as is a fillet weld test.
47. If backing was used to weld the test coupons, enter Required. If backing was not used, enter Optional.

The Following Items Apply to All Process Types

48. If bend tests are performed, mark the appropriate box for the type of bend test conducted.
49. Enter the bend test type (root & face or side) as was performed.
50. Enter the results of each bend specimen. The results may describe the effects found in detail, or the word "acceptable" may be used. All results must indicate that each specimen was or was not acceptable.
51. If the test coupon was radiographed instead of mechanically tested, enter the test results. All results must indicate that each coupon was or was not acceptable. It is good practice to attach the radiographic reader sheet or test laboratory's report to the qualification record.
52. When the test coupon is radiographed, part of the evaluation of the radiograph is for complete penetration and fusion; this can be determined from the radiographic reader sheet.

    When the test coupon is tested by bend testing, the completed weld shall first be evaluated by visual examination for fill penetration and fusion on the face side and on the root side (after removal of the backing strip, if any). If radiographic reader sheet or the visual examination indicates that there is complete penetration and fusion, enter Acceptable in this space.
53. Enter the results of the fillet weld fracture test, if fillet weld tests are conducted.
54. Enter the length and percent of defects found during the fracture test, if fillet weld tests are conducted.
55. Enter the results of the fillet weld Macro fusion test, if fillet weld tests are conducted,

56/57.

Enter the size of the fillet weld legs from the fillet weld macro fusion test, if fillet weld tests are conducted.

58. Enter the measured concavity or convexity from the fillet weld macro fusion test, if fillet weld tests are conducted.

59/61. Enter the name, title and employing company of the individual who witnessed the actual welding of the test coupon. This witness shall be an independent observer, and his presence is a requirement of the NCPWB policy and procedures. This person may hold a commission from the National Board of Boiler and Pressure Vessel Inspectors, or he may work for the Quality Assurance or Quality Control group of the NCPWB Contractor when that Contractor has an ASME Certificate of Authorization (Code Stamp) such as a PP, U, S or H Certificate. He may also be a representative of an independent testing laboratory or the qualified representative of the owner for whom the work is being done. This individual may also be a technical consultant whose credentials have been reviewed and approved by the Board of Trustees of the National Bureau or their authorized representative. **Witnessing by the Contractor's supervisor who is responsible for production welding is not acceptable. This witness** shall confirm the identification of the welder, verify the size, thickness and testing position of the test coupon, the identification of the welding electrode being used and the welding procedure specification being followed. He shall verify marking the test coupon with the welder's name and the location of the top of the test coupon so that the test specimens may be removed from the correct locations. The witness shall observe the welder welding the test coupon; witnessing welding of the entire test coupon is not required.

62. Enter the date that the welder/operator welded the test coupon.

63/65.

Enter the name, title and employing company of the individual who evaluated the mechanical or radiographic tests. This witness shall be an independent observer. This person may hold a commission from the National Board of Boiler and Pressure Vessel Inspectors, or he may work for the Quality Assurance or Quality Control group of the NCPWB Contractor when that Contractor has an ASME Certificate of Authorization (Code Stamp) such as a PP, U, S or H Certificate. He may also be a representative of an independent testing laboratory or the qualified representative of the owner for whom the work is being done. This individual may also be a technical consultant whose credentials have been reviewed and approved by the Board of Trustees of the Bureau or their representative. **Evaluation by a Contractor's supervisor who will be responsible for production** welding is **not** acceptable.

Qualifications for those who evaluate radiographs shall be as required by Section IX, QW-190 (ASNT-SNT-TC-1A). Persons who evaluate bend test coupons shall determine that the bend test specimen has been bent around the correct size fixture, and that each specimen meets the acceptance criteria of QW-163.

66. The outside testing organization test report number or radiographic reader sheet number should be entered here if testing was performed by an outside organization.

Complete items 66 through 69 on two copies of the QW-484 Form or the WPQT Form as follows:

67. Enter the name of the NCPWB Contractor which is qualifying the welder or operator.
68. Signature of the individual certifying the qualification record of the welder or operator for the NCPWB Contractor.

69. Enter the title of the individual who signed space #68.
70. Enter the date that the Form was signed by the contractor.

