

LIGO-E940026-00-B



## FACSIMILE MESSAGE

Chicago Bridge & Iron Company  
 P.O. Box 41146  
 Houston, TX 77241-1146  
 713/466-7581  
 Fax No.: 713/466-4259

Date: June 29, 1994

To: LARRY JONES  
CALTECH  
(818) 304 - 9834

From: RICK PRIOR  
CHICAGO BRIDGE & IRON  
HOUSTON CORPORATE WELDING

WE ARE TRANSMITTING <sup>27</sup> ~~25~~ PAGE(S) (INCLUDING THIS COVER SHEET). IF THERE ARE ANY PROBLEMS, PLEASE CALL ( 713 ) 896 - 2916

REFERENCE: LIGO / Tubetec

Attached please find:

WMS-ER308L - Revised to specify Techalloy's process

TT-H1N - Tube Handling and Shipping Procedure for Tubetec. Due to time constraints, this alternate shipping restraint will be produced by a small shop called *Easton Repair*. Tubes will have these restraints during shipping and handling with the end restraints resting on cribbing blocks to support the load. Three shipments will be made from Tubetec to Houston. Also due to time constraints, there may (I am trying not to have this happen) be a delay of when the tubes are complete to when the restraints arrive at Tubetec. I suggest, with your approval, that we insert wood framing, with end covers of carpet or plastic to eliminate wood to tube contact, in the tube ends to lift the tubes and place on tube carts. Tubes would then be moved to storage area until shipping restraints arrive.

WPS-INDEX - Index of WPS's, PQR's and WPQ's for Tubetec. With your approval, these documents will be sent to Tubetec for their review and signatures. They will have these procedures on file at Tubetec.

WPS-SPIRAL(ALT) - This procedure is an alternate using 60argon/40helium as a shielding gas. I doubt it will be used as the penetration on the 100argon plate was better than I started in the meeting on June 22nd (approx. 70% from both sides).

I am trying to coordinate tube fabrication to begin July 5th providing these attachments can be approved for use by Caltech. Please review and return comments to me as soon as is practicable.

  
 Rick W. Prior  
 Houston Corporate Welding

cc: LRS/CNS/930212-7.1  
MARTY TELLALIAN - RCE  
000

**CBI**

CBI PROPRIETARY

TITLE <b>HANDLING FOR MANUFACTURED TUBES FROM TUBETEC</b>		IDENTIFICATION TT-H1N			
		REFERENCE NO.		SHT 1 OF 3	
PRODUCT <b>LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY</b>		OFFICE COH		REVISION Draft 2	
		MADE BY RWP	CHKD BY	MADE BY	CHKD BY
		DATE 6/24/94	DATE	DATE	DATE

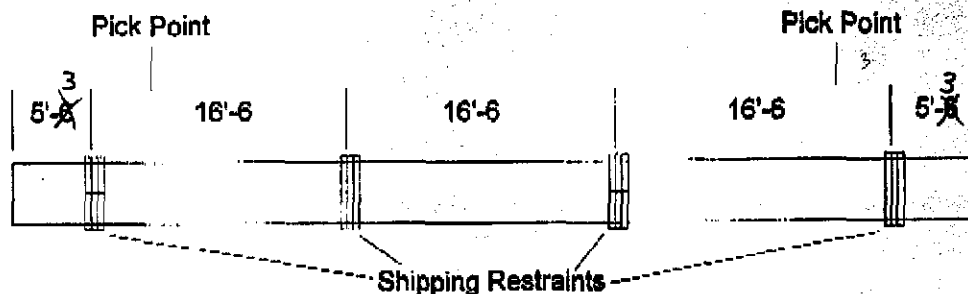
**1.0 SCOPE:**

This procedure outlines the procedures for handling of manufactured beam tubes from tube mill to load truck.

**2.0 TUBE HANDLING:**

Stress levels of an unstiffened beam tube may approach the yield stress of the tube material. Caution must be taken to minimize these stress levels.

- 2.1 A minimum of two (2) shipping restraints, detailed in attached sketch, shall be attached to the 60' tube sections as follows (the center supports need only be attached for shipment):



**Lifting Sketch for 60' Beam Tube Sections**  
(Short beam tube sections may have only 1 restraint)

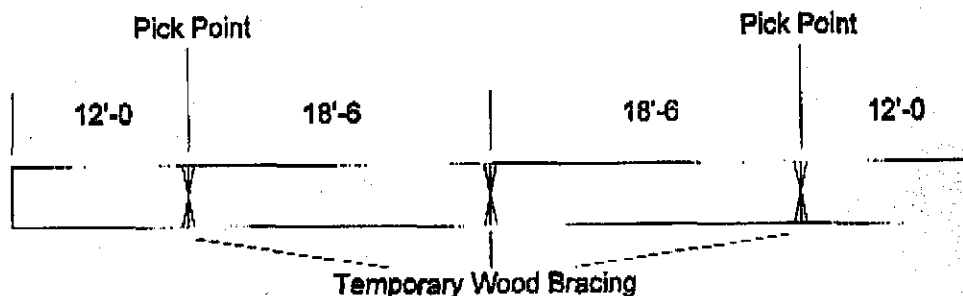
Note: Wood frames with ends covered to prevent wood contact with tube wall may be inserted into the tube as shown below to move beam tube sections to storage area until shipping restraints are available.

**CBI**

CBI PROPRIETARY

IDENTIFICATION  
TT-H1N

TITLE	HANDLING FOR MANUFACTURED TUBES FROM TUBETEC	REFERENCE NO.		SHT 2 OF 3	
		OFFICE COH		REVISION Draft 2	
PRODUCT	LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY	MADE BY	CHKD BY	MADE BY	CHKD BY
		RWP			
		DATE	DATE	DATE	DATE
		6/24/94			



Lifting Sketch for 60' Beam Tube Sections  
(Using temporary wood bracing)

- 2.2 These restraints or frames shall be attached after the tube is cut from the mill and prior to any tube handling.
- 2.3 Tubes shall be lifted using two (2) point loading using locations specified in above sketches. (Short sections may use a single point pick).
- 2.4 While moving beam tubes, care must be taken to minimize the amount of stress (bending, bouncing, etc) to the tubes. (Tubes may be placed on tube carts to transport tubes to storage or to shipping trailers)

### 3.0 SHIPPING:

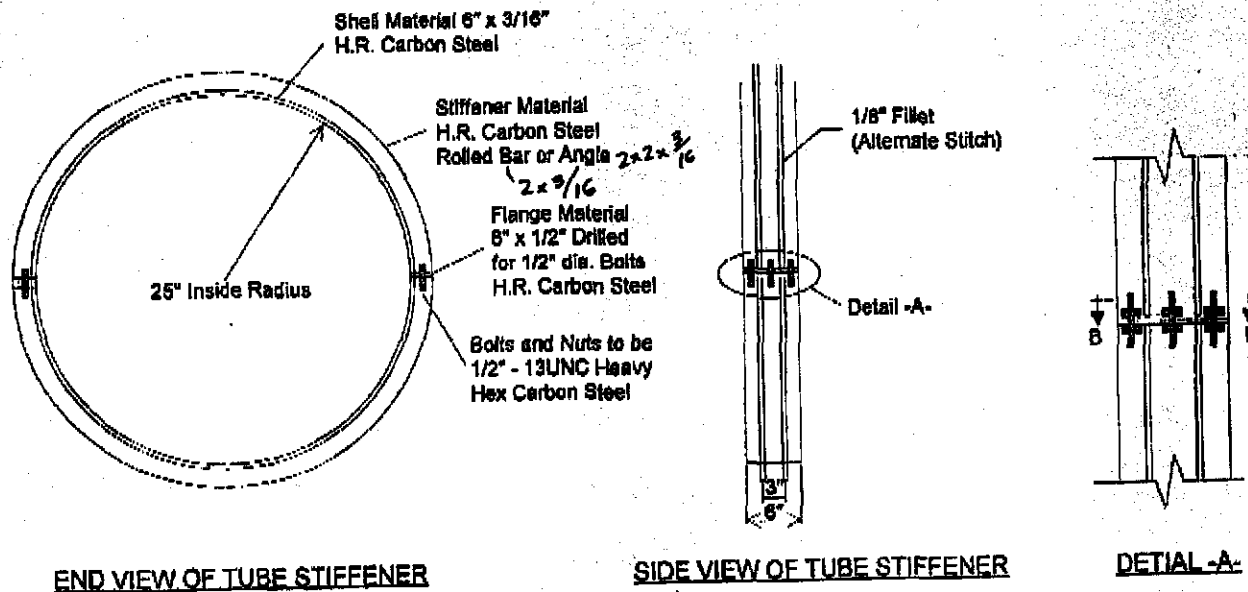
- 3.1 Wood framing shall be removed, if applicable, prior to attaching shipping restraints for transportation.
- 3.2 Beam tubes shall consist of four (4) restraints with spacing as detail in above sketch. The short tube sections shall have a minimum of two (2) restraints attached.
- 3.3 Tube ends shall be covered with two (2) layers of plastic and sealed for transportation. *plywood?*
- 3.4 Tubes shall be completely covered by two layers of white tarp to serve as insulation.



