

CALIFORNIA INSTITUTE OF TECHNOLOGY  
Laser Interferometer Gravitational Wave Observatory (LIGO) Project

To: F. Asiri  
From: L. Jones  
Phone: 2970  
Refer to: LIGO-E950105-00-B  
Date: 12/20/95

Subject: Beam tube termination foundation: loads update

The attached two drawings, D950029 and D950093 have been marked up to reflect the design update loads that CBI has supplied (also attached).

There are actually two types of load conditions for the fixed support shown on D950029. Most of the fixed supports (all but 2) are supporting 65' long tube sections. The two outermost fixed supports are supporting shorter tube sections, which causes higher loads (from adjoining, longer tubes) during bake. These two load conditions are spelled out in the markups.

LJ

cc: Mark Coles  
Dennis Coyne  
Albert Lazzarini  
Otto Matherny  
Gerry Stapfer  
Chronological File  
Document Control Center

*Attachments: D950029  
D950093  
LIGO-C951392-00-B*

NOTES: (UNLESS OTHERWISE SPECIFIED)

- 1) ICD INFORMATION: This drawing contains interface information.
- 2) SLAB LOADS DURING CONSTRUCTION OF THE-BEAM TUBE SHALL NOT EXCEED 1488 kgf/m (1000 lbf/ft) OVER EACH FOOTING
- 3) BEAM TUBE FIXED SUPPORTS ARE EQUALLY SPACED AT 130'-0" [39624 mm] ALONG TUBE AXIS
- 4) BEAM TUBE SUPPORTS ARE FASTENED WITH 16 mm [5/8"] EXPANSION ANCHORS, WITH 4" EMBEDMENT
- 5) SLAB TO BE DESIGNED FOR A MAXIMUM SETTLEMENT OF NO MORE THAN 50 mm [2.0"] OVER 20 YEARS.

REV	DESCRIPTION OF CHANGE	APPROVAL	DATE
A	Original		
B	English units, ICD note and tolerance added. Clarified loading point: Clarified loading point: load corrections.	<i>[Signature]</i>	10/19/95

TYPE LOAD	RL	RV1 MAX.	RV2 MIN.	RV MAX.	RA
SEISMIC	584	766	-766	0	984
DEAD LOAD & VAC.	39	1755	1655	3410	350
THERMAL	0	0	0	0	<del>263</del>
SETTLEMENT	0	324	-324	649	0
HORIZ. ALIGN.	560	735	-735	0	0
<b>TOTAL</b>	<b>1183</b>	<b>3581</b>	<b>-171</b>	<b>4059</b>	<del>357</del>

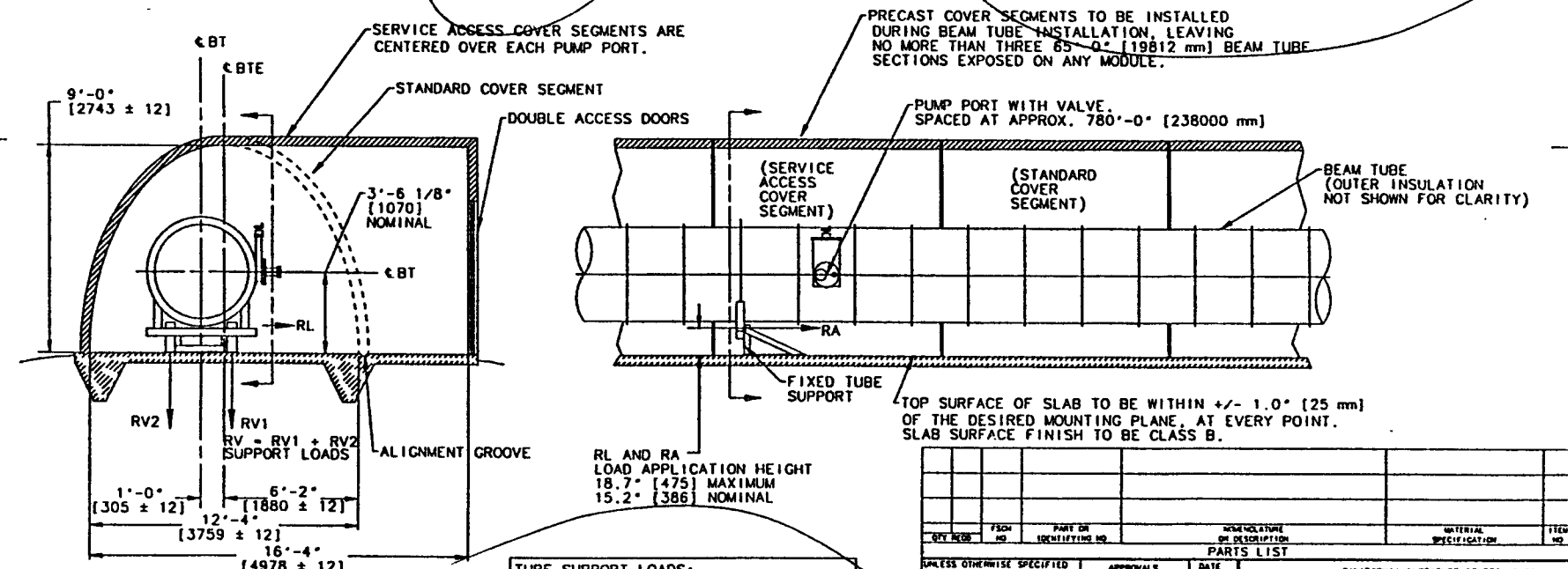
TYPE LOAD	RL	RV1 MAX.	RV2 MIN.	RV MAX.	RA
SEISMIC	1287	1689	-1689	0	2169
DEAD LOAD & VAC.	85	3870	3648	7518	771
THERMAL	0	0	0	0	<del>594</del>
SETTLEMENT	0	715	-715	1430	0
HORIZ. ALIGN.	1235	1621	-1621	0	0
<b>TOTAL</b>	<b>2607</b>	<b>7895</b>	<b>-371</b>	<b>8948</b>	<del>328</del>

