THE RALPH M. PARSONS COMPANY

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Contract PP150969
Control No. 950907-1

September 7, 1995

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LIGO Project
Mail Stop 102-33
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Dear Linda,

We are transmitting the following items to you:

Item	Copies	Original	Dated	Description
1	3	1	9/5/95	Review Minutes for Preliminary Design Repor Rev 1

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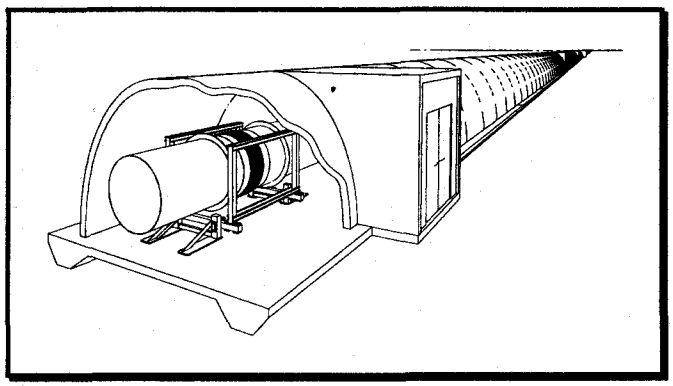

Hanford -- Beam Tube Enclosure

Review Minutes for Preliminary Design Report Revision 1

September 5, 1995

LIGO
Laser Interferometer Gravitational-Wave Observatory
California Institute of Technology
The Ralph M. Parsons Company
Contract Number: PP150969

LIGO Document	_____
CDRL Number	**23**
DRD Number	**10**

PAR-FDCM010AE1X02

APPROVAL STATUS

YES NO NOT REQUIRED

Project Manager, Parsons

Technical Representative, Caltech

Parsons–LIGO

Minutes of Meeting

Subject: Hanford -- Beam Tube Enclosure -- Preliminary Design Review	Date: 8/29/95
Location: Ralph M. Parsons Company, Pasadena	Time: 14:30 to 17:00
Prepared By: Jeff Hermann	Revision: 1 Date: 9/5/95

Attendees

Organization	Attendee	Position	Phone	Distri-bution
Parsons	Jeff Hermann	Project Engineer	440-2394	✓
Parsons	Alex Krill	Architect	440-2332	✓
Parsons	Freddy Dickens	Structural	440-2644	✓
Parsons	Paul MacCalden	Technology Department	440-3449	✓
Parsons	Jim Thrash	Engineering Manager	440-3377	✓
Caltech	Fred Asiri	Technical Representative	395-2971	✓
Caltech	Otto Matherny	Construction Representative	395-3186	✓
Caltech	Rick Savage	Cognizant Scientist	395-2122	✓

Item	Reviewer	Document	LIGO Comment *LIGO Disposition*	Code	Response
2	Coyne	Vol. 1	In paragraph 2.1.2, reference is made to a seal without previously introducing it, i.e. "This seal...". Modify as follows: "... due to thermal changes with a seal." *Will advise Parsons to correct wording.*	A	PE --
3	Coyne	Vol. 1	On top of page 2-3, statement does not read properly or make sense: "Precast segments will be installed over the Beam Tube modules within placement of three 65 foot Beam Tube section to provide the required protection." What does this mean? Please re-phrase. *Will advise Parsons to re-phrase.*	A	PE --
6	Coyne	Vol. 1	In subsection 2.7 including figure 2.7-2, replace "48 inch terminus valve" with "large terminus (gate) valve" in multiple locations. The valve is no longer 48 inches in diameter and its specific size is not relevant to the BTE documentation. *Will advise Parsons.*	A	PE --
7	Coyne	Vol. 1	In appendix A, subsection 1.5.3, has the stipulation that the BT installer has the responsibility to install the precast BTE segments, service and egress segments, and door assemblies been accepted by CBI and is it part of their intended contract? *Parsons will be advised to rewrite Sec. 2.1.3 to remove inferences that BTE will be installed by BT contractor. This will be addressed in BTE RFP.*	A	PE --

