

VALUE Rs. 500.00

**Aryabhata Research Institute of
Observational Sciences (ARIES)**

REQUEST FOR PROPOSAL (RFP)

FOR

**Supply, manufacture, shop assembly, transport, erection, inspection
testing and commissioning of Dome as per enclosed specification
including 1 Ton electric hoist and insulation in the dome**

This document has 26 pages including this cover page along with assembly drawings.

Scope of Work

Supply, manufacture, shop assembly, transport, erection, inspection testing and commissioning of Dome as per enclosed specification including 1 Ton electric hoist and insulation in the dome.

Tender Notice

The ARIES invites sealed offers from established Manufacturers for Supply, manufacture, shop assembly, transport, erection, inspection testing and commissioning of Dome as per enclosed specification including 1 Ton electric hoist and insulation in the dome as per details given in the RFP. RFP forms can be purchased from ARIES, Nainital in working hours.

Date of commencement of issue of RFPs	: 18 th March 2008 at 1100 hours
Last date for submission of RFPs	: 08 th April 2008 at 1400 hours
Opening of Technical bid	: 09 th April 2008 at 1500 hours
Opening of Financial bid	: 11 th April 2008 at 1500 hours

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Eligibility Criteria:

1. Vendor should have reputed background and should be well established in doing heavy mechanical fabrication works in India for at least five years.
2. The vendor must have adequate infrastructure, skilled manpower, inspection & testing equipments along with the desired working machines & equipments. Vendor must enclose relevant information in the form of brochures, leaflets, manuals etc. to support his technical competence for this job.
3. Three years comprehensive on site warranty for the fabricated and assembled structure of the dome should be offered by the manufacturer only in original letterhead.
4. Vendor must comply with all the above-mentioned criteria. Non-compliance of any of the criteria will entail rejection of the offer summarily. Photocopies of relevant documents / certificates should be submitted as proof in support of the claims made. ARIES reserves the right to verify / evaluate the claims made by the vendor independently.
5. All bids should be accompanied by a bid-security of Rs. 60,000/= (Rs. Sixty Thousand only) in the form of a Demand Draft/Bank Guarantee issued by a scheduled commercial bank favouring Director, ARIES, payable at Nainital.
6. RFP document can be obtained against payment of Rs. 500/- in the form of Demand Draft issued by a scheduled commercial bank favouring Director, ARIES, payable at Nainital.

TERMS AND CONDITIONS

Scope of Supply

Supply, manufacture, shop assembly, transport, erection, inspection testing and commissioning of Dome as per enclosed specification including 1 Ton electric hoist and insulation in the dome.

As necessary requirements for the manufacture of the dome the manufacture of the following items come under the scope of contract.

1. Any jigs, fixtures, gauges and tooling necessary to complete the fabrication, assembly, inspection, testing and erection of the dome at site of the ARIES.
2. Grouting of the rails etc. at the telescope building.
3. Providing necessary facilities, instruments and erection equipments for the fabrication & erection of the parts of the dome at the site.

Terms of execution of work

The vendor shall fabricate & install the dome at the ARIES site within 3 months from the date of receiving the intimation from the ARIES, failing which the ARIES reserves its right to levy liquidated damages as prescribed hereunder.

Two Part Offer

The offer will be in two parts; Technical & Commercial. Both the parts must be submitted at the same time but **in separate sealed covers**, giving full particulars, addressed to the ARIES and duly super-scribed "**Technical Offer for Dome of Schmidt telescope**" and "**Commercial Offer for Dome of Schmidt telescope**".

Bid Security

Bid security of Rs. 60,000/- (Rs Sixty Thousand only) in the form of a demand draft/bank guarantee issued by a scheduled commercial bank favouring ARIES, payable at Nainital must be submitted alongwith the offer. This amount will be forfeited if the vendor refuses to accept purchase order or having accepted the purchase order, fails to carry out his obligations mentioned therein. **No interest will be payable on the Bid Security amount.**

Offer Validity Period

The offer should remain valid for a period of at least 45 days from the date of opening of tender.

Technical Offer (TO)

The Technical offer (TO) should be complete in all respects and contain all information asked for in this document. Vendor should attach Annexure – A in its technical offer. ***It should not contain any price information.*** However TO should confirm that all required rates have been quoted in Commercial Offer (CO), without showing the actual amounts in the TO.

It is mandatory to understand & accept the technical specifications as per the Annexure-B, along with the offer. ARIES, at its discretion, may not evaluate a TO in case of non-submission or partial submission of technical details.

The TO must be submitted in an organised and structured manner. No brochures/leaflets etc., should be submitted in loose form.

