		IDENTIFICATION			
		ICD-BTT LIGO-E570025-02-B			
TITLE	BEAM TUBE AND TERMINATION SUPPORT TO GATE VALVE AND TERMINATION FOUNDATION	REFERENCE NO. 953570		SHT 1 OF 5	
		OFFICE LIGO		REVISION 2D	
PRODUCT	LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY	MADE BY MLT	CHKD BY ARL	MADE BY MLT	CHKD BY DTR
		DATE 3/8/96	DATE 3/8/96	DATE 1/28/97	DATE 1/29/97

1.0 SCOPE

This document provides the interface information for mechanical and dimensional interfaces between the following components:

- The beam tube termination support and the termination support foundation.
- The ends of the beam tube and the large gate valves.

2.0 APPLICABLE DOCUMENTS

The following documents are applicable to the interfaces between the beam tube modules and termination supports and the valves and termination foundation:

Caltech Dwg #D950021 - "LIGO Arm Layouts"
Caltech Dwg #D950028 - "Beam Tube Terminations"
Caltech Dwg #D950093 - "Beam Tube Terminations Foundations"
CBI Drawing # 20, Sheet 1 - "Termination Support Detail"

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CBI	DATE
CALTECH	DATE

3.0 BEAM TUBE TO VALVE INTERFACE REQUIREMENTS

3.1 TUBE TO VALVE INTERFACE LOCATIONS

The beam tube module lengths and layouts are shown on Caltech drawing #D950021. The information contained on drawing #D950021 has been converted into station locations. The station locations of the tube to valve interface measured from the vertex of the facility are shown below in millimeters. The millimeter values have been converted to feet and inches and are shown in parenthesis rounded to the nearest sixteenth of an inch.

3.1.1 Hanford Tube to Valve Interface Locations

Modules HX1 & HY1: 46,000 mm (150'-11)	2,007,500 mm (6,586'-3 7/16)
Modules HX2 & HY2: 2,027,000 mm (6,650'-3 1/8)	3,988,500 mm (13,085'-7 1/2")

3.1.2 Livingston Tube To Valve Interface locations

Modules LX1 & LY1: 46,000 mm (150'-11)	2,016,433 mm (6,615'-7 1/16)
Modules LX2 & LY2: 2,017,433 mm (6,618'-10 1/2)	3,988,500 mm (13,085'-7 1/2)

3.2 VALVE STUB DIMENSIONAL REQUIREMENTS

The beam tube gate valves will be welded to beam tube sections at every location except for the mid station valve at Livingston. The mid station valves at Livingston will be welded to a beam tube section for modules LX1 and LY1 and will be welded to a beam tube expansion joint for modules LX2 and LY2.

3.2.1 Valve Stub Weld End Detail

Valves are welded directly to the beam tube modules. Valves must have a cylindrical stub piece on the side or sides which attach to the beam tube. The valves at the mid station at Livingston must have a stub on both sides. All other valves attach to beam tube sections on one side only. All stub ends shall have an the following end detail:

Inside Diameter: 1,248 mm +/- 0.38 mm (49.125" +/- 0.015")
Thickness Range: 3.23 mm +/- 0.18 mm (0.127" +/- 0.007")
Flatness & Squareness of the Stub End: Within 0.25 mm (.010")

3.2.2 Valve Axial Length

The valve at the mid station at Livingston attaches to a beam tube module on each side of the valve. The mid station valve at Livingston must have an axial length of 1,000 mm between the ends of the stubs.

3.3 VALVE STUB END CLEARANCE REQUIREMENTS

Beam tube module to valve welds are made with the Dimetrics F Head which travels around the tube and valve stub on a track. The weld track is supported on the beam tube section for all valve to beam tube section welds. The weld track is supported on the valve stub for the valve to beam tube expansion joint weld at the Livingston mid station. The circumferential seam must be visible and accessible for the weld operator at all locations. In addition, a minimum clearance is required for the weld equipment. The following clear area is required around the entire circumference of the weld stub.

