भारत सरकार
अन्तरिक्ष विभाग
सतीश धवन अन्तरिक्ष केन्द्र
शार
श्रीहरिकोटा रेंज डा.घ.524 124,
नेल्लूर जिल्ला, आंप्र., भारत
टेलिफोन:+91-8623-245060 (10 जं)
फैक्स:+91-8623-225160

सत्यमेव जयते

Government of India
Department of Space
Satish Dhawan Space Centre
SHAR
Sriharikota Range P.O. 524 121,
Nellore Dist., A.P., India
Telephones : +91-8623-245060 (10 Lines)
Fax : +91-8623-225160

निविदा सूचना सं. TENDER NOTICE NO. SDSC SHAR/Sr.HPS/PT/RO-VALF/46/2025-2026

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/ 2025001406 [Public Tender - Two Part]	Supply of crane based LINAC Handling and Film Positioning System	01 Nos.
02.	SDSC SHAR /VALF PURCHASE /VALF/ 2025001415 [Public Tender - Two Part]	Supply of 450KV X-ray system for Industrial Application	01 Nos.

निविदा दस्तावेजों को डाउनलोड करने की अंतिम तिथि Last Date for downloading of tender documents : 15.12.2025 at 16:00 hrs.
ऑनलाइन निविदा जमा करने की अंतिम तिथि Due Date for submission of bids online : 15.12.2025 at 16:30 hrs.
निविदाएं खोलने की नियत तिथि Due Date for opening of tenders : 16.12.2025 at 14:30 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.

01. 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.

02. इच्छुक निविदाकार इसरो की ई-खरीद वेबसाइट इसरो न्यू ई-प्रोकुरमेंट 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.

03. निविदा दस्तावेज इसरो की वेबसाइट www.isro.gov.in इसरो न्यू ई-प्रोकुरमेंट 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.

04. निर्धारित तिथि/समय के पश्चात प्राप्त बोलियों पर विचार नहीं किया जाएगा। / Quotations received after the due date/time will not be considered.

05. निविदा दस्तावेज दिनांक 15.12.2025 को 16:00 बजे तक डाउनलोड करने के लिए उपलब्ध रहेंगे तथा निविदा ऑनलाइन जमा करने की अंतिम तिथि 15.12.2025 को 16:30 बजे तक है। निविदाएं दिनांक 16.12.2025 को 14:30 बजे खोली जाएंगी। / The tender documents are available for download upto 15.12.2025 at 16:00 hrs. and last date for submission of tenders on line 15.12.2025 at 16 30 hrs. and Tender Opening on 16.12.2025 at 14:30 hrs.

06. 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.

07. 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.

08. GeM ARPTS Report ID: GEM/GARPTS /09102025/I74VRU9CNAVV and GEM/GARPTS /09102025/V90Y8M9A83SC

दिनांक DT: 17.11.2025

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

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

Tender for Supply of crane based LINAC Handling and Film Positioning System

Bids to be submitted online

Tender No.: SDSC SHAR/VALF PURCHASE/SH202500140601 dated 18-11-2025

A. Tender Details

Tender No :	**SDSC SHAR/VALF PURCHASE/SH202500140601**
Tender Date :	**18-11-2025**
Tender Classification:	**GOODS**
Purchase Entity :	**VALF PURCHASE**
Centre :	**SATISH DHAWAN SPACE CENTRE SHAR SRIHARIKOTA (SDSC SHAR)**

Supply of crane based LINAC Handling and Film Positioning System

GEM/GARPTS /09102025/I74VRU9CNAVV

As per tender document.

A.1 Tender Schedule

Bid Submission Start Date :	**18-11-2025 17:00**
Bid Clarification Due Date :	**03-12-2025 10:00**
Bid Submission Due Date :	**15-12-2025 16:30**
Bid Opening Date :	**16-12-2025 14:30**
Price Bid Opening Date :	**30-12-2025 14:00**

B. Tender Attachments

NA

Instructions To Vendors

1. STANDARD TERMS & CONDITIONS

1. Tele No.08623-225174/225127/226082
Fax No.08623-225170/22-5028
e-Mail ID : hps@shar.gov.in, sselvan@shar.gov.in, jomin@shar.gov.in
1. Instruction to Indigenous Suppliers:
a) Payment Terms shall be as specified in RFP. If not specifically mentioned Our Normal payment term is 100% within 30 days after receipt and acceptance of the item at our site. Please confirm acceptance in your quotation.
b) Our GST No. is. 37AAAGS1366J1Z1.
c) 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 + 15% 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% of the total tendered value. In case of more than one such eligible MSE, the supply will be shared equally.
Micro & Small Enterprises which have technical capability to deliver the goods & Services as per prescribed technical & quality specifications and may not be able to meet the qualification criterion relating to prior experience-prior turnover may be relaxed as per guidelines issued by Ministry of MSMEs & as amended from time to time.
Interested vendors shall specifically claim the benefit with supporting documents.
d) 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%. 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 make along with their bid, failing which no purchase preference shall be granted. In case the bid value is more than Rs. 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.

2. Instruction to Foreign Suppliers:

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 viz., hay, straw, wood shavings, wood chips, saw dust, wood waste, wooden pallets, Dunn age Mats, wooden packages, coir pith, pear or sphagnum moss etc., will be allowed entry by Customs only with a Phytosanitary Certificate. In case if 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 no.50/2017 Customs dated 30.06.2017,Serial No.539(A) as amended by Notification no.05/2018 dated 25.01.2018. In case the quote is on Indian Rupee (Outside High Sea Sale), the price shall include taxes and duties if any. We shall not 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 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.

Common terms to Indigenous and foreign suppliers:

3.Warranty

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

4.Performance Bank Guarantee

Towards the performance of the systems during the warranty period you shall submit a performance bank guarantee equivalent to 3% 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.

5.Security Deposit

On acceptance of the order, you shall submit an interest free amount equivalent to 3% 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.

6.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 you offer validity is less than the mentioned above, the said offer is liable for rejection which may please be noted.

7.Liquidated Damages:

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

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 & War, stoppage of deliveries by the Government , freight embargoes etc; 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.

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

9. 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.

10. 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.

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

12. Arbitration:

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, such dispute/s or difference/s or claim/s shall be settled amicably by mutual consultations of the good Offices 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.

Work under the Contract shall be continued by the CONTRACTOR during the pendency of arbitration proceedings, without prejudice to a final adjustment in accordance with the decision of the Arbitrator unless otherwise directed in writing by the DEPARTMENT or unless the matter is such that the works cannot be possibly continued until the decision (whether final or interim) of the Arbitrator is obtained.

2. 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.

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 - Supply of crane based LINAC Handling and Film Positioning System

1. CRANE: Design, Fabrication, Supply, Erection and Commissioning of Flame Proof Double Girder based LINAC Handling System (5t - SWL) and Film Positioning System (50 Kg -SWL) for NDT facility, SLC Project, as per specification attached in the annexure.

Item specifications for CRANE: Design, Fabrication, Supply, Erection and Commissioning of Flame Proof Double Girder based LINAC Handling System (5t - SWL) and Film Positioning System (50 Kg -SWL) for NDT facility, SLC Project, as per specification attached in the annexure.

Sl No	Specification	Value	Compliance	Offered Specification	Remark
1	Crane -- Design, Fabrication, Supply, Erection and Commissioning of Flame Proof Double Girder based LINAC Handling System (5t - SWL) and Film Positioning System (50 Kg -SWL) for NDT facility, SLC Project, as per specification attached in the annexure.	As per specification 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. OEM authorization certificate

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. 1.5 CR

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

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	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). End User certificate shall be issued in this effect along with placement of order.	Yes / No / Explain	
3	Please confirm here whether your quoted "UNIT PRICE" in our Price Bid is EXCLUDING GST or INCLUDING GST. ---------- 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.	Yes / No / Explain	
4	Delivery Term FOR : SLC Site Madhavankurichi (MANDATORY)	Yes / No / Explain	
5	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.	Yes / No / Explain	
6	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.	Yes / No / Explain	
7	Delivery Period required for delivery of the items/completion of total scope of work: 10 Months from the date of release of as detailed in Para No. 3.20 Section-B of RFP.	Yes / No / Explain	

8	Payment Terms: 1. 80% of supply cost along with GST shall be paid on receipt and acceptance by CLIP at SLC site. 2. 20% of Supply cost along with 100% Erection & Commissioning cost shall be paid on satisfactory completion of erection & commissioning and acceptance at SLC site. 3. 100% TPI charges and Transportation charges shall be paid on completion of transportation. (Detailed at para no. 3.19 Section-B of tender RFP)	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	Validity of Offer 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.	Yes / No / Explain	
16	We reserve the right to place part order based on MSE/MII Purchase preferences.	Yes / No / Explain	
17	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.	Yes / No / Explain	
18	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.	Yes / No / Explain	

19	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. 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.	Yes / No / Explain	
20	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	

21	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	
22	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	
23	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	

24	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	
25	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	
26	Address on which PO is to be placed and GSTIN	-	
27	Please provide valid/currently using E-mail Id & Contact no. for seeking further clarifications if any	-	
28	Remarks if any.	-	

C.3 Price Bid

Sl. No.	Item	Quantity	Unit Price	Currency	Total Price	P&F IN PERCENTAGE	FREIGHT PERCENTAGE	Remark
1	CRANE: Design, Fabrication, Supply, Erection and Commissioning of Flame Proof Double Girder based LINAC Handling System (5t - SWL) and Film Positioning System (50 Kg - SWL) for NDT facility, SLC Project, as per specification attached in the annexure.	1.00 Nos.		-				

Design, Manufacture, Inspection, Supply, Erection, & Commissioning of Flame proof, Double Girder based LINAC Handling (SWL- 5t) and Film Positioning System (SWL-50Kg) for NDT facility

SPECIFICATIONS & PRICE SCHEDULE

OWNER : INDIAN SPACE RESEARCH ORGANISATION

PROJECT : SSLV LAUNCH COMPLEX (SLC)

LOCATION : SDSC, SHAR, SRIHARIKOTA

SSLV LAUNCH COMPLEX (SLC)
SATISH DHAWAN SPACE CENTRE
SRIHARIKOTA -524124
INDIAN SPACE RESEARCH ORGANISATION

SECTION –A

GENERAL TERMS AND CONDITIONS OF THE CONTRACT

PROPOSAL DOCUMENT, CLARIFICATION AND ADDENDUM

Quotations are invited from the interested bidders for

Title of the proposal

***"Design, manufacture, inspection, supply, erection, & commissioning of Flame proof, double girder-based* LINAC Handling (SWL- 5t) and Film Positioning System (SWL-50Kg) for NDT facility"**

Crane No:	Facility Name	Trolley Capacities	Span in meter (approx)	Lift of height (above FFL)
1.	NDT Facility	5t (LHS) + 50 Kgs (FPS)	20 m	7.5 m (Minimum)

Supply and Commissioning of crane (LHS & FPS) in NDT Facility located

at

"SSLV LAUNCH COMPLEX, SURVEY NO. 260-3C, MADHAVANKURICHI VILLAGE – 628206, OPP. TO KOODAL NAGAR,
THIRUCHENDUR TK., TUTICORIN DIST., TAMILNADU"

The RFP document is organized in Seven sections as follows.

