SAFETY AND BUILDINGS DIVISION
Plumbing Product Review
P.O. Box 7302
Madison, Wisconsin 53701-2658
TTY: Contact Through Relay

Scott Walker, Governor
Dave Ross, Secretary

October 5, 2016

FELKER BROS. CORP.
RANDY KROGMAN
22 N. CHESTNUT AVE.
MARSHFIELD WI 54449

Re: Description: PIPES AND FITTINGS, STAINLESS STEEL
Manufacturer: FELKER BROS. CORP.
Product Name: (trans id 2776199) STAINLESS STEEL PIPE AND FITTINGS
Model Number(s): WELDED A312 STAINLESS STEEL PIPE SCHEDULES 5S, 10S, 40S, 10, 20, 30, 40 AND STD IN THE FOLLOWING SPECIFIC SIZES: 2, 2½, 3, 3½, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 24, 30 AND 36"
Product File No: 20160231

The specifications and/or plans for this plumbing product have been reviewed and determined to be in compliance with chapters SPS 382 through 384, Wisconsin Administrative Code, and Chapters 145 and 160, Wisconsin Statutes.

The Department hereby issues an alternate approval to s. SPS 384.30 (2) (a) & (b) based on the Wisconsin Statutes and the Wisconsin Administrative Code. This approval is valid until the end of October 2021.

This approval supersedes the approval issued on December 29, 2011 under product file number 20110250.

This alternate approval is contingent upon compliance with the following stipulation(s):

- This stainless steel pipe may have the following end configurations provided by and in accordance with the manufacturer:

  Flanged Ends: All sizes can be furnished flanged with either flat or angle face rings and back-up flanges (ductile iron, carbon or stainless steel). A full range of metal to metal connectors, through 36" and larger, is also available for use with either metal to metal clamps or back-up flanges. Sizes of 3" and 4" long radius 45° elbows require long tangent to be flanged.

  Belled Ends: All sizes 2" through 36" (maximum 0.188 wall thickness) can be belled.

  Rolled Grooved End: Felker standard roll grooving capabilities are suitable for use with Victaulic couplings and others.

  Beveled Ends

- This product is approved for water distribution piping provided the welding procedures found within the attached documents are used.

- This product can be used in the following locations:
  ....Sanitary DWV drain piping.
  ....Sanitary building sewer.
  ....Storm drain piping.
  ....Storm sewer.

- DWV fittings shall conform to the radius requirements ins. SPS 382.30 (8) Wis. Adm. Code.

The department is in no way endorsing this product or any advertising, and is not responsible for any situation which may result from its use.

Sincerely,

Glen W. Schlueter
Environmental Engineer - Plumbing Product Reviewer
Department of Safety and Professional Services
Division of Industry Services
Bureau of Technical Services
(608) 267-1401 Phone
(608) 267-9723 Fax
glen.schlueter@wi.gov E-mail

WELDING PROCEDURE SPECIFICATION

NO.8-3-1

FOR

GAS TUNGSTEN ARC WELDING (GTAW)

OF

AUSTENITIC STAINLESS STEEL PIPE, VALVES, FITTINGS AND FLANGES

USING ERXXX FILLER METAL WITHOUT POSTWELD HEAT TREATMENT

THIS DOCUMENT IS THE PROPERTY OF

J. F. Ahern Company

(Company)

Jointly Developed With The

NATIONAL CERTIFIED PIPE WELDING BUREAU

5410 Grosvenor Lane, Suite 120

Bethesda, MD 20814

WELDING PROCEDURE SPECIFICATION (WPS)

Company Name: J. F. AHERN CO.

WPS Number: 8-3-1 **Original WPS Date:** 4-1-75 **Supporting PQRs:** 87802, 87804

Revision Number: 1 (8.10) **Revision Date:** 5-5-87

Welding Process: Gas Tungsten Arc (GTAW) **Type:** Manual

Joints (QW-402)

Joint Design: Sq,SBev,V,U,J,Fillet, Repair, Build-up Details: See other side for typical joints

Backing: Optional Backing Material Type: Stainless Steel, when used

Base Metals (QW-403)		Filler Metals (QW-404)	Root	Balance
P-Number: 8	Group Number: 1	Specification Number (SFA):	5.9	5.9
to P-Number: 8	Group Number: 1	Classification:	ERXXX (see below)	ERXXX (see below)
Thickness Range		F-number:	6	6
Groove Welds:	1/16 to 8"	A-Number:	8	8
Fillet Welds:	All	Maximum Deposited Weld Metal Thickness - Groove:		8"(includes root)
Pipe Diameter Range		- Fillet:	All	All
Groove Welds:	Over 1" O.D.	Maximum Bead Thickness:	1/8"	1/8"
Fillet Welds:	All	Flux Trade Name:	N/A	N/A
		Consumable Insert:	None	None

Positions (QW-405)

Welding Positions: All

Welding Progression: Uphill

Postweld Heat Treatment (QW-407)

Temp. Range: None

Time Range: N/A

Preheat and Interpass Temperature (QW-406)

Minimum Preheat: 50°F

Maximum Interpass: 350°F*

Preheat Maintenance: Not Required

Gas (QW-408)

Shielding Gas: 100% Argon

Composition: Welding Gr.

Flow Rate: 8-20 CFH

Gas Backing: Ar or N at 5-15 CFH

Trailing Shield: None

Electrical Characteristics (QW-409)

Current Type: DC

Polarity: Straight

Amperage: See Table

Electrode Feed Speed: N/A

Voltage: N/A

Travel Speed: See Table

Tungsten Type: 2% Thoria

Tungsten Size: 3/32,1/8"

Pulsed Current: None

Technique (QW-410)

String or Weave Bead: Either

Method of Backgouging: None

Initial and Interpass Cleaning: Grind to remove cutting oxide, solvent clean to remove cutting oil. Grind or wire brush to remove slag and silica deposits.

