LSST Enclosure

Warren Davison –Steward Observatory

Enclosure Design Parameters

- Protect Telescope
  - Total protection from rain, survival wind, sun.
  - Support telescope operations.
  - Operating wind, how much can you take.
  - Thermal variations, how much can you take.
- Cost
  - Enclosure is major portion of budget.
  - Efficient design to support low cost operation.
  - Smaller sizes cost less

Open Enclosure Observatory

- Let wind flush dome and flow around telescope.
- Thermal control based on following atmosphere.
- Requires a telescope servo bandwidth of at least 2 Hz.
- Small dome with little telescope shielding.

Telescope Performance

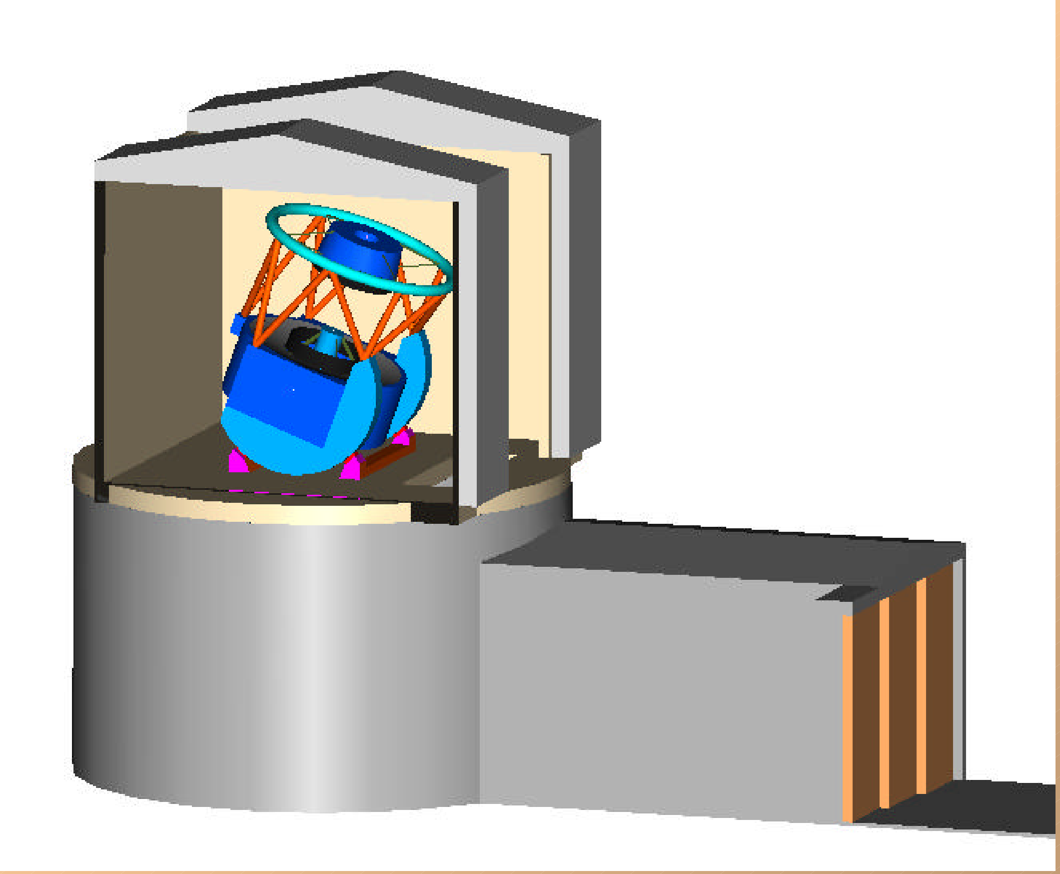
- Altitude over azimuth telescopes benefit from better structural and thus servo performance in many ways.
  - Tracking is better.
  - Wind rejection is better.
  - Pointing corrections are smaller.
  - Optics moving with gravity is reduced.
- High performance is worth the trouble.

Biggest Bang for the Buck

- Invest in great mechanical performance.
  - First cut FEA has shown at least 7 Hz can be achieved and I believe 10 Hz is likely obtainable.
  - This will allow a servo bandwidth of 2 Hz to 3 Hz
- With this we can use a small open dome.
  - This short telescope can use a very small dome.
  - In situ aluminizing can further reduce space.