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8	Coyne	Vol. 1	In appendix A, subsection 2.2, why is the transfer point for an off-site yard at the yard and not on-site? This statement is in conflict with the statement that the precast segments are transferred at an on site storage point in subsection 1.5.3. *Parson will be advised to remove exact specification of transfer point. BTE installation contract bidders will address transfer point in proposals.*	A	PE --
9	Coyne	Vol. 1	Appendix B, the 4.75 month duration for bakeout of each BT arm seems excessive. *Detailed schedule will be coordinated with L. Jones and transmitted to Parsons during final design phase*	AIC	PE -- This data was provided by Caltech.
13	Coyne	Vol. 2	"Surface Preparation", Subsection 1.5 entitled "Submittals" is blank. Minimal requirement would seem to be a statement of compliance with the surface preparation specification. Might also want an "as-built/installed" description or drawing to indicate materials used and depths, etc. *Will discuss with Parsons.*	A	PE --
14	Coyne	Vol. 2	Section 02249, "Slope Protection". Does this apply, since the slopes have already been prepared for erosion control by the project at the Hanford site? *Will notify Parsons.*	Info	CE -- Since the tops of the embankments are to be reworked (i.e., graded, paved, raised slightly), it is expected that some of the existing erosion control will also need rework. This item is assuming that 3 feet of slope on each side of the embankment will need rework to ensure slope protection.

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15	Coyne	Vol. 2	Section 02515, "Concrete Pavement for Beam Tube Enclosure Slab", paragraph 3.03 A, "Slipform Method": "Horizontal and vertical alignment shall be referenced to a laser device." Isn't GPS to be used for alignment or at least alignment checks? What is the expected accumulated error in slab placement if a surveying laser is used to do the alignment? *Will investigate with Parsons.*	AWC	CE -- Parsons will investigate benefits of requiring GPS as a check, but this is more suitably determined by the Contractor. The Contractor will be required to provide a submittal describing his methods that will ensure alignment tolerance. This submittal will then be reviewed by the CM for compliance to requirements. A rework requirement will be added to the specification for cases found where the tolerances are not met.
16	Coyne	Vol. 2	Section 03400, "Precast Concrete Beam Tube Enclosure Segments", paragraph 1.1, implies that the BTE segments are to be coated. I thought that the coating was eliminated in a cost reduction measure. *Will discuss with Parsons. Coating (chemical) may be required for curing, but is not for water-proofing.*	A	ST -- Waterproofing is not required by the DCCD.
17	Coyne	Vol. 2	Re: "BTE - Thermal Deformations", page 3: temperature gradients are based on the daily range. The BTE acts as a solar absorber, causing an elevated air temperature within the BTE. The thermal gradient across the slab is likely to be considerably higher than 1/2 the daily ambient excursion. *Will advise Parsons to consider.*	AWC	TE -- Will investigate.

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22	Coyne	Vol. 2	Re: "MICAS Enclosure Input Model and Output": missing every other page. *Will instruct Parsons to provide missing pages for DCCD file document.*	AWC	PE -- Please check with Linda Turner. I believe this is a printing error at Caltech. The originals are double sided. How does this deliverable relate to the DCCD?
24	Coyne	Vol. 2	Re: "Beam Tube Enclosure Foundation Design Loads": What are the five slabs referred to in the table of soil spring stiffnesses? If there are 5 types of slabs, then this should be noted and a drawing giving their geometry included or at least referenced. *Will ask Parsons to clarify.*	AWC	ST -- SLAB1, SLAB2,... are spring constant given names to be used in MICAS. The line beginning with 'At Ends' was not used and should be deleted since the 2 ft wide end section was changed to 4 feet which makes it typical section.
26	Coyne	Vol. 2	The seven load cases referred to in the MICAS anchor foundation results (reactions, displacements and moments) are not defined and related to the anchor foundation loads. In addition, there is no summary and interpretation of the results, i.e. what is the margin of safety in the design given the loads? *Will ask Parsons for clarification.*	R	ST -- The reactions for the beam tube enclosure are listed on p. 44 of the MICAS output for the Beam Tube Enclosure analysis. All the above output reactions are load factored per criteria listed on p. 1 'Enclosure Design loads'.
37	Lazz	Vol I	The 48" gate valves at the termini of the BT are identified as VE package: however they are provided to the BT contractor for welding/integration onto BT. Also, their dimensions have changed: delete reference to dimensions, since this is irrelevant to Parsons design. *Will advise Parsons.*	A	ST --