Orifice or Gas Cup Size: #4 to #12

Oscillation: N/A

Contact Tube to Work Distance: N/A

Multiple or Single Pass: Either

Multiple or Single Electrode: N/A

Peening: Not Permitted

Other:

Use 3/32" tungsten on Schedule 5 or 10 pipe

When welding different types of 300 series stainlesses to each other,select a filler metal designated for both types.

Weld Layer*	Welding Process	Filler Metal Class	Filler Metal Dia. (in)	Current Type/Polarity	Current Amps	Volts	Travel Speed * (ipm)
1(S5,10)	GTAW(3/32)	As Above	3/32 or 1/8	DCSP	40-60		2-4
1(S40+)	GTAW	As Above	3/32 or1/8	DCSP	70-100		2-4
Fill and Fillets	GTAW	As Above	3/32	DCSP	70-170		2-6
	GTAW	As Above	1/8	DCSP	70-200		2-8

Base Metal	Other Filler Metal
304	308,308L,316,316L
304L	308L,316,316L
316	316, 316L
316L	316L
321,347	308L,321

*These values are recommended only, not mandatory

The undersigned contractor, a member of the National Certified Pipe Welding Bureau, hereby adopts this jointly developed procedure as its company Welding Procedure Specification and certifies that this procedure has been qualified as shown on the attached Procedure Qualification Record.

NATIONAL CERTIFIED PIPE WELDING BUREAU — THE SEAL OF QUALITY PIPE WELDING

Contractor: J. F. AHERN CO.

By: Date:

Title: WPS 8-3-1

PROCEDURE QUALIFICATION RECORD (PQR)

WPS followed during welding of test coupon: WP-43, Rev 17 dated 1/21/83 Test Date: 2-11-83

Welding Process(s) used: Gas Tungsten Arc Type: Manual

Base Metal Specification: SA-240, Type 304 to Base Metal Specification: SA-240, Type 304

P-No: 8 Group No: 1 to P-No: 8 Group No: 1 Thickness: 1.75"

Plate: X Diameter if Pipe: _____ Joint Type: Single V-Groove without backing, 1/8 root opening

Filler Metal Specification: SFA 5.9 AWS Classification: ER308L - ER308 F-No: 6

A-No: 8 Filler Metal Size: 3/32, 1/8 Supplementary Filler Metal: NA

Weld Metal Deposit Thickness: 1.75 Maximum Pass Thickness: 0.188

Preheat Temp (°F): 50 Interpass Temp (°F): 350 Welding Position/Progression: 3G Uphill

Tungsten Type/Size: 2% Thoria, 1/8" Current: DC Polarity: SP Travel Speed: NA ipm

Postweld Heat Treatment (°F): None Heat Treatment Time (Hrs): NA

Shielding Gas Composition: Welding Grade Argon,25-35 CFH Backing Gas: Argon, 25-35 CFH

Stringer/Weave Bead: Stringer and Weave Transfer Mode: NA

Oscillation: NA Single/Multi-Pass: Multi Single/Multi-Arc: Single

Layer	Process	Filler Class	Diameter	Amperage	Travel Speed	Other
1,2	GTAW	ER308L	3/32	90	2.4-2.5 ipm	
3	GTAW	ER308	1/8	110	2.0 ipm	
4/81	GTAW	ER308	1/8	125-145	2-3 ipm	

Reduced Section Tensile Tests

Specimen No.	Width/Dia.	Thickness	Area	Ult. Load (lbs)	Ult. Stress (psi)	Failure Location
T11 Crown	0.508		0.203	17,800	87,700	Base Metal
T12 Root	0.510		0.204	18,400	90,200	Base Metal
T21 Crown	0.510		0.204	18,400	90,200	Base Metal
T22 Root	0.510		0.204	18,100	88,700	Base Metal

Guided Bend Tests [X] QW-452.2 (Side) [ ] QW-462.3(a) (Trans R&F) [ ] QW-462.3(b) (Long R&F)

Side	Acceptable	Side	Acceptable
Side	Acceptable	Side	Acceptable

Welder's Name: J. Hancock, H. Cain Stamp No. 950-731, 13-65 Test Number: M-6988

Welding Witnessed by: L. M. Petrick, ESI Specimens Evaluated by: Lucius Pitkin Laboratory

We certify that the statements in this record are correct, and that the test coupons were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

NATIONAL CERTIFIED PIPE WELDING BUREAU

Contractor: J. F. AHERN CO.

By: _____ Date: _____

BY: _____

Chairman, Technical Committee

NCPWB Form QW-483 4/87

PQR Number: 87802

PROCEDURE QUALIFICATION RECORD (PQR)

WPS followed during welding of test coupon: SP-302, Rev 2 Test Date: 7-7-77

Welding Process(s) used: Gas Tungsten Arc Type: Manual

Base Metal Specification: SA-312 type 304 to Base Metal Specification: SA-312 type 304

P-No: 8 Group No: 1 to P-No: 8 Group No: 1 Thickness: 0.280

Plate: — Diameter if Pipe: 6" Joint Type: Single V-Groove without backing

Filler Metal Specification: SFA 5.9 AWS Classification: ER308 F-No: 6

A-No: 8 Filler Metal Size: 1/16,3/32,1/8 Supplementary Filler Metal: NA

Weld Metal Deposit Thickness: 0.280 Maximum Pass Thickness: 0.10

Preheat Temp (°F): 60 Interpass Temp (°F): 350 Welding Position/Progression: 1G Rolled

Tungsten Type/Size: Not Recorded Current: DC Polarity: SP Travel Speed: below lpm

