CBI

WELDING PROCEDURE SPECIFICATION

IDENTIFICATION	CONTRACT
LIGO-E950043 00-B WPS ER70S-3/STRUCT	930212

PRODUCT *LIGO BEAM TUBE MODULES*
CUSTOMER *CALTECH*

PAGE NO. *1* OF *3*
REV. NO. *0*
BY *JSC* DATE *04/06/95*

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)
10348	*3G*	*1/16" to 3/4"*	*ALL*	*3/16" to 3/4"*

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*

BACKING MATERIAL (QW-402)
None Required

BASE MATERIAL (QW-403)

SA36 (ASME P-1, Gp. 1)
A500 Gr. B (Similar to ASME P-1, Gp. 1)

Any ASME P-1, Gp. 1 material may be welded together or to each other in any combination.

FILLER METAL (QW-404)

ASME SPECIFICATION NO: *SFA 5.18*
ASME CLASSIFICATION: *ER70S-3*
ASME ANALYSIS NO: *A-1*
ASME GROUP NO: *F-6*
CONSUMABLE INSERT: *N/A*
SUPP. POWDER FILLER: *N/A*

FLUX (QW-404) *N/A*

CUSTOMER APPROVAL

PREHEAT/INTERPASS TEMPERATURE (QW-406)
SEE ATTACHED PAGE *2*

POST WELD HEAT TREATMENT (QW-407)
PWHT REQUIRED *No*
IF PWHT IS REQUIRED, SEE APPROVED CONTRACT PWHT PROCEDURE FOR DETAILS AND EXTENT OF PWHT.

GAS (QW-408)	SHIELDING	BACK UP
COMPOSITION:	*98% Ar/ 2% CO2*	*N/A*
FLOW RATE:	*25-50 cfh*	*N/A*

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 & Spray*

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

MANUAL ☐ MACHINE ☐
SEMI-AUTOMATIC ☒ AUTOMATIC ☐

REVIEWED	OB ENGR	DIST ENGR	WELDING SERVICES HOUSTON	CORP QA	REG CONST QA	REG MFG QA				BY	DATE
				M. Tellalian 11/10/95		S Jones LIGO	11/10/95	PREPARED		JSC	04/06/95
								CHECKED		AEH	04/06/95
								AUTHORIZED			/ /

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WELDING PROCEDURE SPECIFICATION

IDENTIFICATION WPS	CONTRACT
ER70S-3/STRUCT	930212

PRODUCT *LIGO BEAM TUBE MODULES*

CUSTOMER *CALTECH*

REV. NO. 0

BY *JSC* DATE *04/06/95*

LIMITATIONS:

1. *This WPS is limited to the welding of structural components. It shall not be used for welding to the vessel shell or nozzle assemblies (ASME Sec. VIII Code Boundary Components).*
2. *Maintain a contact tip to work distance of 3/8" to 1".*
3. *Use gas cup nozzle sizes between 3/8" and 1" diameter.*
4. *Use a single pass or multiple passes per side.*
5. *Use a single electrode.*
6. *Vertical welding may progress uphill or downhill.*
7. *No single pass shall exceed 1/2" in thickness.*

INTERPASS TEMPERATURE:

The interpass temperature shall not exceed 500 F.

PREHEAT REQUIREMENTS:

No preheat is required except as an aid to remove moisture unless the ambient temperature falls below 32 F. When the ambient temperature falls below 32 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.

	IDENTIFICATION WPS	CONTRACT
WELDING PROCEDURE SPECIFICATION	*ER70S-3/STRUCT*	*930212*

PRODUCT *LIGO BEAM TUBE MODULES*	PAGE NO. *3* OF *3*
CUSTOMER *CALTECH*	REV. NO. *0*
	BY *JSC* DATE *04/06/95*

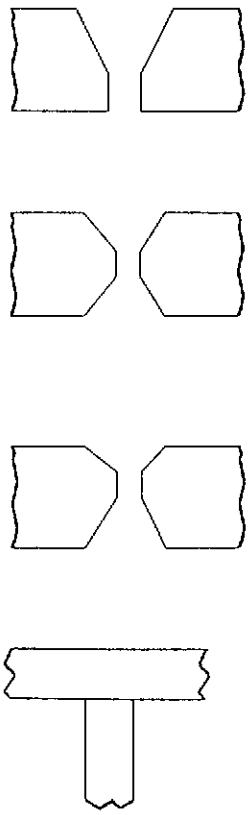
GENERAL WELDING TECHNIQUE

Operation Description	Beads Layer	Weld Proc.	Electrode Size	Electrode Type	Current (amps)	Voltage (Volts)	Travel (IPM)	B.O.R. Sec/12"
*Stringer Beads**	*As Reqd*	*GMAW*	*.035* *.045*	*ER70S-3*	*130-260* *160-280*	*21-28* *23-26*		

