

New Folder Name Cost Scaling

Rules of: Thump for the LIGO Building

CALIFORNIA INSTITUTE OF TECHNOLOGY
Laser Interferometer Gravitational Wave Observatory (LIGO) Project

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Subject: Cost Scaling Rules of Thumb for the LIGO Building

Fred Asiri, Otto Matherny and I met with Mel Weingart, Tim Melott, and Jeff Hermann of Ralph M. Parsons Co. on November 21 to discuss unit cost sensitivities to change in the present LIGO building design. I am distributing this memo because I thought it might be generally useful to everyone to be aware of these approximate rules when considering alternates to the present design.

The sensitivities are unit costs for incremental changes, i.e. they will be less accurate for big changes to the design than for little ones. All of the costs were judged by Parsons to have on the order of 20% uncertainties. Costs stated are *total cost*, i.e. direct cost with markups, G&A, etc. Total cost is estimated as 150% of direct cost.

<u>Item</u>	<u>Unit cost</u>
Slab thickness change	\$12K/inch
OSB increase or decrease	\$160/sq. ft. (in 400 sq. ft. increments)
LVEA height increase	\$120K/ft (+ engineering cost to reanalyze bldg.)
LVEA floor space expansion*	\$1.3M/interferometer (11 bay expansion) \$2.1M/interferometer (17 bay expansion)

*LVEA expansion is calculated as:

- \$150/sq. ft. direct cost
- 11 bays expansion at 400 sq. ft./bay
- \$100K increase to crane cost
- \$100K increase due to additional roof truss
- 150% multiplier on all items:

$$((\$150 \times 11 \times 400) + \$100K + \$100K) \times 1.5 = \$1.3M$$

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