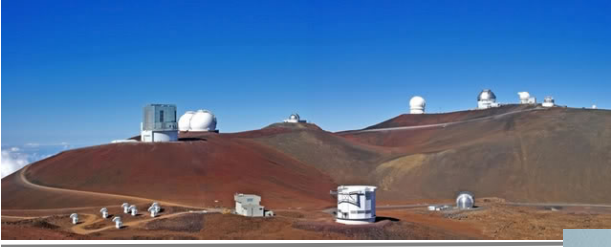




Domes & Shutters Overview

Steven E. Bauman
CFHT





Dome -dōm/ *noun*

1. A rounded vault forming the roof of a building or structure, typically with a circular base.

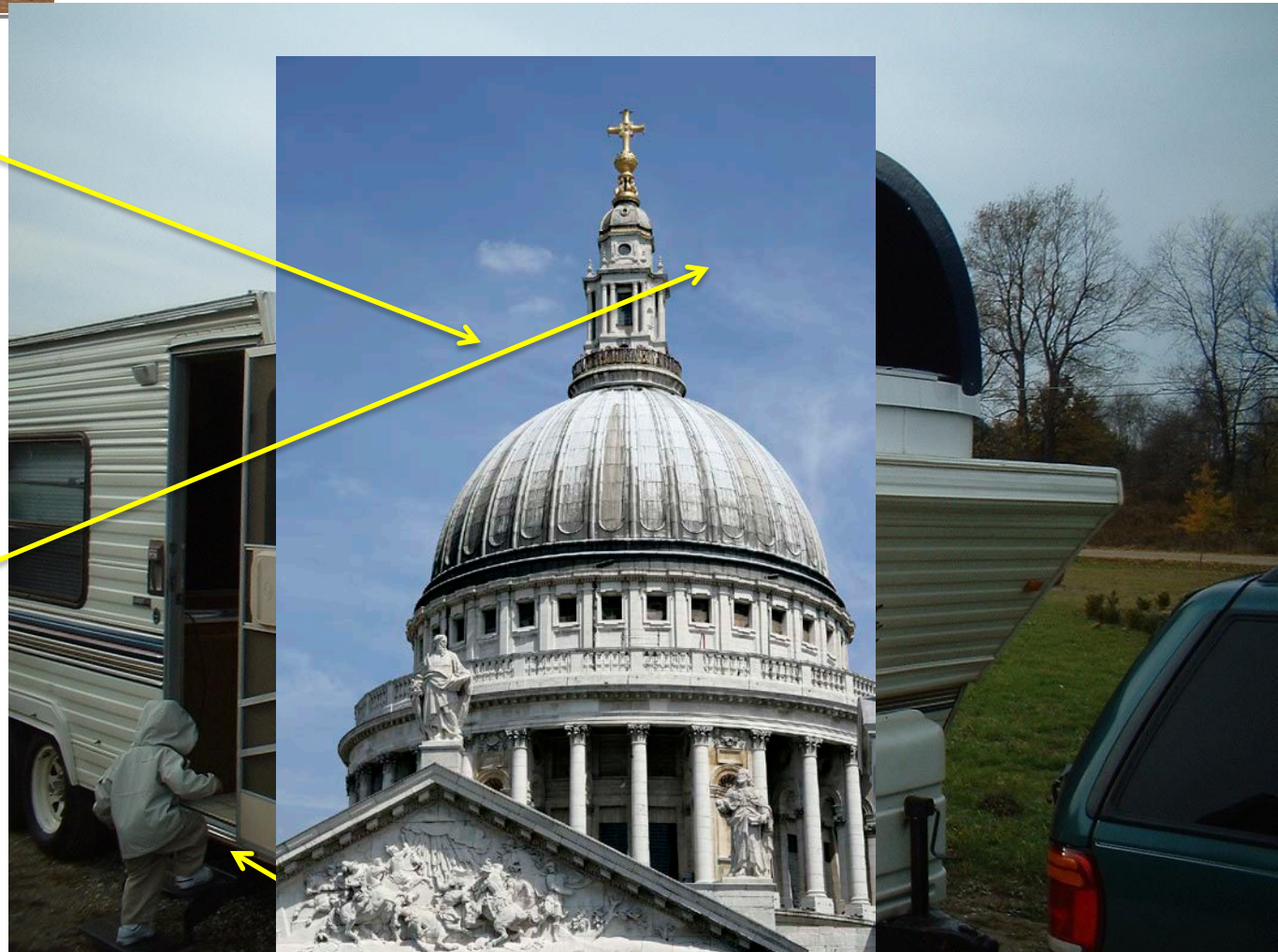
"the dome of St. Paul's Cathedral"

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

verb

1. cover with or shape as a dome.

