CBI

WELDING PROCEDURE SPECIFICATION

LIGO-E950038-03-B

IDENTIFICATION	CONTRACT
WPS	
ER308L/GMA	930212

PRODUCT	LIGO BEAM TUBE MODULES	PAGE	1	OF	3
CUSTOMER	CALTECH	REV. NO.	3		
		BY	DMF	DATE	06/26/95

WORK THIS DOCUMENT WITH GENERAL WELD PROCEDURE SPEC. GWPS GMAW&FCAW

REFERENCE PROCEDURE QUALIFICATION RECORD			SPECIFIC CONTRACT	
NO.	POSITION QUALIFIED (QW-405)	THICKNESS QUALIFIED (QW-403)	POSITION (QW-405)	THICKNESS RANGE (QW-403)
4858	2G	All size fillet welds	All	1/8" to 3/8"

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
IF PWHT IS REQUIRED, SEE APPROVED CONTRACT PWHT PROCEDURE FOR DETAILS AND EXTENT OF PWHT.

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.

GAS (QW-408) COMPOSITION:

SHIELDING:	98% Ar - 2% O2
FLOW RATE:	20-45 cfh
BACK UP	100% Nitrogen
FLOW RATE:	See page 2

ELECTRICAL CHARACTERISTICS (QW-409)

CURRENT:	Direct Current
POLARITY:	Electrode Positive
OTHER:	Reverse Polarity
AMPERAGE AND VOLTAGE RANGE. SEE PAGE	3
VOLUME OF WELD METAL REQUIRED	No
SEE ATTACHED PAGE	N/A
MODE OF TRANSFER	Globular or Spray

FILLER MATERIAL (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

TECHNIQUE (QW-410) / SPECIAL LIMITATIONS
SEE ATTACHED PAGE(S) 2, 3
STRINGER OR WEAVE TECHNIQUE SEE PAGE 3
TYPE OF WELDING

MANUAL		MACHINE	
SEMI-AUTOMATIC	X	AUTOMATIC	

FLUX (QW-404)
N/A

CUSTOMER APPROVAL

* ER308L in accordance with WMS-ER308L.

REVIEWED	OB ENGR	DIST ENGR	WELDIN SERVICE HOUSTON	CORP QA	REG CONST QA	REG MFG QA				BY	DATE
					APPROVED		11/10/95	PREPARED		RWP	03/01/94
								CHECKED		BGG	02/28/95
								AUTHORIZED			

LIGO
M. Fallerini 11/10/95

WL100 REV JUL 87<PC>

LIMITATIONS:

1. *Maintain a contact tip to work distance of 3/8" to 1".*

2. *Use a gas cup nozzle sizes between 3/8" to 1" diameter. The gas cup nozzle shall cover the contact tip 1/8" minimum.*

3. *Use a single pass per side technique.*

4. *No single pass shall exceed 1/2" in thickness.*

5. *Only stainless steel brushes shall be used on stainless steel.*

6. *A purge using 100% nitrogen must be in place before any tacking or welding. The oxygen content shall bel less than 2.0%.*

7. *No welding over the spiral tube weld shall exist.*

8. *See procedure FPSTIFFENER for purging procedures.*

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.

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PRODUCT	*LIGO BEAM TUBE MODULES*	PAGE	*3*	OF	*3*
CUSTOMER	*CALTECH*	REV. NO.	*3*		
		BY	*DMF*	DATE	*06/26/95*

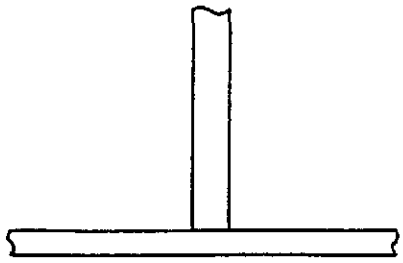
GENERAL WELDING TECHNIQUE

Operation Description	Beads Layer	Weld Proc.	Electrode Size	Electrode Type	Current (amps)	Voltage (Volts)	Peak (amps)	
*Stringer Beads**	*As Reqd*	*GMA*	*.035*	*ER308L***	*130-260*	*21-28*		

* *Vertical uphill welds & overhead welds may be deposited using a weave technique.*

** *ER308L in accordance with WMS-ER308L.*

JOINT DETAIL - See contract drawings for applicable joint details and dimensions.



