

L160-E930001-00-B



FACSIMILE MESSAGE

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

Date: Dec 7, 1993

To: LARRY JONES
CALTECH
(818) 304 - 9834

From: RICK W. PRIOR
HOUSTON CORPORATE WELDING

WE ARE TRANSMITTING 9 PAGE(S) (INCLUDING THIS COVER SHEET). IF THERE ARE ANY PROBLEMS, PLEASE CALL (713) 896 - 2916

REFERENCE: WPS-WELDCOUP

Attached you find WPS-WELDCOUP for welding of the outgassing test coupons. A summary letter is also attached to explain what is contained within this package. If you have any questions, feel free to call.

Rick W. Prior
Houston Corporate Welding

cc: _____

cc:

December 7, 1993

TO: LARRY JONES
CALTECHRe: WPS for Outgassing Test Coupons
Contract 930212-710

Attached you'll find WPS-WELDCOUP and GWPS-GTAW. The cleaning of the weld coupons prior to welding and after welding will be in accordance with procedure CLCOUP. The weld wire will be in accordance with WMS-ER308L. Section 6.2 "Wide Gaps" of GWPS-GTAW will be revised to a maximum allowable gap of 1/64" nominal. An exact number and procedure will be written with information from the tube vendors and from CBI experience.

This WPS simulates the Spiral Weld Technique. Side 1 will be an autogenous pass with 60 to 80% penetration. The plates will be turned over and side 2 will be welded with ER308L (0.035" diameter) wire with 60 to 80% penetration. The use of 0.035" wire was chosen because Northwest Pipe uses 0.035" dia. wire for their spiral welding. Tubetec uses 0.045" dia but can use 0.035" dia if need be. Also, 0.035" diameter wire can be used for both the Gold Track (GTA) and for GMA wire feeders.

The welding parameters on Page 3 of WPS-WELDCOUP are only approximate values based on information from tube vendors and from previous weld development by CBI. The actual welding parameters to be used for the outgassing test coupons will be determined from a few test samples welded on material provided from Caltech.

WMS-ER308L: This document will be written to specify the procedure necessary to clean and bake out the filler wire. The wire will be cleaned with a solvent (not yet determined) to remove any oils (etc.) from the surface. The wire will then be baked out at 810°F for 36 hours. The type of bake out will most likely be in a nitrogen purge oven. These details will be determined in the next few days.

Please let me know if there are any revisions, corrections or other procedures required.



Rick W. Prior
Houston Corporate Welding

Attachments
RWP

INTEROFFICE CORRESPONDENCE



WELDING PROCEDURE SPECIFICATION

IDENTIFICATION
WPS
WELDCOUP

CONTRACT
930212

PRODUCT CUSTOMER	OUTGASSING TEST COUPONS CALTECH - NSF	PAGE NO. REV. NO. BY	1 OF 3 RWP DATE
WORK THIS DOCUMENT WITH GENERAL WELD PROCEDURE SPEC. GWPS-		G7AW	

REFERENCE PROCEDURE QUALIFICATION RECORD			SPECIFIC CONTRACT	
NO.	POSITION QUALIFIED (QW-405)	THICKNESS QUALIFIED (QW-403)	POSITION (QW-405)	THICKNESS RANGE (QW-403)
PQR to be done for LIGO at a later date.			1G	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
BACKING MATERIAL (QW-402)	None Required		POST WELD HEAT TREATMENT (QW-407)	No
BASE MATERIAL (QW-403)	A240 Tp. 304L (ASME F-8, Gp. 1)		IF PWHT IS REQUIRED, SEE APPROVED CONTRACT PWHT PROCEDURE FOR DETAILS AND EXTENT OF PWHT.	
Any ASME F-8, Gp. 1 material may be welded together or to each other in any combination.		GAS (QW-408) SHIELDING BACK LIP		
		COMPOSITION: 60%Ar/40%He 100%Ar		
		FLOW RATE: 20-45 cfm 10-20 cfm		
		ELECTRICAL CHARACTERISTICS (QW-409)		
		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		
		TECHNIQUE (QW-410)/ SPECIAL LIMITATIONS		
		SEE ATTACHED PAGE(S) 2, 3		
		STRINGER OR WEAWE TECHNIQUE SEE PAGE 2, 3		
		TYPE OF WELDING		
FILLER METAL (QW-404)		MANUAL <input type="checkbox"/>		
		MACHINE <input checked="" type="checkbox"/>		
		SEMI-AUTOMATIC <input type="checkbox"/>		
		AUTOMATIC <input type="checkbox"/>		
CUSTOMER APPROVAL				

R E V I E W	OB ENGR	DIST ENGR	WELDING SERVICES HOUSTON	CORP QA	REG CONST QA	REG MFG QA			BY	DATE
								PREPARED	RWP	12/6/93
								CHECKED	BGG	12/6/93
								AUTHORIZED		



WELDING PROCEDURE SPECIFICATION

IDENTIFICATION
WPS
WELDCOUP

CONTRACT

930212

PRODUCT OUTGASSING TEST COUPONS
CUSTOMER CALTECH - NSF

PAGE NO.	2	OF	3
REV. NO.	0		
BY	RWP	DATE	12/6/93

LIMITATIONS.

