

Government of India  
Bhabha Atomic Research Centre  
Electronics & Instrumentation Systems Division

Ref: BARC/EISD/RMSB/2018/MF/ 18

Date: 29<sup>th</sup> August 2018

Sub: Invitation of Quotation for the **Fabrication/Assembly/Integration, testing, supply, installation and commissioning of 4 Rugged Stereo Vision Systems**

Dear Sir,

1. Quotations are invited for the minor fabrication job, as per the Annexure I.
2. 4 Nos. of the system as per Annexure I are to be supplied
2. Bidder shall quote for entire work involved in this fabrication with material.
3. Taxes/GST/IGST/other charges shall be quoted separately.
4. The quotation must reach Head, Electronics & Instrumentation Systems Division by **17<sup>th</sup> September 2018** and must be sent by *Indian Postal Services only* in a sealed envelope super scribed with the reference number & the due date given above.
5. The address on the envelope should read:  
**Head, Electronics & Instrumentation Systems Division  
BARC, Trombay,  
Mumbai – 400085  
(Kind Attn: R. K. Verma, SO/E, ASDS, EISD)**
6. The fabrication work shall be subjected to inspection by our engineer. The finished components shall not be dispatched prior to approval by our engineer at bidder's premises. Necessary inspection facilities should be provided to our engineer during fabrication at bidder's premises.
7. The bidder shall deliver the finished components after approval by our engineer within **10 weeks** from the date of firm work order issued to the bidder. The finished components along with the left over material shall be delivered by the bidder at **EISD, BARC, Trombay, Mumbai - 400 085**.
8. Head, Electronics & Instrumentation Systems Division reserves the rights to accept / reject any or all quotations without assigning any reason.
9. Delivery charges if any must be clearly mentioned in the offer.
10. Quotation must also indicate the applicable GST for items and duration of validity of offer.
11. The Bidder should also provide GSTIN/PAN/TAN/GIR No.
12. The supplier should mention HSN code for each of the items in his quotation.
13. The item shall be used for R&D purpose only. BARC is entitled for concessional GST rate of IGST @5% (or CGST @2.5% and SGST @ 2.5%) (Refer notification no. 47/2017 dated 14/11/2017 issued by ministry of finance). A certificate to this effect will be provided to the supplier certifying that the items are required for research purpose only.

Encl: Annexure I

  
(R. M. Suresh Babu)  
OS & Head, EISD

आर. एम. सुरेश बाबू / R. M. SURESH BABU  
अध्यक्ष, इआईएसडी / Head, EISD  
भापअ केंद्र, मुंबई / BARC, Mumbai

## **Annexure-I**

### **Fabrication/Assembly/Integration, testing, supply, installation and commissioning of 4 Rugged Stereo Vision Systems**

#### **1. Overview**

This system is being fabricated for stereo vision setup. This system should be highly rugged, stable, accurate and precise. It consists of enclosures for cameras, which will enable cameras to be mounted in a strict parallel stereo fashion. It shall also consist of an enclosed processing unit interfaced to cameras.

#### **2. Scope of work**

The scope of work includes design, development and fabrication of mechanical hardware, selection & supply of Industrial PC and its peripherals, demonstration at vendor's site, delivery, installation and commissioning at user premises in BARC. Detailed analysis of the qualification should be provided against the specifications. Supply of Cameras is not in the scope of this work. However the maximum dimensions of camera are specified for fabrication of enclosures for the cameras.