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39	Lazz	Vol I	The schedule discussion indicates BTE installation will be done by OTHERS (BT installation contractor). If so, then why is Parsons carrying the cost of labor for installation in the cost book? *LIGO will preserve option of BTE installation by other than BT installer. Parsons will be instructed to remove references to BT contractor installing BTE.*	A	PE --
40	Lazz	Vol I	Related to [39], there are a lot of assumptions being made about the BT installation contractor -- is this consistent with CBI's present scope (if it is ever completely negotiated)? *See disposition of #39.*	D	PE --
48	Weiss		Intermediate entrances are described as being 780 ft. (237.7m) apart and shown with this spacing in the figures. I expected that the entrances and pump ports would actually be 250 meters apart. Is the dimension given by Parsons' correct and if so is Larry! Jones aware of this change? *Will discuss BT/BTE pump port/service entrance interface requirements with D. Coyne who will generate ICD.*	R	PE -- Per CBI drawing (LIGO-D950031-03-B, revision 3) shows 25 cm vacuum ports located at 237.744 meters. Is this information correct?
51	Weiss	Fig. BT-S-002	The seal to the slab (detail 7) may be better if it is not made with a flat gasket, but rather with a seal more in the shape of an "O" ring. *Will investigate with Parsons.*	R AI	AR -- No O-ring approach. A continuous compressible seal is the construction industry's standard. Parsons will submit life expectancy information.

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52	Weiss	Fig. BT-S-002	How is the sealer between arches (detail 6) actually applied. What keeps this seal from hardening and dropping away from the edges? Parsons should supply LIGO with an estimate for the seal lifetime and maintenance costs. (Note that in the completed volume 1 Parsons is not expecting to use any sealer initially. I would be amazed if this works.) *This important concern will be addressed during final design.*	Info AI	AR -- Sealant is applied with the backing rod to provide a "dam" that limits the extent of the injection of the sealant into the gap. The baking rod is soft foam rubber material. Parsons will submit life expectancy information.
55	Weiss	Fig. BT-S-004	What is put into the 1 inch expansion joints on the slab to avoid leakage of water and the entry of animals and insects. *Will investigate with Parsons.*	AI	AR -- This is probably increasing to 1.5 or 2 inches. Will investigate.
56	Weiss	Section 2.4.1	The statement that the Facility Monitoring and Control System (FMCS) will never have an interface to the beam tube enclosure is most likely wrong. I realize this is not a constraint on Parsons but rather a consideration for LIGO. *Noted.*	W	PE -- The statement reads *"The FMCS will not interface with any item in the BTE. The FMCS fiber optic cable in the BTE is only a means of transferring data between Facility provided mechanical, electrical, and communication components in the Corner, Mid, and End Station."* Per direction from LIGO there is to be no provisions in this design package for connection to devices inside the BTE other than a loop at each Service Entrance such that a FO interface can be installed.

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57	Weiss		What is the best estimate for the porosity of the enclosure? How much water is expected to seep through the concrete in a rain storm dropping 2 inches of rain in 24 hours? Parsons can pick another number but it should represent extreme conditions that are expected to occur once a year in Louisiana. If the porosity is large enough, what are the options open to us to reduce the water seepage and how much are they estimated to cost? *Will investigate with Parsons during Livingston BTE design.*	R	PE -- Per meeting minutes dated, June 15, 1995, Item 12, a waterproof enclosure is not a requirement. Since condensation is allowed this would serve no purpose.
58	Weiss		What is the best estimate for the average humidity (humidity averaged over time) in the enclosure? Several people at MIT (A student of Tom Eagar and Prof Ballinger are looking at the corrosion processes in the oxidized 304 SS. Prof. Eagar is not initially worried about the corrosion, he guesses that the oxide may passivate the surface). Parsons' HVAC specialist has made rough estimates. *Will investigate further.*	W	MU -- This is out of our present scope.
59	Weiss		If the enclosure leaks, what provision is being made to drain the water from above the slab. Are there periodic drains with sieves? Is the slab crowned? (In the complete volume 1 section 2.1.5, Parsons explicitly rules out floor drains, I am not convinced this is the best strategy nor that it will be difficult to keep bugs out and let water flow through a well designed drain.) *No drains to be provided in Hanford BTE. Will revisit during Livingston BTE design.*	Info	PE -- The seal between the floor slab and the enclosure segments is a open cell foam and will allow passage of moisture from the inside to the outside. No drains are provided for the Hanford BTE.

