PUBLIC TENDER NOTICE NO: PR/PUK/1.3 METER DOME/VBO/CAP/54 DATED 18 MAY 2011

The Director, Indian Institute of Astrophysics invites sealed Quotations/Bids both Technical bid and Commercial bid separately in a sealed cover from reputed firms for following / specification. The firm (s) interested in offering bids should have executed similar items/works.

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Description</th>
<th>Quantity</th>
<th>E.M.D (Refundable) Rs.</th>
<th>Tender Fee (Non-refundable) Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Fabrication and Installation of 1.3 Meter Dome and Enclosure Structure (As per detailed specification in the Request for Proposal and drawings enclosed).</td>
<td>3,40,000/-</td>
<td>300/-</td>
<td></td>
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Note: The Tender documents with Specification details are available on IIA website www.iiap.res.in/tenders.htm. Hence the interested tenderers may at their option download the same from our website (as no hard copies of Tender documents is/are provided from this office) and submit their offer along with EMD (refundable) & Tender fee (non-refundable) prescribed therein, only in the form of Demand Draft drawn in favour of Director, IIA. However, your offer (both Technical & Commercial bids) with bids should be superscribed in a envelope mentioning the tender notice no., Date of opening, and submit the Bids in a sealed envelope addressed in favour of Director, Indian Institute of Astrophysics, 2nd Block, Koramangala, Bangalore – 560 034.

2. The firms who fulfill the following requirements shall be eligible to submit their bids. Joint ventures are not acceptable.

(a) Tendering Company shall be professionally managed and equipped with facility for the supply and maintenance of tendered items.

(b) The tenderers should have completed, in the last 3 financial years (i.e., current year and two previous financial years) at least one similar single work for a minimum value of Rs.200 Lakhs.

(c) The total contract amount received during the last 3 financial years, and the current financial year should be minimum of Rs.200 Lakhs. The tenderer should submit Audited Balance
Sheet duly certified by the chartered accountant to this effect. They should also submit Bankers Solvency Certificate to a minimum of Rs.200 Lakh.

(d) The Private Body Contractor shall be required to produce the TDS Certificate indicating the Income Tax deducted by the client for the execution of similar items, completed individually of value not less than Rs.200 Lakh.

3. Both Technical / Commercial/Price Bids supported by the above information should be submitted in Sealed envelope duly superscribed with the name of work/item. The completed Bids will be received by this office **upto 15.00 Hrs. latest by 20.6.2011.**

4. If any information furnished by the tenderers is found incorrect at a later stage, the firm shall be liable to be debarred from tendering and taking up of work in IIA. The Institute reserves the right to verify the particulars furnished by the tenderers.

5. The interested tenderers may contact Mr. P.M.M Kemkar (Ph.No.25530672, Ext: 381) or Mr P.U. Kamat (ext.244) to discuss Technical Clarification and Shri.Y.K.Raja Iyengar (Ph.No.25530672, Exten: 244) for Commercial Clarification, if any, with prior permission on or before 10.6.2011, before submitting bids. The pre bid meeting will be held at IIA, Bangalore on 10.6.2011 at 15.00 hours.

6. The firms should submit the bids superscribed along with Tender fee of prescribed amount **upto 15.00 Hrs. Latest by 20.6.2011.** The Technical Bids will be opened in presence of the bidders or their authorized representatives **at 16.00 Hrs on 20.6.2011.**

7. The commercial bids of those who are successful in the Technical bid will be opened later. The date will be intimated to successful vendors.

8. Incomplete bids are liable for rejection.

9. Late / delayed offer will not be considered.

10. IIA is not responsible for any delay / loss of documents in transit.

11. No bids will be considered if prescribed Tender Fee and EMD is not found with the Technical bid.

12. The offer should be valid for a minimum period of 120 days from the date of opening of bid.

13. Both EMD and Tender fee DD should be sent along with Technical Bid only.

14. IIA reserves the right to reject any or all tenders without assigning any reasons.

**Administrative Officer**

IIA, Bangalore-34
No. PR/PUK/1.3 METER DOME/VBO/CAP/54                  DATED: 18 May, 2011

M/s.

Dear Sirs,

The Director, Indian Institute of Astrophysics, Bangalore invites Sealed Tenders for the supply of Stores detailed in the Tender Form hereto annexed. The Tender Terms enclosed are also may be noted carefully. If you are in a position to quote for the supply in accordance with the requirement, please submit your quotation in the attached Tender Form also.

Your Tender must reach this office on or before the date and time indicated in the Tender Schedule.

Thanking you,

Yours faithfully,

P.Kumaresan
Administrative Officer

Encl: as above.
INDIAN INSTITUTE OF ASTROPHYSICS  
IIInd Block, Koramangala, Bangalore-560 034

No. PR/PUK/1.3 METER DOME/VBO/CAP/54  
DATED: 18 May, 2011

FROM:

TO
THE DIRECTOR,  
Indian Institute of Astrophysics.,  
Bangalore-560 034.

Sir,

I/We hereby offer to supply the stores indicated below at the price hereunder quoted and agree to hold this offer open till_________. I/We shall be bound to supply the store hereby offered upon the issue of the Purchase Order communicating to the acceptance thereof on or before the expiry of the last mentioned date. You are at liberty to accept any one or more of the items of such stores. I/We not withstanding that the offer in this tender has not been accepted in whole, shall be bound to supply such items and such portion or portions of one or more of the items as may be specified in the said Purchase Order communicating the acceptance.

<table>
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<tr>
<th>Sl.No.</th>
<th>Description of the item(s)</th>
<th>Quantity</th>
<th>Unit</th>
<th>Rate</th>
<th>Dely. Period</th>
</tr>
</thead>
</table>
| 1.0    | Fabrication and Installation of 1.3 Meter Dome  
And Enclosure Structure as per detailed  
specification in the Request for Proposal  
and drawings enclosed |

Place at which the Delivery is required : Vainu Bappu Observatory, Kavalur Tamilnadu
Date by which the supplies are required : Six months from the date of purchase order.

2. I/We have understood the items of the tender annexed to the invitation to this Public Tender
and have thoroughly examined the specifications/drawing and/or pattern quoted or referred to herein and/are fully aware of the nature of the stores required and my/our offer is to supply the stores strictly in accordance with the requirements subject to the terms and conditions contained in the Purchase Order, if communicated on the acceptance of this tender either in whole or in part.

Date: 

Signature and seal of Tenderer
1.3metre Telescope Project

Indian Institute of Astrophysics, Bangalore

REQUEST FOR PROPOSAL

for

Manufacture and erection of 1.3m Telescope Enclosure and Dome structure at Vainu Bappu Observatory, Kavalur

Indian Institute of Astrophysics,
Block –II, Koramangala,
Bangalore –560034.
Ph: 080-25530672 –76
Fax: 25534043

Date: 18th May 2011
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ANNEXURE 'A' - SP.No.336-03 - Technical Specifications for 1.3m telescope Dome & enclosure.  
Appendix I - Lists of drawings.  
Appendix II - Lists of bought outs, proprietary and hardware parts.  
Appendix III- Bill of Materials  
ANNEXURE ‘B’ - Assembly and Part drawings  
ANNEXURE ‘C’ - Instructions to the bidders & General Terms and conditions
1.0 **Background Information**

The Indian Institute of Astrophysics (IIA) is setting up a 1.3m optical telescope at Vainu Bappu Observatory (VBO), Kavalur, which is located 30 kms from Vaniyambadi, Tamilnadu. The manufacturing of 1.3m Telescope has already completed and the telescope is in the process of commissioning stages. The civil works on the project is under progress and an enclosure (building structure and dome) have to be fabricated and installed at VBO, Kavalur to house the telescope and auxiliary facilities. The fabrication of dome and enclosure is planned to complete by July 2011. This RFP is for manufacturing and project management services for realization of a suitable enclosure with dome and other auxiliary facilities.

2.0 **Project Site Information**

This project site is at Vainu Bappu Observatory, Kavalur, Tamilnadu.

Postal address: Vainu Bappu Observatory, Kavalur, Alangayam –635704, Tamilnadu
Phone: 04174 203014 –15, 16

Nearest railway station: Vaniyambadi (Bangalore-Chennai route)
Road Distance: From Bangalore to Kavalur about 180 kms
Vaniyambadi to Kavalur 30 kms

Altitude: Around 800m MSL
Ambient Temperature: Maximum 40deg C/minimum 10 deg C
Relative Humidity: 100% Max (monsoon) 20% Min 50% Average
Climate condition: Mild tropical but generally dry
Latitude: 12 deg 35’ N  Longitude: 78 deg 37’E

Vendor may visit the observatory to evaluate site requirements after obtaining prior permission from the institute. The institute may be able to provide food and accommodation for the installation team limited to 8 to 10 persons. Vendor should ascertain availability of accommodation or arrange for erection of temporary sheds. Adequate power for welding and installation will be provided by the institute to the working team.

Contact:

For any technical clarifications pertaining to the scope of work,:
P.M.M. Kemkar email: pmmk@iiap.res.in
P.U.Kamath email: puk@iiap.res.in

For purchase terms & conditions and other commercial issues:

Mr. Y.K. Raja Iyengar email: ykri@iiap.res.in
3.0 **Scope of works**

The vendor shall be responsible for executing the following scope of works of 1.3m telescope enclosure and dome, conforming to the design and specifications detailed in *Annexure ‘A’ “1.3m telescope Enclosure and Dome specifications”*.

The scope of work briefly outlined below shall include complete manufacturing, installation and commissioning of dome and enclosure along with accessory systems as specified in *Annexure A*

3.1 **Dome:**

This includes Dome structure, dome cladding, ring beams, circular rails, drive & wheel assemblies, guide roller & guide roller anti lift assemblies, dome drive automation, dome shutter drive & wheel assemblies, encoder assembly, lightning roller assembly, cable laying and routing arrangements, seven remote controlled windows/ventilators on dome, power supply method for automated windows, encoder mounting arrangements, limit switches, methodology of installation for dome drive and shutter drive assembly, material handling facility including dome hoist, painting/ surface treatment etc.

