



TOPCOR BELCO

P.O. BOX 1019

PRAIRIEVILLE, LA. 70769

Welding Procedure Specification (WPS)

WPS No.: TopCoreBelco-102-GMFC Date: 3/30/2008 Rev.: 0 Page: 1 of 4

By: _____ Date Signed: 3/30/2008

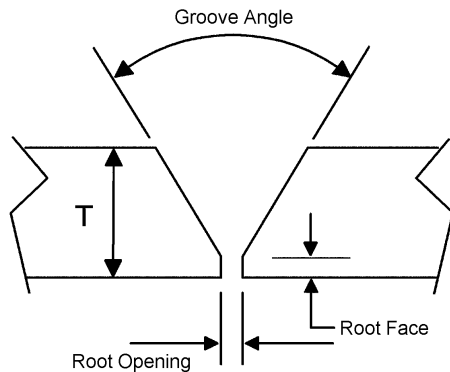
Supporting PQR's: TopCoreBelco 102-GMFC/A

Welding Process(es) / Type(s): (1) GMAW / Semiautomatic (2) FCAW / Semiautomatic

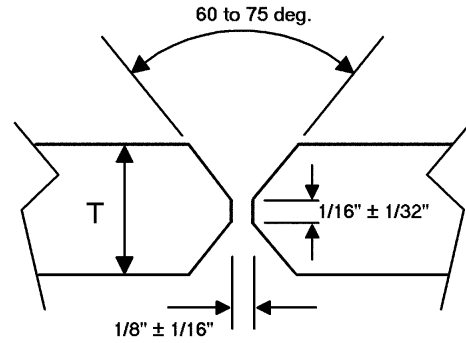
Joints (QW-402)

Joint Design: Groove and fillet welds

Backing: Without backing only Backing Material: none



SINGLE VEE GROOVE



DOUBLE VEE GROOVE

Fillet Welds: All fillet sizes on all base metal thicknesses and all diameters.

Retainers: None

No Nonmetallic or Non fusion Retainers Allowed. No single pass should exceed 1/4" and shall not exceed 1/2", No inserts allowed.

WELD JOINT DESCRIPTIONS SHOWN ARE NOT INCLUSIVE OF ALL THOSE FOUND ON A JOB. WELD JOINT DESIGN REFERENCE IN AN ENGINEERING SPECIFICATION OR A DESIGN DRAWING SHALL TAKE PRECEDENCE OVER WELD JOINTS SHOWN IN THIS WPS.

Base Metals (QW-403)

SA-106 Gr.B P-No.: 1 Group No.: 1 & 2 Thickness Range (in.): 0.1875 to 0.7500
to SA-106 Gr. B P-No.: 1 Group No.: 1 & 2

Thickness range for B31.3 is 3/4" maximum for as welded. Typical materials A53-X, A105, A106-X, A234

Minimum preheat must be maintained during thermal cutting, tacking, and welding operations.
Welds shall be cleaned between each pass. When completed, remove all slag and projections.

Filler Metals (QW-404)

Spec. No. (SFA): (1) 5.18 (2) 5.20

AWS No. (Class): (1) ER70S-2 (2) E71T-1M

F No.: (1 & 2) 6 A No.: (1) 1 (2) (verify chemistry)

Weld Metal Thickness Range: (1) 0.1375 in. maximum No Pass Greater Than 1/2" Allowed
(2) 0.7500 in. maximum No Pass Greater Than 1/2" Allowed

