APPENDIX B — NONMANDATORY WELDING AND BRAZING FORMS

B-100 FORMS

This Nonmandatory Appendix illustrates sample formats for Welding and Brazing Procedure Specifications, Procedure Qualification Records, and Performance Qualification.

B-101 Welding

Form QW-482 is a suggested format for Welding Procedure Specifications (WPS); Form QW-483 is a suggested format for Procedure Qualification Records (PQR). These forms are for the shielded metal-arc (SMAW), submerged-arc (SAW), gas metal-arc (GMAW), and gas tungsten-arc (GTAW) welding processes, or a combination of these processes.

Forms for other welding processes may follow the general format of Forms QW-482 and QW-483, as applicable.

Form QW-484 is a suggested format for Welder/Welding Operator/Performance Qualification (WPQ) for groove or fillet welds.

Form QW-485 is a suggested format for Demonstration of Standard Welding Procedure Specifications.

B-102 Brazing

Form QB-482 is a suggested format for Brazing Procedure Specifications (BPS); Form QB-483 is a suggested format for Procedure Qualifications Records (PQR). These forms are for torch brazing (TB), furnace brazing (FB), induction brazing (IB, resistance brazing (RB), and dip brazing (DB) processes.

Forms for other welding processes may follow the general format of Forms QW-482 and QW-483, as applicable.

Form QB-484 is a suggested format for Brazer/Brazing Operator/Performance Qualification (BPQ).

QW-482 SUGGESTED FORMAT FOR WELDING PROCEDURE SPECIFICATIONS (WPS)
(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)

Company Name _____ By: _____

Welding Procedure Specification No. _____ Date _____ Supporting PQR No.(s) _____

Revision No. _____ Date _____

Welding Process(es) _____ Type(s) _____
(Automatic, Manual, Machine, or Semi-Auto.)

JOINTS (QW-402) Details

Joint Design _____

Backing (Yes) _____ (No) _____

Backing Material (Type) _____
(Refer to both backing and retainers.)

☐ Metal ☐ Nonfusing Metal

☐ Nonmetallic ☐ Other

Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of weld groove may be specified.

(At the option of the Mfgr., sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g., for notch toughness procedures, for multiple process procedures, etc.)

*BASE METALS (QW-403)

P-No. _____ Group No. _____ to P-No. _____ Group No. _____

OR

Specification type and grade _____

to Specification type and grade _____

OR

Chem. Analysis and Mech. Prop. _____

to Chem. Analysis and Mech. Prop. _____

Thickness Range:

Base Metal: Groove _____ Fillet _____

Other _____

*FILLER METALS (QW-404)		
Spec. No. (SFA)		
AWS No. (Class)		
F-No.		
A-No.		
Size of Filler Metals		
Weld Metal		
Thickness Range:		
Groove		
Fillet		
Electrode-Flux (Class)		
Flux Trade Name		
Consumable Insert		
Other		

*Each base metal-filler metal combination should be recorded individually.

(7/00) This form (E00006) may be obtained from the Order Dept., ASME, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

SAMPLE

QW-482 (Back)

WPS No. _____ Rev. _____

POSITIONS (QW-405)
Position(s) of Groove _____
Welding Progression: Up _____ Down _____
Position(s) of Fillet _____

POSTWELD HEAT TREATMENT (QW-407)
Temperature Range _____
Time Range _____

PREHEAT (QW-406)
Preheat Temp. Min. _____
Interpass Temp. Max. _____
Preheat Maintenance _____
(Continuous or special heating where applicable should be recorded)

GAS (QW-408)

	Gas(es)	Percent Composition (Mixture)	Flow Rate
Shielding			
Trailing			
Backing			

ELECTRICAL CHARACTERISTICS (QW-409)
Current AC or DC _____ Polarity _____
Amps (Range) _____ Volts (Range) _____
(Amps and volts range should be recorded for each electrode size, position, and thickness, etc. This information may be listed in a tabular form similar to that shown below.)

Tungsten Electrode Size and Type _____
(Pure Tungsten, 2% Thoriated, etc.)