Distribute copies of the welder qualification form as follows:

a. **One copy with items 66 through 69 filled in to the contractor who had supervision and control of the welder during test.**
b. **One copy with items 66 through 69 filled in to the local NCPWB chapter.**
c. **One copy with items 66 through 69 blank to the local NCPWB chapter and one copy to the NCPWB National Office.**

The Following Items are to be Completed by the Chapter Secretary on the Copy Signed by the Contractor and the Copy for the NCPWB National Office.

71. Signature of the NCPWB Chapter Secretary.
72. NCPWB Chapter number.
73. Testing Location Code **(Union Local Number).**

LIMITATION OF PERFORMANCE QUALIFICATION **WPS 1-12-1, 6G** POSITION

A welder satisfactorily completing performance qualification using Welding Procedure 1-12-1 and the 6" pipe material recommended, is qualified to weld materials listed as P-No. 1 through P-No. 11 and P-No. 4X (QW-423. 1 *) for diameters from 2 1/2" NPS (2 7/8" OD) and larger, and up to 0.864" wall thickness (2t the coupon wall thickness). For welder qualification alternate base materials in accordance with QW-423-1* may be substituted for the P-No. material specified in the Welding Procedure Specification (WPS). The welder is also qualified to weld with electrodes in F-No. 1, 2, 3, and 4 QW-404. 15*. A welder qualified without the use of a backing ring is also qualified for welding using a backing ring. A welder qualified with the use of a backing ring is not qualified for welding without the use of a backing ring. (Essential Variable QW-402.4). *

WELDING POSITION AND SPECIMEN REMOVAL

Paragraph QW-304* permits the use of radiographic examination in lieu of guided bend tests. Radiographic examination requires no specimens to be removed from the welds. Paragraph QW-302.2* requires the entire weld in the pipe be radiographer. The technique and acceptance standards shall be in accordance with QW-191.

In the 6G Position, make one complete joint for radiographic inspection or for mechanical testing. For mechanical testing remove four side bend specimens, or 2 root bend and 2 face bend specimens for examination prepared in accordance with configuration in QW-462.2 or 462.3(a)* taken from locations per QW-463.2(d) and (e). * It is recommended that the bend specimens be numbered as shown on page 10.

**Refer to Section IX ASME Boiler and Pressure Vessel Code.*

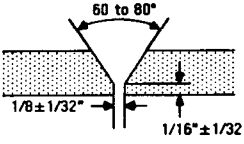
National Certified Pipe Welding Bureau

Welder Performance Qualification Technique Sheet

Welding Conditions

Material Specification: A106B or A53B
Pipe Size: 6" Sch 80
Pipe Thickness: 0.432"
Testing Position: 6G
Backing: None
Preheat Temperature: 50°F
Interpass Temperature: 500°F*
PWHT: None
Initial Cleaning: Grinding
Interpass Cleaning: Grinding, Wire Brushing
Backgouging: Not Permitted
Number of WPS Followed: 1-12-1, latest edition

Typical Joint Details



Weld Layers:	1	2	Balance
Welding Process(es):	SMAW	SMAW	SMAW
Electrode/Filler Metal Class:	E6010	E7018	E7018
Electrode/Filler Metal Size:	1/8"*	3/32"	1/8"*
Consumable Insert:	NA	NA	NA
Tungsten Size (in.) and Type:	NA	NA	NA
Current Type and Polarity:	DCRP	DCRP	DCRP
Welding Current Range:	75 to 125*	70 to 100	90-140*
Wire Feed Speed (ipm):	NA	NA	NA
Welding Voltage:	NA	NA	NA
Travel Speed (ipm):	2 to 4*	2 to 4*	2 to 4*
Progression:	Uphill	Uphill	Uphill
Shielding Gas , CFH:	NA	NA	NA
Backing Gas, CFH:	NA	NA	NA
Gas Cup Size:	NA	NA	NA
Wire Stick-out:	NA	NA	NA
String or Weave:	String*	Weave*	Weave*
Weld Deposit Thickness:	0.094"	0.338"(Total for E7018)	

* indicates recommended ranges which may be changed to suit testing conditions.