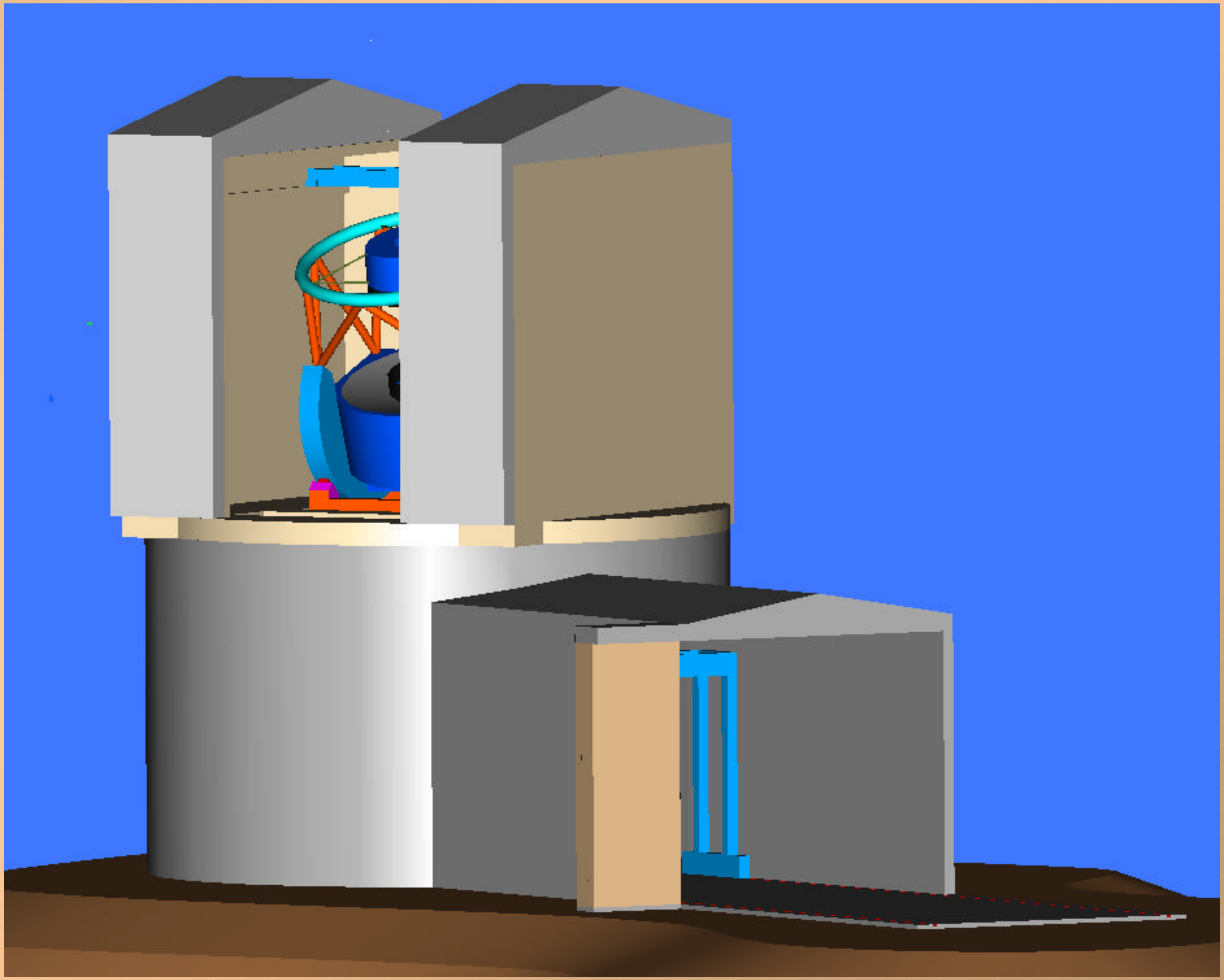
Facility Concept

- Corotating Building
- Facility cranes included
- Internal handling of optics
- Aluminizing facilities included
- Moderate elevation for boundary layer



