

भारत सरकार
अंतरिक्ष विभाग
सतीश धवन अंतरिक्ष केंद्र शार
श्रीहरिकोटा रेंज डा.घ. 524 124
श्री पोडि श्रीरामुलु नेल्लूर जिला, आ.प्र., भारत
दूरभाष : +91-8623 245060 (6 जं)
फैक्स : +91-8623 222099



सत्यमेव जयते

Government of India
Department of Space
Satish Dhawan Space Centre SHAR
Shriharikota Range P.O. 524 124
SPSR Nellore Dist., AP, India
Telephone : +91-8623 245060 (6 Lines)
Fax : +91-8623 222099

निविदा सूचना सं. TENDER NOTICE NO. SDSC SHAR/Sr.HPS/PT/RO-VALF/55/2025-2026

भारत के राष्ट्रपति की ओर से वरि. प्रधान क्रय एवं भंडार, सतीश धवन अंतरिक्ष केंद्र श्रीहरिकोटा निम्नलिखित वस्तुओं के लिए ऑनलाइन निविदाएं आमंत्रित करते हैं/On behalf of President of India, Sr. Head Purchase and Stores, SDSC SHAR, SRIHARIKOTA invites on line quotations for the following: -

| क्र.सं. Sl No | संदर्भ सं. Ref. No. | विवरण Description | मात्रा Qty. |
|------------------|---|---|-------------|
| 01. | SDSC SHAR /VALF PURCHASE /VALF/ 2025001579 Object Manipulator for 450KV X-ray system [Public Tender - Two Part] | Object Manipulator for 450KV X-ray system | 01 Lot |

निविदा दस्तावेजों को डाउनलोड करने की अंतिम तिथि Last Date for downloading of tender documents : 19.01.2026 at 16:00 hrs.
ऑनलाइन निविदा जमा करने की अंतिम तिथि Due Date for submission of bids online : 19.01.2026 at 16:30 hrs.
निविदाएं खोलने की नियत तिथि Due Date for opening of tenders : 20.01.2025 at 10:30 hrs.

निविदाकार के लिए निर्देश Instructions to Tenderers:

निविदाएं ईजीपीएस के माध्यम से ही भेजी जाएं तथा कोई निविदा शुल्क लागू नहीं होगा।
Bids shall be submitted on line through EGPS only and No tender fee shall be applicable.

- कार्य के सम्पूर्ण विवरण/जानकारी तथा नियम व शर्तों इत्यादि के लिए संलग्न अनुलग्नक को देखें। / For full details/scope of work and terms and conditions etc., please see the enclosed annexures.
- इच्छुक निविदाकार इसरो की ई-खरीद वेबसाइट इसरो न्यू ई-प्रोक्यूरमेंट www.eproc.vssc.gov.in से ई-निविदा डाउनलोड और अपनी निविदा ई-खरीद पोर्टल पर ऑनलाइन जमा कर सकते हैं। डाक / वाहक / स्वयं द्वारा प्राप्त निविदाओं पर विचार नहीं किया जाएगा। / Interested tenderers can download the e-tender from ISRO e-procurement website ISRO NEW E-PROCUREMENT www.eproc.vssc.gov.in and submit the offer on line in the e-procurement portal. Offers sent physically by post/courier/in person will not be considered.
- निविदा दस्तावेज इसरो की वेबसाइट www.isro.gov.in इसरो न्यू ई-प्रोक्यूरमेंट वेबसाइट www.eproc.vssc.gov.in तथा सतीश धवन अंतरिक्ष केंद्र शार की वेबसाइट www.shar.gov.in पर भी उपलब्ध हैं। इन्हें केवल ई-खरीद पोर्टल से डाउनलोड और निविदा ऑनलाइन जमा कर सकते हैं। / Tender documents are also available on ISRO website www.isro.gov.in ISRO New e-procurement website www.eproc.vssc.gov.in and SDSC SHAR, Sriharikota website www.shar.gov.in. The same can be down loaded and offer submitted on line in the new e-procurement portal only.
- निर्धारित तिथि/समय के पश्चात प्राप्त बोलियों पर विचार नहीं किया जाएगा। / Quotations received after the due date/time will not be considered.
- निविदा दस्तावेज दिनांक 19.01.2026 को 16:00 बजे तक डाउनलोड करने के लिए उपलब्ध रहेंगे तथा निविदा ऑनलाइन जमा करने की अंतिम तिथि 19.01.2026 को 16:30 बजे तक है। निविदाएं दिनांक 20.01.2026 को 10:30 बजे खोली जाएंगी। / The tender documents are available for download upto 19.01.2026 at 16:00 hrs. and last date for submission of tenders on line 19.01.2026 at 16 30 hrs. and Tender Opening on 20.01.2026 at 10:30 hrs.
- इच्छुक विक्रेता विवरण जानने के लिए निविदा खोले जाने वाले सत्र में शामिल हो सकते हैं। निविदा के मूल्यांकन पर विचार करने के लिए उनकी उपस्थिति अनिवार्य नहीं है। / Interested vendors can attend the Bid opening sessions to know the details. Presence not mandatory to consider the quote for evaluation.
- वरि. प्रधान क्रय एवं भंडार, सतीश धवन अंतरिक्ष केंद्र श्रीहरिकोटा के पास किसी भी या सभी निविदाओं को स्वीकार / अस्वीकार करने का अधिकार है। / Sr. Head, Purchase and Stores, SDSC-SHAR, Sriharikota reserves the right to accept or reject any/or all the quotations.
- GeM ARPTS Report ID: GEM/GARPTS/20112025/TBNDY779R5VZ

दिनांक DT: 19.12.2025

वरि. प्रधान क्रय एवं भंडार
Sr. HEAD PURCHASE AND STORES

भारतीय अंतरिक्ष अनुसंधान संगठन



Indian Space Research Organisation

**GOVERNMENT OF INDIA
DEPARTMENT OF SPACE
SATISH DHAWAN SPACE CENTRE SHAR SRIHARIKOTA (SDSC SHAR)
NELLORE**

Tender for Object Manipulator for 450KV X-ray system

Bids to be submitted online

Tender No.: SDSC SHAR/VALF PURCHASE/SH202500157901 dated 22-12-2025

A. Tender Details

| | |
|------------------------|--|
| Tender No : | SDSC SHAR/VALF PURCHASE/SH202500157901 |
| Tender Date : | 22-12-2025 |
| Tender Classification: | GOODS |
| Purchase Entity : | VALF PURCHASE |
| Centre : | SATISH DHAWAN SPACE CENTRE SHAR SRIHARIKOTA (SDSC SHAR) |

Object Manipulator for 450KV X-ray system

GEM/GARPTS/20112025/TBNDY779R5VZ

As per tender documents

A.1 Tender Schedule

| | |
|------------------------------|------------------|
| Bid Submission Start Date : | 22-12-2025 13:00 |
| Bid Clarification Due Date : | 09-01-2026 10:00 |
| Bid Submission Due Date : | 19-01-2026 16:30 |
| Bid Opening Date : | 20-01-2026 10:30 |
| Price Bid Opening Date : | 27-02-2026 14:30 |

B. Tender Attachments

NA

Instructions To Vendors

1. INSTRUCTIONS TO TWO PART TENDER

1. We are proposing to invite Tenders in Two Parts viz., Part-I Techno and Commercial & Part-II Price. All Tenderers are requested to follow carefully the following instructions before preparing their offer.

PART- I- TECHNO COMMERCIAL BID:

(1) This part should contain detailed Specifications of the items quoted by you along with Technical Literature and Leaflets if any.

(2) All the Commercial terms and Conditions applicable also should be indicated separately under separate heads.

(3) The Commercial terms such as delivery terms, delivery period, payment terms, warranty, validity of the offer, Installation & Commissioning, Duties and Taxes etc shall come into this.

(4) Either Technical Specifications or Terms & Conditions as above should be very clearly reflected items wise with reference to the items called for in the tender.

(5) Please note that Prices should not be indicated in this part.

(6) Any deviations from the Technical Specifications and Commercial Terms shall be indicated separately.

PART II-PRICE BID:

(1) The prices applicable for the items, item wise in response to the tender shall come into this part.

(2) Tender shall indicate very clearly item wise prices with reference to their Technical Offer.

Note: 1. PLEASE NOTE THAT THE OFFERS SUBMITTED CONTRADICTORY TO ABOVE INSTRUCTIONS WILL BE LIABLE FOR REJECTION. PLEASE ENSURE OFFERS ARE SUBMITTED WITHIN THE DUE DATE.

2. BEING TWO PART TENDER, WE REQUEST YOU NOT TO DISCLOSE / INDICATE ANY OF THE PRICE VALUE WHILE SEEKING / PROVIDING CLARIFICATION. YOU SHOULD INDICATE ONLY IN PERCENTAGE. IN CASE IF YOU DISCLOSE ANY OF THE PRICE AMOUNT YOUR OFFER WILL BE REJECTED.

2. STANDARD TERMS & CONDITIONS

1. 1. OUR GST NUMBER: 37HYDF00385A1DZ- SDSC SHAR SRIHARIKOTA

2. Email for communication: psovalf(at)shar.gov.in

3. Instruction to Indigenous Suppliers:

A) Payment Terms shall be as specified in RFP. If not specifically mentioned Our Normal payment term is 100 percent within 30 days after receipt and acceptance of the item at our site. Please confirm

acceptance in your quotation.

B) Purchase - Price preference to MSEs

Purchase - Price preference will be applicable to the product reservation admissible to the Micro and Small Enterprises. Purchase - Price Preference shall be extended to the MSEs under the Public Procurement Policy for MSEs formulated under the Micro, Small and Medium Enterprises Development Act, 2006. The participating MSEs in a tender, quoting price within the band of L-1 plus 15 percent may also be allowed to supply a portion of the requirement by bringing down their price to the L-1 price, in a situation where L-1 price is from someone other than an MSE. Such MSEs may be allowed to supply up to 25 percent of the total tendered value. In case of more than one such eligible MSE, the supply will be shared equally.

Micro and Small Enterprises which have technical capability to deliver the goods and Services as per prescribed technical and quality specifications and may not be able to meet the qualification criterion relating to prior experience minus prior turnover may be relaxed as per guidelines issued by Ministry of MSMEs and as amended from time to time.

Interested vendors shall specifically claim the benefit with supporting documents.

C) Purchase - Price preference to Make-in-India Products:

Preference shall be given to Class 1 local supplier as defined in public procurement (Preference to Make in India), Order 2017 as amended from time to time and its subsequent Orders - Notifications issued by concerned Nodal Ministry for specific Goods - Products. The minimum local content to qualify as a Class 1 local supplier is denoted in the bid document 50 percent. If the bidder wants to avail the Purchase preference, the bidder must upload a certificate from the OEM regarding the percentage of the local content and the details of locations at which the local value addition is made along with their bid, failing which no purchase preference shall be granted. In case the bid value is more than Rupees 10 Crore, the declaration relating to percentage of local content shall be certified by the statutory auditor or cost auditor, if the OEM is a company and by a practicing cost accountant or chartered accountant for OEMs other than companies as per the Public Procurement (preference to Make-in-India) order 2017 dated 04.06.2020 and amendments thereof. In case Buyer has selected Purchase preference to Micro and Small Enterprises clause in the bid, the same will get precedence over this clause.

D) Instruction to Foreign Suppliers-(if allowed as per RFP)

a) Payment Terms shall be as specified in RFP. If not specifically mentioned Our normal payment term is SIGHT DRAFT, Please confirm acceptance in your offer, if you insist for L - C, and all bank charges shall be to your account. Confirm acceptance.

b) Please specify whether any export clearance is required in case of an order on you.

c) Warranty - Guarantee applicable for the item shall be mentioned in your offer

d) Special Certification for packing Material : as per Plant Quarantine (Regulation of Control into India) Order 2003, Articles packed with packing material of plant origin namely, hay, straw, wood shavings, wood chips, saw dust, wood waste, wooden pallets, Dunn age Mats, wooden packages, coir pith, pear or sphagnum moss etcetera, will be allowed entry by Customs only with a Phytosanitary Certificate. In case of a Purchase Order, if you propose to us any of the above material for packing such a certificate issued by your local Plant Quarantine Authority shall be furnished.

e) Confirm whether any Export License is required and for which End User Certificate is to be provided

by us, in case of an Order on you. (Enclose format for EUC, if applicable)

f) Either Indian Agent on behalf of the foreign principals or the foreign principal directly can quote against this order, but not both. In either case an Indian agent cannot represent more than one principal against the same tender.

g) In case the quote is in INR we prefer to execute the same on HSS Basis and for which Concessional Customs duty as per Notification number 50 - 2017 Customs dated 30.06.2017, Serial Number 539(A) as amended by Notification number 05 - 2018 dated 25.01.2018 and vide Notification No.05-2025 dt.01.02.2025 and 45-2025 dtd 24.10.2025. In case the quote is on Indian Rupee (Outside High Sea Sale), the price shall include taxes and duties if any. We shall not be able to provide any duty or IGST tax exemption - concession certificates. If the item quote is of USA make, please quote for all-inclusive price since we prefer to get the item on FOR destination basis.

h) Any bidder from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the bidder is registered with Competent Authority as specified in Office Memorandum number F.No.6 - 18 - 2019-PPD, Ministry of Finance, Department of Expenditure, Public Procurement Division dated 23rd July 2020. All the conditions mentioned in the above OM is applicable for this tender.

E) Common terms to Indigenous and foreign suppliers:

a.Warranty

You shall provide applicable warranty for the items offered by you without fail. For the applicable period you shall provide necessary warranty certificate.

b.Performance Bank Guarantee

Towards the performance of the systems during the warranty period you shall submit a performance bank guarantee equivalent to 3 percent of the order value to cover the warranty period. This PBG shall be interest free and the same shall be returned to you on successful completion of all contractual obligations. The said PBG shall have a further claim period of 2 months.

c.Security Deposit

On acceptance of the order, you shall submit an interest free amount equivalent to 3 percent of the total contract - order value towards security deposit. This security deposit is collected towards the performance of the Contract. The said Security Deposit shall be submitted either in the form of Bank Guarantee - Demand Draft - FDR receipts duly endorsed in the name of the centre. The Security Deposit will be returned to you on successful completion of the Contractual obligations; failing which it shall be forfeited - adjusted.

4.Offer Validity

Your offer shall be valid for 180 days in case of 2 part - 90 days in case of single part from the date of tender opening. In case your offer validity is less than the mentioned above, the said offer is liable for rejection which may please be noted.

5. Liquidated Damages:

If you fail to deliver the ordered items satisfactorily within the time specified or any extension thereof, Liquidated Damage at 0.5 percent (zero point five percent) of the order value or part thereof the undelivered items for each calendar week of delay shall be recovered from your bill. However total Liquidated Damage shall not exceed 10 percent (ten percent) of the order value.

6.FORCE MAJEURE:

Should a part or whole work covered under this contract be delayed in delivery - completion of work due to reasons of Force majeure which shall include legal lockouts, strikes, riots, civil commotion, fire, accidents, quarantines, epidemic, acts of God and War, stoppage of deliveries by the Government, freight embargoes etcetera; the delivery period - completion of work referred to in this Contract shall be extended by a period not in excess of duration of such Force Majeure. The occurrence shall be notified by either party within reasonable time.

Note:

I.Offers received through post, courier, fax or email will not be considered.

II.Technical and commercial bid (Part-I) shall not contain any price details. Optional accessories or other price details, if any shall be uploaded in Supporting documents related to Price Bid, to be opened along with Price Bid.

III.In respect of FIM being issued, the fabricator shall submit Bank Guarantee for equivalent sum compulsorily. In case, submission of Bank Guarantee is not possible, the reasons there for shall be clearly mentioned. However, for such cases the fabricators at their cost shall secure such FIM through Insurance Policy with Director, SDSC SHAR as beneficiary. In case of PSU and Government Organization, Indemnity Bond in lieu of Bank Guarantee is acceptable. Balance FIM - Scrap, if any shall be returned along with the supply of the items. Please confirm acceptance in your quotation.

IV.SDSC SHAR shall have the right to place part order among the parties for the items for which they are the lowest.

V.TERMS AND CONDITIONS IN THE RFP SHALL PREVAIL OVER OTHER TERMS AND CONDITIONS(in case of any contradiction or ambiguity)

3. General Instructions to Vendor

1. Instructions to tenderers

TeleNo.08623-225174/225127

Fax No.08623-225170/22-5028

e-Mail ID : hps@shar.gov.in, sselvan@shar.gov.in, psovalf@shar.gov.in

1. Interested tenderers may, at their option, login to <https://eproc.isro.gov.in> and submit your offers.

2. TENDER FEE IS NOT APPLICABLE.

3. EARNEST MONEY DEPOSIT IS NOT APPLICABLE IF NOT MENTIONED IN THE RFP SPECIFICATION.

4. Indian agents while quoting on behalf of their principals are requested to attach Principals original quote, necessary authorization letter from their Principals, copy of agency agreement etc. in their bid.

5. TWO PART BIDS: In case of Two part tender, price details shall not be uploaded in the Technical &

Commercial Bids (Part I), failing to which the bid will be treated as INVALID.

6. The offer should be valid for a minimum period of 180 days for 2 part / 90 days for single part from the date of opening.

7. Due date & time: Sufficient time has been allotted for Bid submission. Vendors are requested to complete Bid submission well in advance. Last minute requests for due date extension citing server problems etc. will not be entertained. Bids will not be entertained after the due date and time.

7 (A). Request for the extension of the due date will not be considered.

8.

(a) Bid Opening for Public Tender: In case of Public Tender-Two Part Tenders: Technical and Commercial Bids will be opened on the first day specified for Tender opening. Interested vendors can attend the tender opening session to know the bidding details (Bidders presence is not mandatory to consider the quote for evaluation). Price Bid opening of the selected vendors will be scheduled later and it will be intimated to the selected Bidder (s).