The TO should comprise of following:

1. Documents in support of the background of manufacturer as established in doing heavy mechanical Fabrication works in India for at least five years.
2. Documents in support of infrastructure, skilled manpower, inspection & testing equipments along with the desired working machines & equipments in the form of brochures, leaflets, manuals etc.
3. Three years comprehensive on site warranty for the warranty for the fabricated and assembled structure of the dome should be offered by the manufacturer only in original letterhead.
4. Bid security of Rs. 60,000/= (Rs. Sixty Thousand only) in the form of a demand draft issued by a scheduled commercial bank favouring ARIES, payable at Nainital.

Commercial Offer (CO)

The Commercial Offer (CO) will give all relevant price information and will quote **prices only in Indian Rupees**. The CO should not contradict the TO in any manner. This must contain all price information.

Erasures or Alterations

Technical details must be completely filled up. The corrections or alterations, if any should be authenticated.

Price Composition

The price quoted should be only in Indian rupees and inclusive of following

1. Cost of the item.
2. All taxes, duties and levies.
3. Transportation and Forwarding charges to respective sites, if applicable.
4. Insurance to cover from transit period till installation.

Prices which are not quoted as above will be summarily rejected.

Total cost of ownership for the items will be taken for cost comparison.

No Price Variations

No upward revision in the price would be considered on account of subsequent increases in, excise tax, sales tax, etc. However, if there is any reduction on account of government levies/taxes, during the validity of offer, the same shall be passed on to the ARIES.

Opening of Offers and Evaluation Criteria

Technical Offers will be opened at ARIES. No separate intimation will be given in this regard to the vendors, for deputing their representatives.

Vendors will be evaluated on various parameters details of which are given in the Annexure - A

No Commitment to Accept Lowest or Any Tender

The ARIES shall be under no obligation to accept the lowest or any other offer received in response to this notice and shall be entitled to reject any or all offers without assigning any reason whatsoever.

Inspection

As a part of evaluation criteria, the ARIES will inspect the works of the manufacturer before placing the purchase order through its staff / consultant for authentication of the various technical parameters being claimed by the vendor. Inspection will be carried out by the ARIES through its staff / consultant at vendor's factory / site. However, not allowing full cooperation in this regard will disqualify the vendor and his offer will be rejected summarily. Manufacturer will furnish the inspection reports of all the materials, parts, subassemblies & assemblies to ARIES during the course of manufacture. The manufactured parts will be inspected, assembled & approved by the ARIES staff along with their consultant before the transport & erection at ARIES site.

Payment Terms

The terms of payment will be as follows:

1. No advance payment against purchase order.
2. 10 % advance will be given against the purchase of raw materials on submission of bills for the same.
3. 40% of the value of the equipment will be paid after inspection & approval of the dome at the works of the vendor. The payment will be made only against inspection & approval reports along with the invoice.
4. 35% of the value of the equipment will be paid after transport & erection of the dome at ARIES site.
5. The balance 15% will be paid after performance evaluation of the telescope against a performance Bank Guarantee of 10 % of total order value, valid for the warranty period.

Liquidated Damages

Notwithstanding the ARIES's right to cancel the order, 0.5% of the order value per week per system would be payable to the ARIES for every week's delay in the execution of this purchase order beyond the specified delivery/installation schedule subject to a maximum of 5% of the value of the systems ordered. ARIES reserves its right to recover these amounts by any mode such as adjusting from any payments to be made by the ARIES to the firm. Part of week will be treated as a week for this purpose. However liquidated damages may be exempted depending upon the reasons of delay on mutually agreed basis between Vendor & ARIES.

Order Cancellation

If the vendor fails to deliver the equipment within the stipulated time schedule or the extended date communicated by the ARIES, it will be a breach of contract and will result in forfeiture of bid security money along with cancellation of his tender.

The ARIES reserves its right to cancel the order in the event of delay in delivery / installation / commissioning of the items.

Guarantees

Vendor should guarantee that the items delivered to the ARIES are of required quality. The manufacturer should also guarantee that all the equipments supplied by the manufacturer are legally obtained. The equipment should be delivered in proper packed condition.

Warranty

The offer must include comprehensive on-site three years warranty from the date of installation and commissioning of the equipment. Warranty should be from supplier only (Letter in this respect should be enclosed in technical bid). Failing which the bank guarantee may be forfeited.

Vendor shall be fully responsible for the manufacturer's warranty in respect of manufacturing, quality and functioning of all equipment covered by the offer. Vendor must warrant all equipment, against any manufacturing defects during the warranty period. During the warranty period vendor shall maintain & replace all the defective good at the installed site, at no additional charge to the ARIES. Vendor should be in a position to supply all necessary spares for the dome for next five years after the warranty period.

