TOPCOR BELCO

P.O. BOX 1019

PRAIRIEVILLE, LA. 70769

Welding Procedure Specification (WPS)

WPS No.: **TopCorBelco-105-FC** Date: **4/18/2008** Rev.: **0** Page: **1 of 2**

By: Date Signed: 4/18/2008

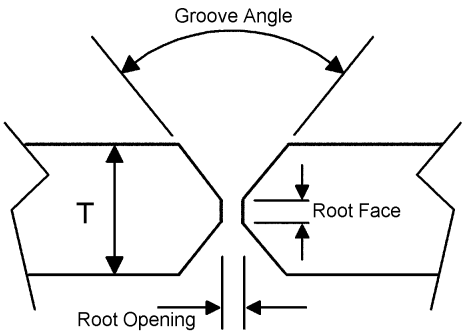
Supporting PQR's: **TopCorBelco-105-FC/A**

Welding Process(es) / Type(s): **FCAW / Semiautomatic**

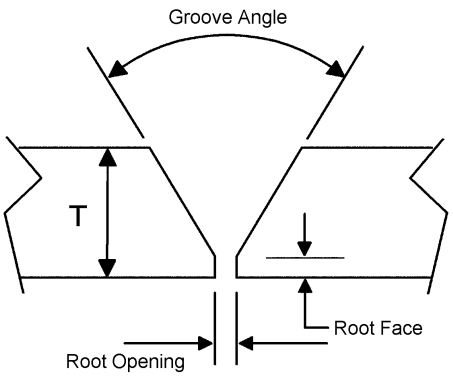
Joints (QW-402)

Joint Design: Groove and fillet welds

Backing: With or without backing Backing Material: Parent metal for fillet joints.



DOUBLE VEE GROOVE



SINGLE VEE GROOVE

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

Retainers: None

Weld meatl for second side.

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-516 Gr. 70 Plate P-No.: 1 Group No.: 1-2 Thickness Range (in.): 0.1875 to 1.5000

to SA-516 Gr.70 P-No.: 1 Group No.: 1-2

All diameters

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): 5.20

AWS No. (Class): E71T-1

F No.: 6 A No.: (verify chemistry)

Weld Metal Thickness Range: 0.187 to 1.5000 in. No Pass Greater Than ½" Allowed

Flux Type: N/A

Flux Trade Name: N/A

Consumable Insert: N/A

Other: HT# 706609

Product Form: Flux cored

Supplemental Filler Metal: E71-T1

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Positions (QW-405)

Position of Joint: All Positions

Weld Progression: Vertical up

All Positions

Postweld Heat Treatment (QW-407)

Type: No PWHT will be performed

Temperature Range: None °F

Time Range: None

Preheat (QW-406)

Preheat Temp. Min.: 200 °F

Interpass Temp. Max.: 650 °F

Preheat Maintenance: Slow cool in still air.

200 F >= 1.250" wt.

50 F < 1.250" wt

Gas (QW-408)

Gas Composition / Flow Rate

Shielding: 75% Argon, 25% CO2 / 59-78 CFH

Trailing: None

Backing: None

Electrical Characteristics (QW-409)

Current Type / Polarity: DCEP (reverse)

Tungsten Electrode Type and Size: N/A

Mode of Metal Transfer for GMAW: Spray arc

Max. Heat Input (J/in): None

Technique (QW-410)

String or Weave Bead: Stringer or weave bead

Orifice or Gas Cup Size: 3/8" to 5/8"

Initial and Interpass Cleaning: With wire brush clean 1 inch (25 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: 3/4"

Single or Multiple Passes (per side): Single and multipass

Single or Multiple Electrodes: N/A

Peening: None

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	FCAW	E71T-1	0.035	DCEP (reverse)	120-200	19-24	3-21	156-216
Any	FCAW	E71T-1	0.045	DCEP (reverse)	150-225	22-26	3-21	156-216
Any	FCAW	E71T-1	1/16	DCEP (reverse)	175-275	25-28	3-21	156-216
Any	FCAW	E71T-1	5/64	DCEP (reverse)	200-400	26-32	3-21	156-216
Any	FCAW	E71T-1	3/32	DCEP (reverse)	300-500	26-34	3-21	156-216

