

ABBREVIATIONS

AB	ANCHOR BOLT	MAX	MAXIMUM
ACI	AMERICAN CONCRETE INSTITUTE	MB	MACHINE BOLT
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION	MECH	MECHANICAL
APPROX	APPROXIMATE	MEZZ	MEZZANINE
ARCH	ARCHITECTURAL	MFR	MANUFACTURER
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS	MIN	MINIMUM
AWS	AMERICAN WELDING SOCIETY	MISC	MISCELLANEOUS
		MPH	MILES PER HOUR
B/B	BACK TO BACK	NIC	NOT IN CONTRACT
B/P	BASE PLATE	NS	NEAR SIDE
BM	BEAM	NTS	NOT TO SCALE
BOF	BOTTOM OF FOOTING		
BOS	BOTTOM OF STEEL		
BRG	BRACING	OC	ON CENTER
BTE	BEAM TUBE ENCLOSURE	OD	OUTSIDE DIAMETER
		OH	OPPOSITE HAND
C	CAMBER	OPNG	OPENING
C/C OR C/C	CENTER TO CENTER	OPP	OPPOSITE
CG	CENTER OF GRAVITY	OTO	OUT TO OUT
C/J	CONSTRUCTION JOINT		
CLG	CEILING	PCF	POUNDS PER CUBIC FOOT
CLP	CLEAR	PL	PLATE
CMU	CONCRETE MASONRY UNIT	PSF	POUNDS PER SQUARE FOOT
COL	COLUMN	PSI	POUNDS PER SQUARE INCH
CONC	CONCRETE	PT	POINT
CONT	CONTINUOUS		
CU	CUBIC	R	RADIUS
		RD	ROOF DRAIN
DET	DETAIL	REF	REFERENCE
DIAG	DIAGONAL	REIN OR BARS	REINFORCING STEEL
DIM	DIMENSION	REQD.	REQUIRED
DL	DEAD LOAD	REV	REVISE OR REVISION
DD	DITTO		
DWG	DRAWING	SCHED	SCHEDULE
DWL	DOWEL	SECT	SECTION
		SHT	SHEET
EA	EACH	SIM	SIMILAR
EF	EACH FACE	SLV	SHORT LEG VERTICAL
EL	ELEVATION	SPA	SPACED
ENCL	ENCLOSURE	ST STL	STAINLESS STEEL
ENGR	ENGINEER	STD	STANDARD
EQ	EQUAL	STIF	STIFFENER
EQUIP	EQUIPMENT	SYM	SYMMETRICAL
ETC	ETCETERA		
EW	EACH WAY	T&B	TOP AND BOTTOM
EXIST	EXISTING	THK	THICKNESS
		TOC	TOP OF CONCRETE
FD	FLOOR DRAIN	TOP	TOP OF FOOTING
FDM	FOUNDATION	TOS	TOP OF STEEL
FIN	FINISH	TOW	TOP OF WALL
FLR	FLOOR	TYP	TYPICAL
FLSHG	FLASHING		
FOC	FACE OF CONCRETE	UON	UNLESS OTHERWISE NOTED
FRMG	FRAMING	VE	VACUUM EQUIPMENT
FS	FAR SIDE	VERT	VERTICAL
FT	FOOT, FEET		
FTG	FOOTING		

SYMBOLS

L	ANGLE	△	DELTA
C	CHANNEL	⊕	SQUARE FEET
PL	PLATE	#	NUMBER OF POUND
⊘	CENTER LINE	&	AND
∅	DIAMETER OR ROUND	@	AT
◆	WORK POINT OR ELEV BENCH MARK		

(Circle with number)	NUMBER FOR DETAILS	(Circle with letter)	LETTER
(Circle with number and letter)	SHEET ON WHICH DETAIL OCCURS	(Circle with number and letter)	SHEET ON WHICH SECTION OCCURS
(Circle with number and letter)	DETAIL	(Circle with number)	ROOM NUMBER
(Circle with number and letter)	NUMBER FOR DETAIL	(Circle with number and letter)	REF
(Circle with number and letter)	LETTER FOR SECTION	(Circle with number and letter)	SHEET WHERE REFERENCED FROM
(Circle with number and letter)	DET/SECT CROSS REF	(Circle with number and letter)	REVISION

GENERAL NOTES

GENERAL

1. ALL WORKMANSHIP AND MATERIALS SHALL CONFORM TO THE PROJECT SPECIFICATIONS.
2. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AFFECTING THE WORK AND SHALL NOTIFY THE CONSTRUCTION MANAGER OF ANY DISCREPANCY WITH THE INFORMATION SHOWN ON THE DRAWINGS PRIOR TO PROCEEDING WITH THE WORK.
3. FOR TOP OF CONCRETE SLAB FOR BEAM TUBE ENCLOSURE SEE CIVIL DRAWINGS.