Flux Type: N/A

Flux Trade Name: N/A

Consumable Insert: N/A

Other: (1) Deposit From PQR .125

Product Form: (1) Bare (Solid) (2) Flux cored

Supplemental Filler Metal: (1 & 2) NONE

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<p>Positions (QW-405) Position of Joint: <u>(1 & 2) All Positions</u> Weld Progression: <u>(1) Vertical up (2) Any</u></p> <p>Preheat (QW-406) Preheat Temp. Min.: <u>80</u> °F Interpass Temp. Max.: <u>450</u> °F Preheat Maintenance: <u>None</u> Below 50 F. or to remove moisture hand warm</p>	<p>Postweld Heat Treatment (QW-407) Type: <u>No PWHT will be performed</u> Temperature Range: <u>None</u> °F Time Range: <u>None</u></p> <p>Gas (QW-408) Gas Composition / Flow Rate Shielding: <u>(1) 99% Argon, 1% CO2 / 27-36 CFH</u> <u>(2) 75% Argon, 25% CO2 / 36-48 CFH</u> Trailing: <u>(1 & 2) None</u> Backing: <u>(1 & 2) None</u></p>
<p>Electrical Characteristics (QW-409) Current Type / Polarity: <u>(1 & 2) DCEP (reverse)</u> Tungsten Electrode Type and Size: <u>(1 & 2) N/A</u> Mode of Metal Transfer for GMAW: <u>(1) Short-circuiting arc (2) Spray arc</u> Max. Heat Input (J/in): <u>(1 & 2) None</u></p>	
<p>Technique (QW-410) String or Weave Bead: <u>(1 & 2) Stringer and weave bead</u> Orifice or Gas Cup Size: <u>(1 & 2) 3/8" to 5/8"</u> Initial and Interpass Cleaning: <u>With wire brush clean 1 inch (25 mm) on both sides of weld joint</u> Method of Back Gouging: <u>When required, grind until all defects are removed.</u> Oscillation: <u>N/A</u> Contact Tube to Work Distance: <u>(1 & 2) 1/2"</u> Single or Multiple Passes (per side): <u>Multipass</u> Single or Multiple Electrodes: <u>N/A</u> Peening: <u>(1 & 2) None</u></p>	

Process Welding Parameters

Weld Layer(s) and/or Pass(es)	Process	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)	Wire Feed Speed Range
		Class	Diameter (in.)	Type / Polarity	Amperage Range			
Any	GMAW	ER70S-2	0.035	DCEP (reverse)	80-145	17-22	Var.	6
Any	GMAW	ER70S-2	0.045	DCEP (reverse)	110-145	18-23	Var.	6
Any	GMAW	ER70S-2	1/16	DCEP (reverse)	165-300	20-25	Var.	6
Any	FCAW	E71T-1M	0.035	DCEP (reverse)	120-200	19-24	Var.	-
Any	FCAW	E71T-1M	0.045	DCEP (reverse)	150-225	22-26	Var.	-
Any	FCAW	E71T-1M	1/16	DCEP (reverse)	175-275	25-28	Var.	-
Any	FCAW	E71T-1M	5/64	DCEP (reverse)	200-400	26-32	Var.	-
Any	FCAW	E71T-1M	3/32	DCEP (reverse)	300-500	26-34	Var.	-

Optional Notes

General Notes

- 1) One inch each side of the weld area (ID & OD) shall be free of heavy mill scale, heavy rust deposits oils or other deleterious materials.
- 2) All deep curf gouges on torch bevels shall be blended or where required repaired prior to fit up.
- 3) Sufficient preheat shall be used to remove moisture and prevent cracking on highly restrained joints.

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The minimum preheat shall be in accordance with the fabrication code unless superceded by the client specification.

4) Tack welds which are to be incorporated into the final weld shall be:

- (a) Subject to the same quality as the final weld.
- (b) Cleaning shall be the same as addressed in interpass.
- (c) Tacks will be of sufficient size and cross sectional area to retain the appropriate fit up and alignment.
- (d) After clean up of the tacks, they shall be visually examined for cracking or other rejectable indications.

5) After completing clean up of the tacks the welder shall visually check for cracking prior to depositing the root pass.

6) Cleaning:

Initial- weld joint edges shall be uniform and free from fins, notches, tears, cracks and other visual defects. The welding surfaces shall also be free from moisture, loose or thick scale, heavy oxides, grease or other foreign deleterious materials. Plasma cut surfaces shall be ground to virgin metal prior to welding. All gouges in the bevel shall be blended or where required repaired prior to fit up.