**Note:** 4 Nos. of such systems are to be supplied.

#### **3. Specifications:**

##### **3.1. Specifications for Rugged Stereo Vision System ---- 4Nos**

<b>S. No.</b>	<b>Specification</b>	<b>Description</b>
1.	Enclosure for two Cameras	<ol style="list-style-type: none"><li>1. The camera enclosure shall be IP65 qualified.</li><li>2. Maximum Camera dimensions: 70(H) x 70(W) x 150(L) all in mm.</li><li>3. Maximum weight of each camera with lens is 1 kg</li><li>4. For camera opening, front facia of enclosure shall have a cover of glass with transparency greater than 90% and with life span greater than 5yrs</li><li>5. Bottom plate of enclosure should have screw arrangement to rigidly hold the camera specified.</li><li>6. Bottom plate should be easily replaceable so as to mount different cameras of different dimensions</li><li>7. Provision to bring the camera power, trigger and data cables outside the enclosure.</li><li>8. Design should ensure heat dissipation from camera</li></ol>
2.	Enclosure Mounting Plate	<ol style="list-style-type: none"><li>1. Enclosures of cameras shall be mounted on an Aluminium mounting plate.</li><li>2. Distance between centres of two enclosures (X-axis) should be <math>1m \pm 0.1mm</math>. Tolerance in Y-axis and Z-axis should be less than <math>\pm 0.1mm</math>.</li><li>3. Enclosures mounted on this plate should be in parallel axis w.r.t each other.</li><li>4. Pan, tilt and yaw angles between enclosures should not change more than 0.05 degrees after mounting.</li><li>5. Allowed Tilt of 0 to 20 degrees w.r.t. ground, precisely downwards.</li><li>6. Cameras should not move, individually. Entire</li></ol>

		<p>Setup should move as a whole</p> <ol style="list-style-type: none"> <li>7. Kinematic mount provided for tilt should have only 1 degree of freedom. The kinematic joint has to be rigid and lockable.</li> <li>8. The plate should be wall-mountable</li> <li>9. The plate should withstand wind speed of 100 Km/hr.</li> <li>10. This plate has to be perfectly horizontal in X and Z directions when tilt angle is zero, ensured by using a sensitive spirit level on the surface.</li> <li>11. Plate should be horizontal and smooth with smoothness better than 1mm</li> <li>12. 2 Nos. of parallel guide slots with precision sliding fit are to be provided on the mount plate to suit the camera housing dimensions in order to ensure parallelism of the optical line. However finer adjustment mechanism has to be provided either on the mount plate or inside the camera housing.</li> </ol>
3.	Wall Mount Bracket for mounting plate	<ol style="list-style-type: none"> <li>1. Stainless steel bracket with swivel and locking arrangement</li> <li>2. Allowed Pan of -45 to 45 degrees w.r.t. vertical axis, precisely.</li> <li>3. The wall mounting structure should have resistance to undergo elastic deformation under the application of component weights and wind load. The allowable value of maximum deflection should be &lt; 0.1mm.</li> <li>4. Static structural FEM analysis should be used to substantiate this phenomenon.</li> </ol>
4.	Industrial PC system and monitor	<ol style="list-style-type: none"> <li>1. Intel Core i5 Processor, 64 bit Windows 7 compatible, built-in Sound, Gigabit LAN, and VGA port.</li> <li>2. 8 GB DDR3 1600 MHz SDRAM DIMM, 1TB 7200rpm HDD, DVDRW optical drive, Stereo speakers and Ports (At least 3 x USB 2.0, 2 x USB 3.0, Headphone, LAN, Serial port for communication)</li> <li>3. 64-bit Windows 7 operating system.</li> <li>4. 2 Nos. of additional GigE LAN cards</li> </ol>
5.	Enclosure for Industrial PC, monitor, keyboard, mouse	<p>IP65 qualified stainless steel PC enclosure with 19" monitor.</p> <p>For connectivity:</p> <ol style="list-style-type: none"> <li>1. Cables from stereo camera system</li> <li>2. Power cable</li> <li>3. 2 or more USB ports</li> <li>4. Control Cable to hooter</li> </ol>
6.	Alarming devices	<ol style="list-style-type: none"> <li>1. Hooter with silence button</li> <li>2. Mini Toggle switch SPDT selector</li> </ol>
7.	Power Backup	<ol style="list-style-type: none"> <li>1. UPS with built-in battery of atleast 1KVA should be provided</li> <li>2. Battery backup to keep whole system running uninterruptedly for atleast 2hours after power failure</li> </ol>
8.	Qualification &	<ol style="list-style-type: none"> <li>1. Wind load calculations and analysis in</li> </ol>