3.2 **Enclosure:**

This includes structure elements such as columns & beams, floors, staircases, lift shaft, outer panels, maintenance structure inside telescope pier etc as per specifications in *Annexure A*. Mechanical fixtures related to electrical power distribution system, cable routing for telescope, lift etc may be added in course of the contract

4.0 **Inspection, Assembly And Testing**

Inspection, assembly and testing of dome structure, dome drive assembly, shutter drive assembly and Enclosure Building structure, etc. at manufacturer’s factory premises is included in the Scope of vendor. Consultant will visit the manufacturer’s works in consultation with IIA as and when required to ensure that manufacturing is being processed as per drawings and technical specifications, Quality of workmanship and dimensional accuracy etc. are maintained as per Quality Assurance Plan. If some unforeseen technical problems arise during fabrication process, consultant will have to study the same and sort out such problems and revise his drawings if required.

For standard equipment such as Fans, Electrical Panels, Cranes etc. inspection at final stage only is desired.

5.0 **Safety Measures:**

Dome shall include safety systems to prevent personnel injuries. All elements of safety such as over speed protection, over current protection, dome and shutter drive interlock with a safety switch, dome crane safety etc. shall be taken in to account during testing of the dome.
6.0 **Vendor’s Scope of Supply**

The following items come under the scope of vendor.

Any jigs, fixtures, gauges and tooling necessary to complete the manufacture, assembly, inspection, testing and erection of dome and building will be under the scope of the vendor.

Grouting of the foundation bolts of the enclosure structure on the concrete columns at level of first floor.

7.0 **Co-ordination with Subvendors / Subcontractors**

After placement of order to vendor for manufacturing, supply and erection of various structural assembly of dome and enclosure building, vendor will approach IIA for their queries on technical and commercial matters.

All technical queries are to be resolved by bidder with intimation to IIA. On the matters where concurrence of IIA is essential, the same should be communicated to Vendor through IIA only. Approval of vendors data sheets, specifications, catalogues / GA drawings / makes of components and fabrication drawing etc. shall be approved by IIA.

Visits to any vendor or sub vendors for technical discussions, inspect / testing or resolving any other technical matter, shall be done in co-ordination with IIA. Representatives of IIA also may visit the vendors works as and when required during manufacturing.

8.0 **Supplier’s Warranty**

Vendor shall be fully responsible for the manufacturer’s warranty of 1 years in respect of manufacturing, quality and functioning of all the complete scope of work covered by the offer. Vendor must warrant complete scope of work against any manufacturing defects during the warranty period and also he shall provide replacement of defective components at the installed site, at no additional charge to the IIA.

9.0 **Dispatch Clearance**

After completion of dome & enclosure structure fabrication, dome and building components/assemblies, dome and shutter drives, electrical panels, cables, instruments etc. will be offered for final inspection at manufacturers works. Representatives of IIA will also witness the final inspection / testing of material/subsystems. On satisfactory completion of inspection and testing IIA shall issue dispatch clearance to vendor.

10.0 **Deliverables**

10.1 Operation manuals and test certificates for all the bought out items such as gear boxes, motors, electrical schematics if any etc.

10.2 The safety Plan/ Procedure have to be provided by the vendor also including precautions, specific to the dome installation, maintenance, general safety
requirements and safety equipments required

10.3 Servicing procedures including trouble shooting techniques shall be provided. The procedures shall also include all technical information provided by sub-component manufacturers, consumable servicing materials specifications (eg. Grease, oil etc.) as well as clearly written disassembly/assembly instructions for the major components of the dome.

10.4 The procedures shall also include a list of all special tools and additional spares required.

10.5 A servicing schedule for assemblies requiring regular maintenance shall also to be provided.

10.6 Vendor shall also provide a detailed procedure for unpacking, transportation details, installation and testing of dome on VBO, Kavalur site.

11.0 Eligibility Criteria:

Vendor shall have adequate background and experience over at least the past five years in doing medium to heavy mechanical fabrication works and site erection, and have exposure to simulation of drive mechanism.

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, work orders etc. to demonstrate the required technical competence for this job. The list of equipments to be placed at site during erection of the enclosure should also be submitted.

The vendor should be prepared to offer a plan for comprehensive on-site warranty for the manufactured / fabricated parts and assembled structure of the dome, dome & shutter drive assembly, and items of enclosure.

Vendor must comply with all the above mentioned criteria. Non-compliance of any of the criteria may lead to rejection of the offer. Photocopies of relevant documents / certificates should be submitted as proof in support of the claims made. IIA reserves the right to verify / evaluate the claims made by the vendor independently.

12.0 Inspection of vendor's premises

As a part of evaluation criteria, the IIA 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’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 IIA during the course of manufacture.

Providing necessary facilities, instruments and tooling for the quality surveillance and inspection of components, assemblies and alignments during inspection.
13.0  **Payment Terms:**

Payments for the work will be made according to the following schedule, with each payment stage linked to a milestone in the contract. Vendor / Contractor’s Bill upon completion of each milestone will be passed for payment only after the stores have been received, inspected and satisfactorily accepted by the Engineers at site.

20% advance payment on receipt and acceptance of Purchase Order (PO). The advance payment will be made against submission of the bank guarantee for the equivalent value with validity till the completion of the project and executing an agreement duly signed by both parties. The balance 80% in 5 stages of payments payable on pro-rate basis duly certified by the indenting officer. The details of stage payments are as follows:-

01. 15% of the value on readiness of material for fabrication /machining etc. - by 6th week from PO

02. 15% of the value on completion of fabrication/machining of dome/enclosure parts - by 12th week from PO

03. 15% of the value on completion of procurement of all the bought out items and shop Assembly - by 16th week from PO

04. 15% of the value on completion of erection of dome and enclosure at site.- by 22nd week from PO

05. 20% of the value on completion of testing and commissioning of the dome and satisfactory performance & acceptance by our engineers. - by 26th week from PO
14.0 **Liquidated Damages**

Notwithstanding the IIA's right to cancel the order, 0.5% of the order value per week would be payable to the IIA 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 work ordered. IIA reserves it's right to recover these amounts by any mode such as adjusting from any payments to be made by the IIA 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 & IIA. The reason for delays shall be recorded for justification by both the parties.

15.0 **Time of Completion**

The entire work shall be completed within 6 months after seven days from the date of awarding the contract. Time schedule shall be the essence of contract. The vendor shall prepare plan of work in consultation with IIA to complete the job as per the schedule. IIA reserves the right to impose a penalty clause for delay in completion of the work and such clauses shall be specified in consultation with the chosen vendor, in the contract to be signed after placement of order.

16.0 **Material Approval**

The material to be procured by the vendor, both at the vendor's premises as well as at the site, shall be approved by IIA before being put to use in the work. In case during execution of the work, any material being used in the work is found to be not as per the specifications, IIA may notify the vendor and such material is to be replaced by the approved material at the vendor's cost. All the necessary test certificates, test reports etc shall be produced from time to time. If any material is found to be not tested according to ISI standards or equivalent, the same shall be tested at approved/reputed laboratory by the vendor at his own cost.

17.0 **Penalty and Termination of The Contract**

In the event of supplier’s failure to fulfill any of the terms and conditions of this contract including its failure to complete the contract within the stipulated period, the IIA shall without prejudice to other remedies available to it under the law enforced in the State be competent to impose all or any of the following penalties on the vendor, in addition to the forfeiture of the security deposit in full or in part as the IIA may deem fit: termination of the contract after 30 days clear notice to the vendor, if no proper response from the vendor.
Annexure A

SP 336-03  1.3m Telescope – Enclosure Technical Specifications

Prepared by M/s Tekcons, Secunderabad.

CONTENTS

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

*Enclosure*

1.3 m Telescope is housed in an octagonal enclosure which is covered on the top by an octagonal steel dome. The ground floor is of r.c.c and brick construction, 3 m in height and 3.5 m above the ground level. The telescope is mounted on an r.c.c pier rising from ground level to 13.7 m above. The pier is located at the centre of the enclosure. Apart from ground floor at 0.5 m and floor at 3.5 m level, floors are located at 6.5 and 9.5 m levels. These and the observation floor at 13.7 m are part of the steel structure made up of steel sections and plates.

Enclosure is as per Drg. No. 33602-000002.

*Dome, Structure, Railing, Maintenance Structure and Hatch Cover are in the scope of this specification.*

**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 16 wheels with spring suspension. 16 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 and it is held in position by clamps fixed to the ring beam on the top of the columns in the steel structure. The dome is driven by a pair of friction rollers. Each roller is driven by DC motor through a planetary gear reduction unit. The speed of rotation of the dome can be varied by varying the speed of the motor.

Each shutter is supported by a pair of wheels at the bottom and top ends which roll on rails fixed on the supports welded to the dome structure. 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 a DC motor through a planetary gear box.

*Dome is fitted with seven windows on the seven vertical faces of the structure. The window shutters are operated by motors powered by a cable running around the dome structure.*

*A 2 ton hoist is provided in the dome. It runs on a radial beam on the centre line of dome opening and extending away from the edge of the opening. It is operated through a pendent hanging from the dome.*

*Two ventilation fans are fitted on the sloping faces of the dome located opposite to the opening and on either side of the central sloping face.*

*Power to operate the shutter motors, window shutters, crane and ventilation fans and lighting on the dome is to be supplied through cables taken from a power supply points*
located on the moving structure of the dome. Power to the circuit will be available only
when the dome is stationary. The power is supplied by plugging in the cable supplying the
power to the receiving sockets fitted on the dome.

1.1. **Dome (Drg. No. 33601-200003)**

The Dome consists of the following assemblies.