Testing shall be done by face and root bends, by side bends or by radiography.
Testing shall be performed in accordance with the Current Edition of ASME Section IX

WPQT-01
REVISION 0

RECORD OF WELDER/OPERATOR QUALIFICATION TEST

Last Name:_____ First:_____ Init:___ SS No: _____ Stamp No:_____

Welding Process(es) used: SMAW/SMAW Type: Manual Number of WPS Followed: 1-12-1

Specification of Base material(s) welded: A106 Grade B or A53 Grade B Thickness: 0.432

Manual or Semi-automatic Variables for each Process	Actual Values	Range Qualified
ASME P-Number 1 to ASME P No:	1	P-1/P-11 & P-41/P-46
Backing (Metal, Weld Metal, Welded from both sides, Flux, etc,):	None	Optional/Required
[ ] Plate [X] Pipe (outer diameter, if pipe):	6" Sch 80	2-7/8" O.D. and over
Filler Metal Specification (SFA): 5.1 Classification:	E6010/E7018	
Filler Metal F-Number:	3/4	1 thru 3/4
Consumable Insert for GTAW or PAW:	N/A	N/A
Weld Deposit Thickness for Each Welding Process:	0.094/0.338	0.864/0.676
Welding Position (1G,5G,etc):	6G	All
Progression (uphill/downhill):	Uphill	Uphill
Backing Gas for GTAW, PAW or GMAW, Fuel Gas for OFW:	N/A	N/A
GMAW Transfer Mode:	N/A	N/A
GTAW Welding Current Type/Polarity:	N/A	N/A
Machine Welding Variables for the Process Used	**Actual Values**	**Range Qualified**
Direct/Remote Visual Control:	N/A	N/A
Automatic Voltage Control (GTAW):	N/A	N/A
Automatic Joint Tracking:	N/A	N/A
Welding Position (1G,5G,etc):	N/A	N/A
Consumable Insert:	N/A	N/A
Backing (Metal, Weld Metal, Welded from both sides, Flux, etc,):	N/A	N/A

Guided Bend Tests [X] QW-452.2 (Side)[ ] QW-462.3(a) (Trans. R&F) [ ] QW-462.3(b) (Long. R&F)

Type	Results	Type	Results
Side	Acceptable	Side	Acceptable
Side	Acceptable	Side	Acceptable

Alternative Radiographic Test Results: _____ **Root Penetration and Fusion** _____

Fillet Weld - Fracture Test: _____ Length and Percent of Defects: _____ In.

Macro Test Fusion: _____ Fillet Leg Size: ____ In. X ____ In. Concavity/Convexity: _____ In.

Welding Witnessed by: _____ Title: _____ Co: _____ Test Date: _____

Specimens Evaluated by: _____ Title: _____ Co: _____ Test Number: _____

We certify that the statements in this record are correct and that the test coupons were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

National Certified Pipe Welding Bureau

By:

Secretary, Chapter No:_____

Location Code: _____

Contractor:

By: _____

Title:

Date:

NCPWB Form QW-484

WPQT 01-S

LIMITATION OF PERFORMANCE QUALIFICATION WPS 1-5-1, 6G POSITION

A welder satisfactorily completing performance qualification using Welding Procedure 1-5-1 and the 6" pipe material recommended is qualified to weld materials listed as P-No. 1 through P-No. 11 and P-No. 4X (QW-423. 1 *) for diameter 2 1/2" NPS (2 7/8" OD) and larger, and up to .475 inch wall thickness (1.lt of the coupon wall thickness). For welder qualification alternate base materials, in accordance with QW-423. 1*, may be substituted for the P-Number material specified in the Welding Procedure Specification (WPS), provided the filler metal called for in the WPS is used. The welder is qualified to weld the root pass in the downhill progression and the balance in the uphill progression only, using the short-circuiting transfer mode with filler metal of the F-Number 6 category.

WELDING POSITION AND SPECIMEN REMOVAL

Paragraph QW-304* does not permit the use of radiographic examination where the welding of the coupon is done using the short circuiting mode.

For test coupons welded in the 5G or 6G position, the specimens shall be removed in accordance with QW-463 .2*(d) or (e) and prepared as shown in QW-462. 2* or QW-462. 3 *-(a). It is recommended that the bend specimens be numbered as shown on page 10.

