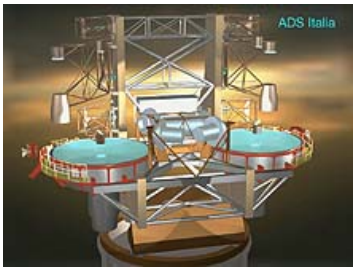

LBT PROJECT
2x8,4m TELESCOPE

Doc.No. : 580s105
Revision : b
Date : 13-Jun-07

LBT PROJECT

2 X 8,4m OPTICAL TELESCOPE

Dynamic Balancing
Piping Installation Bid Specifications

	Signature	Date
Prepared	Victor Gasho	21-May-07
Reviewed	Joar Brynnel	21-May-07
Approved	Joar Brynnel	21-May-07

1. Revision History

Issue	Date	Changes	Responsible
a	21-May-07	Initial Release	Victor Gasho
b	13-Jun-07	Modification of dates in section 9.2.1	Victor Gasho

2. Table Of Contents

3. About this document

3.1. Purpose

This document describes the scope of work for the installation of the piping for the Dynamic Balancing System on the Large Binocular Telescope located on Mt. Graham, AZ.

3.2. Reference Documents

[RD1] 580s039 Dynamic Balancing Cover Page

[RD2] 580s040 Dynamic Balancing Y-System Piping Assy.

[RD3] 580s041 Dynamic Balancing Y-System Support Locations

[RD4] 580s050 Dynamic Balancing Z-System Piping Assy.

[RD5] 580s051 Dynamic Balancing Z-System Support Locations

4. System Overview

The LBT telescope will be used in varying configurations depending on the type of observations being performed and which instruments are being utilized for those observations. To reduce the time required to achieve a different configuration, the telescope uses swing arms to introduce various optical components and/or instruments in and out of the light path. Typically changes in instrumentation, and/or optical components, required the addition of static weights. Traditionally steel or lead plates were used as ballast and were bolted or mechanically moved on the telescope to counterbalance the change in moment about the elevation axis. Here the LBT will also employ a fluidic dynamic balancing system to alleviate the operational overhead associated with static weights and make possible a more efficient and capable telescope.

The system uses 6 stainless steel tanks on the elevation axis of the telescope that allow the transfer of fluid between the tanks in order to balance the telescope about the y and z-axis. The y-axis and z-axis systems are independent piping circuits. They both contain one pump, one mass flow meter, along with the associated piping and auxiliary components that make up the system. The y-axis axis uses two 6000 liter stainless steel tanks and the z-axis uses four 1500 liter stainless steel tanks. The primary use of the Y axis tanks is to balance the telescope when the swing arm configuration is changed. The Z axis is used to balance the telescope during instrument changes. Both axes will be used to fine tune the balance of the telescope. Both can be used simultaneously.

Copper piping is used to connect the tanks and used for the tank vent lines. Copper was chosen based on its corrosion resistance, ease of installation, and highly reliable soldered connections. The primary sizes of the lines are 2 ½ inch. Some 2 and 3 inch pipe is used in short runs where required.

To vent the air to and from the tanks during pumping vent lines are used at the upper 1” port of the tank. The vent lines are then connected to a vent tank with 1” copper pipe and then tygon-PVC tube upon entering the tank. There are two vent tanks, one for the y-axis and z-axis systems and they are mounted above and behind the –y-axis tank and +z-axis tanks respectively. The vent tank serves as a common place where all tanks for a particular axis can vent to the atmosphere. It also contains a sensor to detect any overfill and provides a drain to the nearest balance tank for any condensate or overflow. If overflow does occur, the vent tank can only hold a finite amount and beyond that the fluid will run out the atmosphere line. The atmosphere line will have to run through the elevation cable wrap and to a larger tank off the telescope.

5. Scope of Work

The scope of work is specified in the reference documents [RD1 – RD5]. Installation activity on site at Mt. Graham shall be supervised and coordinated by the Dynamic Balancing Project Manager (Victor Gasho) or his designee. Installation activities must be scheduled in cooperation with LBT through the Project Manager.

Contractor will supply all parts and installation material as called out in the reference documents except where noted.

It shall be noted that the telescope is symmetrical left to right. Two independent dynamic balancing circuits are required for balancing of the telescope about the Y-axis and Z-axis.

Note: All temperatures in this document are expressed in degrees C.

6. Installation requirements

6.1. Telescope installation

The installation of the piping on the telescope is called out in [RD1 – RD3].

6.2. Component requirement

Our goal is to start with as clean a system as possible to prevent particulate and bacterial contamination. Components must be free of dirt and debris before installation.

6.3. Pipe thread sealant

The cooling system will be exposed to steady winds up to 75 MPH. Wind excitation and extreme temperature variations require high quality pipe sealants. A vibration resistant thread sealant such as Rectorseal Tru-blu or equivalent will be used.