CBI PROPRIETARY

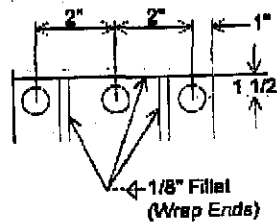
<b>TITLE</b> HANDLING FOR MANUFACTURED TUBES FROM TUBETEC		<b>IDENTIFICATION</b> TT-H1N			
		<b>REFERENCE NO.</b>	SHT 3 OF 3		
<b>PRODUCT</b> LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY		<b>OFFICE</b> COH		<b>REVISION</b> Draft 2	
		<b>MADE BY</b> RWP	<b>CHKD BY</b>	<b>MADE BY</b>	<b>CHKD BY</b>
		<b>DATE</b> 6/24/94	<b>DATE</b>	<b>DATE</b>	<b>DATE</b>

**SHIPPING RESTRAINTS:**



**NOTES:**

- 1) Fourteen (14) Stiffener Assemblies are required.
- 2) Material shall be A36 Carbon Steel or as a minimum 283C Carbon Steel
- 3) Manufacturer shall provide 1/2" - 13UNC bolts, nuts, lock washers and flat washers as required
- 4) Manufacturer shall match mark each connection point and identify each stiffener as #1, Side A and Side B; etc.
- 5) Manufacturer shall ship assembled stiffeners to address noted on purchase order



SHIM BETWEEN RESTRAINT & TUBE WITH RESILIENT MAT'L (CARPETING)

Supplier's Purchase Order No. \_\_\_\_\_

**CBI**

**LIGO PROJECT**  
**QT SHIPPING RESTRAINTS**

Customer's No. \_\_\_\_\_ Contract No. 990212  
 Order No. 92285 Date 6/24/94  
 Rev. 0



CBI PROPRIETARY

		IDENTIFICATION WMS-ER308L			
TITLE	CLEANED ER308L FILLER MATERIAL SPECIFICATION	REFERENCE NO. 930212		SHT	1 OF 1
		OFFICE COH		REVISION 3	
PRODUCT	LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY	MADE BY	CHKD BY	MADE BY	CHKD BY
		RWP	BGG	RWP	BGG
		DATE	DATE	DATE	DATE
		12/9/93	12/9/93	6/17/94	6/17/94

**1.0 SCOPE:**

This procedure covers the purchasing specifications and handling of filler material to be used during the construction of the LIGO Beam Tube Modules.

**2.0 REFERENCES:**

- 2.1 ASME Section II, Part C, latest edition.
- 2.2 California Institute of Technology Technical Specification Number 1100007 for Low Hydrogen, Type 304L Stainless Steel Vacuum Products.

**3.0 MATERIAL:**

- 3.1 ASME Specification SFA 5.9, latest edition in Part C, Section II Material Specification.
- 3.2 AWS Classification - ER308L.
- 3.3 Techalloy Company Inc Code ID: LIGO-35C
- 3.4 Unit Package Type - 25-30 lb. and 2-3 lb. spools of 0.035" diameter.

**4.0 CERTIFICATION AND TESTING per SFA 5.01, latest edition in Part C, Section II Material Specification:**

- 4.1 Lot Classification - S3.
- 4.2 Level of Testing - Schedule F.

**5.0 PACKAGING:**

- 5.1 All handling of the cleaned filler material shall be done wearing cloth gloves. No contact with skin shall occur.
- 5.2 Each spool of clean filler material shall be packed and sealed to prevent outside contamination from the atmosphere. Each spool shall be labeled with the Code ID specified in 3.3 above.



WELDING PROCEDURE SPECIFICATION

WPS No. INDEX Rev. 0

Page 1 of 1

Product LIGO Beam Tube Can Sections  
 Customer CBI for Caltech

Contract \_\_\_\_\_  
 Date 6/27/94  
 By SRF

WELDING PROCEDURE SPECIFICATIONS (WPS):

REVISION NO.

WPS-SPIRAL

Rev 0

WPS-SPLICE *END TABS?*

Rev 0

WPS-REPAIR

Rev 0

WPS-SPIRAL(ALT)

Rev 0

PROCEDURE QUALIFICATION RECORDS (PQR):

REVISION NO.

100 - SPIRAL WELD PROCEDURE USING 100% ARGON GAS

Rev 0

101 - SPLICE WELD PROCEDURE

Rev 0

102 - SPIRAL WELD PROCEDURE USING 80% ARGON/40% HELIUM GAS

Rev 0

WELDER/OPERATOR PERFORMANCE QUALIFICATION TESTS (WPQ):

WPS NO.

DAN OWENS

SPIRAL

CHARLES JONES

SPIRAL

JAMES AKER

SPIRAL

MATTHEW NEWELL

SPIRAL

ROBERT DECKER

SPIRAL

STEPHEN R. FRANA

SPIRAL

DAN OWENS

SPLICE/REPAIR



WELDING PROCEDURE SPECIFICATION

WPS No.            SPIRAL            Rev. 0

Page 1 of 2

Product LIGO Beam Tube Cap Sections  
 Customs CBI for Caltech

Contract             
 Date 6/27/94  
 By SRF

Welding Process(es) Gas Tungsten Arc Welding (GTAW) Type(s)            Machine             
 (Automatic, Manual, Machine, or Semi-Auto.)

REFERENCE PROCEDURE QUALIFICATION RECORDS			SPECIFIC CONTRACT	
No.	Position Qualified (QW-405)	Thickness Qualified (QW-403)	Position (QW-405)	Thickness Range (QW-403)
100	1G	1/16" to 0.28"	1G	1/8"

Code Edition and Addenda ASME Section VIII & Section IX, 1992 Edition, 1992 Addenda

**BASE METALS (QW-403)**

Specification A240 Type 304L to A240 Type 304L Thickness Range:             
 P-No. P-8 to P-8 Base Metal 1/8"  
 Group No. Gp. 1 to Gp. 1 Pipe Dia. 48"  
 Other           

**FILLER METALS (QW-404)**

Spec. No. (SFA) <u>SFA 5.9</u>	<u>N/A</u>	<u>          </u>
AWS No. (Class) <u>ER308L</u>	<u>Autogenous</u>	<u>          </u>
F-No. <u>F-6</u>	<u>N/A</u>	<u>          </u>
A-No. <u>A-8</u>	<u>N/A</u>	<u>          </u>
Weld Metal Thickness Range:		
Groove <u>5/32"</u>	<u>5/32"</u>	<u>          </u>
Fillet <u>N/A</u>	<u>N/A</u>	<u>          </u>
Electrode-Flux (Class) <u>N/A</u>	<u>N/A</u>	<u>          </u>
Flux Trade Name <u>N/A</u>	<u>N/A</u>	<u>          </u>
Consumable Insert <u>N/A</u>	<u>N/A</u>	<u>          </u>
Other <u>          </u>	<u>          </u>	<u>          </u>

**PREHEAT (QW-406)**

Preheat Temp. None Required  
 Interpass Temp. 350°F maximum  
 Preheat Maintenance 100°F if ambient falls below 0°F

**ELECTRICAL CHARACTERISTICS (QW-408)**

Current Direct Current  
 Polarity Electrode Negative  
 Other Straight Polarity  
 Mode of transfer (GMAW) N/A

**POSTWELD HEAT TREATMENT (QW-407)**

PWHT Required None Required  
 Temperature Range N/A  
 Time Range N/A

**GAS (QW-408)**

Shielding	<u>100% Argon</u>	Flow Rate <u>20-45 cfm</u>
Trailing	<u>N/A</u>	<u>N/A</u>
Backing	<u>100% Nitrogen</u>	<u>10-35 cfm</u>



WELDING PROCEDURE SPECIFICATION

WPS No. SP1RAL Rev. 0

Product LIGO Beam Tube Can Sections  
 Custome CBI for Caltech

Page 2 of 2  
 Contract \_\_\_\_\_  
 Date 6/27/94  
 By SRF

**TECHNIQUE AND LIMITATIONS (QW-410)**

- 1) Use a single EWTh-2 (2% thoriated tungsten) electrode.
- 2) Use a single pass per side technique.
- 3) No single pass shall exceed 1/8" in thickness.
- 4) Only stainless steel brushes shall be used on stainless steel.
- 5) Weld joint shall be power brushed adequately to remove oxidation (approx. 1/2" to 1" from each edge)
- 6) Only filler material in accordance with WMS-ER308L shall be used.
- 7) A magnetic oscillator shall be used.
- 8) Use gas cup nozzle sizes between 3/8" to 1".
- 9) Use a 1/8" diameter electrode only.

**BACKING MATERIAL (QW-402)**  
 Type None Required

**JOINTS (QW-402)**

Side 1: Autogenous  
 Side 2: ER308L

Each pass to have a minimum of 80% penetration

Magnetic oscillator parameters:  
 Amplitude: 35  
 Left: 10  
 Speed: 10  
 Right: 10

GENERAL WELDING TECHNIQUE

Weld Layer(s)	Process	Filler Material		Current (amps)	Voltage (volts)	Travel Speed (ipm)	Remarks
		Class	Dia.				
Side 1	GTAW	Autogenous	N/A	285-295	11.0-12.0	16-18	Inside of tube
Side 2	GTAW	ER308L	0.035"	330-340	11.0-12.0	Same	Outside of tube WFS = 38 to 45 ipm





WELDING PROCEDURE SPECIFICATION

WPS No. \_\_\_\_\_ SPLICE \_\_\_\_\_ Rev. 0

Product LIGO Beam Tube Can Sections Page 1 of 2  
 Customs CBI for Caltech Contract \_\_\_\_\_  
 Date 6/27/84  
 By SRF

Welding Process(es) Gas Tungsten Arc Welding (GTAW) Type(s) Manual  
 (Automatic, Manual, Machine, or Semi-Auto.)