Mode of Metal Transfer for GMAW _____
(Spray arc, short circuiting arc, etc.)

Electrode Wire feed speed range _____

TECHNIQUE (QW-410)
String or Weave Bead _____
Orifice or Gas Cup Size _____
Initial and Interpass Cleaning (Brushing, Grinding, etc.) _____
_____
Method of Back Gouging _____
Oscillation _____
Contact Tube to Work Distance _____
Multiple or Single Pass (per side) _____
Multiple or Single Electrodes _____
Travel Speed (Range) _____
Peening _____
Other _____
_____
_____

Weld Layer(s)	Process	Filler Metal Class	Filler Metal Dia.	Current Type Polar.	Current Amp. Range	Volt Range	Travel Speed Range	Other (e.g., Remarks, Comments, Hot Wire Addition, Technique, Torch Angle, Etc.)

SAMPLE

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORDS (PQR)
(See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
Record Actual Conditions Used to Weld Test Coupon.

Company Name _____

Procedure Qualification Record No. _____ Date _____

WPS No. _____

Welding Process(es) _____

Types (Manual, Automatic, Semi-Auto.) _____

JOINTS (QW-402)

Groove Design of Test Coupon

(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

BASE METALS (QW-403)

Material Spec. _____

Type or Grade _____

P-No. _____ to P-No. _____

Thickness of Test Coupon _____

Diameter of Test Coupon _____

Other _____

FILLER METALS (QW-404)

SFA Specification _____

AWS Classification _____

Filler Metal F-No. _____

Weld Metal Analysis A-No. _____

Size of Filler Metal _____

Other _____

Weld Metal Thickness _____

POSITION (QW-405)

Position of Groove _____

Weld Progression (Uphill, Downhill) _____

Other _____

PREHEAT (QW-406)

Preheat Temp. _____

Interpass Temp. _____

Other _____

POSTWELD HEAT TREATMENT (QW-407)

Temperature _____

Time _____

Other _____

GAS (QW-408)

	Gas(es)	Percent Composition (Mixture)	Flow Rate
Shielding			
Trailing			
Backing			

ELECTRICAL CHARACTERISTICS (QW-409)

Current _____

Polarity _____

Amps. _____ Volts _____

Tungsten Electrode Size _____

Other _____

TECHNIQUE (QW-410)

Travel Speed _____

String or Weave Bead _____

Oscillation _____

Multipass or Single Pass (per side) _____

Single or Multiple Electrodes _____

Other _____

SAMPLE

This form (E00007) may be obtained from the Order Dept., ASME, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

QW-483 (Back)

PQR No. _____

Tensile Test (QW-150)

Specimen No.	Width	Thickness	Area	Ultimate Total Load lb	Ultimate Unit Stress psi	Type of Failure & Location

Guided-Bend Tests (QW-160)

Type and Figure No.	Result

Toughness Tests (QW-170)

Specimen No.	Notch Location	Specimen Size	Test Temp.	Impact Values			Drop Weight Break (Y/N)
				Ft. lbs.	% Shear	Mils	

Comments: _____

Fillet-Weld Test (QW-180)

Result — Satisfactory: Yes_____ **No**_____ **Penetration into Parent Metal: Yes**_____ **No**_____

Macro — Results _____

Other Tests

Type of Test _____

Deposit Analysis _____

Other _____

Welder's Name _____ Clock No. _____ Stamp No. _____

Tests conducted by: _____ Laboratory Test No. _____

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

Manufacturer _____

Date _____ By _____

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)

SAMPLE

01
A02

QW-484A SUGGESTED FORMAT A FOR WELDER PERFORMANCE QUALIFICATIONS (WPQ)
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name _____ Identification No. _____

Test Description

Identification of WPS followed _____ ☐ Test coupon ☐ Production weld
Specification of base metal(s) _____ Thickness _____