**Refer to Section IX, ASME Boiler and Pressure Vessel Code.*

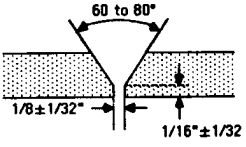
National Certified Pipe Welding Bureau

Welder Performanoe Qualifioation Teohnique Sheet

Welding Conditions

Material Specification: A106B or A53B
Pipe Size: 6" Sch 80
Pipe Thickness: 0.432"
Testing Position: 6G
Backing: None
Preheat Temperature: 50°F
Interpass Temperature: 600°F*
PWHT: None
Initial Cleaning: Grinding
Interpass Cleaning: Grinding, Wire Brushing
Backgouging: Not Permitted
Number of WPS Followed: 1-5-1, latest edition

Typical Joint Details



Weld Layers:	All
Welding Process(es):	GMAW—S
Electrode/Filler Metal Class:	ER70S-2
Electrode/Filler Metal Size:	0.035"
Consumable Insert:	NA
Tungsten Size (in.) and Type:	NA
Current Type and Polarity:	DCRP
Welding Current Range:	100 to 180
Wire Feed Speed (ipm):	120 to 300
Welding Voltage:	18 to 22
Travel Speed (ipm):	5 to 12*
Progression:	Root Down, Balance Up
Shielding Gas , CFH:	CO2, 25/40
Backing Gas, CFH:	None
Gas Cup Size:	Standard
Wire Stick-out:	3/8 to 1/2"
String or Weave:	Either
Weld Deposit Thickness:	0.094" Down/0.338" Up

* indicates recommended ranges which may be changed to suit testing conditions.

Testing shall be done by face and root bends or by side bends. **Radiography is not permitted.**
Testing shall be performed in accordance with the Current Edition of ASME Section IX

WPQT-03
REVISION 0

RECORD OF WELDER/OPERATOR QUALIFICATION TEST

Last Name:_____ First:_____ Init:___ SS No: _____ Stamp No:_____

Welding Process(es) used: GMAW Type: Semi-Auto Number of WPS followed: 1-5-1

Specification of Base material(s) welded: A106 Grade B or A53 Grade B Thickness: 0.432

Manual or Semi-automatic Variables for each Process	Actual Values	Range Qualified
ASME P-Number 1 to ASME P No:	1	P-1/P-11 & P-41/P-46
Backing (Metal, Weld Metal, Welded from both sides, Flux, etc,):	None	Optional
[ ] Plate [X] Pipe (outer diameter, if pipe):	6" Sch 80	2-7/8" O.D. and over
Filler Metal Specification (SFA): 5.18 Classification:	ER70S-2	
Filler Metal F-Number:	6	6
Consumable Insert for GTAW or PAW:	N/A	N/A
Weld Deposit Thickness for Each Welding Process:	0.094/0.338	0.103/0.372
Welding Position (1G,5G,etc):	6G	All
Progression (uphill/downhill):	Root down/balance up	Root down/balance up
Backing Gas for GTAW, PAW or GMAW, Fuel Gas for OFW:	None	Optional
GMAW Transfer Mode:	Short-Circuiting	Short-Circuiting
GTAW Welding Current Type/Polarity:	N/A	N/A
Machine Welding Variables for the Process Used	**Actual Values**	**Range Qualified**
Direct/Remote Visual Control:	N/A	N/A
Automatic Voltage Control (GTAW):	N/A	N/A
Automatic Joint Tracking:	N/A	N/A
Welding Position (1G,5G,etc):	N/A	N/A
Consumable Insert:	N/A	N/A
Backing (Metal, Weld Metal, Welded from both sides, Flux, etc,):	N/A	N/A

Guided Bend Tests [X] QW-452.2 (Side) [ ] QW-462.3(a) (Trans. R&F) [ ] QW-462.3(b) (Long. R&F)

Type	Results	Type	Results
Side	Acceptable	Side	Acceptable
Side	Acceptable	Side	Acceptable

Alternative Radiographic Test Results: _____ **Root Penetration and Fusion** _____

Fillet Weld - Fracture Test: _____ Length and Percent of Defects: _____ In.

