	IDENTIFICATION			
	HMST2N LIGO-E950067-02-B			
TITLE HELIUM MASS SPECTROMETER HOOD TEST OF CLOSING WELD JOINTS BETWEEN BEAM TUBE CANS	REFERENCE NO. 930212		SHT _1_ OF _4_	
	OFFICE RSE		REVISION 2	
PRODUCT LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY	MADE BY CNS	CHKD BY EEB	MADE BY WAC	CHKD BY MLT
	DATE 3/15/94	DATE 5/1/94	DATE 11/8/95	DATE 11/9/95

1.0 SCOPE:

1.1 This procedure covers the helium mass spectrometer hood test of the closing weld joint between beam tube can sections. Perform this procedure in accordance with the current revision of procedure LIGOTP.

1.2 Perform the leak testing outlined in this procedure after the closing weld joint between two adjacent beam tube can sections has been visually inspected and any weld repairs have been made to correct excess undercut, lack of penetration and pinholes in that weld.

2.0 LEAK TESTING EQUIPMENT TO BE USED IN THIS PROCEDURE:

2.1 The helium mass spectrometers used to perform the leak testing outlined in this procedure shall be the Alcatel Model ASM 110TCL, Leybold Model UL400, Varian Model 960, Veeco Model 18AB or equivalent with an optimum high sensitivity in the range of 10^{-11} atm. cc/sec. of helium. All leak detectors must be turbo pumped. Diffusion pumped units are not acceptable.

2.2 A channel shaped curved metal box with a 40 KF (1 1/2"Ø) long flange for connection to the HMS and a 16 KF flange for attachment of the calibrated leak. The box shall completely surround the outside circumference of the closing weld joint between beam tube can sections. See drawings ER-121, ER-122 & ER-123.

2.3 Approximately ten (10) feet of flexible stainless steel hose with 40 KF (1-1/2"Ø) connectors on the ends for connecting the HMS to the metal vacuum box.

2.4 Combination weld purge dam/helium hood enclosure consisting of two (2) inflatable rubber seals containing two (2) 1/8"Ø connections. The seals are interconnected with a fiber reinforced rubber ring also containing two (2) 1/8"Ø connections 180º apart. The inflatable seal connections are for pressurizing and venting the seals. One connection in the fiber reinforced rubber ring is for injecting both argon and helium gas and the second is for venting or evacuating the enclosure. See the figure at the end of this procedure.

2.5 Two (2) hoses with 1/8"Ø connections for attaching to the fiber reinforced rubber ring and one (1) hose with two (2) 1/8"Ø connections for attaching to the inflatable rubber seals.

2.5.1 The hose attached to one of the reinforced rubber ring connectors is for gas and the hose attached to the second reinforced rubber ring connector is for evacuation. The gas hose splits at a tee in the clean room and each of these hoses connects through a gas valve to an argon gas bottle and a helium gas bottle to be used respectively for welding purge gas and leak testing tracer gas.

M. Fellabaum 11/10/95
CBI

11/10/95
LIGO

2.5.2 A compressed air line is connected through a valve to one of the inflatable seal connections and a vent line is connected through a valve to the other inflatable seal connection.

2.6 Mechanical vacuum pump such as a Leybold Trivac D2B or equivalent.

2.7 Two (2) clamping rings for the two (2) 16 KF flanged connectors.

2.8 One standard helium calibrated leak, 1-5 X 10^{-10} atm. cc/sec. of helium

3.0 PROCEDURE:

3.1 Remove any rough areas adjacent to the weld in the vicinity of where the metal box seals will contact the outside surface of the tube in order to effect the best possible temporary seal. Remove purge ring and inspect weld per procedure "VI8X", making any required chipping, grinding, or repairs per procedures "GR8X" and "INSTALLSEQ". Replace purge ring for leak testing.

3.2 Install the channel shaped curved metal box over the outside of the closing weld joint between the beam tube can sections.