Annexure – A

Technical Offer

(Letter to the ARIES on the vendor's letterhead)

To
The Director
ARIES , Manora Peak
Nainital-263129

Dear Sir,
Sub: RFP for Dome of Schmidt Telescope.

With reference to the above RFP, having examined and understood the instructions, terms and conditions forming part of the RFP, we hereby enclose our offer for the supply of the Dome as detailed in your above referred RFP. We also submit required information in following format:

Parameter	Vendor's response
Details of infrastructure, skilled manpower, inspection & testing equipments along with the desired working machines & equipments.(Enclose relevant information in the form of brochures, leaflets, manuals etc. to support technical competence for this job)	
Year of establishment for manufacturing business in India	
Acceptance of technical specifications as per Annexure 'B' & assembly drawings	
Acceptance of the responsibility of the manufacturer to take the supply, manufacture, shop assembly, transport, erection, inspection testing and commissioning of Dome as per enclosed specifications including 1 Ton electric hoist and insulation in the dome at ARIES as a complete Job without any extra claims.	
Acceptance of three years on site warranty of the fabricated parts of the dome after successful erection of Dome for Schmidt Telescope at ARIES	

We further confirm that the offer is in conformity with the terms and conditions as mentioned in your above referred letter and enclosures.

We also confirm that the offer shall remain valid for forty-five days from the date of the opening.

We also understand that the ARIES is not bound to accept the offer either in part or in full and that the ARIES has right to reject the offer in full or in part without assigning any reasons whatsoever.

We enclose Demand Draft/BG for Rs. 60,000/- (Rs. Sixty Thousand only) favoring Director, ARIES and payable at Nainital, towards bid security, details of the same are as under:

1. Demand Draft/BG no. :
2. Date of Demand Draft/BG :
3. Name of Issuing Bank :

Yours faithfully,

Authorized Signatories
(Name & Designation, seal of the firm)

Date:

ANNEXURE - B
80 CM SCHMIDT – DOME : Technical Specification

CONTENTS

1. Description
2. Drawings
3. Manufacture
4. Surface Treatment
5. Transport
6. Erection
7. Quality Surveillance

DOME for 80 CM SCHMIDT TELESCOPE

TECHNICAL SPECIFICATION

1. Description

80 cm Schmidt Telescope is housed in an enclosure, which is covered on the top by a hemispherical steel dome. The dome has a slit, which is closed by a pair of shutters. Both the shutters and dome are supported by wheels running on steel rails.

The dome is supported by 12 wheels with spring suspension. 12 pairs of guide rollers located on either side of rail prevent radial movement of the dome. The wheels are conical with an angle converging on the axis of the dome to ensure smooth rolling on circular track. The rail is 52 Kg/m standard rail clamped to the steel plates anchored to the RCC beam on the top of the columns in the enclosure. The dome is driven by a pair of friction rollers. Each roller is driven by an A.C squirrel cage induction motor through a planetary gear reduction unit. The speed of rotation of the dome can be varied by varying the speed of the motor through frequency control.

Each shutter is supported by a pair of wheels at the bottom and top ends which roll on rails welded to the extended arms from the dome. The shutters are also fitted with guide and anti lifting rollers. A pair screw/nut mechanisms connected to the top and bottom ends of the shutters move the shutters apart or towards each other. A common screw having left hand and right hand trapezoidal threads pushes the nuts connected to each shutter in the opposite directions. The screw is driven by an AC squirrel cage motor through a timer belt/pulley reduction.

The Dome consists of the following assemblies.

- | | |
|--------------------------------------|-----------------------|
| 1. Dome Assembly | Drg. No. 33401-000001 |
| 2. Shutter Wheel Assembly | Drg. No. 33401-100005 |
| 3. Dome Wheel Assembly | Drg. No. 33402-200006 |
| 4. Dome Guide Roller Assembly. | Drg. No. 33402-300007 |
| 5. Shutter Drive Assembly | Drg. No. 33401-400008 |
| 6. Dome Drive Assembly. | Drg. No. 33401-500009 |
| 7. Dome Guide Roller Assy.-Anti lift | Drg. No. 33402-600010 |

1.1. Dome (Drg. No. 33401-000001)

The Dome is made of structural steel sections covered by sheet metal. It consists of two main arches located at equal distance from the centre of dome and a transverse arch running perpendicular to the main arch. The opening formed by the main and transverse arches provides window for observations. The rest of the hemispherical surface formed by equally spaced radial and circumferential members is covered by steel sheet. The radial members and the three arches are welded to a ring beam made of steel plates.

No of active coils	10
Free length	228 mm
Operating length	208 mm
Stiffness	130.3 N/mm
Maximum deflection	32.8 mm
Ends	Squared & ground

1.3. Guide Roller Assembly (Drg. No. 33402-300007/600010)

Twelve pairs of rollers butting on either side of the rail ensure that the dome remains on the track in spite of any wind or other disturbing horizontal loads on the dome.

