

# Welding Procedure Specification (WPS)

## ASME Boiler and Pressure Vessel Code , Section IX

**Company Name:** www.WeldCanada.com

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Welding Procedure Specification WPS No.: DEMO-WPS

Revision No.: (0)

Date: 12,12, 2005

Supporting PQR No. (s): DEMO-PQR

Date: 11,12, 2005

### BASE METALS (QW-403)

P-No.: 4	Group No.: 1	Material Specification: SA-335	Type or Grade: P11
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Welded to

P-No.: 4	Group No.: 1	Material Specification: SA-234	Type or Grade: WP11, Class 1
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OR

Chem. Analysis and Mech. Prop.	N/A
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Welded to Chem. Analysis and Mech. Prop.	N/A
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Qualified Thickness Range mm (in)	Groove: 5 mm (3/16 in.) to 60 mm (2.36 in.)	Fillet: Unlimited
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Qualified Diameter Range mm (in)	Groove: All Sizes	Fillet: Unlimited
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Other information: This is a DEMO WPS from www.WeldCanada.com

	FIRST PROCESS	SECOND PROCESS
Welding Process (es):	Gas Tungsten Arc Welding (GTAW)	Shielded Metal Arc Welding (SMAW)
Type (s):	Manual	Manual

### FILLER METALS (QW-404)

AWS Classification	ER80S-G (see sheet 3)	E8016-B2 (see sheet 3)
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Electrode-Flux Class (SAW)	ER80S-G (see sheet 3)	E8016-B2 (see sheet 3)
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SFA Specification	SFA 5.28	SFA 5.5
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Filler Metal F-No.	6	4
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Weld Metal Analysis A-No.	-	3
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Size of Filler Metals mm (in)	2.0 mm (see sheet 3)	3.25 mm (see sheet 3)
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Filler Metal Product Form	Solid copper coated wire	Iron powder low hydrogen
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Max. Weld Pass Thickness mm (in)		3/16 in.
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Qualified Weld Metal Range: Groove mm (in)	10 mm (3/8 in.)	60 mm (2.36 in.)
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Qualified Weld Metal Range: Fillet mm (in)	Unlimited	Unlimited
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Weld Deposit Chemistry	-	-
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Flux Trade Name and Flux Type (SAW)	N/A	N/A
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Consumable Insert, Class and Size	-	-
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Other information: This is a DEMO WPS from www.WeldCanada.com

### POSITIONS (QW-405)

Position (s) of Groove	ALL Position	ALL Position
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Welding Progression	Up	Up
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Position (s) of Fillet	ALL Position	ALL Position
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### PREHEAT (QW-406)

Preheat Temp. °C (°F)	150 °C	150 °C
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Interpass Temp. Max. °C (°F)	280 °C	280 °C
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Preheat Maintenance °C (°F)	New Joint	New Joint
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### GAS (QW-408)

Shielding Gas Type (Mixture)	100% Ar	N/A
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Flow Rate lt/min. (CFH)	7 to 9 lt/min.	-
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Trailing Gas Type (Mixture)	N/A	N/A
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Flow Rate lt/min. (CFH)	-	-
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Gas Backing (Mixture)	N/A	N/A
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Flow Rate lt/min. (CFH)	-	-
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### POSTWELD HEAT TREATMENT (QW-407)

Holding Temperature Range °C (°F): 680 °C + or - 10 °C	Holding Time Range: 1 hr/ in. (15 minutes Min.)
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Heating Rate °C/hr (°F/hr): 120 °C/hr	Method: Furnace
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Cooling Rate °C/hr (°F/hr): 120 °C/hr	Method: Open Air
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**ELECTRICAL CHARACTERISTICS (QW-409)**

Following data may also shown on Table below in this sheet	FIRST PROCESS	SECOND PROCESS
Current/ Polarity	DCEN	DCEP
Amps (Range)	90 to 120	100 to 130
Volts (Range)	18 to 25	20 to 28
Wire Feed Speed (Range) mm/min (in/min)	-	-
Travel Speed (Range) mm/min (in/min)	Manual control	Manual control
Mode of Metal Transfer for GMAW (FCAW)	N/A	N/A
Tungsten Electrode Size mm (in)	2.5 mm	-
Tungsten Type	SFA 5.12 EWTh-2	-