Section –A: General Terms and Conditions of the Contract

Section –B : General Specifications & Project information

Section –C : Scope of work & Technical Specifications.

Section –D : Quality Assurance Plan

Section –E : Codes and standards

Section –F : Schematic of pendent push button operating system

Section- G1 to G6 : Annexure.

1. PROPOSAL DOCUMENT

1.1. Bidder shall sign & stamp each page of the tender document (RFP) as token of his acceptance and submit the same along with the technical bid.

1.2. Proposal documents shall remain the property of SDSC SHAR and shall not be used for any another purpose without the consent of SDSC SHAR.

1.3. The proposal shall be completely filled in all respects and shall be tendered together with requisite information & Annexure. Any offer incomplete in any particulars is liable to be rejected.

1.4. The Proposal (Unpriced Techno-commercial bid) with a complete set of the required documents shall be submitted.

1.5. The Proposals shall be submitted on-line before the time limit for bid submission specified in the Letter Inviting Bid.

2. PREPARATION OF BIDS

2.1 SITE VISIT

Bidder is advised to visit & examine the site and it's surrounding to familiarize himself of the existing facilities & environment and shall collect all other information which may require for preparing & submitting the Bid and entering into the contract. Claims and objections due to ignorance of existing conditions or inadequacy of information will not be considered after submission of the Bid and during implementation.

2.2 VALIDITY OF OFFER

Bid shall remain valid for acceptance for a minimum period of 4 (four) months from the due date of submission of the Bid. The Bidder shall not be entitled during the said period to revoke or revise his Bid or to vary the Bid except and to the extent required by SDSC SHAR in writing. Bid shall be revalidated for extended period as required by SDSC SHAR in writing. In such cases, unless otherwise specified, it is understood that validity is sought and provided without varying either the quoted price or any other terms & conditions of Bid finalized till that time.

2.3 COST OF BIDDING

All direct and indirect costs associated with the preparation and submission of bid shall be to Bidder's account and SDSC SHAR will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bid process.

2.4 APPLICABLE LANGUAGE/ MEASUREMENTS

The bid and all correspondence incidental to and concerning the bid shall be in the English Language. For supporting document and printing literature submitted in any other language, an accurate English Translation shall also be submitted. Responsibility for correctness in translation shall lie with the Bidder.

All the measurements shall be given in metric system.

2.5 ARRANGEMENT OF BID

The Bid shall be neatly presented with consecutively numbered pages. It should not contain any terms and conditions which are not applicable to the Bid. The Bid and all details submitted by the Bidder shall be signed and stamped on each page as token of acceptance, by a person legally authorised to enter into agreement on behalf of the Bidder. (Corrections / alteration, if any, shall also be signed by the same person).

2.6 SCHEDULE OF PRICES

The schedule of prices shall be read in conjunction with all the sections of proposal document. The price must be filled in the same format of 'Schedule of Prices' in Section G1. No copy of price bid shall be enclosed along with other document and upload the same anywhere.

2.7 DOCUMENTS COMPRISING THE BID

Bids shall be arranged in the following order.

2.7.1 Technical and Unpriced Commercial Part

Technical and unpriced commercial part shall comprise the attachments, specifying attachment number arranged in the order as follows:

(a) Submission of bid letter.

(b) Power of attorney in favour of authorised signatory of the bid / proposal documents.

(c) All the annexure in Section-G1 to G6 (Without price details related to offered product) enclosed in proposal duly filled, signed and sealed

(d) Bid qualification criteria and all supporting documents.

(e) Write-up on the detailed procedure to be followed for manufacturing, supply, testing at vendor & at SLC Site of all the items.

(f) Unpriced copy of schedule of prices with all other commercial terms, taxes, duties, exemption certificates and conditions duly filled (Prices to be kept blank), signed and stamped.

(g) Audited balance sheet including profit and loss account for last three financial years showing annual turn over

(h) Latest income tax certificate for last three financial year.

(i) Solvency certificate from a scheduled bank for a value not less than 1.5 Cr and not before 6 months from the date of tender closing.

(j) Description of the procedures adapted for material procurement, fabrication with deviations from technical specification and proposed design modifications.

(k) Data sheets for all the equipment & checklists enclosed in proposal duly filled, signed & stamped.

(l) Technical literature & data sheets of equipment / machinery used by him and any other document as mentioned in the proposal.

(m) Project execution plan

(n) Any other relevant document, bidder desires to submit.

2.7.2 Part – II : Priced Commercial Bid

Priced commercial bid shall be filled online in the price bid format. Schedule of prices also to be filled in the online format and no separate document shall be attached. Deviations in terms and conditions, assumptions, conditions, discounts etc. shall be stipulated in format specified in the portal. SDSC SHAR will not take cognizance of any such statement and may at their discretion reject such bids.

3. BID SUBMISSION

Bids duly filled in by the Bidder should invariably be submitted as stipulated in the Letter inviting bid. Bids shall be submitted in the following manner.

3.1 PART – I: UN PRICED TECHNO-COMMERCIAL PART OF THE BID FOR THE WORK

Complete Techno–commercial part of the bid shall be filled in the "Vendor Specified Terms' form. Any documents related, technical literature, guarantee / warrantee certificates and any other relevant documents as per the tender shall be scanned and uploaded

The deviation statement and checklist shall be filled online, without which the bid will not be considered.

3.2 PART – II : PRICE PART OF THE BID FOR THE WORK

Price bid shall be filled in the 'price bid' form only.

a) SDSC SHAR may open Part – I of the bid on the due date of opening subject to meeting the minimum evaluation criteria. Price Bids (Part-II) of technically and commercially acceptable offers shall be opened at a later date.

b) SDSC SHAR reserves the right to reject any or all the Bids without assigning any reasons thereof.

c) **Any bids/offers with price details related to offered product in Techno-Commercial Offer (Part –I) shall be rejected.**

4. Vendor Evaluation Format

SDSC SHAR seeks response to the given questionnaire for assimilating data which would be used for evaluating the capability of the supplier for executing the referred work. Hence, the supplier is requested to provide only genuine data and any discrepancy found at a later point of time may result in rejection of the supplier from purchase process. Furnishing of data cannot be construed as automatic qualification for participation in the tender. Questionnaire should be signed by a responsible and authorized person of the Company / Agency.

Schedule of general particulars / vendor evaluation format shall be filled as per Section: G3. Schedule of Bidders experience and details of present works being executed are to be filled as per Section : G5.

Note: In order to consider as valid experience, it has to be supported with technical details, completion certificate and purchase order.

If warranted, department/ third party will carry out the inspection of the vendor site / site at which vendor crane is erected for evaluation of the capability and genuineness of the documents.

5. DETERMINATION OF RESPONSIVENESS

SDSC SHAR will scrutinize tenders to determine whether the tender is substantially responsive to the requirements of the tender documents. For the purpose of this clause, a substantially responsive tender 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 SDSC SHAR shall be final in this regard.

6. BID EVALUATION

6.1 During evaluation, SDSC SHAR may request Bidder for any clarification on the bid or additional documents.

6.2 Bidder must provide the point-by-point compliance to the technical specifications along with deviations as per "Schedule of deviations" attached in ` G4. The tender will be rejected, if the deviations are not acceptable to the Department.

6.3 Performance of Bidder on similar nature of works executed/ under execution shall be taken into consideration before selecting the Bidder for opening his price bid.

6.4 The time schedule for completion is given in the Proposal document. Bidder is required to confirm the completion period unconditionally.

6.5 SDSC SHAR 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 SDSC SHAR shall bear no liability whatsoever consequent upon such decision.

6.6 The Bidder, whose bid is accepted by SDSC SHAR, shall be issued a Letter of Intent (LOI) /Purchase Order (PO) to proceed with the work. Bidder shall confirm acceptance by returning a signed copy of the LOI/PO.

SECTION –B

GENERAL SPECIFICATION & PROJECT INFORMATION

1. SCOPE OF WORK AND TECHNICAL SPECIFICATIONS

The detailed scope of work and technical specifications is given in Sections C of this document. The general terms and conditions are given below.

2. SUPPLIER's OBLIGATIONS & FUNCTIONS

2.1 SPECIFICATIONS AND DRAWINGS

The Supplier shall execute the works in compliance with the provisions of Contract, good engineering practices and codes requirements.

2.2 PROCUREMENT, FABRICATION & SUPPLY

Supplier shall carry out Design, detailed engineering, manufacture, inspection, shop testing, supply, erection & commissioning of Flame proof, Top running, ***double girder-based*** **LINAC Handling (LHS) and Film Positioning System (FPS) for NDT facility of SLC** as per specifications and IS 3177, IS 807 & relevant codes & standards in accordance with the scope, technical specifications and terms & conditions of contract.

2.3 DELIVERY AND STORAGE

2.3.1 Dispatch Instructions given in the Contract shall be strictly followed. Failure to comply with the instructions may result in delay in payment apart from imposing any other charges as may be deemed to fit.