Locks for preventing lifting of the dome off the rails are fitted to six of the guide roller assemblies (drg. no. 33402-600010) alternatively.

1.4. Dome Drive Assembly (Drg. No. 33401-500009)

A pair of rubber lined roller drive the dome by friction. Each roller is driven by a planetary gear reduction unit powered by an Ac induction motor. The entire assembly swivels on bearings. Two helical springs apply the force required to press the roller on to the dome for driving the same. The bracket housing the drive is fitted with screws to a plate embedded in the column supporting the RCC beam. Two drives each capable of independently driving the dome and located at diametrically opposite ends move the dome.

The bracket and frame holding the drive may require modification in design to suit the bus bar system used in the dome.

The dome rotates at a speed of 0.154 rpm driven by a roller of diameter 300 mm giving 3 m /min. The roller rotates at a speed of 3.69 rpm driven by AC induction motor through a planetary gear unit having a ratio of 1:64. The motor with rated rpm of 1440 shall run at 236.2 rpm.

The motor shall have frequency control drive to vary the speed as necessary and to run at the required lower rpm than the rated speed.

Specifications for the springs:

Material	IS: 4454 Grade 2
Wire diameter	6 mm
Mean Diametre	27 mm
No of active coils	14
Free length	125 mm
Operating length	111.5 mm

Stiffness	47.9 N/mm
Maximum deflection	25 mm
Ends	Squared & ground

1.5. Shutter Wheel Assembly (Drg. No. 33401-100005)

Shutter is fabricated from box sections made out of plates and T sections covered by a sheet metal. Drawing no. 33412-000003 presents the construction details of the shutter.

Each shutter is supported by two wheels at the top and lower ends. Shutter wheel are flanged wheels running on rectangular bars. The bottom and top rails support and guide the shutter during its traverse. The supports are welded to the dome structure while installing the shutters. Each wheel assembly contains guide rollers and rollers preventing the lifting of the shutter off the rails. The gap between the anti lift roller and rail support can be adjusted by rotating the eccentric housing holding the roller shaft.

Top and bottom supports as well the rail and its supports need to be machined to ensure alignment of both shutter, smooth movement over the rails and vibrations/oscillations in the shutter due to wind loads. The guide rollers and the roller shaft for preventing lift shall have no gaps or minimum gaps with rail/supports.

1.6. Shutter Drive Assembly (Drg. No. 33401-400008)

Both top and bottom ends of each shutter is traversed by a screw and nut mechanisms. Each shutter is connected to nuts by arms welded to top and bottom ends. Both the nuts are moved by a common screw having left and right hand threads. The screw is driven by an AC induction motor through a timer belt pulley reduction of 3.8. Motor running at rated rpm of 1440 will give a speed of traverse of 378.9 rpm of screw. The shutters traverse at a speed of 3.03 m/min.

Both the motors driving the top and bottom screws shall operate simultaneously with a common control system. No variable speed is required for moving the shutters.

The shutter drives are mounted on the structure of dome using angle sections and plates.

1.7. Louvers (Drg. No. 33401-000001)

Louvers are welded to shutter and dome structures to prevent leakage of rain into the dome and to block access to the birds when the shutters are closed.

They are made from 10/14 gauge steel sheets. The louvers fitted to parts which move relative to each other shall have overlapping edges forming labyrinth seals.

Even though design of the louvers is furnished the vendor shall modify the same if necessary to improve the sealing and present aesthetic look. All the louvers shall be adequately anchored by appropriate welding and providing necessary cleats.

Whenever two sheets are joined by butt weld a back up plate of 10X50 shall be used over the complete length of joint.

Cleats supporting the louver attached to the RCC beam shall be welded to embedded plates in the RCC beam.

1.8. Rails (Drg. No. 33401-000001)

Rails shall be laid to form a circular track of mean diameter of 6211 mm. The track shall be circular and the segments forming the track shall be concentric. The rail is supported by steel plates and held in position by clamps and retainers. Four foundation bolts at each location hold the plates and clamps in position.

The joint between the segments shall be closed by weld.

The circularity, concentricity of different segments and the level of the rail top shall be ensured before grouting the foundation bolts holding the rail.

1.9. Insulation

Inside surface of the dome shall be insulated by using an appropriate fire resistant insulating material sheets of minimum thickness 25mm fixed to dome structure with aluminum sections. The vendor will be require to show a sample of insulating material and will get it approved before procurement of the same. Also vendor will give a plan/method of fixing the insulation in the dome with aluminium sections for approval before installation.