REFERENCE PROCEDURE QUALIFICATION RECORDS			SPECIFIC CONTRACT	
No.	Position Qualified (QW-405)	Thickness Qualified (QW-403)	Position (QW-405)	Thickness Range (QW-403)
101	1G	1/16" to 0.28"	1G	1/8"

Code Edition and Addenda ASME Section VIII & Section IX, 1992 Edition, 1992 Addenda

**BASE METALS (QW-403)**

Specification A240 Type 304L to A240 Type 304L Thickness Range:  
 P-No. P-8 to P-8 Base Metal 1/8"  
 Group No. Gp. 1 to Gp. 1 Pipe Dia. 49"  
 Other \_\_\_\_\_

**FILLER METALS (QW-404)**

Spec. No. (SFA) SFA 5.9  
 AWS No. (Class) ER308L  
 F-No. F-6  
 A-No. A-8  
 Weld Metal Thickness Range:  
 Groove 1/8"  
 Fillet N/A  
 Electrode-Flux (Class) N/A  
 Flux Trade Name N/A  
 Consumable insert N/A  
 Other \_\_\_\_\_

**PREHEAT (QW-406)**

Preheat Temp. None Required  
 Interpass Temp. 350°F maximum  
 Preheat Maintenance 100°F if ambient falls below 0°F

**ELECTRICAL CHARACTERISTICS (QW-409)**

Current Direct Current  
 Polarity Electrode Negative  
 Other Straight Polarity  
 Mode of transfer (GMAW) N/A

**POSTWELD HEAT TREATMENT (QW-407)**

PWHT Required None Required  
 Temperature Range N/A  
 Time Range N/A

**GAS (QW-408)**

	Composition	Flow Rate
Shielding	100% Argon	20-45 cfm
Trailing	N/A	N/A
Backing	100% Nitrogen	10-35 cfm



WELDING PROCEDURE SPECIFICATION

WPS No. \_\_\_\_\_ SPLICE \_\_\_\_\_ Rev. 0  
 Page 2 of 2  
 Contract \_\_\_\_\_  
 Date 6/27/94  
 By SRF

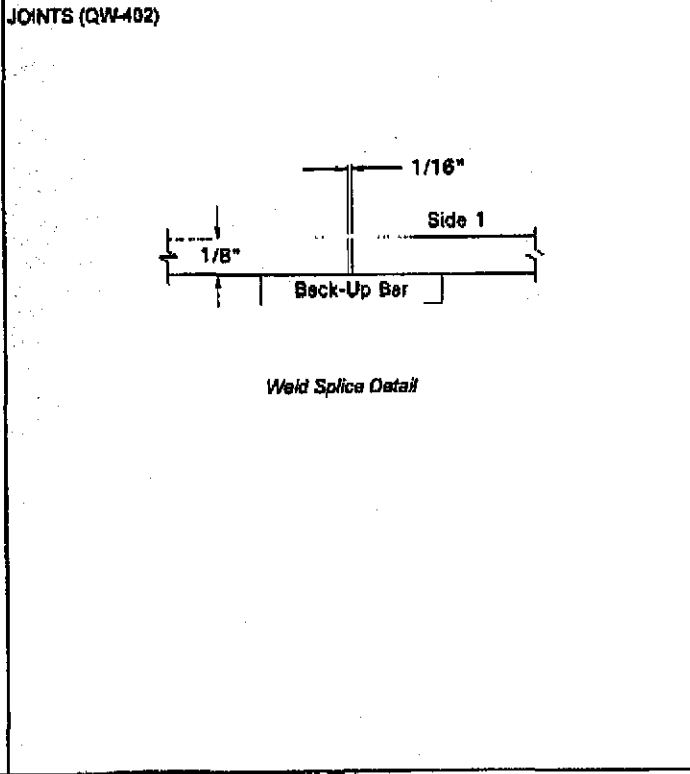
Product LIGO Boom Tube Can Sections  
 Customs CBI for Caltech

**TECHNIQUE AND LIMITATIONS (QW-410)**

- 1) Use a single EWTh-2 (2% thoriated tungsten) electrode.
- 2) Use a single or multiple pass technique.
- 3) No single pass shall exceed 1/8" in thickness.
- 4) Only stainless steel brushes shall be used on stainless steel.
- 5) Weld joint shall be power brushed adequately to remove oxidation (approx. 1/2" to 1" from each edge)
- 6) Welding may be stringer or weave bead technique.
- 7) Use gas cup nozzle sizes between 3/8" to 1".
- 8) A brass back-up bar shall be used for welding of Side 1. (Back purge is not necessary)
- 9) Side 2 shall be ground to clean metal and welded after tube fabrication.  
 (Back purge required on inside of tube)

END TRBS  
FILLER METAL  
ALCOHOL WIPE DOWN  
CLEAN GLOVES/HAND

**BACKING MATERIAL (QW-402)**  
 Type Brass back-up bar



GENERAL WELDING TECHNIQUE

Weld Layer(s)	Process	Filler Wire Class	Tungsten Dia.	Current (amps)	Voltage (volts)	Travel Speed (ipm)	Remarks
Side 1	GTAW	Autogenous	N/A	100-160	10-18	As Red'd	
Pass 1		ER308L	1/16"	100-160	10-18	As Red'd	
Pass 2							
Side 2		ER308L	1/16"	100-160	10-18	As Red'd	
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">                     Filler Metal: ER308L                      Filler Metal Dia.: 1/16"                      Passes may be made with stringer or weave beads as required                 </div>							



WELDING PROCEDURE SPECIFICATION

WPS No. REPAIR Rev. 0

Product LIGO Beam Tube Can Sections  
 Customs CBI for Caltech

Page 1 of 2  
 Contract  
 Date 6/27/94  
 By SRF

Welding Process(es) Gas Tungsten Arc Welding (GTAW) Type(s) Manual  
 (Automatic, Manual, Machine, or Semi-Auto.)

REFERENCE PROCEDURE QUALIFICATION RECORDS			SPECIFIC CONTRACT	
No.	Position Qualified (QW-405)	Thickness Qualified (QW-403)	Position (QW-405)	Thickness Range (QW-403)
101	1G	1/16" to 0.28"	1G	1/8"

Code Edition and Addenda ASME Section VIII & Section IX, 1992 Edition, 1992 Addenda

BASE METALS (QW-402)

Specification A240 Type 304L to A240 Type 304L Thickness Range:  
 P-No. P-8 to P-8 Base Metal 1/8"  
 Group No. Gp. 1 to Gp. 1 Pipe Dia. 49"  
 Other

FILLER METALS (QW-404)

Spec. No. (SFA) SFA 5.9  
 AWS No. (Class) ER308L  
 F.No. F-6  
 A.No. A-8  
 Weld Metal Thickness Range:  
 Groove 1/8"  
 Fillet N/A  
 Electrode-Flux (Class) N/A  
 Flux Trade Name N/A  
 Consumable Insert N/A  
 Other

PREHEAT (QW-406)

Preheat Temp. None Required  
 Interpass Temp. 350°F maximum  
 Preheat Maintenance 100°F if ambient falls below 0°F

ELECTRICAL CHARACTERISTICS (QW-409)

Current Direct Current  
 Polarity Electrode Negative  
 Other Straight Polarity  
 Mode of transfer (GMAW) N/A

POSTWELD HEAT TREATMENT (QW-407)

PWHT Required None Required  
 Temperature Range N/A  
 Time Range N/A

GAS (QW-408)

	Composition	Flow Rate
Shielding	100% Argon	20-45 cfh
Trailing	N/A	N/A
Backing	100% Nitrogen	10-35 cfh



WELDING PROCEDURE SPECIFICATION

WPS No. REPAIR Rev. 0

Page 2 of 2

Product LIGO Beam Tube Can Sections  
 Customs CBI for Caltech

Contract \_\_\_\_\_  
 Date 6/27/94  
 By SRF

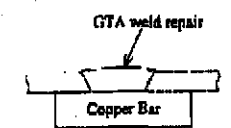
**TECHNIQUE AND LIMITATIONS (QW-410)**

- 1) Use a single EWTh-2 (2% thoriated tungsten) electrode.
- 2) Use a single or multiple pass technique on Side 2.
- 3) No single pass shall exceed 1/8" in thickness.
- 4) Only stainless steel brushes shall be used on stainless steel.
- 5) Weld joint shall be power brushed.
- 6) Welding may be stringer or weave bead technique.
- 7) Use gas cup nozzle sizes between 3/8" to 1".
- 8) This WPS is limited to weld repairs only.  
 Weld repairs may include but limited to:
  - a) Full thickness weld repairs.
  - b) Weld pick-ups (undercut)
- 9) Full thickness weld repairs shall use a brass back-up bar.
- 10) Welding may be done with or without filler material.


*FLUX METAL  
 ALCOHOL WIPED DOWN  
 \* CLEAN GLOVES*

**BACKING MATERIAL (QW-402)**  
 Type Brass back-up bar as required

**JOINTS (QW-402)**



GTA weld repair  
 Copper Bar  
 Full thickness weld repairs



GTA weld repair  
 Weld Pick-Ups

GENERAL WELDING TECHNIQUE

Weld Layer(s)	Process	Filler Wire Class	Tungsten Dia.	Current (amps)	Voltage (volts)	Travel Speed (ipm)	Remarks
As required	GTAW	ER308L	1/8"	50-300	12-18	As Req'd	
<p>Filler Metal: ER308L                      Filler Metal Dia.: 1/16", 3/32", 1/8"                      Passes may be made with stringer or weave beads as required</p>							



WELDING PROCEDURE SPECIFICATION

WPS No. SPIRAL(ALT) Rev. 0

Product LIGD Beam Tube Can Sections Page 1 of 2  
 Contract \_\_\_\_\_  
 Customer CBI for Caltech Date 6/27/94  
 By SRF

Welding Process(es) Gas Tungsten Arc Welding (GTAW) Type(s) Machine  
 (Automatic, Manual, Machine, or Semi-Auto.)