3.3 Attach the circumferential leak test box to the tube wall and caulk the joints with Duxseal type putty or equal

3.4 Calibrate (peak tune) the HMS to obtain the optimum test sensitivity for the model instrument being used. Record the helium signal level then open the valve to the helium permeation standard leak mounted on the vacuum box and allow the helium signal to stabilize. While monitoring with a stop watch, close the standard leak valve and record the clean up time and the background signal after it has stabilized. The clean up time is the response time of the system.

3.5 Vent the HMS manifold and connect the flexible metallic hose to the curved metal box and HMS.

3.6 Evacuate the curved metal box with the HMS auxiliary vacuum pump. After it has evacuated to approximately 100 millitorr, throttle open the HMS high vacuum system to the metal box. Should the vacuum in the metal box stabilize at a higher pressure indicating potential seal leakage, tracer probe the perimeter of the box seal to detect and pinpoint the area of leakage. If seal leakage is detected and pinpointed, increase the seating force to obtain a sufficient seal.

3.7 Install the internal helium hood enclosure if it is not already in place as a purge dam for the prior welding.

3.8 When the HMS throttle valve is all the way open, the high vacuum absolute pressure meter indicator has stabilized (reached a plateau) and the leak rate meter indicator is on a scale that would enable the operator to detect 10^{-10} atm. cc/sec. range leakage, evacuate the helium hood enclosure to remove the argon present during welding.

3.9 Record the HMS background signal in divisions. A division shall be based on the smallest increment on the most sensitive scale of the leak rate indicator meter.

3.10 Backfill the hood enclosure with helium by opening the regulated helium gas supply.

3.11 Observe the HMS leak rate indicator meter for the larger of one (1) minute or three times the measured response time from section 3.4. If there is no increase in the leak indicator signal after the observation period, the leakage rate of the closing weld joint is less than 1×10^{-10} atm. cc/sec. and the leak test of the closing joint is acceptable and complete. If there is an increase in the leak indicator signal of $1x10^{-10}$ atm. cc/sec. or greater, proceed to step 3.12 to pinpoint the location of the unacceptable leakage in this portion of the closing weld joint.

3.12 Isolate the HMS from the test system and vent the vacuum box. Replace the vacuum box with a small vacuum box approximately six inches (6") in length.

3.13 Visually inspect the weld joint that contains the unacceptable leakage. If any area or areas are observed that appear to contain potential leaks, locally leak test that area or areas first.

3.14 Place the six inch (6") long box over the selected area of the closing weld joint. Connect the flexible metallic hose to the short metal box.

3.15 Evacuate the short metal box with the HMS auxiliary vacuum pump. After it has evacuated to approximately 100 millitorr, throttle open the high vacuum system to the metal box. Should the vacuum in the metal box stabilize at a higher pressure indicating potential seal leakage, tracer probe the perimeter of the seal to detect and pinpoint the area of leakage. If seal leakage is detected and pinpointed, increase the seating force to obtain a sufficient seal.

3.16 Observe the HMS leak indicator signal in divisions as the high vacuum absolute pressure meter stabilizes (reaches a plateau). If the indicator signal shows an increase over the normal background, isolate the box. If the signal decreases, leakage is indicated in the area being tested. If the indicator signal shows no increase over normal background and/or does not change when the box is isolated, no leakage is indicated in that area.

3.17 When a leak(s) is pinpointed, vent the vacuum box and vent the helium hood enclosure.

3.18 Repair the pinpointed leak or leaks and retest the entire closing weld joint.

3.19 When that leak test shows no increase in the leak indicator signal after the observation period, the leakage rate of the closing joint is less than 1×10^{-10} atm. cc/sec. and the leak test of the closing weld joint is complete. If the leakage rate of the closing joint is still unacceptable, repeat steps 3.12 through 3.18.

3.20 Remove test equipment and secure for movement of the weld shelter. The purge dam is relocated in accordance with procedure INSTALLSEQ.

4.0 DOCUMENTATION:

See procedure LIGOTP for documentation requirements.