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*

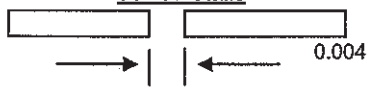
Revision No. *0* Date: *09/30/1994*

WELDING PROCESSES : *GTAW* Type: *Machine*

*1 Essential Variable
*2 Non-Essential Variable

*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 : *.073 - .190*
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 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

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*

Mulitple 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*

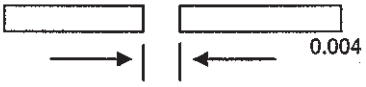
Revision No. *0* Date: *12/06/1995*

WELDING PROCESSES : *GTAW* Type: *Machine*

*1 Essential Variable
*2 Non-Essential Variable

*2 (QW-402) JOINTS
*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: *.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*

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*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.

(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*

Mulitple 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*

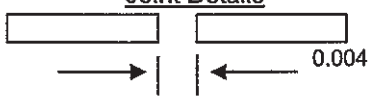
Revision No. *0* Date: *10/09/1993*

WELDING PROCESSES : *GTAW* Type: *Machine*

*1 Essential Variable
*2 Non-Essential Variable

*2 (QW-402) JOINTS
*2 Joint Design: *Square Groove*
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 : *.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.

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*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.

(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*

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*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.

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

*2 (QW-402) JOINTS
*2 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
*1 THICKNESS RANGE
Base Metal : *.063 - .164*
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	*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*						

*2 (QW-409) ELECTRICAL CHARACTERISTICS
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

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
Procedure Specification No. *Tube 6F*
Supporting PQR NO. *Tube 6F*

BY: *Dennis Adler*
Date: *08/01/04*

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

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

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

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(QW-405) POSITIONS
*2 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.

*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*

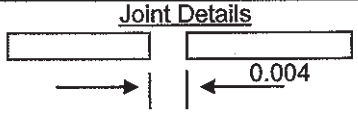
Revision No. 0 Date: *03/18/2009*

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

*Essential Variable
*Non-Essential Variable

*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 : .097 - .253
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

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*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	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						

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

Torch:	Amps Range	Volts Range	Tungsten Size & Type	
O.D. Tig 1	120-240	13-22	*1/8*	*2% thoriated*
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.

(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