REFERENCE PROCEDURE QUALIFICATION RECORDS			SPECIFIC CONTRACT	
No.	Position Qualified (QW-405)	Thickness Qualified (QW-403)	Position (QW-405)	Thickness Range (QW-403)
102	1G	1/16" to 0.28"	1G	1/8"

Code Edition and Addenda ASME Section VIII & Section IX, 1992 Edition, 1992 Addenda

**BASE METALS (QW-403)**

Specification A240 Type 304L to A240 Type 304L Thickness Range: \_\_\_\_\_  
 P-No. P-8 to P-8 Base Metal 1/8"  
 Group No. Gp. 1 to Gp. 1 Pipe Dia. 49"  
 Other \_\_\_\_\_

**FILLER METALS (QW-404)**

Spec. No. (SFA) <u>SFA 5.9</u>	<u>N/A</u>
AWS No. (Class) <u>ER308L</u>	<u>Autogenous</u>
F-No. <u>F-6</u>	<u>N/A</u>
A-No. <u>A-8</u>	<u>N/A</u>
Weld Metal Thickness Range:	
Groove <u>5/32"</u>	<u>5/32"</u>
Fillet <u>N/A</u>	<u>N/A</u>
Electrode-Flux (Class) <u>N/A</u>	<u>N/A</u>
Flux Trade Name <u>N/A</u>	<u>N/A</u>
Consumable Insert <u>N/A</u>	<u>N/A</u>
Other _____	

**PREHEAT (QW-406)**

Preheat Temp. None Required  
 Interpass Temp. 350°F maximum  
 Preheat Maintenance 100°F if ambient falls below 0°F

**ELECTRICAL CHARACTERISTICS (QW-408)**

Current Direct Current  
 Polarity Electrode Negative  
 Other Straight Polarity  
 Mode of transfer (GMAW) N/A

**POSTWELD HEAT TREATMENT (QW-407)**

PWHT Required None Required  
 Temperature Range N/A  
 Time Range N/A

**GAS (QW-408)**

	Composition	Flow Rate
Shielding	<u>80% Argon - 40% Helium</u>	<u>20-45 cfm</u>
Tailing	<u>N/A</u>	<u>N/A</u>
Backing	<u>100% Nitrogen</u>	<u>10-35 cfm</u>



WELDING PROCEDURE SPECIFICATION

WPS No. SPIRAL(ALT) Rev. 0

Product LIGO Beam Tube Can Sections  
 Customer CBI for Caltech

Page 2 of 2  
 Contract \_\_\_\_\_  
 Date 6/27/94  
 By SRF

**TECHNIQUE AND LIMITATIONS (QW-410)**

- 1) Use a single EWTh-2 (2% thoriated tungsten) electrode.
- 2) Use a single pass per side technique.
- 3) No single pass shall exceed 1/8" in thickness.
- 4) Only stainless steel brushes shall be used on stainless steel.
- 5) Weld joint shall be power brushed adequately to remove oxidation (approx. 1/2" to 1" from each edge)
- 6) Only filler material in accordance with WMS-ER308L shall be used.
- 7) A magnetic oscillator shall be used.
- 8) Use gas cup nozzle sizes between 3/8" to 1".
- 8) Use a 1/8" diameter electrode only.

**BACKING MATERIAL (QW-402)**  
 Type None Required

**JOINTS (QW-402)**

Side 1: Autogenous  
 Side 2: ER308L

Each pass to have a minimum of 60% penetration

Magnetic oscillator parameters:  
 Amplitude: 35  
 Left: 10  
 Speed: 10  
 Right: 10

GENERAL WELDING TECHNIQUE

Weld Layer(s)	Process	Filler Material		Current (amps)	Voltage (volts)	Travel Speed (ipm)	Remarks
		Class	Dia.				
Side 1	GTAW	Autogenous	N/A	270-290	11.5-12.5	16-18	Inside of tube
Side 2	GTAW	ER308L	0.035"	290-310	11.5-12.5	Same	Outside of tube WFS = 38 to 45 ipm



PROCEDURE QUALIFICATION RECORD  
TO A.S.M.E SECTION IX  
ESSENTIAL VARIABLES

Page 1 of 2  
Contract \_\_\_\_\_

Procedure Qualification Record No. 100 Date 6/27/94  
Welding Process(es) Gas Tungsten Arc Welding (GTAW)  
Types (Manual, Automatic, Semi-Auto.) Machine

<b>BASE METALS (QW-403)</b> Material Spec. <u>A240</u> Type or Grade <u>304L</u> P-No. <u>P-8, Gr. 1</u> to P-No. <u>P-8, Gr. 1</u> Thickness of Test Coupon <u>0.140"</u> Diameter of Test Coupon <u>N/A</u>		<b>POSTWELD HEAT TREATMENT (QW-407)</b> Temperature <u>N/A</u> Time <u>N/A</u>													
<b>FILLER METALS (QW-404)</b> SFA Specification <u>SFA 5.9</u> AWS Classification <u>ER308L</u> Filler Metal F-No. <u>F-6</u> Weld Metal Analysis A-No. <u>A-8</u> Size of Filler Metal <u>0.045"</u> Other _____ Weld Metal Thickness <u>3/32"</u>		<u>N/A</u> <u>Autogenous</u> <u>N/A</u> <u>N/A</u> <u>3/32"</u>													
<b>POSITION (QW-405)</b> Position of Groove <u>Downflat (1G)</u> Weld Progression (Uphill, Downhill) <u>N/A</u> Other _____		<b>GAS (QW-408)</b> <table border="1"> <thead> <tr> <th></th> <th>Gas(es)</th> <th>Percent Composition (Mixture)</th> <th>Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td><u>100% Argon</u></td> <td></td> <td><u>45 cfm</u></td> </tr> <tr> <td>Backing</td> <td><u>100% Nitrogen</u></td> <td></td> <td><u>60 cfm</u></td> </tr> </tbody> </table>			Gas(es)	Percent Composition (Mixture)	Flow Rate	Shielding	<u>100% Argon</u>		<u>45 cfm</u>	Backing	<u>100% Nitrogen</u>		<u>60 cfm</u>
	Gas(es)	Percent Composition (Mixture)	Flow Rate												
Shielding	<u>100% Argon</u>		<u>45 cfm</u>												
Backing	<u>100% Nitrogen</u>		<u>60 cfm</u>												
<b>PREHEAT (QW-406)</b> Preheat Temp. <u>0° to 70°F</u> Interpass Temp. <u>350°F</u>		<b>ELECTRICAL CHARACTERISTICS (QW-409)</b> Current <u>Direct Current</u> Polarity <u>Electrode Negative (Straight Polarity)</u> Mode of transfer (GMAW) <u>N/A</u> Tungsten Electrode Size <u>1/8" diameter</u> Tungsten Type <u>EWTh-2</u>													
		<b>TECHNIQUE (QW-410)</b> Travel Speed <u>16 ipm</u> String or Weave Bead <u>Stringer</u> Oscillation <u>Magnetic Oscillator</u> Multipass or Single Pass (per side) <u>Single</u> Single or Multiple Electrodes <u>Single</u> Other _____													

TEST RESULTS

Tensile Test (QW-160)

Specimen No.	Dimensions, in.		Area (sq. in.)	Ultimate Total Load (Kips)	Ultimate Unit Stress (ksi)	Type of Failure and Location
	Width	Thickness				
<u>TT100-A1</u>	<u>0.748</u>	<u>0.118</u>	<u>0.087</u>	<u>7.3</u>	<u>83.9</u>	<u>Ductile in Plate</u>
<u>TT100-A2</u>	<u>0.747</u>	<u>0.114</u>	<u>0.085</u>	<u>7.1</u>	<u>83.5</u>	<u>Ductile in Weld Metal</u>

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
<u>2 Transverse Root Bends</u>	<u>OK</u>
<u>2 Transverse Face Bends</u>	<u>OK</u>

Welder's Name Dan Owens Social Security No. 396-58-5788 Welder's Symbol DO  
 Welder's Name \_\_\_\_\_ Social Security No. \_\_\_\_\_ Welder's Symbol \_\_\_\_\_  
 Tests conducted by: Chicago Bridge & Iron Company Laboratory Test No. H11816 Rev. 1

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.