1.10 Hoist

1 Ton motorised hoist is to be supplied and installed in the dome. ISMB 250 has been provided in the dome structure for installing the dome. If smaller section of the beam is adequate the same shall be used.

Specifications for the hoist

Load rating	1 Ton
Lift	about 10m total from top to ground floor of building
Radial traverse	1.5 m

Both lift and radial traverse are to be motorized.

The hoist shall be operated by a pendant hanging from the hoist. Hoist should be of standard make/ ISO Company conforming to latest National and International standards. Hoist should have a low speed of about 2-3 m/minute so as to be able to handle optics in its cell.

2. Drawings

Annexure I lists the drawings covering the assemblies described in 1. Lists of parts specifying manufactured components, bought outs, proprietary and hardware parts are also listed.

The drawings as well as this specification form composite technical specifications for the Dome of the 80 Cm Optical Schmidt Telescope. In case of conflict between specifications the vendor shall obtain the clarification from the Purchaser.

3. Manufacture and Assembly

3.1. Raw Materials

Raw materials used for manufacture shall confirm to the specification given in the drawings/lists of parts. Use of materials other than specified would be permitted only if prior approval for the same is obtained from the purchaser.

In cases of plates undergoing machining, the drawings specify only the thickness required (even where plate or bar sizes are given) to be maintained after machining. Plates/bars having adequate size to accommodate required machining allowance, errors in weld fit up, and distortion during welding and heat treatment shall be used.

3.2. Manufacture

It is essential that the processes and machines used for manufacture would be of appropriate type and precision necessary to meet the dimensional and geometric tolerances specified in the drawing. Manufacturer shall permit access to the purchaser or his representative to assess the machines on which the components would be manufactured. Manufacturer shall adopt processes and methods appropriate for meeting specifications of the drawings/documents and ensuring quality of the components.

Noted below are some important aspects of manufacture.

1. All gas cut surfaces shall be ground or machined minimum 1 mm below the cut surface.
2. Necessary land/root gap shall be maintained between the mating edges/surfaces for the butt and fillet welds.
3. Stress relief or heat treatment, if specified, shall be carried out leaving sufficient allowance for machining after the heat treatment to maintain the dimensional and geometric tolerances.
4. Machines and manufacturing processes used shall be such that specified accuracies shall be easily achievable.
5. Where drawings call for certain machining operations to be done at assembly they shall be carried out only at assembly following notes given in the component/assembly drawings. Purchaser shall be contacted for guidance if no specific instructions are provided in the drawings for such an operation.

6. Some of the work can only be completed while or after installing the sub-assemblies after the erection of the dome. Such work will be done only at site. However trial fit up/assembly at work is necessary to finalise dimensions and minimise work at site.

3.3. Assembly

While assembling the components guide lines/instructions given in the assembly drawings shall be implemented using appropriate assembly methods and techniques.

Dome structure shall be completely assembled (fit up) at works to ensure all the members are correctly formed and cut. The joints between the radial and circumferential members and the arches shall be verified for proper fit up for welding at site. The sheet metal cover shall sit properly on the arches and other members for welding at site.

Noted below are some important aspects for assembly.

1. All components shall be cleaned completely free of rust preventive, oil, grease etc and wiped dry of any cleaning agent used before assembling the components.
2. Wherever holes are to be drilled or tapped to match with mating components at the time of assembly the requirement of alignment and fit of the mating components shall be ensured while marking/transferring holes for drilling.
3. Spacers and bearing covers locating bearings shall be ground after trial assembly to determine the exact extent of machining. When these components are reassembled the bearings shall rotate free and smooth with no axial play.
4. Only specified grease (will be specified) shall be used in the bearings wherever required.
5. Trial/proof assembly of the components in subassemblies shall be completed and offered for inspection before giving surface treatments viz. phosphate coating, painting etc. Components, which have undergone surface treatment, shall be thoroughly cleaned dry and reassembled.
6. Screws shall be tightened to the specified torque at the time of final assembly (for some of the assemblies at site only).
7. Movement of the shutter wheel assemblies (manual) on the top and bottom rails shall be verified at works.

4. Surface Treatment

Surface treatment to be given to each component is specified in the drawing. Noted below are the general guidelines to be followed.

4.1. General Instructions

1. All machined surfaces of components shall be protected by applying rust preventive or grease to clean dry surface after completion of machining till they

- are taken up for assembly. All the traces of rust preventive or grease shall be completely removed before placing the component in assembly.
2. Chemicals, paints etc used for the surface treatment shall be from reputed manufacturers.
 3. Surfaces shall be ground free of weld spatter, tack welds and burrs before giving any surface treatment.
 4. Surface treated components shall be well protected from damage to the surface during storage, handling, transport and erection.
 5. Instruments, electrical or electronic components, bearing etc shall be protected from paint or any damage during painting.
 6. All hard ware items viz. bolts, screws, nuts and washers shall be zinc plated.
 7. All the un-machined surfaces of the components and structural of the dome shall be painted. Purchaser would specify the colours of paint to be used on the components, which are exposed.