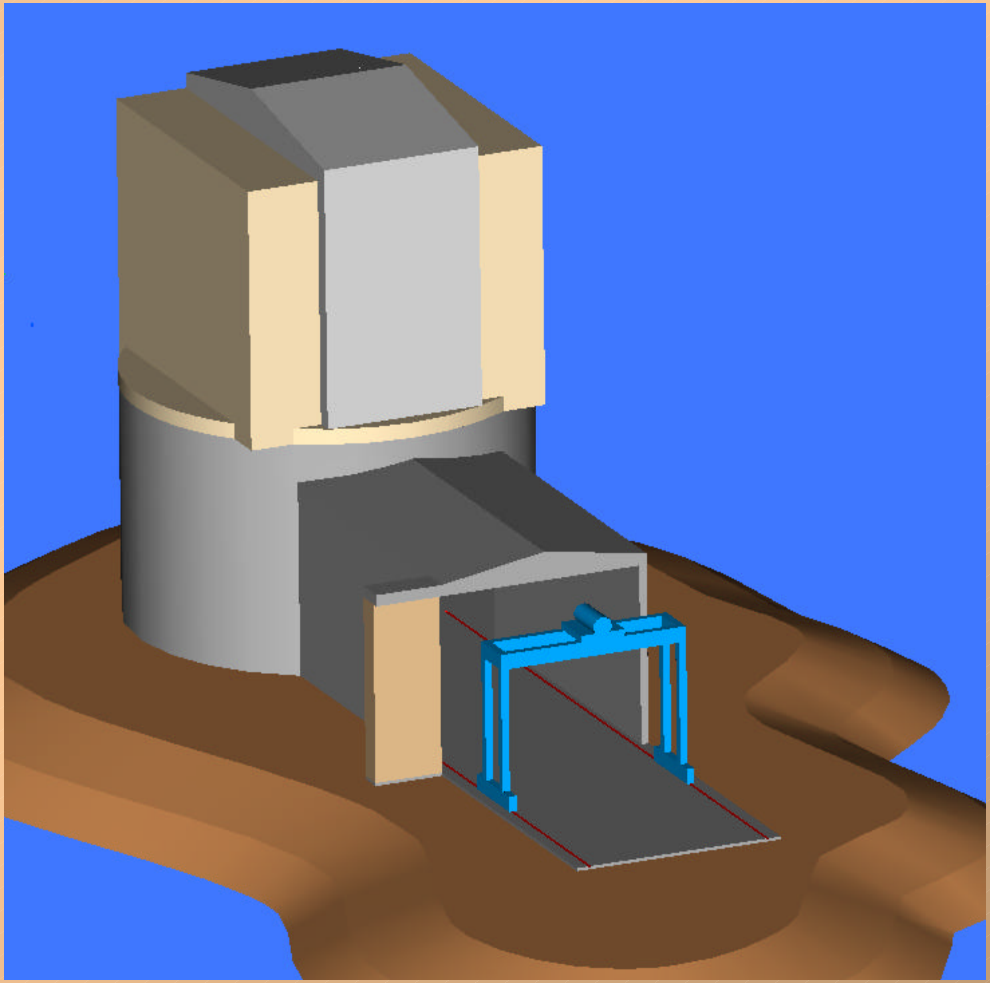
Building Dimensions

- Rotating building 20m square by 17m tall
- Shutters add another 3m in height
- Base 26m diameter
- 35 m High
- Auxiliary building 14m x 20m
- Handling pad 12m x 20m