2.3.2 The Supplier shall be responsible for transporting all the equipment to site, unloading and storage.

2.3.3 No equipment shall be delivered without obtaining dispatch clearance from SDSC SHAR.

2.3.4 All the equipment shall be properly packed to avoid any damage during transportation / handling / storage and any damage found has to be replaced free of cost.

2.3.5 The equipment received at site shall be stored at a place assigned for this purpose.

2.3.6 Supplier shall take proper care while storing the equipment and shall provide watch & ward at his own cost.

3. INSTALLATION

3.1 GENERAL

3.1.1 Supplier's staff shall include adequate number of competent erection engineers with proven experience on similar works to supervise the erection works and sufficient skilled, unskilled and semiskilled labour to ensure completion of work in time.

3.1.2 Supplier's erection staff shall arrive at site on date agreed by SDSC SHAR. Prior to proceeding to work, Supplier shall however, first ensure that required/sufficient part of his supply has arrived at site.

3.1.3 Erection of equipment may be phased in such a manner so as not to obstruct the work being done by other Suppliers and / or operating staff who may be present at that time.

3.1.4 During erection, Department's quality team / their engineer will visit site from time to time with or without Supplier's engineer to establish conformity of the work with specification. Any deviations, deficiencies or evidence of unsatisfactory workmanship shall be corrected as instructed by Department.

3.1.5 Supplier shall carry out work in a true professional manner and strictly Adhere to the approved drawings. Any damage caused by Supplier during erection to new or existing building / environment shall be made good at no extra cost to Department.

3.2 SAFETY

Supplier shall follow all the safety regulations / codes and shall take necessary measures at his own cost for men, material during this project till completion including insurance of person working for erection at site and other statutory clearances.

3.3 ERECTION & CONSTRUCTION POWER

3.3.1 Electrical power provided by the Purchaser during installation of crane is NOT chargeable. Reasonable quality of normal power will be made available at one point (415V, 3 phase, 50 Hz) with the standard procedure including earthing as directed by Electrical and safety engineers. However, onward distribution shall be done by the bidder. All electrical installation by the bidder shall be as per safety regulation & standard and will be subjected to Purchaser inspection & approval.

3.3.2 Material handling equipment required at site along with required manpower for the following are in the scope of contractor

- **Loading or unloading of items at the identified location for temporary storage within 5km from the erection site.**
- **Loading, unloading and movement of stored items from the temporary storage area to the erection facility.**
- **Material handling requirement for erection and commissioning.**
- **Loading, unloading and movement of the test load for load test (for SWL and over load) from the storage location to facility and back to the storage facility located within 5km from the erection site.**

3.4 SITE PREPARATION / CLEARANCE

No site preparation works are planned by SLC Project for site fabrication works. Only environmental clearance will be provided for site preparation works. Preparation of required site for any fabrication and approach requirements for handling shall be in scope of contractor.

Upon completion of work, supplier shall remove all his equipment and material from the site within one month or time mutually agreed. Supplier at all times shall keep site in clean condition and remove all unwanted material at regular intervals. In case supplier fails to remove all their equipment and material within the mutually agreed time, it is deemed that SDSC SHAR will arrange to remove the same at Supplier's cost.

3.5 ACCOMMODATION

Supplier shall make their own arrangement for accommodation, transportation & canteen facility for all his staff, technicians, labour & workers.

3.6 MEDICAL FACILITIES

Supplier shall make their own arrangement at their own expenses for medical facilities for site personnel.

3.7 WORK PROGRAMME

Supplier shall prepare a detailed program schedule for review / approval by SDSC SHAR. Supplier as per exigencies of work shall revise and update programme periodically.

3.8 SUB-CONTRACTS

3.8.1 No work shall be sub-contracted without prior approval of SDSC SHAR.

3.8.2 Supplier shall be responsible for the proper execution of any sub-contract placed by him in connection with this purchase order.

3.8.3 Supplier shall furnish to SDSC SHAR the copies of all un-priced sub-orders showing promised delivery dates and places.

3.9 CHANGES AND MODIFICATION TO SPECIFICATIONS, DRAWINGS AND QUALITATIVE / QUANTITATIVE REQUIREMENTS

3.9.1 Supplier shall obtain approval from SDSC SHAR before initiating the action for procurement of bought out items.

3.9.2 During the fabrication review, supplier has to carry out the mutually agreed modifications to meet the overall requirement.

3.10 TAXES AND DUTIES

3.10.1 The tendered items as per the above subjected tender comes under "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" having GST @ 5% (As per Dept of Revenue IGST Notification No. 25/2018 Integrated Tax (Rate) Schedule-I ; Sl. No.243B dt: 31.12.2018 (Amendment to Notifications No. 7/2018-Integrated Tax (Rate) dt: 25.01.2018. Clause A (ix) about Schedule I 243A))

Kindly accept to offer the item with 5% GST against End User Certificate from our Competent Authority that the items belong to the above category

3.10.2 It is the responsibility of the contractor to issue the Tax Invoice strictly as per the format prescribed under the relevant applicable GST law (CGST Act/SGST Act/UTGST Act/IGST Act). Contractor to indicate the proper GSTN Registration/ HSN code in their tax invoices.

3.10.3 CGST/SGST/UTGST/IGST shall be paid at actuals against Tax Invoice but restricted to the amount and percentage in the contract.

3.10.4 GST details of SDSC SHAR are given below:

Designation : Purchase and stores officer VALF
Contact no : 08623-226082
GSTIN : 37HYDF00385AIDZ

3.11 STATUTORY VARIATION

Statutory variation for CGST/SGST/UGST/IGST is applicable, provided the actual completion of services does not occur beyond the period stipulated in the order/contract or any extension (without levy of penalty). For variation after the agreed completion periods, the service provider alone shall bear the impact for the upwards revisions.

For downward revisions, the Department shall be given the benefit of reduction in CGST/SGST/UGST/IGST.

3.12 RISK COVERAGE

The Supplier shall arrange comprehensive risk coverage at his own cost covering the value of equipment including transportation to the site from manufacturer's works, storage at site till demonstration, testing at site. The period of such coverage shall be up to contractual completion period or any extension granted by Department thereof.

3.13 INCOME TAX

Income tax at the prevailing rate as applicable from time to time shall be deducted from the supplier's bills as per Income Tax Act,1961 and the rules there-under or any re-enactment or modifications thereof and a TDS certificate shall be issued.

3.14 BANK GUARANTEE FOR SECURITY DEPOSIT, PERFORMANCE BANK GUARANTEE :

3.14.1 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.

3.14.2 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).

3.14.3 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).

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

3.15 PACKING AND FORWARDING

3.15.1 The Supplier shall arrange to have all the material suitably packed as per the standards and as specified in the contract. Unless otherwise provided for in the contract, all containers (including packing cases, boxes, tins, drums, and wrappings) used by the Supplier shall be non-returnable.

3.15.2 All packing and transport charges, transit handling costs, transit risk coverage and transport fees of agents employed at the place of delivery or elsewhere, shall be deemed included in the price to be paid to the Supplier.

3.16 FORCE MAJEURE

Should a part or whole work covered under this purchase order be delayed due to reasons of Force Majeure which shall include legal lockouts, strikes, riots, civil commotion, fire accident, quarantines, epidemic, natural calamities and embargoes the completion period for work, equipment referred to in this agreement shall be extended by a period not in excess of the duration of such Force Majeure. The occurrence shall be notified within reasonable time.

3.17 WARRANTY

The bidder shall provide **twelve months warranty** for the entire system for a defect liability, after final official handing over at his cost. During this period bidder has to provide and adhere to the following:

3.17.1 This period shall include maintenance, replacement of defective/ failed parts at free of cost.

3.17.2 Bidder has to attend unlimited breakdown calls.

3.17.3 Purchaser will not provide any transport/accommodation for this purpose.

3.17.4 Upon oral or written notification of defects in or malfunctioning of the goods during the warranty period which require corrective action, bidder shall send the necessary personnel to job site to supervise and assume responsibility

for repairs and/or replacement, if necessary, of the defective goods or material at his own cost. If Bidder does not respond, within seven (7) days after receipt of notification, the Purchaser has got every right to resolve reported problem and Purchaser may do so at the cost and expense of the Bidder. Bidder shall reimburse to the Purchaser all expenses incurred by Purchaser to repair or replace malfunctioning or non-conforming goods and Forfeit the performance security.

3.17.5 Purchaser has no obligation to discover defects, patent or otherwise, and this shall be sole responsibility of Bidder. Inspection and clearance for shipment by Purchaser's inspectors or Inspection agency appointed by Purchaser shall not relieve Bidder of any of his obligation and duties under the terms and conditions herein.

3.17.6 Where defects in items are remedied under warranty, the period for which the warranty operates shall be extended by such period, as the items were not available to the Purchaser. Where defects items are replaced by new ones, the full warranty period stipulated in the contract shall apply to such replacement items as from the date of their delivery.

3.17.7 Bidder shall obtain similar warrantee from each of his sub-bidders. However, the overall responsibility shall lie with the Bidder.

3.17.8 The Bidder shall guarantee that the equipment furnished by him are in conformance with the requirement of the specifications.

Goods covered by the contract shall be free from defects in design, materials or workmanship for a period of twelve months from the date of successful commissioning & acceptance by Purchaser.

3.18 SCHEDULE OF PRICE

3.18.1 CONTRACT price shall include all costs of "Design, Detailed engineering, Procurement, Manufacture, Supply, Erection, Testing and Commissioning of Flame proof, Top running, ***double girder*** **based LINAC Handling and Film Positioning System for NDT facility of SLC** as per following specifications and IS 3177, IS 807 & relevant codes & standards for SLC", shop testing, packing, forwarding, transport to site, unloading, storage, all risk coverage, erection, installation, testing & evaluation and commissioning of equipment including any other cost for proper and complete execution of the CONTRACT.

3.18.2 CONTRACT prices shall also include all travelling expenses, living expenses, salaries, overtime, benefit and any other compensation for engineers, supervisors, skilled, semiskilled workmen, watch and ward staff,

labours and other staff employed by the Supplier, cost of tools and tackles required for erection and other consumable material required, and all taxes, duties, and levies as applicable on the date of submission of bid.

