New Folder Name Response to Multiple Action Items in Persons Requirements Defination Worksheet
T950066

DCC

CALIFORNIA INSTITUTE OF TECHNOLOGY

Laser Interferometer Gravitational Wave Observatory (LIGO) Project

To/Mail Code: Fred Asiri/51-33
From/Mail Code: D. Coyne/51-33 D. Coyne
A. Lazzarini/51-33
Phone/FAX: 395-2034/304-9834
395-8444/304-9834

Refer to: LIGO-T950066-00-E
Date: 12 Sep 95

Subject: **RESPONSE TO MULTIPLE ACTION ITEMS IN PARSONS' "REQUIREMENTS DEFINITION WORKSHEET"**

The following pages are the LIGO responses[1] to the following action items from Parsons' "Requirements Definition Worksheet (RDW)":

1) Communications between CDS and FCMS (Action Item No. 75 and 134)
2) Requested Terminus Valve ICD Data (Action Item No. 132)
3) Requested Revision of "Building Considerations for CDS" (Action Item No. 133)
4) Clean Work Benches (Action Item No. 135)
5) Compressed Air Needs (Action Item No. 139)
6) Laser Table Assembly (Action Item No. 140)
7) Special Telephone Requirements (Action Item No. 141)

I would also like to propose that the following questions/actions be added to the RDW for Parsons in order to help resolve issues raised in the attached:

1) Propose a solution for bridging across the gap between the LVEA slab and the perimeter footings with embedded power conduits (of approx. 6 in. in diameter) without transmitting significant vibration and without intruding into the aisle space adjacent to the interior walls.

2) Propose a chiller water system concept which can accommodate the expected large range in nominal power dissipation (from the HVAC alone in the winter in Hanford, to a single interferometer, to three simultaneous lasers in the summer at Hanford). Consider the assertion that the chiller plant will generate more vibration (due to the bypass loop) if it is operated at a small fraction of its design capacity. Also consider the likely scenario that we will want a chiller system which can readily be expanded to accommodate three simultaneous Argon-Ion lasers (184.5 kW), but may be initially sized for three simultaneous Nd:YAG lasers (3 kW), e.g. multiple, modular smaller capacity chiller plants with plumbing to accommodate the maximum flow rates.

3) Define an "industry standard" control system to be used for the FCMS designed only on the

1. As discussed in the 11 Sep 95 Integration and Systems Engineering meeting.

basis of Parsons' self-derived requirements to adequately monitor and control the building. Convey to LIGO the attributes and features of this system, particularly its remote control aspects (capabilities and proposed equipment) and its computer/network interface capability, if any.

4) Identify sources/candidates for Current Transducers (CTs) to be added to the electrical power lines of major electrical loads and rotating/translating equipment (per the response to action item 75) with reliability/lifetime, cost and specifications. Propose a method of termination and a list of candidate equipment and/or circuits.

DCC & AL:dcc

Distribution:

M. Coles	A. Lazzarini	F. Raab
A. Sibley	J. Worden	R. Vogt
F. Asiri	O. Matherny	W. Althouse
R. Savage	J. Heefner	R. Bork
R. Spero	G. Sanders	

Chronological File
Document Control Center

Needed information on communications between CCDS and FCMS
Response to Action Item No. 75 & 134 of Parsons' "Requirements Definition Worksheet"

Action Item No. 134 of Parsons' "Requirements Definition Worksheet" states:
It is still unclear if any data are to be transferred between the CDS and the FCMS. An example is "state" information of major Facility equipment such as AHUs and chillers. If data transfer does occur then we need specifications to follow to ensure the compatibility of data.

and the related action item No. 75 of Parsons' "Requirements Definition Worksheet" states:
V. Schmidt and K. Ramsing will investigate monitoring the HVAC equipment state changes by placing load sensing instruments on the electrical power system and having this data collected by the CDS.

[1] The networks which provide CDS and FCMS functions are separate entities. The two networks shall be accessed via separate workstation terminals which shall be, as a minimum, co-located in the Control Room within the OSB. The FCMS shall be limited to a single workstation (and its wiring) within the Control Room of the OSB.