1. Dome-General Assembly  
   Drg. No. 33601-200003
2. Shutter Assembly  
   Drg. No. 33601-210007
3. Shutter Wheel Assembly  
   Drg. No. 33601-211008
4. Shutter Drive Assembly  
   Drg. No. 33601-212009
5. Dome Drive Assembly  
   Drg. No. 33601-220010
6. Encoder Assembly  
   Drg. No. 33612-290011
7. Dome Wheel Assembly  
   Drg. No. 33601-230012
8. Dome Guide Roller Assembly  
   Drg. No. 33602-240013
9. Dome Guide Roller Assy-Anti lift  
   Drg. No. 33602-250014
10. Lightning Roller Assembly  
    Drg. No. 33602-260015
11. Dome Cladding  
    Drg. No. 33601-270016
12. Dome Structure  
    Drg. No. 33601-280017

The Dome is octagonal in shape and made of tubular steel sections (mostly square tubes).  
A ring girder (box section made of plates) supports the eight vertical columns forming 
octagonal structure. The octagonal pyramid on top is truncated on the opening side. It  
consists of two main arches located at equal distance from the centre of dome and which 
rise from the top of the circular ring girder and extend up to the top rail support of the  
shutter at 22°. The opening formed by the main arches and top rail support provides the 
window for observations. The rest of the vertical and pyramid of the structure is made of  
eight vertical and inclined diagonal members connected by radial and circumferential  
members.

The dome is covered by aluminium sheet cladding which envelops the dome structure  
including ring beam, wheel assemblies etc. Aluminium cladding sheet is riveted to  
supporting structure made up of steel tubes. Structure for cladding is connected to steel  
structure of dome through cleats (square tubes).

7 windows with motorised aluminium shutters are fitted in the dome/cladding structure  
for ventilating the dome when necessary.

The ring beam of the dome structure is supported on sixteen wheels having spring  
suspension to ensure smooth and silent rotation of dome. The wheels run on rail fixed on
the top of the ring beam of the structure. The wheel is conical in shape. The angle of apex of the cone is the angle subtended by the diameter of the wheel at the centre of the dome. The axis of the wheel is tilted to make contact with the flat head of the rail.

The rail is clamped by steel plates at regular intervals. The clamps are fixed to the ring beam of the structure with screws.

Concentric rotation of dome on rails is ensured by sixteen pair of guide rollers which roll along the sides of the rail.

The dome is fitted with anti-lifting locks to prevent lifting of the dome off the rail track in extreme weather conditions.

The opening in the dome is closed by a pair of shutters. The shutter rail supports are welded to dome structure.

The following drawings present the structural details of the dome:

<table>
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<tr>
<th>Dome Structure</th>
<th>Drg. No. 33601-280017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dome Cladding</td>
<td>Drg. No. 33601-270016</td>
</tr>
</tbody>
</table>

Apart from the main structural members other structural supports, tubes and plates are to be welded while assembling or installing the dome and shutter wheels/rollers and drive assemblies. The details of such items are given in the assembly drawing for the Dome. These items shall be welded only after assembling/installing the sub-assemblies and verifying their correct location and alignment for smooth operation of dome and shutters. Full welding shall be done only after ensuring smooth operation through trial runs.

Sheet metal louvers are welded to shutter and dome structure to prevent entry of birds and leakage of rain water into the dome when the shutters are closed. The gap between moving and stationary louvers shall not exceed 20 mm. No gaps that allow seepage of water into the dome shall be left between the louvers and the supporting members of the dome or shutter. Suitable sealant shall be applied at the joint between the cladding sheet and members.

1.1.1. Dome Wheel Assembly (Drg. No. 33601-230012)

The conical wheels of the dome are keyed to shaft running in spherical roller bearings. The axis of the shaft is tilted to match the wheel with head of the rail. The bearing housings are bolted to a base frame which is fitted with a pair of springs and a vertical pin to carry the vertical load and horizontal loads respectively. The wheel assembly is inserted between the rail and ring beam of the dome. After adjusting to proper height and aligning the axis of the wheel the plate is welded to the ring beam in position.

1.1.2. Guide Roller Assembly (Drg. No. 33602-240013/250014)

Sixteen 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 eight of the guide roller assemblies (drg. no. 33602-250014) alternatively.

1.1.3 Dome Drive Assembly (Drg. No. 33601-220010)

A pair of rubber lined rollers drive the dome by friction. Each roller is driven by a planetary gear reduction unit powered by an Ac servo 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 holding the drive is welded to the ring girder on the top of structure. Two drives each capable of independently driving the dome and located at diametrically opposite ends move the dome.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Speed of rotation of dome</td>
<td>0.2 rpm</td>
</tr>
<tr>
<td>Ratio between dome and roller</td>
<td>9020/754</td>
</tr>
<tr>
<td>Speed of rotation of roller</td>
<td>2.4 rpm</td>
</tr>
<tr>
<td>Rated speed of DC motor</td>
<td>1750 rpm</td>
</tr>
<tr>
<td>Ratio of planetary gear unit</td>
<td>1:252</td>
</tr>
<tr>
<td>Operating speed of motor</td>
<td>603 rpm</td>
</tr>
<tr>
<td>Torque on motor (start)</td>
<td>18.4 Nm</td>
</tr>
<tr>
<td>Running torque</td>
<td>8.8 Nm</td>
</tr>
<tr>
<td>Load Inertia on motor shaft</td>
<td>31 Nmsec²</td>
</tr>
</tbody>
</table>

The motor speed is varied. The dome shall have a soft start of minimum 3 seconds for accelerating to operating speed. Both motors shall operate in synchronous mode at same speed.

1.1.4 Encoder Assembly (Drg. No. 33612-290011)

Encoder is coupled to the shaft of a roller driven by the roller driving the dome.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter of the roller</td>
<td>100 mm</td>
</tr>
<tr>
<td>Ratio between dome/encoder</td>
<td>90.2</td>
</tr>
<tr>
<td>Accuracy of positioning of dome</td>
<td>0.5⁰</td>
</tr>
<tr>
<td>Accuracy on encoder roller position</td>
<td>45.1⁰</td>
</tr>
<tr>
<td>Resolution of encoder</td>
<td>4.51⁰ or better</td>
</tr>
<tr>
<td>Precision of encoder</td>
<td>10 bit/1000 ppr or better</td>
</tr>
</tbody>
</table>

Encoder is coupled to the roller shaft through flexible torsionally rigid coupling.
1.1.5 Shutter Wheel Assembly (Drg. No. 33601-211008)

Shutter is fabricated from square section steel tubes and plates covered by aluminium sheet metal. Drawing no. 33611-210068 presents the construction details of the shutter.

Each shutter is supported by two wheels at the top and lower ends. Shutter wheels are flanged wheels running on rectangular bars. The bottom and top rails support and guide the shutter during it 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 avoid 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.

1.1.6 Shutter Drive Assembly (Drg. No. 33601-212009)

Both top and bottom end of each shutter is traversed by a screw and nut mechanism. Each shutter is connected to nuts by arms welded to top and bottom ends. While the nut at the drive at top end is rigidly connected to the shutter and nut at the bottom end is connected to the shutter through a stiff spring. This will eliminate jamming in case of any mismatch at the start of the movement of the shutter. Both the nuts of the drive at each end are moved by a common screw having left and right hand threads. The screw is driven by an 24V DC motor through a planetary gear unit.

Both the motors driving the top and bottom screws shall operate simultaneously with a common control system. Speeds of both motors shall be set to be identical

The shutter drives are mounted on the structure of dome.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of traverse for each shutter</td>
<td>1110 mm</td>
</tr>
<tr>
<td>Speed of traverse</td>
<td>3.9 m/min</td>
</tr>
<tr>
<td>Ratio of gear unit</td>
<td>3.75</td>
</tr>
<tr>
<td>Speed of rotation of DC motor</td>
<td>1800 rpm</td>
</tr>
<tr>
<td>Operating speed of motor</td>
<td>433 rpm</td>
</tr>
<tr>
<td>Motor 0.75 HP, 1800 rpm, 24 V Baldor Make</td>
<td>Flange mounted</td>
</tr>
</tbody>
</table>

Both top and bottom drive motors shall operate in synchronous mode at same speed.

1.1.7 Louvers (Drg. No. 33601-200003 and 210007)

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.

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. Once the steel plates are welded in position and found satisfactory aluminium cladding sheets shall be riveted.

1.1.8 Rails (Drg. No. 33401-000001)

Rails shall be laid to form a circular track of specified mean diameter. 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. The clamps/retainers are fastened to a plate supporting the rail through screws. The plates supporting the rail are located at regular intervals along the track and are welded to the ring beam on the top of the steel structure.

The joint between the segments of the rail shall be closed by weld.

The circularity and radius of different segments and the level of the rail top shall be ensured before welding the supporting plate to the structure.

1.1.9 Hoist

2 Ton motorized hoist is to be supplied and installed in the dome. ISMB 250 has been provided in the dome structure for installing the hoist.

Specifications for the hoist

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated load</td>
<td>2 Ton</td>
</tr>
<tr>
<td>Lift</td>
<td>17 m</td>
</tr>
<tr>
<td>Travel</td>
<td>1.8 m</td>
</tr>
<tr>
<td>Hoisting speed</td>
<td>5 m/min</td>
</tr>
<tr>
<td>Travelling speed</td>
<td>5 m/min</td>
</tr>
<tr>
<td>Head room</td>
<td>750 mm</td>
</tr>
<tr>
<td>(bottom of hook to centre of travelling rollers)</td>
<td></td>
</tr>
<tr>
<td>Load chain</td>
<td>Grade 80, tested and certified</td>
</tr>
<tr>
<td>Applicable code</td>
<td>Hercules</td>
</tr>
</tbody>
</table>
Machined hardened steel gears and load chain wheel.

Ergonomically designed hanging pendent. Contractor shall provide suitable socket on the ring girder of dome (above the dome drive roller) for keeping the pendent when not in use.

Brake, motors, gearbox and panel unit shall be easily accessible. FSB brakes shall be provided.

Hoist shall be tested and certified for lifting 2.5 tons load through complete lift.

Hoist shall be tested at rated load for full traverse.

Both lift and radial traverse are to be motorized.