STEEL REINFORCEMENT FOR CONCRETE

1. STEEL REINFORCEMENT SHALL BE DEFORMED BARS CONFORMING TO ASTM A615, GRADE 60.
2. STEEL REINFORCEMENT SHALL HAVE THE FOLLOWING MINIMUM CONCRETE COVER UNLESS OTHERWISE NOTED:
 CONCRETE CAST AGAINST EARTH ----- 3"
 CONCRETE EXPOSED TO EARTH OR WEATHER: #6 BARS & LARGER ----- 2"
 (INCLUDING VAPOR BARRIER) #5 BARS & SMALLER ----- 1 1/2"
 CONCRETE NOT EXPOSED TO EARTH OR WEATHER: SLABS & WALLS ----- 1/2"
3. ALL CONCRETE STEEL REINFORCEMENT SHALL BE DETAILED, FABRICATED AND PLACED IN ACCORDANCE WITH ACI 318-89 AND ACI 315-80.
4. MINIMUM SPLICE LENGTH SHALL BE 2'-0".

FOUNDATIONS AND SOILS

1. ALLOWABLE SOIL BEARING PRESSURE IS 2000 PSF ON FOOTINGS WITH A MINIMUM OF 2'-0" DEPTH. 1/3 INCREASE IN ALLOWABLE BEARING VALUES ARE PERMITTED FOR SHORT DURATION LOADINGS RESULTING FROM WIND OR SEISMIC.
2. FOUNDATION AND SOIL REQUIREMENTS ARE BASED ON SOIL REPORT BY WOODWARD CLYDE; REPORT NO. 93B107C DATED: JANUARY, 1995.
3. REFER TO CIVIL DRAWINGS FOR BASE COURSE FOR SLABS AND FOUNDATIONS.

STRUCTURAL AND MISC METAL WORKS

1. STRUCTURAL AND MISCELLANEOUS STEEL SHALL CONFORM TO ASTM A36.
2. ALL WELDING AND ELECTRODES SHALL CONFORM TO THE REQUIREMENTS OF AWS D1.1 STRUCTURAL WELDING CODE.
3. FIELD WELDING SHALL BE PERFORMED BY CERTIFIED WELDERS AND CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER PRIOR TO WELDING.
4. ALL STRUCTURAL STEEL SHALL BE FABRICATED BY AN APPROVED FABRICATION SHOP.
5. CONTRACTOR SHALL SUBMIT STRUCTURAL AND MISCELLANEOUS METAL WORK SHOP DRAWINGS TO THE CONSTRUCTION MANAGER FOR REVIEW AND APPROVAL PRIOR TO START OF FABRICATION.
6. HEADED ANCHORS SHALL BE "NELSON" TYPE #4L OR #3L, FLUX FILLED, MADE FROM COLD DRAWN STEEL GRADES C-1010 THROUGH C-1020 PER ASTM A108 OR APPROVED EQUAL. ANCHORS SHALL BE WELDED PER THE MANUFACTURER'S SPECIFICATIONS.

CONCRETE

1. PORTLAND CEMENT SHALL BE TYPE I OR II CONFORMING TO ASTM C150.
2. CONCRETE SHALL BE NORMAL WEIGHT AND SHALL HAVE A COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS.
3. ALL STEEL REINFORCEMENT, ANCHOR BOLTS AND OTHER EMBEDDED ITEMS SHALL BE SECURED IN PLACE. CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER PRIOR TO CONCRETE PLACEMENT.
4. ALL CONCRETE MIX DESIGNS SHALL BE SUBMITTED TO THE CONSTRUCTION MANAGER FOR REVIEW 3 WEEKS PRIOR TO SCHEDULED CONCRETE PLACEMENT.
5. ALL EXPOSED EDGES SHALL BE CHAMFERED TO 1/4" UNLESS OTHERWISE NOTED ON THE DESIGN DRAWINGS.
6. CONTACT SURFACE AT CONSTRUCTION JOINTS WITHOUT A SHEAR KEY SHALL BE ROUGHENED TO A FULL AMPLITUDE OF 1/4" THROUGHOUT.
7. NO SAWCUTTING OF CONCRETE WALLS OR SLABS SHALL BE PERFORMED WITHOUT PRIOR WRITTEN APPROVAL FROM THE CONSTRUCTION MANAGER.
8. ANCHOR FOUNDATIONS AT VACUUM EQUIPMENT INTERFACES AT CORNER, MID AND END STATIONS SHALL BE CURED WITH MOISTURE CURING METHOD. SEE SPECIFICATION SECTION 03300, "CAST-IN PLACE CONCRETE".
9. SEE SPECIFICATION SECTION 7110 FOR UNDERSLAB WATERPROOFING OCCURRING AT BEAM TUBE TERMINATION SLABS.