[2] The FCMS and its access at the various buildings of the LIGO facilities shall be defined and designed according to the standard practices for such systems. The OSB control room is the **only place** where LIGO requires access to (but not connections between) both the CDS and the FCMS networks.

[3] The facilities design shall include, as a deliverable, a complete specification of the FCMS LAN system and data formats so that LIGO can, at a later date, access any FCMS data via a gateway connection between networks. However, for the purposes of this action item, it shall be assumed that no data transfer is required between CDS and FCMS.

[4] FCMS shall provide for the powering on and off, via workstation control, of all moving machinery under its control. This feature shall be implemented in a manner to ensure building safety at all times. LIGO has no additional requirements (beyond those dictated by standard physical plant operational and safety practices) regarding which equipment the FCMS shall be capable of remotely controlling.

[5] Pursuant to earlier discussions with Parsons (Mr. K. Ramsey), LIGO requires that all major facilities electrical loads and moving/rotating machinery (with the exception of overhead cranes) be outfitted at the time of installation and wiring with current transducers (CTs) or other suitable sensors that can, at a later date, be accessed and instrumented via the CDS. Prior to wiring, Parsons shall identify all hardware components characterized as (i) major power load, or (ii) moving/rotating machinery, and shall recommend to LIGO a list of such equipment for sensor hook-up. Locations of all such installed sensors shall be documented and provided as part of the facilities documentation package. Also, CDS access between the LVEA or VEA and the corresponding, outlying chiller building shall be provided by the Civil Construction contractor, via a separate 4 in. diameter (or larger) conduit.

Requested Terminus Valve ICD Data
Response to Action Item No. 132 of Parsons' "Requirements Definition Worksheet"

Action Item No. 132 of Parsons' "Requirements Definition Worksheet" states:

> Need Terminus Valve ICD. Include criteria for power, grounding and/or pneumatics.

LIGO will issue overall ICDs between the Civil Construction (CC) package and the other major subsystems (i.e. Detector, Vacuum Equipment (VE) and Beam Tube (BT)). In the ICD between the CC and the VE, information relevant to the Terminus Valve will be included. This should be dropped as an action item.

The power distribution (and associated green wire safety ground) to the valves will be provided by LIGO; The CC contractor provides power at specific (TBD) locations to be defined in the ICD from which distribution along the vacuum tubes is accomplished by LIGO. Other grounding sites or provisions are TBD and will be defined in the ICD.

There is no requirement for the CC contractor to support a pneumatic interface with the terminus valves (see also the response to action item no. 139).

Requested Revision of "Building Considerations for CDS" (LIGO-T940002-06-C, Draft 6)
Response to Action Item No. 133 of Parsons' "Requirements Definition Worksheet"

Action Item No. 133 of Parsons' "Requirements Definition Worksheet" states:

> The document titled "Building Considerations for CDS" is still in Draft. This needs to be updated and approved by LIGO.

The referenced document was generated as an internal working paper, never meant for formal review and approval; Other subsystems besides CDS have requirements levied upon the Civil Construction. The appropriate requirements derived from this document and elsewhere will be conveyed to Parsons for inclusion in the "Design Configuration Control Document" as a compendium of all requirements. The appropriate interface control requirements derived from this document and elsewhere will be provided in appropriate Interface Control Documents (ICD). The referenced document will not be formally approved and issued by LIGO.

Needed information on clean work benches
Response to Action Item No. 135 of Parsons' "Requirements Definition Worksheet"

Action Item No. 135 of Parsons' "Requirements Definition Worksheet" states:

> Need information on clean work benches. Are these to be provided by Facilities?.

Clean room benches to be installed in the OSB fall under the Facilities element of the LIGO WBS. However, LIGO will provide the clean room benches directly; they will not be part of the Facilities general construction contract. They will be portable units, 8' long, standard design, and Class 100 cleanliness level. The units will be self-contained and require only electrical power (110V) for operation. Electrical power shall be provided from standard 120V outlets located throughout the room by means of, for example, power strips. The OSB rooms containing benches include:

Optics lab -- 3 to 4 benches at **TBD** locations around the room.
Electronics lab -- 1 bench at **TBD** location.
Vacuum prep and cleaning -- 1 to 2 benches at **TBD** locations.