The hoist shall be operated by a pendant hanging from the hoist. Power for the hoist will be supplied from a stationary power point on the steel structure through trailing cable of length sufficient to permit the radial movement of hoist and rotation of dome through 180°.

A cable dispensing drum for the hoist power cable shall provide required length of cable for the hoist while the dome is rotated.

1.1.10 Windows. (Drg No. 33601-200 003)

7 motorised window shutters fixed in the dome structure shall be procured as per the specification and installed.

Specifications for Windows in Dome.

Size

1200 wide x 1400 high

No.

7

Survival wind (closed)

44 m/sec

Operational Wind

30 m/sec

Material of Construction

Aluminium with colour anodizing (25 microns class 1)

Colour – White

Operation

Motor driven with E.M. Brake for stopping at any position

Speed

6 m/min

Control

Remote control

Push button

Manual in case of motor or power failure
Limit switch/Sensor control at closed/fully open position

Power Supply 230 V or 430V AC

Spares 1 no. drive along with motor

Scope of work Supply, erection, testing and commissioning

Make M/s Gandhi Automation Pvt. Ltd., Mumbai
Ph. (022) 6672 0200/www.geapl.co.in or equivalent

1.2. **Structure (Drg. No. 33601-100002)**

Rotating dome is supported by a rail fixed on the top of the ring beam of the steel structure. The steel structure is the enclosure covering the levels 3.5 m to 13.7 m. The columns are bolted on the top of the r.c.c columns extending 500 mm above the 3.5 m level (r.c.c slab on ground floor). Steel structure provides for lift shaft to house lift going from 3.5 m level to 9.5 m. It also supports the steel staircases to the floors at 6.5, 9.5 and 13.7 m level. The structure is covered by aluminium sheet/stainless steel wire mesh bolted/riveted to steel frame extending from the main structure. Floors at 6.5 m and 9.5 m levels are made of steel grating. The wire mesh panelling and the grating on the floor permit adequate ventilation of the structure minimising accumulation of heat during the day time. The structure is fitted with doors for entry to 3.5 m level and to access the open terrace above the extended portion of the ground floor. Railing around the periphery of the terrace is also part of the steel structure.

Structure consists of the following sub-assemblies.

1. **Structure – General Assembly** Drg. No. 33601-100002
2. **Columns and Beams** Drg. No. 33601-111018
3. **Staircase 3.5 m to 6.5 m** Drg. No. 33601-112019
4. **Staircase 6.5 m to 9.5 m** Drg. No. 33601-113020
5. **Staircase 9.5 m to 13.7 m** Drg. No. 33601-114021
6. **Floors** Drg. No. 33601-110022
7. **Panel Assembly** Drg. No. 33601-120023
8. **Lift shaft** Drg. No. 33601-111024

1.2.1.**Columns Beams (drg. no. 33601-111018)**

8 columns defining the octagon of the structure are fixed on the top of concrete columns at 4 m level above the ground. The columns are fixed by grouting the anchor bolts in the pockets provided in the r.c.c. Columns.
1.2.2 Lift Shaft (drg. no. 33602-111024)

The columns of the lift shaft are welded to the steel plates inserted in the r.c.c columns at 3.5 m level. These columns are connected to the beams at levels 4.4, 6.485, 9.485 and 13.694 levels.

1.2.3 Stair Cases (Drg. nos. 33601-112019,113020 and 114021)

Stair cases are provided by taking support of the beams and columns to reach floors at 6.5, 9.5 and 13.7 m levels. One of the channels and columns for the staircase starting from 3.5 m level are welded to the plates inserted in the slab at 3.5 m level.

1.2.4 Floors (Drg. no. 33601-110022)

Floors at 6.5 m and 9.5 m level are made of 15 mm thick steel grating and the floor at 13.7 m level is made of 6 mm thick steel plate (plain).

1.2.5 Panel (Drg. no. 33601-120023)

A frame structure made of T, angle, tubular and channel sections surrounds the beams and columns of the structure and is covered by stainless steel wire mesh or aluminium sheet.

1.3 Railing (Drg. no. 33612-000025)

Railing around the terrace and hand rail for stairs from ground level to 3.5 m level is included in the scope of this tender. The vertical pipes of the railing shall be fixed to the slab/steps with anchor bolts.

1.4 Maintenance Structure (Drg. No. 33612-500027)

A monkey ladder and a maintenance platform inside the pier are used to erect and maintain the drain oil pipe line from the bearings of the telescope.

1.5 Hatch Cover (Drg. no. 33613-000026)

Aluminium hatch cover is provided to cover the hole in the top surface of the pier.

1.6 Drives, Motors and Control Systems

The following parts and systems, including electrical and electronic works, are part of the scope of the vendor (some of which are already covered in the lists of parts and assembly drawings for the dome).

1.6.1 Gear Box and coupling for the shutter drive as specified in the lists of parts. (Motor for shutter drive is excluded from the scope of supply)

1.6.2 Limit switches, actuators and suitable bracket for mounting and power and control cabling to the motor/control panel/limit switches for the shutter as per site requirement. The contractor shall mount the limit switches and the actuators such that the shutter traverses the specified distance and stops in open/closed position

One limit switch for the end of traverse both at open and closed positions as well as the top
and bottom ends for each shutter shall be provided. In all eight limit switches shall cover all limiting positions. Actuation of any limit switch shall cut off power supply to both top and bottom drives simultaneously.

1.6.3. Gear Box, coupling and motor (permanent magnet DC/AC servo motor), and speed control system/panel and cabling to from motor and control panel for dome drives.

1.6.4. Incremental encoder, coupling and display system for monitoring the speed of rotation of dome.

1.6.5. Motor powered windows with rolling shutters (made of aluminium) suitable for remote and push button operation. Make M/s Gandhi Automation Pvt Ltd, Mumbai or equivalent.

1.6.6. Cable and cable dispensing drum for the hoist so that hoist can be used for nearly 180° rotation of dome due east or west of North South axis.

2. Drawings

Appendix I contains lists the drawings covering the assemblies/subassemblies.

Appendix II contains details of parts specifying bought outs, proprietary and hardware parts.

Appendix III contains the Bill of Materials referred to in the drawings.

The drawings as well as this specification form composite technical specifications for the Enclosure containing Structure, Dome and Railing of the 1.3 m Optical Telescope. In case of conflict between specifications the vendor shall obtain the clarification from the Purchaser.

Even though drawings give weights of the parts and the assemblies bidder/contractor can not question any deviations in weights from the manufactured/executed works due to omission or errors in the same and they can not claim any compensation for the same.

Part and assembly drawings contain notes giving instructions/guidelines for manufacture, assembly and erection. The contractor shall ensure that these are understood by the work force actually executing the work and in case of any doubt clarification shall be obtained from the purchaser. Any defect in the work due to non-compliance with the guidelines may lead to rejection of the work executed.

3. Manufacture and Assembly

3.1. Raw Materials

Raw materials used for manufacture shall conform to 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 case of plates/bars 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. 1 to 1.5 mm gap shall be maintained for all structural members joining to another member or plate.

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 works (wherever possible) is necessary to finalise dimensions and minimise work at site.

7. Members of the steel structures shall be cut/shaped to meet the requirement of the already erected members so that the geometry, alignment, level and specifications of the assembly are maintained. The sizes of members given are as per design dimensions and the members may have to be cut longer or shorter than given in the drawing.

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 or horizontal members and the arches shall be verified for proper fit up 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/rotating parts 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/proofof assembly of the components in sub-assemblies 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, bearings 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 unmachined surfaces of the components and structural shall be painted. Purchaser would specify the colours of paint to be used.

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.

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

All painting of steel members in dome shall be completed before taking up fixing cladding sheets by riveting or bolting. Fixing of stainless steel wire mesh and aluminium sheets in the panel for structure shall be taken up only after completing painting of all steel members including those in the panel.

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 (if and wherever required), 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.**

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 Kavalur from Vaniyambadi in Tamilnadu.

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 structure is to be erected on the RCC columns at 3.5 m from the ground.

**Erection of Structure**

1. Eight columns of the structure shall be erected and approval of the client obtained before grouting the foundation bolts. A gap of 50 mm below the base of the column shall be left for grouting later.

   Octagon beams with plates/gussets in position as well 150 mm beams connecting the opposite columns shall be tack welded. Verticality and location of columns and beams in floor levels (whether horizontal or correctly located) shall be verified. If necessary, adjustments shall be made.

   Quick cure grout mix made by M/s Fosroc Chemicals, shall be used for grouting.

2. The structure comprising of beams and columns (as per the drawing for the same), including the lift shaft, 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.

   Filling the 50 mm gap below the base with grout shall be taken up only after obtaining clearance/approval after tack welding.

3. After completing all welding of the beams and columns the same shall be offered for inspection and clearance obtained for taking up further work.
4. Weld fit-up for ring beam on the top of columns shall be offered for inspection before full welding. Top surface of the ring beam shall be horizontal within 3 mm over complete perimeter. The joints between the different segments of the ring beam shall be welded only after clearance by the purchaser.

5. Floor supporting members shall be tack welded and offered for inspection for each floor. The same shall be offered for inspection and clearance for further work after completion of full welding.

6. Staircases shall be erected and offered for inspection in tack welded stage and again offered for inspection after completion of all welding.

7. Gratings and plates forming the floors shall be welded in position.

Fitting and welding of railings and panels covering the structure shall be taken up only after completion of erection of dome and trial run.

**Dome**

8. Rail supporting the wheels of the dome shall be laid at specified diameter concentric to the ring beam. Diameter of rail shall be within ± 3 mm of the specified value. Top of rail surface shall be horizontal within 3 mm. After inspection and clearance the supporting plates below the rail shall be welded to the ring beam.

9. Ring beam for the dome shall be erected on supports placed on either side of the rail such that the specified gap between the structure ring beam and dome ring beam is maintained. The joints between the different segments of the ring beam shall be welded only after clearance by the purchaser.

