2.4m Observatory Technical Note

Date:2008 January 1 - version 1.6Subject:Facility Overview





MROST is a 2.4m astronomical observatory in central New Mexico, USA, at elevation 3,244m, 107° 11' 21.0" west longitude, 33° 59' 6.0" north latitude. The building was completed in 2006 and the telescope is currently undergoing commissioning. The facility consists of living quarters, the telescope pier and its surrounding tower. The building was designed by architectural firm Dekker/Perich/Sabatini, Albuquerque, NM; the prime building contractor was Rio Conchos Corporation, Albuquerque, NM; the dome is by Observa-Dome, Jackson MS; and the telescope is by EOS Technologies, Tucson, AZ.

MROST stands for Magdalena Ridge Observatory – SINGLE Telescope. Magdalena is a small village of some 1000 people located at the north base of the mountain range containing the ridge. The ridge runs N-S for about 1.5 km but is only some tens of meters wide. On the northern end of the ridge is South Baldy, the highest point along the ridge at 3,268m. The Observatory is several hundred meters south of South Baldy. On the southern end of the ridge is the Langmuir Lightning Laboratory and in between is the MRO Interferometer. SINGLE historically differentiated this observatory from the multi-telescope interferometer but today stands for <u>S</u>cientific Instrument for <u>NEO</u>, <u>GEO</u> and <u>LEO</u> <u>Exploration</u>. The observatory has three main missions: conventional astronomical research with an emphasis on solar system bodies; support for Department of Defense space situational awareness; and education and public outreach.

The living quarters include three fully furnished bedrooms, two baths, kitchen, dining area, control room and a dual purpose secure room and conference room. See illustration 1. Amenities include linens, potable and hot water, generator backed electrical service, UPS for all critical

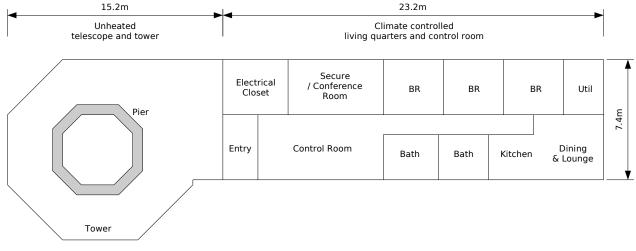


Illustration 1: 1st floor plan

control systems, heating and air conditioning and high speed Internet. The facility is built to be self-sufficient for three persons for eight days. The building is aligned such that the telescope is upwind of the living quarters based on the predominant wind direction from the west.

The telescope is a Nasmyth az-el design with 2.4m f/2.03 primary and f/8.8 exit beam. The primary mirror was built by Itek in the 80's as one of three to compete for the Hubble Space Telescope. A rotating tertiary can direct the beam to either Nasmyth port or to any of four Bent-Cassegrain locations around the primary mirror cell. The classical Cassegrain position is not currently accessible but can be used in principle if the tertiary mirror assembly and a dummy weight are removed and a suitable mounting fixture is created. The telescope is housed in a hemispherical rotating dome with parting shutters. The dome diameter is 12.2m and the maximum shutter opening width is 3.7m. Both the telescope azimuth axis and the dome can rotate at 10° /s and accelerate at 3° /s².

The telescope sits on an octagonal pier comprised of 1.5 million kg (1700 tons) of concrete and 36 thousand kg (40 tons) of reinforcing steel. There is no convenient bedrock so the pier foundation is a floating slab stabilized with a plug hanging below. The pier lifts the telescope above air turbulence discovered near ground level thought to be caused by the prevailing winds ascending the ridge from the west and breaking as they flow over the top of the ridge. The dome sits on an octagonal tower section which surrounds the pier protecting it from the elements and intense wind gusts, provides air flow and thermal management and offers three floors of (unheated) work spaces. The second and third tower floors are open grids to allow vertical air mixing for improved natural cooling. The telescope frame is hollow to allow cooling air to be actively pulled from the dome space, down through the pier and out the prevailing leeward end of the building. See illustration 2.

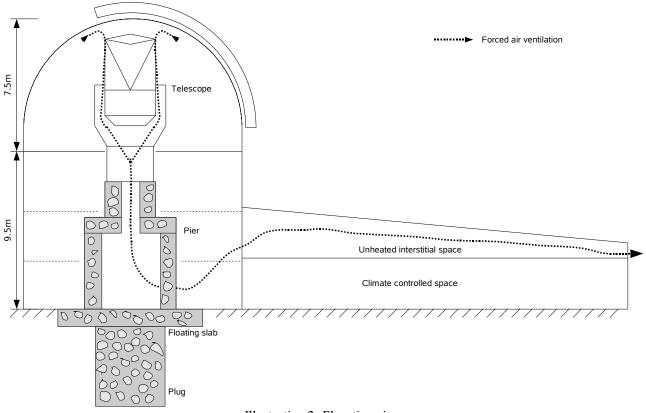


Illustration 2: Elevation view

Construction History

Date	Milestone		
2004 Jan 15	Begin		
2004 Jun 24	Release telescope RFP		
2004 Jul 13	Select DPS as building architects		
2004 Sep 30	EOST begins telescope		
2004 Oct 19	Primary mirror shipped to EOST		
2004 Nov 10	Albuquerque Underground begins pier foundation		
2004 Dec 20	Pier foundation complete		
2005 Feb 13	Release building RFB		
2005 May 11	RCC begins building		
2005 Jun 20	Release dome RFB		
2005 Aug 10	Observa-dome begins dome		
2006 Aug 4	Dome installed		
2006 Sep 25	Receive Certificate of Occupancy		
2006 Sep 29	Telescope delivered		

Document Update History

Version	Date	Author	Changes
1.0	2007-Feb-22	E.C.Downey	initial release
1.1	2007-Mar-14	E.C.Downey	Add photo
1.2	2007-May-1	E.C.Downey	Add builders
1.3	2007-May-4	E.C.Downey	Add history
1.4	2007-May-16	E.C.Downey	Add MROST definition, rocks in concrete
1.5	2007-July-11	E.C.Downey	minor tweaks
1.6	2008-Jan-1	E.C.Downey	Improve drawing of pier