3.18.3 Supplier shall quote the prices similar to price bid format enclosed as Section –G1 only in online.

3.18.4 Erection charges and third party inspection charges shall be firm and fixed.

3.18.5 The rate quoted shall be on FOR SLC site, Tuticorin, Tamil Nadu, basis.

3.19 TERMS OF PAYMENTS

Party shall comply with following payment terms,

PAYMENT TERM	APPORTION	STAGE
I. Supply payment.	▪ 80% Supply cost of LINAC Handling and Film Positioning System and 100% taxes & duties on supply cost.	After receipt & acceptance by CLIP of LINAC Handling and Film Positioning System at SLC Site.
II. Commissioning payment	▪ 20% Supply cost ▪ 100% Erection cost	After completion of erection & commissioning and acceptance of LINAC and Film System and also after submission of Performance Bank Guarantee.
III. Transport	▪ 100% Transport Charges	After completion of equipment transportation to site
IV. TPI	▪ 100% Charges	

3.20 DELIVERY SCHEDULE

The realization of fabrication works within the schedule is very essential. Hence, bidders are requested to adhere to the schedules given below. Contractor shall follow the following schedule for executing the contract:

S.No	Event	Time	Remarks
	LINAC and Detector Handling System		
1.1	Date of Purchase order	T0	Reference for supply
1.2	Party shall submit the Design / PDR for approval	T1 = T0 +30	PDR approval
1.3	Party shall submit all the drawing & brought out items list/specification and calculations for approval to department.	T2 = T1+ 30 Days	Within 1 month from the date of PDR approval. T1
1.4	Intermediate reviews and Final approvals of drawings and calculations by purchaser (department) and TPI	T3 = T2 + 30 Days	within 1 months from the date of completion of T2
1.5	**Final inspection and clearance**	T4 = T3 + 150 Days	**within 5 months** from the date of final approvals of drawings and calculation by department, after completing the PDI &

			dispatch clearance
1.6	**Dispatch clearance to SLC site**	T4	**Reference date for dispatch of crane from company to site**
1.7	**Receipt of items, unloading and storing at identified location**	T5 =T4+15days	**Transportation time from company to SLC site**
1.8	Date of site readiness / clearance provided by the department for erection & commission of the complete system	T6	**Reference date for erection**
1.9	**Erection & Commissioning**	T7= T6+45 days.	**1 ½ months** from date of **site clearance** for erection & commissioning work

3.21 LIQUIDATED DAMAGES

In case your quotation is accepted, and order is placed on you, the supply against the order should be made within the period stipulated in the order. Failure to supply the material within the stipulated period shall entitle Procuring Entity for the imposition Liquidated Damages without assigning any reasons @ 0.5% of the value of the delayed item, per week (or part thereof) of the delay, subject to a maximum of 10% of the total contract value

3.22 DISCLOSURE AND USE OF INFORMATION

3.22.1 If the documents supplied by SDSC SHAR are marked **"Strictly Confidential"**, supplier shall take all necessary steps to ensure the same.

3.22.2 Supplier shall guarantee that all information and data received during execution of Purchase Order from SDSC SHAR shall be classified as **"confidential"** within the meaning of the Official Secrets Act and will not be divulged to any third party without prior written permission of SDSC SHAR. All drawings & documents shall be returned after execution of work.

3.22.3 No publicity of any kind whatsoever regarding this work shall be given without prior clearance from SDSC SHAR.

3.23 ACCEPTANCE AND REJECTION:

On completion of the work or part of the work as specified in the contract, the representative of the Department referred to, shall check as soon as possible, but in any event within one month of notification of readiness for acceptance that the work performed complies with the contract requirements as regards quantity and quality.

In the event of rejection of any of the articles, whereby the Supplier feels himself aggrieved, he may within eight days of the receipt of notification of rejection and before such articles have been removed from the place of inspection, give the Department notice of objection. Such objection shall be considered by a Board of Appeals of the Department. The Department shall, without prejudice to the

arbitration clause in the contract, take a decision upon presentation of the Board's findings.

On completion of tests, the members of the Inspection Organisation of the Department or Inspection agency appointed by Department shall prepare a report, which must be countersigned by the Supplier.

3.24 SUSPENSION:

3.24.1 Department may notify the Supplier to suspend performance of any or all of his obligations under the Contract. Such notice will specify the reasons for suspension and the effective date of suspension. Supplier there upon shall suspend the performance of such obligations until ordered in writing to resume performance of Contract by Department.

3.24.2 If Supplier's performance or his obligations remain suspended or the rate of progress is reduced, then, the time of completion will be suitably extended and all costs incurred by Supplier as a result of suspension or reduction in rate of progress will be paid to Supplier provided that the suspension or reduction in the rate of progress is not by reasons of Supplier's default or breach of Contract.

3.25 CANCELLATION

3.25.1 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.

3.25.2 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.

3.26 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 shoe 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 contract 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.

3.27 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

3.28 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.

3.29 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. 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.

4 PROJECT INFORMATION

4.28 Project Title : SSLV LAUNCH COMPLEX (SLC)

4.29 Location of Plant : SSLV LAUNCH COMPLEX, SSLV PROJECT OFFICE, SURVEY NO. 260-3C, MADHAVANKURICHI VILLAGE – 628206, OPP. TO KOODAL NAGAR, THIRUCHENDUR TK., TUTICORIN DIST., TAMILNADU

4.30 Elevation : 22 m

4.31 Access to Site : Road about 21km from Thiruchendur and about 46km from Koodankulam approximately.

4.32 Terrain :Uneven with level varying significantly.

4.33 Climatic Conditions

4.33.1 Temperature

4.33.1.1 Mean of daily max :34 ^{0}C

4.33.1.2 Mean of daily min. :28 ^{0}C

4.33.1.3 Maximum Temperature : 39 ^{0}C

a. Design ambient temperature for performance guarantee :45.0 ^{0}C

b. For electrical system design :50 ^{0}C

4.33.2 Relative humidity

4.33.2.1 Range :58% to 95%

4.33.2.2 Design relative humidity for performance guarantee :95%

4.33.3 Rainfall

4.33.3.1 Annual average maximum :1222.7 mm

4.34 Wind Load

4.34.1 Basic wind speed :7m/s (Enhanced by a factor 1.4)

4.35 Seismic Data : As per IS : 1893 latest issue

Zone : Zone II

SECTION –C

SCOPE OF WORK & TECHNICAL SPECIFICATION

Technical Specification of LINAC Handling and Film Positioning System

1. Scope of Work

Design, detailed engineering fabrication inspection, shop load testingat factory, transportation to site, unloading at site, storage at site, erection, testing, commissioning and handing over of 5T + 50 Kg capacity Double Girder Flameproof based LINAC Handling System (LHS) and Film Positioning System (FPS), Bridge Girder, Gantry Girders, CR rails and cable management system along with third party inspection, as per following specifications and IS 3177, IS 807 & relevant codes & standards.

2. Configuration Details.

LINAC handling is intended for Maneuver the LINAC X-ray machine head (5t SWL) and and Film Positioning System is intended Positioning the Radiographic film (50Kg SWL) as per the defined way for radiography purpose of Solid motors and accessories. It is an overhead based (EOT Crane) system shall configured with two independent cross travel trolleys, one for handling the LINAC head and another for handling the Film position, on a common LT girder.

The exposure hall (Bay) size, Where the system to be realized is 25 (L) X 20 (W) X 21.8(H) m.

The hall is planned with 60t EOT crane at 13.5 m elevation along with this LINAC handling system at 9 m (LT rail height) elevation, two tier system concepts. Refer Sketch – 1&2

Major Sub system Configuration details are listed below

2.1. LINAC Handling System Configuration

The LINAC handling system shall accommodate the LINAC head size, 2740 (l)x 1250(w) x 1500mm (h)for integration. The LINAC head shall connect to overhead CT trolley by wire rope arrangement. The major sub systems for LINAC head integration and defined operational movements are given below. Refer Sketch - 3

- Individual CT trolley for cross movement
- Yoke system for LINAC head integration and specific operational (Rotational and Tilt movements) requirements.
- Number of movements to be planned is "Five". Lateral -X (LT), Cross - Y(CT), Hoist – Z, Rotation in X plane (Powered) and Tilt in Z plane (manual)
- Stabilization System to attest the LINAC head oscillation (Hydraulic power pack based telescopic arrangement)
- Hoist arrangement with load cell.
- Lateral movement (common for both system)
- Operation, both local and remote.
- The LINAC head positional movements are powered and controlled one. Except Tilt alone where it can be adjusted manually.
- Cable Management system inside bay and Hoist movements. The Cable management system design shall consider the LINAC machine cables also in addition to handling system cables.

2.2. Film Positioning System Configuration

Film positioning system shall configure to accommodate the Radiography film cassettes and aid to position the same inside the bay as per user defined requirement in this document. The film positioning system shall connect to overhead CT trolley through wire rope and telescopic guided arrangements. Refer sketch -4

Supplier shall design the cassette holder. It is a channel type system with front and back under open condition i.e. without any metal sheet and the channel shall hold the cassettes, the size of the individual full cassette is 420 X 320 X10 mm. The holder shall design to accommodate three cassettes at a time in series. Similarly, Cassette holder frame for half cassette, size 170 X 420 X 10 mm, for two cassettes at a time.

- Individual CT trolley for cross movement
- Interface arrangement to integrate the cassette holder frame in the system.
- Number of movements to be planned is "Four". Lateral -X (LT common for both LINAC Handling and Film positioning), Cross - Y(CT), Hoist – Z, Minor independent movement of 1200mm stroke (+/- 600 mm) in LT plane (with screw movement to align Film with LINAC head). All the motions are powered.
- Telescopic based guiding system shall be provided to arrest (without hydraulic) the oscillation and to maintain the cassette holder normal axis at various dynamic location in the hoist stroke.

