

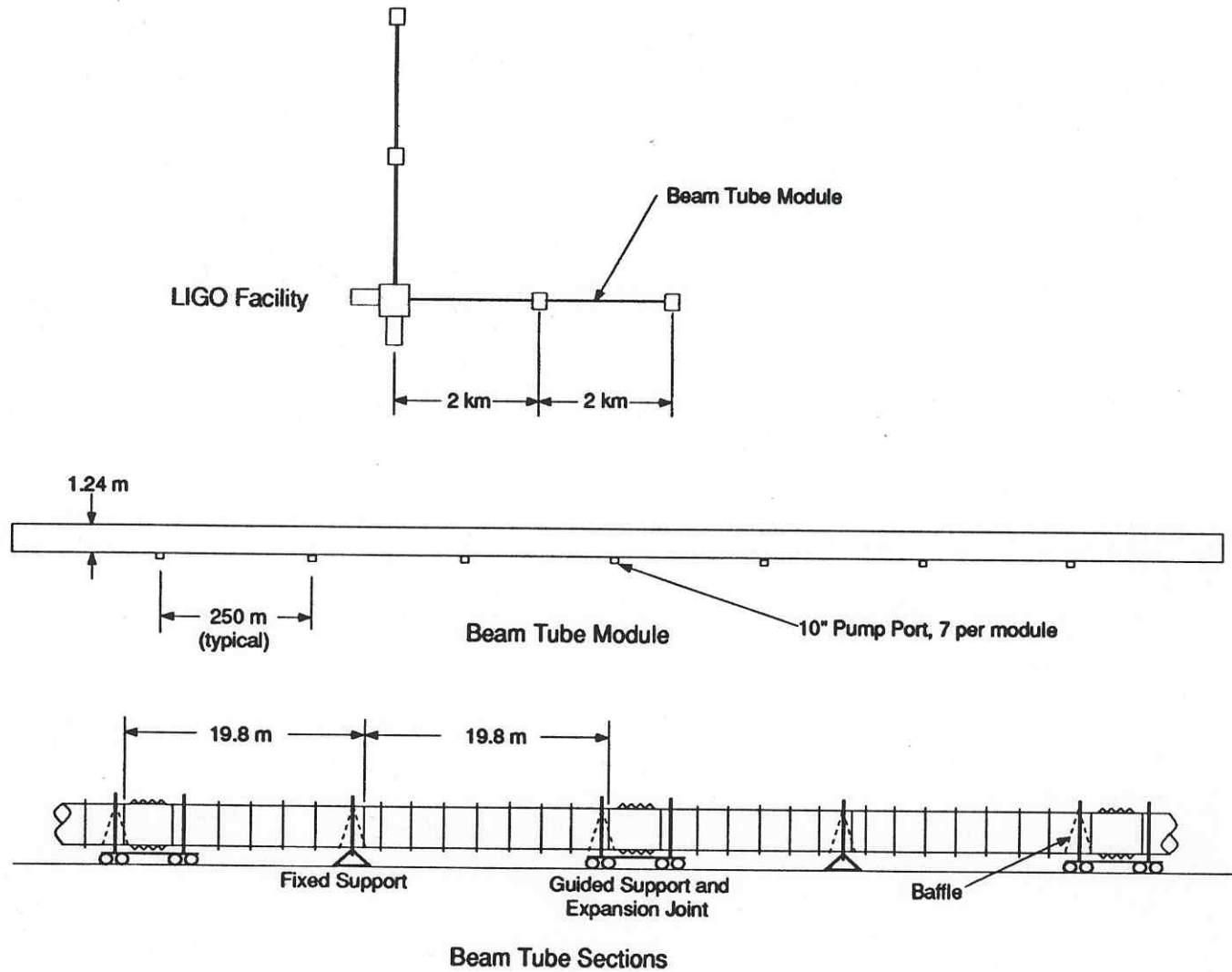
BEAM TUBE MODULES

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1190-9940038-00-B

BEAM TUBE MODULES CONFIGURATION



BEAM TUBE MODULES COMPONENTS

ITEM	QUANTITY REQUIRED
SPIRAL TUBE SECTION	800
STIFFENING RING	20,000
SUPPORT RING	1400
GUIDED SUPPORT	400
FIXED SUPPORT	400
EXPANSION JOINT	400
PUMP PORT	56
BAFFLE	960

BEAM TUBE MODULES REQUIREMENTS

- **VERY LOW LEAKAGE: $\leq 1 \times 10^{-10}$ ATM CC/S, HELIUM**
- **CLEAR APERTURE: ≥ 1.07 M DIA.**
- **VERY LOW OUTGASSING: FOLLOW LIGO SPECIFICATION 100007**

