

LIGO-E940028-05-B



1501 North Division Street
Plainfield, Illinois 60544-8929

FACSIMILE MESSAGE

Fax No. is: 815 439 6010
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November 10, 1994

To: Larry Jones
LIGO Project Caltech Pasadena, California

Fax No. (818)304-9834

From: M. L. Tellalian Phone (815)439-6517

Plainfield Engineering - PAE

RE: Circumferential Weld Procedure Revision
LIGO Design & Qualification Test - Caltech Contract C146

Larry,

Attached is the revised circumferential weld procedure which incorporates oscillation into the root pass and increases the oscillation on the second pass. The revision is consistent with the changes we discussed prior to execution of the weld. I meant to fax this procedure to you when the weld was made but forgot to do so. This procedure will be used to weld the two sections together when the cleaning issues are resolved. Let me know if you have any questions.

Regards,

M. L. Tellalian
Plainfield Engineering



WELDING PROCEDURE SPECIFICATION

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WPS
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PRODUCT LIGO BEAM TUBE MODULES
CUSTOMER CALTECH

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GENERAL WELDING PROCEDURE SPECIFICATIONS

GWPS-SMAW.....	Rev. 15
GWPS-GTAW.....	Rev. 14
GWPS-GMAW&FCAW.....	Rev. 15

WELDING PROCEDURE SPECIFICATIONS

WPS-ER308L/CIRC.....	Rev. 4
WPS-ER308L/STIFFENER.....	Rev. 3
WPS-ER308L/PORT.....	Rev. 3
WPS-ER308L/GMA.....	Rev. 1
WPS-ER308L/REPAIR.....	Rev. 0
WPS-E7018/STRUCT.....	Rev. 0
WPS-E308L/STRUCT.....	Rev. 1
WPS-E309/STRUCT.....	Rev. 0
WPS-E6010/STRUCT.....	Rev. 0
WPS-ER308L/TEST HEAD.....	Rev. 0 *

WELDING MATERIAL SPECIFICATIONS

WMS-ER308L.....	Rev. 1
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* This procedure is to be used for the Qualification Test only.



WELDING PROCEDURE SPECIFICATION

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WORK THIS DOCUMENT WITH GENERAL WELD PROCEDURE SPEC. GWPS-

GTAW

REFERENCE PROCEDURE QUALIFICATION RECORD			SPECIFIC CONTRACT	
NO.	POSITION QUALIFIED (QW-405)	THICKNESS QUALIFIED (QW-403)	POSITION (QW-405)	THICKNESS RANGE (QW-403)
10029	3G	1/16" to 1/4"	All	0.105" to 1/8"

SPECIFIC CONTRACT WPS REQUIREMENTS

CODE EDITION AND ADDENDA ASME Section VIII & IX, 1992 Edition, 92 Add.

JOINTS (QW-402)	SEE GENERAL WELDING TECHNIQUE PAGE 3	PREHEAT/INTERPASS TEMPERATURE (QW-406)	SEE ATTACHED PAGE 2
BACKING MATERIAL (QW-402)	None Required	POST WELD HEAT TREATMENT (QW-407)	PWHT REQUIRED No
BASE MATERIAL (QW-403)	A240 Tp. 304L (ASME P-8, Gp. 1) Any ASME P-8, Gp. 1 material may be welded together or to each other in any combination.	IF PWHT IS REQUIRED, SEE APPROVED CONTRACT PWHT PROCEDURE FOR DETAILS AND EXTENT OF PWHT.	
		GAS (QW-408)	SHIELDING BACK UP
FILLER METAL (QW-404)	ASME SPECIFICATION NO: SFA 5.9 ASME CLASSIFICATION: ER308L * ASME ANALYSIS NO: A-8 ASME GROUP NO: F-6 CONSUMABLE INSERT: N/A SUPP. POWDER FILLER: N/A	COMPOSITION: 60% Ar - 40% He 100% Argon	
		FLOW RATE: 20-45 cfh See page 2	
		ELECTRICAL CHARACTERISTICS (QW-409)	
FLUX (QW-404)	N/A	CURRENT: Direct Current POLARITY: Electrode Negative OTHER: Straight Polarity AMPERAGE AND VOLTAGE RANGE. SEE PAGE 3 VOLUME OF WELD METAL REQUIRED No SEE ATTACHED PAGE N/A MODE OF TRANSFER N/A	
CUSTOMER APPROVAL		TECHNIQUE (QW-410)/ SPECIAL LIMITATIONS SEE ATTACHED PAGE(S) 2, 3 STRINGER OR WEAVE TECHNIQUE SEE PAGE 3 TYPE OF WELDING MANUAL <input type="checkbox"/> MACHINE <input checked="" type="checkbox"/> SEMI-AUTOMATIC <input type="checkbox"/> AUTOMATIC <input type="checkbox"/>	
		* ER308L in accordance with WMS-ER308L.	