**TECHNIQUE (QW-410)**

	String Bead	String and Weave Bead
String or Weave Bead	String Bead	String and Weave Bead
Multiple or Single Electrodes	Single	Single
Multiple or Single Pass (per side)	Multiple	Multiple
Orifice or Gas Cup Size	5/8 in. Nozzle Size	-
Contact Tube to Work Distance mm (in)	-	-
Initial and Interpass Cleaning	Brushing	Brushing and Grinding
Method of Back Gouging	n/a	n/a
Oscillation	-	-
Peening	Not Required	Not Required

Other information: Clean each layer before start welding new passes/layers

**JOINTS (QW-402)**

Joint Design: Groove Design Used      Backing Type: Metal      Backing Material (Refer to both backing and retainers.): Same as base metals

Joint Details/ Sketch:      Groove Details (or as per production drawing): Root Opening G: \_      Root Face RF: \_      Groove Angle: \_      Radius (J-U): \_

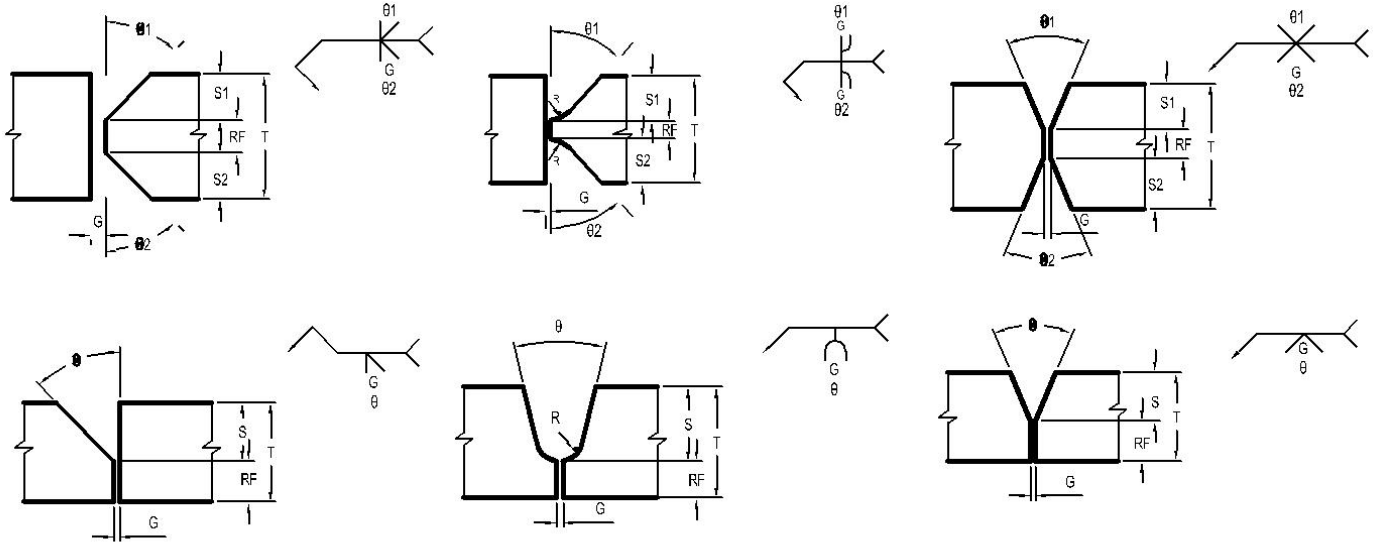


Table for recorded welding parameters; Refer to QW-409

Weld Layer(s)	Pass No. (s)	Process	Filler Metal Classification	Filler Size Diameter mm (in)	Current Amps Range	Current Type & Polarity	Wire Feed Speed Range mm/min (in/min)	Volts Range	Travel Speed Range mm/min (in/min)	Max. Heat Input kJ/mm (kJ/in) Or Remarks
1	1	GTAW	ER80S-G	2.0 mm	90-120	DCEN	N/A	18-25	-	Root Pass
2	2 to 3	GTAW	ER80S-G	2.0 mm	90-120	DCEN	N/A	18-25	-	
3 to n	4 to n	SMAW	E8016-B2	3.25 mm	100-130	DCEP	N/A	20-28	-	Fill and Cap Passes