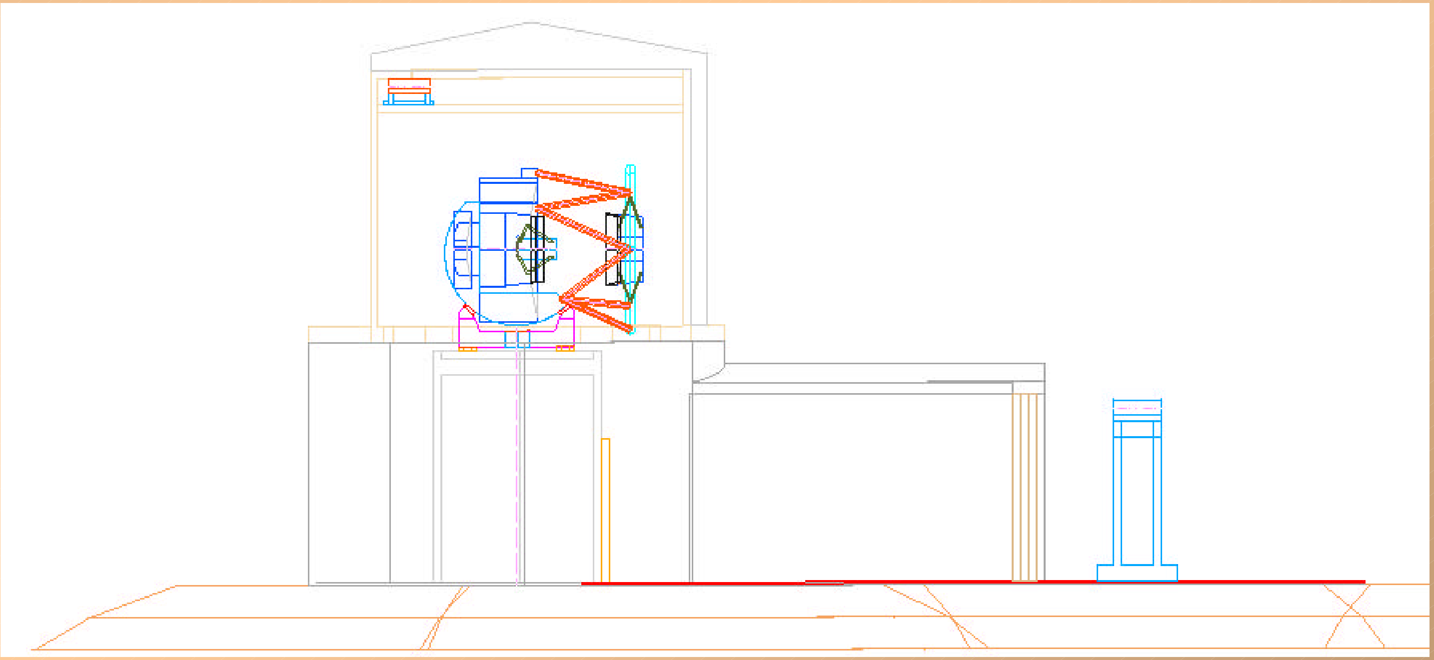
Gantry Crane

- A gantry crane allows much greater access area with little building cost
- Maintenance area could even be detached, with double doors



Aluminizing

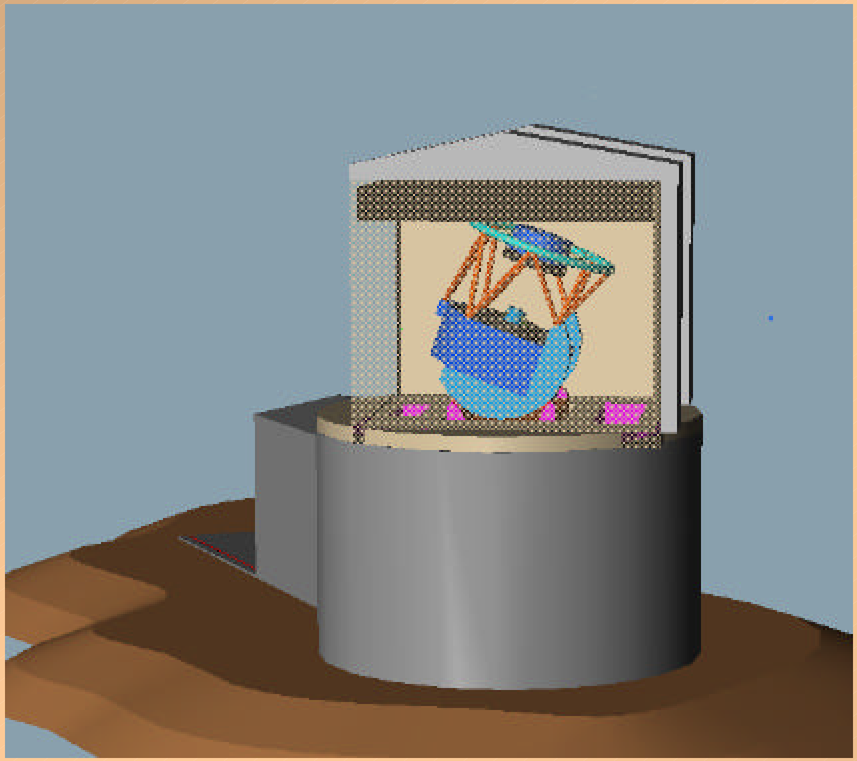
- Secondary and Tertiary can be lowered through hatches in the floor and aluminized in a Bell Jar.
- The Primary will have to have the front end removed and aluminized in place.