Postweld Heat Treatment (°F): None Heat Treatment Time (Hrs): NA

Shielding Gas Composition: Welding Grade Argon, 15-25 CFH Backing Gas: Argon, 10-20 CFH

Stringer/Weave Bead: Weave, 3X wire size Transfer Mode: NA

Oscillation: NA Single/Multi-Pass: Multi Single/Multi-Arc: Single

Layer	Process	Filler Class	Diameter	Amperage	Travel Speed	Other
	GTAW	ER308	1/16	95	2.0 ipm	
	GTAW	ER308	3/32	105	2.0	
	GTAW	ER308	1/8	120	2.0	

Reduced Section Tensile Tests

Specimen No.	Width/Dia.	Thickness	Area	Ult. Load (lbs)	Ult. Stress (psi)	Failure Location
T-1	0.753	0.200	0.151	13,250	88,000	Weld Metal
T-2	0.752	0.216	0.162	14,150	87,100	Weld Metal

Guided Bend Tests [ ] QW-452.2 (Side) [X] QW-462.3(a) (Trans R&F) [ ] QW-462.3(b) (Long R&F)

Face	No defects-acceptable	Root	No defects-acceptable
Face	No defects-acceptable	Root	No defects-acceptable

Welder's Name: Jim Gilcrist Stamp No. F-305 Test Number: 776238

Welding Witnessed by: James J. Sekely Specimens Evaluated by: Earl Gallagher, PTL

We certify that the statements in this record are correct, and that the test coupons were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

NATIONAL CERTIFIED PIPE WELDING BUREAU

Contractor: J. F. AHERN CO.

By: Date:

BY: James J. Sekely

Chairman, Technical Committee

NCPWB Form QW-483 4/87

PQR Number: 87804

***Satellite Location - Felker Mill**

(QW-482) WELDING PROCEDURE SPECIFICATION

FELKER BROTHERS CORPORATION

Procedure Specification No. *Tube 1A*

Supporting PQR NO. *Tube 1A*

BY: *Dennis Adler*

Date: *09/30/1994*

Revision No. *0* Date: *09/30/1994*

WELDING PROCESSES : *GTAW* Type: *Machine*

*1 Essential Variable

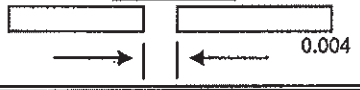
*2 Non-Essential Variable

(QW-402) JOINTS

*2 Joint Design *Square Groove*

*2 Backing *None*

Joint Details



(QW-403) BASE METALS

*1 P-No. 8 Gr. No. 1 to P-No. 8 Gr. No. 1

THICKNESS RANGE

*1 Base Metal : *.073 - .190*

Deposited Weld Metal: *None*

(QW-407)

*Filler Metal: *None*

(QW-406) PREHEAT

*1 Preheat Temp. Min. *60° F*

Interpass Temp. Max. *300° F*

(QW-407) POSTWELD HEAT TREATMENT

Temperature Range *1900 - 2050 F.*

Time Range *QUICK WATER QUENCH*

(QW-405) POSITIONS

*2 Position of Grooves *1G OD*

4G ID

*1 **(QW-408) GAS**

Torch	Shielding Gas	Flow Rate	Plasma Gas	Flow Rate	Backing Gas	Flow Rate	Trailing Gas	Flow Rate
O.D. Tig 1	*Argon*	*20 - 45 CF*			*Argon*	*20 - 45 CF*	*Argon*	*5 - 45 CF*
O.D. Plasma								
O.D. Tig 2								
I.D. Tig	*Arg*	*20-45 CF*					*Arg*	*20-45 CF*

*2 **(QW-409) ELECTRICAL CHARACTERISTICS**

Current: *DC* Polarity: *Straight*

Torch:	Amps Range	Volts Range	Tungsten Size & Type	
O.D. Tig 1	*125 - 420*	*12 - 20*	*3/16*	*2% thoriated*
O.D. Plasma				
O.D. Tig 2				
I.D. Tig	*75 - 270*	*12 - 21*	*1/8*	*2% thoriated*

For amperage and voltage range of each thickness welded, see attachment to form.

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Tube 1A

WPS - Page 2
Rev. 0 Date: 09/30/94

*2

(QW-410) TECHNIQUE

String or Weave Bead : *String*

Torch	Gas Cup Size	Plasma Orifice Size
O.D. Tig 1	*1/2"*	
O.D. Plasma		
O.D. Tig 2		
I.D. Tig	*No. 8*	

Multiple or single pass per side *Single*

Multiple or single electrodes *Multiple*

Travel speed range 13 - 30 IPM *see attachments for each thickness

Torch	Oscillation
O.D. Tig 1	*Width 25, Frequency 06, Dwell 00*
O.D. Tig 2	
O.D. Tig 3	
I.D. Tig	

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ATTACHMENT - WELDING PROCEDURE SPECIFICATION NO. TUBE 1A

Rev. 0
Date: 09/30/94

Gauge	Torch	Amp-Range	Volt Range	Travel Speed
10" SCH 5	OD # 1	340 - 380	12 - 18	13 - 30 IPM
	Plasma			
	OD # 3			
	ID	130 - 210	15 - 20	
10" SCH 10	OD # 1	380 - 415	12 - 18	13 - 30 IPM
	Plasma			
	OD # 3			
	ID	140 - 270	15 - 21	
10" SCH 10 FG	OD # 1	375 - 420	12 - 18	13 - 30 IPM
	Plasma			
	OD # 3			
	ID	140 - 270	15 - 21	
12" SCH 5	OD # 1	340 - 380	12 - 18	13 - 30 IPM
	Plasma			
	OD # 3			
	ID	140 - 270	15 - 20	
12" SCH 10	OD # 1	380 - 415	12 - 18	13 - 30 IPM
	Plasma			
	OD # 3			
	ID	140 - 270	15 - 21	
12" SCH 10 FG	OD # 1	380 - 415	12 - 18	13 - 30 IPM
	Plasma			
	OD # 3			
	ID	140 - 270	15 - 21	