10. Eight columns forming the octagon of the dome shall be erected and kept in position by tack welding the tie members forming the bottom octagon and tack welding columns to the dome ring beam along with gussets. The columns shall be offered for inspection before full welding.

Structure for the cladding shall be taken up only after completing the structure of the dome and installation of the shutter.

Window frames for fixing the shutters shall be erected to ensure that the shutters can be fitted properly and present an aesthetic view. Tack welding and fitting of shutter for one window frame shall be completed and approval obtained before taking up the erection of balance 6 window frames.

11. Aluminium Sheet metal covering of the dome shall be taken up only after obtaining approval for the structure of the dome.

12. The shutter supports (top and bottom) shall be kept in position and offered for inspection. Full welding of supports shall be carried out only after installation of
shutter and wheel assemblies and satisfactory movement by shutter drive.

13. The shutters can only be completed at site because of the size. Completed shutters shall be offered for inspection before installing on the dome.

14. 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.

15. 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 before installation of motors and operating with the same.

The motors with gear boxes shall be coupled to the screw and nut mechanisms at the top and bottom end of the shutters. Motors of both top and bottom drives shall be operate simultaneously with no time lag through a single control system.

16. Cladding structure shall be installed following the guidelines.

Riveting of aluminium cladding shall be taken up only after installation of dome wheels, guide rollers etc. and trial run of dome.

17. All the wheels and guide rollers for the dome shall be kept in the specified locations in between the temporary supports for the dome.

Radial 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 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.

18. 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 (through small angles) shall be made. Only after satisfactory rotation of dome brackets in the drive assemblies shall be welded to the ring beam in the steel structure.

Assembly of drives for dome is required to be dome for the completion of the assembly of wheels, guide rollers and locks.
19. After satisfactory run of the dome, aluminium cladding of the dome and shutters shall be installed by riveting.

20. Fitments of louvres on the dome structure and shutters shall be completed and offered for inspection before taking up full welding or bolting or riveting.

21. 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.

22. Limit switches shall be kept at the end of traverse for both the open and closed positions of shutters which cut off the power to shutter drive before the dead end is reached.

23. 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.

24. 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 structure for the enclosure should be fabricated and erected following good fabrication practices. Vertical columns shall be straight and erect and the beams forming the floor shall be horizontal. Gratings and plates in the floor shall be cut and laid neatly and straight. Wherever necessary they shall be cut to clear the gussets or railing to present neat and clean cut edges. Panels surrounding the structure shall be elegant and aesthetic in appearance and form a regular octagonal shape. Lift shaft inside the structure shall meet the requirement for satisfactory installation and operation of electric lift.

Uniformity of rise of step in all staircases shall be maintained.

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 structure.

Water proof condition shall be demonstrated by conducting rain water test by spraying water at necessary pressure and flow rate on the cladding, louver joints and shutters.

The shutters shall move uniformly at both the ends and automatically stop at the end of traverse.
On receipt of order vendor shall prepare a ‘Quality Assurance Plan’ covering raw material procurement to testing and commissioning of enclosure at site. The plan shall include check points where inspection and approval of clients needs to be obtained from purchaser before proceeding with further processing or work. The plan shall be submitted to purchaser for approval. After receipt of the comments if any from purchaser the vendor shall incorporate such comments and submit the final plan to purchaser. Vendor shall inform the purchaser well in advance of the check point to arrange for the inspection at works or site. Vendor in no case shall proceed with further processing/work without explicit clearance from purchaser.

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.

4. All square tubes and any other sections procured shall be straight and regular in cross section with no objectionable defects. Vendor shall submit certificates from reputed testing labs for chemical composition of raw material as stipulated in the quality assurance plan.

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 subjected to check as specified in the drawing viz. dye-penetrant, 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. **Heat Treatment, Residual Stresses and Stress Relief**

Components requiring hardening and tempering shall be heat treated in reputed heat treatment works. Chemical composition, time temperature chart for hardening and tempering and hardness test report shall be submitted. This procedure shall be followed without fail for all the springs used in the dome

Residual stress shall be kept to a minimum to ensure dimensional stability and minimum stress corrosion. Excessive force shall not be used to achieve a fit. Welding shall be performed in such a manner as to control and minimize distortion.

Stress relieving shall be carried out wherever required as per the ASME Code.

7.4. **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.

7.5. **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.
7.6. **Proprietary Components and Hardware (ref. Appendix II of Annexure A)**

Proprietary and hardware parts of the dome, which the vendor would procure, shall be from reputed manufacturers made to the specification given. The following guidelines shall be followed. All such items 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.

3. Where a specific manufacturer name is specified the vendor shall seek approval of the purchaser if the proprietary products of different make are to be procured. Purchaser reserve the right to reject products of alternate suppliers if prior approval is not obtained.

7.7. **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. **All sections and plates that are gas cut shall be ground minimum 1 mm beyond the cut surface before use in the weld fit up.** The edges shall be ground smooth and straight.
8. All members in the dome and enclosure structure shall be inspected for location and orientation to match the geometry and shape at weld fit up stage.

9. After welding at site the welds shall be dye checked at all critical joints and any joints randomly identified by the client.

10. All welds of the dome and shutter which offer protection shall be leak proof against rain water.

11. All movements/rotations shall be checked for smooth and silent operation. No objectionable vibrations shall be present.
Appendix I  (of Annexure A) List of Drawings

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Component Drawings

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Axle  
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Dome Encoder Assembly

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Gusset 2  
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Gusset 3  
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Cladding 1&3  
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Inclined tube 1  
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**Columns and Beams**

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<td>33614-111198</td>
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**Staircase 3.5 m to 6.5 m**

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<tbody>
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<td>Channel</td>
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<td>33614-112205</td>
<td>Channel</td>
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<td>33614-112208</td>
<td>Landing tube 2</td>
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<td>33614-112209</td>
<td>Step</td>
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<td>Step supporting plate</td>
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<tr>
<td>33614-112211</td>
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<td>Gusset 3</td>
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**Staircase 6.5 m to 9.5 m**

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<tr>
<td>33614-113223</td>
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**Staircase 9.5 m to 13.7 m**

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<td>Channel</td>
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## Floors

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<td>33614-110256</td>
<td>Gusset 2</td>
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<td>Plate 13.7-11</td>
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## Panel Assembly

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<td>Channel 125</td>
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<td>33614-120263</td>
<td>Vertical Tee 1</td>
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<td>33614-120264</td>
<td>Horizontal Tee 1</td>
<td>336120264</td>
</tr>
<tr>
<td>33614-120265</td>
<td>Horizontal Tee 2</td>
<td>336120265</td>
</tr>
<tr>
<td>33614-120266</td>
<td>Horizontal Angle 75</td>
<td>336120266</td>
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<tr>
<td>33614-120267</td>
<td>Vertical Tee 2</td>
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<td>33614-120268</td>
<td>Cladding 1</td>
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</tr>
<tr>
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<td>Flat 1</td>
<td>336120269 R1</td>
</tr>
<tr>
<td>33614-120270</td>
<td>Flat 2</td>
<td>336120270 R1</td>
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<td>33614-120271</td>
<td>Flat 3</td>
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<td>Angle</td>
<td>3361270152 R1</td>
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<tr>
<td>33614-120277</td>
<td>End Cover 2</td>
<td>336120277 R1</td>
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Appendix II (of Annexure A) – proprietary & bought out parts

Below are the specifications for proprietary or bought out items in the enclosure. The contractor shall obtain approval of the purchaser after submitting complete specifications of the items given by the respective supplier before procuring the same. Contractor shall procure only those makes specified in the enclosed specification if the same is insisted by the purchaser.

1.0 Specifications for Windows in Dome. (Drg No. 33601-200 003)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
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<tbody>
<tr>
<td>Size</td>
<td>1200 wide x 1400 high</td>
</tr>
<tr>
<td>No.</td>
<td>7</td>
</tr>
<tr>
<td>Survival wind (closed)</td>
<td>44 m/sec</td>
</tr>
<tr>
<td>Operational Wind</td>
<td>30 m/sec</td>
</tr>
<tr>
<td>Material of Construction</td>
<td>Aluminium with colour anodizing (25 microns class 1)</td>
</tr>
<tr>
<td>Colour</td>
<td>White</td>
</tr>
<tr>
<td>Operation</td>
<td>Motor driven with E.M. Brake for stopping at any position</td>
</tr>
<tr>
<td>Speed</td>
<td>6 m/min</td>
</tr>
<tr>
<td>Control</td>
<td>Remote control</td>
</tr>
<tr>
<td></td>
<td>Push button</td>
</tr>
<tr>
<td></td>
<td>Manual in case of motor or power failure</td>
</tr>
<tr>
<td></td>
<td>Limit switch/Sensor control at closed/fully open position</td>
</tr>
<tr>
<td>Power Supply</td>
<td>230 V or 430V AC</td>
</tr>
<tr>
<td>Spares</td>
<td>1 no. drive along with motor</td>
</tr>
<tr>
<td>Scope of work</td>
<td>Supply, erection, testing and commissioning</td>
</tr>
<tr>
<td>Make</td>
<td>M/s Gandhi Automation Pvt. Ltd., Mumbai</td>
</tr>
<tr>
<td></td>
<td>Ph. (022) 6672 0200/www.geapl.co.in (or equivalent)</td>
</tr>
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2.1 Gear Boxes for Shutter and Dome Drives

For Shutter (Drg No. 33601-212 009)

<table>
<thead>
<tr>
<th>Type</th>
<th>Planetary with minimum backlash</th>
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<tbody>
<tr>
<td>Ratio</td>
<td>3.75</td>
</tr>
<tr>
<td>Torque</td>
<td>8 Nm</td>
</tr>
<tr>
<td>Service factor</td>
<td>1.0</td>
</tr>
<tr>
<td>Input</td>
<td>0.75 HP 1800 RPM 24 V DC motor (free supply) Baldor Flange mounted – 34PM NEMA 56C TEFC</td>
</tr>
<tr>
<td>Construction</td>
<td>Foot mounted with solid output shaft and hollow input suitable to fix the flange mounted motor</td>
</tr>
<tr>
<td>Orientation</td>
<td>Axis of output shaft horizontal</td>
</tr>
<tr>
<td>Mounting</td>
<td>Footmounted</td>
</tr>
<tr>
<td>Model</td>
<td>1065 L Magtorq Pvt. Ltd., Hosur, <a href="http://www.magtorq.com">www.magtorq.com</a></td>
</tr>
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</table>

