TOPCOR BELCO

P.O. BOX 1019

PRAIRIEVILLE, LA. 70769

Welding Procedure Specification (WPS)

WPS No.: **TopCorBelco-107-SM** Date: **4/21/2008** Rev.: **0** Page: **1 of 4**

By: Date Signed: 4/18/2008

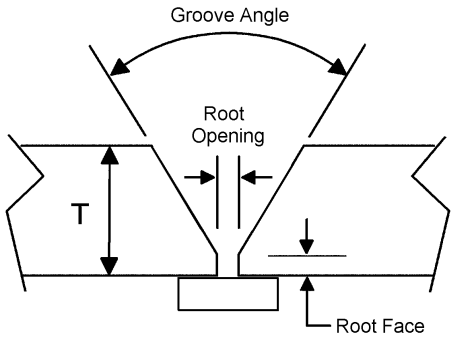
Supporting PQR's: **TopCorBelco 107-SM/A**

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

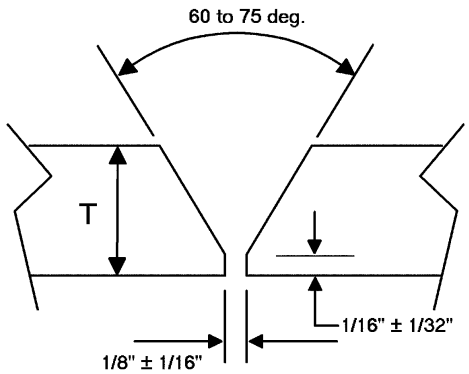
Joints (QW-402)

Joint Design: Groove and fillet welds

Backing: With backing only Backing Material: 304 Base or weld deposit



SINGLE VEE GROOVE



SINGLE VEE GROOVE

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

Retainers: None

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)

P-No.: 8 Group No.: 1 Thickness Range (in.): 0.0625 to 0.5600

to P-No.: 8 Group No.: 1

All P-8 304 series

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): 5.4

AWS No. (Class): E308-16

F No.: 5 A No.: 8

Weld Metal Thickness Range: 0.062 to 0.5600 in. No Pass Greater Than ½" Allowed

Flux Type: N/A

Flux Trade Name: N/A

Consumable Insert: N/A

Other: Deposit from PQR = .280"

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Positions (QW-405)
Position of Joint: All Positions
Weld Progression: Vertical up

Preheat (QW-406)
Preheat Temp. Min.: 50 °F
Interpass Temp. Max.: 350 °F
Preheat Maintenance: None

Postweld Heat Treatment (QW-407)
Type: No PWHT will be performed
Temperature Range: None °F
Time Range: None

Gas (QW-408)
Gas Composition / Flow Rate
Shielding: N/A
Trailing: N/A
Backing: N/A

Electrical Characteristics (QW-409)
Current Type / Polarity: DCEP (reverse)
Tungsten Electrode Type and Size: N/A
Mode of Metal Transfer for GMAW: N/A
Max. Heat Input (J/in): None

Technique (QW-410)
String or Weave Bead: Stringer and weave bead
Initial and Interpass Cleaning: With Stainless steel brush clean 2 inches (50 mm) on both sides of weld joint
Method of Back Gouging: When required, grind until all defects are removed.
Oscillation: N/A
Contact Tube to Work Distance: N/A
Single or Multiple Passes (per side): Multipass
Single or Multiple Electrodes: N/A
Peening: None

Process Welding Parameters

Weld Layer(s) and/or Pass(es)	Process	Filler Metal Class	Filler Metal Diameter (in.)	Current Type / Polarity	Current Amperage Range	Voltage Range	Travel Speed Range (in/min)
Any	SMAW	E308-16	3/32	DCEP (reverse)	60-90	21-26	Var.
Any	SMAW	E308-16	1/8	DCEP (reverse)	80-120	21-26	Var.
Any	SMAW	E308-16	5/32	DCEP (reverse)	110-160	20-24	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. 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.

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) Aexcessive 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) 4The 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) 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) E308-15 electrodes shall be stored in a dry holding box (125°F max).

8) The E308-15 electrodes shall be stored in a rod oven after opening at 225°F minimum.

9) 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.

10) 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.

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

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Procedure Qualification Record (PQR)

PQR No.: **TopCorBelco 107-SM/A** WPS No.: **TopCorBelco 107-SM** Date: **4/18/2008** Page: **1 of 3**

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

Joints (QW-402)

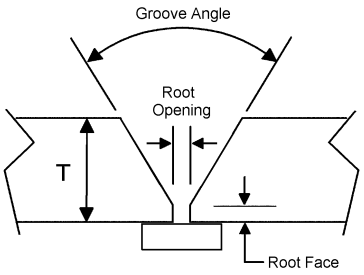
Weld Type: Groove weld

Single-V groove

Backing: Backing used

Root Opening: 1/8" in. Root Face: .3/32" in.

Groove Angle: 30 °



SINGLE VEE GROOVE

SA-312 T304 Base Metal

Base Metals (QW-403)

Material Spec., Type or Grade:

SA-312, TP304 to SA-312, TP304

P-No.: 8 Group No.: 1 to P-No.: 8 Group No.: 1

Thickness of Test Coupon (in.): 0.28

Diameter of Test Coupon (in.): 6.625

Filler Metals (QW-404)

SFA Specification: 5.4

AWS Classification: E308-16

Filler Metal F-No: 5

Weld Metal Analysis A-No: 8

Size of Filler Metal (in.): 3/32

Weld Deposit 't' (in.): 0.28

Pass Greater Than ½": No

Positions (QW-405)

Position of Joint: 6G - 45 degree pipe

Weld Progression: Vertical up

Preheat (QW-406)

Preheat Temp.: 50 °F

Interpass Temp.: 350 °F

Preheat Maintenance: monitored with temperature crayon

Postweld Heat Treatment (QW-407)

Type: No PWHT performed

Temperature: None °F

Time: None hr

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: 24

Tungsten Type / Size: N/A

Heat Input: N/R

Technique (QW-410)

Travel Speed (in/min): -

Thermal Processes: No

String/Weave Bead: Stringer and weave bead

Oscillation: N/A

Mult./Single Pass (per side): Multipass

Mult./Single Electrode: N/A

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		
Root	SMAW	E308-16	3/32	DCEP (reverse)	70	24	
Hot	SMAW	E308-16	3/32	DCEP (reverse)	90	24	
Cap	SMAW	E308-16	3/32	DCEP (reverse)	90	24	

Optional Notes

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Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (in²)	Ultimate Total Load (lb)	Ultimate Stress (PSI)	Failure Type and Location
1	0.750	0.238	0.179	15100	84400	Ductile - BM
2	0.750	0.230	0.173	14500	83800	Ductile - BM

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.3(b) Face bend	Acceptable	QW-462.3(b) Root bend	Acceptable
QW-462.3(b) Face bend	Acceptable	QW-462.3(b) Root bend	Acceptable
QW-462.3(b) Face bend	Acceptable	QW-462.3(b) Root bend	Acceptable

Macro-Examination Test: NA

Visual Examination: Satisfactory

Liquid Penetration Test: NA

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 & Fabrication Test ID.: 41930

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: _____ 4/18/2008 QA/QC Manager

RONNIE SARVIS Date