Macro Test Fusion: _____ Fillet Leg Size: ____ In. X ____ In. Concavity/Convexity: _____ In.

Welding Witnessed by: _____ Title: _____ Co: _____ Test Date: _____

Specimens Evaluated by: _____ Title: _____ Co: _____ Test Number: _____

We certify that the statements in this record are correct and that the test coupons were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

National Certified Pipe Welding Bureau

By:

Secretary, Chapter No:____

Location Code: _____

Contractor:

By: _____

Title:

Date:

WPQT 03-5

NCPWB Form QW-484

LIMITATION OF PERFORMANCE QUALIFICATION WPS 1-32-1 AND 8:1-32-1, 6G POSITION

A welder satisfactorily completing performance qualification using WPS 1-32-1 OR 8:1-32-1 and 6 inch pipe material is qualified to weld base metals P-No. 1 through P-No. 11 and P-No. 4X, as shown in QW-423*, for pipe diameters from 2 1/2" NPS (2 7/8" OD) pipe and larger. Since this WPS combines two welding processes (GTAW and SMAW), the limit of the thickness that the welder may weld with either process is 2t the actual thickness of deposited weld metal welded by the specific process. A welder qualified in a combination test is qualified to weld with either process individually or in difference combinations provided he stays within the limits established with each specific process during the qualification test.

For welder qualification alternate base materials, in accordance with QW-423. 1 *, may be substituted for the P-Number materials in the WPS, provided the filler metal called for in the WPS is used.

WELDING POSITION AND SPECIMEN REMOVAL

Paragraph QW-304* permits the use of radiographic examination in lieu of guided bend tests. Radiographic examination requires no specimens to be removed from the coupon. Paragraph QW-302.2* requires that the entire weld circumference be examined. The technique and acceptance criteria shall be in accordance with QW-191*.

For mechanical testing four (4) side bend specimen or two (2) root and two (2) face bend specimen shall be removed from location as shown in QW-463.2*(d) and (e) and shall be prepared in accordance with para. QW-462* or QW-462.3*-(a). For test coupon thickness greater than .75 inches no root and face examination is permitted. It is recommended that the bend test specimen be numbered as shown on page 10.

Refer to Section IX, ASME Boiler and Pressure Vessel Code.

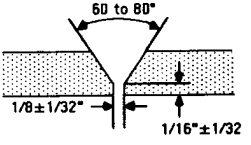
National Certified Pipe Welding Bureau

Welder Performance Qualification Technique Sheet

Welding Conditions

Material Specification: A106B or A53B
Pipe Size: 6" Sch 80
Pipe Thickness: 0.432"
Testing Position: 6G
Backing: None
Preheat Temperature: 50°F
Interpass Temperature: 500°F*
PWHT: None
Initial Cleaning: Grinding
Interpass Cleaning: Grinding, Wire Brushing
Backgouging: Not Permitted
Number of WPS Followed: 1-32-1, latest edition

Typical Joint Details



Weld Layers:	1	2	Balance
Welding Process(es):	GTAW	SMAW	SMAW
Electrode/Filler Metal Class:	ER70S-2	E7018	E7018
Electrode/Filler Metal Size:	3/32"*	3/32"	3/32, 1/8, 5/32"*
Consumable Insert:	Not Permitted	NA	NA
Tungsten Size (in.) and Type:	3/32"-EWTh-2	NA	NA
Current Type and Polarity:	DCSP	DCRP	DCRP
Welding Current Range:	70 to 100	70 to 100	Follow WPS
Wire Feed Speed (ipm):	NA	NA	NA
Welding Voltage:	NA	NA	NA
Travel Speed (ipm):	2 to 4*	2 to 6*	2 to 6*
Progression:	Uphill	Uphill	Uphill
Shielding Gas , CFH:	Argon, 12/20	NA	NA
Backing Gas, CFH:	None	NA	NA
Gas Cup Size:	4 to 8	NA	NA
Wire Stick-out:	NA	NA	NA
String or Weave:	String*	Either	Either
Weld Deposit Thickness:	0.094	0.338" (Total for E7018)	

* indicates recommended ranges which may be changed to suit testing conditions.