4.2. Manganese Phosphate Coating

All the completely machined components shall be given a coat of manganese phosphate. This is a chemical treatment process involving surface preparation like degreasing, phosphate coating, rinsing and finishing. All the machined components that can be immersed in the processing tanks (components which are not very big) shall be given this treatment. All hardware items viz. bolts, screws, nuts, washers etc. shall be given manganese phosphate coating.

Noted below are the guidelines, which shall be followed.

1. The manganese coating shall be of Class 1 of IS: 3618. Cleaning, degreasing, coating and sealing process shall be as per IS: 6005.
2. Petroleum solvent degreasing is not acceptable. Alkaline degreasing shall not be used on components having surface finish of 0.8 microns or better. Traces of chemicals used for degreasing shall be completely removed before phosphating.
3. After phosphating and rinsing in water rinsing in dichromate solution is recommended.
4. The manganese-coated components shall be immersed in black stain (spirit stain) and rust preventive oil to seal the coating.

4.3. Painting

The drawings specify the components and surfaces, which are to be painted. Noted below are the important guidelines for the components.

1. Projections on the surfaces to be painted viz. weld spatter, tack welds, burrs etc, shall be removed by grinding. The surfaces shall be cleaned completely free of oil, grease, scale.

2. When specified in the drawings components requiring blast cleaning shall be blast cleaned after cleaning as per 1. above. All machined surfaces shall be coated with grease or rust preventive and well protected from any possible damage during blast cleaning. The surface shall be blast cleaned to white metal. Shot or grit blasting method shall be used (no sand blasting).

Any area left due to covers protecting the machined surface shall be inspected and cleaned to white metal by hand grinding/buffing.

3. Surfaces cleaned as per 1. and 2. above shall be taken up immediately for painting. **No cleaned surface shall remain unpainted more than 4 hours after cleaning.**
4. The surface shall be given first coat of primer. The coat of primer shall be applied by brush followed by pressing with a roller. Spray painting of primer is not permitted.
5. The primer coat shall be followed by application of putty, which shall be applied by a trowel or a putty applicator to fill the dents and crevices if any.
6. Large components, which are dismantled and transported to site for reassembly at site, shall be transported to site with one coat of primer and putty. No further painting shall be carried out at works.
7. Components, which are assembled at works and transported to site as parts of an assembly, shall be finish painted before transport to site.
8. Only Zinc chromate primer shall be used. Putty shall be of the same manufacturer as primer. Finish coat shall be of synthetic enamel of the same manufacturer as primer. Instructions of the manufacturer for painting shall be strictly followed.

Vendor shall obtain the approval of the purchaser for the make of the paint before procurement.

Two coats of synthetic enamel finish coat shall follow primer and putty coats. Finish coating shall be by spray. The second coat shall be applied after the first coat is hard dried and its gloss is knocked off by scuffing.

In case of external surfaces of dome and shutter titanium dioxide paint shall be used for the two finish coats.

9. If there is any gap between the primer/putty application and finish coat any grease/oil/dust that might have gathered shall be completely wiped off (if necessary using soft soap solution) and dried before finish coating. Any damage to primer shall be rectified by applying primer to the damaged area and allowed to dry before spraying finish coat.

Accumulation of moisture, dust, oil etc. on surfaces, which received primer, or first coat of enamel, would lead to peeling of paint applied subsequently.

10. The components, which receive only primer coat at works before despatch to site, shall be inspected for any damage to primer coat after erection at site. All painting

at site shall be done after completion of erection and assembly except of surfaces that become inaccessible after erection. The surfaces shall be cleaned to remove oil, grease, soil, rust, dust, moisture etc. Locally damaged primer coating and rusted areas shall be painted locally with primer by brush.

Then the whole surface shall be given a second coat of primer by spray. If necessary putty shall be applied on damaged surfaces before coating with primer.

Two coats of synthetic enamel as described earlier shall follow the primer coat.

All titanium dioxide painting shall be carried out at site following the instructions of the supplier of the paint.

11. Surfaces sliding and rolling against another, surfaces mating with others and threads shall not be painted.

5. Transportation

After weld fit up and inspection the dome structure shall be dismantled into transportable units, to ensure their safety during transportation. Each unit shall be put in wooden crates, if necessary, with appropriate packing material/restraints to prevent movement inside the crate. All items being transported shall be secured to the body of the truck. Contractor undertaking the transport shall be familiar with roads leading to Manora Peak near Nainital in Uttarakhand.

