



TITLE
 FITTING/PURGE PROCEDURE FOR STIFFENER ATTACHMENT WELDS

PRODUCT
 LIGO BEAM TUBE MODULES
 CALIFORNIA INSTITUTE OF TECHNOLOGY

IDENTIFICATION FPSTIFFENER LIGO-8950051-05-B			
REFERENCE NO. 930212		SHT 1 OF 3	
OFFICE COH		REVISION 5	
MADE BY RWP	CHKD BY BGG	MADE BY SWP	CHKD BY WLR
DATE 1/25/94	DATE 1/31/94	DATE 11/2/95	DATE 11/2/95

1.0 PURPOSE:

This procedure is to be used in conjunction with WPS - ER308L / STIFFENER. It is to be used for the fitting / purging and welding of the vacuum stiffeners and support rings to the spiral welded tube.

2.0 STIFFENER PLACEMENT:

- 2.1 Tube shall be marked for stiffener location per contract drawings.
- 2.2 Vacuum stiffeners may be "locked" open using stiffener fitting device. The vacuum stiffeners shall be placed in their approximate location prior to end seals.
- 2.3 Support rings shall be bolted together in position per contract drawings. Verify that the correct support ring is used for the specific tube section.

3.0 PURGING:

- 3.1 End covers shall be placed in position.
- 3.2 Outlet valve to tube assembly should be open. Nitrogen shall be pumped into inlet valve, using a liquid nitrogen dewar with vaporizer or high pressure outlet, until the oxygen level within the tube falls below 1.0%.
- 3.3 When the oxygen level falls below 1.0%, reduce the flow of nitrogen to a minimum flow rate necessary to maintain less than 1.0% oxygen. Check periodically during any tacking and welding operation.

4.0 FITTING STIFFENERS AND SUPPORT RINGS:

- 4.1 Pull the splice of the vacuum stiffeners together by cranking the fitting device while making sure the stiffener is in the proper location. The vacuum stiffener may vary by ± 1/2" from the specified location. The splice of the stiffener must be positioned over the spiral weld with the lap of the splice positioned to minimize the length of unwelded stiffener.

APPROVED

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11/20/95
 DATE

11/10/95



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- 4.2 All tacking shall be done by the semi-automatic GMAW process using ER308L in accordance with WMS ER308L (special cleaned). Tacks shall be spaced approximately 12" apart. The tacks shall be on the opposite side of the stiffener weld and shall be a minimum of 1/2" in length with all craters backfilled.
- 4.3 Tack the vacuum stiffener. Tighten the fitting device if necessary to maintain tight fit.
- 4.4 After the vacuum stiffener is tacked to the beam tube, weld the vacuum stiffener splice. Apply 3/16" fillet weld to both sides of the splice leaving 1/4" not welded against the tube wall.
- 4.5 Apply a minimum of 1" weld across the top of the splice.
- 4.6 Repeat steps 4.1 through 4.5 for all the remaining vacuum stiffeners.
- 4.7 The support rings shall be aligned to the beam tube cardinal lines. The 180° (bottom) cardinal lines of beam tube and the support rings shall match with ± 1/16" tolerance. The support rings may vary by ± 1/4" in the longitudinal direction from the specified location. Tack the support rings to the beam tube as described in step 4.2 above.

5.0 WELDING:

- 5.1 Weld the vacuum stiffeners and support rings using WPS-ER308L/STIFFENER. The weld shall start at the splice continuing around the tube ending at the opposite side of the splice. The support rings will have two extra start/stop. One at the second splice and another at the spiral weld.
- 5.2 No welding over the spiral weld shall exist. Care must be taken to minimize the length of unwelded stiffener.
- 5.3 The maximum tilt of the welded stiffener shall not exceed ten (10) degrees.
- 5.4 Repeat steps 5.1 and 5.2 for all remaining stiffeners.
- 5.5 Fit and weld support accessories per WPS-ER308L/GMA.
- 5.6 If a pump port is not installed in this stiffened tube section, proceed to step 7.0.



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6.0 PUMP PORT REINFORCING RING:

- 6.1 Position reinforcing ring at specified location. Verifying before fitting that the ring does not cross the spiral weld.
- 6.2 Fit ring using tacks where necessary.
- 6.3 Weld the reinforcing ring to the beam tube per WPS-ER308L/GMA.

7.0 VISUAL INSPECTION:

- 7.1 Perform a visual inspection of the vacuum stiffener, support ring and pump port reinforcing ring welds. If there are to be any welded repairs use WPS-ER308L/REPAIR.
- 7.2 Repeat step 7.1 above until all welds are acceptable.
- 7.3 When the welding of the stiffened tube is complete, vent the tube and remove end covers.