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60	Weiss		What are estimates for the temperature extremes of the air inside the enclosure at mid tube height for the Washington and the Louisiana sites. *Will discuss with Parsons' HVAC specialist who has made some rough estimates.*	W	MU -- This is out of scope.
61	Weiss		What is the maximum temperature gradient (dT/dh) with height that might occur in the enclosure at mid tube height. A primitive thermal analysis is included in Volume II which can be extended to give the answers to 61) and 62). It would also be useful for Parsons to provide recommendations and estimated costs should either the temperature excursions and or the thermal gradients are too large. *Will discuss with Parsons.*	W	MU -- This is out of scope.
63	Coyne	Vol. 2	The anchor slab skirt sizing analysis is confusing. There are three separate sizing calculations for the rebar, but the spans (2A = 5.5, 11.8 and 17') don't correspond to the anchor slab dimensions. What is the factor Ka? (Is it to account for the non-uniform hydraulic pressure distribution?) Shouldn't the lengths used in the soil and concrete differential pressure calculation be equal (i.e. not 3' and 6') and shouldn't the pressure be the difference, not the sum? *Will investigate with Parsons.*	Info	ST -- Three '2A' wide sections were selected. The shortest '5.5 ft', the longest '17 ft', and an intermediate '11.8 ft' are taken from Dwg BTS-004; details 4, All, and 3 respectively. K_A is active lateral static soil pressure coefficient shown on page 12 of the Dames & Moore Soil report Dated Feb. 10, 1993. The triangular soil pressure distribution was conservatively taken as rectangular using the maximum value. This was added to the equivalent surcharge. Please note that the reinforcement design was controlled by minimum steel reinforcement.

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64	Coyne	Vol. 3	Section 1.10 cites an off-site precast yard, whereas in Vol. 1, section 1.5.1, an "on site yard" is cited. Which is correct? Is the BT contract written to support the requirement to take delivery of the BTE segments off-site? Potential BTE installation contractors will propose pre-cast yard location. *Parsons will be asked to remove references to specific location.*	A	PE --
66	Coyne	Vol. 3	Section 1.16: Why aren't the costs of permits, design, program management, construction management, testing and inspection included? *Parsons will be asked to include construction permit costs.*	Info	PM -- Estimate is for construction contract cost only. Permits are not to be a BTE contract cost.
70	Stapfer		Why does Parsons care about the survey monuments? *Will remind Parsons that the Beam Tube contractor will develop the procedure for GPS monitoring.*	A	PE --
71	Stapfer	App. A	1.3 Assumptions: Need to change the "Beam Tube Installation contractor is responsible for the installation of.....". LIGO will preserve option of BTE installation by other than BT installer. *Parsons will be instructed to remove references to BT contractor installing BTE.*	D	PE --

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72	Jones	Vol. I	Appendix A, 1.3: Beam tube installation rate of (2) 65' sections per day, 5 days per week is NOMINAL. Enclosure casting/installing contractor is to keep within 1-3 tube sections behind beam tube installation, even if beam tube installation can be performed at a higher rate. I will find out what the maximum expected rate will be. *Once obtained, information will be passed on to Parsons.*	AIC	PE --
73	Jones	Vol. I	Appendix B, Construction Schedule - Hanford: Install B/T mid-end sta., mid crnr sta. should be 5/17/96 > 10/23/96 (NW). Install B/T mid-end sta., mid crnr sta. should be 10/24/96 > 3/24/97 (SW). *Will verify and inform Parsons.*	AIC	PE --
74	Jones	Vol. II	Specifications and Calculations; Joint installation & fabrication tolerances: In the July 31, 1995 memo from Paul B. MacCalden to Jeff Hermann, these tolerances are briefly mentioned with an expectation of a combined values of +,- 0.01". This is a very optimistic expectation, considering that its elements include: 1) cover segment end squareness to base, 2) cover segment end flatness (specified as +,- 1/16", and 3) cover segment placement. Each of these need to have a value assigned that is commensurate with fabrication & installation practicalities - what kind of controls can we really afford? +,-0.01 appears unreasonable. *Will discuss with Parsons.*	Info AI	TE -- This value is 0.1 inches, not 0.01. Parsons will reinvestigate install/fabrication tolerance of 0.1" for the enclosure segments.

