Solar Flux

P.O. Box 9145, Calabasas, CA 91372

ASME - Welding Procedure Specification (WPS)

WeldOffice WPS

WPS record number	SF_P43-P43-GT-625-TypI Revision 0	Qualified to	ASME Section IX
Date	2/11/2020	Company name	Solar Flux
Supporting PQR(s)	PQ20-0035 - Rev 0		
Reference docs.			

Scope	For GTAW production welding of P43 material with the use of Solar Flux Type I. Groove, fillet, no PWHT (As-welded)
Joint	Joint details for this welding procedure specification in: JOINTS section of this WPS, Production drawings, Engineering specifications

BASE METALS (QW-403)

Type	Nickel Alloys	P-no. 43	Grp-no. Any
Welded to	Nickel Alloys	P-no. 43	Grp-no. Any
Backing:	Flux*	P-no.	Grp-no. -
Retainers	None		
Notes	*Apply Type I Solar Flux to back-side of root		

THICKNESS RANGE QUALIFIED (in.)

	As-welded		With PWHT	
	Min.	Max.	Min.	Max.
Complete pen.	3/16	1	-	-
Impact tested	-	-	-	-
Partial pen.	3/16	1	-	-
Fillet welds	no min.	no max.	-	-

DIAMETER RANGE QUALIFIED (in.)

	As-welded		With PWHT	
	Min.	Max.	Min.	Max.
Nominal pipe size	no min.	no max.	-	-

FILLER METALS (QW-404)

THICKNESS RANGE QUALIFIED (in.)

	SFA	Classification	F-no.	A-no.	Chemical analysis or Trade name	As-welded Min.	As-welded Max.	With PWHT Min.	With PWHT Max.
GTAW	5.14	ERNiCrMo-3	43	-	See Note 1	no min.	1	-	-
Cons. insert	-	-	-	-	-	- None -			
Flux	-	-	-	-		- None -			

WELDING PROCEDURE

Welding process		GTAW
Type		Manual
Minimum preheat/interpass temperature	(°F)	50
Maximum interpass temperature	(°F)	350
Tungsten size	(in.)	3/32, 1/8
Tungsten type		SFA 5.12 EWTh-2
Filler metal size	(in.)	3/32, 1/8
Layer number		All
Position		All
Weld progression		Uphill
Current/polarity		DCEN (straight polarity)
Waveform control		None
Energy	(J)	
Power	(J/s)	
Amperes		110 - 240
Volts		9 - 16.5
Travel speed	(in./min)	2.5 - 14.5
Maximum heat input	(kJ/in.)	N/A
DC pulsing current		None
Shielding: Gas type		99.997% Argon
Flow rate	(cfh)	30 - 70
Trailing: Gas type		None
Flow rate	(cfh)	-
Backing: Gas type		None
Flow rate	(cfh)	-
String or weave		Stringer or Weave
Orifice/gas cup size		#6 - #12
Multi/Single pass per side		Multiple passes
Weld deposit chemistry		Ni - Cr - Mo
Notes		No autogenous welding

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Solar Flux

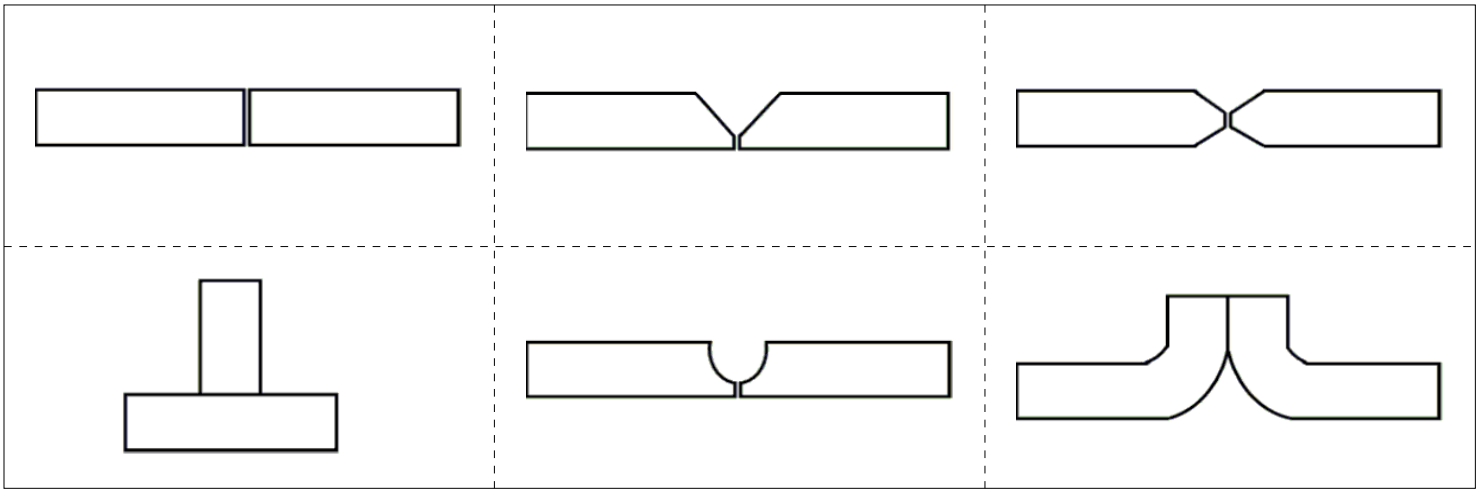
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JOINTS (QW-402) Typical joint(s). See actual production drawings and engineering specifications for details.