7. System Verification and Tests

7.1. Pneumatic Leak Test

Contractor will perform a pneumatic leak check for each system in the following manner:

1) Pressurize system to 10 psi and hold for 30 minutes.
2) If a pressure drop is observed bring system back to 10 psi, hold pressure with regulated air, and check for leaks in system.
3) Repair leaks as necessary and repeat step 1 and 2 until no leaks are observed.
4) If no leaks are observed in step 1 or 2 initially or after repair, pressurize system to 60 psi and hold for 10 minutes.
5) If a pressure drop is observed bring system back to 60 psi, hold pressure with regulated air, and check for possible leaks in system.
6) Repair all leaks and repeat steps 4-5 as necessary until no leaks are observed.

Air from a clean compressor will be provided by the LBT. Contractor will provide an air fitting to pressurize each circuit of the system.

7.2. 24-hour Water Pressure Test

The system will be flushed and filled with facility water for a 24-hour pressure test at 60 psi measured at the pressure gages near the pumps. Vent lines are exempt from this test.

After test water will be drained and the strainer screens will be cleaned.

7.3. Ball Valve Test

All manual ball valves will be shown to be operational.

8. Bid requirements.

8.1. LBT Responsibilities.

As with any large project nearing completion, several activities will be occurring simultaneously at the observatory during the cooling water installation.

The Project Manager will approve all schedules and coordinate all telescope activities. LBT understands the complexities of undertaking such large projects and will take every measure to support all contractors and support staff during completion of projects.

8.2. Contractor responsibilities.

The contractor will provide LBT a proposed schedule(s) for completion of each part of the installation. Any changes in schedule including extensions must be pre-approved by LBT. The contractor understands that they will be working with other contractors and support staff during installation and will take every measure to coordinate activities with others during installation.

The contractor is responsible for transport of material and personnel to and from site.

The contractor is responsible for supplying all tooling and support equipment needed to complete the job.

8.3. Value engineering

The installation of the cooling system will have a significant impact on scheduling the development of the telescope. For this reason, the selection process for awarding the bid will consider the ability of the contractor to provide adequate resources for rapid installation of the system.

We also realize the importance of allowing the contractor to suggest modifications to the installation that may reduce costs, installation time, or improve functionality. All design changes must be pre-approved by LBT.

8.4. Change orders

All change orders must be pre-approved by the Project Manager. These include changes that effect costs, schedule, or system performance.

9. Bid format

9.1. Cost break downs

Contractor will provide line item costs in the costing section for:

1) Material (piping, fittings, etc.)
2) Support Equipment (manlifts, special tooling, etc.)
3) Installation Labor
4) Per Diem
5) Travel Expenses
6) Administration Costs

Having these items broken out will expedite the negotiation phase of the contracting process.

9.2. Schedule

9.2.1. Delivery Date

Currently it is anticipated that the contract will be negotiated and awarded 1 week after the bids are received. Additionally we have allocated telescope time for this work from September 10, 2007 to October 05, 2007, which is the desired period for the work to occur.

If the Contractor can not perform the work during that period, due to other obligations or if it is desired to start sooner, he shall state this in the bid. The Contractor shall also provide a delivery schedule based on his work load and capabilities as outlined in section 9.2.2.

9.2.2. Contractor Schedule

The Contractor will provide a schedule for the work to be completed. The schedule shall contain a breakdown showing the anticipated start date, duration of procuring material, transportation of material to the mountain, duration of installation, dates for leak testing, and anticipated completion date.

9.2.3. Contractor will indicate work shift(s) in schedule

Due to travel time, elevation, LBT manpower resources, and the remote location
The LBT program manager, Jim Slagle, recommends considering ten-hour shifts for all work on the mountain.

The LBT is flexible on shifts if it can accelerate the installation. Contractors will indicate their preference in the bid.

10. Points of Contact

For issues concerning project management, contracts, engineering, telescope, or telescope related issues contact Victor Gasho, Dynamic Balancing Project Manager, 520-626-9898.

For questions concerning safety concerns on the mountain, facility issues, procedures for working in the building and facility resources contact John Little at 520-626-1466.

For contract resolution issues contact Jim Slagle, LBT Program Manager 520-621-6506.

11. General requirements

11.1. Safety

Every effort will be made to make the LBT a safe working environment. All personnel at the facility will adhere to state and federal safety procedures. The contractor is responsible to the LBT Operations Manager for daily safety.

Butch Vaughn is the safety officer overseeing this contract. As the safety officer, Butch Vaughn has the authority to suspend any unsafe activity or to expel from the site anyone failing to adhere to these procedures. Address any safety issues or concerns to Butch Vaughn.

11.2. Use of facility

The site is located in a National Endangered Species Refugium Area. All individuals and vehicles must have proper credentials to enter. Permits will be obtained at the Mount Graham International Observatory Base Camp.

The job site is designated as a University of Arizona educational site and is thereby considered weapon, drug, and alcohol free. Be warned that this policy is strictly enforced. All vehicles having business at the site are subject to search by law enforcement at any time. The area is daily patrolled by the University of Arizona Police.

The LBT has a new kitchen and dining area available for use by contractor.

No sleeping accommodations are available on site.

12. Milestones

Payment of contract will be based on the following milestones. The payment will be based on the percent completion as specified in the following sections.

12.1. Completion of installation on telescope

See section 6.1. (80% project completion)

12.2. Successful completion of all system tests

See section 7. (20% project completion)

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