Testing shall be done by face and root bends, by side bends or by radiography.
Testing shall be performed in accordance with the Current Edition of ASME Section IX

WPQT-14
REVISION 0

RECORD OF WELDER/OPERATOR QUALIFICATION TEST

Last Name:_____ First:_____ Init:___ SS No: _____ Stamp No:_____

Welding Process(es) used: GTAW/SMAW Type: Manual WPS/Rev. Followed: 1-32-1

Specification of Base material(s) welded: A106 Grade B or A53 Grade B Thickness: 0.432

Manual or Semi-automatic Variables for each Process	Actual Values	Range Qualified
ASME P-Number 1 to ASME P-No:	1	P-1/P-11 & P-41/P-46
Backing (Metal, Weld Metal, Welded from both sides, Flux, etc,):	None	Optional/Required
[ ] Plate [X] Pipe (enter diameter, if pipe):	6" Sch80	2-7/8" O.D. and over
Filler Metal Specification (SFA): 5.18/5.28 Classification:	ER70S-2/E7018	
Filler Metal F-Number:	6/4	6/1 thru 4
Consumable Insert for GTAW or PAW:	None	Not Permitted
Weld Deposit Thickness for Each Welding Process:	0.094/0.338	0.188/0.676
Welding Position (1G,5G,etc):	6G	All
Progression (uphill/downhill):	Uphill	Uphill
Backing Gas for GTAW, PAW or GMAW, Fuel Gas for OFW:	None	Optional
GMAW Transfer Mode:	N/A	N/A
GTAW Welding Current Type/Polarity:	DCSP	DCSP

Machine Welding Variables for the Process Used	Actual Values	Range Qualified
Direct/Remote Visual Control:	N/A	N/A
Automatic Voltage Control (GTAW):	N/A	N/A
Automatic Joint Tracking:	N/A	N/A
Welding Position (1G,5G,etc):	N/A	N/A
Consumable Insert:	N/A	N/A
Backing (Metal, Weld Metal, Welded from both sides, Flux, etc,):	N/A	N/A

Guided Bend Tests [X] QW-452,2 (Side) [ ] QW-462,3(a) (Trans, R&F) [ ] QW-462.3(b) (Long. R&F)

Type	Results	Type	Results
Side	Acceptable	Side	Acceptable
Side	Acceptable	Side	Acceptable

Alternative Radiographic Test Results: _____ Root Penetration and Fusion _____

Fillet Weld - Fracture Test: _____ Length and Percent of Defects: _____ In.

Macro Test Fusion: _____ Fillet Leg Size: ____ In. X ____ In. Concavity/Convexity: _____ In.

Welding Witnessed by: _____ Title: _____ Co: _____ Test Date: _____

Specimens Evaluated by: _____ Title: _____ Co: _____ Test Number: _____

We certify that the statements in this record are correct and that the test coupons were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

National Certified Pipe Welding Bureau

By:

Secretary, Chapter No:_____

Location Code: _____

Contractor:

By: _____

Title:

Date:

WPQT 14-S

NCPWB Form QW-484

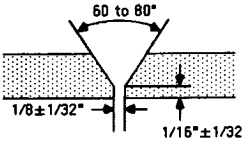
National Certified Pipe Welding Bureau

Welder Performance Qualification Technique Sheet

Welding Conditions

Material Specification: A106B or A53B
Pipe Size: 6" Sch 80
Pipe Thickness: 0.432"
Testing Position: 6G
Backing: None
Preheat Temperature: 50°F
Interpass Temperature: 500°F*
PWHT: None
Initial Cleaning: Grinding
Interpass Cleaning: Grinding, Wire Brushing
Backgouging: Not Permitted
Number of WPS Followed: 8:1-32-1, latest edition