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Procedure Qualification Record (PQR)

PQR No.: **TopCorBelco-105-FC/A** WPS No.: **TopCorBelco-105-FC** Date: **4/18/2008** Page: **1 of 4**

Welding Process(es) / Type(s): **FCAW / Semiautomatic**

Joints (QW-402)

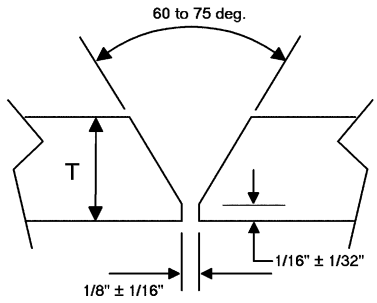
Weld Type: Groove weld

Single-V groove

Backing: Back welded

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

Groove Angle: 35 °



SINGLE VEE GROOVE

Base Metals (QW-403)

Material Spec., Type or Grade:

SA-516, Grade 70 to SA-516, Grade 70

P-No.: 1 Group No.: 2 to P-No.: 1 Group No.: 2

Thickness of Test Coupon (in.): 0.750

Filler Metals (QW-404)

SFA Specification: 5.20

AWS Classification: E71T-1

Filler Metal F-No: 6

Weld Metal Analysis A-No: (verify chemistry)

Size of Filler Metal (in.): 0.045

Weld Deposit 't' (in.): 0.750

Pass Greater Than ½": No

Filler Metal Product Form: Flux cored

Filler Metal Trade Name: HT# 706609

Supplemental Filler Metal: E71-T1

Positions (QW-405)

Position of Joint: 3G - Vertical

Weld Progression: Vertical up

Preheat (QW-406)

Preheat Temp.: 50 °F

Interpass Temp.: 650 °F

Postweld Heat Treatment (QW-407)

Type: No PWHT performed

Temperature: None °F

Time: None hr

Gas (QW-408)

Gas Composition / Flow Rate

Shielding: 75% Argon, 25% CO2 / 65 CFH

Trailing: None

Backing: None

Electrical Characteristics (QW-409)

Current / Polarity: DCEP (reverse)

Amps: 160-189

Volts: 21-23

Tungsten Type / Size: N/A

Transfer Mode: Spray arc

Wire Feed Speed: 156-216

Heat Input: N/R

Technique (QW-410)

Travel Speed (in/min): 4.2-10.2

Thermal Processes: No

String/Weave Bead: Weave bead

Oscillation: N/A

Mult./Single Pass (per side): Single and multipass

Mult./Single Electrode: N/A

Nozzle/Gas Cup Size: 8-9

Contact Tube to Work Dist.: 3/4"

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Procedure Qualification Record (PQR)

PQR No.: **TopCorBelco-105-FC/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		
1	FCAW	E71T-1	0.045	DCEP (reverse)	160	23	6.0
2	FCAW	E71T-1	0.045	DCEP (reverse)	160	23	4.2
3	FCAW	E71T-1	0.045	DCEP (reverse)	160	22	6.8
4	FCAW	E71T-1	0.045	DCEP (reverse)	160	22	7.2
5	FCAW	E71T-1	0.045	DCEP (reverse)	175	23	6.8
6	FCAW	E71T-1	0.045	DCEP (reverse)	175	22	6.5
7	FCAW	E71T-1	0.045	DCEP (reverse)	140	21	4.3
8	FCAW	E71T-1	0.045	DCEP (reverse)	140	21	4.5
9	FCAW	E71T-1	0.045	DCEP (reverse)	189	21	10.2
10	FCAW	E71T-1	0.045	DCEP (reverse)	190	22	10.1

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.

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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
T-1	0.751	0.712	0.535	43500	81300	Ductile - BM
T-2	0.749	0.700	0.524	42100	80300	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: 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.: 43566

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