HYDROGEN: $< 1 \times 10^{-13}$ TORR LITER/S CM²

WATER: $< 1 \times 10^{-15}$ TORR LITER/S CM²

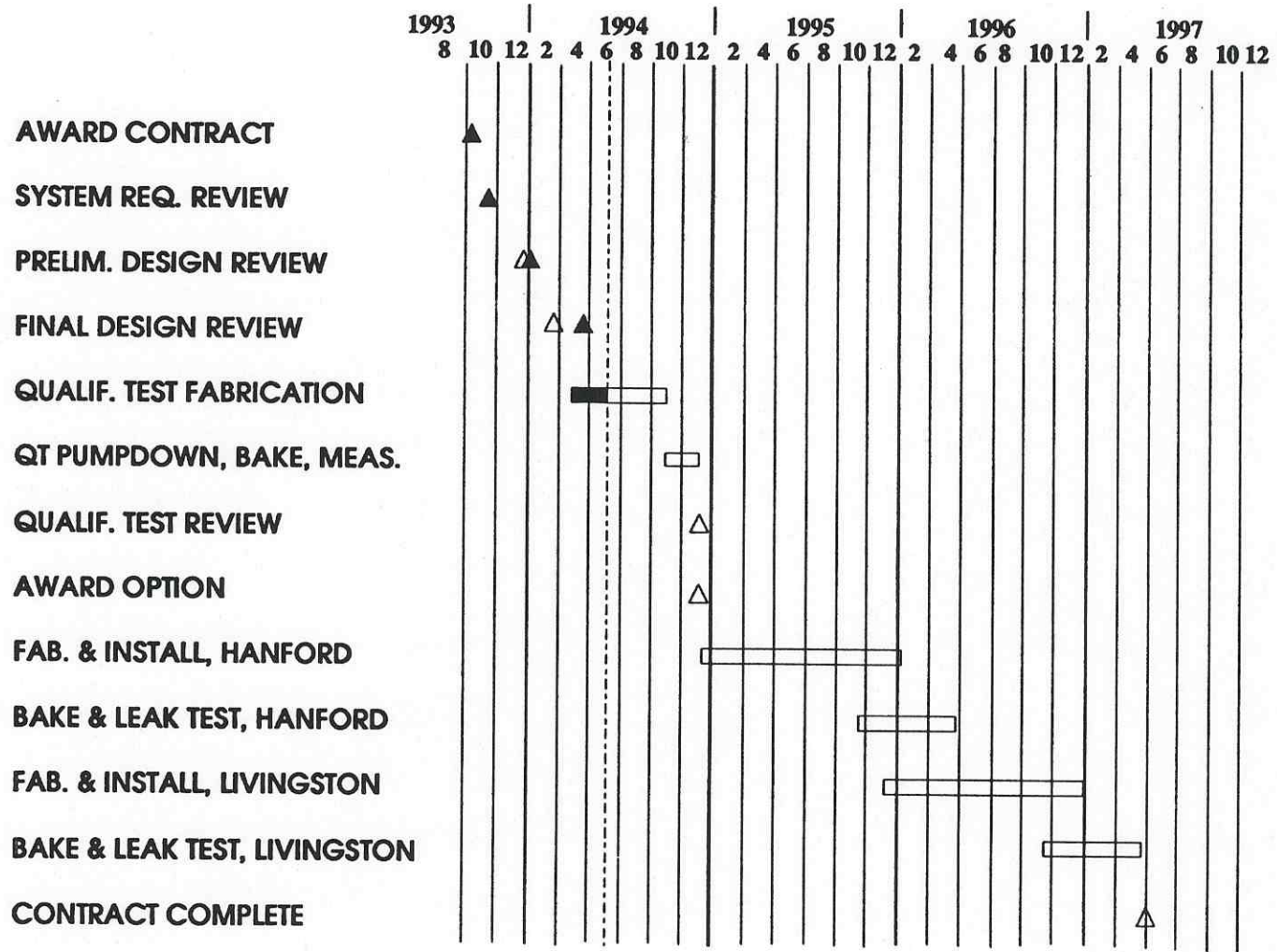
- **CLEAN**

BEAM TUBE MODULES QUALIFICATION TEST OBJECTIVES

DEMONSTRATE CONFORMANCE OF DETAILED DESIGN

- **PHYSICAL CONFIGURATION: DIMENSIONS, FIT**
- **STRUCTURAL LOADS**
- **FABRICATION, WELDING CLEANING PROCEDURES & PROCESSES**
- **LEAK RATE MEASUREMENT**
- **WATER BAKE PROCEDURE, THERMAL GRADIENTS**
- **H₂, H₂O OUTGASSING MEASUREMENTS**
- **HYDROCARBON OUTGASSING MEASUREMENTS**

BEAM TUBE MODULES SCHEDULE



**BEAM TUBE MODULES
COSTS (ALL '93 \$M)**

WBS NO.	TASK	NSF PROPOSAL 12/89	CBI ESTIMATE 4/94	INCREASE FROM CONTRACT AWARD ESTIMATE
1.5	DESIGN, MANAGEMENT, QA	4.1	5.6	2.9
2.5	FAB & INSTALL, HANFORD	15.9	20.6	5.0
3.5	FAB & INSTALL, LIVINGSTON	15.9	14.8	
	TOTAL	35.8	41.0	7.8

ELEMENTS OF 4/94 ESTIMATE:

- **SIZEABLE INCREASE IN MANAGEMENT COSTS**
- **ASSUMES 12% PROFIT: CBI HAS NOT YET INCLUDED PROFIT IN THE ESTIMATE**
- **INCLUDES \$1.6M PREMIUM, DAVIS-BACON (HA) VS. NON-UNION RATES**
- **INCLUDES \$4.6M MAJOR EQUIPMENT (HA):**
 - **\$0.5M LIKELY REDUCTION IN REVISING HOODS, ROUNDING FIXTURES**
 - **\$0.3M POTENTIAL REDUCTION IN SETUP, DEMO COSTS**
 - **\$1.0M TEMPORARY BUILDINGS: FURTHER REVIEW REQUIRES TRADE-OFF IN SHIPPING, DAVIS-BACON**