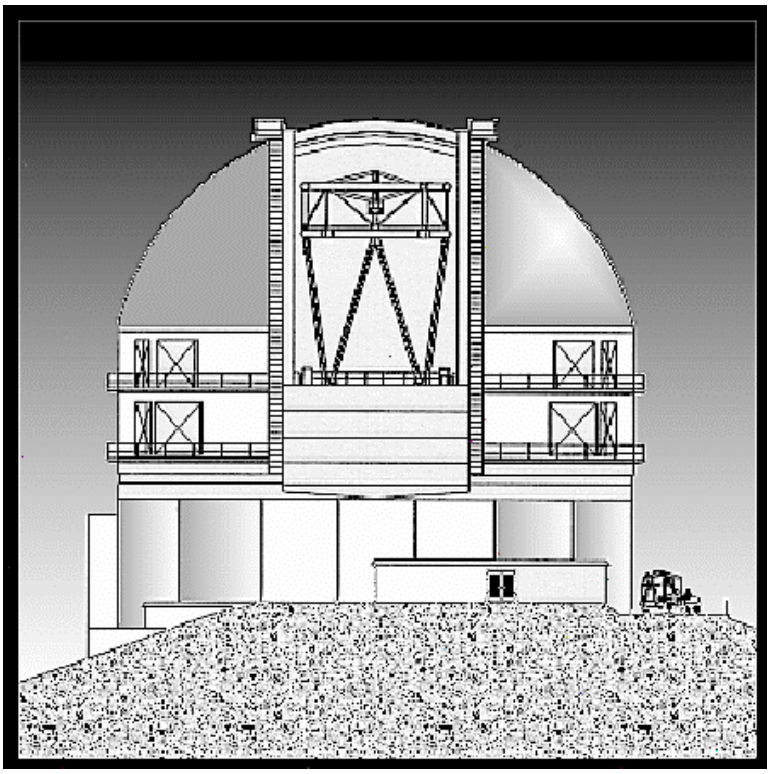
GEMINI
8-M Telescopes
Project

SPE-TE-G0055

Design Requirements for the Primary Mirror Cell Cart



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1. Definitions

Cassegrain Cluster (CC): Shown in drawing (90-GP-0001-0028).

Primary Mirror Cell (PMC): Shown in drawing (85-GP-2000-0021).

Primary Mirror: 8m Corning ULE meniscus mirror

Primary Mirror Cell Assembly (PMCA): Comprised of the Mirror Cell, Primary Mirror, Mirror Cell Support Frame and the Cassegrain Cluster

Primary Mirror Cell Support Frame (PMCSF): Shown in drawing (87-GP-0210-0002).

2. Operating conditions

Seismic loading during operation.

The seismic criteria under which conditions there shall be no damage to the PMC or load are as follows:

Seismic accelerations load factors: Lateral acceleration = 0.10g
Vertical acceleration = 0.10g

In addition, the PMC shall be designed to prevent damage that could result in catastrophic failure of the carried load (PMCA), if a seismic event of peak ground acceleration of 0.40g where to occur at any time, and at any location during the transportation of the PMCA along its guide track except during extension of the second stage cylinders, when peak ground acceleration shall be limited to 0.2g.

3. Functional Operation of the PMCC.

The PMCC is used to lower the primary mirror assembly (total mass 100,000 kg) from the telescope to a position where the primary mirror assembly can be removed from under the telescope to a location on the platform lift. At this position the primary mirror will be lifted from the primary mirror cell by the mirror lifter attached to the enclosure crane. The PMCC will then be driven to a location under the telescope.

4. Technical Requirements

4.1 Mechanical Interfaces

The PMCC shall support the mirror cell support frame at the 4 locations shown in drawing 87-GP-0210-0002; this load must be supported at each of the four locations on a diameter of not less than 200mm.

The PMCC shall support the load of the mirror cell assembly at the four locations to the nominal load +-10%. This can be achieved by using a synchronous lifting control system.

The PMCC shall support the Primary Mirror Assembly level at all times to within ±5mm.

The PMCC shall allow the Cassegrain Cluster, shown in drawing 90-GP-0001-0028, to remain with the telescope during removal of the PMA from the telescope.

The PMCC must clear the telescope columns and altitude drive motors shown in drawing 90-GP-0001 -0028.

A pivot pin shall be provided to allow the primary mirror cell cart to rotate about a vertical axis that bisects the center of the four lifting locations. The pin shall be actuated by a remote mechanical linkage that allows operation from the perimeter of the PMCC. The pin should extend into the floor no less than two inches.

4.2 Vertical Motions

Location of the PMA when attached to the telescope center section is shown in drawing 90-GP-0001 -0051.

When the PMA on the PMCC is removed from under the telescope, no structure must be higher than the line shown in drawing (90-GP-0001-0028), otherwise the structure will interfere with the telescope center section as it is removed form the telescope.

A mechanical locking mechanism shall be provided to lock the first stage vertical movement to the static base of the PMCC. This mechanism shall be manually actuated.

4.3 Support and Drive Mechanisms

The PMCC shall be guided by a rail set into the telescope floor as shown in drawing 90-GP-0001-0051.

The final location of the PMCC shall be set by a hard stop attached to the rail.

The PMCC will be located to its nominal position for removal of the PMA using the guide rail and rail stops to within ±5mm.

The PMCC shall be supported by air bearings.

The gap between the telescope floor and the platform lift shall be bridged over by a sheet metal covered bridge piece.

The PMCC shall be driven by air motors/ electric motors from under the telescope onto the platform lift. Time to travel this distance shall not exceed 2 minutes.

4.4 Access

When the PMA is supported by the PMCC, there shall be access for personnel to reach the bipod feet locations in the MCSF. This is shown in drawing 87-GP-0210-0002.

4.5 Mass Constraints

The mass of the PMCC shall not exceed 13,000 kg (28,600 lb).

4.6 Safety

All structures and mechanism shall be designed with factor of safety of 4, except hydraulic cylinders, which will have a safety factor of 2.

Failure of any mechanical component shall not compromise the safety of the PMA.

When supported by the air bearings the PMCC must not be able to run away in an uncontrolled fashion if the floor is not level. Maximum floor slope for controlled movement= 1%.

(*Exhibit A to Workscope No. 4, AURA Contract No. 47990-GEM00025.)*