
Vacuum Equipment Procurement

PRESENTATION TO NSF
AUGUST 28, 1995

Objective

- Recommend that Process Systems International (PSI) be awarded a contract to provide all vacuum systems for both LIGO sites.
- Procured items:
 - Pumping systems
 - 32 vacuum chambers
 - Vacuum instrumentation
 - Valves
 - Purge/vent system
 - Bakeout system

Contract Value

- LIGO Cost Book \$41.7 M
- PSI proposed price \$42.5 M
- Optimized price after negotiation \$39.1 M

Negotiated price fully satisfies all LIGO technical and schedule requirements

AGENDA

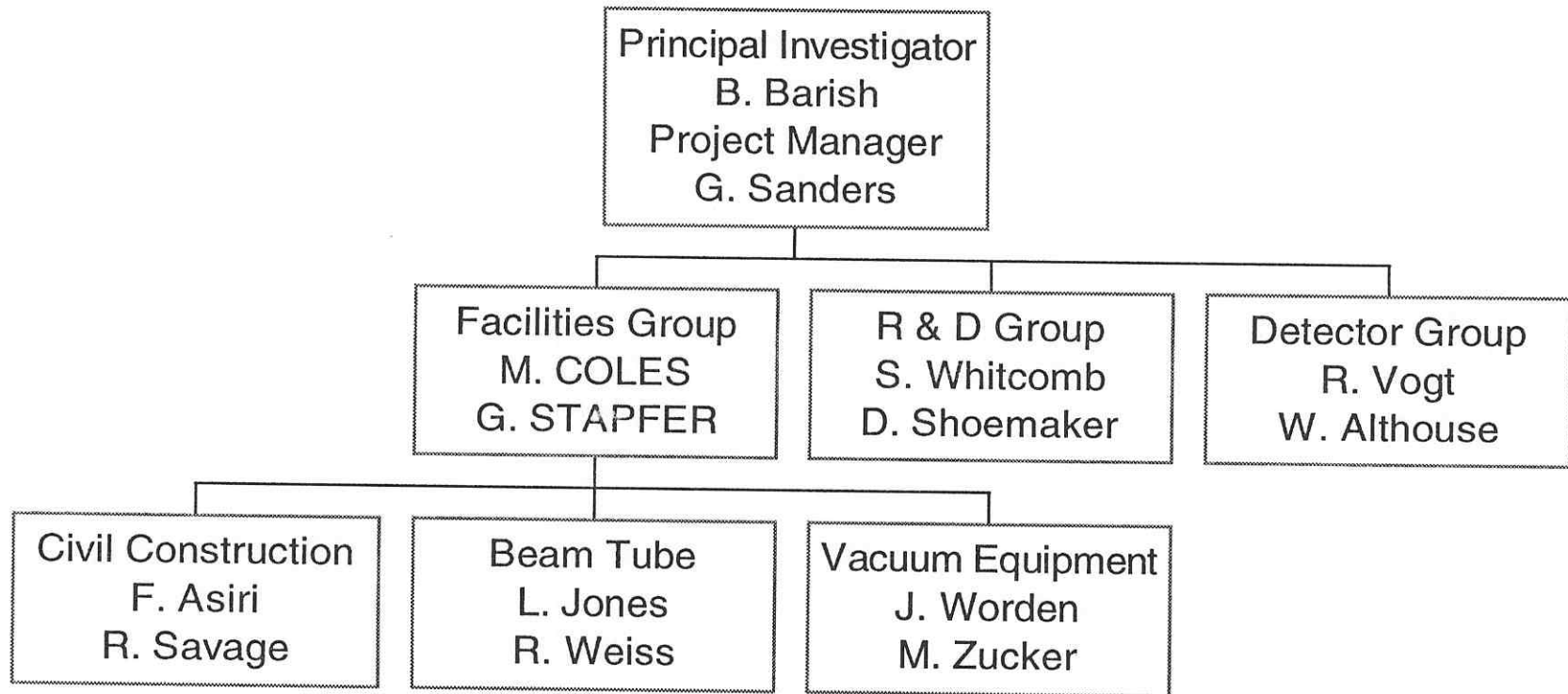
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- PROCUREMENT STRATEGY AND APPROACH
- SUMMARY OF PHASE-A EVENTS
- SUPPORT FOR PHASE B RECOMMENDATION:
 - Approach
 - Evaluation
 - Selection