TECHNIQUE (QW-410)

Peening	None permitted
Surface preparation	Brush and / or Grinding a minimum 2" back from edge of groove
Initial/interpass cleaning	Brushing and Grinding
Back gouging method	None

NOTES

1. Inconel Filler Metal 625 or equivalent shall be used.

2. Bare solid wire shall be used.

3. Maximum weave width shall not exceed 1.5x the GTAW cup size.

4. No single pass fillet welds allowed.

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Solar Flux

P.O. Box 9145, Calabasas, CA 91372

ASME - Procedure Qualification Record (PQR) - QW-483

WeldOffice WPS

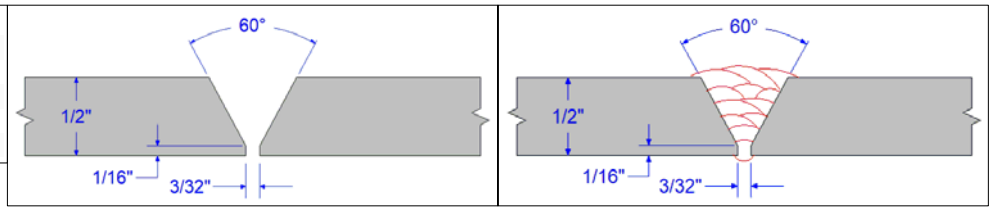
PQR record number	PQ20-0035	Revision 0	WPS record number	SF_P43-P43-GT-625-TypI	Revision 0
Date	2/4/2020		Company name	Solar Flux	
			Welding standard	ASME Section IX	

BASE METALS (QW-403)

	Product form	Specification (type or grade)	P no.	Grp-no.	Size	Sch.	Thick. (in.)	Dia. (in.)
	Plate	SB-443 (1)	43	1	-	-	0.5	-
Welded to:	Plate	SB-443 (1)	43	1	-	-	0.5	-
and tested:	Without PWHT							
Notes								

JOINTS (QW-402)

Joint design		Single-V-groove
Backing:		None
Retainers		None Used
Groove angle	(deg.)	60
Root opening	(in.)	3/32
Root face	(in.)	1/16



WELDING PROCESSES

Welding process	GTAW
Type	Manual

FILLER METALS (QW-404)

SFA specification		5.14
AWS classification		ERNiCrMo-3
Filler metal F-number		43
Weld metal A-number		-
Filler metal nominal composition		See MTR
Filler metal trade name		Inconel Filler Metal 625
Filler metal size	(in.)	1/8
Deposited thickness	(in.)	0.5
Maximum pass thickness	(in.)	0.125
Weld deposit chemistry		Ni - Cr - Mo

POSITION (QW-405)

Position	1G
Weld progression	-

PREHEAT (QW-406)

Preheat temperature	(°F)	75
Maximum interpass temperature	(°F)	350

GAS (QW-408)

Shielding gas:	Type		99.997% Argon
	Flow rate	(cfh)	60 - 70
Trailing gas:	Type		None
	Flow rate	(cfh)	-
Backing gas:	Type		None
	Flow rate	(cfh)	-

ELECTRICAL (QW-409)

Filler metal size	(in.)	1/8
Waveform control		Not Used
Energy	(J)	
Power	(J/s)	
Arc time	(sec)	
Weld bead length	(in.)	
Amperes		124 - 218
Volts		9.5 - 15.4
Travel speed	(in./min)	2.9 - 11.7
Maximum heat input	(kJ/in.)	31.24
Tungsten size	(in.)	1/8
Tungsten type		SFA 5.12 EWTh-2
Current/polarity		DCEN (straight polarity)
DC pulsing current		Not used

TECHNIQUE (QW-410)

String or weave	Stringer and Weave
Orifice/gas cup size	#10
Multi/Single pass per side	Multiple passes
Peening	Not used
Initial/interpass cleaning	Brushing and Grinding
Back gouging method	Not Used

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Solar Flux

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ASME - Procedure Qualification Record (PQR) - Test results (as welded)

WeldOffice WPS

PQR record number	PQ20-0035	Revision 0	WPS record number	SF_P43-P43-GT-625-TypI	Revision 0
Date	2/4/2020		Company name	Solar Flux	
			Welding standard	ASME Section IX	

TENSILE TESTS (QW-150)

Reduced section

Specimen number	Width (in.)	Thickness (in.)	Area (in²)	Ultimate total load (lb)	Ultimate unit stress (psi)	Type of failure and location
T1	0.755	0.475	0.359	43000	119800	Ductile-Weld
T2	0.754	0.474	0.357	42900	120200	Ductile-Weld

Comments	2 reduced section tension tests per QW-151.1 and QW-462.1(a)

GUIDED BEND TESTS (QW-160)

Type of test	Acceptance criteria	Result	Comments
4 transverse side bends per QW-161.1 and QW-462.2	QW-163	Acceptable	

Comments	

OTHER TESTS

Type of test	Acceptance criteria	Result	Comments
Radiographic examination per QW-191.1	QW-191.1.2	Acceptable	Report # TXLO-2020-0099-0076

Comments	

CERTIFICATION

Welder's name	ID Number	Stamp number
Boyd Herrera	6099	

Mechanical testing by	ALS Maverick Testing Laboratories
Laboratory test number	PQ20-0035
Test file number	PQ20-0035 (02/07/2020)
Tests conducted by	Andrew Davila & Brad Berglan

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.

Maverick Representative

Name	Signature
Ian Thompson	
Date	
02/11/2020	

Customer Representative

Name	Signature
Date	

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Date	2/4/2020		Company name	Solar Flux	
			Welding standard	ASME Section IX	

1. Type I Solar Flux applied to back-side of root prior to welding.
2. Preheat applied via propane torch to ensure the weld joint and base material is held to minimum preheat temperature specified.
3. Interpass temperature was monitored using an electrical pyrometer.
4. Initial and Interpass cleaning was performed using mechanical brushing & grinding.

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