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***Satellite Location - Felker Mill**

(QW-482) WELDING PROCEDURE SPECIFICATION

FELKER BROTHERS CORPORATION

Procedure Specification No. *Tube 2A*

Supporting PQR NO. *Tube 2A*

BY: *Denny Adler*

Date: *12/06/1995*

Revision No. *0* Date: *12/06/1995*

WELDING PROCESSES : *GTAW* Type: *Machine*

*1 Essential Variable

*2 Non-Essential Variable

*2 (QW-402) JOINTS

Joint Design *Square Groove*

*2 Backing *None*

Joint Details

0.004

*1 (QW-403) BASE METALS

P-No. 8 Gr. No. 1 to P-No. 8 Gr. No. 1

THICKNESS RANGE

*1 Base Metal : *.045 - .085*

Deposited Weld Metal: *None*

(QW-407)

Filler Metal: *None*

*1 (QW-406) PREHEAT

Preheat Temp. Min. *60* F*

Interpass Temp. Max. *300* F*

(QW-407) POSTWELD HEAT TREATMENT

Temperature Range *N/A*

Time Range *N/A*

*2 (QW-405) POSITIONS

Position of Grooves *1G*

*1 (QW-408) GAS

Torch	Shielding Gas	Flow Rate	Plasma Gas	Flow Rate	Backing Gas	Flow Rate	Trailing Gas	Flow Rate
O.D. Tig 1	*Argon*	*20 - 40 CFH*			*Argon*	*40 - 55 CFH*	*Argon*	*2-8 CFH*
O.D. Plasma								
O.D. Tig 2								
I.D. Tig								

*2 (QW-409) ELECTRICAL CHARACTERISTICS

Current: *DC* Polarity: *Straight*

Torch:	Amps Range	Volts Range	Tungsten Size & Type
O.D. Tig 1	*110 - 180*	*12-26 V*	*3/16 2% thoriated*
O.D. Plasma			
O.D. Tig 2			
I.D. Tig			

For amperage and voltage range of each thickness welded, see attachment to form.

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Tube 2A

Rev. 0 Date: 12/06/95

(QW-410) TECHNIQUE

String or Weave Bead : *String*

Torch	Gas Cup Size	Plasma Orifice Size
O.D. Tig 1	*1/2"*	
O.D. Plasma		
O.D. Tig 2		
I.D. Tig		

Multiple or single pass per side *Single*

Multiple or single electrodes *Single*

Travel speed range 18 - 30 IPM *see attachments for each thickness

Torch	Oscillation
O.D. Tig 1	*Width 25, Frequency 06, Dwell 00*
O.D. Tig 2	
O.D. Tig 3	
I.D. Tig	

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ATTACHMENT - WELDING PROCEDURE SPECIFICATION NO. TUBE 2A

Rev. 0
Date: 12/06/95

Gauge	Torch	Amp-Range	Volt Range	Travel Speed
16	***OD # 1***	*110 - 180*	*12 - 25*	*18 - 30 IPM*
	Plasma			
	OD # 3			
	ID			
14	***OD # 1***	*110 - 180*	*12 - 25*	*18 - 30 IPM*
	Plasma			
	OD # 3			
	ID			

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*Satellite Location - 35 Mill, 36 Mill

(QW-482) WELDING PROCEDURE SPECIFICATION

FELKER BROTHERS CORPORATION
Procedure Specification No. *Tube 3B*
Supporting PQR NO. *Tube 3B*

BY: *Dennis Adler*
Date: *10/09/93*

Revision No. *0* Date: *10/09/1993*

WELDING PROCESSES : *GTAW* Type: *Machine*

*1 Essential Variable
*2 Non-Essential Variable

*2 (QW-402) JOINTS
Joint Design *Square Groove*
*2 Backing *None*

Joint Details
0.004

*1 (QW-403) BASE METALS
P-No. 8 Gr. No. 1 to P-No. 8 Gr. No. 1
THICKNESS RANGE
*1 Base Metal : *.060 - .156*
Deposited Weld Metal: *None*

(QW-407)
Filler Metal: *None*

*1 (QW-406) PREHEAT
Preheat Temp. Min. *60* F*
Interpass Temp. Max. *300* F*

(QW-407) POSTWELD HEAT TREATMENT
Temperature Range *1900 - 2050 F.*
Time Range *QUICK WATER QUENCH*

*2 (QW-405) POSITIONS
Position of Grooves *1G - O.D.*
4G - I.D.

*1 (QW-408) GAS

Torch	Shielding Gas	Flow Rate	Plasma Gas	Flow Rate	Backing Gas	Flow Rate	Trailing Gas	Flow Rate
O.D. Tig 1	*85 - 15 Arg / Hyd*	*30 - 50 CFH*			*Argon*	*5 - 50 CFH*	*Argon*	*10 - 60 CFH*
Plasma								
O.D. Tig 2	*95 - 5 Arg / Hyd*	*10 - 40 CFH*			*Argon*	*5 - 50 CFH*	*Argon*	*5 - 20 CFH*
I.D. Tig	*Argon*	*30 - 45 CFH*						

*2 (QW-409) ELECTRICAL CHARACTERISTICS
Current: *DC* Polarity: *Straight*

Torch:	Amps Range	Volts Range	Tungsten Size & Type	
O.D. Tig 1	*230 -350*	*14 - 28*	*1/8*	*2% thoriated*
Plasma				
O.D. Tig 2	*160 - 250*	*13 - 25*	*3/16*	*2% thoriated*
I.D. Torch	*150 - 300*	*12-17*	*1/8*	*2% thoriated*

For amperage and voltage range of each thickness welded, see attachment to form.