For the purpose of determining power demand, assume separate 20 A, 120V circuits for each clean room bench. Assume a power dissipation of 2.4 kW per unit.

Compressed Air Needs
Response to Action Item No. 139 of Parsons' "Requirements Definition Worksheet"

Action Item No. 139 of Parsons' "Requirements Definition Worksheet" states:

> Need information on compressed air needs.
> Are the 48 inch terminus valves pneumatic. If yes, then what are the requirements for the compressed air to be provided by the Facility?.

The Design Configuration Control Document (DCCD) (section 3.5.4) states that compressed air is required from the Civil Construction (CC) system in the form of "shop air". LIGO has reviewed this requirement and determined that no shop air is required from the Civil Construction contractor.

The large gate valves[1] which are at the terminations of the beam tubes are in fact pneumatic. The Vacuum Equipment (VE) contractor will supply the compressed air for actuation of these valves; There is no requirement for the CC contractor to provide compressed air for the valves.

1. The large gate valves are no longer 48 inches in diameter (as indicated in the action item wording).

Laser Table Assembly

Response to Action Item No. 140 of Parsons' "Requirements Definition Worksheet"

Action Item No. 140 of Parsons' "Requirements Definition Worksheet" states:

Need information on laser table assembly.
Location and weight of assembly.

Since the interfaces between the LIGO Detector Subsystem and the Civil Construction do not directly involve the laser bench assemblies[1] (of the Prestabilized Laser (PSL) system), the requested location information is not necessary. As far as the weight is concerned, the load represented by these populated optical tables is small compared to the loads of the large vacuum chambers and certainly not a concern for the 2 meter thick slabs (either for dynamics studies or strength concerns).

1. This also applies to the Optical Lever table assembly within the Alignment and Control System (ACS).

Needed information on telephone system
Response to Action Item No. 141 of Parsons' "Requirements Definition Worksheet"

Action Item No. 141 of Parsons' "Requirements Definition Worksheet" states:
Need information on any special requirements for the telephone system.

The following design requirements hold:

[1] Within buildings (LVEA/VEA/OSB) phone communications shall be by wire (FO or copper: i.e., no RF transmissions) using DIGITAL phone lines.

[2] Inter-building communications links shall be provided as part of the Facilities construction contract.

[3] Intra-building communications shall be provided by the Facilities as follows:
Phones shall be provided according to standard practice in all OSB rooms and other spaces (lounges, kitchens, etc.).
Access from the phone line distribution panel in all buildings shall be made available. LIGO will arrange for installation of wire-based phone systems within the LVEA/VEAs.
Communications along the BTE shall be by means of wireless communications devices of **TBD type**. These shall also be provided separately by LIGO.

CALIFORNIA INSTITUTE OF TECHNOLOGY
LIGO Project. 102-33 East Bridge Laboratory, Pasadena, California 91125
818-395-2129, Fax 818-304-9834

LETTER OF TRANSMITTAL

REFER TO: LIGO-T950066-E	
TO: Tyler Jackson	
Ralph M. Parsons Company	
100 W. Walnut Street	
Pasadena, CA 91124	

DATE: 9/14/95	PROPOSAL #: PP150969
PROJECT NAME: LIGO-Construction	
RE: **Response to Multiple Action Items in Parsons' Requirements Definition Worksheet**	

Dear Tyler:

WE ARE SENDING YOU as checked below:

☒ U.S. Mail ☐ Overnight ☐ Courier

COPIES	DATED	DESCRIPTION
1	9/12/95	LIGO-T950066-00-E

THESE ARE TRANSMITTED as checked below:

☐ For Approval ☐ For your signature ☐ Resubmit___copies for review
☐ For your use ☑ Make changes noted ☐ Submit___copies for distribution
☐ As requested ☑ Revise and resubmit ☐ Return___corrected prints
☐ For review and comment
☐ _____

REMARKS: Please incorporate attached comments/changes into a revised version of the Requirements Definition Worksheet and resubmit.

Signed: Fred B. Bartlett 9/14/95
transmit. (Name of Signee)

CALIFORNIA INSTITUTE OF TECHNOLOGY

Laser Interferometer Gravitational Wave Observatory (LIGO) Project

FBA 9/14/95

To/Mail Code: Fred Asiri/51-33
From/Mail Code: D. Coyne/51-33
A. Lazzarini/51-33
Phone/FAX: 395-2034/304-9834
395-8444/304-9834

Refer to: LIGO-T950066-00-E
Date: 12 Sep 95

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Chronological File
Document Control Center

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Location and weight of assembly.

