New Folder Name Crane Hook Height in the LVEA and VEAS

T950048

CALIFORNIA INSTITUTE OF TECHNOLOGY

Laser Interferometer Gravitational Wave Observatory (LIGO) Project

To/Mail Code: G. Stapfer/51-33
From/Mail Code: R. Savage/51-33
Phone/FAX: 395-2122/304-9834

Refer to: LIGO-T950048-00-O
Date: July 24, 1995

Subject: Crane hook height in the LVEA and VEAs

During the Facilities Final Concept Design Report Review on Thursday, July 24th, I was assigned and action item to determine the required minimum crane hook height for the LVEA and VEAs in the LIGO observatory facilities. The minimum hook height requirement of 26'6" was determined by the following process:

- The working requirement is that a BSC bell jar should be able to be removed from a fully-loaded BSC. For this exercise, I used the requirement that a BSC bell jar be able to be lifted over a BSC with the bell jar attached. This gives a small safety factor of the thickness of the wall of the bell jar.
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- Height of lifting fixture (spreader bar) = 2'2". Based on a 12" deep I-beam, with 2" deep tabs below and 6" for shackles to attach to the chambers, and 6" above for an eye through which the crane hook passes. This fixture design was discussed with J. Worden, O. Matherny and a rigging expert from Parsons, Mike McKenna. M. McKenna felt that the 2'2" for the lifting fixture was conservative, and that the height of a carefully-designed fixture might be as little as 1'4".

The total minimum hook height is thus 17'2" + 6'8" + 6" + 2'2" = 26'6".

RLS:rls

cc:
F. Asiri
B. Barish
M. Coles
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A. Lazzarini
O. Matherny
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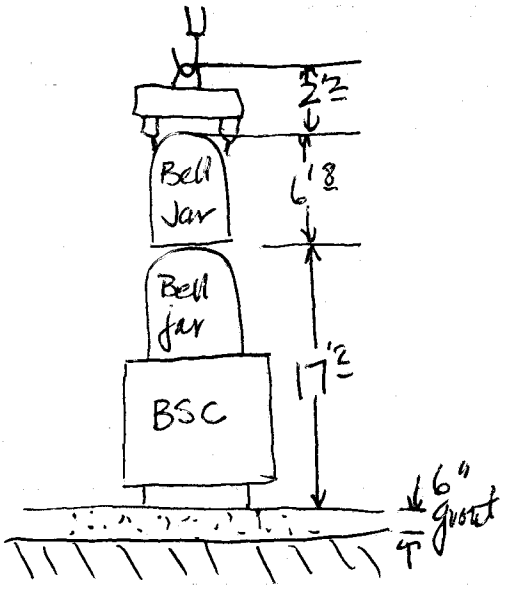

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From mike@tristan.mit.edu Tue Jul 25 13:04:45 1995
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Subject: LIGO-T950048-00-0 (Crane hook height in LVEA/VEA)

Rick--

Thanks for sharing this issue with us. Your dimensions appear to be sound. Nonetheless, I'd like to take issue with some of your assumptions.

First, I should admit I am ignorant about the cost delta per foot of crane hook height. In the trade study documentation the issue appears to have been glossed over; was there any resolution eventually? It seems this should be the starting point for optimization. Althouth it's clear the lower the cheaper (zero being cheapest), I do not understand how a potential penalty in function can be accepted without even a rough idea of the balancing cost benefit.

Second, the roof height is a qualitatively different parameter than the building footprint, in the sense that expansion vertically essentially amounts to rebuilding the structure. (I have heard proposals for local pop-ups or cutouts, and in my opinion they appear less workable than rebuilding). I would therefore argue that crane hook height belongs more to the set of permanent, immovable facility constraints, along with such parameters as beam tube outgassing, tube baffles, and site vibration, than to the set of "initial" parameters, such as the station floorplan or footprint.

In all other cases where a fundamental facility constraint is encountered, a suitable contingency allowance has been made and documented. This has not been done for the hook height, partly because a particular piece of hardware (the TMC) was consistently linked to that dimension in the past (erroneously, I feel). While a preliminary analysis of one future seismic isolation scenario appeared to vindicate the BSC envelope (ref. Sievers and Li), this was a very narrow and highly conceptual sample of future configuration space, and I feel it should not be taken as representative. If the BSC had NOT proven large enough for this potential future variant, we would have considered it a serious problem; this possibility drove us to check it out.

Given the current state of affairs, there may be no way to make a cogent study of future interferometer possibilities and their sensitivities to building height in time for a reasoned strategy to emerge. I would therefore plead that we at least include some proportional contingency margin, over and above the absolute minimum dictated by the initial vacuum equipment. This is consistent with our approach to other permanent facility constraints (for example, beam tube baffles) in which uncertainty about the future state of the art defeats a closed solution. For a feature of this importance, adding 20% does not seem unreasonable.

Regards,

FAX COVER PAGE

CALIFORNIA INSTITUTE OF TECHNOLOGY

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TIME:	9:00 am

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ORGANIZATION:	Cal-Tech
FAX NUMBER:	304-9834
VOICE NUMBER:	
REFER TO:	LIGO-T950048-00-D
SUBJECT:	Memo: Crane hook height

NUMBER OF PAGES FAXED INCLUDING THIS COVER SHEET:	

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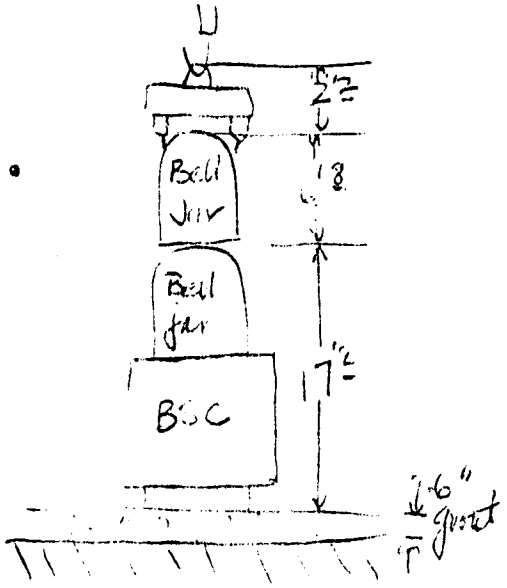

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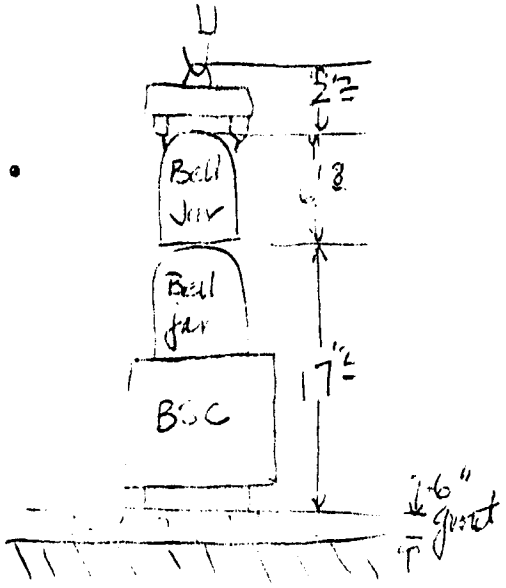

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