All position fillet welds

Page

Contract

PROCEDURE QUALIFICATION RECORD

TO A.S.M.E. SECTION IX

ESSENTIAL VARIABLES

PQR No. 4858

Process GMAW/GTAW — GTAW / GTAW

Manual [X] Machine [ ] Automatic [X] Semiautomatic [ ]

Material specification SA204 Type 304

ASME p. no. 8, Gp. 1 To ASME p. no. 8, Gp. 1

Thickness (if pipe, dia and wall thick) 1/4"

Filler metal group no. F. F-6

Weld metal analysis no. A. A-8

ASME specification no. SFA-5.9

AWS specification no. A-5.9

FLUX OR ATMOSPHERE

Flux trade name None Required

Inert gas composition *

Flow rate GMAW-40 CFH, GTAW-20CFH

Preheat temperature range 70°F to 350°F IPT

Postweld heat treatment None

WELDING PROCEDURE

Single or multiple pass Multiple Single or multiple arc Single Position 2G

Mode of transfer for GMAW: Spray [X] Globular [ ] Pulsating [ ] Short Circuit [ ]

Filler Metal for GTAW or PAW Not Required Filler metal diameter Not Required

Electrode GMAW-ER308, GTAW-EWTh-2 Electrode diameter GMAW-.035", GTAW-3/32"Ø

Type of backing None** Welding current GTAW-Direct Current, Elec. Neg. (Straight Polarity)

Consult WELDING VARIABLES for joint dimensions and welding current settings.

GMAW-Direct Current, Elec. Pos. (Reverse Polarity)

TEST RESULTS

Reduced Section Tensile Results

Specimen No.	Dimensions in Width	Dimensions in Thickness	Area in 2	Ultimate Total Load Kips	Ultimate Unit Stress ksi	Ultimate Unit Stress MPa	Character of Failure and Location
H610R-1	1.498	0.222	0.332	29.5	88.9	612.9	Ductile in WM
H610R-2	1.502	0.220	0.330	29.1	88.2	608.1	Ductile in WM

Guided Bend Test

Type	Result	Type	Result
2 Transverse Face Bends	OK	2 Transverse Root Bends	OK

Welder's name Curtis Campbell Social Security no. 403-36-4037 Welder's Symbol CC

Who by virtue of these tests meets welder performance requirements.

Work Order (Orig. WPS) No. H610R Rev. 0

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

Signed CBI

By J. S. Lee J. S. Lee Date 10/15/80

Remarks:

*GTAW - 100% Argon

GMAW - 98% Argon/2% Oxygen

**Temporary copper chill bar used.

Updated to new form, 8/28/87, JSL JSL

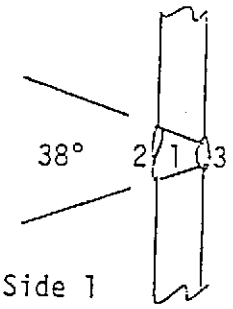
Printed in USA

WL 200 REV JUL 87

PROCEDURE QUALIFICATION RECORD

To A.S.M.E. Section IX

PART III WELDING VARIABLES



3/32" Gap

HORIZONTAL

Layer	Electrode		Amps	Volts	Travel Speed in./min.	Remarks (Gas Flow etc)
	Type	Size				
1	ER308	.035	150	24	7	GMAW-Stringer
2	ER308	.035	150	24	19	Beads Side 1
3	EWTH-2	1/8"	120	12	— — —	GTAW with out filler
						metal Side 2.

Qualification No. 4858

Date: 10-15-80

BY Alan E. Hudson

Alan E. Hudson