



TOPCOR BELCO

P.O. BOX 1019

PRAIRIEVILLE, LA. 70769

Welding Procedure Specification (WPS)

WPS No.: TopCorBelco-SM-103 Date: 4/15/2008 Rev.: 0 Page: 1 of 5

By: _____ Date Signed: 4/15/2008

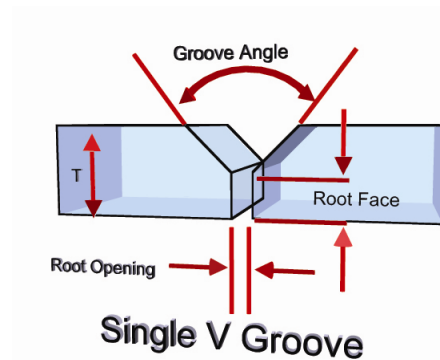
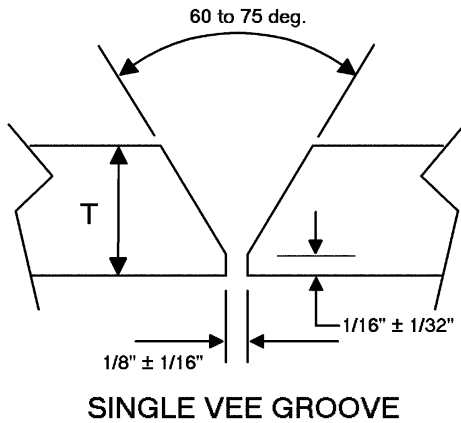
Supporting PQR's: TopCorBelco 103-SM/A

Welding Process(es) / Type(s): SMAW / Manual

Joints (QW-402)

Joint Design: Groove and fillet welds

Backing: Without backing only Backing Material: P-1 base metal only



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

Retainers: None

No Nonmetallic retainers allowed. No single pass deposit should exceed 5/16" and shall not exceed 1/2" thickness.

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-36 plate P-No.: 1 Group No.: 1-3 Thickness Range (in.): 0.0625 to 0.7500

to SA-36 Plate P-No.: 1 Group No.: 1-3

Typical material A53-X, A105, A106-X, A192, A234-X, A283-X, A285-X, A516-70 & B31.3 Listed Materials

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.

Thermal processes used for groove preparation.

Filler Metals (QW-404)

Spec. No. (SFA): 5.1

AWS No. (Class): E6010

F No.: 3 A No.: 1

Weld Metal Thickness Range: 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: _____

Trade Name: Atom Arc

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Positions (QW-405) Position of Joint: <u>Vertical only</u> Weld Progression: <u>Vertical down</u>	Postweld Heat Treatment (QW-407) Type: <u>No PWHT will be performed</u> Temperature Range: <u>None</u> °F Time Range: <u>None</u>
Preheat (QW-406) Preheat Temp. Min.: <u>70</u> °F Interpass Temp. Max.: <u>400</u> °F Preheat Maintenance: <u>None</u> Below 50 F to remove moisture preheat to hand warm.	Gas (QW-408) Gas Composition / Flow Rate Shielding: <u>N/A</u> Trailing: <u>N/A</u> Backing: <u>N/A</u>
Electrical Characteristics (QW-409) Current Type / Polarity: <u>DCEP (reverse)</u> Tungsten Electrode Type and Size: <u>N/A</u> Mode of Metal Transfer for GMAW: <u>N/A</u> Max. Heat Input (J/in): <u>None</u>	
Technique (QW-410) String or Weave Bead: <u>Stringer and weave bead</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>N/A</u> Single or Multiple Passes (per side): <u>Multipass</u> Single or Multiple Electrodes: <u>N/A</u> Peening: <u>None</u>	

Process Welding Parameters

Weld Layer(s) and/or Pass(es)	Process	Filler Metal		Current		Voltage Range	Travel Speed Range (in/min)
		Class	Diameter (in.)	Type / Polarity	Amperage Range		
Root	SMAW	E6010	1/8"	DCEP (reverse)	70-90	20-26	3-5
Hot	SMAW	E6010	1/8	DCEP (reverse)	80-120	20-26	5-6
Cap	SMAW	E6010	1/8"	DCEP (reverse)	110-165	20-26	5-6

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. The minimum preheat shall be in accordance with the fabrication code unless superseded 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) Tack will be of sufficient size and cross sectional area to retain the appropriate fit up

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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.

Cleaning :

- 1) 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

- 2) 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

- 3) Excessive slag 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.
- 4) The completed weld shall blend smoothly into the surface plain of the parent metal.
- 5) Excessive weld reinforcement and excessive weave width shall be avoided. Reinforcement shall not exceed the allowable limits of the fabrication code.
- 6) 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.
- 7) 10) E6010 electrodes shall be stored in a dry holding box (125°F max).
- 8) 12) The low hydrogen electrodes shall be protected from moisture pick up during welding. The electrodes should not be exposed to high moisture (un heated exposure) for periods greater than 4 hours. Rods exceeding this exposure time shall be discarded or baked at 500°F to 600°F for 2 hours before returning to a normal rod oven.
- 9) 13) Weld Backing strips are not allowed with out the written approval of the client. Specific

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client not allowing backing strips. Written approval must be appended to welding procedure or shop traveler.

