	IDENTIFICATION			
	C-PORT-OP LIGO-E950030-04-B			
TITLE PUMP PORT FABRICATION SPECIFICATION CONSTRUCTION OPTION	REFERENCE NO. 930212		SHT _1_ OF _6_	
	OFFICE NOE-C		REVISION 4	
PRODUCT LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY	MADE BY JGS	CHKD BY WJC	MADE BY SWP	CHKD BY MLT
	DATE 03/01/94	DATE 03/04/94	DATE 5/10/95	DATE 5/12/95

0.1 SCOPE

This specification is for the supply, welding, fabrication, cleaning, testing, and packaging of shop fabricated pump ports for **ultra high vacuum service**. The pump ports are part of a vacuum system for sensitive interferometer components and optical beams for the Laser Interferometer Gravitational-Wave Observatory (LIGO). VAT Series 10 gate valves will bolt to the pump ports. Field installation will be by the Purchaser.

1.0 APPLICABLE DOCUMENTS

1.1 Drawings / Figures

The following drawing(s) and figure(s) form an integral part of this specification:

Sketch 1 -- "Pump Port".

1.2 Specifications

1.2.1 The vendor shall comply with all applicable sections of the latest edition of the following documents and codes:

ASME Unfired Pressure Vessels, Section VIII, Division 1, as applicable (Code Stamping is not required).

ASME Welding Qualifications, Section IX.

1.2.2 In the event of a conflict between the text of this specification (including drawings and figures) and the references listed in Section 1.2.1, the vendor shall immediately notify the Purchaser for resolution.

2.0 MATERIAL SUPPLY

2.1 The vendor shall supply pump ports with gaskets, bolts, and blind flanges per Sketch 1 and the purchase order to the Purchaser for installation in the vacuum vessels.

APPROVED

M. Tellalian 11/10/95

J Jones 11/10/95

3.0 SUBMITTALS

3.1 Information Required with Quotation and 5 Days After Receipt of Purchase Order:

3.1.1 The vendor shall state in his quotation (and response to purchase order) that the quotation complies with this technical specification and the purchase order with any exceptions or alternates noted and explained. The Purchaser will assume complete conformance unless exceptions are noted.

3.1.2 Type of forging material used for flange to be supplied and type of pipe material to be supplied.

3.1.3 A description of the vendor's quality assurance manual in accordance with ANSI/ASQC Standard Q91. (Certification is not mandatory).

3.1.4 If the pipe material is welded, the welding procedure(s) used to fabricate the pipe shall be provided.

3.1.5 Sketch or drawing detailing the pump port pipe-to-flange joint and proposed welding procedure(s).

3.1.6 Thickness of flange.

3.1.7 Fabrication tolerances

3.1.8 HMS Leak Test Procedure

3.1.9 Packaging Protection Methods including flange seal surface protection

3.2 Information Required After Receipt of Order and 4 Weeks Prior to Fabrication:

3.2.1 Welding procedures with supporting procedure qualification records and welder personnel qualification records per ASME Section IX.

3.2.2 NDE procedures and qualifications for NDE personnel.

3.3 Information Required 2 Weeks Prior to Shipment:

3.3.1 Certified material test reports (CMTR) or certificate of compliance (COC) for all material.

3.3.2 Documentation of measured helium leakage rates for each pump port.

4.0 MATERIALS

4.1 Stainless steel conforming to SA240 type 304L.

4.2 Flanges shall be fabricated from forged material and cross rolled.

4.3 Pipe is preferred to be seamless.

4.4 All welding material shall be ER308L, flux cored wire is not allowed.

4.5 Lubricants that affect the ability to obtain high vacuum levels such as hydrocarbons or silicon shall not be used during fabrication. If a lubricant must be used, the type of lubricant shall be specified and approved by the purchaser before use.

5.0 FABRICATION

5.1 Welding

5.1.1 *All welding exposed to vacuum* shall be done by the gas tungsten arc welding (GTAW) process. The use of flux core wire is strictly prohibited.

5.1.2 For all welding, use an inert gas purge on the vacuum side of the weld.

5.1.3 All vacuum welds shall be, wherever possible, internal and continuous. All external welds added to these for structural purposes shall be intermittent to eliminate trapped volumes.

5.1.4 Welding procedures shall be submitted prior to production welding. Welder and weld operator qualification records shall be submitted prior to any individual performing welding. Welders and weld operator qualifications shall comply with Section IX of the ASME Boiler and Pressure Vessel Code. The Purchaser shall have the option to require the re-qualification of any welder at any time if, in the Purchaser's opinion, the welder's qualifications are suspect or welds appear not to be of the proper quality.

5.1.5 Weld edge preparation shall be made by machine cutting or grinding. Burning is not permitted.

5.2 Cleanliness and Cleaning

5.2.1 All contact made with the stainless steel material during fabrication shall be such as to prevent carbon steel contamination.

5.2.2 After fabrication and prior to packaging, the inside surfaces shall be cleaned with a solvent wipe to remove all visible traces of oil and grease. Acetone shall be used first, followed by alcohol. A detergent and water cleaning mix shall not be used.

5.3 Tolerances

5.3.1 Tolerances shall be per the vendor's standard. The vendor's fabrication tolerances shall be submitted to the Purchaser with the quotation (and in response to purchase order).

6.0 IDENTIFICATION AND TRACEABILITY

Material marking and traceability specified in ASME, Section VIII, Division 1 shall apply.