2.3. LT Girder (Double) (Common for both the handling system)

The design of the LT girder shall consider the SWL of Film positioning system as 5t instead of 50kg. Hence, the LT girder shall accommodate the both trolleys of 5t capacity each.This requirement shall allow the Purchaser for future augmentation Purpose.

2.4. Electrical and Instrumentation.

It is the PLC based operatable system. The system is going to be used in explosive area; hence the electrical motors, brakes 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 PLC system, motor VVVF drives, electrical switchgears will be placed in a non-flame proof area adjacent to the bay. The instrumentation system (comprises of push button, limit switches, Indication lamps, display system, etc) can be an intrinsically safe for getting data from exposure hall. The limit switches and encoders used in the system for positional accuracies, X-ray hardened are preferable.

Compatible communication shall be planned between the VVVF drives and instrumentation system, the PLC based. Operator shall make operation trough MMI console.

2.5. Cable Management System.

The necessary cabling between the end equipment and electrical panel rooms shall be properly routed and suitable cable management system shall be designed inside the bay. The cable management system along with cable drag chain shall be considered for LINAC machine cables and chilled water hose in additional to the cables meant for LINAC Handling & Film positioning system. The minimum bending radius for LINAC cable is 305mm and water hoses is 255mm. Refer image 2

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 LINAC 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 small 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 (Plug in Pendent) and remotely at Control room (Control Console). To have readable image during the film interpretation, the motion of the LINAC handling system 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 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. For wire rope design the factor of safety shall be 6 times of the rated load.

The operational logic for control shall be made as per requirement. Initially, the home position of individual systems (LHS and FPS) shall be defined and the operator shall enable to command the system for a specific position during radiographic operation. The individual movements shall operable with certain safety condition, example, the lateral motion will be allowed if both the system at some elevation. Similarly, all the movements shall be controlled through department cleared logic with certain safety conditions.

1.	**FUNCTIONAL REQUIREMENTS**		
1.1.	a) The LINAC handling system shall have provisions for long travel (X-axis), cross travel (Y-axis), Hoist (Z-axis) and in yoke X-ray machine tilting (about trunion-axis) and rotation (about Z- axis). Design and interface requirements of LHS with LINAC machine shall be done as per requirements (X-ray head and dimension 2.7 X 1.25 (w) X 1 (h) m). The LINAC head shall be supplied by the Purchaser while on integration. **b)** The Film Positioning system shall aid to position the Radiographic film as per the requirement. The FPS shall have the provision for Long travel (same for Both LINAC and FPS), Cross travel (Y- axis) and Hoist (Z axis) and in addition to the above it shall provision of minor independent motorised movements in LT plane.		
1.2.	LINAC handling system is to manipulate the positions of LINAC X-ray head for radiographic imaging, it shall have a PLC based operating system. The LINAC handling system shall be accordingly provided with suitable VVVFDs, encoders, Proximity switches/limit switches for it to be controlled and operated using (i) Man-Machine Interface (MMI) from control room (safe area) and (ii) Local push button station / pendant system for manual operation locally (Hazardous area).		
1.3.	Contractor shall supply PLC hardware and carryout the PLC programming to meet functional requirements and providing all necessary interlocks of the system		
1.4.	Contractor shall supply necessary hardware development to operate LHS & FPS through remote mode. GUI program/coding shall be done by contractor		
1.5.	As Radiography operation requires precise positioning LINAC, all interfaces and different mechanisms shall be designed accordingly in LINAC Handling System		
1.6.	The pendant / local push button station shall be provided with local display for position information of all motions.		
1.7.	Two independent Pendant control shall be supplied, one for LHS and other for FPS.		
1.8.	In NDT exposure hall at 13.5 m elevation, above this system the 60t EOT is planned. Supplier suggested to design the CT trolley (height), so that positive clearance will be there for clear movement.		
2.	**Quantity of LHS and FPS**	One Number each	
3.	**Usage of LINAC handling and Film Positioning System**		

3.1.	Application	The crane-based LINAC handling and the Film Positioning System shall aid to manipulate the LINAC machine and Film as the per requirement needed for NDT of Solid motor.	
3.2.	Usage period & desired life of System	This heavy-duty LINAC and FPS will be put to use for 365 Days' intermittent duty (Class II duty (M5) as per IS3177) with CT, LT and Hoist movements. Electrical and instrumentation control including PLC used in LHS and FPS shall be of latest technology and the same shall be submitted for department approval before start of fabrication / procurement.	
4.	**Hazardous area conditions**		
4.1.	As mentioned in BOQ (as applicable), LHS and FPS shall be equipped with flame proof electrical systems suitable for operating in hazardous area classified as Zone 1, Gas group IIA/IIB, T4 temperature classification as per IS/IEC:60079, IS:5571, IS:5572, IS:2148, IS:5780, IS:8239 and other relevant IS standards. Motors and brakes shall have minimum Class "F" insulation with temperature rise limiting to class-B.		
5.	**Operating Environment of LHS and FPS / Weather conditions**	Operating environment is Indoor, near to sea (i.e., saline atmosphere), with ambient temperature of 50°C and with relative humidity of 95%. Weather conditions are tropical. Contractor shall consider above while design of LHS and FPS, electrical, painting of LHS and FPS& related parts.	
6.	**MAIN PARAMETERS OF LHS AND FPS**		
6.1.	Type of LHS and FPS	Double girder, Flameproof, Indoor, Heavy duty VVVF (Main and redundant as specified in this document) with Stabilization System	
6.2.	Class & duty of LHS and FPS	Structures: Group of LHS and FPS M5as per IS 807	
		Mechanisms: Group of classification M5 as per IS3177	
		Hoist Mechanism: Class II (M5) duty as per IS:3177.	
6.3.	LHS and FPS capacity (in tonne)	5t + 50 Kgs	
6.4.	Span	20 m (approx.)	
6.5.	Lift Height (Height of Lift)	Minimum 7.5 m for LHS and FPS	
6.6.	**Operation Speeds (meters/minute)**		
a)	Hoist	Main speed: 3.0 m/min & creep speed: 0.3 m/min	
b)	Cross travel (For both Trolleys)	Main speed: 3.0 m/min & creep speed: 0.3 m/min	
c)	Long travel	Main speed: 3.0 m/min & creep speed: 0.3 m/min	
d)	Yoke Rotation	Main speed: 180 Degree/min & Creep Speed 18 Degree/min	
e)	Tilt	Manual operation. (+/- 15 Degree)	

6.7.	Side clearance (Distance from centre of gantry rail to nearest obstruction)	As per the Sketch-1	
6.8.	Bay length in meters	25m (approx)	
6.9.	LT wheel base	as per IS:807 and shall not be less than 1/5th of span.	
6.10.	Width of LHS and FPS	shall be as minimum as possible for having optimum LT yoke approaches for better utilization of LHS and FPS & building (indicative LINAC approaches are provided in the drawing, Sketch-1).	
7.	**Hoist**		
7.1.	Hoist Drive – 2 Nos. to be considered. (1 for LHS and another one for FPS)		
7.2.	Both the above system shall be of independent to each other with respect to operation.		
7.3.	Bidder can suggest & design configuration along with LINAC stabilization system to meet above safety, redundancy, and reliable Hoist system with optimum LINAC approaches.		
	Motors and gearboxes shall be rated such that motor and Gearbox will take full rated torque at rated speed.		
7.4.	Brakes shall be located on Input shaft of gearbox. 2 nos. of flameproof brakes per motor shall be provided.		
7.5.	Hoist Drives for LHS and FPS	Single motor each one for LHS and one for FPS with Horizontal, foot mounted, parallel shaft Helical gearbox of standard make mentioned in this specification. For any other system supplier shall get approval from purchaser.	
8.	**LT Drive**		
8.1.	Twin drive shall be used. Horizontal/ Vertical type, foot mounted standard makes gear boxes as specified in the list of bought out items		
8.2.	Each corner drive components shall be easily accessible and shall be designed with interchangeable components.		
8.3.	Wherever applicable the driving pinions shall not interfere with the removal of wheels.		
8.4.	Number of wheels for LT drive	4 Nos. as per design / as approved by Dept. Drive wheels: 50% of total wheels based on design.	
8.5.	Diameter of wheels for LT drive	As per IS 3177.	

9.	**CT Drive (applicable for LHS and FPS)**		
9.1.	CT Drive – 2 Nos. to be considered. (1 for LHS and another one for FPS)		
9.2.	Both the above system shall be of independent to each other with respect to operation.		
9.3.	CT drive shall be provided with central drive with vertical type gearbox. Helical parallel shaft gearbox, motor and thrusters brakes Department approved make shall be used.		
9.4.	All the drive components shall be easily accessible and shall be designed with interchangeable systems.		
9.5.	Wherever applicable the driving pinions shall not interfere with the removal of wheels.		
9.6.	Number of wheels for CT drive for each system	4 Nos. as per design / as approved by Dept. Drive wheels : 50% or 25% of total wheels based on design	
9.7.	Diameter of wheels for CT drive	As per IS 3177.	
9.8.	Maintenance of CT drives	Maintenance platform shall be provided for CT drives covered with chequered plate.	
9.9.	Type of bearings for CT wheels	Anti-friction, Heavy duty Double row Spherical Roller Bearings	
9.10.	Type of mounting of CT wheels	"L" type brackets with fit bolts and locknuts.	
10.	**Rotational Drive**		
10.1.	Rotational drive shall be provided with suitable drive, gearbox and thrusters brakes Department approved make shall be used.		
10.2.	All the drive components shall be easily accessible and shall be designed with interchangeable systems.		
10.3.	Wherever applicable the driving pinions shall not interfere with the removal of any sub-system.		
10.4.	Maintenance of Rotational drives	Suitable maintenance approach shall be provided for Rotational drives covered with chequered plate.	
10.5.	Type of bearings for Rotation drive	Anti-friction, Heavy duty Double row Spherical Roller Bearings	
10.6.	Type of mounting of CT wheels	"L" type brackets with fit bolts and locknuts.	
11.	**MECHANICAL DESIGN AND ELEMENTS' DETAILS**		
11.1.	Factor of Safety	The design of components shall be done on the basis of ultimate tensile strength, the value of stress factor used shall be the product of the basic stress factor and the duty factor for the appropriate mechanism class as mentioned in **IS:3177.**	
		The design of all mechanical components shall be done as per **IS:3177** & as per this technical specification and also on the basis of minimum ultimate tensile strength with factor of safety of **not less than 5**.	