Typical Joint Details



Weld Layers:	1&2	3&4	Balance
Welding Process(es):	GTAW	SMAW	SMAW
Electrode/Filler Metal Class:	ER309	E309-16	E309-16
Electrode/Filler Metal Size:	3/32"*	3/32"	3/32, 1/8, 5/32"*
Consumable Insert:	Not Permitted	NA	NA
Tungsten Size (in.) and Type:	3/32"-EWTh-2	NA	NA
Current Type and Polarity:	DCSP	DCRP	DCRP
Welding Current Range:	60 to 100	40 to 80	Follow WPS
Wire Feed Speed (ipm):	NA	NA	NA
Welding Voltage:	NA	NA	NA
Travel Speed (ipm):	2 to 4*	2 to 5*	2 to 6*
Progression:	Uphill	Uphill	Uphill
Shielding Gas , CFH:	Argon, 12/20	NA	NA
Backing Gas, CFH:	Argon, 5/20	NA	NA
Gas Cup Size:	4 to 8	NA	NA
Wire Stick-out:	NA	NA	NA
String or Weave:	String*	Either	Either
Weld Deposit Thickness:	0.094	0.338" (Total for E309-16)	

* indicates recommended ranges which may be changed to suit testing conditions.

Testing shall be done by face and root bends, by side bends or by radiography.
Testing shall be performed in accordance with the Current Edition of ASME Section IX

WPQT-16
REVISION 0

RECORD OF WELDER/OPERATOR QUALIFICATION TEST

Last Name:_____ First:_____ Init:___ SS No: _____ Stamp No:_____

Welding Process(es) used: GTAW/SMAW Type: Manual Number of WPS Followed: 8:1-32-1

Specification of Base material(s) welded: A106 Grade B or A53 Grade B Thickness: 0.432"

Manual or Semi-automatic Variables for each Process	Actual Values	Range Qualified
ASME P-Number 1 TO ASME P No. 1		P-1/P-11 & P-41/P-46
Backing (Metal, Weld Metal, Welded from both sides, Flux, etc,):	None	Optional/ Required
[ ] Plate [X] Pipe (enter diameter, if pipe):	6" Sch 80	2-7/8" O.D. and over
Filler Metal Specification (SFA): 5.28/5.9 Classification:	ER309/E309-16	
Filler Metal F-Number:	6/5	6/5
Consumable Insert for GTAW or PAW:	None	Not Permitted
Weld Deposit Thickness for Each Welding Process:	0.094/0.338	0.188/0.676
Welding Position (1G,5G,etc):	6G	All
Progression (uphill/downhill):	Uphill	Uphill
Backing Gas for GTAW, PAW or GMAW, Fuel Gas for OFW:	Used	Required
GMAW Transfer Mode:	N/A	N/A
GTAW Welding Current Type/Polarity:	DCSP	DCSP

Machine Welding Variables for the Process Used	Actual Values	Range Qualified
Direct/Remote Visual Control:	NA	NA
Automatic Voltage Control (GTAW):	NA	NA
Automatic Joint Tracking:	NA	NA
Welding Position (1G,5G,etc):	NA	NA
Consumable Insert:	NA	NA
Backing (Metal, Weld Metal, Welded from both sides, Flux, etc,):	NA	NA

Guided Bend Tests [ ] QW-452.2 (Side) [X] QW-462.3(a) (Trans. R&F) [ ] QW-462.3(b) (Long. R&F)

Type	Results	Type	Results
Root	Acceptable	Root	Acceptable
Face	Acceptable	Face	Acceptable

Alternative Radiographic Test Results: _____ Root Penetration and Fusion _____

Fillet Weld - Fracture Test: _____ Length and Percent of Defects: _____ In.

Macro Test Fusion: _____ Fillet Leg Size: ____ In. X ____ In. Concavity/Convexity: _____ In.

Welding Witnessed by: _____ Title: _____ Co: _____ Test Date: _____

Specimens Evaluated by: _____ Title: _____ Co: _____ Test Number: _____

We certify that the statements in this record are correct and that the test coupons were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

National Certified Pipe Welding Bureau

By:

Secretary, Chapter No:_____

Location Code: _____

Contractor:

By: _____

Title:

Date:

WPQT-16-R&F

NCPWB Form QW-484

SOME OF THE PURPOSES OF THE NCPWB ARE:

to engage in research and educational work that will assist the contractor in furnishing the public safe and dependable installations through the use of . . .

CERTIFIED WELDING

to keep members of the Bureau informed of the latest scientifically proven methods and supply information and data in connection with . . .

CERTIFIED WELDING

to establish uniform procedures which conform with ANSI/ASME Codes for various methods of welding and to promote and develop . . .

CERTIFIED WELDING

NOTES

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