(b) For Limited Tender: Bidders participation is not allowed.

9. Prices are required to be quoted according to the units indicated.

10. Preference will be given to those tenderers offering supplies from ready stocks and on the basis of FOR destination delivery at site.

11. (a) All available technical literature, catalogues and other data in support of the specifications and detail of the items should be furnished as attachments.

(b) Samples, if called for, should be submitted free of all charges by the tenderer 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 tenderer will 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 dimensions details are available the same should be indicated in your offer.

(d) Specifications: Stores offered should strictly conform to our specifications. Deviations, if any, should be clearly indicated by the tenderer in their quotation. The tenderer should also indicate the Make/Type number of the stores offered and provide catalogues, technical literature and samples wherever necessary. Test certificates wherever necessary should be attached. Whenever options are called for in our specifications, the tenderer should address all such options. Wherever specifically mentioned by us the tenderer could suggest changes to specifications with appropriate response for the same.

12. 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 quantity offered and the tenderers shall supply the same at the rates quoted.
13. 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.
14. The tenderer will be required to furnish a document containing the name of his bankers as well as the latest income-tax clearance certificate duly counter signed by the Income-tax Officer of the Circle concerned under the Seal of his office, if required by the Purchaser.
15. The Purchaser reserves the right to place order on the successful tenderers for additional quantity up to 25% of the quantity offered by them at the rates quoted.
16. Sr. Head, Purchase and Stores, SDSC SHAR SRIHARIKOTA reserves the right to accept or reject any bid in part or full without assigning any reason thereof.
17. Any bidder from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the bidder is registered with Competent Authority as specified in Office Memorandum no.F.No.6/18/2019-PPD, Ministry of Finance, Department of Expenditure, Public Procurement Division dated 23rd July 2020. All the conditions mentioned in the above OM is applicable for this tender.

C. Bid Templates

C.1 Technical Bid - Object Manipulator for 450KV X-ray system

1. Advanced NDT Systems - Design, Supply, Erection, Commissioning and Testing of Object Manipulator for 450KV X-ray System as per Specification attached in annexure.

Item specifications for Advanced NDT Systems - Design, Supply, Erection, Commissioning and Testing of Object Manipulator for 450KV X-ray System as per Specification attached in annexure.

| SI No | Specification | Value | Compliance | Offered Specification | Remark |
|-------|--|--|--------------------|-----------------------|--------|
| 1 | Technical and Commercial Terms and Conditions, | Party shall accept Commercial and Technical terms & conditions of the Tender document (attached) | Yes / No / Explain | | |

Document : Tender Document

Supporting Documents required from Vendor

- 1. Vendor shall attach the supportive documents for his commitments including pre qualification criteria**
- 2. Please upload Annexure duly sealed & signed by your competent authority**
- 3. Udyam Certificate if caliming MSE purchase preference.**
- 4. Self-deceleration indicating percentage of local content along with location of value addition.**
- 5. Technical datasheet**
- 6. Experince certificate as mentioned in the attached RFP**
- 7. Copy of IT return for last three FY**
- 8. Current Solvency Certificate for an amount of Rs. 50 Lakhs**

9. Copy audited balance sheet

10. Firm establishment certificate and nature of work

11. List of Machinery & Equipment to be used for the work

12. Structure and organization chart

13. List of personnel with qualification and experience

14. Any other documents as mentioned in the RFP

5 additional documents can be uploaded by the vendor

C.2 Commercial Terms / Bid

| Sl. No. | Description | Compliance | Vendor Terms |
|---------|---|--------------------|--------------|
| 1 | Full | Yes / No / Explain | |
| 2 | <p>The procurement intended for the bonafide use in Systems/Sub-systems of Launch Vehicle Project of Indian Space Research Organization, Government of India, Department of Space and eligible for IGST@5% as per guiding principles conveyed by the Ministry of Finance Dept. of Revenue Notification No. 25/2018-Integrated Tax (Rate) Schedule-I; Sl. No. 243B dated 31.12.2018 (Amendment to Notification No. 07/2018-Integrated Tax (Rate) dated 25.01.2018 and Notification No. 01/2017- Integrated Tax (Rate) dated: 28.06.2017)</p> <p>IGST Declaration Certificate shall be issued in this effect.</p> | Yes / No / Explain | |
| 3 | <p>Please confirm here whether your quoted "UNIT PRICE" in our Price Bid is EXCLUDING GST or INCLUDING GST.</p> <p>----- NOTE: If you are not clearly stating "GST is Inclusive OR Extra in basic cost" it will be treated as "GST is included in the quoted Basic/Unit cost in the price bid". Your offer will be evaluated as INCLUSIVE OF GST.</p> | Yes / No / Explain | |
| 4 | Delivery Term FOR, SLC Site, Thoothukudi (MANDATORY) | Yes / No / Explain | |
| 5 | <p>Packing and Forwarding(P & F) charges, extra if any, please mention percentage in price-bid. Please note that in case of Two part tenders, only percentage should be mentioned otherwise those offers shall be summarily rejected.</p> | Yes / No / Explain | |
| 6 | <p>Freight charges, extra if any, please mention percentage in price-bid Please note that in case of Two part tenders, only percentage should be mentioned otherwise those offers shall be summarily rejected.</p> | Yes / No / Explain | |
| 7 | Delivery Period required for delivery of the items/completion of total scope of work:Total Six Months (Detailed in RFP) | Yes / No / Explain | |

| | | | |
|---|---|--------------------|--|
| 8 | <p>Payment Term: OPTION 1: 100% Payment after installation, testing and acceptance of the system.</p> <p>Option 2: For Supply of Items: a. 20% of supply cost as advance against submission of bank guarantee for an equal amount from a reputed nationalized/scheduled bank and shall be valid till Contract completion period. Format of Advance Bank guarantee shall be furnished by Department after award of contract. b. 60% of supply cost payment against receipt of complete material at Purchasers /Department site, along with 100% GST. c. 20% of supply cost, after successful commissioning of equipment & system covered under contract and acceptance by the department, against submission of Performance bank guarantee valid till warranty period plus 60 days. For Erection Commissioning and Testing of System: a. 100% of erection cost after successful assembly of system in all respect, including testing & commissioning and acceptance of equipment & systems covered under contract by the department, against submission of performance bank guarantee.</p> <p>Note: 1. Kindly clearly indicate option of your payment while quoting. 2. The rate of interest shall be loaded on option of advance by the bidder for arriving L1. 3. After release of advance payment, any delay attributable to the supplier in effecting the scope of PO after prescribed delivery period, interest will be levied beyond the specified delivery period on the amount of balance advance payments as per the Prime Lending Rate of RBI. 4. In case of non-performance/poor performance, advance payment shall be recovered from supplier with interest as per the Prime Lending Rate of RBI along with 2% penal interest from the date of release of advance payment and the BG against advance payment shall be forfeited.</p> | Yes / No / Explain | |
|---|---|--------------------|--|

| | | | |
|----|--|--------------------|--|
| 9 | Warranty/Guarantee: Warranty/Guarantee for the offered item shall be from the date of acceptance of the item at our site for a minimum period of one year or specified in the tender document. | Yes / No / Explain | |
| 10 | Liquidated Damages (LD) :- Since delivery is the essence of this order, LD @ 0.5% per week or part thereof subject to a maximum of 10% of the order value for the delayed period of supply. | Yes / No / Explain | |
| 11 | Security Deposit (SD) 3% value of the order shall be deposited with SDSC within 10 days from the date of the Purchase Order towards security deposit in the form of Bank Guarantee(BG)/ FDR/DD towards performance of the Contract valid till completion of the contract period plus sixty days towards claim period. (This will be returned by SDSC immediately on execution of the order satisfactorily as per order terms. If not, the amount will be forfeited). NOT REQUIRED FOR LANDED COST BELOW RS.5 LAKHS. | Yes / No / Explain | |
| 12 | Performance Bank Guarantee (PBG) You have to submit a BG/DD/FDR in lieu of PBG from a Nationalized / Scheduled Bank for 3% of the order value at the time of supply valid till the completion of warranty period plus 60 days towards claim period. | Yes / No / Explain | |
| 13 | Combined BG for PBG cum SD In case, if parties are unable to provide two separate BGs, i.e., one for SD & one for PBG, they can submit a combined BG for SD & PBG for 3% of the Order value valid till the completion of total contractual obligation (i.e., Supply period plus warranty period plus 60 days). Please confirm. | Yes / No / Explain | |
| 14 | Insurance Being a Govt. Of India Dept., Insurance is not required at our cost. Please ensure the safe delivery of the ordered item with proper transport worthy packing. | Yes / No / Explain | |

| | | | |
|----|--|--------------------|--|
| 15 | <p>Validity of Offer</p> <p>In case of single part tender - the validity of offers/tenders should be 90 days. In case of two part tender - 120 days from the date of opening of Part-I bid and 60 days from the date of opening of Part-II bid. Tenders shorter than offer validity mentioned above will not be considered for evaluation.</p> | Yes / No / Explain | |
| 16 | <p>The bidder shall provide compliance to Order No. F.No.7/10/2021 PPD dated 23.02.2023 and amendments thereof by Ministry of Finance, Department of Expenditure, Public Procurement Division regarding restrictions on procurement from a bidder of a country which shares a land border with India and comply to all the provisions of the Order. In this regard, you shall certify that the bidder entity is not from such a country or, is from such a country, has been registered with the Competent Authority.</p> | Yes / No / Explain | |
| 17 | <p>As per the above Order, are you (the Bidder/Company/Entity) OR offering product/service is from such a Country sharing Land border with INDIA.</p> | Yes / No / Explain | |
| 18 | <p>Make-In-India (MII) Clause: Provisions contained in Public Procurement Policy (Preference to Make in India), Order 2017 issued by DPIIT vide OM No. P-45021/2/2017-PP(BE-II) dated 16.09.2020 & directives related including latest amendments (if any) is applicable for this tender.</p> <p>You are requested to provide Self Declaration Certificate that the offered Item meets Local Content Requirement of Class 1 or Class 2 as per Make in India(MII) Policy, clearly indicating the Percentage of local content & the details of Location(s) at which value addition is made in the offered product.</p> <p>It may be noted that Local Content shall not include services such as Transportation, Insurance, Installation, Commissioning, Training and after sales service support like AMC/CMC etc.</p> | Yes / No / Explain | |

| | | | |
|----|--|--------------------|--|
| 19 | Please mention in PERCENTAGE the Value addition of offered products happened in INDIA in line with Make In India Policy. (Mandatory). You have to upload MII Deceleration mentioning place and percentage of value addition along with Offer. | Yes / No / Explain | |
| 20 | Purchase preference to Micro and Small Enterprises (MSEs): Purchase preference will be given to MSEs as defined in Public Procurement Policy for Micro and Small Enterprises (MSEs) Order, 2012 dated 23.03.2012 issued by Ministry of Micro, Small and Medium Enterprises and its subsequent Orders/Notifications issued by concerned Ministry. If the bidder wants to avail the Purchase preference, the BIDDER MUST BE MANUFACTURER OF THE OFFERED PRODUCT in case of bid for supply of goods. TRADERS ARE EXCLUDED from the purview of Public Procurement Policy for Micro and Small Enterprises. In respect of bid for Services, the bidder must be the Service provider of the offered Service. Relevant documentary evidence along with UDYAM REGISTRATION in this regard shall be uploaded along with the bid in respect of the offered product or service. If L-1 is not an MSE and MSE Seller (s) has/have quoted price within L-1 plus 15% (Selected by Buyer) of margin of purchase preference/price band defined in relevant policy, such Seller shall be given opportunity to match L-1 price and contract will be awarded for 25% (selected by Buyer) percentage of total QUANTITY. | Yes / No / Explain | |
| 21 | Are you claiming MSME Preference for this tendered item/service? Note: You should have been the MANUFACTURER of the offered product or SERVICE Provider of the said service (in service tender) as per your MSME Registration. (If YES, valid Udyam Registration documents shall be uploaded. Otherwise your claim will not be considered. False declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h)) | Yes / No / Explain | |

| | | | |
|----|---|--------------------|--|
| 22 | Please Select for the offered Product whether you are: (1) Manufacturer (2) Authorized Agent (3) Distributor (4) Dealer (5) Reseller (6) Others | Yes / No / Explain | |
| 23 | ARBITRATION:- The Contract/PO shall be interpreted, construed and governed by the Laws in India. In the event of any dispute/s, difference/s or claim/s arising out of or relating to the interpretation and application of the Contract/PO, such dispute/s or difference/s or claim/s shall be settled amicably by mutual consultations of the good Office of the respective Parties and recognizing their mutual interests attempt to reach a solution satisfactory to both the parties. If such a resolution is not possible, within 30 days from the date of receipt of written notice of the existence of such dispute/s, then the unresolved dispute/s or difference/s or claim/s shall be referred to the Sole Arbitrator appointed by the Parties by mutual consent in accordance with the rules and procedures of Arbitration and Conciliation Act 1996 as amended from time to time. The arbitration shall be conducted in Bengaluru in the Arbitration and Conciliation Centre - Bengaluru (Domestic and International) as per its rules and regulations. The expenses for the Arbitration shall be shared equally or as may be determined by the Arbitrator. The considered and written decision of the Arbitrator shall be final and binding between the Parties. The applicable language for Arbitration shall be English only. | Yes / No / Explain | |
| 24 | Do you have Unique GeM Seller ID? If YES, provide details If NO, As per Office Memorandum No 6/9/2020-PPD dated 24/08/2020 of Department of Expenditure, it shall be mandatory for sellers providing Goods and Services to Central Government Organizations to be registered on GeM and obtain a Unique GeM Seller ID, at the time of Placement of Order/acceptance of contract. Tenderers shall ensure the same. | Yes / No / Explain | |
| 25 | Address on which PO is to be placed and GSTIN | - | |

| | | | |
|----|--|---|--|
| 26 | Please provide valid/currently using E-mail Id & Contact no. for seeking further clarifications if any | - | |
| 27 | Remarks if any. | - | |
| 28 | Please note that the all bidders have to qualify qualification criteria, there is no relaxation shall be provided to any category of the bidder in per-qualification criteria to the tender. | - | |

C.3 Price Bid

| Sl. No. | Item | Quantity | Unit Price | Currency | Total Price | P&F IN PERCENTAGE | FREIGHT PERCENTAGE | Remark |
|---------|--|----------|------------|----------|-------------|-------------------|--------------------|--------|
| 1 | Advanced NDT Systems - Design, Supply, Erection, Commissioning and Testing of Object Manipulator for 450KV X-ray System as per Specification attached in annexure. | 1.00 Lot | | - | | | | |

**Request for Proposal (RFP) of
Object Manipulator for 450KV X-ray System**

**For
NDT Facility – SLC**

Kulasekarappattinam, Thoothukudi District. Tamilnadu



Satish Dhawan Space Centre SHAR

Indian Space Research Organization

Sriharikota -524 124, A.P

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Annexure-1: Specifications of Object Manipulator system

Annexure-2: Price Bid Format

Annexure-3: Vendor Compliance sheet

I. Overall Scope of Work

- (i) Design, supply, erection, commissioning and testing of Object Manipulator System (Qty: 1 Lot) for handling the 450 KV X-ray system, Radiographic detector and Test object as per the specifications given in annexure-1.

Requirements of supplier:

- a) **Object Manipulator system:** Supplier shall meet the pre-qualification criteria specified in the tender document for fabrication & supply of the Object (Multi Axis) manipulator system.

However, supplier shall submit the offer as prescribed in the price bid format given in Annexure-2. Details regarding bid preparation are given in the document.

Details of the NDT facility and other interface details are explained in this document. (It may be noted that SDSC SHAR may be referred to as Purchaser/User/Department/Owner, etc. and so also the supplier as the Contractor/Party/Tenderer/Seller/Bidder/Vendor/supplier etc. elsewhere in this document, to mean the same).

II. Responsibilities of Supplier and SDSC SHAR

- **Responsibility of Supplier**

1. Design, supply, erection, commissioning and testing of Object Manipulator System (Qty: 1 Lot) for handling the 450 KV X-ray system, Radiographic detector and Test object as per the specifications given in annexure-1.
2. Transportation, erection, commissioning, testing and evaluation of the Manipulator system along with the necessary accessories at SLC site, ISRO, near Kulasekaranpattinam, Thoothukudi Dist, Tamilnadu.
3. All material handling equipments, special purpose tools/fixtures, loads required during erection & commissioning shall be arranged by supplier.

4. Object Manipulator System:

- a) Supplier shall submit the general arrangement/Configuration drawings along with quotation and this configuration shall meet all the manipulation requirements specified in annexure-1
 - b) Supplier shall submit all design details of manipulator sub systems for clearance by purchaser before commencing the fabrication work.
 - c) Supplier shall submit the structural analysis of critical structural members of manipulator based on the system configuration for clearing the design of the manipulator.
 - d) Design of manipulator subsystem components shall be as per the IS standards mentioned in this report and other elements not covered shall be designed & supplied based on the SDSC SHAR guidelines for design clearance.
- 5. Providing acceptance test & measurement procedures and test certificates for the Manipulator system for the acceptance tests at supplier's site prior to dispatch of the systems to SLC.
 - 6. Supplier shall arrange for inspection of the Manipulator system by the purchaser at the supplier's premises for ensuring /meeting the specifications.
 - 7. During this period, the purchaser inspectors shall be trained in the operation and maintenance including troubleshooting of Manipulator.
 - 8. Training of SDSC SHAR Engineers during testing and commissioning at SLC.
 - 9. Supplier shall be responsible for attending major breakdowns for a period of one year after commissioning of the Manipulator system at SLC at no additional cost.
 - 10. Three sets of Operation, service & Maintenance manuals for the complete system.
All service & maintenance manuals shall contain block diagram, circuit diagram/wiring diagram and flow charts.