11.2.	The stresses in all components of hoist mechanism and gearboxes should not exceed **66% of yield point (proof stress) of the material** for the component **under break down conditions of motor i.e. pull out torque of motor which is minimum 2.75 times full load torque of motor.**		
11.3.	All mechanical components in Hoist (vertical load path), shall be designed for infinite fatigue life. Fatigue analysis shall be based on the LHS and FPS maximum rated load.		
11.4.	Materials with less than 15% elongation shall not be used for any of mechanical load bearing component except for electrical motors, panels and hydraulic components.		
11.5.	Stress Concentration factors shall be considered in mechanical design for calculating working stresses and also combination of stress concentration factors shall be considered at required conditions.		
11.6.	No cast iron part should be used as load bearing member on the LHS and FPS except for electrical equipment. Similarly, wood or combustible material and Bush bearing should not be used in any part of the LHS and FPS.		
11.7.	Hoist Yoke	the Yoke system shall be provided for manipulating the LHS system. Configuration as given in this document. Material certificate, grade for yoke design shall be submitted.	
11.8.	**ROPE DRUM (Applicable for LHS and FPS)**		
a)	Independent ropes drum to be considered. (for LHS and for FPS)		
b)	Rope Drum shall be of welded / fabricated type of IS: 2062 steel with duly stress relieved. Rope drum shall be designed as specified in IS: 3177 in general. Allowable stress in drum shall not be more than 1/5th of UTS.		
c)	Rope drum diameter shall be as per IS 3177.		
d)	Fleet angle of wire rope from drum to sheave shall not be more than 2.5 deg and drawings & calculations shall be provided in this regard.		
e)	Drum grooves shall be helical and machined with smooth surface finish. Drum grooves shall be dimensioned as per IS3177.		
f)	Length of the drum shall be sufficient to accommodate the rope in one layer of the rope requisite for the specified lift and in addition rope drum shall be provided with no fewer than **three dead turns** at each anchored end and at least one spare groove at the other end when hook is at full height of lift condition. Grooves shall be finished smooth and shall be rounded at edges & corners.		

g)	Rope dead ends shall be clamped with minimum **three clamping wedges with two numbers of bolts on each clamp.** The bolts shall be at the centre of clamp and shall be wire locked.	
11.9.	**HOIST WIRE ROPE**	
a)	No joints shall be used for wire ropes under this specification.	
b)	Hoist (Conventional hoist system) wire rope shall be single path & conventional revving system with true vertical lift as per IS:3177. Wire rope shall have factor of safety of **6** on Minimum Breaking Strength (MBS). The wire rope shall be of M/s USHA MARTIN make only. Wire rope shall be Non-rotating type, Hot dip Galvanized, suitable construction, Core: IWRC, RH, Regular lay, preformed, Minimum tensile strength/Grade: 1960MPa.	
11.10.	**ROPE SHEAVES**	
a)	Design of sheaves in general shall be as per IS:3177.	
b)	All sheaves shall be of forged steel only.	
c)	All sheaves shall be mounted on special roller type sheave bearings. Grease lubricated sheave bearings should be provided with individual grease lubrication fittings and shall be easily accessible for maintenance.	
d)	Sheave diameters (at the bottom of groove) shall be as per IS 3177. Sheave fleet angle shall not be more than 2.5 degrees.	
e)	If applicable, the equalizer sheave /Equalizer Bar shall be mounted above the trolley floor and shall be easily accessible for maintenance from the floor of the trolley. Equalizer Bar / sheave shall be made in such a manner that it can turn or swivel to align itself with the pull of the ropes.	
f)	If applicable, equalizer sheave /Bar shall be arranged such that revving equalization shall not be restricted under normal operating conditions. Adequate free movement to compensate for operational block swing and/or normal rope stretch shall be provided.	
g)	Sheave grooves shall be machined smooth and support wire rope uniformly at least 130° angle of contact over its circumference.	
h)	All Sheaves shall have guards, which fit closed to the flange having a clearance not more than 1/4thrope diameter between sheave and inside of guard, to prevent the wire rope from leaving the sheave grooves.	
i)	All the upper block sheaves shall be mounted above the trolley platform for ease of maintenance and inspection.	
11.11.	**GEARBOXES**	

a)	Hoist	**Standard make,** crane duty, parallel shaft, Helical, horizontal foot mounted gearboxes shall be used. Hoist gearboxes shall be designed & manufactured as per class II (M5) duty of IS:3177	
b)	Gear Boxes for 2 nos. of Hoist, CT, 1 No. of LT and Rotation	Helical parallel shaft, crane duty, gearboxes, shall be used	
		Travel drive gearbox ratings for bending strength and pitting resistance shall be based on 2 times rating of AC motor.	
c)	Make of Gearboxes	Heavy duty, and crane duty gearboxes of Elecon / Shanti/ GREAVES (Premium transmission) / Fender/ DB-Radicon / Sumitomo / Renold only. Other make & **Own make gearboxes are not acceptable.**	
d)	Torque & Power rating of Gearboxes / Pinions / Gears / Shafts	1) Gearboxes selection shall consider starting torque of motor (i.e., 2 times the Full load torque) of selected motors.	
		2) The gearing shall be designed for strength, durability, and momentary high overloads which include the loads imposed during starting, braking and failure of components.	
		3) Due consideration shall be given for braking torque on input shaft of Gearboxes.	
		4) The stresses in all components of hoisting machinery and gearboxes should not exceed 66% of yield point of the material for the component under break down conditions (Pull Out Torque) of motor.	
		5) In design of gearboxes, due consideration shall be given to creep speed and also ramping down of rated speed (rpm) to zero speed through VVVF drives.	
e)	Drawings and dimensional details of gear boxes, selection criteria, power rating & torque rating calculations, bearing details, data sheets from gearbox manufacturer shall be submitted for TPIA & Department approvals during design engineering phase. TPA has to certify the same		
f)	Gearboxes with parallel shaft helical gearing shall be used for all motions.		
g)	All pinions shall be integral with shafts.		
h)	All gears shall be of forged alloy steel preferably case hardening steels.		
i)	Gear teeth shall be cut in metric module system. All gear teeth shall be profile ground to smooth with less error & for low noise while running.		
j)	All gear boxes shall be totally enclosed and splash or forced lubrication system shall be provided. Gearboxes shall have sufficient heat radiation area to maintain lubricant at temperatures below maximum operating temperature		

k)	Vertical Gearboxes shallhave anoil pump lubrication system whenvertical gearingexceeds of two reductions. Tubing/ Piping for gearbox lubrication shall be provided with SS316/SS304 and must be properly clamped. No hoses shall be used. Visual indicator for oil flow shall be provided in line.	
l)	Gearboxes shall have fill and drain connections, BREATHERS, lubricant level indicator, and shall have good accessibility for checking, maintenance and oil filling.	
m)	For all gearboxes lubrication shall be ensured even at creep speed of motor and from the initial start of motion (i.e. main or creep).	
n)	Gearbox cover shall be split horizontally at each shaft centre line and fastened and arranged so that the top half can be removed for inspection and repair without disturbing the bottom half.	
o)	Radial clearance between the gear box inner surface and the outside diameter of the gears shall be at least 1 ¼ times the depth of the largest gear tooth inside gear box or 20 mm whichever is higher.	
p)	No oil leakage is allowed from gearboxes. Oil drip pans shall be provided around the gearbox.	
q)	Sufficient clearance need to be maintained between gear of one stage to pinion of next stage of non meshing sets to avoid interference.	
r)	The noise level at gear box must not be more than 85 dBA (with 5t load) measured at a distance of 1m from the direct vicinity of the gear box. This is very important for all the gearboxes, and *any gearbox making more noise is liable to be rejected.*	
s)	Reliable oil seal arrangement i.e., preferably double stage oil sealing arrangement shall be provided for shafts of gearboxes.	
t)	Open gears should not be used in any drive / motion.	
11.12.	**Drive Shafts (LT & CT application for LHS and FPS)**	
a)	Shafts shall be of 45C8 forged steel or alloy steel.	
b)	Torsional deflection of the shafts at torque corresponding to 1.33 motor rated torque during acceleration shall not exceed 0.10deg./meter of shaft length.	
c)	Shaft supports on plumber blocks of SKF / FAG / TIMKEN make only.	
11.13.	**Brakes**	
a)	Flameproof thruster drum brakes shall be used for Hoist motions in LHS and FPS. Make of brakes shall be M/s Pincsh Bubenzer, M/s SIBRE, M/s Galvi, M/s SIME-GKN.	