By Stephen R. Franz Date 6/27/94

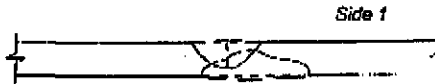
Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



**PROCEDURE QUALIFICATION RECORD**  
**TO A.S.M.E. SECTION IX**  
**WELDING VARIABLES**

Page 2 of 2  
 Contract \_\_\_\_\_

A-240 Type 304L  
 0.140" Thick



Penetration: Side 1 approximately 70%      1/8" diameter EWTh-2 electrode  
 Side 2 approximately 70%

Magnetic Oscillator Parameters:

Amplitude: 35  
 Left: 10  
 Speed: 10  
 Right: 10

Side	Pass	Electrode		Amps	Volts	Travel Speed		Heat Input		Remarks	
		Type	Size			in./min.	cm/min.	kJ/in	kJ/cm		
			in								mm
1	1	Autogenous	N/A	N/A	290	11.5	18.0	40.6	12.51	4.92	
2	1	ER308L	0.035	0.889	335	11.5	18.0	40.6	14.48	5.69	WFS = 41 fpm

Qualification No. 100

Date: 6/27/94

By Stephen R. Franu





**PROCEDURE QUALIFICATION RECORD**  
TO A.S.M.E. SECTION IX  
ESSENTIAL VARIABLES

Page 1 of 2  
Contract \_\_\_\_\_

Procedure Qualification Record No. <u>101</u> Date _____													
Welding Process(es) <u>Gas Tungsten Arc Welding (GTAW)</u>													
Types (Manual, Automatic, Semi-Auto.) <u>Manual</u>													
<b>BASE METALS (QW-403)</b> Material Spec. <u>A240</u> Type or Grade <u>304L</u> P-No. <u>P-8, Gp. 1</u> to P-No. <u>P-8, Gp. 1</u> Thickness of Test Coupon <u>0.140"</u> Diameter of Test Coupon <u>N/A</u>	<b>POSTWELD HEAT TREATMENT (QW-407)</b> Temperature <u>N/A</u> Time <u>N/A</u>												
<b>FILLER METALS (QW-404)</b> SFA Specification <u>SFA 5.9</u> AWS Classification <u>ER308L</u> Filler Metal F-No. <u>F-6</u> Weld Metal Analysis A-No. <u>A-8</u> Size of Filler Metal <u>1/16" dia.</u> Other _____ Weld Metal Thickness <u>1/8"</u>	<b>GAS (QW-408)</b> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th></th> <th>Gas(es)</th> <th>Percent Composition (Mixture)</th> <th>Flow Rate</th> </tr> <tr> <td>Shielding</td> <td><u>100% Argon</u></td> <td></td> <td><u>45 cfm</u></td> </tr> <tr> <td>Backing</td> <td><u>100% Nitrogen</u></td> <td></td> <td><u>80 cfm</u></td> </tr> </table>		Gas(es)	Percent Composition (Mixture)	Flow Rate	Shielding	<u>100% Argon</u>		<u>45 cfm</u>	Backing	<u>100% Nitrogen</u>		<u>80 cfm</u>
	Gas(es)	Percent Composition (Mixture)	Flow Rate										
Shielding	<u>100% Argon</u>		<u>45 cfm</u>										
Backing	<u>100% Nitrogen</u>		<u>80 cfm</u>										
<b>POSITION (QW-405)</b> Position of Groove <u>Downflat (1G)</u> Weld Progression (Uphill, Downhill) <u>N/A</u> Other _____	<b>ELECTRICAL CHARACTERISTICS (QW-409)</b> Current <u>Direct Current</u> Polarity <u>Electrode Negative (Straight Polarity)</u> Mode of transfer (GMAW) <u>N/A</u> Tungsten Electrode Size <u>1/8" diameter</u> Tungsten Type <u>EWTh-2</u>												
<b>PREHEAT (QW-406)</b> Preheat Temp. <u>0° to 70°F</u> Interpass Temp. <u>350°F</u>	<b>TECHNIQUE (QW-410)</b> Travel Speed <u>See page 2</u> String or Weave Bead <u>Stringer</u> Oscillation <u>None</u> Multipass or Single Pass (per side) <u>Multiple Side 1</u> Single or Multiple Electrodes <u>Single</u> Other _____												

**TEST RESULTS**

**Tensile Test (QW-150)**

Specimen No.	Dimensions, in.		Area (sq. in.)	Ultimate Total Load (Kips)	Ultimate Unit Stress (ksi)	Type of Failure and Location
	Width	Thickness				
<u>TT101-A1</u>	<u>0.749</u>	<u>0.140</u>	<u>0.105</u>	<u>8.8</u>	<u>83.8</u>	<u>Ductile in Weld Metal</u>
<u>TT101-A2</u>	<u>0.750</u>	<u>0.139</u>	<u>0.104</u>	<u>8.9</u>	<u>85.6</u>	<u>Ductile in Weld Metal</u>

**Guided-Bend Tests (QW-160)**

Type and Figure No.	Result
<u>2 Transverse Root Bends</u>	<u>OK</u>
<u>2 Transverse Face Bends</u>	<u>OK</u>

Welder's Name Dan Owens Social Security No. 396-58-5758 Welder's Symbol DO  
 Welder's Name \_\_\_\_\_ Social Security No. \_\_\_\_\_ Welder's Symbol \_\_\_\_\_  
 Tests conducted by: Chicago Bridge & Iron Company Laboratory Test No. H11817 Rev. 1

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.

By Stephen R. Frana Date 6/27/94

Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



**PROCEDURE QUALIFICATION RECORD**  
**TO A.S.M.E. SECTION IX**  
**WELDING VARIABLES**

Page 2 of 2  
 Contract \_\_\_\_\_

A240 Type 304L  
 0.140" Thick

1/16" Gap



1/8" diameter EWTh-2 electrode

Side 1: Brass back-up bar without backing gas

Side 2: Ground to sound metal before welding  
 100% nitrogen purge on back side

Side	Pass	Electrode		Amps	Volts	Travel Speed		Heat Input		Remarks	
		Type	Size			in./min.	cm/min.	kj/m	kj/cm		
			in								mm
1	1	Autogenous	N/A	N/A	140	18.0	10.0	25.40	15.12	5.95	
1	2	ER308L	1/16"	1.587	140	18.0	6.0	15.24	25.20	9.92	
2	1	ER308L	1/16"	1.587	140	18.0	6.0	15.24	25.20	9.92	

Qualification No. 101

Date: 6/27/94

By \_\_\_\_\_

Stephen R. Frana



**PROCEDURE QUALIFICATION RECORD**  
TO A.S.M.E. SECTION IX  
ESSENTIAL VARIABLES

Page 1 of 2  
Contract \_\_\_\_\_

Procedure Qualification Record No. 102 Date 6/27/84  
Welding Process(es) Gas Tungsten Arc Welding (GTAW)  
Types (Manual, Automatic, Semi-Auto.) Machine

<b>BASE METALS (QW-403)</b> Material Spec. <u>A240</u> Type or Grade <u>304L</u> P-No. <u>P-8, Gp. 1</u> to F-No. <u>P-8, Gp. 1</u> Thickness of Test Coupon <u>0.140"</u> Diameter of Test Coupon <u>N/A</u>		<b>POSTWELD HEAT TREATMENT (QW-407)</b> Temperature <u>N/A</u> Time <u>N/A</u>													
<b>FILLER METALS (QW-404)</b> SFA Specification <u>SFA 5.9</u> AWS Classification <u>ER308L</u> Filler Metal F-No. <u>F-8</u> Weld Metal Analysis A-No. <u>A-6</u> Size of Filler Metal <u>0.045"</u> Other _____ Weld Metal Thickness <u>3/32"</u>		<b>GAS (QW-408)</b> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Gas(es)</th> <th>Percent Composition (Mixture)</th> <th>Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td><u>50% Argon</u></td> <td><u>40% Helium</u></td> <td><u>45 cfm</u></td> </tr> <tr> <td>Backing</td> <td><u>100% Nitrogen</u></td> <td></td> <td><u>60 cfm</u></td> </tr> </tbody> </table>			Gas(es)	Percent Composition (Mixture)	Flow Rate	Shielding	<u>50% Argon</u>	<u>40% Helium</u>	<u>45 cfm</u>	Backing	<u>100% Nitrogen</u>		<u>60 cfm</u>
	Gas(es)	Percent Composition (Mixture)	Flow Rate												
Shielding	<u>50% Argon</u>	<u>40% Helium</u>	<u>45 cfm</u>												
Backing	<u>100% Nitrogen</u>		<u>60 cfm</u>												
<b>POSITION (QW-405)</b> Position of Groove <u>Downflat (1G)</u> Weld Progression (Uphill, Downhill) <u>N/A</u> Other _____		<b>ELECTRICAL CHARACTERISTICS (QW-409)</b> Current <u>Direct Current</u> Polarity <u>Electrode Negative (Straight Polarity)</u> Mode of transfer (GMAW) <u>N/A</u> Tungsten Electrode Size <u>1/8" diameter</u> Tungsten Type <u>EWTh-2</u>													
<b>PREHEAT (QW-406)</b> Preheat Temp. <u>0° to 70°F</u> Interpass Temp. <u>350°F</u>		<b>TECHNIQUE (QW-410)</b> Travel Speed <u>18 ipm</u> String or Weave Bead <u>Stringer</u> Oscillation <u>Magnetic Oscillator</u> Multipass or Single Pass (per side) <u>Single</u> Single or Multiple Electrodes <u>Single</u> Other _____													

**TEST RESULTS**

**Tensile Test (QW-150)**

Specimen No.	Dimensions, in.		Area (sq. in.)	Ultimate Total Load (Kips)	Ultimate Unit Stress (ksi)	Type of Failure and Location
	Width	Thickness				
<u>TT102-A1</u>	<u>0.748</u>	<u>0.111</u>	<u>0.083</u>	<u>7.0</u>	<u>84.3</u>	<u>Ductile in HAZ</u>
<u>TT102-A2</u>	<u>0.748</u>	<u>0.111</u>	<u>0.083</u>	<u>7.0</u>	<u>84.3</u>	<u>Ductile in Weld Metal</u>

**Guided-Bend Tests (QW-160)**

Type and Figure No.	Result
<u>2 Transverse Root Bends</u>	<u>OK</u>
<u>2 Transverse Face Bends</u>	<u>OK</u>

Welder's Name Dan Owens Social Security No. 396-58-5758 Welder's Symbol DO  
 Welder's Name \_\_\_\_\_ Social Security No. \_\_\_\_\_ Welder's Symbol \_\_\_\_\_  
 Tests conducted by: Chicago Bridge & Iron Company Laboratory Test No. H11818 Rev. 1

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.