Goal of Presentation

- Present vacuum equipment procurement strategy
- Review events leading to recommendation to award contract to PSI
- Aid NSF by explaining procurement process so that contract can be approved

LIGO Organization Chart

LIGO Project Organization



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- JULY 21, 1995 REVIEW OF CONTRACTOR SELECTION
- JULY 28, 1995 PHASE-B SOURCE SELECTION BOARD REVIEW
- AUGUST 29, 1995 NSF REVIEW OF PHASE-B CONTRACT

PROCUREMENT STRATEGY

- TWO PROCUREMENT PHASES

- » PHASE-A

- PRELIMINARY DESIGN PHASE
- DESIGN COMPETITION BETWEEN PSI AND CB&I
- PROVIDES CONTRACTOR FAMILIARITY WITH LIGO
- MINIMIZE COST UNCERTAINTY FOR PHASE-B PROPOSALS

- » PHASE-B

- DESIGN, FABRICATION AND INSTALLATION PHASE
- PERFORMED BY BEST QUALIFIED PHASE-A CONTRACTOR - PSI

REVIEW OF DESIGN - PHASE A

- EACH CONTRACTOR DEVELOPED ITS OWN PRELIMINARY DESIGN
 - » A FIXED PRICE OF \$ 250K EACH WAS EXECUTED WITH CB&I AND PSI
 - » ALL COMMUNICATION BETWEEN LIGO AND THE CONTRACTORS WAS COMMON TO ASSURE FAIRNESS
 - » PERIODIC MEETINGS HELD WITH BOTH CONTRACTORS
 - » VACUUM REQUIREMENTS WERE UPDATED AND CLARIFIED AS NECESSARY DURING THE PHASE-A PERIOD

PHASE A DELIVERABLES

- PRELIMINARY VACUUM EQUIPMENT DESIGN
 - » SYSTEM SPECIFICATIONS, DRAWINGS, SCHEMATICS
- PROVIDE PROJECT MANAGEMENT PLAN
 - » DESCRIBING DESIGN, FABRICATION, INSTALLATION
- SUBMIT FIXED PRICE PROPOSAL
 - » FIRM FIXED PRICE PROPOSAL FOR PHASE B

INSERT

(JOHN'S TECHNICAL DESCRIPTION
SLIDES)

PHASE-B SELECTION CRITERIA

SELECTION FOR PHASE-B AWARD BASED ON:

COST EFFECTIVENESS OF THE PROPOSED APPROACH FOR
THE PHASE-B IMPLEMENTATION.

RELATIVE TECHNICAL MERITS OF PRELIMINARY DESIGN
DELIVERABLES.

PROGRAM MANAGEMENT

NEXT STEPS

- INITIATE PHASE-B CONTRACT
 - » GOAL SEPTEMBER 5, 1995
- COMPLETE FINAL DESIGN
 - » SCHEDULED APRIL 1996
- COMPLETE PHASE-B
 - » HANFORD, MARCH 1998
 - » LIVINGSTON, JANUARY 1999

EVALUATION OF PHASE A DESIGN/PROPOSAL

- BOTH CONTRACTORS PRESENTED THEIR PRELIMINARY DESIGN
 - » A ONE DAY PDR WAS CONDUCTED BY EACH OF THE CONTRACTORS TO DESCRIBE THEIR DESIGN AND FABRICATION / INSTALLATION APPROACH
- BOTH CONTRACTORS SUBMITTED FIXED PRICE COST PROPOSALS
- PROPOSALS WERE EVALUATED BY THE EVALUATION COMMITTEE AND JUDGED TO BE RESPONSIVE TO CARRY OUT THE DETAIL DESIGN, FABRICATION AND INSTALLATION TASK

EVALUATION PROCESS

- REVIEW AND EVALUATE THE TWO PROPOSALS INDIVIDUALLY
 - IDENTIFY RELATIVE STRENGTHS AND WEAKNESSES
- ESTABLISH CONSENSUS
 - INDIVIDUAL ASSESSMENTS DISCUSSED DURING THE COURSE OF SEVERAL MEETINGS
- ISSUE TECHNICAL, MANAGERIAL, AND PROGRAMMATIC COMPARISON REPORT
- RECOMMEND SELECTION OF PSI TO REVIEW PANEL
- REVIEW PANEL PRESENTS RECOMMENDATION TO SOURCE SELECTION BOARD