- 10) 14) Amperage, voltage and travel are non-essential variable and are projected ranges that should be followed closely.

Welder Qualification - Welders using this procedure shall be qualified in accordance with applicable section of ASME Section IX (Latest Edition).

Recommended General Repair Procedure Rules

This section of the document is intended to provide basic guidelines for repair of defects in welds and base metals.

Extensive or unusual repairs will be documented through normal procedures by obtaining a rework router through the Methods Department.

This procedure is to apply to all repairs of weldments.

Procedures:

Defective or unsound welds or base metal shall be corrected by either removal or replacement of the entire area or as follows:

1. Overlap Or Excessive Convexity- Reduce by removal of excess metal.
2. Excess Concavity Of Weld Or Crater, Undersized Welds Or Undercut-Clean and deposit additional weld metal.
3. Excessive Weld Porosity, Slag-Inclusions, Incomplete Fusion Or Penetration- Remove defective portion and re-weld. The cavity created by excavation (groove) shall have approximately a 15° bevel all around and a root radius of 1/8" minimum. Use caution NOT to nick base metal outside of groove.
4. Cracks In Weld Or Base Metal- Remove the crack to sound metal and at least 50% of the crack length, or two (2) inches (whichever is least) beyond each end of the crack and re-weld, observing all provisions of this Procedure. The minimum length of the weld repair groove should not be less than two (2) inches. Minimize removal of base metal during repair cavity excavation. Minimize heat input when excavating repair cavity with Arc-Air process. Excess heat may cause the crack to propagate.
5. Contour of repair welds shall blend smoothly into adjacent welds and base metal.
6. Slugging of welds is not permitted.
7. Improperly fitted parts should be cut apart and refitted at the discretion of supervision.
8. Minor distortion caused by welding may be corrected by mechanical means, as approved by

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Engineering.

Inspectors

Visual-All visual welding inspectors shall be qualified and certified to the requirements of AWS QC-1-96 Standard for Qualification and Certification of Welding Inspectors or one of the applicable API certifications (example 510, 563, 570).



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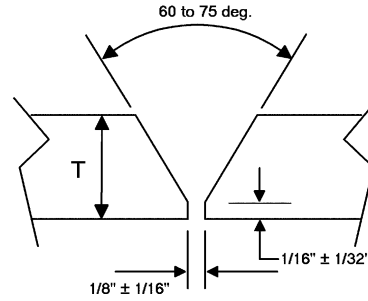
Procedure Qualification Record (PQR)

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Welding Process(es) / Type(s): SMAW / Manual

Joints (QW-402)

Weld Type: Groove weld
Single-bevel groove
 Backing: Open butt, no back weld
 Root Opening: 3/32" in. Root Face: 3/32" in.
 Groove Angle: 30 °



SINGLE VEE GROOVE

No nonmetallic retainers allowed.

Base Metals (QW-403)

Material Spec., Type or Grade: SA-36 to SA-36
 P-No.: 1 Group No.: 1 to P-No.: 1 Group No.: 1
 Thickness of Test Coupon (in.): 0.375
 UNS# K02600

Postweld Heat Treatment (QW-407)

Type: No PWHT performed
 Temperature: None °F
 Time: None hr

Filler Metals (QW-404)

SFA Specification: 5.1
 AWS Classification: E6010
 Filler Metal F-No: 3
 Weld Metal Analysis A-No: 1
 Size of Filler Metal (in.): 1/8
 Weld Deposit 't' (in.): 0.375
 Pass Greater Than 1/2": No
 Filler Metal Trade Name: Atom Arc Electrode

Gas (QW-408)

Gas Composition / Flow Rate

Shielding: N/A
 Trailing: N/A
 Backing: N/A

Electrical Characteristics (QW-409)

Current / Polarity: DCEP (reverse)
 Amps: 70
 Volts: 22
 Tungsten Type / Size: N/A
 Heat Input: N/R

Positions (QW-405)

Position of Joint: 3G - Vertical
 Weld Progression: Vertical down

Technique (QW-410)

Travel Speed (in/min): 7-8
 Thermal Processes: Yes
 String/Weave Bead: Stringer and weave bead
 Oscillation: N/A
 Mult./Single Pass (per side): Multipass
 Mult./Single Electrode: N/A

Preheat (QW-406)

Preheat Temp.: 70 °F
 Interpass Temp.: 400 °F
 Preheat Maintenance: Monitored with temp stick.
 Each side of the beveled plate was preheated to remove moisture.

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Optional Notes (Continued)

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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	0.749	0.361	0.270	17000	63000	Ductile - BM
2	0.744	0.368	0.274	17200	62800	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
QW-462.2 Side bend	Acceptable	QW-462.2 Side bend	Acceptable

Hardness Test - Rockwell-B hardness

Location	Readings								
	1	2	3	4	5	6	7	8	9
SA-36 BM	63.6								
SA-36 HAZ	76.5								
Weld metal	86.1								

Visual Examination: Satisfactory

Welder's Name: Carpenter, Barry ID: BC2 Stamp: BC2

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

Tests Conducted By: BC's Inspection and Fabrication Test ID.: 15280

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: _____ 4/15/2008 QA/QC Manager

RONNIE SARVIS

Date