Testing Conditions and Qualification Limits

Welding Variables (QW-350)	Actual Values	Range Qualified
Welding process(es)		
Type (ie; manual, semi-auto) used		
Backing (metal, weld metal, double-welded, etc.)		
☐ Plate ☐ Pipe (enter diameter if pipe or tube)		
Base metal P- or S-Number to P- or S-Number		
Filler metal or electrode specification(s) (SFA) (info. only)		
Filler metal or electrode classification(s) (info. only)		
Filler metal F-Number(s)		
Consumable insert (GTAW or PAW)		
Filler type (solid/metal or flux cored/powder) (GTAW or PAW)		
Deposit thickness for each process		
Process 1: _____ 3 layers minimum ☐ Yes ☐ No		
Process 2: _____ 3 layers minimum ☐ Yes ☐ No		
Position qualified (2G, 6G, 3F, etc.)		
Vertical progression (uphill or downhill)		
Type of fuel gas (OFW)		
Inert gas backing (GTAW, PAW, GMAW)		
Transfer mode (spray/globular or pulse to short circuit-GMAW)		
GTAW current type/polarity (AC, DCEP, DCEN)		

RESULTS

Visual Examination of Completed Weld (QW-302.4) _____
☐ Bend test; ☐ Transverse root and face [QW-462.3(a); ☐ Longitudinal root and face [QW-462.3(b); ☐ Side (QW-462.2);
☐ Pipe bend specimen, corrosion-resistant overlay [QW-462.5(c)]; ☐ Plate bend specimen, corrosion-resistant overlay [QW-462.5(d)];
☐ Macro test for fusion [QW-462.5(b)]; ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) _____
Fillet weld — fracture test (QW-180) _____ Length and percent of defects _____
Macro examination (QW-184) _____ Fillet size (in.)_____ x _____ Concavity/convexity (in.) _____
Other tests _____
Film or specimens evaluated by _____ Company _____
Mechanical tests conducted by _____ Laboratory test no. _____
Welding supervised by _____
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 Boiler and Pressure Vessel Code.

Organization _____

Date _____ By _____

This form (E0008A) may be obtained from the Order Dept., ASME, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300.

SAMPLE

01

QW-484B SUGGESTED FORMAT B FOR WELDING OPERATOR PERFORMANCE QUALIFICATIONS (WOPQ)
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name _____ Identification no. _____

Test Description (*Information Only*)

Identification of WPS followed _____ ☐ Test coupon ☐ Production weld

Specification of base metal(s) _____ Thickness _____

Base metal P or S-Number _____ to P or S-Number _____ Position (2G, 6G, 3F, etc.) _____

☐ Plate ☐ Pipe (enter diameter if pipe or tube): _____

Filler metal (SFA) specification _____ Filler metal or electrode classification _____

Testing Conditions and Qualification Limits When Using Automatic Welding Equipment

Welding Variables (QW-361.1)	Actual Values	Range Qualified
Type of welding (Automatic)		
Welding process		
Filler metal (EBW or LBW)		
Type of laser for LBW (CO_2 to YAG, etc.)		
Continuous drive or inertia welding (FW)		
Vacuum or out of vacuum (EBW)		

Testing Conditions and Qualification Limits When Using Machine Welding Equipment

Welding Variables (QW-361.2)	Actual Values	Range Qualified
Type of welding (machine)		
Welding process		
Direct or remote visual control		
Automatic arc voltage control (GTAW)		
Automatic joint tracking		
Position qualified (2G, 6G, 3F, etc.)		
Consumable inserts (GTAW or PAW)		
Backing (metal, weld metal, etc.)		
Single or multiple passes per side		

SAMPLE

RESULTS

Visual Examination of Completed Weld (QW-302.4) _____

☐ Bend test; ☐ Transverse root and face [QW-462.3(a)]; ☐ Longitudinal root and face [QW-462.3(b)]; ☐ Side (QW-462.2);
☐ Pipe bend specimen, corrosion-resistant overlay [QW-462.5(c)]; ☐ Plate bend specimen, corrosion-resistant overlay [QW-462.5(d)];
☐ Macro test for fusion [QW-462.5(b)]; ☐ Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result

Alternative radiographic examination results (QW-191) _____

Fillet weld — fracture test (QW-180) _____ Length and percent of defects _____

Macro examination (QW-184) _____ Fillet size (in.) _____ × _____ Concavity/convexity (in.) _____

Other tests _____

Film or specimens evaluated by _____ Company _____

Mechanical tests conducted by _____ Laboratory test no. _____

Welding supervised by _____

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.