- 1) *This WPS to be used with Dimetrics Gold Track II weld unit.*
- 2) *All welding is to be done in the downflat (1G) position.*
- 3) *Pulsing current may be used.*
- 4) *Use a single pass per side technique.*
- 5) *Use a single EWTh-2 (2% thoriated Tungsten) electrode.*
- 6) *No single pass shall exceed 1/2" in thickness.*
- 7) *Only stainless steel brushes shall be used on stainless steel.*
- 8) *Parameters on Page 3 shall be followed.*
- 9) *Only filler material in accordance with WMS-ER308L shall be used.*

CLEANING:

Cleaning of coupons to be done in accordance with cleaning procedure CLCOUP.

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

IDENTIFICATION

WPS

WELDCOUP

CONTRACT

930212

PRODUCT OUTGASSING TEST COUPONS
 CUSTOMER CALTECH - NSF

PAGE NO. 3 OF 3
 REV. NO. 0
 BY RWP DATE 12/6/93

WELDING PARAMETERS FOR GOLD TRACK II:

Parameter	First Pass	Second Pass
Position	1G	1G
Shielding Gas	60% Argon - 40% Helium	60% Argon - 40% Helium
Flow rate	20 - 45 cfh	20 - 45 cfh
Purge Gas	100% Argon	100% Argon
Flow rate	10 - 25 cfh *	10 - 25 cfh *
Filler Wire	Autogenous	ER308L **
Diameter	N/A	0.035"
Pulse Mode	Off	Sync. Pulsed
Pulse Width	N/A	50%
Pulse Frequency	N/A	2 - 5
AVC Response	20	0
AVC Mode	Sampled	Continuous
Upslope Time	2	2
Downslope Time	5	5
Travel Start Delay	2	2
Oscillation Amplitude	Zero	0.15 - 0.25
Travel Speed (ipm)	15 - 20	15 - 20
Primary Weld Current (amps)	175 - 225	175 - 225
Primary Arc Voltage (volts)	10 - 11	10 - 11
Primary Wire Speed (ipm)	N/A	10 - 20
Background Weld Current (amps)	N/A	80 - 150
Background Arc Voltage (volts)	N/A	10 - 11
Background Wire Speed (ipm)	N/A	10 - 20
Out Dwell Time (sec x .1)	N/A	1 - 3
Excursion Time (sec x .1)	N/A	1 - 3
In Dwell Time (sec x .1)	N/A	1 - 3

Notes:

- * Flow rate necessary to achieve < 0.5% oxygen level.
- ** ER308L to be cleaned and baked out per WMS-ER308L.



DOC. ID GWPS-GTAW
REV. NO. 14
CONTRACT STANDARD

**TITLE: GENERAL WELDING PROCEDURE
SPECIFICATION FOR THE GAS TUNGSTEN
ARC PROCESS**

**PAGE NO. 1 OF 4
BY AEH
DATE 3-24-93**

1.0 SCOPE:

- 1.1** This is a general Welding Procedure Specification to be used with a specific Welding Procedure Specification (WPS) when referenced on the WPS. In cases of conflict between this document and the specific WPS, the specific WPS shall govern.

2.0 REFERENCE:

- 2.1** ASME Boiler and Pressure Vessel Code, Section IX, Welding Qualifications, Edition and Addenda as shown on the specific WPS.

3.0 PROCEDURE QUALIFICATIONS:

- 3.1** Procedure qualifications have been made in accordance with the requirements of the ASME Code, Section IX and will be available for review.

4.0 PREPARATION OF BASE METAL:

- 4.1** The edges or surfaces of the pieces to be joined by welding shall be prepared by flame cutting, plasma arc cutting, arc gouging, machining, shearing, grinding, or chipping and shall be cleaned of detrimental oil, grease, scale and rust. The edges of the pieces may have a protective coating applied to them which need not be removed before they are welded unless specifically prohibited by the specific WPS.

5.0 WEATHER CONDITIONS FOR WELDING:

- 5.1** Welding shall not be performed when the surfaces in the welding area (within 6" (15.2 cm) of the arc) are wet, nor in periods of high winds unless the welder and the pieces to be welded are properly protected.