AT ALL BUT THE OUTERMOST FIXED SUPPORTS

AT THE OUTERMOST FIXED SUPPORTS

5566

8506 9862



MAXIMUM RL	= 2607 lbf [1183 kgf]
MAXIMUM RV1	= 7895 lbf [3581 kgf]
MINIMUM RV2	= -377 lbf [-171 kgf]
MAXIMUM RV	= 8948 lbf [4059 kgf]
MAXIMUM RA	= 328 lbf [148 kgf]

8506/9862 (SEE ABOVE)

QTY	REV	FRSH NO	PART OR IDENTIFYING NO	REVISIONS OR DESCRIPTION	MATERIAL SPECIFICATION	ITEM NO
PARTS LIST						
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN 1/8-IN (MM) TOLERANCES ARE:						
FRACTIONS		DECIMALS		APPROVALS		
F. 1/8 ± 0.005		D. 0.005		DESIGNED	DATE	
F. 1/16 ± 0.002		D. 0.002		D. Coyne	10/18/95	
F. 1/32 ± 0.001		D. 0.001		L. Jones	10/17/95	
F. 1/64 ± 0.0005		D. 0.0005		F. Aulri	10/19/95	
F. 1/128 ± 0.0002		D. 0.0002		M. Cole	10/17/95	
DO NOT SCALE DRAWING						
MATERIAL		FINISH		APPROVALS		DATE
NA		NA		A. Lessorini	10/17/95	
NA		NA		J. Worden	10/17/95	
SCALE NTS				SHEET 1 of 2		REV B