2.2 For Dome (Drg No. 33601-220 010)

<table>
<thead>
<tr>
<th>Type</th>
<th>Planetary with minimum backlash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio</td>
<td>252</td>
</tr>
<tr>
<td>Maximum load torque</td>
<td>3933 Nm</td>
</tr>
<tr>
<td>Operating speed</td>
<td>603 rpm (input)</td>
</tr>
<tr>
<td>Service factor</td>
<td>1</td>
</tr>
<tr>
<td>Orientation</td>
<td>Axis of output shaft vertical</td>
</tr>
<tr>
<td>Input</td>
<td>Suitable for flange mounting</td>
</tr>
<tr>
<td>5 HP 1760 RPM DC motor (to be supplied) Baldor Flange mounted – CD 1805R or 1500 rpm 20 Nm torque (Siemens FT6102-8AB7)</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>Foot mounted with solid output shaft and hollow input suitable to fix the flange mounted motor</td>
</tr>
</tbody>
</table>
3  **Floor Grating (Drg No. 33601-110 022)**

Load capacity 200 Kg/m²

Height 15 mm (max)

Opening width 25 mm (max)

Material Steel

Grating shall be galvanized.

4  **Wire Mesh in Panel (Drg No. 33601-120 023)**

Material 304 SS

Wire gauge 18

Mesh 4/sq cm

5  **Bearings**

All ball and roller bearings to be used in the dome assemblies shall be of SKF or FAG make.

6  **Hoist (Drg No. 33601-280 017)**

Rated load 2 Ton

Lift 17 m

Travel 1.8 m

Hoisting speed 5 m/min

Travelling speed 5 m/min

Head room 750 mm
(bottom of hook to centre of travelling rollers)

Load chain Grade 80, tested and certified

Applicable code
Make                    Hercules

Machined hardened steel gears and load chain wheel.

Ergonomically designed hanging pendent. Contractor shall provide suitable socket on thr ring
girder of dome (above the dome drive roller) for keeping the pendent when not in use.

Brake, motors, gearbox and panel unit shall be easily accessible. FSB brakes shall be provided.

Hoist shall be tested and certified for lifting 2.5 tons load through complete lift.

Hoist shall be tested at rated load for full traverse.

Cable dispensing Drum Spring loaded cable dispensing drum for permitting 180° rotation of dome  in clock wise or anti clock wise directions.

7   Rivets (Drg No. 33601-270 016)

Round head S S rivets shall be used for fixing the aluminium cladding sheets to the supporting structural members.

8   Sealant (Drg No. 33601-270 016)

Edges of the cladding sheets shall be sealed using all weather proof sealant.

9.   Ventilation Fans

Size                     200 mm

Power Supply              230 V AC

Mounting                  Wall/flange mount

Quantity                  2 nos.

10.  Shutter Drive (Drg No. 33601-212 009)

Speed of traverse         3.9 m/min

Ratio of gear unit         3.75

Speed of rotation of DC motor     1800 rpm

Operating speed of motor     433rpm

Motor                     0.75 HP, 1800 rpm, 24 V
                           Baldor Make
Mounting

Flange mounted

Both top and bottom drive motors shall operate in synchronous mode at same constant set speed with single push button operation. The motor speed shall be reversible with selection of open/close push buttons.

10.1 Control Panel

Single Push button operation to move the shutters at set(constant) speed. The operation shall either fully open or close the shutter to reach the end position controlled by limit switches. Shutter can be stopped at any position by the release of push button.

Accuracy

± 5 mm

Resolution

0.5 mm

Mode of operation

Position mode

Power

1.5 KW max

Power input

230 V AC

Protection

IP 55.

10.2 Limit Switches (Drg No. 33601-212 009)

Limit switches, their mounting brackets, actuators and necessary hardware are to be supplied and fitted appropriately to ensure the specified traverse of shutter and open and closing positions.

Type

Normal roller lever

Construction

Oil tight, metal clad

Contacts

1 NC + 1 NO

Code

IS 6875

Quantity

8 nos.

11 Dome Drive (Drg No. 33601-220 010)

11.1 Dome Drive
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Speed of rotation of dome</td>
<td>0.2 rpm</td>
</tr>
<tr>
<td>Speed of rotation of roller</td>
<td>2.4 rpm</td>
</tr>
<tr>
<td>Rated speed of DC motor (Baldor)</td>
<td>1750 rpm</td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>AC synchronous motor</td>
<td>1500 rpm (Siemens FT6102-8AB7)</td>
</tr>
<tr>
<td>Ratio of planetary gear unit</td>
<td>1:252.</td>
</tr>
<tr>
<td>Operating speed of motor</td>
<td>603 rpm</td>
</tr>
<tr>
<td>Starting Torque on motor (start)</td>
<td>18.4 Nm</td>
</tr>
<tr>
<td>Running torque</td>
<td>8.8 Nm</td>
</tr>
<tr>
<td>Load Inertia on motor shaft</td>
<td>31 Nm/sec²</td>
</tr>
</tbody>
</table>

The motor speed is varied. The dome shall have a soft start of minimum 3 seconds for accelerating to operating speed. Both motors shall operate in synchronous mode at same constant set speed with single push button operation. The motor speed shall be reversible with selection of clockwise/anticlockwise push buttons.

### 11.2 Controller (Drg No. 33601-220 010)

<table>
<thead>
<tr>
<th>Type</th>
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<td>Make</td>
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<td>Range</td>
<td>Continuous</td>
</tr>
<tr>
<td>Accuracy</td>
<td>± 0.5°</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.05°</td>
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<tr>
<td>Mode of operation</td>
<td>Position mode</td>
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<tr>
<td>Power</td>
<td>7.5 KW max</td>
</tr>
<tr>
<td>Power input</td>
<td>420 V 3 Ph AC</td>
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<tr>
<td>Motor</td>
<td>AC servo motor with built in encoder</td>
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<tr>
<td>Protection</td>
<td>IP 55</td>
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<tr>
<td>Over load protection</td>
<td>Overload current protection</td>
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</tbody>
</table>

Control panel shall be ergonomically designed with touch screen selection. It shall have Power
on, start/stop, position command and emergency power cut off. It shall display position, speed and direction of rotation (clockwise or anticlockwise). Panel shall display operation voltage and motor current.

12 Encoder (Drg No. 33602-290 011)

Position of dome shall be read by an incremental coupled to a roller driven by the drive roller of the dome.

Resolution of encoder \[4.51^\circ\] or better

Precision of encoder \[10 \text{ bit/1000 ppr} \] or better

Encoder is couple to the roller shaft through flexible torsionally rigid coupling (JACOB make or equivalent.)
Appendix III (of Annexure A) - Bill of Materials

1. The Bill of Materials referred to in the drawings listed in Appendix 1 of annexure A can be made available as computer files to vendors in standard document format

2. The Bill of Materials are segregated as per subsystem eg. Dome drives, dome encoder, dome wheel assembly, shutter assembly, shutter drive assembly etc. and are in ten separate files.

   DOMEDRIVE.doc
   DOMEENCOSDER.doc
   DOMEGENASSLYR1.doc
   DOMEWHEELASSY.doc
   GUIDEROLLER ANTILIFTASSY.doc
   GUIDEROLLERASSY.doc
   LIGHTNINGROLLER.doc
   SHUTTER ASSY.doc
   SHUTTERDRIVE ASSY.doc
   SHUTTERWHEEL.doc
Annexure ‘B’ Assembly and part drawings

Note 1

Only Assembly drawings are attached in the tender document as Adobe Acrobat (pdf) format files. Bidders may download all the Assembly drawings, part Drawings and the Bill of materials from IIA Website "ftp://ftp.iiap.res.in/rfp". The pdf files can be enlarged to view all details except in the case of the top level assembly drawings of dome, shutter and enclosure. The bidder or his authorised representative can see or seek clarifications about the drawings, site of installation and any other details as required with Mechanical engineering Division at IIA during the working hours, with prior information (see contact information on Page 2 and Page 8 Section 2.0 “Project site information”)

All the drawings and specifications are the property of and proprietary to IIA and shall not be copied/forwarded/remodeled in any manner without explicit permission from IIA.

Note 2

HARD COPIES AND AUTOCAD FILES OF DRAWINGS:

Bidders may refer to & examine the hard copies of main drawings available at IIA if they so require. Further, bidders may collect the set of enclosed drawings in printed form (A3 size for assembly drawings and A4 size for part drawings) or as AUTOCAD files on CD, from this office in person or through Post. These prints or AUTOCAD drawings will only be supplied on furnishing a letter expressing intent to bid referring to this Public Tender number and making a statement of non-disclosure as below:

“ We, M/s __________________ Co. Ltd, hereby express our intent to bid for the Tender No. Xxxxxx floated by M/s Indian Institute of Astrophysics (IIA) for 'Manufacture and erection of 1.3m Telescope Enclosure and Dome structure at Vainu Bappu Observatory, Kavalur'. We request a copy of prints / AUTOCAD files of the design drawings to enable us to submit a quotation. We agree that the design, drawings and computer files are proprietary to and the property of the IIA, and we declare and affirm that the design and drawings will only be used in pursuance of the bidding process and will not be used for manufacture of the parts, sub-assemblies or assemblies in the form contained in the drawings or any modifications thereof without the written consent of IIA. We further declare that the designs, ideas and drawings shall not be disclosed to or supplied to any other party for any purpose whatsoever, except in pursuance of the tender process or for fulfilling the Purchase Order placed by IIA, if our bid is successful.