- **Responsibility of SDSC-SHAR**

SDSC SHAR will provide the NDT building and necessary electrical power (415V, 3 phase or 230V, 50Hz) requirements for erection and commissioning of the Manipulator system.

III. General Terms and Conditions

1. VALIDITY OF OFFER

The offer shall be valid for 120 days from the date of opening the bids. In case of any delay in obtaining technical clarifications from the supplier due to incomplete bid, the validity shall be extended accordingly.

2. DELIVERY SCHEDULE

Supplier shall deliver the Object Manipulator system at SLC site, near Kulasekaranpattinam, Thoothukudi Dist, Tamilnadu within 05 months from the date of release of purchase order from SDSC SHAR and commission & demonstration of the rated outputs/performance of the systems as per the tender document shall be within 01 month from the date of clearance given by the department for erection and commissioning.

The realization of fabrication works within the schedule is very essential. Hence, bidders are requested to adhere to the schedules given below.

| S.No | Description of Target | Responsibility | Target Completion Date |
|-------------|--|-----------------------|---|
| 1 | Purchase Order release | Dept. | T |
| 2 | Design, fabrication / machining, control assembly, inspection, transportation, handling and storage at site. | Vendor | T + 05 months |
| 3 | Department clearance for erection and commissioning. | Dept. | T1 |
| 4 | Erection, Commissioning of the equipment. | Vendor | T1 + 01 months from the date of site clearance for erection |

Note: Site clearance for stating erection and commissioning will be given by department via official correspondence. T1 shall be considered as the date mentioned in the correspondence

In case if supplier is ready to supply the systems well before the schedule delivery, department/purchaser's clearance is essential.

3. PRICE

Price shall be quoted in the format enclosed in Annexure-2.

4. TAXES AND DUTIES

As per the Notification No.6/2018-Entral Tax (Rate) dt:25.01.2018 A(ix) S.No.243A (88 or any other chapter) as amended by Notification No.24/2018-Central Tax (Rate) Dt:31.12.2018 b(viii) S.No.243B issued by Ministry of Finance (Dept. of Revenue) & Government of Andra Pradesh, Revenue (Commercial Taxes -II) Department, G.O.MS.No.93 Dated: 19.02.2018 A(ix) S.No.243A and as per the Notification No. 7/2018-Integrated Tax (Rate) dt: 25.01.2018 A(ix) S.No.243A (88 or any other chapter) as amended by Notification No.25/2018-Integrated Tax(Rate) Dt:31.12.2018 b(viii) S.No.243B issued by Ministry of Finance (Dept. of Revenue), SDSC SHAR is eligible to avail GST/IGST @5% for the procurements related to Scientific and technical instruments, apparatus, equipment, accessories, parts, components, spares, tools, mock ups and modules, raw material and consumables required for launch vehicles and satellites and payloads. We will issue End Use Certificate for availing GST/IGST @ 5%.

5. STANDARD PAYMENT TERMS

5.1. 100% Payment after installation, testing and acceptance of the system.

or

5.2. For Supply of Items:

- a. 20%** of supply cost as advance against submission of bank guarantee for an equal amount from a reputed nationalized/scheduled bank and shall be valid till Contract completion period. Format of Advance Bank guarantee shall be furnished by Department after award of contract.

b. 60% of supply cost payment against receipt of complete material at Purchasers / Department site, along with 100% GST.

c. 20% of supply cost, after successful commissioning of equipment & system covered under contract and acceptance by the department, against submission of Performance bank guarantee valid till warranty period plus 60 days.

d. Penal interest

1. If you fail to execute the Order after drawing Advance, you should return the Advance amount in full with interest at Bank lending rate plus 2% beyond delivery period and all BG/FDR/etc. shall be forfeited.

2. In case of delay in execution of contractual obligations beyond delivery period, the seller is liable to pay interest on advance paid beyond the delivery period till the completion of scope of contract.

3. The rate of interest shall be loaded on option of advance by the bidder for arriving L1.

5.3. For Erection Commissioning and Testing of System:

a. 100% of erection cost after successful assembly of system in all respect, including testing & commissioning and acceptance of equipment & systems covered under contract by the department, against submission of performance bank guarantee.

6. DELIVERY TERMS

Delivery of all the items shall be on 'FOR, SLC Site, Thoothukudi District, Tamilnadu basis and the supplier take responsibility to deliver the consignment to SLC site.

7. PACKING

a) The Suppliers responsible for packaging the system as per the guided norms of Principals. The Supplier is responsible for delivering the items at site without damages.

8. INSTALLATION, TESTING, EVALUATION & COMMISSIONING

a) The erection, testing and commissioning shall be completed within 01 month after issuing the site clearance by department/purchaser.

- b) The acceptance of the system is as per the Acceptance Test Plan to be supplied by the supplier, which shall be discussed and mutually agreed upon.
- c) The detailed installation and commissioning schedule shall be provided to SLC Project on mutual agreement.
- d) Supplier shall submit all the test certificates of individual sub-systems tested at supplier's site along with the systems.

9. INSPECTION & TRAINING

- a) Inspection of Object Manipulator will be carried out by the purchaser at the supplier's premises for ensuring /meeting the specifications.
- b) SDSC SHAR Engineers shall be trained during testing and commissioning of the Object Manipulator System and maintenance including various troubleshooting tasks at SLC.

10. LIQUIDATED DAMAGES

If the Supplier fails to deliver the Stores within the time specified in the contract or any extension thereof, the Purchaser shall recover from the Supplier as liquidated damages a sum of 0.5 percent per calendar week or part thereof of the PO value of the Installation work. The total liquidated damages shall not exceed ten percent (10 percent) of the contract price of the unit.

11. STANDARD TERMS & CONDITIONS:

1. Offer shall be sent online only using standard digital signature certificate of class iii with encryption /decryption. The tenders authorize online on or before the open authorization date and time only will be considered as valid tenders even though the bids are submitted online.
2. The tenderer must authorize bid opening within the time stipulated in the schedule by SDSC SHAR. Otherwise the online bid submitted will not be considered for evaluation. Physical copy will not be considered even though it is received before the bid submission date.

Being a two-part tender, parties shall submit their offers as follows:-

- a) Part-I – Techno-commercial Bid**

(No price details shall be mentioned in this bid and shall not upload the details of price along with the techno-commercial bid)

b) Part-II – Price Bid

In view of Two-Part Tender, the Offers submitted contrary to above instructions will be summarily rejected.

3. PERFORMANCE BANK GUARANTEE (PBG):

Successful vendor has to submit a BG/DD/FDR in lieu of PBG from a Nationalized / Scheduled Bank for 3% of the order value after commissioning and acceptance of Manipulator system, valid till the completion of warranty period plus 60 days towards claim period.

4. SECURITY DEPOSIT (SD)

3% value of the order shall be deposited with SDSC within 10 days from the date of the Purchase Order towards security deposit in the form of Bank Guarantee (BG)/ FDR/DD towards performance of the Contract valid till completion of the contract period plus 60 days towards claim period. (This will be returned by SDSC immediately on execution of the order satisfactorily as per order terms. If not, the amount will be forfeited).

5. Combined BG for PBG cum SD

In case, if parties are unable to provide two separate BGs, i.e., one for SD & one for PBG, they can submit a combined BG for SD & PBG for 3% of the Order value valid till the completion of total contractual obligation plus 60days. (i.e., Supply period plus warranty period plus 60 days).

6. Note: No interest shall be payable on any bank guarantee.

7. The delivery period mentioned in the tender enquiry, IF ANY, is with the stipulation that no credit will be given for earlier deliveries and offers with delivery beyond the period will be treated as unresponsive.

8. The bidders should note that conditional discounts would not have edge in the evaluation process of tenders.

9. Non-acceptance of any conditions wherever called for related to Guarantee/ Warranty, Performance Bank Guarantee, Security Deposit, Liquidated damages are liable for disqualification.
10. Wherever installation/ commissioning involved, the guarantee/warranty period shall reckon only from the date of installation and commissioning.
11. The drawings, specifications, end use etc., given by the Centre/Unit along with the tender enquiry are confidential and shall not be disclosed to any third party.

12. EXCLUSION OF TENDERS

The following tenders shall be summarily rejected from the procurement process

- a. Tenders received from vendors who have not qualified in terms of their registration.
- b. Tenders received against publishing of a limited tender in the EGPS portal.
- c. Tenders of vendors who have been removed from the vendor list or banned/debarred from having business dealings.
- d. Unsolicited tenders from vendors.
- e. The tenders which materially depart from the requirements specified in the tender document or which contain false information.
- f. The tenders of vendors who have not agreed to furnish Security Deposit, Performance Bank Guarantee and Liquidated Damages.
- g. The validity of the tenders is shorter than the period specified in the tender enquiry.
- h. The tenders received from vendors or their agents or anyone acting on their behalf, who have promised or given to any official of the Centre/Unit/Department, a gratification in any form, or anything of value, so as to unduly influence the procurement process.
- i. The tenders received from vendors, who, in the opinion of the Centre/Unit, have a conflict of interest materially affecting fair competition.
- j. The tenders received from Indian agents on behalf of their foreign Principals/OEMs (in cases where the Principals/OEMs also submit their tenders simultaneously for the same item/product in the same tender).

k. In case two or more tenders are received from an Indian agent on behalf of more than one foreign Principal/OEM, in the same tender for the same item/product.

l. If a firm quotes 'NIL' charges / consideration, the bid shall be treated as un-responsive and will not be considered.

13. WARRANTY, PERFORMANCE BANK GUARANTEE & REPLACEMENT

- a) The Supplier shall guarantee/ warranty that the Stores supplied shall comply fully with the specifications laid down, for material, workmanship and performance.
- b) Warranty shall be applicable for a period of twelve months after the acceptance of the system by purchaser at SLC, if any defects are discovered therein or any defects therein are found to have developed under proper use arising from faulty materials, design or workmanship, the Supplier shall rectify such defects at his own cost.
- 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 supplier free of all costs to the Purchaser.

14. TECHNICAL DOCUMENTS

Supplier shall deliver, three copies of the Test certificates, Technical Manual, consisting of Operation Instructions, Preventive Maintenance procedures & Trouble Shooting etc. in English along-with the system. Any changes or modifications that may be found necessary at the time of test and evaluation shall be incorporated and the documents shall be amended suitably

15. MII Clause

Provisions contained in Public Procurement Policy (Preference to Make in India); Order 2017 issued by DPIIT vide OM No. P-45021/2/2017-PP(BE-II) dated 16.09.2020 & directives related including latest amendments (if any) is applicable for this tender. You are requested to provide Self Declaration Certificate that the offered Item meets Local Content Requirement of Class 1 or Class 2 as per Make in India (MII) Policy, clearly indicating the Percentage of local content & the details of Location(s) at which value addition is made in the offered product. It may be noted that Local Content shall not include services such as Transportation, Insurance, Installation, Commissioning, Training and after sales service

support like AMC/CMC etc. Minimum 50% local content for Class-1 local supplier and minimum 20% local content for class 2 local suppliers.

Bidders shall submit self-declaration indicating percentage of local content along with location of value addition in INDIA.

16. MSE's Clause

Purchase/Price Preference will be extended to the MSEs under the Public Procurement Policy for MSEs formulated under the Micro, Small and Medium Enterprises Development Act, 2006 and instructions issued by Government of India from time to time. Vendors who would like to avail the benefit of MSME should clearly mention the same and submit all the documentary evidences to substantiate their claim along with tender itself.

17. LANGUAGE AND MEASURES

All documents pertaining to the contract including specifications, schedule notices, correspondence, operating and maintenance instructions, drawings or any other writings shall be written in English Language. The metric system of measurement shall be used exclusively in this contract.

18. APPLICABLE LAW

The Supplier shall be interpreted, construed and governed by the laws of India.

19. FORCE MAJEURE

Neither party will be held responsible for non-fulfillment of their respective obligations under this agreement due to the exigency of one or more of the force majeure events such as but not limited to Acts of God, war, flood, earthquake, strike, lock-outs, epidemics, riots, civil commotions etc., provided on the occurrence and cessation of any such events, the party affected thereby will give a notice in writing to the other party within one month of such occurrence or cessation. If the force majeure conditions continue beyond six months, the parties will then mutually decide about the future course of action.

The agreement contains the modalities, terms and conditions of different services during the development, testing and commissioning phases.

20. ARBITRATION

In the event of any question, dispute of difference arising under these conditions or any conditions contained in the Purchase Order or 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 Purchase Office or some other person appointed by him, it will be no objection that the arbitrator is a Government Servant that he had to deal with matter to which the contract relates or that in the course of his duties as Government Servant he had expressed views on all or any of the matters in disputes or difference. The award of the arbitrator shall be final and binding on the parties of this contract.

It is Term of this contract:

a. If the arbitrator be the head of the purchase office.

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 Purchase Office to appoint another person as arbitrator:

or

b. If the arbitrator be a person appointed by the Head of the Purchase Office in the event of his dying, neglecting or refusing to act, or resigning or being unable to act, for any reason, it shall be lawful for the Head of the Purchase Office either to proceed with the reference himself or to appoint another person as arbitrator in place of the outgoing arbitrator. Subject as aforesaid, the Indian Arbitration and Conciliation Act, 1996 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 the extent with the consent of the Purchaser and the Contractor the time making and publishing the award. The venue of arbitration shall be place as the purchaser in his absolute discretion may determine. Work under the Contract shall, if reasonably possible, continue during arbitration Proceedings.

c. In case order is concluded on the public Sector Undertakings, the following Arbitration Clause will be applicable.

In the event of any dispute or differences relating to the interpretation and application of the provisions of contracts, such dispute or difference shall be referred by either party to the Arbitration of one of the Arbitrator in the Department of Public Enterprises to be nominated by the Secretary to the Government of India in-charge of the Bureau of Public Enterprises. The Indian Arbitration and Conciliation Act, 1996 shall not be applicable to the Arbitration under this clause. The award of the arbitrator shall be binding upon the parties to the dispute provided, however, any party aggrieved by such award may make a further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law & Justice, Government of India. Upon such Additional Secretary when so authorised by the Law Secretary whose decision shall bind the parties finally and conclusively. The parties to the dispute will share equally the cost of arbitration as intimated by the arbitrator.

21. CANCELLATION OF CONTRACT

21.1 GENERAL RULE

The Department shall have the right at any time to cancel a contract either totally or in part by giving written notice by registered mail. From the time of receipt of the written notice, the Supplier shall undertake to observe the instructions of the Department as to the winding up of the contract both on his own part and on the part of his sub-suppliers.

21.2 WITHOUT FAULT OF SUPPLIER

In the case of cancellation of a contract by the Department without any fault of the Supplier, the Supplier shall on receipt of Department's instructions forthwith take the necessary steps to implement them. The period to be allowed to implement them shall be fixed by the Department after conclusion with the Supplier and, in general, shall not exceed three months. Subject to the Supplier confirming, Department shall take over from the Supplier at a fair and reasonable price all finished parts not yet delivered to the Department, all unused and undamaged material, bought-out components and articles in course of manufacture in the possession of the supplier and property obtained by or supplied to the Supplier for the

performance of the contract, except such material, bought-out components and articles in course of manufacture as the supplier shall, with the agreement of the Department, elect to retain.

22 FRAUDULENT PRACTICES, BRIBERY AND CORRUPTION OF GOVERNMENT SERVANTS

The contractor represents and undertakes that he has not given, offered or promised to give, directly or indirectly any amount, gift, consideration, reward, commission, fees, brokerage or inducement to any person in service of the department or otherwise in procuring the contracts or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of the contract or any other contract with the Government for obtaining a contract or showing or forbearing to show favour or disfavour to any person in relation to the contract or any other contract with the government. Any breach of the aforesaid undertaking by the contractor or any one employed by him or acting on his behalf or for his benefit (whether with or without the knowledge of the contractor) or the commissioning of any offence by contractor or any one employed by him or acting on his behalf, as defined in chapter IX of the Indian Penal code, 1860 or the prevention of corruption Act. 1947 or any other Act enacted for the prevention of corruption shall, without prejudice to any other legal action, entitle the Department to cancel the contract either wholly or in part, and all or any other contracts with Contractor and recover from the Contractor such amount or the monetary value thereof and the amount of any loss arising from such cancellation without any entitlement or compensation to the Contractor. The Department will also have the right to recover any such amount from any contracts concluded earlier between the contractor and the Government of India. The contractor will also be liable to be debarred from entering into any contract with the Government of India for a minimum period of five years. A decision of the Department to the effect that a breach of the undertaking had been committed shall be final and binding on the Contractor.

23 Risk and Cost Purchase

Timely delivery of goods/services is of prime importance and where the vendor fails to fulfil their contractual obligations, the Procuring Entity shall be entitled, and it shall be lawful on his

part, to procure Stores and/ or services similar to those ordered/cancelled, with such terms and conditions and in such manner as it deems fit at the “Risk and Cost” of the Contractor and the Contractor shall be liable to the Procuring Entity for the extra expenditure, if any, incurred or accrued by the Procuring Entity for arranging such procurement. However, the Contractor shall not be entitled to benefits if any, from such procurements.

Prior to resorting to risk purchase the Purchaser shall consider impact of the default by the contractor, proper notice to the contractor to invoke risk purchase clause and method of recovering the additional amount spent by the Purchaser. The cost as per risk purchase exercise may be recovered from the Earnest Money Deposit/ Security Deposit/ Performance Security of the supplier and/or bills submitted by the supplier against the same contract or any other contract. GST will be charged / levied on Risk Purchase as per the provision of GST Act Rule thereon.

Risk purchase action may be initiated under any of the following conditions.