Interpass- Before welding over previously deposited weld metal all gas residues, glass beads and visible porosity shall be removed. Any unacceptable bead profile shall be ground to accommodate a defect free weld. The weld and adjacent base metal shall be brushed clean and visually examined.

Final-All excessive gas residue shall be removed from all completed welds. The weld and the adjacent base metal shall be cleaned by brushing or other suitable means. Tightly adhering weld spatter remaining after the cleaning operation shall be removed by other suitable means as required by contact specifications or as required to perform nondestructive examination or prevent masking of indications.

7) The completed weld shall blend smoothly into the surface plain of the parent metal.

8) Excessive weld reinforcement and excessive weave width shall be avoided. Reinforcement shall not exceed the allowable limits of the fabrication code.

9) The final weld shall be cleaned based on NDE inspection method and contract requirements. The final weld shall be cleared of slag and heavy weld spatter.

10) All rolls of filler wire shall be tagged as to their type and stored in a dry environment. The wire should be protected from excessive grinding contaminates both on the feeder and when not in use.

11) Other acceptable filler metal with engineering and written authorization by the client are ER70S-3 or ER70S-6

12) Weld Backing strips are not allowed with out the written approval of the client. Specific client not allowing backing strips. Written approval must be appended to welding procedure or shop traveler.

13) Amperage, voltage and travel are non-essential variable and are projected ranges that should be

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followed closely.

In Process Repairs:

Significant defects that appear on the surface on any bead of weld deposit shall be removed by chipping, gouging and or grinding and re-welded before depositing the next successive weld layer.

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Additional Welding Parameters

Layer(s) and/or Pass(es)	Process	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)
		AWS Classification	Size (in.)	Type / Polarity	Amperage Range		
1 Root	GMAW	ER70S-2	0.035	DCEP (reverse)	115	21	6
2 Fill	FCAW	E71T-1M	0.045	DCEP (reverse)	180	24	6
3 Fill	FCAW	E71T-1M	0.045	DCEP (reverse)	185	24.1	7
4 Cap	FCAW	E71T-1M	0.045	DCEP (reverse)	185	24.1	7.7
5 Cap	FCAW	E71T-1M	0.045	DCEP (reverse)	180	24.9	6

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Optional Notes

General Notes:

1. Two inches on each side of the weld area (ID & OD) was free of heavy mill scale, heavy rust deposits oils, or other deleterious materials.
2. There were no deep gouges on bevels prior to fit up.
3. No preheat was required to prevent cracking.
4. Tacks were of sufficient size and cross sectional area to retain the appropriate gap.
5. After completing clean up of the tacks, the tacks were visually check for cracking prior to depositing the root pass. All tacks accepted.
6. Prior to depositing each layer the previous deposit was cleaned of glass deposits for GMAW and slag for the FCAW.
7. The complete weld blended smoothly into the parent metal.
8. No excessive weld reinforcement or excessive weave was used by splitting the beads for the cap.
9. The final weld was cleaned foe visual examination and VT accepted.
10. All GMAW & FCAW wire used were removed from a controled enviroment.
11. The completed weld was tested in the as welded condition. The results of the testing met the requiriements of ASME Section IX for procedure qualification.

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Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in ²)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
1	0.0749	0.472	0.0354	24672	696900	Ductile - BM
2	0.749	0.473	0.354	24666	69700	Ductile - BM

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.2 Side bend	Acceptable	QW-462.2 Side bend	Acceptable
QW-462.2 Side bend	Acceptable	QW-462.2 Side bend	Acceptable
None		None	

Macro-Examination Test: NA

Visual Examination: Satisfactory

Liquid Penetration Test: NA

Welder's Name: Savoy, Mike ID: 2 Stamp: 2

PQR was done and welding of coupon was witnessed by: TOPCOR BELCO

Tests Conducted By: Gonzales Industrial Xray Test ID.: 72981

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.

Prepared By: RONNIE SARVIS 3/28/2008 QA/QC Manager
Date