7.0 TESTING AND INSPECTION

7.1 The leak testing of pump ports shall be done with a helium mass spectrometer (HMS) using the helium hood technique. The pump port HMS test system must be calibrated and the system calibration must indicate that in-leakage of 1×10^{-10} atm. cc/sec. is readily detectable within a reasonable amount of time. The pump port shall contain no leakage in excess of 1×10^{-10} atm. cc/sec. The HMS leak test procedure to be used shall be submitted to the Purchaser for approval.

7.1 The Purchaser shall have the option of inspecting at the vendor's facility and witnessing tests or procedures required in this specification.

7.3 Written notification shall be provided to the Purchaser no less than 5 working days prior to beginning fabrication.

7.4 The National Science Foundation (NSF) and Caltech, through their authorized representatives, have the right to inspect and evaluate the work performed or being performed under this specification, including the premises where the work is being performed at all reasonable times. The NSF and Caltech shall have non-escort privileges to all areas of the facilities where the work is being performed under this specification. This shall include access to fabrication, assembly, cleaning, and test areas for the purpose of monitoring activities. The vendor shall furnish all reasonable facilities and assistance for the safe and convenient inspection of the work if requested.

8.0 PACKAGING

It shall be the responsibility of the vendor to protect the pump ports during shipment. In particular, the interior of the pump port shall be protected from contamination by sealing all openings. The flange sealing surface shall be adequately covered to prevent damage during handling and shipping. The vendor's method of protecting the pump ports shall be submitted to the Purchaser for review with the quotation (and in response to the purchase order).

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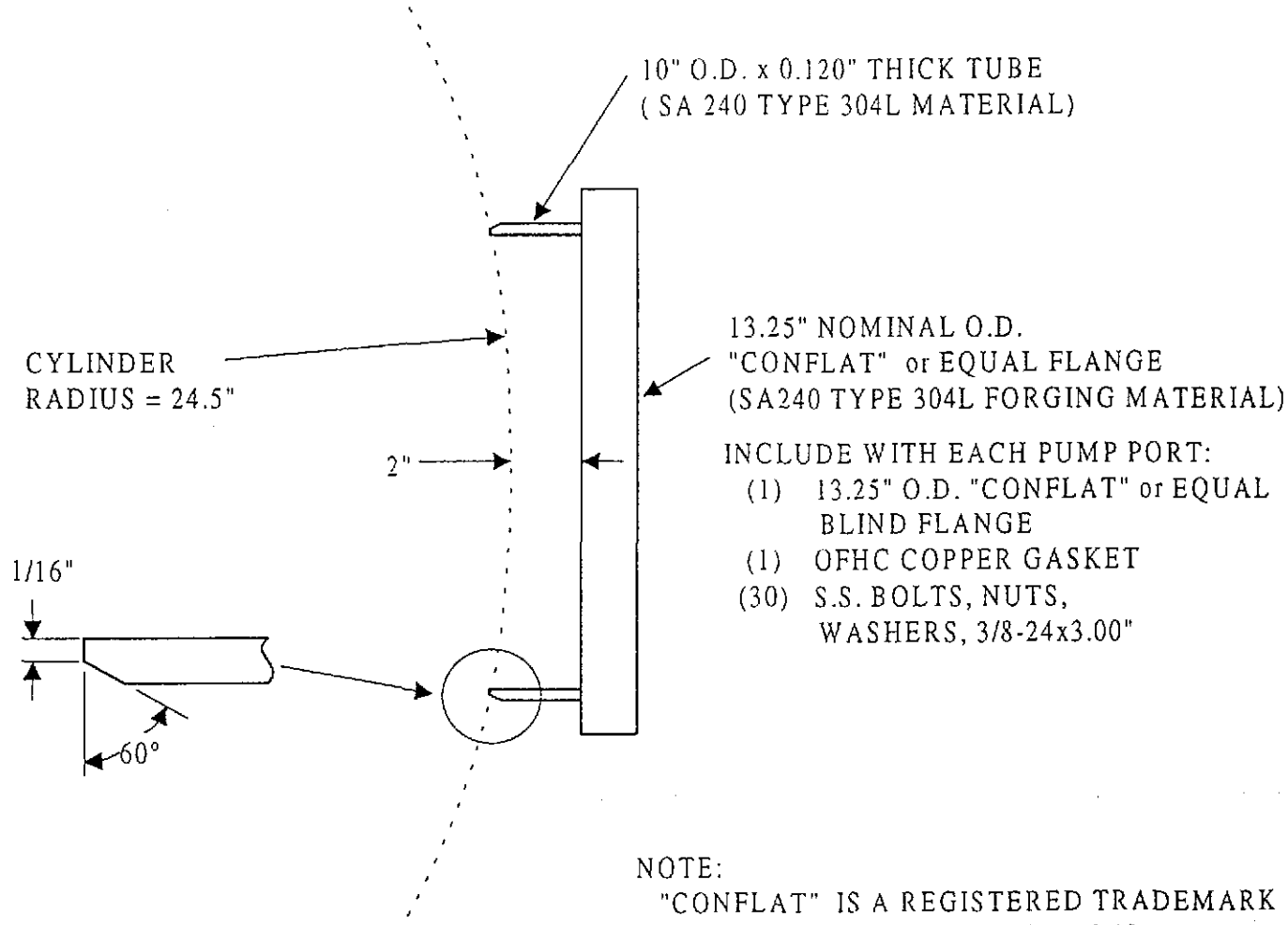

NOTE:
"CONFLAT" IS A REGISTERED TRADEMARK OF VARIAN VACUUM PRODUCTS

SKETCH 1