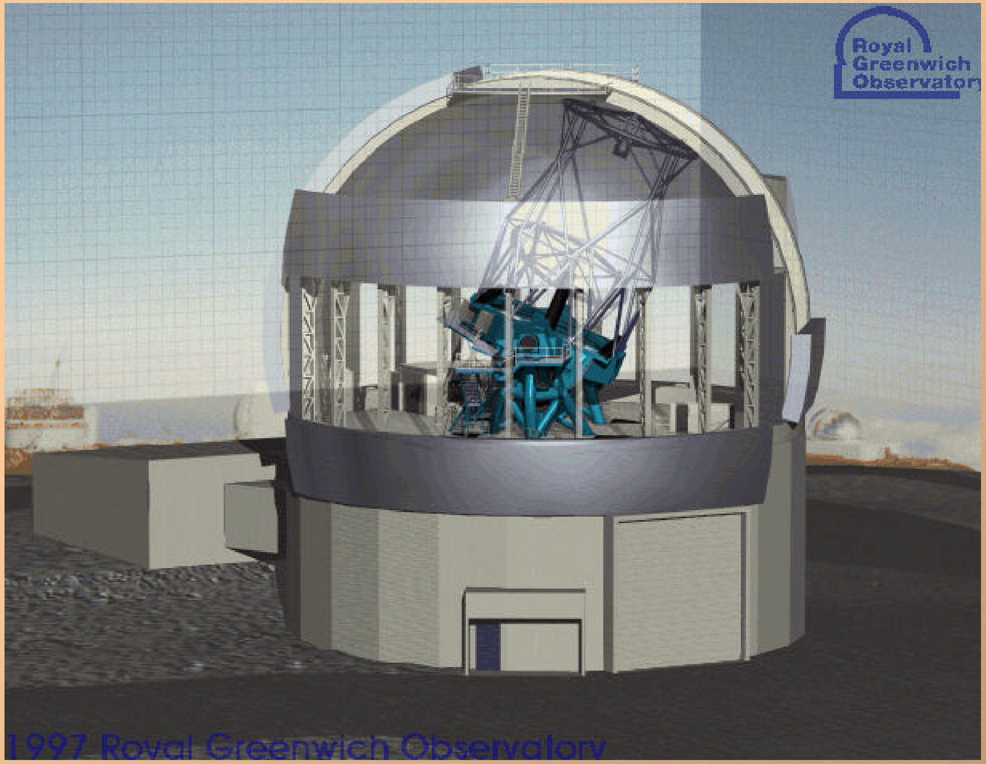


Primary In Situ Aluminizing

- In situ aluminizing is not good for the telescope but;
  - A mirror cell designed for stiffness is capable of vacuum pressure.
  - It reduces the size and cost of the building.
  - Handling is a risky business, it is better to risk a bell jar than the primary mirror.
  - These size mirrors need automated cleaning.
  - LBT has already pioneered this technology.

LSST & Gemini

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Site Specific Parameters

- Some site specific parameters are important enough to change the design of the telescope facility
  - Height of boundary layer, thus the telescope
  - Wind rose, prevailing direction
  - Mountain shape, size, elevation and composition
  - Environmental or political restrictions

Costs

- The primary influence on the cost of the enclosure is style. Not only the shape of the observatory but its management.
- Another major influence is the site which has remoteness, labor costs and ancillary facilities.
- With the Magellan telescopes as a basis; $8M is plausible, other choices could reach $20M.

Conclusions

- We can build a relatively small efficient low cost building.
- We must choose a site, ancillary functions and detailed design before a credible cost can be attached. The only other alternative is a high budget. Much work is needed here.
- This building is based on a tried and true observatory concept. It is not the only one possible but is a balance of cost and utility.