By Stephen R. Frana Date 6/27/84

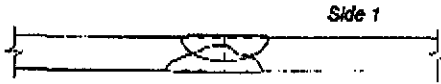
Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



PROCEDURE QUALIFICATION RECORD  
TO A.S.M.E. SECTION IX  
WELDING VARIABLES

Page 2 of 2  
Contract \_\_\_\_\_

A-240 Type 304L  
0.140" Thick



Penetration: Side 1 approximately 70%      1/8" diameter EWTh-2 electrode  
Side 2 approximately 80%

Magnetic Oscillator Parameters:

Amplitude: 35  
Left: 10  
Speed: 10  
Right: 10

Side	Pass	Electrode		Amps	Volts	Travel Speed		Heat Input		Remarks	
		Type	Size			in./min.	cm/min.	kJ/in.	kJ/cm		
			in.								mm
1	1	Autogenous	N/A	N/A	280	12.0	16.0	40.6	12.60	4.88	
2	1	ER308L	0.035	0.889	300	12.0	16.0	40.6	13.60	5.31	WFS = 41 ipm

Qualification No. 102  
Date: 6/27/94

By Stephen R. Frana



**PERFORMANCE QUALIFICATION TEST**

In Accordance with Section IX of the ASME Code - Latest Edition

**SPECIAL QUALIFICATION**

Process 1						Record of Utilization			
Tubetec Code: _____ Process 1: <u>GTAW</u> Groove Type: <input type="radio"/> Overlay <input type="radio"/> Single Butt <input checked="" type="radio"/> Double Butt <input type="radio"/> Fillet Weld Backing: <input type="radio"/> Gas <input type="radio"/> Back up Ring <input type="radio"/> Consumable Insert Electrode SFA: <u>SFA 5.9</u> Electrode/Filler Metal Class: <u>Autogenous</u> F No.: _____ <input checked="" type="radio"/> Manual <input type="radio"/> Machine Pass direction (3G, 5G, 6G) <input type="radio"/> Up <input type="radio"/> Down Welding Current: <input type="radio"/> AC <input type="radio"/> DCRP <input checked="" type="radio"/> DCSP GTA Special: <input type="checkbox"/> AVC <input type="checkbox"/> Remote Visual <input type="checkbox"/> Auto Joint Tracking GMA Special: <input type="radio"/> Spray, Globular, or Pulsed <input type="radio"/> Short Circuit						Month / Year	Type of Insp.	Initials	
Process 2 Tubetec Code: _____ Process 2: <u>GTAW</u> Electrode SFA: <u>SFA 5.9</u> Electrode/Filler Metal Class: <u>ER308L</u> F No.: _____ <input checked="" type="radio"/> Manual <input type="radio"/> Machine Pass direction (3G, 5G, 6G) <input type="radio"/> Up <input type="radio"/> Down Welding Current: <input type="radio"/> AC <input type="radio"/> DCRP <input checked="" type="radio"/> DCSP GTA Special: <input type="checkbox"/> AVC <input type="checkbox"/> Remote Visual <input type="checkbox"/> Auto Joint Tracking GMA Special: <input type="radio"/> Spray, Globular, or Pulsed <input type="radio"/> Short Circuit									
WPS No.: <u>SPLICE</u> Position: <u>1G</u> <input type="radio"/> Pipe <input checked="" type="radio"/> Plate Machine only: <input type="radio"/> Single pass per side <input type="radio"/> Multiple pass per side									
Test Coupon			Qualification Range						
Thickness: <u>0.140</u> in.			Thickness Max.: <u>1/8</u> in.						
Outside Diameter: <u>N/A</u> in.			Outside Diameter Min.: <u>49</u> in.						
Material Spec (1): <u>A240-304L</u>			Process 1 Max weld Metal Thick: <u>1/8</u> in.						
P. No. (1): <u>P-8, Gp. 1</u>			Process 2 Max weld Metal Thick: <u>1/8</u> in.						
Material Spec (2): <u>A240-304L</u>									
P. No. (2): <u>P-8, Gp. 1</u>									
Thickness Weld Metal (Root): <u>3/32</u> in.			General Note: Acceptance of test results includes the examination of welded coupon(s) for complete penetration and fusion.						
Thickness Weld Metal (Fill): <u>3/32</u> in.									
Test Method									
Bends Test Number of Bends: <u>4</u> Result: <u>OK</u>		Radiography (pipe) Result: <input type="checkbox"/>	Radiography of 6" of test plate Result: <input type="checkbox"/>	Radiography of 36" of Production weld. Result: <input type="checkbox"/>	Liquid Penetrant Test of Surface Result: <input type="checkbox"/>	Cross sections Number Examined: Result: <input type="checkbox"/>			
Notes: 1) Side 1, pass 1 without filler metal 2) Side 1 welded with brass back-up bar 3) Side 2 ground to clean metal before welding				Hand Sketch: 					
Date <u>6/27/94</u>	Location <u>Sanford, FL</u>		Social Security No. <u>398-58-5758</u>	Clock Number <u>TT# 108</u>	Specimen Mark <u>DO</u>				
WE CERTIFY THAT THE STATEMENTS MADE IN THIS RECORD ARE CORRECT AND THAT THE TEST WELDS WERE PREPARED, WELDED, AND TESTED IN ACCORDANCE WITH SECTION IX OF THE ASME CODE - LATEST EDITION / AND MAINTAINED FROM THE TIME OF TEST TO THIS DATE.				Address: <u>301 Brown Avenue</u> City: <u>Sanford</u> State: <u>FL</u> Full Name: <u>Dan Owens</u> Tubetec Representative: <u>Dan Owens</u>				X = X-Ray V = Visual R = Renewal	
TUBETEC REPRESENTATIVE		DATE		First	Middle	Last			



**PERFORMANCE QUALIFICATION TEST**  
In Accordance with Section IX of the ASME Code - Latest Edition  
**SPECIAL QUALIFICATION**

Process 1						Record of Utilization			
Tubetec Code: _____ Process 1: <u>GTAW</u> Groove Type: <input type="radio"/> Overlay <input type="radio"/> Single Butt <input checked="" type="radio"/> Double Butt <input type="radio"/> Fillet Weld Backing: <input checked="" type="radio"/> Gas <input type="radio"/> Back up Ring <input type="radio"/> Consumable Insert Electrode SFA: <u>SFA 5.9</u> Electrode/Filler Metal Class: <u>Autogenous</u> F No.: _____ <input type="radio"/> Manual <input checked="" type="radio"/> Machine Pass direction (3G, 5G, 6G) <input type="radio"/> Up <input type="radio"/> Down Welding Current: <input type="radio"/> AC <input type="radio"/> DCRP <input checked="" type="radio"/> DCSP GTA Special: <input checked="" type="checkbox"/> AVC <input checked="" type="checkbox"/> Remote Visual <input type="checkbox"/> Auto Joint Tracking GMA Special: <input type="radio"/> Spray, Globular, or Pulsed <input type="radio"/> Short Circuit						Month / Year	Type of Insp.	Initials	
Process 2 Tubetec Code: _____ Process 2: <u>GTAW</u> Electrode SFA: <u>SFA 5.9</u> Electrode/Filler Metal Class: <u>ER308L</u> F No.: _____ <input type="radio"/> Manual <input checked="" type="radio"/> Machine Pass direction (3G, 5G, 6G) <input type="radio"/> Up <input type="radio"/> Down Welding Current: <input type="radio"/> AC <input type="radio"/> DCRP <input checked="" type="radio"/> DCSP GTA Special: <input checked="" type="checkbox"/> AVC <input checked="" type="checkbox"/> Remote Visual <input type="checkbox"/> Auto Joint Tracking GMA Special: <input type="radio"/> Spray, Globular, or Pulsed <input type="radio"/> Short Circuit									
WPS No.: <u>SPIRAL</u> Position: <u>1G</u> <input type="radio"/> Pipe <input checked="" type="radio"/> Plate Machine only: <input checked="" type="radio"/> Single pass per side <input type="radio"/> Multiple pass per side									
Test Coupon			Qualification Range						
Thickness: <u>0.140</u> in.			Thickness Max.: <u>1/8</u> in.						
Outside Diameter: <u>N/A</u> in.			Outside Diameter Min.: <u>.49</u> in.						
Material Spec (1): <u>A240-304L</u>			Process 1 Max weld Metal Thick: <u>1/8</u> in.						
P. No. (1): <u>P-8, Gp. 1</u>			Process 2 Max weld Metal Thick: <u>1/8</u> in.						
Material Spec (2): <u>A240-304L</u>									
P. No. (2): <u>P-8, Gp. 1</u>									
Thickness Weld Metal (Root): <u>3/32</u> in.			General Note: Acceptance of test results includes the examination of welded coupon(s) for complete penetration and fusion.						
Thickness Weld Metal (Fill): <u>3/32</u> in.									
Test Method									
Bends Test	Radiography (pipe)	Radiography of 6" of test plate	Radiography of 36" of Production weld.	Liquid Penetrant Test of Surface	Cross sections Number Examined:				
Number of Bends: _____	Result	Result	Result	Result	Result				
Result		OK							
Notes:			Hand Sketch:						
1) Side 1 without filler metal 2) Side 2 with ER308L 3) Magnetic oscillator used on all passes									
Date	Location	Social Security No.	Clock Number	Specimen Mark					
<u>6/27/94</u>	<u>Sanford, FL</u>	<u>267-55-8028</u>	<u>TT# 150</u>	<u>CJ</u>					
WE CERTIFY THAT THE STATEMENTS MADE IN THIS RECORD ARE CORRECT AND THAT THE TEST WELDS WERE PREPARED, WELDED, AND TESTED IN ACCORDANCE WITH SECTION IX OF THE ASME CODE - LATEST EDITION / AND MAINTAINED FROM THE TIME OF TEST TO THIS DATE.			Address: <u>301 Brown Avenue</u>						
			City: <u>Sanford</u> State: <u>FL</u>						
			Full Name: <u>Charles Jones</u>						
TUBETEC REPRESENTATIVE			DATE	First	Middle	Last			
								X = X-Ray V = Visual R = Renewal	