Machined surfaces of components, which are dismantled from assembly, shall be given a protective coating before packing and despatch to prevent rusting during transport and storage.

6. Erection

The dome is to be erected on the RCC beam at the top of the observatory building.

1. The rail for the dome is to be erected and approval of the client obtained before grouting the foundation bolts leaving a gap of 50 mm below the rail for grouting later.
Concentricity/radius and level of rail shall again be verified. If necessary, adjustments can be made before filling the 50 mm gap below the rail/plate with grout.
Quick cure grout mix, viz. made by M/s Fosroc Chemicals, shall be used for grouting.
2. The structure of the dome shall be erected and offered for acceptance in the tack welded condition. Full welding of structure shall be taken up only after obtaining the clearance to proceed. The structure shall be offered for inspection again after full welding.
3. Sheet metal covering of the dome shall be taken up only after obtaining approval for the structure of the dome.
4. The shutter rails/supports shall be kept in position and offered for inspection before taking up full welding.

5. The shutters can only be completed at site because of the size. Completed shutters shall be offered for inspection before installing on the dome.
6. The wheel assemblies for the shutter shall be installed and offered for inspection. The rollers on the shutters shall be adjusted such that the movement of the shutter is free and smooth over the complete traverse with no excess gap between the rollers and the rail/support.
7. Screw and nut mechanisms for the movement of shutter shall be installed and assembled. The satisfactory movement of shutters with manual rotation of screw shall be ensured.
8. The assembly of wheels and rollers for the dome shall be taken up only after the installation of sheet metal covering for the dome and shutters with their wheels and screw/nut mechanisms.
9. All the wheels and rollers for the dome shall be kept in the specified locations in between the temporary supports for the dome. Alignment of the wheels (converging of axes of all wheels at the centre of dome) shall be ensured and offered for inspection.

Guide rollers and anti lifting locks shall be adjusted in stages slowly while rotating the dome and correcting any drift that may take place due to improper positioning of wheels/guide rollers. Position of guide rollers shall be fixed only after satisfactory rotation of dome number of times.

Installation of at the least one drive assembly of dome is necessary for carrying about the above adjustments.

Full welding of plates connecting the wheel assemblies to the ring beam of the dome shall be taken up only after satisfactory trial runs of the dome over complete revolutions.
10. The drive assembly for dome shall be held in position and alignment of driving roller with the dome shall be ensured. The drive assembly shall be temporarily held in position by tack welding/clamping and trial runs of dome shall be made. Only after satisfactory rotation of dome the embedded plate in the column of the building shall be the drilled and tapped.

Assembly one drive for dome is required to be dome for the completion of the assembly of wheels, guide rollers and locks.

After the satisfactory completion and performance of the one drive the second drive for the dome shall be installed following the same procedure.
11. Fitment and tack welding of louvers on the dome structure and shutters shall be completed and offered for inspection before taking up full welding.

If found necessary additional back up plates, cleats and gussets shall be welded for securing the louvers to the dome/shutters.
12. The ISMB 250 beam (or its replacement if found necessary to suit the hoist) shall be kept in position and offered for acceptance by client.

The hoist shall have maximum possible radial travel in both directions without causing obstructing the view of the telescope.

13. The motors shall be coupled to the screw and nut mechanisms at the top and bottom end of the shutters. The tension in the belts shall be maintained at adequate level to ensure smooth rotation. Motors of both top and bottom drives shall be operate simultaneously with no time lag through a single control system.
Limit switches shall be kept at the end of traverse for both the open and closed positions which cut off the power to shutter drive before the dead end is reached.
Stoppers shall be welded at the end of the rails for each shutter at the top and bottom ends to stop the movement in case of failure of the limit switches.
14. Specified insulation shall be stuck on the dome using appropriate adhesive. A sample piece shall be made in the works for verifying the adhesion of the insulation to the sheet metal in the dome.
15. The vendor shall study conditions at site and make necessary arrangements including handling systems and devices for proper handling and erection of components of the dome.
The vendor is responsible for proper storage at site for all the components and assemblies till the time of erection/assembly. Vendor shall discuss with the purchaser the available facilities and the need to augment any requirements.

7. Quality Surveillance

The dome shall rotate silent with uniform speed. No rain water shall enter the dome when the shutters are closed through the gaps between the dome and shutter or between the dome and the building. The shutters shall move uniformly at both the ends and automatically stop at the end of traverse.

The vendor shall carry out inspection of the components and assemblies at various stages of manufacture and assembly and maintain record of inspections. Test reports, inspection records etc. shall contain reference to the drawing, identification to each and every unit of the part (in case of parts, which are made in quantities) and the actually recorded results/dimensions etc. Any deviations from the specifications shall be noted.