"a domed stadium"



Maintenance crew

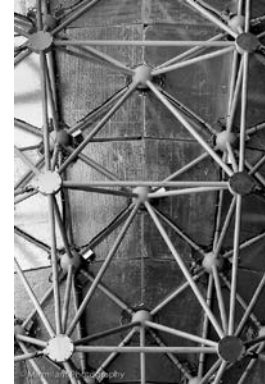




Structure and Enclosure

- 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





Enclosure

- Enclosure Types

- Dome with vertically opening -up and over shutter

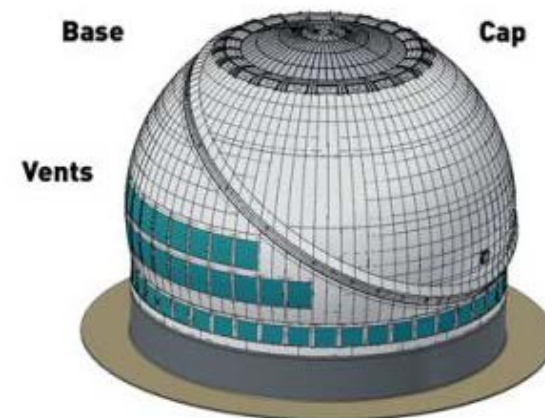
- CFHT & Keck

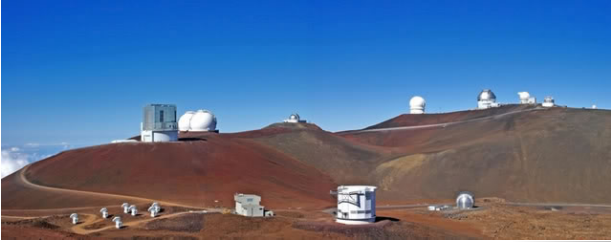
- Carousel - Lateral opening shutter

- 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



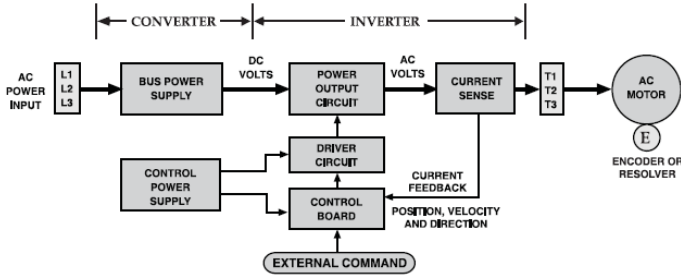




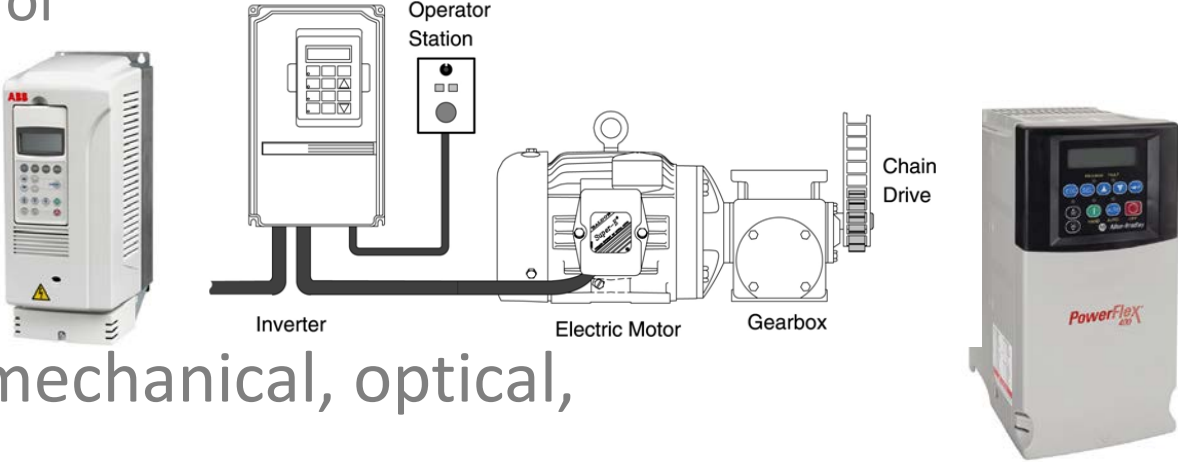
Drives and Rotation

- 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,

Inverter Block Diagram



- Parts and Pieces
 - Prime Mover
 - Mechanical Reduction(s)
- Control Circuits