	Calibration	<p>computational fluid dynamics are to be provided to ensure that modal deviation due to wind load is within allowable limits to support the strength of the system</p> <ol style="list-style-type: none"> <li>2. Static structural FEM analysis should be carried out on wall mount to prove that the structure would not deform due to component weights.</li> <li>3. The modal analysis should be carried out to establish that the natural frequency of the structure is higher than that of floor vibration &amp; vibration due to wind load. (Expected natural frequency should be <math>\geq 20</math> Hz)</li> <li>4. Material should be such that long term creep due to temperature or time should be minimal.</li> <li>5. Fine adjustment of camera should be provided</li> </ol>
9.	Corrosion Resisting Coating	<ol style="list-style-type: none"> <li>1. All Aluminium components should be anodised.</li> <li>2. All MS components should be powder coated.</li> </ol>

#### **4. Deliverables**

4 Nos of complete Rugged Stereo Vision Systems, each consisting of:

1. Mounting arrangement of stereo camera system with wall mount assembly.
2. An adjustable camera-mount with kinematic elements of 1 DOF of positional accuracy of 0.05 mm with tilting adjustment 0 to 20 degrees angle downwards w.r.t. ground.
3. Provision for Pan Movement of -45 to 45 degrees w.r.t. vertical axis, precisely.
4. CFD analysis with external disturbances, floor vibration and wind load analysis.
5. FEM analysis for static structural deflection, max allowable 0.1 mm
6. Modal analysis of the structure for a natural frequency of 25 Hz or better
7. Camera alignment and fine adjustment mechanism to obtain planner deviation within 0.05 mm and parallelism within 1mm in 10 meters on optical axis.
8. Camera Housing with IP65 rating
9. I/O connectors and connecting power supply and CAT-6 data cables 50 meters with suitable connectors at both ends.
10. Industrial PC with 19" monitor, i5 processor, with weather shield casing (IP65 Qualified) with power supply.
11. Overall assembly and installation at user's site.

#### **5. Development methodology**

The job should be executed in the following steps:

1. Preliminary design review: Vendor should submit preliminary designs including general drawings for user's approval.
2. Detailed design review: Vendor should submit detailed designs with 3D models and detailed drawings for user's approval.
3. Fabrication.
4. Testing & demonstration to user at vendor's site.
5. Installation and commissioning at user's site.

#### **6. Acceptance/Rejection Criteria**

1. Demonstrate conformity of the system against all the technical requirements.
2. The acceptance criterion of the mounting of the cameras will be parallelism of the camera axis within 1 mm over a distance of 10 metres. On screen spot measurement to

check divergence using Parallel beam should be provided. This will be tested at vendor's site by fixing the unit and monitoring the same for any change over a period of 24hrs.

3. The acceptance criterion of the tilt and pan angle should not change over time once fixed. This will be tested at vendor's site by fixing the angles at one position and monitoring for any change over a period of 24hrs.

## **7. General conditions**

1. Vendor must submit detailed drawings & design schematic of complete system for assessment of offer.
2. Detailed design/drawings/3D models of complete system should be submitted by vendor for approval prior to fabrication.
3. Pre-dispatch inspection and demo should be arranged at vendor's site.
4. Vendor should ensure safe transportation to BARC premises.
5. The equipments/materials supplied should be warranted for trouble free operation and any manufacturing defect for a period of 12 months from the date of final acceptance.
6. Vendor qualification: The vendor shall provide organizational details including organizational chart, manufacturing facilities, testing and inspection facilities, manpower etc. along with quotation. These details are mandatorily required for vendor evaluation. Considering the amount of complexity and precision work involved, the organization should have a minimum of 2 Mechanical engineers with at least 10yrs of experience, and adequate technicians for assembling.
7. Vendor should have been previously engaged for atleast 5years, in fabrication of similar complex & precision systems
8. In case of any past works of similar complexity & precision, undertaken for BARC, vendor should submit details of work order reference numbers with concerned division's name.