Purchaser or his representatives shall be allowed to inspect the components or inspection records of the vendor at any stage of manufacture.

7.1. Raw Materials

All raw materials shall be free from any visible and metallurgical defects.

1. Plates, whether they undergo machining or not, shall be free from scale, pitting, dents etc.
2. Bars of alloy steel procured shall be in annealed condition. They shall be inspected for hardness. Any bars showing significant hardness shall be rejected.
Bars shall be inspected for chemical composition to meet relevant standard for the material.
3. Vendor shall maintain a record of all the raw materials inspected for chemical composition with references to the parts for which the same would be used.

7.2. Fabrication

1. The vendor shall inspect all welded components at the weld-fit up stage recording the locating dimensions of the machined surfaces and the available machining allowance on the plates forming the surface. Inspection record of the weld-fit ups shall be maintained. Gaps for the root of the welds and the lands maintained on the edges of the groove welds shall be inspected.
2. Welds shall be ground and blended smooth and subject check as specified in the drawing viz. dye penetrant, radiography etc.
3. The welded components shall be inspected again after clearance of welds to verify the available machining allowance on the plates. If necessary any corrections shall be made to ensure minimum plate thickness specified after machining while maintaining the locating dimensions. Then only the components shall be taken up for stress relieving wherever applicable.

7.3. Machining

1. Components requiring heat treatment shall be rough machined leaving adequate allowance for finish machining before heat treatment.
2. All finish machined components shall be inspected immediately and as measured dimensions shall be recorded for each piece before storage for assembly.

Components shall be inspected for the removal of burrs and sharp corners.

7.4. Surface Treatment

Components, which have undergone manganese phosphate coating, shall be inspected for the following.

- i. All surfaces requiring coating have received coating over the complete area. Any surfaces exempted from coating are not coated. The coating is uniform. The coating is followed by oil and black stain rinsing.
- ii. Components undergoing painting shall be inspected at every stage viz. cleaning before primer coat, primer coat, application of putty, first finish coat and second finish coat. Any defects at every stage shall be rectified before proceeding further with painting.

Only approved paints and chemicals shall be used. Paints from the same manufacturer shall be used at all stages and for the complete project.

7.5. Proprietary Components and Hardware

Proprietary and hardware part of the telescope, which the vendor would procure, shall be from reputed manufacturers made to the specification given. The following guidelines shall be followed. All such item shall be offered to Quality surveyor for approval well before they are required for use in assembly. Any rejections of the procured items shall not be a cause for the delay in assembling the components.

1. The bearing used in the telescope shall be of SKF or FAG make.

2. Lock nut and lock washers used for locating the bearings shall be inspected for complete checking of dimensions and quality of material used.

7.6. Assembly

Components and assemblies shall be inspected for the following.

1. All components entering the assembly shall be clean and dry. They shall be inspected for the presence of rust preventive, oil, or grease if required shall be sent for cleaning and drying. Superior kerosene shall be used for cleaning all machined surfaces.
2. All the components shall have inspection records showing clearance for assembly including acceptance of the surface treatment they have undergone. For the components, which require machining, to suit at assembly surface treatment would be done only after the trial assembly.
3. Components shall be free from burrs and sharp corners.
4. Where assembly involves use of bearings the bearings shall be thoroughly cleaned with superior kerosene if the bearings are not shielded bearings. Shielded bearings shall be cleaned with a clean, dry and lint free cloth.
5. Components rotating on bearings shall be inspected for free and smooth rotation with no axial or radial play. If the assembly is final and the component does not require dismantling for transport to site the locknuts locating the bearing shall be tightened fully and locked with lock washer in position.
6. If the assembly is final and the component do not require dismantling for transport to site screws/bolts shall be tightened with locking compound and tightened to specified torque after the approval of the assembly by quality surveyor. Approval of the assembly by the quality surveyor shall be in writing.
7. Movement of the wheels and rollers over the top and bottom rails of the shutters shall be verified at shop before despatch.
8. After welding at site the welds shall be dye checked at all critical joints and at joints randomly identified by the client.
9. All welds of the dome and shutter which offer protection shall be leak proof against rain water.
10. All movement/rotations shall be checked for smooth and silent operation. No objectionable vibrations shall be present.

ANNEXURE - C

Commercial Offer

Items to be considered for total cost of ownership

Items	Price
Total cost of Supply, manufacture, shop assembly, transport, erection, inspection testing and commissioning of Dome as per enclosed specifications including 1 Ton electric hoist and insulation in the dome for Schmidt Telescope at ARIES	
Taxes, duties & levies.	
Transport & forwarding charges.	
Insurance to cover from transit period till commissioning.	
Total	

Annexure - D
(Assembly drawings)

Assembly drawings are available in the hard copy of tender document available at ARIES.