**PERFORMANCE QUALIFICATION TEST**  
In Accordance with Section IX of the ASME Code - Latest Edition  
**SPECIAL QUALIFICATION**

Process 1						Record of Utilization							
Tubetec Code: _____ Process 1: <u>GTAW</u> Groove Type: <input type="radio"/> Overlay <input type="radio"/> Single Butt <input checked="" type="radio"/> Double Butt <input type="radio"/> Fillet Weld Backing: <input checked="" type="radio"/> Gas <input type="radio"/> Back up Ring <input type="radio"/> Consumable Insert Electrode SFA: <u>SFA 5.9</u> Electrode/Filler Metal Class: <u>Autogenous</u> F No.: _____ Pass direction (3G, 5G, 6G) <input type="radio"/> Up <input type="radio"/> Down Welding Current: <input type="radio"/> AC <input type="radio"/> DCRP <input checked="" type="radio"/> DCSP GTA Special: <input checked="" type="checkbox"/> AVC <input checked="" type="checkbox"/> Remote Visual <input type="checkbox"/> Auto Joint Tracking GMA Special: <input type="radio"/> Spray, Globular, or Pulsed <input type="radio"/> Short Circuit						Month / Year	Type of Insp.	Initials					
Process 2 Tubetec Code: _____ Process 2: <u>GTAW</u> Electrode SFA: <u>SFA 5.9</u> Electrode/Filler Metal Class: <u>ER308L</u> F No.: _____ Pass direction (3G, 5G, 6G) <input type="radio"/> Up <input type="radio"/> Down Welding Current: <input type="radio"/> AC <input type="radio"/> DCRP <input checked="" type="radio"/> DCSP GTA Special: <input checked="" type="checkbox"/> AVC <input checked="" type="checkbox"/> Remote Visual <input type="checkbox"/> Auto Joint Tracking GMA Special: <input type="radio"/> Spray, Globular, or Pulsed <input type="radio"/> Short Circuit													
WPS No.: <u>SPIRAL</u> Position: <u>1G</u> <input type="radio"/> Pipe <input checked="" type="radio"/> Plate Machine only: <input checked="" type="radio"/> Single pass per side <input type="radio"/> Multiple pass per side													
Test Coupon			Qualification Range										
Thickness: <u>0.140</u> in.			Thickness Max.: <u>1/8</u> in.										
Outside Diameter: <u>N/A</u> in.			Outside Diameter Min.: <u>49</u> in.										
Material Spec (1): <u>A240-304L</u>			Process 1 Max weld Metal Thick: <u>1/8</u> in.										
P. No. (1): <u>P-8, Gp. 1</u>			Process 2 Max weld Metal Thick: <u>1/8</u> in.										
Material Spec (2): <u>A240-304L</u>			General Note: Acceptance of test results includes the examination of welded coupon(s) for complete penetration and fusion.										
P. No. (2): <u>P-8, Gp. 1</u>													
Thickness Weld Metal (Root): <u>3/32</u> in.													
Thickness Weld Metal (Fill): <u>3/32</u> in.													
Test Method													
Bends Test	Radiography (pipe)	Radiography of 6" of test plate	Radiography of 36" of Production weld.	Liquid Penetrant Test of Surface	Cross sections Number Examined:								
Number of Bends: _____	Result _____	Result _____	Result _____	Result _____	Result _____								
Notes: 1) Side 1 without filler metal 2) Side 2 with ER308L 3) Magnetic oscillator used on all passes						Hand Sketch: <div style="text-align: right; margin-right: 50px;">Side 1</div>							
Date: <u>6/27/94</u>	Location: <u>Sanford, FL</u>	Social Security No.: <u>303-54-8899</u>	Clock Number: <u>TT# 123</u>	Specimen Mark: <u>JA</u>									
WE CERTIFY THAT THE STATEMENTS MADE IN THIS RECORD ARE CORRECT AND THAT THE TEST WELDS WERE PREPARED, WELDED, AND TESTED IN ACCORDANCE WITH SECTION IX OF THE ASME CODE - LATEST EDITION / AND MAINTAINED FROM THE TIME OF TEST TO THIS DATE.						Address: <u>301 Brown Avenue</u>							
						City: <u>Sanford</u> State: <u>FL</u>							
						Full Name: <u>James Aker</u>							
TUBETEC REPRESENTATIVE			DATE			First	Middle	Last	X = X-Ray V = Visual R = Renewal				



PERFORMANCE QUALIFICATION TEST
In Accordance with Section IX of the ASME Code - Latest Edition
SPECIAL QUALIFICATION

Process 1

Tubetec Code:
Process 1: GTAW
Groove Type: Overlay, Single Butt, Double Butt, Fillet Weld
Backing: Gas, Back up Ring, Consumable Insert
Electrode SFA: SFA 5.9
Electrode/Filler Metal Class: Autogenous
F No.:
Welding Current: AC, DCRP, DCSP
GTA Special: AVC, Remote Visual, Auto Joint Tracking
GMA Special: Spray, Globular, or Pulsed, Short Circuit

Record of Utilization

Month / Year, Type of Insp., Initials

Process 2

Tubetec Code:
Process 2: GTAW
Electrode SFA: SFA 5.9
Electrode/Filler Metal Class: ER308L
F No.:
Welding Current: AC, DCRP, DCSP
GTA Special: AVC, Remote Visual, Auto Joint Tracking
GMA Special: Spray, Globular, or Pulsed, Short Circuit

WPS No.: SPIRAL
Position: 1G
Machine only: Single pass per side, Multiple pass per side

Test Coupon

Qualification Range

Thickness: 0.140 in.
Outside Diameter: N/A in.
Material Spec (1): A240-304L
P. No. (1): P-8, Gp. 1
Material Spec (2): A240-304L
P. No. (2): P-8, Gp. 1
Thickness Weld Metal (Root): 3/32 in.
Thickness Weld Metal (Fill): 3/32 in.

Thickness Max.: 1/8 in.
Outside Diameter Min.: 49 in.
Process 1 Max weld Metal Thick: 1/8 in.
Process 2 Max weld Metal Thick: 1/8 in.

General Note: Acceptance of test results includes the examination of welded coupon(s) for complete penetration and fusion.

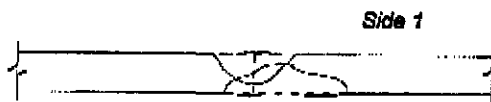
Test Method

Table with 6 columns: Bands Test, Radiography (pipe), Radiography of 6" of test plate, Radiography of 36" of Production weld, Liquid Penetrant Test of Surface, Cross sections Number Examined. Includes Result boxes.

Notes:

- 1) Side 1 without filler metal
2) Side 2 with ER308L
3) Magnetic oscillator used on all passes

Hand Sketch:



Date: 6/27/94
Location: Sanford, FL
Social Security No.: 001-56-0183
Clock Number: TT# 168
Specimen Mark: CJ

WE CERTIFY THAT THE STATEMENTS MADE IN THIS RECORD ARE CORRECT AND THAT THE TEST WELDS WERE PREPARED, WELDED, AND TESTED IN ACCORDANCE WITH SECTION IX OF THE ASME CODE - LATEST EDITION / AND MAINTAINED FROM THE TIME OF TEST TO THIS DATE.