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Tube 3B

WPS - Page 2
Rev. 0 Date: 10/09/93

(QW-410) TECHNIQUE

String or Weave Bead : *String*

Torch	Gas Cup Size	Plasma Orifice Size
O.D. Tig 1	*10*	
Plasma		
O.D. Tig 2	*10*	
I.D. Tig	*10*	

Multiple or single pass per side *Single*

Mulitple or single electrodes *Multiple*

Travel speed range 40 - 105 IPM *see attachments for each thickness

Torch	Oscillation
O.D. Tig 1	*Midpoint*
Plasma	*N/A*
O.D. Tig 2	*3*
I.D. Tig	*N/A*

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ATTACHMENT - WELDING PROCEDURE SPECIFICATION NO. TUBE 3B

Rev. 0
Date: 10/09/93

Gauge	Torch	Amp-Range	Volt Range	Travel Speed
3' sch 5	OD # 1	230-350	14-28	40 - 105 IPM
	Plasma			
	OD # 2	160-250	13-25	
	ID	150-300	12-17	
3" sch 10	OD # 1	230-350	14-28	40 - 105 IPM
	Plasma			
	OD # 2	160-250	13-25	
	ID	150-300	12-17	
4' sch 5	OD # 1	250-350	14-28	40 - 105 IPM
	Plasma			
	OD # 2	160-250	13-25	
	ID	150-300	12-17	
4' sch 10	OD # 1	250-350	14-28	40 - 105 IPM
	Plasma			
	OD # 2	160-250	13-25	
	ID	150-300	12-17	
3" sch 10 FG	OD # 1	250-350	14-28	40 - 105 IPM
	Plasma			
	OD # 2	160-250	13-25	
	ID	150-300	12-17	
4' sch 10 FG	OD # 1	250-350	14-28	40 - 105 IPM
	Plasma			
	OD # 2	160-250	13-25	
	ID	150-300	12-17	

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(QW-482) WELDING PROCEDURE SPECIFICATION

FELKER BROTHERS CORPORATION
Procedure Specification No. *Tube 4A*
Supporting PQR NO. *Tube 4A*

BY: *Dennis Adler*
Date: *8/29/95*

Revision No. *0* Date: *08/29/95*

WELDING PROCESSES : *GTAW/PLASMA* Type: *Machine*

*1 Essential Variable
*2 Non-Essential Variable

*2 (QW-402) JOINTS
*2 Joint Design *Square Groove*
*2 Backing *None*

Joint Details

*1 (QW-403) BASE METALS
P-No. 8 Gr. No. 1 to P-No. 8 Gr. No. 1
*1 THICKNESS RANGE
Base Metal : *.127 - .330*
Deposited Weld Metal: *None*

(QW-407)
Filler Metal: *None*

*1 (QW-406) PREHEAT
Preheat Temp. Min. *60* F*
Interpass Temp. Max. *300* F*

(QW-407) POSTWELD HEAT TREATMENT
Temperature Range *1900 - 2050* F*
Time Range *Quick Water Quench*

*2 (QW-405) POSITIONS
Position of Grooves *OD Weld 1G, ID Weld 4G*

*1 (QW-408) GAS

Torch	Shielding Gas	Flow Rate	Plasma Gas	Flow Rate	Backing Gas	Flow Rate	Trailing Gas	Flow Rate
O.D. Tig 1	*95 - 5 Arg / Hyd*	*20 - 45 CFH*			Argon	5 - 40 CFH		
O.D. Plasma	*85 - 15 Arg / Hyd*	*5 - 35 CFH*	*Argon*	*.8 - 1.8 LPM*	Argon	5 - 40 CFH	Argon	0 - 45 CFH
O.D. Tig 2	*95 - 5 Arg / Hyd*	*15 - 45 CFH*				5 - 40 CFH	Argon	5 - 45 CFH
I.D. Tig	*Argon*	*15 - 45 CFH*						

*2 (QW-409) ELECTRICAL CHARACTERISTICS
Current: *DC* Polarity: *Straight*

Torch:	Amps Range	Volts Range	Tungsten Size & Type	
O.D. Tig 1	*175 - 300*	*14 - 25*	*1/8*	*2% thoriated*
O.D. Plasma	*175 - 280*	*20 - 35*	*3/16*	*2% thoriated*
O.D. Tig 2	*175 - 250*	*14 - 25*	*3/16*	*2% thoriated*
I.D. Tig	*130 - 230*	*12 - 17*	*1/8*	*2% thoriated*

For amperage and voltage range of each thickness welded, see attachment to form.

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Tube 4A

Rev. 0 Date: 8/29/95

*2

(QW-410) TECHNIQUE

String or Weave Bead : *String*

Torch	Gas Cup Size	Plasma Orifice Size
O.D. Tig 1	*10*	
O.D. Plasma		*.125"*
O.D. Tig 2	*10*	
I.D. Tig	*7*	

Multiple or single pass per side *Single*

Mulitple or single electrodes *Multiple*

Travel speed range 10 - 40 IPM *see attachments for each thickness

Torch	Oscillation
O.D. Tig 1	*Forward Deflection*
Plasma	*N/A*
O.D. Tig 2	*Cross Seam Oscillation*
I.D. Tig	*N/A*