REVIEWED	OB ENGR	DIST ENGR	WELDING SERVICES HOUSTON	CORP QA	REG CONST QA	REG MFG QA				BY	DATE
										PREPARED CHECKED AUTHORIZED	RWP BGG



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LIMITATIONS:

1. This WPS is to be used with Dimetrics Gold Track welding system.
2. Use a two pass technique on side one only.
3. Use a single EWTh-2 (2% thoriated tungsten) electrode.
4. No single pass shall exceed 1/8" in thickness.
5. Only stainless steel brushes shall be used on stainless steel.
6. Parameters on Page 3 shall be followed.
7. Only filler metal in accordance with WMS-ER308L shall be used.
8. Welding may progress uphill or downhill.
9. Welding may begin at any location along the weld joint.
10. See Procedure FPCIRCUMFERENTIAL for fitting/purging.

INTERPASS TEMPERATURE:

The interpass temperature shall not exceed 350°F.

PREHEAT REQUIREMENTS (ASME P-8, Gp. 1):

No preheat is required except as an aid to remove moisture unless the ambient temperature falls below 0°F. When the ambient temperature falls below 0°F, a preheat of warm to the hand (approx. 100°F) is required within 3" of where the welding is started and maintained 3" ahead of the arc.



WELDING PROCEDURE SPECIFICATION

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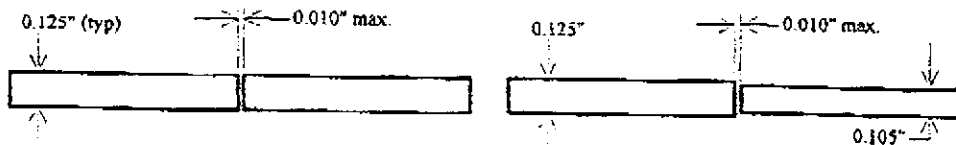
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WELDING PARAMETERS FOR DIMETRICS GOLD TRACK:

Parameter	First Pass	Second Pass
Position	5G	5G
Shielding Gas	60% Ar - 40% He	60% Ar - 40% He
Flow rate	20 - 45 cfh	20 - 45 cfh
Purge Gas	100% Argon	100% Argon
Flow rate	Note (1)	Note (1)
Filler Wire	Autogenous	ER308L (2)
Diameter	N/A	0.035"
Pulse Mode	Pulsed	Sync Pulsed
Pulse Width	50%	N/A
Pulse Frequency	3.0	3.0
AVC Response	20	0
AVC Mode	Samp	Cont
Upslope Time	2	2
Downslope Time	5	5
Travel Start Delay	2	2
Wire Start Delay	N/A	1
Oscillation Amplitude	0.00 - 0.06 (5)	0.15 - 0.26 (5)
Travel Speed	5.0 ipm	4.0 ipm
Primary		
Weld Current	120 amps	85 amps
Arc Voltage	9.5 volts	9.5 volts
Wire Feed Speed	N/A	25 ipm
Background		
Weld Current	85 amps	60 amps
Arc Voltage	9.5 volts	9.5 volts
Wire Feed Speed	N/A	13 ipm
Out Dwell Time	N/A	2
Excursion Time	N/A	3
In Dwell Time	N/A	Note (3)

NOTES:

- (1) See Procedure FPCIRCUMFERENTIAL for purge details.
- (2) ER308L in accordance with WMS-ER308L.
- (3) 2 for 1/8" thick plates.
3 for 0.105" thick plate welded to 1/8" thick plate.
- (4) Welding parameters may vary +/- 10% from above values.
- (5) Oscillation amplitude may vary due to plate offset and position.



SG Position