

**COST MANAGEMENT
FOR
BEAM TUBE SUBCONTRACT**

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APRIL 6, 1994

LIGO COST BREAKDOWN

('93 \$M)

		% SUBCONTRACTED
• CIVIL CONSTRUCTION	\$ 71.8	100
• VACUUM EQUIPMENT	56.5	100
• BEAM TUBES	39.6	100
• SUPPORT EQUIPMENT	11.3	?
• INITIAL INTERFEROMETER	15.1	?
• STAFFING SUPPORT & OPERATION	44.8	0
TOTAL	\$ 239.2	70%

APPROACH TO BEAM TUBE SUBCONTRACT

- **NEGOTIATED FIRM-FIXED PRICE (FFP) SUBCONTRACT WITH CHICAGO BRIDGE & IRON (CBI)**

- **NEGOTIATED PHASED CONTRACT**
 - **DESIGN**

 - **QUALIFICATION TESTING**

 - **OPTION TO BUILD**

- **NEGOTIATED TERMS WHICH PROVIDE FOR:**
 - **TECHNICAL DIRECTION BY LIGO PROJECT STAFF**

 - **PROGRESS PAYMENTS BASED ON PERFORMANCE MILESTONES**

 - **PROGRAMMATIC CHARACTERISTICS OF CPFF CONTRACTS:**
 - **DETAILED TECHNICAL STATUS**

 - **COST EXPERIENCE**

 - **ESTIMATE TO COMPLETE**

MANAGING THE BEAM TUBE SUBCONTRACT

- **A COGNIZANT TECHNICAL MANAGER AND A COGNIZANT SCIENTIST IS ASSIGNED:**
 - **COGNIZANT TECHNICAL MANAGER, L. JONES**
 - **COGNIZANT SCIENTIST, R. WEISS**

- **REGULAR (USUALLY MONTHLY) MEETINGS ARE SCHEDULED AT THE CONTRACTOR:**
 - **MONITOR TECHNICAL STATUS**
 - **REVIEW COST EXPERIENCE**
 - **ENSURE TIMELINESS OF DECISIONS FOR CORRECTIVE ACTIONS**

- **TECHNICAL CONTROL REMAINS IN THE HANDS OF THE LIGO TEAM:**
 - **REVIEW AND APPROVAL OF CONTRACTOR PLANS AND PROCEDURES**
 - **CONTRACTUALLY REQUIRED FORMAL DESIGN REVIEWS**
 - **CONTRACTUAL PROVISIONS TO REVIEW AND INSPECT WORK IN PROGRESS**

BEAM TUBE SUBCONTRACT STATUS

- **CURRENT STATUS OF CONTRACT:**
 - **COMPLETED REQUIREMENTS REVIEW**
 - **COMPLETED PRELIMINARY DESIGN REVIEW**
 - **CONDUCTED MONTHLY STATUS REVIEWS**
 - **REVIEWED 8 DOCUMENTS, APPROVED 6**
 - **REVIEWED AND APPROVED SEVERAL CONTRACT MODIFICATIONS (NOT YET ISSUED)**
 - **FINAL DESIGN REVIEW IS SCHEDULED FOR APRIL 26–27, 1994**
 - **QUALIFICATION TEST IS SCHEDULED FOR COMPLETION IN OCTOBER 1994**

SELECTED COST ESTIMATES

('93 \$K)

2.5.1.1 WALL MATERIAL COSTS, T304 / LOW H₂

'89 PROPOSAL ESTIMATES (LIGO)	\$ 3,109.2
RFP REVISION ESTIMATE (LIGO)	\$ 3,109.2
PROPOSAL ESTIMATE (CBI)	\$ 2,968.0
CURRENT DESIGN ESTIMATE (CBI)	\$ 2,200.6

- APPROXIMATELY 40% COST SAVINGS MADE POSSIBLE MAINLY BY LOWER STEEL PRICING AND CBI'S DECISION TO PROCURE THE STEEL FOR THE TUBE FABRICATOR

2.5.1.3 STIFFENERS

'89 PROPOSAL ESTIMATES (LIGO)	\$ 1,298.2
RFP REVISION ESTIMATE (LIGO)	\$ 1,298.2
PROPOSAL ESTIMATE (CBI)	\$ 2,235.8
CURRENT DESIGN ESTIMATE (CBI)	\$ 1,079.6

- THE ORIGINAL CBI ESTIMATE WAS SIGNIFICANTLY REDUCED BY OPTIMIZATION OF ASME CODE DESIGN AND, MINIMIZING THE FABRICATION AND ASSEMBLY LABOR REQUIREMENT

SELECTED COST ESTIMATES (‘93 \$K)

2.5.2.2 SUPPORTS & BAFFLES

‘89 PROPOSAL ESTIMATES (LIGO)	\$ 663.8
RFP UPDATE ESTIMATE (LIGO)	\$ 663.8
PROPOSAL ESTIMATE (CBI)	\$ 1,110.2
CURRENT DESIGN ESTIMATE (CBI)	\$ 2,100.4

- THE ORIGINAL SIMPLE SUPPORT CONCEPT PROVED NOT TO BE REALISTIC

- CBI’s CURRENT DESIGN IS FELT TO BE OVER DESIGNED, EFFORTS TO REDUCE COMPLEXITY, THUS COST ARE UNDERWAY

2.5.2.7 LEAK CHECK AND REPAIR

‘89 PROPOSAL ESTIMATES (LIGO)	\$ 316.9
RFP UPDATE ESTIMATE (LIGO)	\$ 316.9
PROPOSAL ESTIMATE (CBI)	\$ 1,415.4
CURRENT DESIGN ESTIMATE (CBI)	\$ 1,415.4

- CBI COSTED A "BRUTE FORCE" He LEAK CHECK, USING BAGGING TECHNIQUES

- A TWO DAY WORK SESSION WITH CBI AND LIGO EXPERTS WAS JUST CONCLUDED TO ADDRESS THIS ISSUE AND REDUCE COST

BEAM TUBE SUMMARY

('93 \$K)

TOTAL BEAM TUBE COST ESTIMATE:

'89 PROPOSAL	\$ 35,797.6
RFP UPDATE	\$ 31,211.1
CBI PROPOSAL	\$ 33,192.6
CURRENT DESIGN	\$ 32,095.4

- DELETED ION PUMPS, ADDED VALVES — REDUCED RFP UPDATE
- THE COST IS MANAGED AT THIS LEVEL
- COST DRIVERS ARE IDENTIFIED AT THE LOWER LEVELS
- PRESENT ESTIMATES ARE, THAT THE COST WILL BE NEAR THE RFP REVISED ESTIMATE, THUS PROVIDING ADDITIONAL CONTINGENCY FOR THE CONSTRUCTION PHASE