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ATTACHMENT - WELDING PROCEDURE SPECIFICATION NO. TUBE 4A

Rev. 0
Date: 8/29/95

Gauge	Torch	Amp-Range	Volt Range	Travel Speed
3" sch 40	OD # 1	175 - 300	14 - 25	20 -40 IPM
	Plasma	175 - 280	20 - 35	
	OD # 2	175 - 250	14 - 25	
	ID	130-230	12 - 17	
3" sch 40 FG	OD # 1	175 - 300	14 - 25	20 -40 IPM
	Plasma	175 - 280	20 - 35	
	OD # 2	175 - 250	14 - 25	
	ID	130-230	12 - 17	
4" sch 40	OD # 1	175 - 300	14 - 25	20 -40 IPM
	Plasma	175 - 280	20 - 35	
	OD # 2	175 - 250	14 - 25	
	ID	130-230	12 - 17	
4" sch 40 FG	OD # 1	175 - 300	14 - 25	20 -40 IPM
	Plasma	175 - 280	20 - 35	
	OD # 2	175 - 250	14 - 25	
	ID	130-230	12 - 17	
6" sch 40	OD # 1	175 - 300	14 - 25	16 - 24 IPM
	Plasma	200 - 270	20 - 35	
	OD # 2	175 - 250	14 - 25	
	ID	150 - 200	12 - 16	
6" sch 40 FG	OD # 1	175 - 300	14 - 25	16 - 24 IPM
	Plasma	200 - 270	20 - 35	
	OD # 2	175 - 250	14 - 25	
	ID	150 - 200	12 - 16	
8" sch 40	OD # 1	175 - 300	14 - 25	16 - 20 IPM
	Plasma	200 - 270	20 - 35	
	OD # 2	175 - 250	14 - 25	
	ID	150 - 200	12 - 16	

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(QW-482) WELDING PROCEDURE SPECIFICATION

FELKER BROTHERS CORPORATION
Procedure Specification No. *Tube 5E*
Supporting PQR NO. *Tube 5E*

BY: *Brad Robertson*
Date: *01/25/2010*

Revision No. *0* Date: *01/25/2010*

WELDING PROCESSES : *GTAW / PLASMA* Type: *Machine*

*Essential Variable
*Non-Essential Variable

(QW-402) JOINTS

*2 Joint Design *Square Groove*
*2 Backing *None*

Joint Details: 0.004

(QW-403) BASE METALS

*1 P-No. *8* Gr. No. *1* to P-No. *8* Gr. No. *1*
THICKNESS RANGE
*1 Base Metal : *.063 - .164*
Deposited Weld Metal: *None*

(QW-407)
Filler Metal: *None*

(QW-406) PREHEAT

*1 Preheat Temp. Min. *60* F*
Interpass Temp. Max. *300* F*

(QW-407) POSTWELD HEAT TREATMENT

Temperature Range: *1900-2050*F*
Time Range: *Quick Water Quench*

(QW-405) POSITIONS

*2 Position of Grooves *Flat outside diameter of welds*
Overhead inside diameter of welds

(QW-408) GAS

*1

Torch	Shielding Gas	Flow Rate	Plasma Gas	Flow Rate	Backing Gas	Flow Rate	Trailing Gas	Flow Rate
O.D. Tig 1	85-15 Arg / Hyd	30-50 CFH			Argon	5-40 CFH		
Plasma	85-15 Arg / Hyd	5-35 L / M	Argon	.8-1.8 L / M	Argon	5-40 CFH	Argon	20-50 CFH
O.D. Tig 2	95-5 Arg / Hyd	30-50 CFH			Argon	5-40 CFH	Argon	20-50 CFH
I.D. Tig	100% Arg	20-50 CFH						

(QW-409) ELECTRICAL CHARACTERISTICS

*2

Current: *DC* Polarity: *Straight*

Torch:	Amps Range	Volts Range	Tungsten Size & Type	
O.D. Tig 1	150-450	14-28	1/8	2% thoriated
Plasma	120-240	25-35	3/16	2% thoriated
O.D. Tig 2	150-450	14-25	3/16	2% thoriated
I.D. Torch	120-220	13-20	1/8	2% thoriated

For amperage and voltage range of each thickness welded, see attachment to form.

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Tube 5E

Rev. 0

WPS - Page 2
Date: 01/25/10

*2

(QW-410) TECHNIQUE

String or Weave Bead : *String*

Torch	Gas Cup Size	Plasma Orifice Size
O.D. Tig 1	*No. 10*	
O.D. Plasma		*0.093*
O.D. Tig 2	*No. 10*	
I.D. Tig	*No. 10 or 7*	

Multiple or single pass per side *Single*

Mulitple or single electrodes *Multiple*

Travel speed range *20-60 IPM* *see attachments for each thickness

Torch	Oscillation
O.D. Tig 1	*Forward Deflection*
Plasma	*None*
O.D. Tig 2	*Cross Seam Oscillation*
I.D. Tig	*None*

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ATTACHMENT - WELDING PROCEDURE SPECIFICATION NO. TUBE 5E

Rev. 0
Date: 01/25/10

Gauge	Torch	Amp-Range	Volt Range	Travel Speed
3" sch 10	OD # 1	150-300	14-28	
	Plasma	120-240	25-35	20-55 IPM
	OD # 2	150-300	14-25	
	ID	120-200	13-15	
3" sch 10 FG	OD # 1	150-300	14-28	
	Plasma	120-240	25-35	20-55 IPM
	OD # 2	150-300	14-25	
	ID	120-200	13-15	
4" sch 10	OD # 1	150-300	14-28	
	Plasma	120-240	25-35	20-55 IPM
	OD # 2	150-300	14-25	
	ID	120-200	13-15	
4" sch 10 FG	OD # 1	150-300	14-28	
	Plasma	120-240	25-35	20-55 IPM
	OD # 2	150-300	14-25	
	ID	120-200	13-15	
6"sch 10	OD # 1	150-300	14-28	
	Plasma	120-240	25-35	20-55 IPM
	OD # 2	150-300	14-25	
	ID	120-200	13-15	
6"sch 10 FG	OD # 1	150-300	14-28	
	Plasma	120-240	25-35	20-55 IPM
	OD # 2	150-300	14-25	
	ID	120-200	13-15	
8"sch 10	OD # 1	150-300	14-28	
	Plasma	120-240	25-35	20-55 IPM
	OD # 2	150-300	14-25	
	ID	120-200	13-15	
8"sch 10 FG	OD # 1	150-300	14-28	
	Plasma	120-240	25-35	20-55 IPM
	OD # 2	150-300	14-25	
	ID	120-200	13-15	
10" sch 5	OD # 1	150-300	14-28	
	Plasma	120-240	25-35	20-55 IPM
	OD # 2	150-300	14-25	
	ID	120-200	13-20	
12" sch 5	OD # 1	150-300	14-28	
	Plasma	120-240	25-35	20-55 IPM
	OD # 2	150-300	14-25	
	ID	120-200	13-20	