- a. When the supplier fails to deliver the materials even after extending the delivery period.
- b. When the supplier fails to respond to purchases request for supply of the materials and fails to provide any genuine and bonafide reason for the delay in supply.
- c. When the supplier breaches any of the terms and conditions of the supply order/ contract and as a result fails to execute the order satisfactorily

24 Land Boarder Sharing Declaration.

The bidder shall provide compliance to Order No. F.No.7/10/2021 PPD dated 23.02.2023 and amendments thereof by Ministry of Finance, Department of Expenditure, Public Procurement Division regarding restrictions on procurement from a bidder of a country which shares a land border with India and comply to all the provisions of the Order. In this regard, you shall certify that the bidder entity is not from such a country or, is from such a country, has been registered with the Competent Authority.

25 PREPARATION OF BIDS- INFORMATION TO BIDDERS

a. SITE VISIT

The Supplier may visit SLC site and acquaint himself fully with the requirements before submitting the tender. Supplier shall be deemed to have clearly understood and satisfied himself regarding the work and services, all conditions liable to be encountered during the execution

b. COST OF BIDDING

All direct and indirect costs associated with the preparation and submission of Bid (including clarification meetings and site visit, if any), shall be to Supplier's account and the Purchaser will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the Bid process.

c. SCHEDULE OF PRICES

The schedule of prices shall be read in conjunction with all the sections of proposal document.

For Lump sum contract, the lump sum prices quoted by the Supplier shall be firm and fixed for the completion of the work, unless stated otherwise. The price must be filled in the format specified in the document.

d. DOCUMENTS COMPRISING THE BID

PART – I TECHNICAL AND UNPRICED COMMERCIAL PART

Technical bid shall be submitted online and the following documents shall be attached along with the technical bid. No attachment with price information shall be attached along with the technical bid.

- i. Submission of bid letter along with one set of proposal document duly signed and stamped as token of acceptance
- ii. Copy of Company's registration number certificate.
- iii. Power of attorney in favour of authorized signatory of the bid / proposal documents.
- iv. All the annexures enclosed in proposal duly filled, signed and sealed

- v. Unpriced copy of schedule of prices with all other commercial terms and conditions duly filled (Prices to be kept blank), signed and stamped
- vi. Data sheets for all the equipment & checklists enclosed in proposal duly filled, signed, & stamped.
- vii. Technical details, equipment general arrangement drawings with part list, catalogue, layout drawings, P & I diagram, catalogues etc as applicable and any other drawing, document as mentioned in the proposal.
- viii. Audited balance sheet including profit and loss account for the last three financial years, ending with March 2025.
- ix. IT return of last three years ending with March 2025.
- x. Vendor shall submit as solvency certificate for the value of 50 lakhs. The certificate date shall be within 06 months from the tender date.
- xi. List of projects in hand & completed during the last 3 financial year indicating the name of client, contact person, contract value, nature of work, work completed, work balance, name of Consultant, month & year of commencement & completion etc.
- xii. Organization chart for the proposed work with bio data of key personnel
- xiii. Schedule Bar chart.
- xiv. Execution Plan.
- xv. Any other relevant document, Supplier desires to submit.

PART – II PRICED COMMERCIAL BID

Commercial bid shall be filled in on line and no scanned copy should be attached to technical bid. No deviations, terms and conditions, assumptions, conditions, discounts etc. shall be stipulated in price bid. Purchaser will not take cognizance of any such statement and may at their discretion reject such bids.

e. PRE-QUALIFICATION CRITERIA

| Sl. No | CRITERIA |
|-----------|---|
| I | <p>Tenderer for supplying the Object Manipulator system shall have experience in the field of design, supply and erection & commissioning of manipulator systems for precision control of scientific equipment, Weighing 100 Kg Minimum and manipulation movements in at least 3-axis. The tenderer, executed the above defined work in last 07 years ending with 31-03-2025 and corresponding PO shall be attached.</p> <p style="text-align: center;">or</p> <p>Tenderer had supplied, telescopic mast guided, overhead based handling system for precise handling & Control of scientific equipment, weighing 500 kgs minimum and in at least 3-axis movements. The tenderer, executed the above defined work in last 07 years ending with 31-03-2025 and corresponding PO shall be attached</p> |
| 2 | The vendor shall have annual turnover of minimum 100 Lakh, last three years, ending with 31-03-2025 |
| 3. | <p>The vendor shall submit the PO copy of work as stated in Sl.No.01.</p> <ul style="list-style-type: none">• One PO copy of Value 100 lakhs (or)• Two PO copy of 50 lakh each (or)• Three PO copy of 30 lakh each. (or) |
| 4. | Vendor shall submit as solvency certificate for the value of 50 lakhs. The certificate date shall be within 06 months from the tender date |

g. BID EVALUATION

- i. If the bid which does not satisfy the pre-qualification criteria as mentioned above shall summarily be rejected and shall not be considered for further evaluation. SDSC SHAR will scrutinize bids to determine whether the bid is substantially responsive to the requirements of the tender documents. For the purpose of this clause, a substantially responsive bid is one which inter-alia conforms to all the terms and conditions of the entire Tender document without any deviations and reservations. The decision of purchaser shall be final in this regard.

- ii. The supplier should not have any record of precedence that any government agency or PSU banned or short closed the active contracts during last 5 years.
- iii. During evaluation, purchaser may request Supplier for any clarification on the bid upon additional documents which is to be complied with; otherwise offer will be deemed incomplete.
- iv. Techno-commercial discussion shall be arranged with Supplier, if needed. Supplier shall depute his authorized representatives for attending discussions. The representatives attending the discussions shall produce authorization from his organization to attend the discussion and sign minutes of meeting on behalf of his organization if required. The authorized representative must be competent and empowered to settle/decide on all technical and commercial issues.
- v. The complete scope of work is defined in the Proposal document. Only those Suppliers who undertake total responsibility for the complete scope of work as defined in the Proposal document shall be considered.
- vi. In case Bid does not fully comply with the requirement of Proposal document and the Supplier stipulates deviations to the clauses of the proposal in Schedule of deviations, which are unacceptable to the Purchaser, the Bid will be rejected.
- vii. Performance of Supplier on similar works executed/ under execution shall be taken into consideration before selecting the Supplier for opening his price bid.
- viii. Purchaser reserves right to visit client's site for verification/validation.
- ix. The time schedule for completion is given in the Proposal document. Supplier is required to confirm the completion period unconditionally.
- x. Purchaser reserves the right to accept a bid other than a lowest and to accept or reject any bid in full or part without assigning any reasons. Such decisions by the Purchaser shall bear no liability on the Purchaser whatsoever consequent upon such decision.
- xi. Purchaser shall not be obliged to furnish any information / clarification to unsuccessful Suppliers as regards to non-acceptance of their Bids.

h. Vendor Evaluation Format:

(i) Tenderer shall submit the following information along with the techno-commercial bid.

| S. No | Description | Vendor Response | | |
|-------|---|-----------------|-----------------|---|
| 1. | Name of the company : | | | |
| 2. | Type of the Company : (Proprietary/Pvt.Ltd/Public Ltd/Joint Venture/Consortium) | | | |
| 3. | Registration number & certificate : | | | |
| 4. | Name & Address of the Office of the Chief Executive of the Company : | | | |
| 5. | Contact person for this tender with name & address and contact number : | | | |
| 6. | From which year the Company is in operation : | | | |
| 7. | IT returns for the last 3 years : | | | |
| 8. | Financial parameters : | | | |
| 9. | In Rs. Lakhs only | 2022-23 | 2023-24 | 2024-25 |
| | Turnover ` in lakhs : | | | |
| | Profit/Loss in Rs. lakhs : | | | |
| | Details of availability of design, 3-D Modeling, Analysis software and PLC programming and GUI/MIMIK design (if outsourcing provided details) | Software | No. of licenses | No. of Persons familiar to work on software |
| | | | | |
| | | | | |
| | | | | |

| S. No | Description | Vendor Response | | |
|-------|--|-------------------|----------------|---------------------------------|
| 10. | Details of availability of machinery and Testing equipments | Machine Type | Qty | No. of Persons familiar to work |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| 11. | Manpower details | Description | No. of Persons | Remarks |
| | | Design & Analysis | | |
| | | Technicians | | |
| | | Engr / Supervisor | | |
| 12. | The major customers for whom similar : works are provided (Enclose copies of the Purchase Orders) | | | |
| 13. | Any customers feedback on the : services which is in writing (Pl. enclose copies) | | | |

(i) Details of experience of contractor in executing similar type of works which are completed

| Sl. No | Full postal address of the client with | Description of the work | Value of the work (Rs. in | Completion Time as per PO | Actual period of completion | Reasons for delay |
|--------|--|-------------------------|---------------------------|---------------------------|-----------------------------|-------------------|
|--------|--|-------------------------|---------------------------|---------------------------|-----------------------------|-------------------|

| | Contact Person | | Lakhs) | | | |
|---|----------------|--|--------|--|--|--|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |

Note: In order to consider as valid experience, all the experience has to be supported with the completion certificate and purchase order

(ii) Details of present works being executed by the contractor

| Sl. No | Full postal address of the client with Contact Person | Description of the work | Value of the work (Rs. in Lakhs) |
|--------|--|-------------------------|-------------------------------------|
| | | | |
| | | | |
| | | | |

Note: copy of purchase orders may be enclosed.

Signature of Authorized Person with Seal

Specifications of Object Manipulator system for 450KV X-ray System

1. Scope of Work

Design, Supply, Erection and Commissioning of “Object Manipulator for 450KV X-ray System” as per the following specifications defined in the document.

2. Configuration Details.

450KV X-ray Object manipulator shall configure to Maneuver, the 450KV X-ray machine head (150Kg SWL), Radiographic Detector (700Kg SWL), for positioning the test article, the Self aligned Chuck (300 Kg SWL for Vertical mode of testing) and Roller sets (SWL 200Kg for Horizontal mode of testing) as per the defined way for radiography purpose of Solid motors and Ignitors. It is a ground-based system used to assist the manipulation in a defined way during the radiography of testing article. The object manipulator is positioned/erected in a exposure hall of size 12 (L) X 10 (W) X 7(H) m. Refer Figure – 2 & 3

Major Sub system Configuration details are listed below

2.1. 450KV X-ray Head Handling System Configuration (Axis -Z1 Powered, X1 Manual))

The 450KV X-ray maneuver, shall accommodate the X-ray head size, 800-950mm (l), Ø200 -250mm & weight 150Kg for integration. The head shall be connected to a system holder arrangement, which in turn adjusted for up and down and lateral movements. Refer Figure – 3. 450KV X-ray Head (pay load) shall be provided by department.

- Individual Up and Down powered Movement
- Manual Lateral Movement
- The distance between the X-ray head and Detector arrangements shall be variable from 600 to maximum of 2000mm

2.2. Detector Positioning System Configuration (Axis -Z2 Powered, X2 Manual)

Film positioning system shall configure to accommodate the Detector of Size, 800 x 800 x 400 mm (D) and Weight 700 Kg and film cassette of size 420 X 320 X 20mm. The Detector

system shall be connected to a holder arrangement, which in turn adjusted for up and down and lateral movements. The detector and film cassette (pay load) are department scope.

- Individual Up and Down powered Movement
- Manual Lateral Movement

2.3. Test Article Vertical Mode Radiography (Self Aligned Chuck, Axis -Y & Rotation $\Theta 1$, both are Powered)

The test article vertical mode of radiography is being done by keeping the article in the self-aligned chuck. The article dimensional parameters are given in functional requirements section. During radiography the chuck shall be positioned in between the X-ray head and Detector position arrangements. All three systems, the X-ray head, Detector position and Chuck shall be aligned in straight line. Initially, the Test article is segmentized along length wise as well as diameter. Each individual segmentation along the article length wise shall be tested by adjusting the up and down movement of X-ray head as well as detector position. After completing, the test article is rotated to a user defined angle and above similar procedure shall be followed for work completion.

- Rotational Movement ($\Theta 1$ Powered)
- Lateral movement (Axis-Y Powered)

2.4. Test Article Horizontal Mode Radiography (Roller Sets (2Nos.), Axis-Y and Rotation $\Theta 2$, Powered)

The test article horizontal mode of radiography is being done by keeping the article in the Roller sets (2- sets, Rollers-4Nos). The article dimensional parameters are given in functional requirements section. Initially, the test article length shall be segmentized as per requirement for radiography. During radiography, the test article shall be placed on roller sets and each individual segmentation(length) of article shall be positioned in between the X-ray head and Detector position arrangements. Similar way, the entire segmentized length shall be covered. After completing the length wise, the test article

shall be rotated to a user defined angle and subsequently the above procedure followed for completion. All three systems, the X-ray head, Detector position and test article shall be aligned in straight line. The Y- axis movements is common for both, the Chuck and Roller sets, since at a time any one of mode is being used.

- Rotational Movement (Θ 2 Powered)
- Individual distance between the roller sets shall be adjusted manually.
- The distance between the individual roller in a set shall be adjusted manually.

2.5. Electrical and Instrumentation.

The system is going to be used in explosive area; hence the electrical motors and junction boxes shall be suitable to use in Zone I class II flame proof environment. The electrical motors used in the system shall be controlled by VVVF drives. The motor VVVF drives will be placed in a non-flame proof area adjacent to the bay. The instrumentation system can be an intrinsically safe for getting data from exposure hall. The limit switches or Proximity sensors and encoders used in the system for positional accuracies, X-ray hardened is preferable. Compatible communication shall be planned between the VVVF drives and instrumentation system, the PLC based. Operator shall make operation through MMI console. The following shall be considered.

1. Necessary suitable intrinsic safe module to be planned for all the Proximity switches/ limit switches, push buttons and indication lamps planned in the hazardous area.
2. Variable voltage and variable Frequency Drives (VVVFD) and position sensing devices
3. Necessary Line filter to be provided in input for reducing Harmonics (recommended by OEM). Necessary filters for LINE and chokes for LOAD are to be supplied along with the VVVFD drives. THD shall not exceed 5% as per IEEE519 guidelines
4. Instrumentation controls and cabling to facilitate operations of the system locally as well as from the control room with the necessary key authorization switch.
5. All the signal cables are to be routed with suitable clearance from the power cables.
6. Mode of operation: The system shall be operated both in local and remote mode. Local operation is through local pendant push button station and remote operation is through

SCADA system from control room. Both mode inputs (Pendent & SCADA) shall be interfaced with PLC. The local mode operation (Pendant mode) shall be directly interfaced with drive. It shall be operated independent of PLC based on mode section in drive panel. SCADA shall have Discrete mode of operation. All the push buttons shall be directly interfaced to PLC through One In-Two Out IS Barriers in PLC RIO Panel using Control cable suitable for laying in Cable Drag Chain system. Cables to pendent push button station shall be hard wired.

7. PLC hardware shall be supplied by vendor and supplier has to carry out the PLC/SCADA programming to meet functional requirements and providing all necessary interlocks.
8. VVFDs with suitable rating shall be provided for all motions and they shall be located in non-hazardous area located about 30m (cable) away from manipulator. Necessary load side chokes/Filter to be planned as per the requirement.
9. As Radiography operation requires precise positioning of manipulator, all interfaces & mechanisms shall be designed accordingly.
10. The pendent / local push button station shall have provision for local display of position information of all motions.
11. Design calculations for selection of drive systems, motors, brakes, gearboxes, couplings, and any other systems shall be submitted to purchaser for clearance approval before fabrication.
12. All the motors rated shall draw only 80% of the rated current while operating with SWL.
13. All the drives shall be selected one rating above the rating of motor rating selected. Vender has to provide drive model no & ratings and clearance to be obtained before placement of order.
14. All the motors are to be provided with Thermistor embedded in winding for winding over temperature protection irrespective of motor rating and same to be interlocked with VVVF drive / external thermistor relay for necessary alarm/tripping at 120 /130 deg C respectively
15. Instrumentation controls and cabling to facilitate operations of the system locally as well as from the control room with the necessary key authorization switch.
16. Software for VFD to be supplied along with system to carryout modifications to meet future requirement. Hard and soft copy of parameters list to be furnished.
17. All source codes of PLC/SCADA/Drives, etc. are to be provided to department and those shall not be used in any other projects without approval of department.

2.6. Cable Management System.

Supplier shall provide a suitable cable drag chain for manipulator system. All cables & hoses of including 450KV Xray machine shall be incorporated in this cable management system, hence cable management system shall be selected accordingly. The cable routing requirements shall be made as per site conditions. The necessary cabling between the system and electrical panel rooms shall be properly routed and suitable cable management system shall be designed inside the bay. The cable management system shall consider additional cables meant for X- ray machine. The number of cables to be considered are, Ø 100 mm – 2Nos, Ø 35mm 2Nos. The X-ray machine cables and hoses shall be supplied by department

3. Operational Philosophy

The main objective of the system is to assist for Radiography of Solid motors and flight related accessories. For doing the radiography laterally or vertically, the X-ray Machine and the corresponding Film (Image Detector) shall be maneuvering in such a way that to cover the desired volume. The article volume, solid motor, is segmentized as per the exposure plan and each minor segment shall be radiographed individually to cover the entire length of the article.

The operational Radiography settings shall be done by maneuvering the system locally (Pendent) and remotely at Control room (Control Console) also. To have readable image during the film interpretation, the motion of the X-ray handling system, Test article rotation and Film positioning system are as per this document defined accuracies.

The entire system positional / rotational readings shall be displayed locally as well as remotely. The system shall have the provision for MMI in control room where the operator has the choice to command the system for specific movements remotely. On part of safety measures, the safety interlocks (soft as well as hard) shall be incorporated suitably based on the user inputs.

4. System Design.

The design of mechanical and electrical components of the system shall consider 125% of rated load (additional 25% safety margin). The electrical motors/components to be

installed at exposure bay shall be flameproof and necessary certificate shall be issued. Motion Interlocks, soft and hard shall be planned as per user requirement defined in this document.

The operational logic in MMI control shall be made as per requirement. Initially, the home position of individual systems shall be defined and the operator shall enable to command the system for a specific position during radiographic operation. All the movements shall be controlled through MMI logic with certain safety conditions.