Organization _____

Date _____ By _____

This form (E0008B) may be obtained from the Order Dept., ASME, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300.

A02

QW-485 SUGGESTED FORMAT FOR DEMONSTRATION OF STANDARD WELDING PROCEDURE SPECIFICATIONS (SWPS) (See Article V)

Identification of Standard Welding Procedure Specification Demonstrated: _____

Demonstration Welding Conditions

Specification, Type, and Grade of Base Metal(s): _____
to Specification, Type, and Grade of Base Metal(s): _____
Base Metal P- or S-Number _____ to Base Metal P- or S-Number _____ Thickness: _____

Welding Process(es) used: _____
☐ Plate ☐ Pipe (Enter Diameter of Pipe or Tube): _____
Groove Type (Single V, Double V, Single U, etc.): _____
Initial Cleaning Method: _____
Backing (Metal, Weld Metal, Backwelded, etc.): _____
Filler Metal (SFA) Specification: _____
Filler Metal or Electrode Classification: _____
Filler Metal or Electrode Trade Name: _____
Tungsten Electrode Type and Size for GTAW: _____
Consumable Insert Class and Size for GTAW or PAW: _____
Shielding Gas Composition and Flow Rate for GTAW, PAW, GMAW: _____
Preheat Temperature (°F): _____
Position (1G, 2G, etc.) of Weld: _____
Progression (Uphill or Downhill): _____
Interpass Cleaning Method: _____
Measured Interpass Temperature (°F): _____
Approximate Deposit Thickness for Each Filler Metal or Electrode Type (in.): _____
Current Type/Polarity (AC, DCEP, DECN): _____
Postweld Heat Treatment Time and Temperature: _____

Visual Examination of Completed Weld: _____ Date of Test: _____

Bend Test ☐ Transverse Root and Face [QW-462.3(a)] ☐ Side [QW-462.2]

Type	Result	Type	Result	Type	Result

Alternative Radiographic Examination Results: _____
Specimens Evaluated By: _____ Title: _____ Company: _____
Welding Supervised By: _____ Title: _____ Company: _____
Welder's Name: _____ Stamp No. _____
We certify that the statements in this record are correct and that the weld described above was prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code.

Manufacturer or Contractor: _____

By: _____ Date: _____ Demonstration Number: _____

This form (E00136) may be obtained from the Order Dept., ASME, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300.

SAMPLE

A02

QB-482 SUGGESTED FORMAT FOR BRAZING PROCEDURE SPECIFICATIONS (BPS)
(See QB-200.1 , Section IX, ASME Boiler and Pressure Vessel Code)

Company Name: _____

BPS Number: _____ Revision: _____ Date Issued: _____

Supporting PQRs: _____

Brazing Process(es): _____ Type(s): _____

Joints (QB-408)

Joint Design: Type: _____ Clearance: _____

Overlap: Minimum: _____ Maximum: _____

Base Metals (QB-402)

P/S Number _____

to P/S Number _____

Other: _____

Base Metal Thickness

Minimum: _____

Maximum: _____

Filler Metals (QB-403)

Specification Number: _____

AWS Classification: _____

F-Number: _____

Filler Form: _____

_____

_____

Post Braze Heat Treatment (QB-409)

Temperature: _____

Max. Holding Time: _____

Brazing Flux, Fuel Gas, or Atmosphere (QB-406)

Flux Type or Trade Name: _____

Fuel Gas: _____

Flame Type: _____

Recommended Brazing Temperature: _____

Other: _____

Flow Positions (QB-407)

Positions Permitted: _____

Flow Direction: _____

Technique (QB-410) and Other Information

Initial Cleaning: _____

_____

Flux Application: _____

Torch Tip Sizes: _____

Final Cleaning: _____

Inspection: _____

_____

Manufacturer: _____

By: _____

Title: _____ Date: _____

This form (E00031) may be obtained from the Order Dept., ASME, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300.