The request letter should be signed by senior authorised personnel of the company or firm making the request ie. Person authorised to submit the Technical and Commercial bid. The requesting company should keep the last date for bids in mind and allow for four days (after receipt of the request by IIA) to receive the prints/files in person and about a week to receive them by Speedpost.

Note 3

Certain assemblies/ sub-assemblies such as the dome drive assembly, the lift shaft structure, fixtures for cabling etc are in process of design optimization. IIA reserves the right to make changes in the design / drawings of such systems and these will be confirmed before actual manufacture of the sub-systems is taken up by the chosen vendor.
Annexure ‘C’  INSTRUCTIONS TO BIDDERS

1. Tenders / bids should be sent in sealed and superscribed envelopes with mention of Tender No. date and date of opening. Only one Tender should be sent in each envelope.

2. Late and Delayed Tender will not be considered.

3. Duties, Taxes where legally leviable and intended to be claimed should be distinctly shown separately in the Tender.

4. a) Quotation should be valid for 120 days from the date of opening of tender.
   b) Prices are required to be quoted accordingly to the units indicated in the annexed tender form. When quotations are given in terms of units other than those specified in the tender form, relationship between the two sets of units must be furnished.

5. Preference will be given to those tenders offering supplies F.O.R Destination/Free door delivery at Site.

6. a) All available Technical Literature(s), Catalogue(s) and other data in support of the specifications and details of the item(s) should be furnished along with the offer.
   b) Samples, if any, called for, should be submitted free of all charges by the bidder and the Purchaser shall not be responsible for any loss or damage thereof due to any reason whatsoever. In the event of non-acceptance of tender, the bidder shall have to remove the samples at his own expense.
   
   c) Approximate net and gross weight of the items offered shall be indicated in your offer. If dimensional details are available the same should indicated in the offer.

   d) SPECIFICATIONS:

   Stores offered should strictly conform to our specifications. Deviation, if any should be clearly indicated by the bidder in their quotation. The bidder should also indicate the Make/type No. of the stores offered and provide catalogue(s), Technical literature(s) and sample(s), wherever necessary along with the quotations. Test certificates wherever necessary should be forwarded along with the supplies. Whenever options are called for in our specifications, the bidder should address all such options. Wherever specifically mentioned by us the bidder could suggest changes to specifications with appropriate response for the same.

7. The purchaser shall be under no obligation to accept the lowest or any tender and reserves the right of acceptance of the whole or any part of the tender or portion of the quantity offered and the bidders shall supply the same at the rates quoted.

8. The purchaser may shortlist qualified vendors / contractors on the basis of technical bids received and the purchaser reserves the right to supply detailed technical drawings and design data only to the shortlisted vendors and to solicit presentations from such shortlisted vendors.
9. Corrections, if any, must be attested. All amounts shall be indicated both in words as well as
in figures. Where there is difference between amounts quoted in words and figures, amount quoted in
words shall prevail.

10. The bidder should supply along with the tender /bid , the name of his bankers as well as the
latest Income Tax Clearance Certificate duly countersigned by the Income Tax Officer of the
circle concerned under the seal of his office, if required by the Purchaser.

11. The Purchaser reserves the right to place order on the successful bidders for additional quantity
upto 25% of the quantity offered by them at the rates quoted.

12. The proof of authority of the person signing the tender / bid , if called for, should be produced.

13. Complete system configuration and system and sub-system design details and
manufacturing drawings should have approval of the purchaser before actual fabrication or
procurement process.

14. A complete set of instruction and operation manual should be supplied at the time of installation.

15. Final performance should be guaranteed at the site.

**TERMS AND CONDITIONS OF CONTRACT**

1. **DEFINITIONS:**

a). The terms ‘Purchaser’ shall mean the Director, Indian Institute of Astrophysics, Bangalore-560 034.

b). The term ‘Contractor’ or 'Vendor' shall mean the person, firm or company with whom or with
which the order for the supply of stores is placed and shall be deemed to include the
Contractor’s successors, representative, heirs, executors and administrators unless excluded by
the contract.

c). The ‘Stores’ shall mean the items that contractor agrees to supply under the contract as specified
in the Purchase Order including erection of Plants and machinery and subsequent testing, should such
a condition be included in the Purchase Order.

d). The terms ‘Purchase Order’ shall mean the communication signed on behalf of the Purchaser by an
officer duly authorized intimating the acceptance on behalf of the Purchaser on the terms and
conditions mentioned or referred to in the said communications accepting the tender, bid or offer
of the contractor for supply of stores or plant, machinery or equipment or part thereof.

2. **PRICES:**

Tenders offering firm prices will be preferred, where a price variation clause is insisted upon by a
contractor / vendor, quotations with a reasonable ceiling should be submitted. Such offers should
invariably be supported by the base price taken into account at the time of tendering / bidding
and also the formula for any such variations.
3. **DUTY EXEMPTION**

(a) Any essential Equipment/part of the equipment can be imported for which “Customs Duty Exemption Certificate” will be provided by IIA under the Government of India notification No. 51/96 as an actual user basis.

(b) Exise duty exemption certificate will be provided if considered against the categories of items tendered, under the Govt. of India notification No. 10/97 valid till 2011.

4. **GUARANTEE AND REPLACEMENT:**

a) The contractor shall guarantee that the stores supplied shall comply fully with the specifications laid down, for material workmanship and performance.

b) For a period of (12) twelve months after the acceptance of the stores, if any defects are discovered therein or any defects therein found to have developed under proper use arising from faulty stores, design or workmanship, contractor shall remedy such defects at his own cost provided he is called upon to do so within a period of 14 months from the date of acceptance thereof by the purchaser who shall state in writing in what respect the store or any part thereof are faulty.

c) If in the opinion of the purchaser, it becomes necessary to replace or renew any defective stores such replacement or renewal shall be made by the Contractor free of all costs to the purchaser provided then notice informing the contractor of the defect is given by the purchaser in this regard within the said 14 months from the date of acceptance thereof.

d) Should the contractor fail to rectify the defects, the purchaser shall have the right to reject or repair or replace at the cost of the contract -or the whole or any portion of the defective stores.

e) The decision of the purchaser, not withstanding any prior approval of acceptance or inspection thereof on behalf of the purchaser, as to whether or not the stores supplied by the contractor are defective or any defects has developed within the said period of 12 months or as to whether the nature of the defectives required renewal or replacement shall be final, conclusive and binding on the contractor.

f) To fulfill guarantee conditions outlined in Clause 5(a) to (d) above, the contractor shall, at the option of the purchaser, furnish a Bank Guarantee (as prescribed by the purchaser) from a Bank approved by the purchaser for an amount equivalent to 10% of the value of the contract along with first shipment documents. On the performance and completion of the contract in all respects, the Bank Guarantee will be returned to the contractor without any interest.

g) All the replacement stores shall also be guaranteed for a period of 12 months from the date of arrival of stores at Purchaser’s site.

h) Even while the 12 months guarantee applied to all stores in case where a greater period is called forth by our specifications then such a specification shall apply; in such cases the period of 14 months referred to in Para 4(b) and (c) shall be ‘asked for’ guarantee period plus two months.
5. PACKING, FORWARDING AND INSURANCE:

The Contractor will be held responsible for the stores being sufficiently and properly packed for transport by rail, road, sea or air, to withstand transit hazards and ensure safe arrival at the destination. The packing and marking of packing shall be done by and at the expenses of the contractor. The Purchaser will not pay separately for transit insurance, all risks in transit being exclusively of the contractor and the Purchaser shall pay only for such stores as are actually received in good condition, in accordance with contract.

6. TEST CERTIFICATE:

Wherever required Test Certificate should be sent along with the relevant dispatch documents.

7. ACCEPTANCE OF STORES:

a) The Stores shall be tendered by the contractor for inspection at such places as may be specified by the purchaser at the Contractor’s own risk, expenses and cost.
b) It is expressly agreed that the acceptance of stores, contracted for is subject to final approval by the Purchaser, whose decision shall be final.
c) If, in the opinion of the Purchaser all or any of the stores that do not meet the performance or quality requirements specified in the Purchase Order, they may be either rejected or accepted at the price to be fixed by the purchaser and his decision as to rejection and the prices to be fixed shall be final and binding on the contractor.
d) If the whole or any part of the store supplied are rejected in accordance with Clause No.7 (c) above, the Purchaser shall be at the liberty, with or without notice to the Contractor, to purchase in the open market at the expenses of the Contractor, stores meeting the necessary performance and quality contracted for in place of these rejected, provided that either the purchase, or the agreement to purchase, from another supplier is made within six months from the date of rejection of the stores as aforesaid.

8. REJECTION OF STORES:

Rejected Stores will remain at the destination at the Contractor’s risk and responsibility, if instructions for their disposal are not received from the Contractor within a period of 14 days from the date of receipt of the advice or rejection, the Purchaser or his representative has, at his discretion the right to scrap or seal or consign the rejected stores to the Contractor’s address at the Contractor’s entire risk and expense, freight being payable by the Contractor at actuals.

9. DELIVERY PERIOD:

a) The time for and the date of delivery of the stores stipulated in the Purchase order shall be deemed to be the essence of the Contract, and delivery must be completed on or before the specified dates.
b) Should the Contractor fail to deliver the stores or any consignment thereof within the period prescribed for such delivery, the Purchaser shall be entitled at his option either.
i) to recover from the Contractor as agreed liquidated damages and not by way of penalty, a sum of 2% of the price of any stores which the contractor has failed to deliver as aforesaid for each month or
part of a month, during which the delivery of such stores may in arrears, or

ii) to purchase elsewhere, without notice to the Contractor on the account and at the risk of the contractor, the stores not delivered or others of similar description (where other exactly complying with the particulars are not, in the opinion of the purchaser readily procurable, such opinion being final) without canceling the Contract in respect of the consignment(s) not yet due for delivery or,

iii) to cancel the contract or a portion thereof, and, if so desired to purchase or authorize the purchase of stores not so delivered or others of similar description (where others exactly complying with the particulars are not, in the opinion of the purchaser readily procurable, such opinion final) at the risk and cost of the Contractor.