Address: 301 Brown Avenue
City: Sanford State: FL
Full Name: Matthew Newell
First Middle Last

X = X-Ray
V = Visual
R = Renewal

TUBETEC REPRESENTATIVE DATE






PERFORMANCE QUALIFICATION TEST
In Accordance with Section IX of the ASME Code - Latest Edition
SPECIAL QUALIFICATION

Process 1
Process 2
WPS No.: SPIRAL
Position: 1G
Test Coupon
Qualification Range
Test Method
Notes:
1) Side 1 without filler metal
2) Side 2 with ER308L
3) Magnetic oscillator used on all passes
Hand Sketch:
Date: 6/27/94
Location: Sanford, FL
Social Security No.: 294-48-3173
Clock Number: TT# 106
Specimen Mark: CJ
WE CERTIFY THAT THE STATEMENTS MADE IN THIS RECORD ARE CORRECT AND THAT THE TEST WELDS WERE PREPARED, WELDED, AND TESTED IN ACCORDANCE WITH SECTION IX OF THE ASME CODE - LATEST EDITION / AND MAINTAINED FROM THE TIME OF TEST TO THIS DATE.
TUBETEC REPRESENTATIVE DATE
Address: 301 Brown Avenue
City: Sanford State: FL
Full Name: Robert Decker
First Middle Last
X = X-Ray
V = Visual
R = Renewal



**PERFORMANCE QUALIFICATION TEST**  
*In Accordance with Section IX of the ASME Code - Latest Edition*  
**SPECIAL QUALIFICATION**

Process 1						Record of Utilization			
Tubetec Code:	Process 1: <u>GTAW</u>					Month / Year	Type of Insp.	Initials	
Groove Type: <input type="radio"/> Overlay <input type="radio"/> Single Butt <input checked="" type="radio"/> Double Butt <input type="radio"/> Fillet Weld	Backing: <input checked="" type="radio"/> Gas <input type="radio"/> Back up Ring <input type="radio"/> Consumable Insert	Electrode SFA: <u>SFA 5.9</u>	Electrode/Filler Metal Class: <u>Autogenous</u>	F No.:					
<input type="radio"/> Manual <input checked="" type="radio"/> Machine	Pass direction (3G, 5G, 6G) <input type="radio"/> Up <input type="radio"/> Down	Welding Current: <input type="radio"/> AC <input type="radio"/> DCRP <input checked="" type="radio"/> DCSP	GTA Special: <input checked="" type="checkbox"/> AVC <input checked="" type="checkbox"/> Remote Visual <input type="checkbox"/> Auto Joint Tracking	GMA Special: <input type="radio"/> Spray, Globular, or Pulsed <input type="radio"/> Short Circuit					
Process 2									
Tubetec Code:	Process 2: <u>GTAW</u>								
Electrode SFA: <u>SFA 5.9</u>	Electrode/Filler Metal Class: <u>ER308L</u>	F No.:							
<input type="radio"/> Manual <input checked="" type="radio"/> Machine	Pass direction (3G, 5G, 6G) <input type="radio"/> Up <input type="radio"/> Down	Welding Current: <input type="radio"/> AC <input type="radio"/> DCRP <input checked="" type="radio"/> DCSP	GTA Special: <input checked="" type="checkbox"/> AVC <input checked="" type="checkbox"/> Remote Visual <input type="checkbox"/> Auto Joint Tracking	GMA Special: <input type="radio"/> Spray, Globular, or Pulsed <input type="radio"/> Short Circuit					
WPS No.: <u>SPIRAL</u>	Position: <u>1G</u>	Machine only: <input checked="" type="radio"/> Single pass per side <input type="radio"/> Multiple pass per side							
Test Coupon			Qualification Range						
Thickness: <u>0.140</u> in.	Outside Diameter: <u>N/A</u> in.	Material Spec (1): <u>A240-304L</u>	Thickness Max: <u>1/8</u> in.	Outside Diameter Min.: <u>49</u> in.	Process 1 Max weld Metal Thick: <u>1/8</u> in.				
P. No. (1): <u>P-8, Gp. 1</u>	Material Spec (2): <u>A240-304L</u>	P. No. (2): <u>P-8, Gp. 1</u>	Process 2 Max weld Metal Thick: <u>1/8</u> in.	General Note: Acceptance of test results includes the examination of welded coupon(s) for complete penetration and fusion.					
Thickness Weld Metal (Root): <u>3/32</u> in.	Thickness Weld Metal (Fill): <u>3/32</u> in.								
Test Method									
Bends Test Number of Bends:	Radiography (pipe) Result	Radiography of 6" of test plate Result	Radiography of 36" of Production weld. Result	Liquid Penetrant Test of Surface Result	Cross sections Number Examined: Result				
Result: <input type="checkbox"/>	Result: <input type="checkbox"/>	Result: <input type="checkbox"/> <b>OK</b>	Result: <input type="checkbox"/>	Result: <input type="checkbox"/>	Result: <input type="checkbox"/>				
Notes: 1) Side 1 without filler metal 2) Side 2 with ER308L 3) Magnetic oscillator used on all passes			Hand Sketch: 						
Date: <u>6/27/94</u>	Location: <u>Sanford, FL</u>	Social Security No.: <u>266-15-8146</u>	Clock Number: <u>TT# 104</u>	Specimen Mark: <u>CJ</u>					
WE CERTIFY THAT THE STATEMENTS MADE IN THIS RECORD ARE CORRECT AND THAT THE TEST WELDS WERE PREPARED, WELDED, AND TESTED IN ACCORDANCE WITH SECTION IX OF THE ASME CODE - LATEST EDITION / AND MAINTAINED FROM THE TIME OF TEST TO THIS DATE.			Address: <u>301 Brown Avenue</u>						
			City: <u>Sanford</u> State: <u>FL</u>						
			Full Name: <u>Stephen R. Frana</u>						
TUBETEC REPRESENTATIVE		DATE	First	Middle	Last	X = X-Ray V = Visual R = Renewal			



**PERFORMANCE QUALIFICATION TEST**

In Accordance with Section IX of the ASME Code - Latest Edition

**SPECIAL QUALIFICATION**

Process 1						Record of Utilization									
Tubetec Code: _____ Process 1: <u>GTAW</u> Groove Type: <input type="radio"/> Overlay <input type="radio"/> Single Butt <input checked="" type="radio"/> Double Butt <input type="radio"/> Fillet Weld Backing: <input type="radio"/> Gas <input type="radio"/> Back up Ring <input type="radio"/> Consumable Insert Electrode SFA: <u>SFA 5.9</u> Electrode/Filler Metal Class: <u>Autogenous</u> F No.: _____ <input checked="" type="radio"/> Manual <input type="radio"/> Machine Pass direction (3G, 5G, 6G) <input type="radio"/> Up <input type="radio"/> Down Welding Current: <input type="radio"/> AC <input type="radio"/> DCRP <input checked="" type="radio"/> DCSP GTA Special: <input type="checkbox"/> AVC <input type="checkbox"/> Remote Visual <input type="checkbox"/> Auto Joint Tracking GMA Special: <input type="radio"/> Spray, Globular, or Pulsed <input type="radio"/> Short Circuit						Month / Year	Type of Insp.	Initials							
Process 2 Tubetec Code: _____ Process 2: <u>GTAW</u> Electrode SFA: <u>SFA 5.9</u> Electrode/Filler Metal Class: <u>ER308L</u> F No.: _____ <input checked="" type="radio"/> Manual <input type="radio"/> Machine Pass direction (3G, 5G, 6G) <input type="radio"/> Up <input type="radio"/> Down Welding Current: <input type="radio"/> AC <input type="radio"/> DCRP <input checked="" type="radio"/> DCSP GTA Special: <input type="checkbox"/> AVC <input type="checkbox"/> Remote Visual <input type="checkbox"/> Auto Joint Tracking GMA Special: <input type="radio"/> Spray, Globular, or Pulsed <input type="radio"/> Short Circuit															
WPS No.: <u>SPLICE</u> Position: <u>1G</u> <input type="radio"/> Pipe <input checked="" type="radio"/> Plate Machine only: <input type="radio"/> Single pass per side <input type="radio"/> Multiple pass per side															
Test Coupon			Qualification Range												
Thickness: <u>0.140</u> in.			Thickness Max.: <u>1/8</u> in.												
Outside Diameter: <u>N/A</u> in.			Outside Diameter Min.: <u>49</u> in.												
Material Spec (1): <u>A240-304L</u>			Process 1 Max weld Metal Thick: <u>1/8</u> in.												
P. No. (1): <u>P-8, Gp. 1</u>			Process 2 Max weld Metal Thick: <u>1/8</u> in.												
Material Spec (2): <u>A240-304L</u>															
P. No. (2): <u>P-8, Gp. 1</u>															
Thickness Weld Metal (Root): <u>3/32</u> in.			General Note: Acceptance of test results includes the examination of welded coupon(s) for complete penetration and fusion.												
Thickness Weld Metal (Fill): <u>3/32</u> in.															
Test Method															
Bends Test Number of Bends: <u>4</u> Result: <u>OK</u>		Radiography (pipe) Result: <input type="checkbox"/>	Radiography of 6" of test plate Result: <input type="checkbox"/>	Radiography of 36" of Production weld. Result: <input type="checkbox"/>	Liquid Penetrant Test of Surface Result: <input type="checkbox"/>	Cross sections Number Examined: Result: <input type="checkbox"/>									
Notes: 1) Side 1, pass 1 without filler metal 2) Side 1 welded with brass back-up bar 3) Side 2 ground to clean metal before welding				Hand Sketch: 											
Date: <u>6/27/94</u>		Location: <u>Sanford, FL</u>		Social Security No.: <u>396-58-5758</u>		Clock Number: <u>TT# 108</u>		Specimen Mark: <u>DO</u>							
WE CERTIFY THAT THE STATEMENTS MADE IN THIS RECORD ARE CORRECT AND THAT THE TEST WELDS WERE PREPARED, WELDED, AND TESTED IN ACCORDANCE WITH SECTION IX OF THE ASME CODE - LATEST EDITION / AND MAINTAINED FROM THE TIME OF TEST TO THIS DATE.				Address: <u>301 Brown Avenue</u>											
				City: <u>Sanford</u> State: <u>FL</u>											
				Full Name: <u>Dan Owens</u>										X = X-Ray V = Visual R = Renewal	
TUBETEC REPRESENTATIVE		DATE		First: <u>Dan</u> Middle: <u>Owens</u> Last: <u></u>											