SAMPLE

A02

QB-483 SUGGESTED FORMAT FOR BRAZING PROCEDURE QUALIFICATION RECORDS (PQR)
(See QB-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
Record of Actual Conditions Used to Braze Test Coupon

Company Name: _____

BPS Followed During Brazing of Test Coupon: _____ PQR No: _____

Brazing Process(es) Used: _____ Date Coupon Was Brazed: _____

Base Metal Specification: _____

to Base Metal Specification: _____

P-Number: _____ to P-Number: _____ Plate/Pipe Diameter: _____

Base Metal Thickness (in.): _____ Joint Type: _____

Filler Metal Specification: AWS Classification: _____ F-No.: _____ Product Form: _____

Filler Metal Size: _____ Method of Applying Filler: _____

Flux Type or Trade Name: _____ Gas Backing: _____

Overlap Used (in.): _____ Clearance Between Parts: _____

Position and Flow Direction: _____

Fuel Gas: _____ Flame Type: _____

Postbraze Heat treatment (°F): _____ Postbraze heat treatment time (hr): _____

Cleaning Prior to Brazing: _____

Cleaning After Brazing: _____

Other: _____

_____

_____

Tensile Tests

Specimen	Width/Dia. (in.)	Thickness (in.)	Area (sq in.)	Ultimate load (lb)	Ultimate Stress (psi)	Failure Location

Bend Tests

Type	Results	Type	Results

Peel or Section Tests

Type	Results	Type	Results

Other Tests: _____

Brazer's Name: _____ ID No.: _____ Company: _____

Brazing of Test Coupon Supervised by: _____ Company: _____

Test Specimens Evaluated by: _____ Company: _____

Laboratory Test Number: _____

We hereby certify that the statements in this record are correct and that the test welds were prepared, brazed, and tested in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code.

Manufacturer: _____

By: _____ Date: _____

This form (E00032) may be obtained from the Order Dept., ASME, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300.

SAMPLE

A02

QB-484 SUGGESTED FORMAT FOR BRAZER/BRAZING OPERATOR PERFORMANCE QUALIFICATIONS (BPQ)
(See QB-301, Section IX, ASME Boiler and Pressure Vessel Code)

Brazer's/Operator's Name: _____ Identification No. _____

Testing Conditions and Ranges Qualified

Identification of BPS followed during brazing of test coupon: _____
Specification of First Test Coupon Base Metal: _____
Specification of Second Test Coupon Base Metal: _____

Brazing Variables	Actual Values	Range Qualified
Brazing Process(es):		
Type of Brazing (manual, semi-automatic, automatic):		
Base Metal P- or S-Number ____ to P- or S-Number		
☐ Plate ☐ Pipe (enter diameter if pipe or tube):		
First Base Metal thickness (in.):		
Second Base Metal thickness (in.):		
Joint Type (Butt, Lap, Scarf, Socket, etc.):		
If Lap or Socket, Overlap Length (in.):		
Joint Clearance (in.):		
Filler Metal (SFA) Specification(s) (info. only):		
Filler Metal Classification(s) (info. only):		
Filler Metal/F-Number:		
Filler Metal Product Form:		
First Brazing Position:		
Second Brazing Position:		

Testing and Results

Visual Examination of Completed Joint: _____ **Date of Test:** _____

Mechanical Test ☐ Peel (QB-462.3) ☐ Section (QB-462.4) ☐ Tension [QB-462.1(e)]

Position	Result	Position	Result	Position	Result

Brazing Supervised by: _____ Company: _____
Mechanical Tests Conducted by: _____ Company: _____
Specimens Evaluated by: _____ Company: _____
Lab Test No.: _____

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 Boiler and Pressure Vessel Code.

Company Name: _____

By: _____ Date: _____

This form (E00033) may be obtained from the Order Dept., ASME, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300.

SAMPLE