	Standard make flameproof thruster drum brakes shall be used for LT & CT drives / motions inLHS and FPS.		
	Brakes shall be mounted on the input pinion shaft of the gear boxes.		
	Brake performance certificate, test certificate, and Ex-proof (ATEX) Certificate shall be provided from original manufacturer of brakes.		
b)	Hoist Brakes	Two nos. of electro hydraulic flameproof thruster drum brakes per motor with Manual release and anti wear compensator shall be provided (the second brake is for redundancy) on the either side of gear box (one number of break between motor and gear box and another after gear box).	
c)	Brake Rating (Hoist).	Torque rating of each thruster brake shall be minimum 2 times motor full load torque. Torque adjusting provision shall be available in the Brakes. Selected Brake shall have sufficient margin with maximum catalogue torque rating.	
d)	Braking distance / brake path for hoist	Hoist components and brake shall be selected such that the braking distance for lowering motion **shall be as per IS: 3177** with one brake at full rated speed. Necessary calculations shall be submitted in this regard during design phase.	
e)	Brakes for CT & LT, Rotation	Flameproof Electro hydraulic thruster drum brakes of above make, as per clause no 27, shall be provided.	
f)	Brake rating for CT and LT motions	Braking torque shall be checked so that it is capable of arresting the motion within a distance in meters equal to 10% of speed when travelling with rated load at rated speed, provided there is no skidding.	
g)	Manual release for Brakes	Manual release mechanisms for brakes shall be provided to permit drive movement during power stoppage. Manual release shall be of self-reset type and operative only when held manually in the release position.	
h)	No oil leakage is allowed from thruster brakes. Oil drip pans shall be provided under thrusters.		
i)	Brake drums	Shall be made from forged / cast steel / SG iron.	
		Drums shall be completely machined to smooth surface and Statically& dynamically balanced.	
		Hardness of surface of finished drum shall be 38-43 Rc.	
		Width of the brake drum shall be 10mm more than the width of the brake shoes.	
j)	Mounting of equipment	All the gearboxes, motors, brakes, bearing pedestals, etc. shall be mounted on machined and levelled surfaces.	
11.14.	**Couplings**		

a)	Couplings	**Flexible Full geared couplings.** Make of Couplings shall be of FENNER / ELECON / Shanthi / Renold. **Selection criteria, service factor, Torque rating, drawing shall be submitted for approval.**	
b)	All Couplings selection shall be based on the manufacturer's rating and applicable service factors for heavy duty LHS and FPSs compared to the applied torque on the coupling and as per IS:3177. Consideration shall be given to motor starting torque, gear ratio, dynamic effects, brake torque etc.,		
c)	Motor shafts shall be connected to gear extension shafts through flexible / shock absorbing couplings. Geared couplings shall be used between gearbox output shaft and intermediate shaft or end shaft and also for connecting intermediate lengths of long travel and cross travel shafts. Between intermediate shaft and end shaft and between end shaft and wheel axle, any other special coupling which can give better and more reliable service may be used after obtaining specific approval of the Department.		
11.15.	**Track Wheels**		
a)	All LHS and FPS wheels shall be of double flanged with straight tread, with 12° taper flanges, and accurately machined. Drive wheels shall be precision machined and matched in pairs with minimum deviation.		
b)	All LHS and FPS wheels shall be made from forged steel C55Mn75 and minimum surface hardness shall be **350 BHN.** The wheels shall be capable of taking up misalignments in span as specified.		
c)	General design & sizing of wheels shall be as per IS:3177. Necessary sizing & contact stress calculations as per IS:3177 shall be submitted.		
11.16.	**Fasteners**	Galvanized, high tensile fasteners of tensile quality not less than 8.8 shall be used in LHS and FPS parts, except for Fit bolts of Girder. Make of all fasters shall be of M/s **TVS** / M/s **UNBRAKO**	
		Maximum combined stresses induced in the fasteners by normal operating loads (but not including pretensioning loads) shall not exceed 20% of the ultimate strength of the fasteners.	
11.17.	**Lubrication of LHS and FPS**		
a)	Wheel bearings shall be provided with suitable greasing points on both the sides of wheel and shall be made approachable.		
b)	Trunnion of wheel bogies shall be provided with suitable greasing points for both the sides of the pins.		
c)	Suitable provision shall be provided for lubrication of hook and sheave bearings.		
d)	Adequate provisions/arrangements shall be made to prevent lubricants falling from the LHS and FPS.		
11.18.	**Keys & Keyways**	All keys where ever used should be of parallel keys as per IS:2048 (Couplings / gear boxes / motor shafts)	
		Material of keys shall be 45C8 or alloy steel.	

		Proper fits and tolerances shall be used between key and key ways, such that key should not get loosened in service life. Key end arrestors shall be provided.	
11.19.	**Bearings**	Ball and roller antifriction bearings of approved make SKF/ TIMKEN/ FAG/ INA only shall be used throughout the drives except where specified otherwise.	
		Rated life of ball and roller bearings i.e., (B10 or L10) in working hours shall not be less than 20,000 hrs .	
		Hoist gearbox's bearings shall be as applicable for class II (M5) of IS:3177	
		Special consideration shall be givento bearings which operate at low speeds. Certified confirmation of the bearing's capacity at low speeds must be obtained from the manufacturer during design phase.	
		All bearings shall be provided with proper lubrication or meansof lubrication. Mounting fits, tolerances and clearances shall be as recommended by the bearing manufacturer.	
		Life of bearing shall be calculated in accordance with bearing manufacturer's recommendations.	
a)	**Bearing Housings**	All bearings housings shall be of STANDARD MAKE (SKF/FAG/TIMKEN) and made of cast steel or wrought steel or fabricated steel bolted to a rigid portion of LHS and FPS structure by at least 4 bolts. Housings shall be split on the shaft centre line to permit removal of the shafts. The underside of the base of each bearing pedestal shall be machined and shall bear upon a machined surface.	
11.20.	**STRUCTURAL DETAILS OF LHS AND FPS**		
a)	Design of structural work of LHS and FPS	The LHS and FPS should be rigid, robust and of sturdy construction. The design of all structures shall be Class II as per IS:807 and as per this technical specifications.	
b)	For the welded construction such as that of bridge girders and carriages, trolley frames, rope drums, gearboxes etc., all steel plates shall confirm to IS:2062 or its equivalent.		
c)	Unless otherwise specified, only bolted or welded joints shall be used.		
d)	**Black bolts shall not be used in the main structures of the LHS and FPS.**		
e)	All the bolts, nuts, washers etc., shall be heavy duty galvanized and shall be protected against **corrosive environment**.		
f)	Material of structural	All the structural plates used in fabrication of Girders, Trolleys and End carriages, machine bases shall be of **minimum 10 mm thick** of IS 2062 Gr. B.	
g)	Covering chequered plates	Trolley and platforms shall be covered with Chequered plates of minimum of 6mm thick.	

h)	Girders	Shall be of double Girder Box Type construction having Maximum rigidity.	
		For box plate girders in addition to the required full-length diaphragms, short diaphragms shall be inserted where required to transmit the trolley wheel load to the web plates and to limit the maximum stress in the trolley rail within safe permissible stress.	
		Girders shall be cambered and amount equal to the deflection caused by the dead load plus one half of the live load and the trolley.	
i)	Deflection of Girders	Deflection shall not be more than **1/1000 of span** in mm with safe working load (5t), with trolley stationed at mid span and excluding deflection due to dead load.	
j)	Girder Joints	No splice joint is permitted. Girder is to be of single piece only. Number of weldable butt joints along the total length of the girder should not exceed two.	
k)	Ratio of span to depth of Girder	For Box Girders Span to Depth ratio shall not exceed 18. Other ratios for construction of girder shall be maintained accordingly as per standard.	
l)	Local Buckling of top flange	Local buckling of top flange and compression members shall be considered and necessary calculations shall be submitted for approval.	
m)	End Carriages	End carriage shall be fabricated as solid box section made from rolled steel plates IS:2062, except for essential openings which shall be reinforced.	
n)	If applicable, end ties for LHS and FPSs with more than four bridge wheels shall be of rigid type. End ties shall be constructed of box sections in structural steel.		
o)	If applicable, equalizer bridge trucks shall be incorporated into the end carriage design to promote equal sharing of bridge wheel loads, and equalizer pins shall be provided between the equalizer trucks and equalizer beam and/or the rigid bridge frame structure.		
p)	If applicable, end ties shall be designed to resist the loads due to LHS and FPS movement and the load combinations as per IS 807 & IS 3177.		
q)	Rail Sweeps.	A rail sweep shall be provided in front of each outside wheel. The rail sweep shall project below the top of the bridge runway rail.	
r)	A rigid frame analysis shall be used to determine the proportions of the loads resisted by the end ties and by the girders.		
s)	End ties shall be designed to accommodate up to 6mm difference in elevation of the bridge rail between any wheels or pair of wheels without exceeding allowable stresses.		
t)	Details of Bogie joint of End carriages shall be provided along with quotation.		

u)	Structural bolted Joints/ Girder to End carriages	Fit Bolts (as per IS:3640) with property class 5.6 and reamed holes shall be used for all structural joints between girder & end carriages, wheel L - bracket & end carriages etc.,	
11.21.	**Trolley (Applicable for LHS and FPS)**		
a)	The trolley frame shall be built up of rolled sections and plates to form a rigid & robust structure and shall be arranged to afford maximum accessibility to mechanical and electrical parts placed on it.		
b)	The trolley frame shall be of rigid construction such that lifted loads do not cause deflections that impair the proper operation of machinery.		
c)	No parts shall be mounted under the trolley except for the gravity limit switch weight. Top pulley block and all other pulleys, equalizer bars, fitments shall be mounted on the top of trolley platform only.		
d)	The maximum projection of LHS from LT girder top shall be restricted below 4.2 m to avoid interference with 60t EOT crane (which is at 14m Level)		
e)	Safe access for maintenance and removal of all mechanical and electrical parts must be ensured without any additional scaffolding.		
f)	All parts requiring replacement or inspection or lubrication shall be easily accessible without the need for dismantling of other equipment's or structures.		
g)	All electrical cables on trolley shall be so laid that they are not liable to be damaged and can be easily inspected and maintained.		
h)	Platforms	Full length chequered platform of width 750mm shall be provided for **both bridge girders** in order to access for LT drive and CT cable track for maintenance and with hand rails of height 1200mm.	
		Additional maintenance access platforms on four inside corners of the girder shall be provided between inside faces of girder for repair & maintenance inner LT wheel bearings & mountings of End carriage.	
i)	Hand rails along girder platform	Handrails of 1200mm height along with toe guard of 100mm height shall be provided along the length of the girder near to platform.	
j)	Hand rails for around trolley	Handrails of 1200mm height along with toe guard of 100mm height shall be provided on all the four sides of the trolley.	
k)	Maintenance of CT drives	Maintenance platform shall be provided for CT drives and shall be covered with chequered plate.	