Additional Notes: This is a DEMO-WPS prepared by online welding software of www.WeldCanada.com

Manufacturer or Contractor's Welding Engineer:

Name: *Jim Clark*

Signature: *J.C.*

Title: *Welding Engineer*

Date: *12, 12, 2005*

Authorized by:

Name: *John Smith*

Signature: *J.S.*

Title: *QA Manager*

Date: *12, 12, 2005*

## Heat Treatment (ASME Code's Guideline):

### PREHEAT TABLE:

ASME Section I: Preheating from Appendix A (A-100)

- (a) 250 °F (120 °C) for material which has either a specified minimum tensile strength in excess of 60,000 psi (410 MPa) or a thickness at the joint in excess of 1/2 in. (13 mm):
- (b) 50 °F (10 °C) for all other materials of P-No. 4 group.

### POSTWELD HEAT TREATMENT TABLE:

ASME Section I: Mandatory Requirements for PWHT of Table PW-39

Min. Holding Temperature: 1,200 °F (650 °C)

Min. Holding Time for Weld Thickness (Nominal):

Up to 2 in. (50 mm): 1 hr/in. (2 min/mm), 15 min Min.

Over 2 in. (50 mm) to 5 in. (125 mm): 1 hr/in. (2 min/mm)

Over 5 in. (125 mm): 5 hr plus 15 min for each additional inch over 5 in. (125 mm)

Heating rate: The weldment shall be heated slowly to the holding temperature, Min. 100 °F (55 °C)/hr

Cooling rate: Cool slowly in a still atmosphere to a temperature not exceeding 800 °F (425 °C)

For Non-Mandatory conditions of PWHT, See Notes (1), (2) of Table PW-39

## WPS Qualified Range (ASME IX Guideline):

Qualified Positions (Groove, Fillet): All Positions for Plate or Pipe. Unless specifically required otherwise by the welding variables (QW-250), a qualification in any position qualifies the procedure for all positions. The welding process and electrodes must be suitable for all positions permitted by the WPS (ASME Section IX, QW-203).

(For impact test application, there are some restrictions for welding in vertical-uphill progression position; See ASME Section IX, QW-405.2)

Qualified Thicknesses (Groove, Fillet): 3/16 in. (5 mm) Min., 2T Max. (Plate or Pipe)

[For GMAW-Short Circuit Arc, when T is less than 1/2 in. (13 mm): 1.1T Max. ASME IX, QW-403.10]

[For impact test application, except ESW process: Min. Qualified Thickness is either T or 5/8 in. (16 mm), whichever is less; This variable does not apply when a WPS is qualified with a PWHT above the upper transformation temperature or when an austenitic material is solution annealed after welding. ASME IX, QW-403.6]

[For ferrous base metals other than P-No. 7, 8 and 45 (when test coupon receives a PWHT above the upper transformation temperature): 1.1T Max. ASME IX, QW-407.4]

[For any weld pass greater than 1/2 in. (13 mm) thick: 1.1T Max. (Except GTAW process). ASME IX, QW-403.9]

T: Thickness of Test Plate or Pipe Wall in PQR (ASME Section IX, Table QW-451.1)

Qualified Diameters (Groove, Fillet): All Nominal Pipe (Tube) Sizes, within Qualified Thicknesses in PQR

WPS Base Metal P-Numbers Allowed by PQR: Any metals of the same P-No. 4, plus combination between any metal from P-No. 4 to any metal from P-No. 3 or P-No. 1 (ASME Section IX, QW-424)

Qualified WPS Filler Metal Allowed by PQR: Only Filler Metal categories with the same F-number and same A-number tested in PQR. Any electrode diameter sizes can be used in WPS, as it is not an essential variable for the most process and conditions. For Non-impacted test applications only, filler metal classification within an SFA specification, with the same F-number and the same A-number and the same minimum tensile strength and the same nominal chemical composition can be used in WPS. (ASME Section IX, QW-250)