In the event of action being taken under sub-clause (ii) and (iii) of clause 9 above, the Contractor shall be liable for any loss which the Purchaser may sustain on that account, provided that the re-purchase, or, if there is an agreement to re-provided that the agreement, is made within (6) six months from the date of such failure. But the Contractor shall not be entitled to any gain on such re-purchase made against default. It shall not be necessary for the purchaser to serve a notice of such re-purchase on the defaulting Contractor. This right shall without prejudice to the right of the purchase to recover damages for breach of contract by the Contractor.

10. EXTENTION OF DELIVERY TIME:

As soon as it is apparent that schedule dates cannot be adhered to, an application shall be sent by the Vendor / Contractor to the Purchaser. If failure, on the part of the Contractor to deliver the stores in proper time shall have arisen from any cause which the Purchaser may admit as reasonable ground for an extension of the time (and his decision shall be final he may allow such additional time as he considers it to be justified by the circumstances of the case without prejudice to the Purchaser’s rights to recover liquidated damages under clause 9 hereof.

11. RECOVERY OF SUMS DUE:

Whenever there is a breach of contract whether liquidated or not, money arising out of or under this contract, the Purchaser shall be entitled to recover such sum by appropriating, in part or full, the security deposited by the Contractor, if a Security is taken against the contract. In the event of the Security being insufficient or if no security has been taken from the Contractor, then the balance or the total sum recoverable as the case may be shall be deducted from any sum then due or which at any time thereafter may become due to the contractor under this or any other contract with the Purchaser. Should this sum be not sufficient to cover the full amount recoverable, the Contractor shall pay to the Purchaser on demand the remaining balance due. Similarly, if the purchaser has or makes any claims, whether liquidated or not, against the Contractor under any other contract with the purchaser, the payment of all moneys payable under the contract to the Contractor including the Security Deposit if any, shall be withheld till such claims of the Purchaser are finally adjudicated upon and paid by the Contractor.

12. INDEMNITY:

The vendor/contractor shall warrant and be deemed to have warranted that all stores supplied against this contract are free and clean of infringement of any patent, copyright or trade mark, and shall at all times indemnity the purchaser against all claims which may be made in respect of the
stores for infringement of any right protected by patent, registration of design or trade mark and shall take all risk of accidents of damage which may cause a failure of the supply from whatever cause arising and the entire responsibility for sufficiency of all the means used by him for the fulfillment of contract.

13. ARBITRATION:

In the event of any question, dispute or difference arising under these conditions contained in the purchase order in connection with this contract, (except as to any matters the decision of which is specially provided for by these conditions), the same shall be referred to the sole arbitration of the Head of the Purchaser Institution or of some other person appointed by him. It will be no objection that the arbitrator is a Government Servant, that he has to deal with matter to which the Contract relates or that in the course of his duties as Government Servant he has expressed views on all or any of the matters in dispute binding on the parties of this Contract.

TERMS OF THIS CONTRACT:

(a) If the Arbitrator be the Head of the Purchaser Institution,

i) in the event of his being transferred or vacating his office by resignation or otherwise, it shall be lawful for his successor-in-office either to proceed with the reference himself, or to appoint another person as arbitrator, or,

ii) in the event of his being unwilling or unable to act for any reason, it shall be lawful for the Head of the Purchaser Institution to appoint another person as arbitrator or,

(b) If the Arbitrator be a Person appointed by the Head of the Purchaser Institution:

In the event of his death, neglecting or refusing to act, or resigning or being unable to act for any reason, it shall be lawful for the Head of the Purchaser Institution either to proceed with reference himself or to appoint another person as arbitrator in place of the outgoing arbitrator. Subject as aforesaid, the Arbitration Act, 1940 and the rules there under and any statutory modifications thereof for the time being in force shall be deemed to apply to the arbitration proceedings under this clause. The Arbitrator shall have the power to extend with the consent of the Purchaser and the Contractor the time for making a publishing the award. The venue of Arbitration shall be the place as the Purchaser. In his absolute discretion may determine. Work under the contract shall if reasonably possible, continue during Arbitration proceedings.

14 COUNTER TERMS AND CONDITIONS OF SUPPLIERS:

Where Counter Terms and Conditions whether printed or copied or cyclostyled, have been offered by the Supplier, the same shall not be deemed to have been accepted by the Purchaser, unless specific written acceptance thereof is obtained.
NOTES:
1. BEARING COVERS LOCATING THE BEARINGS SHALL BE INSTALLED AT CLOSELY TO ENSURE THAT THE BEARINGS ARE LOCATED ADEQUATELY AND POSITIE CONSISTENTLY FREE WITH NO CLAMP FLX.
2. EXCESSIVE PRESSION ON ROLLER SHALL BE ADJUSTED TO MAXIMIZE VIEW.
3. PLATE 1 WITH ENCODER AND COUPLING IS FIXED SHALL BE KEPT IN POSITION FOR DRILLING HOUSING 1.
4. FIT THE ENCODER 1 TO PLATE 1. KEEP THE CLAMP 3 IN POSITION FOR DRILLING HOUSING 1.
5. MOUNTING PLATE 2 SHALL BE KEPT IN POSITION ENSURING THAT ROLLER 1 IS IN PROPER CONTACT WITH DRIVE PULLEY (ALONG THE ARMS) AND ROTATES FREE AND SMOOTH. TIGHTEN 2 TO FRAME AND OBSERVE CORRECTIVE OR CLAMP FOR MONITORING ENCODER PULSES. AFTER SATISFACTORY DISPLAY INSTALL ALL CLAMPS AND MOUNTING PLATE TO FRAME.

ALL DIMENSIONS ARE IN mm.

INSTITUTION OF AEROSCIENCE, BENGALURU

DATE: 10/10/20
DESIGNER: [Signature]
CHECKER: [Signature]
DRAW: [Signature]

33612-020003
NOTES

1. BEARING COVERS AND SPACERS LOCATING THE BEARINGS SHALL BE MACHINED AT ASSEMBLY TO ENSURE THAT THE BEARINGS ARE LOCATED AXIALLY AND ROTATE SMOOTH AND FREE FROM ANY JAMMED FRICTION.

2. ROLLER POSITION SHALL BE INSPECTED AFTER PARTITION OF DOME WITH A ROW OF ROLLERS SHALL ROTATE PROPERLY WITHOUT JAMMING AND A MINIMUM CLEARANCE GAP WITH DOME SHAPE. SPRINGS 1 SHALL BE ADJUSTED THROUGH ONE COMPLETE ROTATION. SUPPORT 1 SHALL BE ADJUSTED AFTER SATISFACTORY RUN ALLOWING FOR EXPANSION OF SPRING.
1. Bearing covers and spacers locating the bearings shall be machined at assembly to ensure that the bearings are located axially and rotate idenfficly and freely with no axial play.

2. Roller position shall be analyzed after partial rotation of cone through 15° division of times. Guide rollers shall rotate freely without seaming and a minimum possible gap with rail shall be ensured through one complete rotation. Support, 1, shall be held after satisfactory run allowing for expansion of springs.

3. Position of locks shall be examined after complete rotation of cone. Locks shall clear measures of rail through complete rotation, ensuring rail gap.
1. Bearing covers and spacers locating the bearings shall be machined at assembly to ensure that the bearings are located axially and rotate smoothly and freely with no axial play.

2. Roller position shall be finalized after trial rotation of cone through 90 degree (if possible). Roller shall roll near to the edge of the copper connector and may be adjusted for satisfactory movement.

NOTES

S2

S1

SECTION S1S1

SECTION S2S2

(A S L E 1:2)

HEIGHT OF ASSEMBLY 34 Kg

RED TEXT FOR REVISION NO. 33602-200003

INSTITUTE OF AUTOMOBILES, BENGALURU

1.34 TELESCOPE - DONE

LIGHTNING ROLLER ASSEMBLY

TEKCONS

DRAWN: PRABHAN

CHECKED: PRABHAN

DATE: 30.11.10

PRO NO. 33602-200003

ISSUE NO.

ALL DIMENSIONS ARE IN MM.
NOTES
1. ALL STEEL BAR BENDS OR PLATES SHALL BE GROUNDED WITH 2 mm HOLLOW BENDS OR PLATES.
2. ALL BARS SHALL BE FILLED OR PLATED.
3. ALL PLATES SHALL BE REAPPLIED AS PER SPECIFICATION.
4. ALL PLATES SHALL BE REAPPLIED AS PER SPECIFICATION.
5. SURFACES OF STEEL PLATES AND NUTS SHALL BE CLEANED AND OILED BEFORE INSTALLATION.
6. MARKING OF ALL PARTS AND COMPONENTS SHALL BE DONE AS PER SPECIFICATION.

ALL DIMENSIONS ARE IN MM.

SECTION S1S1 (Scale 1:3)
SECTION S2S2 (Scale 1:3)

RAILING FOR STAIRCASE/LANDING
RAILING FOR TERRACE

VIEW V1
VIEW V2

RAILING FOR STAIRCASE/LANDING
RAILING FOR TERRACE

TOTAL WEIGHT 408 KG

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REF: ENS NO. 35001-000001
SECTION S1S1

NOTES:
1. REMOVE BURRS AND SHARP CORNERS
2. STEEL PLATES SHALL BE FIXTED ON EITHER SIDE OF ALUMINIUM FRAME KEEPING THE PIVETS AT A SPACING OF 200 MM.
3. 4 HOLES AS SPECIFIED BY DFN SHALL BE MADE IN STEEL BAR 7.

TOTAL WEIGHT = 136 Kg

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Rem No. DESCRIPTION Drg No./SPEC OTO MATERIAL WT Kg

INSTITUTE OF ASTROPHYSICS

SCALE 1:10.12 1.3 M TELESCOPE - ENCLOSURE

HATCH COVER

TEKCONS

DATE 20.12.10 Drg No. 33613-000026 ISSUE RO