Note: Supplier may suggest any other better configuration (like Fig-1 which can fulfill all functional requirements (like changing the Focus to film distance (FFD), image magnification, changing over from grain radiography to tangential radiography etc) of the manipulator system mentioned in this document. However, the manipulator configuration/general arrangement shall be submitted by vendor along with quotation and technical bid. Subject to meeting all functional needs of manipulator, vendor prequalification criteria and accepting/confirming the clarifications (if any) during technical bid evaluation, vendor's bid will be considered for further evaluation

5. Specifications of Functional Requirements

5.1. 450KV X-ray Head Handling System Requirements (Axis -Z1 Powered, X1 Manual))

Weight of X-ray tube Head (SWL) : 150 kg (Standard 450 kV X-ray machine of above mentioned makes along with shutters), corresponding dimensional details will be supplied during design phase.

Vertical travel for X-ray tube (Z_1) : 1500 mm from rotary table top level

Speed (variable) : 50mm/min to 500 mm/min (approx.)

Balancing for X-ray tube head : By counter weight/LM guide supports.

Position Accuracy : ± 0.1 mm

Display Resolution : 0.05 mm

Distance between tube-head and detector:

2000mm (Max) & 600mm (Min)

Type of screw Mechanism : Lead/Ball screw

Stroke for X1 movement: 750 mm (Manual movement)

Drive system :

Flame proof Servo motor (Ex-d, T4 Temp class) with Thermistor winding protection and Integrated Encoder/resolver feedback for speed accuracy/dynamic performance of suitable capacity with VVFD drive, suitable gear box and absolute encoder on driven side of the mechanism.

Position display :

DPM shall be located in portable intrinsically safe local bush button pendent system. During remote mode of operation positional information shall be displayed in GUI/MMI along with MIMIC.

- a) Swiveling arrangement for X-ray tube head in vertical and horizontal planes with manual clamping system for $\pm 30^\circ$ shall be provided.
- b) Suitable cable drag chains as supports shall be provided for holding the HT cables and cooling hoses of the X-ray tube head for smooth operation of the system.
- c) Proximity sensors to be provided for Parking & End position with redundancy configuration.

5.2. Detector Positioning System Requirements (Axis -Z2 Powered, X2 Manual)

Detector holder will accommodate both the types of detecting medium, i.e., flat panel including shielding as well as X-ray film cassette and the respective sizes are given below

(However exact size and weight details will be supplied during system design)

Size of flat panel (approx) : 800 x 800 x 400 mm

Weight of Detector (approx.)(SWL) : 700 kg.

Size of X-ray film cassette : 420 x 320 x 25 mm

Vertical travel (Z₂-Movement) : 1500 mm from rotary table top

Speed range : 50mm/min to 500 mm/min

Balancing for X-ray tube head : By counter weight/LM guide supports.

Positional accuracy : ± 0.1 mm
 Display Resolution : 0.05 mm
 Stroke for X2 movement : 750 mm (Manual movement)
 Type of screw : Lead/Ball screw
 Drive system :

Flame proof Servo motor (Ex-d,T4 Temp class) with Thermistor winding protection and Integrated Encoder/resolver feedback for speed accuracy/dynamic performance of suitable capacity with VVVF drive, suitable gear box and absolute encoder on driven side of the mechanism.

Position display :

DPM shall be located in portable intrinsically safe local push button pendant system. During remote mode of operation positional information shall be displayed in GUI/MMI along with MIMIC.

- a) The detector holder frame shall be designed in such a way to reach the centre of rotary table to facilitate radiography of test article.
- b) To ensure smooth movement linear ball bearings shall be provided.
- c) Provision for mounting and clamping the detector and film cassette shall be provided.
- d) A fixture frame arrangement (independent) detachable type shall be provided on the Flat Panel Detector holder in line with the beam center
- e) Proximity sensors to be provided for Parking & End position with redundancy configuration.

5.3. Test Article Vertical Mode Radiography Requirements (Self Aligned Chuck, Axis -Y & Rotation Θ 1, both are Powered)

Diameter of the Table : 450 mm (To accommodate Test article diameter, Minimum $\varnothing 100$ to Max $\varnothing 370$ mm)
 Height of Table top from floor : 500 mm
 Max. Weight of Object (SWL) : 300 Kg. (Max.)

| | |
|---------------------|---------------------------------------|
| Rotation speed | : 1rpm (Main) & 0.5rpm (Micro) |
| Rotary movement | : Indexing (settable from 1° to 180°) |
| Positional Accuracy | : $\pm 0.05^\circ$ |
| Display Resolution | : 0.01° |

Design Arrangements:

The Y Axis movements is common for both Rotary table and Roller sets. During Radiography by using the Rotary table, the Table center shall align with X-ray head and Detector position center line. Hence, the suitable Y – Stretch shall be planned to accommodate both the system.

Drive system :

Flame proof Servo motor(Ex-d,T4 Temp class) with Thermistor winding protection and Integrated Encoder/resolver feedback for speed accuracy/dynamic performance of suitable capacity with VVFD drive, zero backlash gear box and absolute encoder on driven side of the mechanism.

Position display :

DPM shall be located in portable intrinsically safe local bush button pendent system. During remote mode of operation positional information shall be displayed in GUI/MMI.

| | |
|------------------|--|
| T –Slots | : Radial, Min.3Nos. |
| Interlocks | : suitable interlocks like home position with flame proof/intrinsically safe type proximity switch/limit switch shall be provided. |
| Out of roundness | : Both Face out & Run out of the table shall be <0.1mm. |

- a) Removable job centering and clamping mechanism by 'Three-jaw chuck' shall be provided along with the table. Suitable clamping mechanism for clamping/holding the smaller size objects during radiography.
- b) The surface of the table shall be marked with concentric circles for easy positioning of objects.

- c) Proximity sensors to be provided for Parking & End position with redundancy configuration.

5.4. Test Article Horizontal Mode Radiography (Roller Sets (2Nos.), Axis-Y and Rotation θ_2 , Powered)

| | |
|---------------------------------------|--|
| Y Travel | : 1000 mm (laterally (both side) from beam center) or as per requirement |
| Weight of the Object(SWL) | : 200 Kgs. (To accommodate Test article diameter, Minimum $\varnothing 100$ to Max $\varnothing 300$ mm) |
| Length of the Job | : 200 mm to 1000 mm (Span adjusted accordingly) |
| Speed | : 300 mm/min (main) & 30mm/min (micro) |
| Positioning accuracy | : ± 0.1 mm (in micro speed) |
| Display Resolution | : 0.05mm |
| Number of Rollers | : 4Nos. (2 sets) Preferable. |
| Type of LM guide | : 4-way recirculated anti friction ball guides |
| Type of screw | : Rolled ball screw |
| Y Travel | : approx. 2000 mm (stroke) or as per requirement |
| Speed range | : 50mm/min to 500mm/min |
| Positional accuracy | : ± 0.1 mm |
| Display Resolution | : 0.05 mm |
| Type of guide | : LM |
| Type of screw | : Rolled ball screw |
| θ_2 Rotation | : 360 ⁰ continuous with indexing facility |
| Speed range | : 0.5 rpm to 1.0 rpm (on 200 dia article) |
| Positioning accuracy | : $\pm 0.1^0$ (on 200 dia article) |
| Display Resolution | : 0.01 ⁰ |
| Drive system | : |

Flame proof Servo motor (Ex-d,T4 Temp class) with Thermistor winding protection and Integrated Encoder/resolver feedback for speed accuracy/dynamic performance of suitable capacity with VVFD drive, suitable gear box and absolute encoder on driven side of the mechanism.

Position display :

DPM shall be located in portable intrinsically safe local push button pendant system. During remote mode of operation positional information shall be displayed in GUI/MMI.

- a. In case of Y frame positioning between the X-Ray source & Detector, the minimum distance between the rotary table axis and X-ray source is 600mm.
- b. There shall be provision for easy loading of objects on Y-θ unit by providing the lateral sliding movement to the object handling roller unit/rotary table unit on LM guide ways. The arrangement of roller holding brackets shall be designed such that they should not foul in the X-ray image of the object during radiography.
- c. Lubrication: All sliding surface will be lubricated by grease.
- d. Proximity sensors to be provided for Parking & End position with redundancy configuration.
- e. As mentioned in functional requirements note point-d, any better configuration (like configuration shown in fig-1(b)) of manipulator suggested by supplier to meet the intended need of X & Y movements of rotary table is acceptable subject to SDSC SHAR approval of the manipulator configuration.

6. Other requirements:

- I. Test load: party has to prepare a test load to simulate the manipulator requirements at vendor site as well as in SLC site. Test load (SWL) shall be handed over to SLC site after successful testing and commissioning of the manipulator in SDSC SHAR.
- II. Painting of all systems and structures listed above
- III. Grouting of systems.

- IV. First fill of oil, grease, lubricants as required during start-up and commissioning
- V. A separate list of spare parts required for trouble free operation of the system for two years.
- VI. All anchor bolts / foundation bolts, nuts, washers and inserts to be embedded in concrete for installing the system.
- VII. Civil related works: Any grouting, drilling, wall mounting/hole making works required in the facility at the time of system erection at SLC site shall be taken up as party's scope of work.
- VIII. Three sets of Operation, service & Maintenance manuals for the complete system. All service & maintenance manuals shall contain block diagram, circuit diagram and flow charts.
- IX. Quality records, history docket, as built drawings and all documentation related to manufacturing, inspection, testing and erection
- X. Installation procedures, Maintenance procedures and Operating procedures
- XI. Any other system not indicated herein, but required to make the system complete shall be included and provided at no extra cost unless otherwise specifically excluded as indicated.
- XII. Where ever specific makes or equivalent are mentioned and if the supplier is providing the equivalent makes prior approval from the purchaser shall be obtained.
- XIII. Laser Calibration: All accuracies (Geometrical & Positional) mentioned for Manipulator shall be demonstrated by laser calibration at SLC site as per standards.

7. DESIGN RESPONSIBILITIES OF SUPPLIER

- (a) The design/ general arrangement/ Mechanical/ Electrical drawings of the manipulator shall have the approval of purchaser prior to commencing the fabrication. Fabrication drawings of all subsystems shall be submitted to SLC site, SDSC
- (b) For Technical bid evaluation, supplier shall provide General Arrangement/configuration drawings of manipulator to the scale clearly showing dimensions and lay out of all items. Supplier shall provide all functional requirements mentioned in this document.

- (c) Manipulator supplier shall route all cables/hoses related to X-ray machine system & manipulator system, from control room/panel room to manipulator system through cable management system.
- (d) All the drawings shall show the bill of quantities and material specifications. Manipulator's sub-system design requirements shall be made as per the prescribed standards and SDSC SHAR approved methodologies.
- (e) Electrical circuit diagrams with bill of materials, diagrams and layout, with a technical description meeting the requirement mentioned in this technical specifications.
- (f) Quality Assurance Plan (QAP) shall be prepared by vendor and it shall be approved by the Purchaser. This QAP shall be followed in the fabrication, assembly and supply of Manipulator system during different stages of inspection.
- (g) Training of purchaser's personnel for MMI controls shall be provided.
- (h) Provide Delivery schedule with major mile stones / activities like procurement of raw materials, bought-out items, fabrication, testing & inspection at shop floor, transportation to site, inspection, erection & integration, testing, and commissioning.
- (i) The Department's approval of the Supplier design/drawings shall not relieve the Supplier from his responsibility for errors or omissions, which may exist, even though work is done in accordance with such approved design/drawings. When such errors or omissions are discovered later, they shall be made corrected by the Supplier at his expense irrespective of any approval of the Department.
- (j) The system integrator (PLC/SCADA) shall be OEM certified/ reputed vendor and shall have minimum 2years experience. The integrator shall be available during the PLC commissioning phase.

8. CODES AND STANDARDS

- (a) All equipment, systems and works covered under this specification shall comply with all currently applicable statutes, regulations, standards and safety codes in the locality where the equipment will be installed. In particular, the latest editions of the following standards are applicable

- (b) Electrical IS 5571 , IS 5572, IS 2148, IS 5780 , IS 325 IS 8623(Pt1), IS 13947(Pt4/Sec1),IS7098&IS1554
- (c) Steel for general structural purposes: IS 2062, calibration: VDI/DGQ: 3441 or equivalent.
- (d) Rolled sections and special sections: IS:808, IS:1161, IS:1173, IS:1252, IS:1730, IS:1731, IS:1732, IS:1863, IS: 1864, IS:2314
- (e) Other national or international standards established to be equivalent or superior to the codes and standards specified are also acceptable. The supplier shall furnish English translation of all standards specified in this specification. Where suitable Indian Standards are not available, other International Standards such as IEC, BS, ASTM, ANSI, ASME and DIN may be adopted with the prior approval of the purchaser.
- (f) If other standards are followed, all equipment and their accessories shall be designed, assembled and tested in accordance with the relevant standards published by the Bureau of Indian Standards wherever applicable so that specific aspects under Indian environmental conditions are taken care of.
- (g) In the event of any conflict between the codes and standards referred to in the specification and the requirements of this specification, the more stringent of these requirements shall govern. Unless indicated otherwise, all codes and standards referred to in this enquiry specification shall be understood to be the latest version on the date of offer made by the supplier.

9. INPUTS TO BE CONSIDERED FOR DESIGN

The approximate weight details and dimensional details of the X-ray machine is provided in this document. Geometric tolerances like parallelity, perpendicularity between machine/detector handling structure & object handling systems (including face out/run out) shall be ensured. The same shall be confirmed at the time of LASER calibration.

- (a) All manipulator components shall have an appropriate service rating per the specified standards in this document.

- (b) Supplier shall submit the general arrangement drawings and complete design details for clearance by purchaser before commencing the fabrication of manipulator system.
- (c) Supplier shall submit the structural analysis of manipulator structural members like columns and support frame etc for clearing the design of manipulator. Design of manipulator subsystem components shall be as per the IS standards mentioned in this report and other elements not covered shall be designed based on the SDSC SHAR guidelines and submitted for prior approval.
- (d) All mechanical parts shall be designed as per SDSC SHAR approved procedures. All structures and welded assemblies shall be designed and fabricated in accordance the applicable codes and standards listed in this document.
- (e) The manipulator system shall operate indoors in a normally heated and cooled environment. The ambient temperature varies from 10°C to 50°C and maximum Relative Humidity is 95% and saline environment at the site.
- (f) If required bidder may visit the SLC site & SDSC SHAR facilities and get the better understanding of systems. SDSC SHAR will arrange the entry permit for the same.

10. ELECTRICAL SYSTEMS

- (a) Design, Fabrication and supply of VVVF Drive Cum Switchgear Panel. The VFD panel shall consist of VVVF Drives along with protection elements as per detailed specification mentioned in this document.
- (b) Supply of Flame Proof Motors with Integrated Brakes with preferably inbuilt absolute Encoder as mentioned in the Document. Driven side of the mechanism of each axis shall be provided with flame proof absolute encoder. The encoder position shall be such that the desired positional accuracy is achieved.
- (c) Supply of suitable rating Power Cables for Interconnecting Motors & Drives, Control cables for Interfacing of FLP Pendant Push Button Station & Axis End limits to the RIO panel through IS barriers suitable for the Cable drag chain system. Testing and commissioning of VVVF Drive Panel Including parameterization of VVVF Drives & Complying all Functional, Operational & Safety Interlocks.
- (d) Site Acceptance Tests, Operational, Functional & Interlock checks, Endurance Trials & Complete System Functional Checks until Complete Satisfaction of Department

(e) The electrical systems shall be designed based on the following power supply:

- 1 415V \pm 10%, 50Hz \pm 3%, 3 phase, 4 wire AC
- 2 230V \pm 10%, 50Hz \pm 3%, Single phase AC

(f) Input and output of the control transformer shall be protected by MCB.

(g) Appropriate number of junction boxes for power cables (Flame proof type).

(h) General Terms:

- a. Party shall realize VVVF Drive Panel as per detailed specifications furnished below.
- b. Party shall engage panel manufacturer, obtain and submit GA Drawing, power and control circuit drawings, Control drawing, VVVF Drives, Bill of material for Dept. Approval prior to start of fabrication.
- c. The panel shall undergo functional checks, Dielectric strength checks, Dimensional checks and other qualification tests as per standards at panel manufacturer works in the presence of the Department.
- d. Instruction, Operation and maintenance manuals of items like VFD, etc. shall be submitted along with dispatch document.
- e. Rubber mats of 2mx1m, min.10 kV grade shall be provided for the complete length of all the panels (the panels which are in the scope of supplier) both in front and back side such that persons stand on rubber mats during maintenance.
- f. The vendor shall supply documents consisting of as built drawings (power & control drawings), catalogue of all bought out electrical items, VFD parameterization Details.
- g. The supplier shall provide three complete sets of all the drawings, operation and maintenance manuals and test certificates for the operation and maintenance purpose of the department.
- h. Panel cubical keys, Handles, interlock keys, are to be handed over to department during supply.
- i. Party shall submit the following for approval before fabrication: Detailed Schematics Panel, General arrangement drawings with complete bill of

materials, installation details etc., Control wiring drawings, Switchgear/Cable Ratings

- j. The party should incorporate all changes/modifications /rectifications suggested by Department after verifying Drawings and bill of materials.
 - k. Any specification deviations required on technical grounds or non-availability of specified items have to be brought to the department notice in a separate deviations table and changes in these regards shall only be acceptable with the approval of the department
 - l. Any item not specified but required for satisfactory functioning and integration of the total system to be considered and included by the party and demonstrating the total functionality of the system as specified is the responsibility of the party.
- (i) Specification for VVFD panel:
- a. Party shall carryout supply, Testing & Commissioning of front operated indoor, Stand mountable, suitable for operation on 3-Phase, 4 wire 415V \pm 10%, 50Hz \pm 3% AC supply.
 - b. The panel should be designed, manufactured and tested in accordance with IS 8623(Pt1), IS 13947(Pt4/Sec1) and as per the specifications issued by us.
 - c. Enclosure symmetrical frame construction of rolled hollow sections made up from 1.5mm Thickness sheet with holes on a 25mm DIN pitch pattern.
 - d. Door shall be fitted with concealed hinge to ensure >180 deg opening & shall be Lockable with Handle type opener with Key.
 - e. Panel lighting shall be provided in the cable chamber and it shall be LED lamps only. The same needs to be controlled with panel door open / close limit switch.
 - f. The structure shall be mounted on a rigid base frame of ISMC channel stand. The design shall ensure that the weight of the components is adequately supported without deformation or loss of alignment during transit or during operation.
 - g. The panel can be limited to maximum height of 2000 mm including ISMC Channel stand.