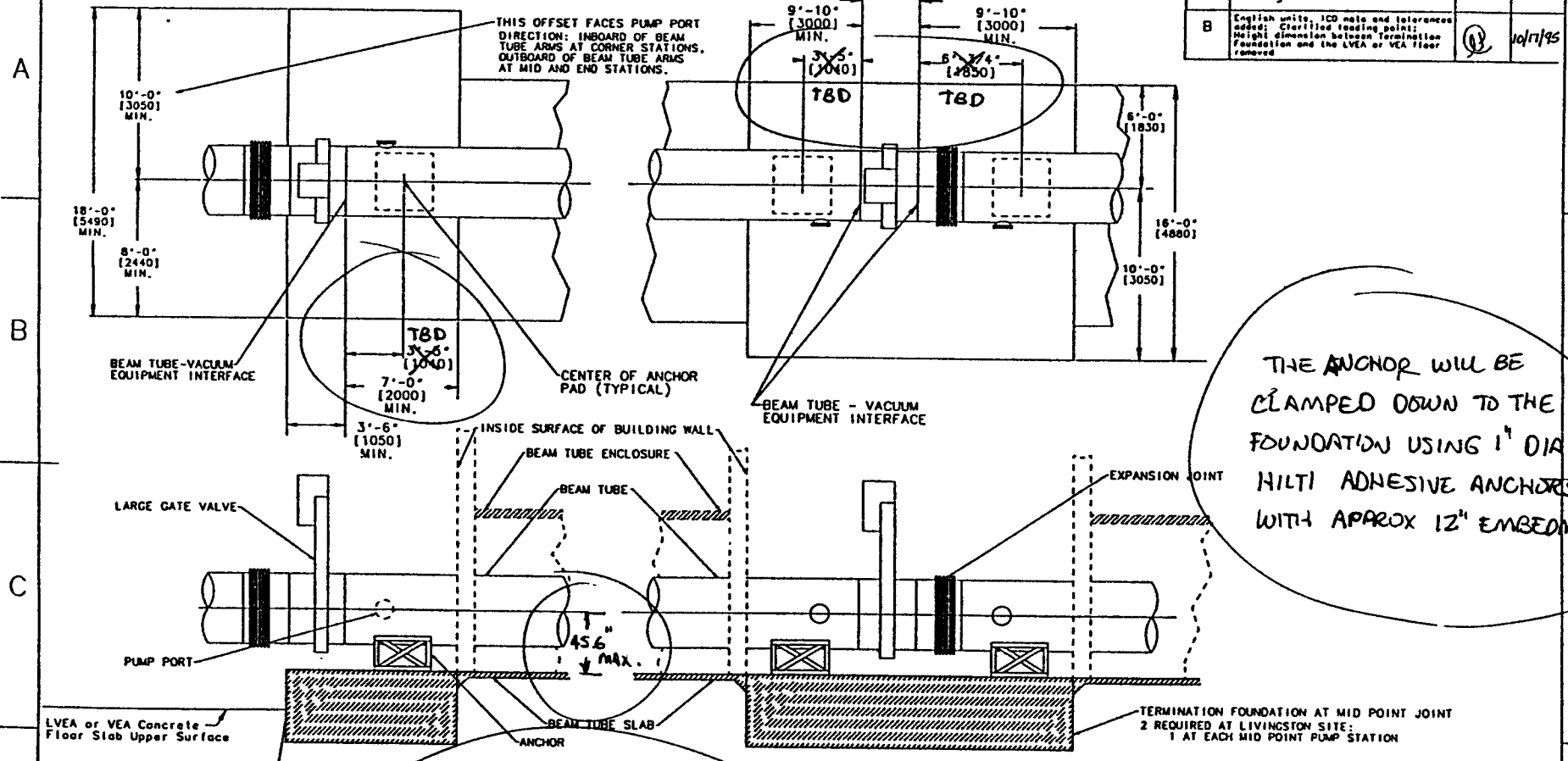
J. Jones 12/20/95

NOTE: THESE CHANGES APPLY TO REV. C OF THIS DRAWING

NOTES: (UNLESS OTHERWISE SPECIFIED)

(1) ICD INFORMATION: This drawing contains interface information.

REV	DESCRIPTION OF CHANGE	APPROVAL	DATE
A	Original		
B	English units, ICD note and tolerances added; Clarified loading points; Height dimension between Termination Foundation and the LVEA or VEA floor removed		10/17/95



THE ANCHOR WILL BE CLAMPED DOWN TO THE FOUNDATION USING 1" DIA. HILTI ADHESIVE ANCHORS WITH APPROX 12" EMBEDMENT

TYPICAL TERMINATION FOUNDATION  
 8 REQUIRED AT HANFORD SITE:  
 2 AT CORNER STATION  
 2 AT EACH MID STATION  
 1 AT EACH END STATION  
 4 REQUIRED AT LIVINGSTON SITE:  
 2 AT CORNER STATION  
 1 AT EACH END STATION

FOUNDATION LOADS AT ANCHORS (kgf)						
DIRECTION	TOTAL	DEAD	VACUUM	SEISMIC	THERMAL	WIND
VERTICAL	3600	3600	0	0	0	0
AXIAL	18200	0	14788	854	2508	0
LATERAL	1400	0	0	696	0	704

FOUNDATION LOADS AT ANCHORS (lbf)						
DIRECTION	TOTAL	DEAD	VACUUM	SEISMIC	THERMAL	WIND
VERTICAL	7937	7937	0	0	0	0
AXIAL	40424	0	32602	1883	5639	0
LATERAL	3086	0	0	1534	0	1552

58,485 2  
 24,000

CITY	STATE	FSDW NO.	PART OR IDENTIFYING NO.	APPROVALS	DATE	MATERIAL SPECIFICATION	ITEM NO.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN (ft-in) (mm) TOLERANCES ARE:		APPROVALS		DATE
ft.-in.	± 0.5 in	DESIGNED BY	D. Cayne	10/16/95
mm	± 12 mm	CHECKED BY	L. Jones	10/17/95
		APPROVED BY	F. Asiri	10/17/95
		APPROVED BY	M. Coles	10/17/95
		APPROVED BY	A. Lazzarini	10/17/95

PARTS LIST		FILE	SCALE	SHEET	OF
LIGO CALIFORNIA INSTITUTE OF TECHNOLOGY MASSACHUSETTS INSTITUTE OF TECHNOLOGY		BEAM TUBE TERMINATION FOUNDATIONS	D950093	1	1

SD Jones 12/20/95