DESIGN LOADS - FOR THE BEAM TUBE ENCLOSURE

1. DEAD LOADS: ACTUAL LOAD
2. LIVE LOADS: SNOW LOADS --- 20 PSF
3. LATERAL LOADS: PER UBC 1994
 - A) SEISMIC LOADS: ZONE 2B IMPORTANCE FACTOR 1.0 COEFFICIENT R= 4.0
 - B) WIND LOADS: BASIC WIND VELOCITY - 100 MPH WIND EXPOSURE C IMPORTANCE FACTOR 1.0
4. CONSTRUCTION LOADS:
 - A) HANDLING AND TRANSPORTATION LOADS INCLUDING IMPACT.
 - B) LOADS DUE TO FOUNDATION SLAB ALLOWABLE TOLERANCES - 1/2 INCH OF VERTICAL DISPLACEMENT BETWEEN OPPOSITE DIAGONAL ENDS OF SEGMENT BASE.
5. BEAM TUBE ENCLOSURE AND ACCESS DOORS SHALL BE CAPABLE OF STOPPING THE PENETRATION OF A STRAY BULLET WITH THE FOLLOWING PROPERTIES:
 - A) CALIBER ----- 308
 - B) WEIGHT ----- 180 GRAINS
 - C) VELOCITY AT IMPACT --- 2900 FEET PER SECOND
 - D) ENERGY AT IMPACT --- 2800 FEET-POUNDS
 - E) MATERIAL ----- LEAD CORE, FULLY JACKETED WITH COOPER

DRAWING INDEX

LA-S-501	GENERAL NOTES, ABBREVIATIONS & LEGEND
LA-S-502	KEY PLAN OF BEAM TUBE ENCLOSURE & PARTIAL ENLARGED PLAN
LA-S-502A	SOUTHEAST ARM BEAM TUBE ENCLOSURE PARTIAL ENLARGED PLAN
LA-S-503	BEAM TUBE ENCLOSURE PLANS, SECTIONS & DETAILS
LA-S-504	KEY PLAN OF BEAM TUBE ENCLOSURE FOUNDATION & PARTIAL ENLARGED PLANS
LA-S-505	BEAM TUBE ENCLOSURE SECTIONS & DETAILS SHEET 1
LA-S-506	BEAM TUBE ENCLOSURE SECTIONS & DETAILS SHEET 2
LA-S-507	BEAM TUBE ENCLOSURE - MID STATIONS "A" & "B" - FOUNDATION PLANS
LA-S-508	BEAM TUBE ENCLOSURE - CONCRETE SLAB & JOINT DETAILS

MATERIALS LEGEND

	CONCRETE		WELDED WIRE FABRIC
	GRAVEL		EARTH
			STRUCTURAL BACKFILL

LIGO-D961235-01-0

NO.	DATE	BY	CHKD	ENGR	PROJ	DESCRIPTION
1	1-15-99	MET	--	--	MDW	ISSUED FOR AS BUILT

ISSUED FOR CONSTRUCTION		
DRAWN	MCS	11-15-96
CHECKED	DDM	11-15-96
ENGINEER	BP	11-15-96
PROJ	TDM	11-15-96

AS-BUILT DRAWINGS

100 WEST WALNUT STREET
PASADENA, CALIFORNIA

CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

LASER INTERFEROMETER
GRAVITATIONAL-WAVE OBSERVATORY
BEAM TUBE ENCLOSURE - LIVINGSTON, LA

TITLE	SCALE	CONTRACT NUMBER	PROJECT NUMBER
STRUCTURAL BEAM TUBE ENCLOSURE GENERAL NOTES, ABBREVIATIONS & LEGEND	NONE	PP150969	8094
SHEET NUMBER	REVISIONS	LA-S-501	

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