3.3.1 Valve Stub For Attachment to a Beam Tube Section
Longitudinal Clearance from the Circumferential Seam: 95 mm (3.75")
Radial Clearance from the Circumferential Seam: 178 mm (7.0")

3.3.2 Valve Stub For Attachment to a Beam Tube Expansion Joint(Livingston mid station valve only.)
Longitudinal Clearance from the Circumferential Seam: 419 mm (16.5")
Radial Clearance from the Circumferential Seam: 229 mm (9.0")

3.4 VALVE STUB END MATERIAL REQUIREMENTS
Valve stub weld ends shall meet the chemistry and physical requirements as specified in SA 240 Type 304L material specification with the following additional restriction:

The sulfur content of the shall not be less than 0.010% nor greater than 0.020% by heat and product analysis.

3.5 ALLOWABLE LOADS AT INTERFACE
The termination support has been designed to support external loads applied to the end of the beam tube module as given below. The loads are assumed to be applied at the centerline of the tube and the axial load limit includes the thrust due to vacuum on one side of the gate valve at the end of the tube.

Axial:	41,100 lb directed toward the beam tube
	31,100 lb directed away from the beam tube
Vertical:	1,000 lb
Lateral:	1,000 lb

4.0 TERMINATION SUPPORT TO TERMINATION FOUNDATION

The ends of the beam tube are supported by a termination support which is composed of a welded steel frame with lateral and vertical adjustment capability. The frame rests on two base plates and is anchored to the termination foundation with bolts drilled into the foundation block during the

installation of the termination support. The following sections provide the locations of the termination supports and the required dimensions and load carrying capacity of the termination block.

4.1 Termination Station Locations

The centerline of the termination anchorage transverse to the tube axis is located 1027 mm (3'-4 7/16) from the beam tube to valve circumferential seam at all locations except for the expansion joint side of the mid stations at Livingston. The presence of the expansion joint moves the termination towards the end station a distance equal to the width of the expansion joint which is 635 mm (2'-1). The centerline of the termination anchorage transverse to the tube axis is located at the following stations. The millimeter values have been converted to feet and inches and are shown in parenthesis rounded to the nearest sixteenth of an inch.

4.1.1 Hanford

Modules HX1 & HY1: 47,027 mm (154'-3 7/16) & 2,006,473 mm (6,582'-11)
Modules HX2 & HY2: 2,028,027 mm (6,653'-7 9/16) & 3,987,473 mm (13,082'-2 5/8)

4.1.2 Livingston

Modules LX1 & LY1: 47,027 mm (154'-3 7/16) & 2,015,405 mm (6,612'-2 5/8)
Modules LX2 & LY2: 2,019,095 mm (6,624'-3 15/16) & 3,987,473 mm (13,082'-3 1/8")

4.2 Termination Foundation Requirements

Each base plate is attached to the foundation block with (6) of the following anchors:

Hilti 7/8" Diamter HY-150 Anchors with 7 1/2" Embedment

Each termination support is anchored to the foundation block with (8) of the following anchors:

Hilti 1" Diameter HY-150 Anchors with 12 3/8" Embedment

The anchor bolt pattern is shown on CBI drawing 20, Sheet 1. The foundation block must have the following characteristics.

4.2.1 Foundation Block Dimensions

Minimum Thickness: 15" (To allow a 12.375" embedment depth of the anchor bolts.)
Minimum Width: 2,870 mm (9'-5) (Centered about the beam tube centerline.)
Minimum Length: 2,642 mm (8'-8) (Centered about the termination station centerline.)

4.2.2 Foundation Block Load Carrying Capacity

The termination support and anchor bolts have been designed to properly transmit the termination loads to a foundation block composed of 3,000 psi concrete meeting the dimensions stated above. The foundation system must be capable of resisting the following loads simultaneously applied at the beam tube centerline:

Axial:	58,485 pounds (Applied in either direction independently.)
Lateral:	3,086 pounds (Applied in either direction independently.)
Vertical:	7,937 pounds (Applied downward only.)

4.2.3 Foundation Block Elevation

The top of the foundation block shall be 1,070 mm +/- 25 mm (3'-6 1/8 +/- 1") below the beam tube centerline.