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[3] Intra-building communications shall be provided by the Facilities as follows:
Phones shall be provided according to standard practice in all OSB rooms and other spaces (lounges, kitchens, etc.).
Access from the phone line distribution panel in all buildings shall be made available. LIGO will arrange for installation of wire-based phone systems within the LVEA/VEAs.
Communications along the BTE shall be by means of wireless communications devices of **TBD type**. These shall also be provided separately by LIGO.

FAX COVER PAGE

CALIFORNIA INSTITUTE OF TECHNOLOGY

LIGO Project, 102-33 East Bridge Laboratory, Pasadena, California 91125
818-395-2129, Fax 818-304-9834

TO:	YOLANDE MIDDLETON
ORGANIZATION:	PARSONS - LIGO
FAX NUMBER:	440-2900
VOICE NUMBER:	
DATE:	9/14/95
TIME:	1:40 PM.

FROM:	LINDA TURNER
ORGANIZATION:	CIT - LIGO
FAX NUMBER:	
VOICE NUMBER:	
REFER TO:	T950066-00-E
SUBJECT:	

NUMBER OF PAGES FAXED INCLUDING THIS COVER SHEET:	

Hi, Yolande - Over to you for handling. The original is in the mail.

Have a nice afternoon,

Linda

CALIFORNIA INSTITUTE OF TECHNOLOGY

Laser Interferometer Gravitational Wave Observatory (LIGO) Project

To/Mail Code: Fred Asiri/51-33
From/Mail Code: D. Coyne/51-33
A. Lazzarini/51-33
Phone/FAX: 395-2034/304-9834
395-8444/304-9834

Refer to: LIGO-T950066-02-E
Date: 29 Nov. 1995

Subject: **RESPONSE TO MULTIPLE ACTION ITEMS IN PARSONS' "REQUIREMENTS DEFINITION WORKSHEET"**

NOTE: This version (v-02) addresses only items 1) and 7) of the original memorandum. See change bars for modifications from v-01.

The following pages are the LIGO responses[1] to the following action items from Parsons' "Requirements Definition Worksheet (RDW)":

1) Communications between CDS and FCMS (Action Item No. 134)
7) Special Telephone Requirements (Action Item No. 141)

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Chronological File
Document Control Center

1. As discussed in the 11 Sep 95 Integration and Systems Engineering meeting.

Needed information on communications between CCDS and FMCS
Response to Action Item No. 134 of Parsons' "Requirements Definition Worksheet"

[NOTE: Responses to AI 134 were modifed 5 November 1995]

Action Item No. 134 of Parsons' "Requirements Definition Worksheet" states:
It is still unclear if any data are to be transferred between the CDS and the FMCS. An example is "state" information of major Facility equipment such as AHUs and chillers. If data transfer does occur then we need specifications to follow to ensure the compatibility of data.

[1] The systems which provide CDS and FMCS functions are separate entities and shall be accessed separately. LIGO has no requirement that FMCS subsystems (if such are needed) which control separate buildings be able to communicate with each other.
Any monitoring system associated with the FMCS in the corner station shall be, as a minimum, co-located in the Control Room within the OSB. FMCS shall be limited to a single monitor (and its wiring) within the Control Room of the OSB.
LIGO has no requirement regarding where FMCS monitors (if such are needed) are located in other buildings.

[2] The FMCS and its access within buildings of the LIGO facilities shall be defined and designed according to the standard practices for such systems . The OSB control room is the only place where LIGO requires access to both the CDS and FMCS to be co-located. In the event, per [1] above, that individual FMCS subsystems in separate buildings do not communicate with the corner station FMCS, then LIGO requires that each of the independent FMCS subsystems provide dry contacts capable of handling 48 VDC, 1A (i.e., two logical states OPEN and CLOSED) which indicates health status of all FMCS-controlled systems in the respective building: CLOSED shall indicate that all systems are functional and OPEN shall indicate that a problem, failure, or fault has been detected.