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(QW-482) WELDING PROCEDURE SPECIFICATION

FELKER BROTHERS CORPORATION

BY: *Dennis Adler*

Date: *08/01/04*

Procedure Specification No. *Tube 6F*

Supporting PQR NO. *Tube 6F*

Revision No. *0* Date: *08/01/04*

WELDING PROCESSES : *GTAW / PLASMA* Type: *Machine*

*1 Essential Variable
*2 Non-Essential Variable

*2 (QW-402) JOINTS
*2 Joint Design: *Square Groove*
*2 Backing: *None*

Joint Details

*1 (QW-403) BASE METALS
P-No. 8 Gr. No. 1 to P-No. 8 Gr. No. 1
THICKNESS RANGE
*1 Base Metal : *.116 - .302*
Deposited Weld Metal: *None*

(QW-407)
Filler Metal: *None*

*1 (QW-406) PREHEAT
Preheat Temp. Min. *60* F*
Interpass Temp. Max. *300* F*

(QW-407) POSTWELD HEAT TREATMENT
Temperature Range *1900 - 2050* F*
Time Range *Quick Water Quench*

*2 (QW-405) POSITIONS
Position of Grooves *Flat outside diameter of welds*
Overhead inside diameter of welds

*1 (QW-408) GAS

Torch	Shielding Gas	Flow Rate	Plasma Gas	Flow Rate	Backing Gas	Flow Rate	Trailing Gas	Flow Rate
O.D. Tig 1	95 - 5 Arg / Hyd	10 - 20 L/M			85-15 Arg / Hyd	10 - 25 L/M		
Plasma	85 - 15 Arg / Hyd	10 - 20 L/M	Argon	1 - 5 L / M	85-15 Arg / Hyd	10 - 25 L/M	Argon	5 - 20 L/M
O.D. Tig 2 (Optional)	95 - 5 Arg / Hyd	10 - 20 L/M			85-15 Arg / Hyd	10 - 25 L/M	Argon	5-20 L/M
I.D. Tig	92-8% Arg / Hyd	10 - 20 L/M					85 - 15 Arg / Hyd	10-25 L/M

*2 (QW-409) ELECTRICAL CHARACTERISTICS
Current: *DC* Polarity: *Straight*

Torch:	Amps Range	Volts Range	Tungsten Size & Type	
O.D. Tig 1	150 -250	13 - 22	1/8	2% thoriated
Plasma	120 -250	21 - 35	3/16	2% thoriated
O.D. Tig 2 (Optional)	80 - 150	12-23	3/16	2% thoriated
I.D. Torch	80 - 150	16 - 21	1/8	2% thoriated

For amperage and voltage range of each thickness welded, see attachment to form.

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Tube 6F

Rev. 0 Date: 08/01/04

*2

(QW-410) TECHNIQUE

String or Weave Bead : *String*

Torch	Gas Cup Size	Plasma Orifice Size
O.D. Tig 1	*No. 10*	
O.D. Plasma		*.125 "*
O.D. Tig 2 (Optional)	*No. 10*	
I.D. Tig	*No. 10*	

Multiple or single pass per side *Single*

Mulitple or single electrodes *Multiple*

Travel speed range *13 - 25 IPM* *see attachments for each thickness

Torch	Oscillation
O.D. Tig 1	*None*
Plasma	*None*
O.D. Tig 2 (Optional)	*Cross Seam Oscillation (Optional)*
I.D. Tig	*None*

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ATTACHMENT - WELDING PROCEDURE SPECIFICATION NO. TUBE 6F

Rev. 0
Date: 08/01/04

Gauge	Torch	Amp-Range	Volt Range	Travel Speed
14" sch 5	OD # 1	150 - 250	13 - 22	13 - 25 IPM
	Plasma	120-250	21 - 35	
	OD # 2 X	80-150	12-23	
	ID	80-150	16 - 21	
14" sch 10	OD # 1	150 - 250	13 - 22	13 - 25 IPM
	Plasma	120-250	21 - 35	
	OD # 2 X	80-150	12-23	
	ID	80-150	16 - 21	
16" sch 5	OD # 1	150 - 250	13 - 22	13 - 25 IPM
	Plasma	120-250	21 - 35	
	OD # 2 X	80-150	12-23	
	ID	80-150	16 - 21	
16" sch 10	OD # 1	150 - 250	13 - 22	13 - 25 IPM
	Plasma	120-250	21 - 35	
	OD # 2 X	80-150	12-23	
	ID	80-150	16 - 21	
18" sch 5	OD # 1	150 - 250	13 - 22	13 - 25 IPM
	Plasma	120-250	21 - 35	
	OD # 2 X	80-150	12-23	
	ID	80-150	16 - 21	
18" sch 10	OD # 1	150 - 250	13 - 22	13 - 25 IPM
	Plasma	120-250	21 - 35	
	OD # 2 X	80-150	12-23	
	ID	80-150	16 - 21	
20" sch 5	OD # 1	150 - 250	13 - 22	13 - 25 IPM
	Plasma	120-250	21 - 35	
	OD # 2 X	80-150	12-23	
	ID	80-150	16 - 21	
20" sch 10	OD # 1	150 - 250	13 - 22	13 - 25 IPM
	Plasma	120-250	21 - 35	
	OD # 2 X	80-150	12-23	
	ID	80-150	16 - 21	
24" sch 5	OD # 1	150 - 250	13 - 22	13 - 25 IPM
	Plasma	120-250	21 - 35	
	OD # 2 X	80-150	12-23	
	ID	80-150	16 - 21	
24" sch 10	OD # 1	150 - 250	13 - 22	13 - 25 IPM
	Plasma	120-250	21 - 35	
	OD # 2 X	80-150	12-23	
	ID	80-150	16 - 21	