- h. The ISMC channel stand shall be made of 100-200 mm ISMC Channel to ease the glanding of Cables and shall be provided with adequate no. of holes at bottom in order to ensure installation convenience at site.
- i. Detachable, split gland plates of 3mm thick sheet steel shall be provided at bottom.
- j. All live parts shall be shrouded with non – deteriorating insulating barrier to prevent against accidental contact.
- k. Provision shall be made for lifting and handling of panel by eyebolts.
- l. The panel shall have high mechanical and dielectric strength.
- (j) Power panel shall be housed with the following:
 - i. Panel shall be planned for M/s RITTAL (Preferable) and it shall be of front operated and floor mounted. Exhaust fan with air filters shall be provided. Light shall be provided with limit switch in side panel.
 - ii. Emergency off switch shall be provided in the Drive panel, PLC panel and operating control desk.
 - iii. Cable entry shall be planned for the bottom entry.
 - iv. Power supply available indication lamps (R,Y,B) to be planned with adequate protection by MCB.
 - v. All the motions shall be controlled using VVVF drives provided with suitable communication system as applicable.
 - vi. Individual VVVF drive power supply shall be extended viz., Switch disconnector unit with Semi-conductor fuse (Fast acting) only with suitable MCCB/Semiconductor fuse as suggested by drive manufacturer.
 - vii. VVVF drive trip, health indication lamps shall be planned for each VVVF drive.
 - viii. No power contactor shall be planned in the output side of the VVVF drive.
 - ix. All the components inside the panel shall have a proper identification tags.
 - x. Necessary cable tags shall be provided for the incoming and outgoing cables.
 - xi. All the power and control cables shall have a proper ferruling for identification.

- (k) A main line contactor shall be provided. Energizing of main line contactor shall be controlled by power OFF/ ON push button in the pendant.
- (l) Drives shall work with PLC through suitable communication interface. Command / status/ data shall flow from PLC to drive and vice versa through the suitable communication.
- (m) The electrical system including electric motors, Brakes, junction boxes (JB), etc located in Exposure hall shall be Flameproof suitable for Zone-1, Gas group-IIA, IIB and temperature class T4 (135°C). The enclosures shall be flameproof (Ex-d) with minimum IP-54 protection.
- (n) The Emergency OFF in the pendant shall switch OFF complete power supply of manipulator; suitable incomer MCCB shall be planned with shunt trip coil.
- (o) Power supply feeder shall be taken from Power control center (PCC).
- (p) Each drive mechanism of the manipulator shall be provided with a separate and independent drive unit with a circuit breaker branch circuit protection device capable of being locked in the open position.
- (q) All control circuits shall be fed from a single phase, air cooled transformer.
- (r) All electrical components shall be industrial grade and located so that they are easily accessible for inspection and maintenance.
- (s) Inside the Exposure hall manipulator cables shall be in suitable cable drag chain system.
- (t) Necessary cable end termination shall be planned (for both power, control and signal cables) suitable for Hazardous location as applicable.
- (u) Each motor shall be provided with suitable protective devices for short circuit and over load protection.
- (v) Where possible all wiring shall be installed before shipment. Thick-wall, rigid-steel conduit shall be used where possible and shall be securely mounted. Flexible conduit is to be used only when connected to moving or vibrating parts or assemblies.

- (w) All controls of the manipulator shall be operated with intrinsic safety system with IS isolators.

11. Motors and VFDs

- (a) All motors shall be flameproof suitable (Ex-d) for Zone-1, Gas group-IIA, IIB and temperature class T4 (135°C) with embedded Thermistor in the winding.
- (b) The size, type, and rating of each motor shall be determined by and shall meet the speed, load, duration, temperature, and duty cycle specified.
- (c) Motors and brakes shall have minimum Class “F” insulation with temperature rise limiting to class-B.
- (d) For flameproof motors with VVVF AC drives the requirements of following standards shall be complied with:
 - i. EN 60079, Part 14
 - ii. EN 50014, Sec. 16.8
 - iii. IEC 60034, Part 17
 - iv. IEC 60079-0, Para 24.4.6.1
 - v. Reference is also made to IEC 60024-17 and IEC 60034-25
 - vi. All VVVF driven motors shall be preferably provided with thermistor protection, irrespective of the kW rating.
- (e) VFD shall be selected & sized based on both kW rating & ampere rating. The kW rating & current rating of drive shall be higher than the kW rating & ampere rating of motor (including applicable overloading factor). Current rating of controller shall be suitable for heavy starting.
- (f) VFD shall be capable of delivering rated / design torque (with corresponding design & safety margins) for all practical conditions including creep speed / micro-motion operation.
- (g) VFD shall be provided with braking chopper & dynamic braking resistor if required to address inertia/hoisting down/braking issues in case required. Also, output choke shall be provided between drive & motor if applicable. If any Bus bars are utilized, support conductors shall be FRP type firmly fitted to the frame work of the pane

(h) Specification of VVVF Drive panel

| Description | Capacity (KW) | Specification |
|--|-------------------------|--|
| Incomer | To be arrived by Vendor | <ul style="list-style-type: none"> ➤ MCCB with adjustable short circuit, earth fault and overload. Electrically operated. Refer data sheets for Specifications ➤ AC-3 duty Line Contactor to switch OFF the I/C supply in case of activation of Emergency Stop PBs ➤ Multi-Function meter with Profinet/ Ethernet connectivity for local display and remote data logging. ➤ Shall have RYB indication lamps, on, off, trip status and Suitable CTs to be provided for current measurement and display at Multi-Function meter. ➤ Digital Earth Leakage Relay with CBCT ➤ 2 Nos of 24V DC SMPS Unit with 'OR' ing Module. Input 230V +/- 10% AC, Output: 24V DC. ➤ Min.500VA, 415V/230V AC Control T/F for 230V AC Control supply requirements |
| <p>(a) Advanced Operator Panel (AOP) for Monitoring/configuration of all Control units</p> <p>(b) Emergency OFF Pushbutton: A Mushroom Emergency Push Button shall be interfaced with Incomer MCCB Shunt Trip Coil</p> <p>(c) Foldable Base Frame with 5A/15A Socket for Laptop: Laptop base frame (Foldable while Locking the Door) shall be provided inside the hinged door for positioning or working with the Laptop during commissioning time along with a 5A/15A socket for laptop charging.</p> <p>Pocket for Drawings: A pocket for Placing Panel Drawings inside the panel shall be provided.</p> | | |

12. ELECTRICAL WIRING

- (a) The installation of electrical wiring and system shall be in accordance with the ANSI C1, National Electrical Code.
- (b) Wiring to resistors shall have Teflon or other appropriate high temperature insulation.

13. Electrical Installation, Commissioning & Testing Requirements:

- The Transportation, installation, testing & commissioning of new VVFD Panel & Motors is under Vendor scope.

- The Interfacing of Drive DI/DIO/AI/AOs as per the requirement shall be carried out by vendor. The Drive parameterization (Including ID Run) with Operational & Functional requirements shall be carried out by vendor.
- After Commissioning the System vendor shall carry out all Functional, Interlock Checks & Endurance Trails in the presence of Department personnel.
- Till Clearance of Complete Satisfactory Functioning of the System by Department, Vendor is responsible for all bought out items & shall replace/repair any item which is not functioning properly.

14. Earthing:

- Two runs of Individual Earthing shall be provided for all Motors, VFD panels, JBs, Pendant etc., with necessary size of earth wire/strip & as per recommended IS standards.
- Within the VVFD Panel all the switch gear bodies shall be duty connected to the earth.
- Provision for connection to the plant earth grid shall be provided at both the ends of the VVFD panel.
- All hinged doors with electrical accessories shall be provided with flexible copper earth connections.
- All electrical equipment mounted on Manipulator including Mechanical structure to be earthed with double runs.
- Along with pendant control cable an additional wire braided flexible suitable copper strip shall run as a special earth from the control panel up to the pendant station.

15. BRIDGE ELECTRIFICATION

- (a) The bridge will be powered by a flexible cable.
- (b) If flexible cable is chosen, it shall be rated for continuous flexing and manipulator service; it shall also have a system to control the extra cable length so that it is always free.

16. SYSTEM RATINGS

- (a) All bridge motors and other electrical system shall be sized, rated, and designed to provide all Bridge motions and speeds for the load, duration, and duty cycles described in this document.
- (b) Drive motor operating temperature requirements, as specified by the motor manufacturer, shall be satisfied in meeting the above requirements.
- (c) All other electrical components shall satisfy temperature and load requirements as specified by each respective component manufacturer.

17. Instrumentation & Control System

- 1) The data acquisition and control system should remotely monitor, control, and record the process parameters.
- 2) The operations are to be monitored and controlled through SCADA System located in control room.
- 3) Pendant shall have Ex-proof (intrinsic safe) Certified HMI/ indicator to display all position parameters.
- 4) For each AI & AO module, minimum of 2 channel spare shall be available.
- 5) For each DI & DO module minimum of 4 channel spare shall be available.
- 6) Supplier has to consider all 2 modes of operation namely Discrete and Local and has to build the SCADA screens as per requirement; parameters mentioned in the User Requirement Document (provided during design phase) shall be monitored, recorded and controlled.
- 7) Drive parameterisation for motor control is in the scope of the supplier and shall be tuned to meet desired machine operation.
- 8) All the interlocks pertaining to process shall be controlled by PLC. PLC has to monitor the health of drive modules and has to take care of associated interlocks. All interlocks and process requirements shall be implemented.
- 9) The Drives, PLC, I/O cards, Signal Conditioner / interfacing modules will be located in non-hazardous area. Supplier has to lay cables from panel to respective equipment's. Supplier is advised to visit facility and plan cable routing.

- 10) Panels should have suitable ventilation arrangements.
- 11) All ethernet switches are of managed switch with 2 SFP single mode fiber port.
- 12) All the field junction boxes shall be of Explosion Proof Type. (Ex-d)
- 13) All electronic equipment should be powered by redundant 24VDC power supplies with diode-ored modules. Two set of power supplies shall be provided – One in Control room console & other set in Drive room PLC/RIO panel. The status & data of all power supplies shall be monitored & logged in SCADA. The power supplies are in addition to power supply mentioned in Electrical section.
- 14) Supplier has to provide 1 in 2 Out IS Isolators (I/I) wherever required to duplicate signal at panel level.
- 15) PLC shall have dedicated communication card to communicate with SCADA. Any other option shall be selected with the approval of department.
- 16) Cable entry shall be planned from bottom side entry which is deemed fit by purchaser.
- 17) Transducers with communication feature shall be supplied to monitor DC Voltage & Current in PLC & Drive panel. Same shall be interfaced with PLC & SCADA
- 18) All I/O should be routed through IS barriers. Redundant power fed modules shall be used to power all barriers.
- 19) Mounting of trays with suitable wall mounting clamps & bends with tray cover is in the scope of supplier.
- 20) All unarmoured cables shall be laid through PVC sheathed metallic conduit and routed in cable trays.
- 21) Interfacing of all systems with SCADA system and developing of PLC & SCADA program is in the scope of the supplier. All original source codes of PLC & SCADA shall be handed over to department.
- 22) User requirement document (URD), Software Requirement Specification (SRS) document, Software Design Document (SDD), Operation Manual and console manual of both PLC & SCADA shall be provided by the party after design of the system to department as per format provided by dept.

- 23) Hard end limits are through two numbers of proximity switches (redundancy) and soft limit by Absolute encoder for each above axis shall be provided.
- 24) The distance between encoder and drive panel is around 30-meter. Suitable encoder module with Profinet/ Ethernet IP/ Modbus TCP communication shall be selected and same shall be interfaced to PLC with suitable communication module.
- 25) All signals in pendants are also interfaced through IS barriers for DI as well as for indication lamps.
- 26) Channel density for Digital Input/output module shall be 16/32 channels, and for Analog Input shall be 4/8 channels.
- 27) All IO modules shall be terminated in Terminal blocks in RIO & PLC Panel
- 28) There shall be separate pages in SCADA to monitor each individual System
- 29) SCADA shall have minimum of 10000 tags and full development version shall be supplied for PC.
- 30) 1 no. of licensed PLC programming software shall be supplied.
- 31) Party shall use only drag chain certified communication cable with prior approval of department.
- 32) All multi turn encoders shall be certified to use in Zone-1, IIB area. Certificates shall be submitted for approval.
- 33) Architecture shall be submitted for approval along all BOM
- 34) Necessary Accessories such as HDMI cables, HDMI Extenders shall be provided as per site requirements.
- 35) Object manipulator should be operated through Pendant inside the Bay and Suitable Interface from Control room. The operations shall be controlled through software. Pendant to be interfaced with PLC including interlocks for the subsystem's operations. Software programming with interlocks shall be carried out by supplier.
- 36) Speed controls for all manipulator motions shall be in accordance with the requirements specified in this document and settable through Software and VVVF. Control philosophy and corresponding scope of work of manipulator shall be as specified in this document.
- 37) All motion functions shall be controlled by pendant controls as described below.

- i. A portable pendant pushbutton station shall be provided near manipulator. A system-grounding conductor shall be brought to the pendant enclosure.
- ii. All movements shall be separately controlled by one pushbutton for each direction of travel.
- iii. There shall be a provision to operate manipulator in micro/main speed through selector switch from pendant.
- iv. The speed of all motions shall be settable in software /VFD
- v. Each pushbutton shall be operated with intrinsic safety barrier as follows.
 - a. "Power ON" red pilot light with cluster LED intrinsically safe along with certification.
 - b. "Stop" red mushroom pushbutton, which will de-energize the main power.
 - c. "Start" which will energize the main power
 - d. Key operated, software /manual mode selection switch
 - e. Selector switch for speed (for main µ speed)
 - f. "Hoist Up" for Z_1 & Z_2
 - g. "Hoist Down" for Z_1 & Z_2
 - h. " θ_1 -Movement" in CW &CCW
 - i. "Y- θ_2 " Unit movements
 - j. Any other motions based on configuration of Manipulator.
- vi. Provision shall be incorporated to have simultaneous operation of manipulator movements. This shall be achieved by following. (through software only not in pendent)
 - Pendent level interlocking
 - Auxiliary contactor level interlocking
 - Drive logic level interlocking

38) The specified Manipulator arrangements shall have the following instrumentation systems. Applicable for all axis movements.

- (a) This system shall have proximity sensors (with redundancy) both at extreme position and parking position (Proximity sensors: 4 Numbers-Digital Input).

- (b) It shall have push buttons for forward & reverse motion (Push button: 2 numbers).
- (c) It shall have provision to monitor the system linear position. (Ex-proof absolute encoder).
- (d) All the Digital Input and Output signals from the subsystem shall be terminated to separate junction box with terminal blocks.
- (e) All the Digital Input and Digital Output signal shall be terminated along with other subsystem from junction box to Instrumentation junction box.
- (f) Appropriate number of junction boxes (Flame proof type) with terminal blocks for control cables.
- (g) All controls / proximity sensors / push buttons/ encoder signals shall be powered through intrinsic safe circuits with IS isolators of P&F make.
- (h) IS isolator with one input/ two outputs shall be provided for all intrinsic safe circuits.
- (i) Supplier shall provide flame proof junction box for encoders and related control cables of length around 3300m.
- (j) Suitable Control cables for all motions and proximity sensors, each of length around 30m. similar length of analog cables for encoders. Suitable Control cables, each of length around 30 m for interfacing with VFDs.
- (k) Encoder/Resolver for speed feedback of VFD shall be on motor drive shaft.