- Ancillary devices
 - Couplings
 - Feedback





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

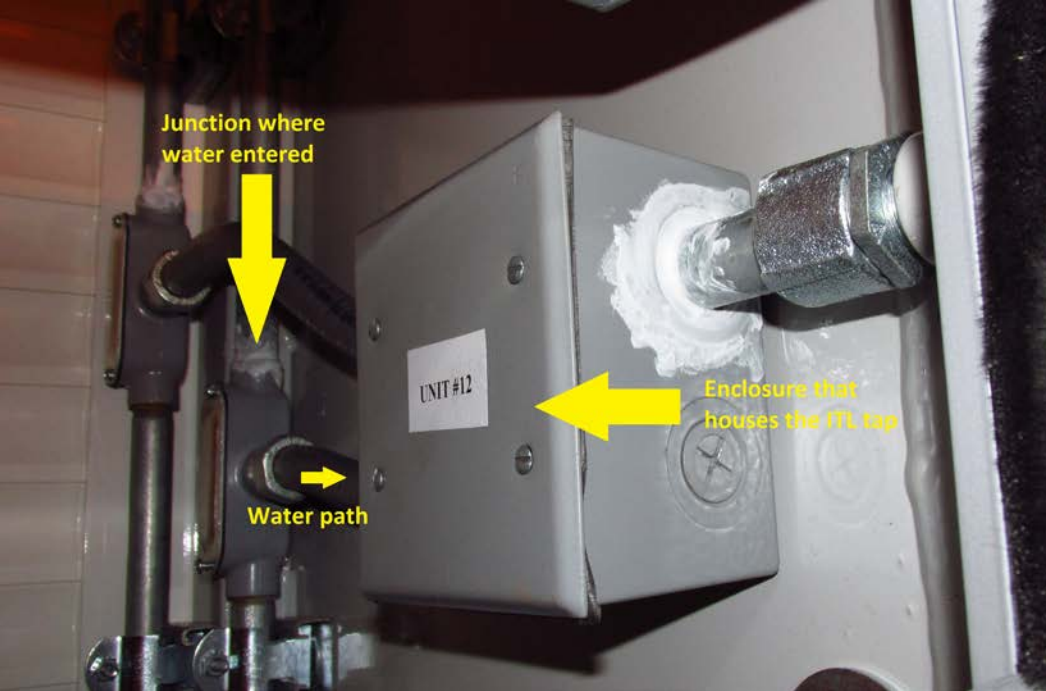




Venting and Windscreens

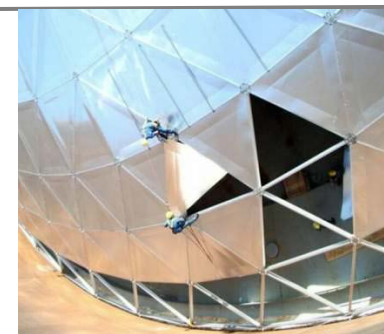
- Windscreen
 - Needed to perform observing during high winds
- Dome venting
 - Not required to observe
 - Secondary importance
 - Failure to close - exposure to elements
- Both simple control and lightweight







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 | - TiO ₂ -based white paint |
| • GEMINI | - Al-based Lo-Mit paint |
| • CFHT | - TiO ₂ -based white paint |
| • IRTF | - reflective aluminum foil |
| • KECK | - TiO ₂ -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