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X = Optional

*sattelite loc 75 mill

(QW-482) WELDING PROCEDURE SPECIFICATION

FELKER BROTHERS CORPORATION
Procedure Specification No. TUBE 7A
Supporting PQR NO. TUBE 7A

BY: DENNIS ADLER
Date: 03/18/2009

Revision No. 0 Date: 03/18/2009

WELDING PROCESSES : GTAW/PLASMA

Type: MACHINE

*Essential Variable
*Non-Essential Variable

(QW-402) JOINTS

*2 Joint Design: SQUARE GROOVE
*2 Backing: NONE

Joint Details

(QW-403) BASE METALS

*1 P-No. 8 Gr. No. 1 to P-No. 8 Gr. No. 1
THICKNESS RANGE
*1 Base Metal : .097 - .253
Deposited Weld Metal: NONE

(QW-407)

Filler Metal: None

(QW-406) PREHEAT

1 Preheat Temp. Min. 60 F
Interpass Temp. Max. 300* F

(QW-407) POSTWELD HEAT TREATMENT

Temperature Range 1900 - 2050 F
Time Range QUICK WATER QUENCH

(QW-405) POSITIONS

*2 Position of Grooves FLAT OUTSIDE DIAMETER OF WELDS
OVERHEAD INSIDE DIAMETER OF WELDS

(QW-408) GAS

*1

Torch	Shielding Gas	Flow Rate	Plasma Gas	Flow Rate	Backing Gas	Flow Rate	Trailing Gas	Flow Rate
O.D. Tig 1	85-15 Arg/Hyd	5-20 L/M			Argon	5-20 L/M	Argon	5-20 L/M
O.D. Plasma	95-5 Arg/Hyd	5-20 L/M	Argon	.5 - 2.0	Argon	5-20 L/M	Argon	5-20 L/M
O.D. Tig 2	95-5 Arg/Hyd	5-20 L/M			Argon	5-20 L/M		
I.D. Tig	100% Arg	5-20 L/M						

(QW-409) ELECTRICAL CHARACTERISTICS

*2 Current: DC Polarity: Straight

Torch:	Amps Range	Volts Range	Tungsten Size & Type	
O.D. Tig 1	120-240	13-22	1/8	2% thorlated
O.D. Plasma	120-250	20-30	3/16	2% thoriated
O.D. Tig 2	120-200	13-22	3/16	2% thoriated
I.D. Tig	120-200	13-22	5/32	2% thoriated

For amperage and voltage range of each thickness welded, see attachment to form.

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Tube 7A

WPS - Page 2
Rev. 0 Date: 3/18/09

(QW-410) TECHNIQUE

String or Weave Bead : STRING

Torch	Gas Cup Size	Plasma Orifice Size
O.D. Tig 1	10	
O.D. Plasma		0.125
O.D. Tig 2	10	
I.D. Tig	10	

Multiple or single pass per side: SINGLE

Mulitple or single electrodes: MULTIPLE

Travel speed range 15-25 IPM *see attachments for each thickness

Torch	Oscillation
O.D. Tig 1	FORWARD DEFLECTION
O.D. Plasma	NONE
O.D. Tig 3	CROSS SEAM OSCILLATION (OPTIONAL)
I.D. Tig	NONE

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ATTACHMENT - WELDING PROCEDURE SPECIFICATION NO.

TUBE 7A
Rev. 0
Date: 3/18/09

Gauge	Torch	Amp-Range	Volt Range	Travel Speed
10" SCH 10	OD # 1	120-240	13-22	
	Plasma	120-250	20-30	15-25 IPM
	OD # 2 X	120-200	13-22	
	ID	120-200	13-22	
10" SCH 10 FG	OD # 1	120-240	13-22	
	Plasma	120-250	20-30	15-25 IPM
	OD # 2 X	120-200	13-22	
	ID	120-200	13-22	
10" 1/4 WALL	OD # 1	120-240	13-22	
	Plasma	120-250	20-30	15-25 IPM
	OD # 2 X	120-200	13-22	
	ID	120-200	13-22	
12" 1/4 WALL	OD # 1	120-240	13-22	
	Plasma	120-250	20-30	15-25 IPM
	OD # 2 X	120-200	13-22	
	ID	120-200	13-22	
12" SCH 10	OD # 1	120-240	13-22	
	Plasma	120-250	20-30	15-25 IPM
	OD # 2 X	120-200	13-22	
	ID	120-200	13-22	
12" SCH 10 FG	OD # 1	120-240	13-22	
	Plasma	120-250	20-30	15-25 IPM
	OD # 2 X	120-200	13-22	
	ID	120-200	13-22	
	OD # 1			
	Plasma			
	OD # 2			
	ID			
	OD # 1			
	Plasma			
	OD # 2			
	ID			
	OD # 1			
	Plasma			
	OD # 2			
	ID			
	OD # 1			
	Plasma			
	OD # 2			
	ID			

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X = OPTIONAL