Domes & Shutters
Overview
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CFHT
Dome -dōm/ noun

1. A rounded vault forming the roof of a building or structure, typically with a circular base. "the dome of St. Paul's Cathedral"

2. a thing shaped like a dome, in particular.

verb
1. cover with or shape as a dome. "a domed stadium"

Maintenance crew
Structure and Enclosure

• Structure
  – Horizontal and vertical ribs and ties
  – Shutter arch girder
  – Azimuth rotation ring
  – Outer spherical shell and inner insulation panels
  – *Support structure for dome related sub-systems

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• Enclosure Types

  – Dome with vertically opening -up and over shutter
    • CFHT & Keck
  – Carousel - Lateral opening shutter
    • Subaru and LBT
  – Calotte
    • TMT & MSE
Cranes and Platforms

• Types of cranes
  – Bridge, polar, job, dome
  – Enclosure mounted, fixed, external

• Crane storage and deployment

• Handling Operations

• Platforms and Limited access
Shutters and seals

• Opening the aperture - Critical operation to establish observing
  – Mechanical systems
  – Rollers, bearings, cables, shafts, couplings
  – Motors, brakes, gear reduction boxes
  – Lubrication
  – Monitoring, electrical and communications cables
  – Regular inspections and maintenance is critical

• Environmental Protection
  – Seals and Overlapping
Drives and Rotation

• Motor controller systems
  – Shutter or aperture opening
  – Rotation of azimuth

• Various types and technology
  – VFD
    • Flux Vector Control
    • Master-slave
    • Torque mode
    • Regenerative
  – Limit switches – mechanical, optical,
Bogies and Suspension

- Fixed or rotating bogies
- Total # of wheels, wheels per bogie, average load per wheel
- Conical or barreled wheels, tilted or vertical
- Geometry
- Wheel track interface
Venting and Windscreens

• Windscreen
  – Needed to perform observing during high winds

• Dome venting
  – Not required to observe
  – Secondary importance
  – Failure to close - exposure to elements

• Both simple control and lightweight
Enclosure Paint and Skin

- Paint and reflective foil
  - Adhesion problems & Corrosion issues
- Outer Enclosure Skin and/or Enclosure cladding
  - Critically important – establishes a weather tight seal
  - Any issues with outer steel stitch welded skins?
  - Problems with cladding systems

- UKIRT - reflective bare aluminum
- UH - TiO₂-based white paint
- GEMINI - Al-based Lo-Mit paint
- CFHT - TiO₂-based white paint
- IRTF - reflective aluminum foil
- KECK - TiO₂-based white paint
- SUBARU - reflective Alclad siding
Discussion topics

• Failures
  – Lessons learned
• Preventative and predictive maintenance
  – Critical repairs and frequency
• Reliability
  – Proven and verified parts and components
• Maintainability
  – Ease of replacement and access