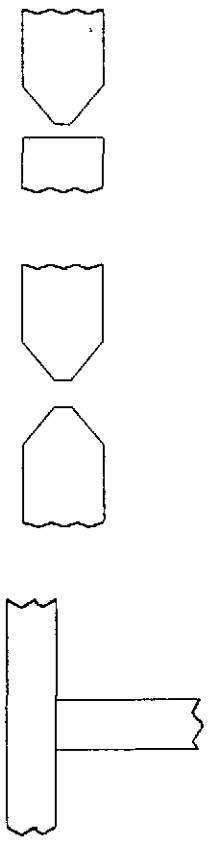
* *Vertical Uphill and Overhead welds may be deposited using a weave technique.*

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

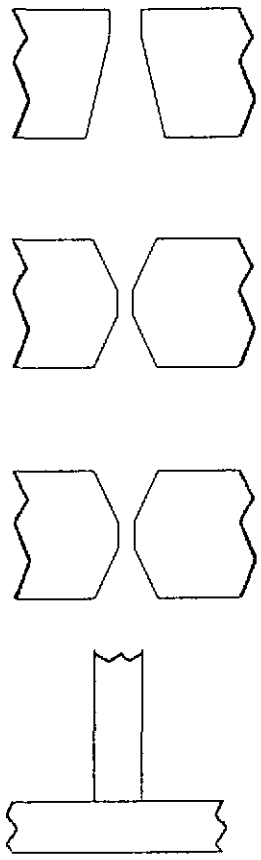
VERTICAL



HORIZONTAL



OVERHEAD & DOWNFLAT



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Contract

PROCEDURE QUALIFICATION RECORD

To A. S. M. E. Section IX

ESSENTIAL VARIABLES

PQR No. 10348
Process GMAW Manual [ ] Machine [ ] Auto. [ ] Semiauto. [X]
Material specification SA516 Gr. 60 Flux or Atmosphere

ASME P No.	1 Gp. 1	To ASME P No.	1 Gp. 1	Flux trade name	N/A
Thickness(if pipe, dia and wall thick)	0.38			Inert gas composition	98%Ar / 2%O2
Filler metal group no. F	6			Flow rate	35 cfh
Weld metal analysis no. A	1			Preheat temperature range	70°F / 350°F (IPT)
ASME specification no. SFA	5.18			Postweld heat treatment	None
AWS specification no. A	5.18				

WELDING PROCEDURE

Single or multiple pass Multiple Single or multiple arc Single Position 1G

Mode of transfer for GMAW:Spray [X] Globular [ ] Pulsating [ ] Short Circuit [ ]
Filler Metal for GTAW or PAW N/A Filler metal diameter N/A
Electrode ER70S-3 Electrode diameter 0.035"
Type of backing None Welding current Direct Current Electrode Positive
Consult WELDING VARIABLES for joint dimensions and welding current settings. (Reverse Polarity)

TEST RESULTS

Reduced Section Tensile Results

Specimen No.	Dimensions, in.		Area	Ultimate Total Load	Ultimate Unit Stress		Character of Failure and Location
	Width	Thickness	in ²	Kips	ksi	MPa	
H12428-1	0.751	0.329	0.247	17.3	70.0	482.6	Ductile in Plate
H12428-2	0.749	0.329	0.246	17.2	69.9	481.9	Ductile in Plate

Guided Bend Test

Type	Result	Type	Result
4 Transverse Side Bends	OK		

Welder's name William K. Brawner Social Security no. 413-82-4060 Welder's symbol WKB
Welder's name Social Security no. Welder's symbol
Who by virtue of these tests meets welder performance requirements.

Work Order (Orig. WPS) No. H12428 Rev. 1

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 David M. French Date 4/4/95
David M. French

Remarks: Spool Arc 85 (ER70S-3) by Alloy Rods
Plate Edges Coated with Deoxaluminite HS

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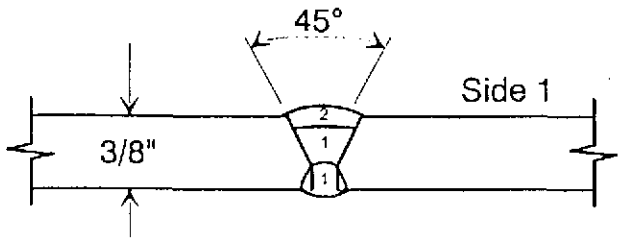
Contract

PROCEDURE QUALIFICATION RECORD
To A. S. M. E. Section IX
WELDING VARIABLES



Land T/3
Gap 1/8"
Technique: Stringer Bead

1G

Side	Pass	Electrode			Amps	Volts	Travel Speed		Heat Input		Remarks
		Type	Size in	Size mm			in/min	cm/min	KJ/in	KJ/cm	
1	1	ER70S-3	0.035	0.89	172	25	5.0	12.7	51.6	20.3	
	2	ER70S-3	0.035	0.89	180	25	5.9	15.0	45.8	18.0	
2	1	ER70S-3	0.035	0.89	186	25	6.3	16.0	44.3	17.4	

Qualification No. 10348
Date: 4/4/95

By: David M. French