18. Specifications of ICS Elements:

a. 24V DC Power Supplies

| Description | Essential Specification |
|--|--------------------------------|
| Input voltage | 230V AC \pm 10%, 50 Hz |
| Output voltage | 24V DC |
| Output current | Min of 10 A |
| Overload & short circuit protection type | Required |
| Load | As required. |
| Ripple | 50 mV peak – peak or better |

| | |
|--|--|
| Mounting | DIN rail mounted. |
| Operating temperature | Ambient to 50 Deg C |
| Oring | Quint Diode Oring Module with protective coating (2 x 10A& 2 x 20A) |
| Fault Contact | Shall be available |
| Quantity | Min 2 Nos –PLC Panel – 24V/10A (with Oring module) Min 2 Nos – Console – 24V/ 10A(with Oring module) Min 2 Nos – Drive – 24V/ 10A(with Oring module) |
| <ul style="list-style-type: none"> ✓ PLC and I/O racks shall be powered with Dual Redundant Power supply with Qunit Diode-ORing modules of Phoenix make. ✓ Status& values of each Power supply and Diode Oring module status. Accordingly, DI& AI channels shall be considered. ✓ Power supply load calculations are to be submitted during design phase. Power supplies shall be 60% de rated. ✓ Power supply shall be conformal coated | |

b. Isolators

| Type of isolator | Make & Model |
|-------------------------|--|
| Analog input | P&F -KFD2-STC5-EX1.2O or latest |
| Power Fed Module | P&F – KFD2-EB2-R4A.B or latest |
| Universal Power Rail | P&F – UPR-03 or latest |
| IS Relay | P&F –KFD2-SR2-EX1.W.LB or latest |
| Digital output Isolator | P&F - Model no. KFD0-SD2-Ex1.1045 |
| LED cluster lamp | Specifications: Power supply: 14 to 30 V DC / 18 to 22 mA. (make: Beka), Intrinsic standard: EN50020:1994 or latest, BEKA or any other make with Dept approval |
| Display unit | BA327C,4 ½ Display, BEKA or any other make with Dept approval |
| Quantity | As Required |

c. Programmable Logic Controller

| Description | Essential Specification |
|-------------------------------------|---|
| Type | Preferably Siemens 1518 Series or latest |
| CPU features | Minimum work memory for CPU shall be 1 MB or better |
| | Cycle time of PLC shall be less than 200 ms. |
| | Number of ports: Profinet/ Ethernet ports-as per requirement |
| CPU rack power supply | Dual 24VDC/ 230 VAC powered backplane or powering from external dual Diode ored power supplies. |
| Interface for communication between | Communication technologies like; PROFINET / Modbus |

| | |
|---|---|
| PLC to I/O modules & 3 rd party devices. | TCP/ Ethernet IP shall be used as per OEM standard for interfacing 3 rd party devices to PLC. |
| Self-diagnostics features | Required for each and every module available in the PLC (i.e. CPU, PS, I/O modules, other communication interface modules etc). |
| Programming languages | All IEC61131 languages shall be supported. |
| User program password protection | Password protection and block encryption. |
| Programming and downloading to PLC | 1 No. of latest and licensed professional version of PLC programming software shall be provided for Engineering Station. |
| Quantity | PLC Qty - 1 Nos |

d. Input/output modules (Located in Non-Hazardous area)

| Description | Essential Specification | |
|----------------------------------|----------------------------|---|
| Analog input module (4-20 mA) | Channels per module (Nos.) | 8 Channels or supplier shall submit spec for approval |
| | Input | 4-20 mA |
| | Accuracy | 0.2% of FS or better |
| | Resolution | 16 bit |
| | Type of isolation | Galvanic / optical |
| | CMRR | >60 dB |
| Analog output module | Channels per module (Nos.) | 4/8 Channels. |
| | Output | 4-20 mA, 2 wire |
| | Accuracy | 0.25% of FS or better |
| | Resolution | 12 bit with sign or better |
| | Type of isolation | Galvanic / optical |
| | CMRR | >70 db |
| Digital input module | Channels per module (Nos.) | 16/32 |
| | Type of input | Potential free/ NAMUR (proximity sensors). |
| | Interrogation voltage | 24V DC |
| | Type of isolation | Galvanic/ Optical |
| | LED status indication | Required for each channel. |
| Digital output module | Channels per module (Nos.) | 16/32 |
| | Type of output | Relay/ TTL, relays, indication lamps etc., |
| | Interrogation voltage | 24V DC |
| | Type of isolation | Galvanic/ Optical |
| | LED status indication | Required for each channel. |

| | |
|--|---|
| LED display | Required for all channels in all modules. |
| Short circuit/ wire break/ reverser polarity protection/ monitoring. | Required. |
| Quantity | As per the requirement |

e. Supervisory Control and Data Acquisition system (SCADA)

| Description | | Essential Specification |
|---|--|--|
| Operating system | | Win11 or latest in Engineering station |
| Essential Features: - ✓ Refresh rate shall be less than 1 second. ✓ OPC Support shall be available to interface with centralized DAS. ✓ Dynamically configurable Mimics ✓ Real time & Historical data trends display ✓ Data logging & Report generation in user prescribed format (excel, pdf) ✓ Tags (PLC & Third-party device tags). ✓ Alarms & Events Logging. ✓ Access security management. | | |
| Mimics | ✓ Sub-system wise screens to monitor the process status ✓ MMI-PLC-IO network configuration screens with critical diagnostic information and messages ✓ Diagnostics screen for PLC hardware components, ✓ Alarms screen (Sub-system wise filtering to be provided). ✓ Trends screen (Sub-system wise trends to be provided). ✓ Any other screen as per the user requirement. | |
| Trends | ✓ Real time & historical trends. ✓ Trends data export to MS Excel (.xls) and pdf format. ✓ Print option for trend chart. | |
| Data logging | ✓ Min. 1 sec data logging interval ✓ Event based data logging ✓ All logging shall be done in SQL based Database | |
| Alarms & Events Logging | ✓ Alarms & Events shall be logged separately. ✓ Sub-system wise filtration option shall be provided. | |
| Report Generation | ✓ Reports shall be generated for logged data, alarms & events as per the user defined formats. ✓ From- & to- date and time shall be user selectable. ✓ Time interval shall be user selectable. ✓ Options to export data in MS Excel, MS Access, SQL formats. ✓ Print report option shall be provided. | |
| License | Supply of Run-time + Configuration license of minimum 10000 Tags Supply runtime Client license - 1 HMI Client | |

f. SCADA Engineering Station

| Description | Specification |
|---|--|
| Processor | i7 latest Gen or latest |
| Hard disk capacity | 4 TB SATA HDD. (Min 2 Nos HDD to meet 4TB) |
| Memory (RAM) | 32 GB DDR4 RAM. |
| Drive controller | Integrated or add-on SATA controller. |
| Network Interface card | Onboard – 1 Nos of 1 Gbps Addon - 4× 1Gbps. |
| Optical Drive | DVD RW. |
| Graphics | 8 GB graphics card with quad HDMI. |
| Cables | HDMI cables are to be provided. |
| I/O ports and connectors | 4 Nos. USB |
| Power supply | 230V AC, 50Hz Indian power cords to be supplied. |
| Operating system | Licensed version of Windows 11 (64 bit) |
| Software to be supplied and loaded on system. | MS Office 2024 Professional or latest with full license. |
| Monitor | 23" –FULL HD LED Bezeless monitor or better Supported resolution 1920x1080 & above. |
| Keyboard | QWERTY full stroke type |
| Optical Mouse | Optical mouse. |
| CD's for all software & drivers | Required. |
| Quantity | 2 Nos. |

g. L2 Switch

| Description | Essential Specifications |
|---|--|
| Type | Manageable, Layer-2 Fast Ethernet switches. |
| Physical Ports | Minimum 8 UTP RJ45 Port. Minimum 2 Nos of SFP port with single mode Fiber SFP Module |
| SNMP management feature | Required |
| Power | 230V AC / 24V DC (Dual powered) – DIN Rail Mounted |
| Diagnostics | LEDs for power & duplex mode indication. Fault status relay shall be available which shall be acquired to PLC IOs. |
| Security | Port security |
| Quality of service | Required |
| Spanning tree protocol | Required |
| Associated software | Required of the same make as the Ethernet switch |
| Type of communication on LAN & protocol | Ethernet, IEEE 802.3u and TCP/IP |
| Virtual LAN capability | Required |
| Quantity | As required (architecture approval) |

h. IO Rack

| Description | Essential Specifications |
|-----------------------|---|
| Service | Housing PLC, I/O modules, DCPS, P&F Isolators, P&F IS Relays, MCBs, Drives etc PLC Rack – as required |
| Type | Free standing for PLC/Drive Rack |
| Cable entry | Bottom/ Side/ rear entry. Base Mounting Height shall be of Minimum 300 mm for free entry of cables. |
| Door | Required |
| | Front & rear door : Double leaf lockable |
| | Concealed type hinges & a 180 degree swing. |
| Temperature | Ambient to 50 Deg C |
| Painting | Inner: Glossy white colour Outer: Siemens grey colour (RAL7032) |
| Shield bus | Through screw connection |
| Mounting and wiring | Double compression SS glands (FCG, Baliga or equivalent) Separate Fuse TBs/ TB for analog, digital and different voltage level signals (Phoenix or WAGO) of Screw/gage terminal type |
| Dimensions | Max1800 mm(H) × 600 mm (D) × 1200 mm (W) or more based on requirement. |
| Material | Sheet material thickness: CRCA-COLD rolled 2mm |
| | Gland plates thickness : 3mm |
| | Gasket for door & cover: neoprene |
| | Plugs for spare cable entries: required |
| Channels | Shall provide with bolt & nut |
| Anti-vibration pads | 15 mm thickness |
| Light | Fluorescent lamp/ LED Light |
| Lifting | Eye-bolts |
| Plugs | For incoming & outgoing |
| Metal tag name plate | Required |
| Clamps | Required |
| Fixtures | Required, Both door shall have lockable hinges. One door manual & another door via lock. |
| Bolts, nuts & gaskets | Required |
| Earthing | Power Earth & Instrumentation Earth shall be separated. |
| Pocket | Plastic pocket shall be provided to keep manuals/ wiring diagrams |
| Lock & key | Required |
| Spares | 10 % spare entries to be provided for incoming & outgoing cables. 10 % spare for terminal blocks, 20 % spare space for future requirement. |

i. Push Buttons/ Lamps

| Description | Essential Specification |
|--------------|--|
| Power supply | 24V DC/ 230V AC |
| Approval | Suitable to use in Hazardous area / Safe Area. |
| Quantity | As per the requirement |

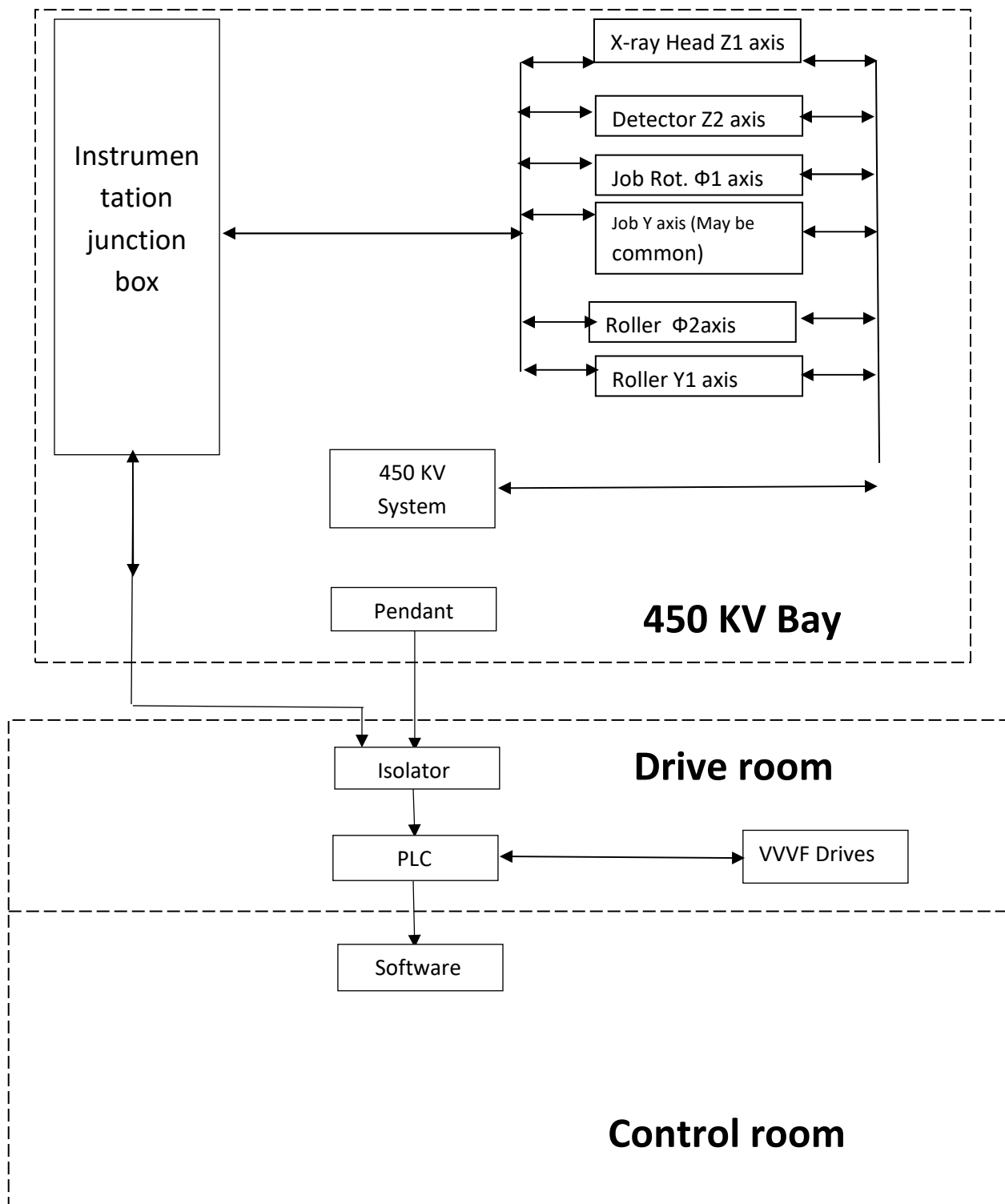
j. Relays

| Description | Essential Specification |
|----------------------|--|
| Primary element type | Solid state relays/Electromagnet relay |
| Input | 24V DC from DO Card |
| Mounting location | I/O racks/ IJB |
| Output | Potential free contacts with minimum 1 No. of NO/NC. For each DO output |

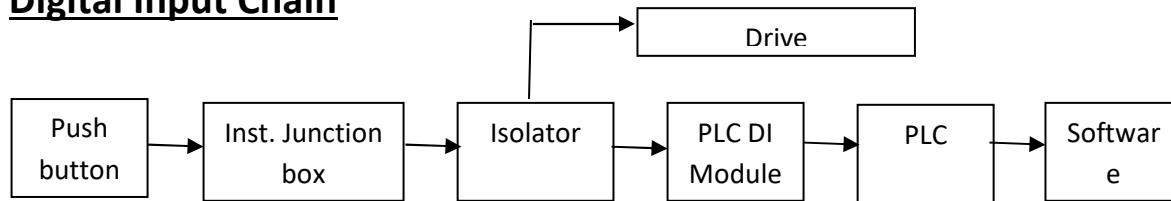
k. Surge Suppressor

| Description | Essential Specification |
|-------------|---|
| Location | UPS Output & IO Rack Input (Lightning & Surge Protection for power supplies) |
| Use | All single phase UPS power incoming in RIO, PLC & Drive panel shall have Type 1/2 SPD with fault contacts |
| Type | Type 1/2 |
| Mounting | Pluggable SPDs between LN, LE , DIN Rail Mounting |
| Quantity | 3 Nos |

450 KV system instrumentation Overview (Conceptual)



Digital Input Chain



20. Spares to be supplied:

a. Electrical:

| S.No | System Name | Qty |
|------|--|---------|
| 1. | Communication cable one for each type (drive to drive, drive to PG) | 1 set |
| 2. | Heavy Duty Limit/Proximity Switches | 2 No's |
| 3. | Selector Switch (Local/ remote selection) | 1No |
| 4. | Selector Switch (Speed selection) | 1 No |
| 5. | Push buttons | 10 No's |
| 6. | Absolute Encoder | 1 No |
| 7. | Servo motor one for each rating | 1 set |
| 8. | servo drive one for each rating along with licensed drive software | 1 set |
| 9. | DI isolators | 8 No's |
| 10. | DO isolators | 2 No's |
| 11. | DO Relays | 8 No's |
| 12. | LED Cluster lamps | 2 No's |
| 13. | DPM (Digital Panel Meter) | 3 No's |
| 14. | Overload relay (OLR) | 1 Set |
| 15. | Switch amplifier for proxy sensor | 1 No |
| 16. | Switch amplifier for display unit /lamp | 1No |
| 17. | Contactor one for each rating | 1 Set |
| 18. | Contacts for limit switches (Each type used in manipulator) | 6 Nos |
| 19. | Push button elements | 6 Nos. |
| 20. | Intrinsic safe display unit | 1No |
| 21. | Terminal block | 10 Nos |

b. Mechanical:

| Sl. No | Item Name | Qty |
|--------|-----------------------------|-------|
| 1. | Roller stand wheels | 2No's |
| 2. | Motor to gear box couplings | 2No's |

c. Instrumentation & control system:

| S.No. | Description | Qty |
|-------|--|-----------|
| 1. | PLC CPU, Power supply , Back plane and memory card | 1 set. |
| 2. | PLC Comm card | 1 Nos |
| 3. | IM Module | 1 Nos |
| 4. | AI, AO, DI and DO module | 1 no each |
| 5. | Encoder cable | 2 set |
| 6. | HMI | 1 No |

17. Approved Makes/Brands of Bought Out Items (Substantial equivalent) :

a. Electrical system preferred make

| | |
|----------------------------------|---|
| Motors | Parker, ABG, SEW, Siemens |
| Gear boxes | Elecon,SEW, Shanthi, Primer transmissions |
| VVVF drives | Parker , Siemens, ABB |
| Fasteners | TVS, Unbrako |
| Penden | Schnieder or other make with department approval |
| Intrinsic safe display unit | BEKA |
| Paints | Asian Paints, JENSON, Berger,Bombay paints, Nerolac |
| Wire rope | Usha martine |
| Bearings, Couplings | SKF, FAG |
| MCCB | Siemens, L&T, Schnieder |
| MPCB/Contactor/OLR/Aux.contactor | Siemens |
| Current transformers | KAPPA, AE, LEM |
| ELR | PROKDVS |
| Timer | Siemens, L&T |
| MCB | Siemens, Schnieder, Legrand |
| Multi function meter | Siemens |

| | |
|--------------------------|---|
| FLP item | Baliga, FCG, STAHL,P&F |
| L T power/Control cables | Universal, Finolex, IGUS, LAPP, Polycab, Havells, KEI, Gloster, CCI, RR Kabel |
| Cable –Control | Havells/ Finolex/ Polycab/ IGUS/ Gloster/ Lapp/ KEI/ RR Kabel |
| Cable (Panel wiring) | Havells/ Finolex/ Lapp/ RR Kabel |
| Cable-Power(1.1KV) | Havells/Finolex/CCI/Universal/Polycab/ IGUS/ Gloster/ Lapp/KEI |
| Cable drag chain | IGUS/LAPP or any other make with department approval |
| Limit switches | SIEMENS/ L&T |

b. ICS Preferred Make (Substantial equivalent)

| S.No. | Item | Make |
|-------|---|--|
| 7. | PLC & IO Modules along communication cards | Siemens S7-1518H series Schneider M580H/ equivalent |
| 8. | PLC programming Software | Siemens / Schneider / equivalent |
| 9. | Full development SCADA License of 10000 Tags for both PCs | Siemens / Schneider / equivalent |
| 10. | Power Supply for PLC | Siemens/ Phoenix/ Aplab/Puls |
| 11. | Diode Oring Module | Phoenix |
| 12. | 1 in 2 Out IS Isolators (I/I) | P&F |
| 13. | 1 in 2 Out IS Relay | P&F |
| 14. | Power fed Module | P&F |
| 15. | Zone-1 certified Absolute Encoders with 14 bit resolution or better | P&F, posital, Kubler, heindenhein, posital, baumer, hengstler |
| 16. | SCADA PC | HP |
| 17. | PLC Rack in Control room | Rittal/ Adarsha/ Equivalent |
| 18. | RIO Rack in Drive room with 1 KW Panel AC | Rittal/ Adarsha/ Equivalent |
| 19. | Industrial grade DIN Mount L2 Ethernet Switch | Extreme, Antaira, Moxa, Schneider, Any other with approval of Dept |
| 20. | Power SPD | Phoenix/ Dhen/ Citel |
| 21. | Signal SPD | Phoenix/ Dhen/ Citel |
| 22. | Encoder Cables | Siemens/ P&F |

| | | |
|-----|-------------------------------|---|
| 23. | MCCB/ MCB | Siemens/ Schneider |
| 24. | Indication Lamp | Siemens |
| 25. | Solid state relay for each DO | Phoenix |
| 26. | Drive Programming Software | Siemens |
| 27. | Console | Pyrotech electronics private limited/ Adarsha/ Rittal/ Cosmos/ equivalent |

18. PAINTING

- a) The surfaces of all steel components shall prepared by sand / steel grit blasting confirming to SA 2 ½ prior to painting.
- b) The surfaces that may become inaccessible after erection or installation or both, shall be prepared and painted with two coats of epoxy paint and one coat of polyurethane enamel final paint positively of different colour to prove application of two coats before assembly.