PROPOSAL EVALUATION COMMITTEE

- COMMITTEE MEMBERS

- » MARK COLES, CHAIR
- » ED JASNOW
- » KEN JOHNSON (JPL)
- » ALLEN SIBLEY
- » JOHN WORDEN
- » MIKE ZUCKER (MIT, LIGO)

Evaluation Committee Recommendation:

Select PSI to provide LIGO Vacuum Equipment

Consensus Score

	Maximum Score	Process Systems International	Chicago Bridge and Iron
Technical	30	26	18
Management	20	17	12
Price	50	45	19
Total	100	88	49

- Scoring Motivation

- >> Approximate \$10 million lower price by PSI
- >> Technically stronger proposal by PSI



Vacuum Equipment Price Analysis

Firm Fixed Prices

	PSI	CBI
Total Cost	\$38,674,045.00	\$47,455,375.00
Profit	\$3,867,404.00 (10%)	\$5,080,000.00 (10.7%)
Total Price	\$42,541,449.00	\$52,535,375.00

Site cost comparison

	LIGO	PSI	CBI
WA Site	\$22,990,000	\$22,878,161	\$27,226,496
LA Site	\$13,038,000	\$12,984,423	\$16,017,694
Total	\$36,028,000	\$35,862,584	\$43,244,190



TECHNICAL DECISION FACTORS CHAMBER DESIGN

- **CBI**

- >> Heavy wall chamber design.

- Increased costs for:

- material

- rigging

- bakeout

- **PSI**

- >> Cost effective mechanical design. Reduced cost for:

- material, installation and alignment, bakeout

- >> Prototype chamber fabrication for design verification.

- Little schedule risk

- No cost risk if chamber fails to meet LIGO specs.

- >> Well developed design presentation

- high level of detail shown in mechanical configuration drawings,



Cleaning and Installation Requirements

- **CBI:**

- ›› Significant number of field welds

- Compromises cleanliness for installation/modification

- **PSI:**

- ›› More methodical approach:

- cleaning
 - bake out
 - leak checking fabricated equipment at their plant under controlled conditions
 - shipping sealed and pressurized vessels to the sites
 - breaking seals and performing the alignment within portable clean room enclosures
 - no welding at job site!
 - Prototype fab allows early test of cleaning processes

Vibration

- **PSI:**

- ›› **Consistent approach**

- Major acoustic sources identified and placed far from sensitive areas in mechanical rooms with header tubing (at viscous flow pressure) running back into the LVEA.
 - placement of ion pump power supplies in mechanical rooms to control fan and transformer noise.

Program Management

- **PSI**

- ›› Organizational structure well suited to this task
- ›› Vertically integrated organization plan.
- ›› Clear QA and configuration management authority with one organization.



Evaluation Committee Summary

- Both proposals technically responsive:
 - ›› PSI approach technically stronger
 - more structured and methodical approach to design, fabrication, and project organization.

 - ›› Much lower PSI price due to:
 - reduced material cost
 - lower installation labor cost

VACUUM EQUIPMENT REVIEW PANEL

- REVIEW PANEL MET ON JULY 21, 1995
- THE RESULTS OF THE EVALUATION WERE PRESENTED BY THE EVALUATION COMMITTEE
- PANEL MEMBERS DISCUSSED THE DETAILS OF THE RESULTS WITH THE COMMITTEE
- THE PANEL MEMBERS UNANIMOUSLY CONCURRED WITH THE SELECTION AND ENDORSED THE RECOMMENDATION MADE BY THE COMMITTEE

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R. POOL, CIT COUNSEL

G. SANDERS, PROJECT MANAGER

SSB DECISION

“THE SOURCE SELECTION BOARD ENDORSES
THE FINDINGS AND RECOMMENDATION OF THE
VACUUM EQUIPMENT EVALUATION COMMITTEE:
THAT CALTECH NEGOTIATE PHASE-B WITH

PROCESS SYSTEMS INTERNATIONAL

TO DESIGN, FABRICATE AND ASSEMBLE THE
VACUUM EQUIPMENT FOR LIGO”