6.0 JOINTS: (QW-402)

6.1 Root Opening:

Normal root opening shall be 0-1/4" (0 mm-6.4 mm). See contract drawings for the specific joint detail. Spacer bar joints are considered 0" gap.

6.2 Wide Gaps:

The following technique shall be used for welding joints with wide gaps which exceed twice that specified on the applicable contract drawing. When zero gap is specified on the contract drawings, gaps exceeding 3/16" (4.8 mm) shall be reduced as outlined below to a 3/16" (4.8 mm) or smaller gap. Maximum weld build-up shall be T (where "T" is the thickness of the plate) for each plate edge or 1/2" (12.7 mm) whichever is smaller.



DOC. ID GWPS-GTAW
REV. NO. 14
CONTRACT STANDARD

**TITLE: GENERAL WELDING PROCEDURE
SPECIFICATION FOR THE GAS TUNGSTEN
ARC PROCESS**

**PAGE NO. 2 OF 4
BY AEH
DATE 3-24-93**

Method:

Plate edge build-up shall be done with a welding procedure approved for contract use. Weld passes shall be deposited utilizing a stringer bead technique to restore the plate edges to the gap and approximate joint configuration as shown on the contract drawings.

On single or square butt joints, a temporary back-up bar of compatible material may be used. The edges should be built-up using stringer beads to restore the joint to the gap and approximate joint configuration as shown on contract drawings, before tying the edges together.

The temporary back-up bar shall be removed by gouging, chipping or grinding to clean, sound-metal before welding the second side.

6.3 Narrow Gaps:

The following technique shall be used for correcting joints with gaps less than specified on the applicable contract drawing which are not sufficiently wide to allow free manipulation of the electrode in the joint.

Method:

The plate edges of the joint shall be prepared by flame cutting, plasma arc cutting, grinding, arc gouging, or chipping to restore the joint to the gap and approximate joint configuration shown on the contract drawings. Gouging dross, burning dross, or residue shall be removed by brushing or grinding before welding commences.

6.4 Retainers:

Nonmetallic retainers or nonfusing metal retainers may only be used when they are specified on the specific WPS.

6.5 Backing:

Double welded groove welds are considered welding with backing.

For single welded groove welds, the backing shall be as specified in the specific WPS.

7.0 FILLER METAL: (QW-404)

7.1 Supplemental filler metals or supplementary powdered filler metals may only be used when specified on the specific WPS.

7.2 Basic filler metal diameters for GTA welding are .45" (1.1mm), 1/16" (1.6mm), 3/32" (2.4mm) and 1/8" (3.2mm).



DOC. ID GWPS-GTAW
REV. NO. 14
CONTRACT STANDARD

**TITLE: GENERAL WELDING PROCEDURE
SPECIFICATION FOR THE GAS TUNGSTEN
ARC PROCESS**

**PAGE NO. 3 OF 4
BY AEH
DATE 3-24-93**

**8.0 PREHEAT AND INTERPASS TEMPERATURE (When required by the specific WPS):
(QW-406)**

8.1 Method:

If required, preheat and/or interpass temperature shall be achieved by any suitable means which will keep the temperature of the joint within the specified limits shown on the specific WPS. The method of preheating and the heat source to be used may be changed or supplemented as deemed necessary or desirable.

8.2 Continuous Preheat:

When continuous preheat is required, it shall be a uniform preheat during the time of welding, obtained by pipe burners or strip heaters. On vertical joints or radial joints, the required preheat is necessary along the entire length. On circumferential joints of larger diameter vessels, the required preheat is necessary along the area or areas being welded. When welders are spaced around the entire circumferential joint on small diameter vessels, the entire joint shall be preheated.

8.3 Monitoring:

Joints requiring preheat and/or interpass temperature control will be checked before and/or during welding of the joints to ensure that the minimum temperature is being maintained and that the maximum interpass temperature is not exceeded.

For temperatures greater than or equal to 150° F (66° C), temperature indicating crayons will normally be used to determine that the joint is at the required minimum temperature or above, but not exceeding the maximum interpass temperature.

9.0 SHIELDING GAS: (QW-408)

9.1 Care shall be taken to ensure that the shielding gas and shielding gas lines do not become contaminated with moisture or other detrimental particles.

10.0 ELECTRICAL CHARACTERISTICS: (QW-409)

10.1 Control of amperes and volts will be by amp and volt meters. Control of heat input/volume of weld metal will be by bead size where applicable.

10.2 The type of tungsten to be used in GTA welding may be pure tungsten (EW), 1% thoriated tungsten (EWTh-1), 2% thoriated tungsten (EWTh-2), or zirconia tungsten (EWZr).

10.3 Pulsing current on d.c. power may only be used when specified on the specific WPS.