19. INSPECTION OF MANIPULATOR SYSTEM

- (a) The supplier shall perform a load test (125% of rating-Over load or SWL) on the drive units and inspect all parts of the manipulator for compliance with this specification prior to shipment.
- (b) The supplier shall notify the purchaser one month in advance of such inspections so that personnel of the latter may witness them.
- (c) Test load: party has to prepare a test load to simulate the manipulator requirments at vendor site as well as in SLC site. Test load (SWL) shall be handed over to SDSC SHAR after successfull testing and commissioing of the system in SDSC SHAR.

20. PERFORMANCE TESTING

- (a) The supplier shall submit detailed testing procedure for approval by the department.
- (b) Prior to final acceptance of the manipulator, the performance of the manipulator shall be checked as per approved test procedure. All conditions not in compliance with this specification, or found to be otherwise defective, shall be corrected at the supplier's expense. The tests shall then be repeated.

- (c) The supplier shall notify the purchaser in advance of such tests so that the purchaser's personnel may witness them.
- (d) The following nomenclature shall apply within this specification:
 Rated Load 100% manipulator Capacity
 Over load 125% manipulator Capacity
- (e) The speed and positional accuracy related to each motion of the manipulator shall be verified as per the specification.
- (f) The purchaser shall operate the system without a load under all phases of operation. Such operation shall include travel over entire length of the runway and actuation of all controls, brakes, warning, and safety devices.
- (g) The operation of up/down limit switches in all movements shall be checked by carefully raising and lowering the load block to the point where these limit switches actuate
- (h) Electric wiring and system shall be inspected for compliance to the requirements of this specification and to codes and standards.
- (i) The manipulator shall be operated for all movements in complete range of travel and speeds with the load. During this Rated Load test a temperature rise and an electrical load test for each motor shall be performed.

21. DOCUMENTS TO BE SUBMITTED ALONG WITH SUPPLY OF MANIPULATOR

- a) Three copies of final drawings (Mechanical & Electrical) and design data of manipulator which have been approved by the purchaser.
- b) Three copies of Operating and Maintenance manuals, with lubrication charts. Supplier shall submit total QAP document (bound book) with material test certificates, test certificates for brought-out items, load bearing elements, fabrication, internal inspection reports, etc., along with supply of manipulator.
- c) Apart from hardcopy, all final drawings of manipulator, major assembly drawings of major components and circuit diagrams of both electrical and instrumentation shall be submitted in soft copy in 'CD' in AUTOCAD format.

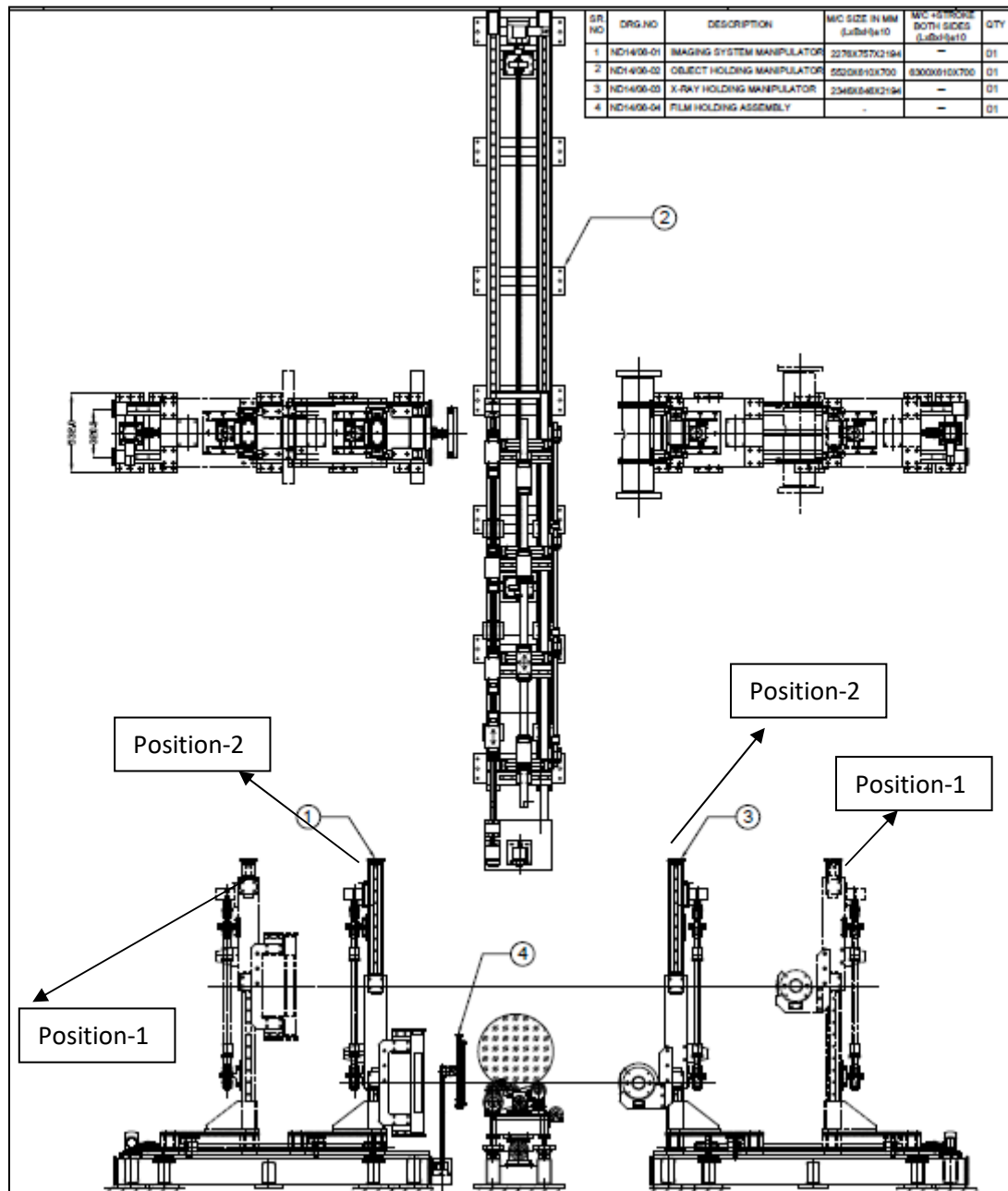


Figure-1: Preferable configuration of manipulator.

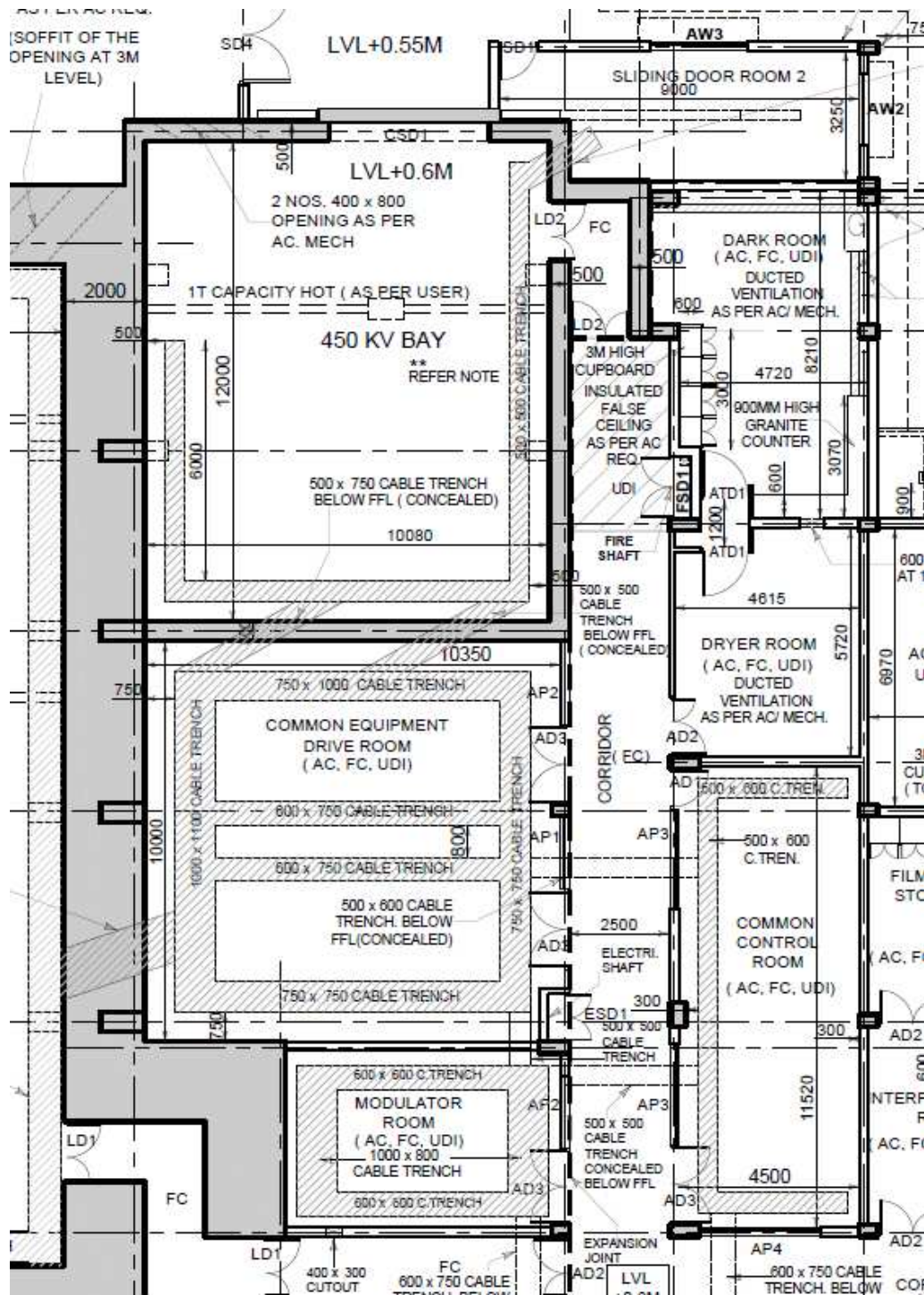


Figure-2: 450KV bay layout with supporting rooms arrangement

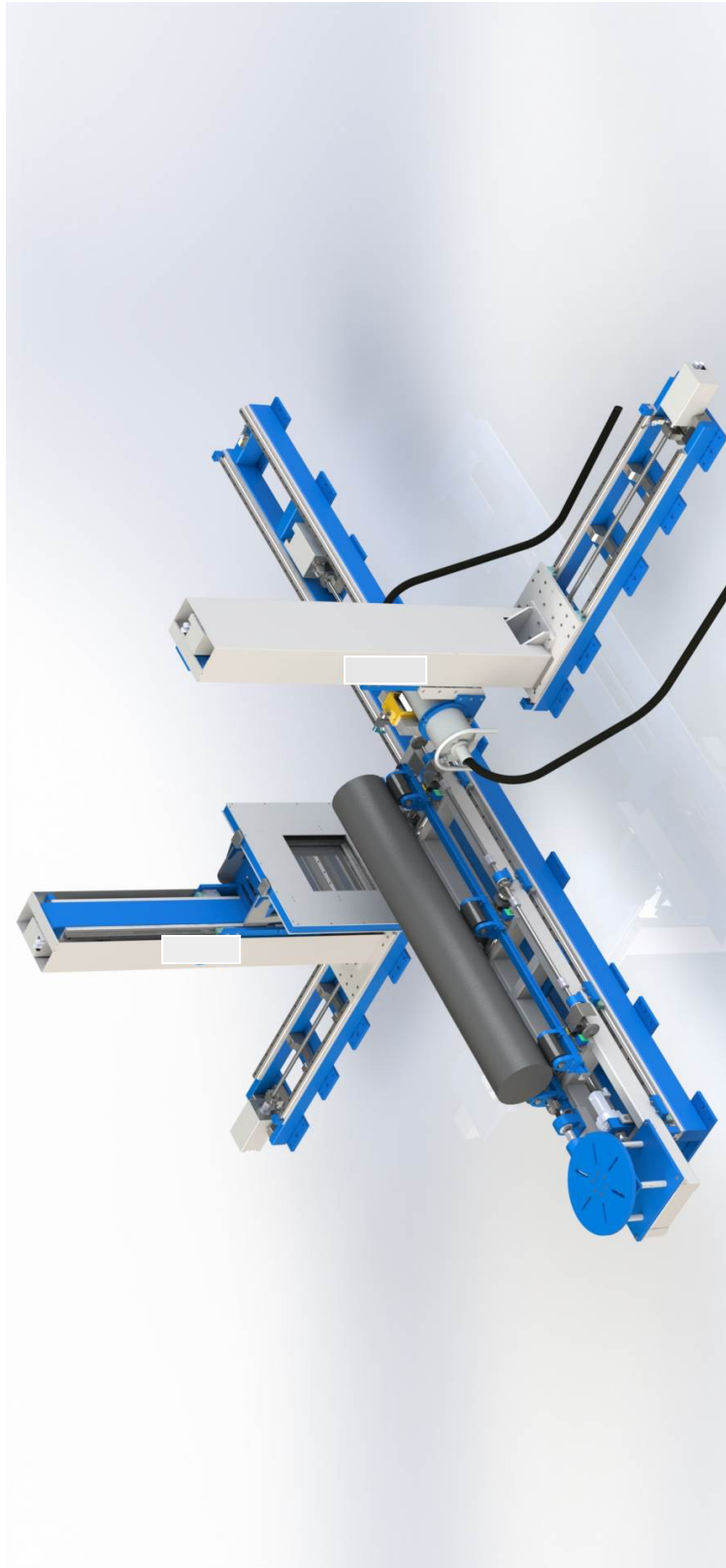


Figure 3: Object Manipulator 3-D view

Annexure - 2**PRICE BID FORMAT**

| S. No. | Description of the item | Unit | Cost |
|--------|---|------|------|
| 1 | Supply of Object Manipulator system as per the specifications (Including spares) given in the tender document | 1 No | |
| 2 | Erection and Commissioning charges for Manipulator system | 1 No | |
| | GST | | |
| | Total Cost (Rs) | | |

Note: The Price bid shall be uploaded only in the price bid stage (i.e Part 2) and not in technical stage.
Any disclosing of price during the technical stage, liable to rejection of offer.

Annexure -3**Vendor Compliance Sheet**

| Sl no | Description | Response by supplier |
|-------|---|----------------------|
| 1. | All documents related to Prequalification criteria mention in this tender document have been met and all related documents are enclosed in technical Bid | Yes / No |
| 2. | The detailed scope of work and technical specifications is understood and price was quoted accordingly. | Yes / No |
| 3. | Confirmation that the quoted prices are firm and fixed till the completion of scope of work. | Yes / No |
| 4. | Validity of Offer is 4 months (minimum). | Yes / No |
| 5. | Vendor Evaluation Format is attached | Yes / No |
| 6. | Delivery Schedule with milestones | Yes / No |
| 7. | Accepted the Department Payment Terms | Yes / No |
| 8. | Are General terms and Conditions of Contract for Supply & Erection included in proposal acceptable? | Yes / No |
| 9. | Warranty for the fully commissioned and accepted system is 12 months | Yes / No |
| 10. | 3 % of the Order Value shall be submitted as Performance Bank Guarantee, which is valid till completion of the warranty period plus 60 days claim period. | Yes / No |
| 11. | Liquidated Damages are acceptable | Yes / No |
| 12. | Last three years audited financial results are enclosed | Yes / No |
| 13. | Registration certificate of the company is enclosed | Yes / No |