CONTRACT NEGOTIATIONS

- CONTRACT NEGOTIATIONS WERE CONDUCTED WITH PSI ON AUGUST 16, 17, 1995
 - » OPTIMIZE SCOPE WHILE PRESERVING TECHNICAL REQ'TS
 - » AGREEMENT ON EXCEPTIONS
 - » DEFINITION OF INTERFACES
- THE CONTRACT PRICE WAS REDUCED
 - » PROPOSAL PRICE \$ 42,541,449
 - » NEGOTIATED PRICE \$ 39.100.000

SUMMARY

- VE procurement was a methodical process of:
competitive procurement,
design competition
- Technically responsive design at fair price
- Procurement recommended technically by in-house
and outside reviewers
- Procurement procedure reviewed and validated by in-
house and outside reviewers

RECOMMENDATION

- LIGO REQUESTS NSF APPROVE SOURCE SELECTION BOARD DECISION:

AWARD VACUUM EQUIPMENT CONTRACT TO
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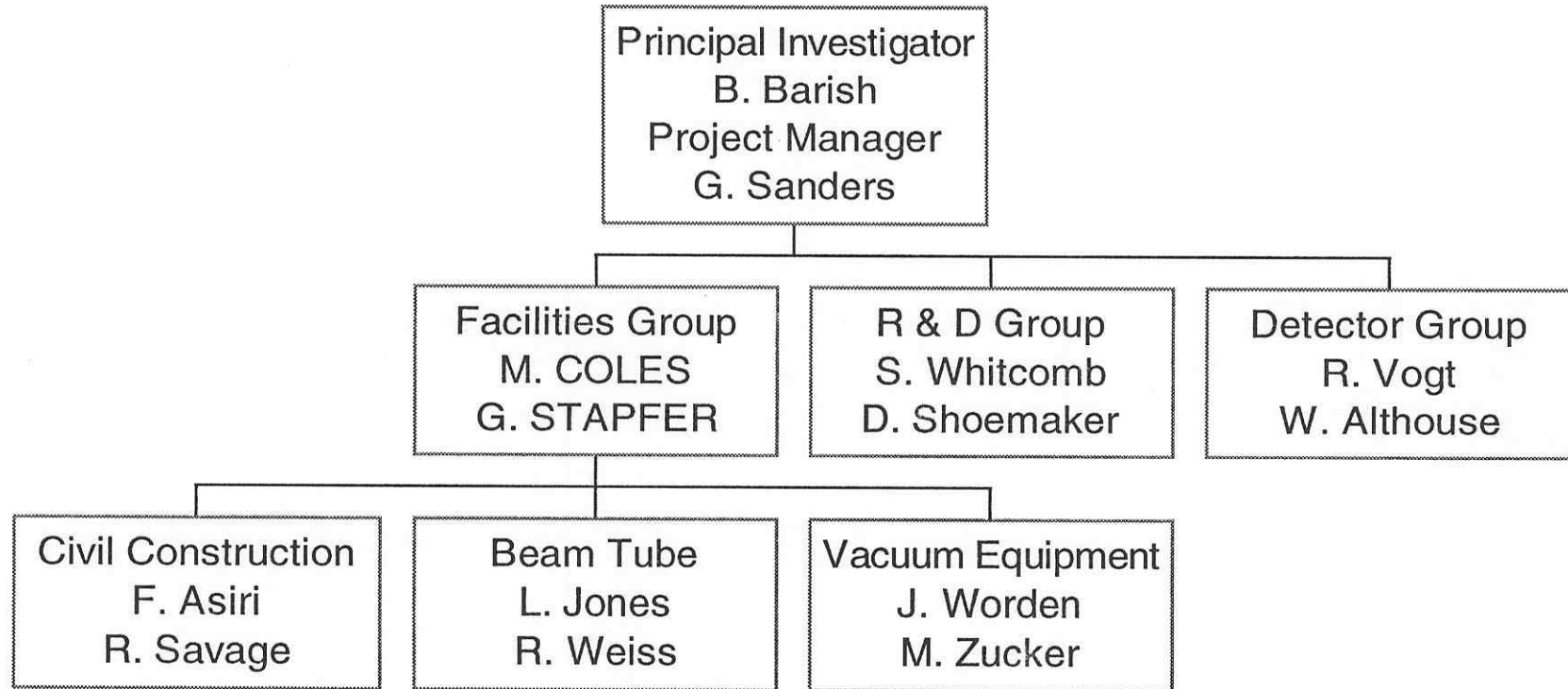
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