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75	Jones	Vol. II	Specifications and Calculations; Joint installation tolerance buildup: With approx. 640 cover segments installed per module, tolerance buildup can prevent proper alignment of doors with pump ports and proper spacing for the final cover section. Parsons needs to plan this carefully, considering GPS or precision surveying techniques for and absolute (rather than serial differential) placement of each cover section. *Will discuss with Parsons. Also see item #48.*	A	CE -- Will add words to specification to tighten this requirement.
76	Jones	Vol. II	Specifications and Calculations; Nomenclature: When specifications are being given, care must be taken to preclude confusion in identifying the subject being specified. For instance, Drawing BT-S-002, Detail 6, shows a "sealant backer rod." This Vol II document calls this item a "gasket" (03400:1.6D, 3.4), "backup filler" (03400:3.5E), & "backing" (07920:2.1). *Will advise Parsons.*	A	AR --
77	Jones	Vol. IV	BT-S-002, Detail 6: I can't find a call-out on the diameter of the sealant backer rod. They should address the expected maximum compression of this rod in the specs/calcs write-up. *Will discuss with Parsons.*	AWC	AR -- The diameter of the backer rod will be determined by the Contractor. Parsons will investigate concern about maximum compression of the sealant.

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78	Jones	Vol. IV	BT-S-004, Details 2, 3 & 4: Distance of 2m from beam tube-vacuum equipment interface to inside surface of the building walls does not appear to have been maintained. This should be discussed with Parsons. *Will investigate and discuss with Parsons.*	R	AR -- 2 meter distance has been maintained at all Stations. Per our ICD 4.1 drawing dated 8/29/95 of the Corner Station the distance from the VE interface to the building wall centerline has been increased fro 13'-1" to 14'-1". This will be corrected on the BTE drawings.
80	F. Asiri	Vol II Structura l Calcs.	Conduct an investigation on cost of a 4 inch and a 5 inch thick floor slab for the BTE.	AWC	ST -- Currently the six inch thick slab meets all Code requirements for concrete coverage of reinforcing, and results in a mesh reinforcing that is common and relatively inexpensive. Preliminary calculations show that a 5 inch slab will require additional reinforcing that would then make this alternative more expensive than the current 6 inch slab. It is also our opinion that for constructability reasons, a 4 or 5 inch thick slab is not advisable due to the tolerances of grade elevations and rebar placement.
			Also use a distributed load from the BT supports rather than a point load to the slab.	AWC	The loads given in LIGO provided document "Fixed and Guided Support Details", dated 7/27/95, cannot be considered distributed loads since the supports of the BT are L shaped supports and do not provide a ridged moment connection to the BT. They are also not depicted as distributed loads in this reference.

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81	F. Asiri	Vol I Section 2.2.2	Obtain ICBO interpretation of Code requirements regarding the emergency egresses.	A	DE --
82	F. Asiri	Appendix B	Add grading and road construction prior to BTE Slab construction.	A	PE --
83	R. Savage		Investigate BTE slab expansion joint movement and how it effects the joint between the enclosure segments that are immediately at that joint.	A	TE --

Summary

This meeting achieved the following:

1. Parsons and Caltech agreed on dispositions of Client comments
2. Clarification of Client comments was achieved
3. Parsons Engineers answered questions, and to some degree discussed design solution

Next Steps

1. Action Items listed in the preceding table need to be closed out immediately in order to proceed with the final design of the beam tube enclosure.
2. ICBO interpretation of Code requirements for the emergency egresses will be received by Tim Melott by Thrusday, 8/31/95.
3. Parsons to submit back-check documents to Caltech that reflect resolution of these comments. This will include Volume I (Basis of Design), Volume II (Specifications only), and Volume IV (Drawings). Volume III (Cost Estimate) will not be submitted for this back-check submittal.
4. Caltech needs to issue a TDM directing Parsons to proceed with final design of the beam tube enclosure for Hanford.
5. Conduct study requested in Item 80. Man-hours required to accomplish this study will have an engineering cost impact and will be documented accordingly.

Meeting Minutes Approved by:

Tyler M. Jackson, Parsons -- Project Manager

9/5/95

Date

JH/jh

cc: Tyler Jackson
Tim Melott
File 1.7
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attachments: None

The minutes of this meeting are intended to reflect only the "highlights" of the discussion, however, they are to be considered true and correct in their content. Agreement with the above by all participants shall be construed unless noted otherwise in writing within 5 calendar days of receipt of these minutes.