l)	Top chequered plate of trolley	Chequered plate of 6mm shall be used all over trolley except for openings required for the ropes for bottom block etc., to pass. All the mechanical and electrical equipment shall be placed above trolley top only.	
m)	CT rail wear plate	Full length wearing plate of minimum 10mm should be provided under the trolley rails.	
n)	Rails	All bridge and trolley rails required to transmit vertical down and horizontal loads due to operation, and shall conform to the IS 3443. Hardness of rail shall be marginally lower than wheel hardness.	
o)	CT rail welding	CT Rails shall be made continuous by welding standard lengths. Welding shall be done as per standard procedure approved by Third Party Inspection Agency and Department.	
p)	CT &LT rail clamping	CT &LT LHS and FPS rails shall be clamped to the girders with double bolt clamping plates. The rail clamps shall be spaced not more than 450mm apart.	
q)	Rail stoppers /Wheel ramps	CT &LT Rails shall be prevented from creeping in the longitudinal direction by welded rail stops and Wheel ramps.	
r)	Jacking pads	Suitable jacking pads should be provided on end carriages and trolley for jacking up the LHS and FPS& trolley for changing track wheels & bearings.	
11.22.	**End Buffers**		
a)	Spring buffers are to be provided on four ends of the bridge and trolley.		
b)	Buffers shall be rigidly bolted in place preferably along the Centre line of LHS and FPS rail or trolley rail as the case may be, such that the bolts are not in direct shear.		
c)	Buffers shall be designed to absorb the kinetic energy released at 50% of the full load rated travelling speed, the average rate of deceleration not exceeding 5.0 m/s^2 at 50% of the rated travelling speed.		
d)	Metric Component Systems	All components including fasteners should be in metric system only	
e)	Locking of All fasteners	Bolts in rotating parts shall be locked with spring washers & lock nuts. All couplings & brake drums shall be provided with "Fit" type bolts.	
f)	NDT of Butt joints of girders	All butt joints shall be 100% radiographed or Ultrasonic tested for both compression and tension joints.	
g)	Toe guards	Toe guards shall be provided for all openings, on trolley and on bridge platforms with minimum height of 100mm.	
h)	Mounting of machinery on machined bases on trolley / LT	Parts of steel frames carrying machinery should be provided with doubling plates (including stiffeners) of adequate thickness welded and **machined to true surface or as per design cleared by dept.**	

i)	Welded snugs shall be fitted against the feet of all pedestals, gearboxes, brakes etc., except motors. Motors shall be provided with alignment screws for side alignment.		
11.23.	**Ladders**		
a)	Approach ladder shall be of Cage type. Ladder for approaching to LT platform shall be provided at one location suitably as directed and as instructed by Engineer-in-charge.		
b)	Approach ladders to be provided for reaching the trolley at two locations along the span of the girder.		
c)	Protection Guards for rotating equipment	**Guards:** All the moving parts couplings; shaft should be duly covered with guards as per safety norm. Proper guard / cover / tray to prevent falling of bolts from coupling etc should also be provided, wherever required. The covers shall be strong enough to take person weight ~ 100 kg.	
d)	Fasteners for pedestal blocks, motors, gear boxes etc., shall be easily removable from the top of platform. Studs or body bound bolts shall not be used as fasteners for mechanical items except for fixing covers.		
11.24.	**GANTRY GIRDERS**		
a)	Gantry girders have to be designed meeting the IS 800. The span between the columns and size of the column are indicative for the respective LHS and FPSs and final span with drawings will be provided during release of purchase order. However, party shall measure once again in the site before design / fabrication.		
b)	Deflection shall not be more than 1/1000 of span in mm, considering LHS and FPS handling safe working load (SWL :5t)		
c)	Gantry girders design has to be cleared by TPI and has to be submitted for departmental clearance. The department cleared construction shall be fabricated, supplied and erected.		
d)	Gantry girders shall be supplied along with MS bottom plates / side supports and necessary anchoring arrangement as per design and site conditions.		
12.	**ELECTRICAL DESIGN AND DETAILS**		
12.1.	Electrical equipment environment	All Electrical equipments shall be supplied for tropical and humid climate (Temperature of 50°C & RH not less than 95%). De-rating of drive motors, power cables etc., shall be done for ambient temperature of 50°C.	
		Flame proof electrical fittings and controls shall be selected, assembled and tested as per relevant Indian/ IEC standards.	
	The Electrical equipment shall conform to **IS3177** and also to the latest Indian electricity rules and regulations as regards safety requirements, earthing and other essential provisions specified therein.		
12.2.	Voltage		

a)	Power supply to panels	3 Ph, 4 Wire, 415 V AC ± 10%, 50 Hz ± 3%. (As per Indian standard)	
b)	Control Voltage inside the Electrical Panel:	1 Ph, 2 Wire, 110 V AC for all contactors, relay, indication lamps, etc. 1 Ph, 3 Wire, 230 V AC for all lights, power sockets, etc. 24 V, DC supply for Drive auxiliary supply.	
c)	Control Voltage in the Pendant push button, limit switches, indication lamps in pendant, etc:	8.9 V (Preferrable), Intrinsic safe module supply. Make: M/s P&F only.	
12.3.	**Electric Motor**		
a)	Should accept the input from VVVF drive, Inverter Duty, Class 'F' insulation limited to class 'B', 60% CDF, min of with 300 starts per hours, IP55, or as approved by department and suitable for hazardous area mentioned above.		
b)	Hoist motor shall have a provision to connect encoder in its shaft.		
c)	Rating of the CT and LT motors shall be of same and it shall be selected based on higher rating within CT and LT motors.		
d)	Terminal blocks of all motors	1. Preferably on top of the motor	
		2. Wherever it is on the side of the motor, a minimum clearance of 600 mm (without affecting hook approaches) to be maintained to approach for maintenance.	
e)	Thermistor	1. All the motors shall be housed with inbuilt THERMISTOR. (For CT and LT motors, TRIP Thermistor alone shall be provided)	
		2. Independent thermistor relay need to be used. The relay shall have a provision of NO / NC contacts and remote resetting.	
		3. Alarm (Only Hoist motor) and Trip (All motors) input to be wired separately as an input to VVVF control unit.	
		4. Protection like switch OFF / TRIP the motor in case of increase in surface temperature more than T4 classification.	
f)	Bearing	1. Type: 'ZZ' bearing.	
		2. Suitable lubrication provision to be provided.	
		3. Insulated bearing to be used in case of motor rating more than 55 kW.	
g)	Torque rating of Motors	1. Pull out torque of motors shall be not less than 2.75 times of full load torque.	
		2. Motor full load torque rating shall be minimum 120% of calculated torque with duty factors as per IS: 3177.	
h)	Speed rating of Motors	Shall be preferably 750 RPM.	

i)	Current drawn by the Motors	Maximum Current drawn by all motors (rating more than 2 hP) with SWL should not exceed 80 % of the full load rated current even at slower speeds.	
j)	Over load capability	150% of full load current for 2 minutes without damage or permanent deformation from zero to base speed.	
12.4.	**VVVF Drives**	The power (kW) rating of VVVF drive shall be one step higher than the selected motor electrical power (kW).	
a)	Hoist Drives for LHS	1. Shall be supplied with 2 Nos. (1 Working; 1 Standby).	
		2. Three positions-maintained selector switches shall be provided for the above selection.	
		3. The selected drive shall be indicated by means of indication lamp.	
		4. The selected drive input and output power isolation need to be interlocked with chosen drive input and output power.	
		5. It shall have a provision for communicating either via. PROFINET / Ethernet protocol.	
b)	Hoist Drives for FPS	1. Shall be supplied with 2 Nos. (1 Working; 1 Standby).	
		2. Three positions-maintained selector switches shall be provided for the above selection.	
		3. The selected drive shall be indicated by means of indication lamp.	
		4. The selected drive input and output power isolation need to be interlocked with chosen drive input and output power.	
		5. It shall have a provision for communicating either via. PROFINET / Ethernet protocol.	
c)	CT and Rotational Drives for LHS	1. Shall be supplied with 3 Nos. 1 No. (1 Working) for CT, 1 No. (1 Working) for Rotation and 1 No. for common standby (CT / Rotation)	
		2. Shall be supplied with 1 No. of common standby for both CT & Rotation Drive.	
		3. Common standby drive shall be selected by selector switch. Selected drive shall be indicated by means of indication lamp. It shall be wired as an DI to both CT and Rotation Working VVVF Drives also.	
		4. All the necessary interlock, inputs and outputs shall be wired in the respective control unit.	
		5. The selected drive input and output power isolation need to be interlocked with chosen drive input and output power.	
		6. It shall have a provision for communicating to the automation system via. PROFINET / Ethernet protocol.	
d)	LT Drives including Minor LT motion for FPS	1. Shall be supplied with 2 Nos. (1 Working; 1 Standby).	
		2. Three positions-maintained selector switches shall be provided for the above selection.	
		3. The selected drive shall be indicated by means of indication lamp.	

		4. The selected drive input and output power isolation need to be interlocked with chosen drive input and output power.	
		5. It shall have a provision for communicating to the automation system via. PROFINET / Ethernet protocol.	
e)	Drive Control Unit	**For M/s SIEMENS Drives (Substantial equivalent)**	
		1. Hoist Drive for LHS: CU250-2 (preferable) or latest model (except CU310) shall be supplied with 2 Nos. (1 for Main Drive; 1 for Standby Drive) - DI: Min. 10 Nos.; DO: Min. 8 Nos. per VVVF drive	
		2. Hoist Drive for FPS: CU250-2 (preferable) or latest model (except CU310) shall be supplied with 2 Nos. (1 for Main Drive; 1 for Standby Drive) - DI: Min. 10 Nos.; DO: Min. 8 Nos. per VVVF drive	
		3. CT and Rotation Drives for LHS: CU250-2 (preferable) or latest model (except CU310) shall be supplied with 3 Nos. (2 for working Drive; 1 for common standby Drive) - DI: Min. 10 Nos.; DO: Min. 8 Nos. per VVVF drive	
		4. LT Drives: CU250-2 (preferable) or latest model (except CU310) shall be supplied with 2 Nos. (1 for Main Drive; 1 for Standby Drive) - DI: Min. 10 Nos.; DO: Min. 8 Nos. per VVVF drive	
		For M/s ABB Drives (all drives can be same make) (Substantial equivalent)	
		1. Hoist Drive for LHS: ZCU with DTC suited for ACS880 (preferable) shall be supplied with 2 Nos. (1 for Main Drive; 1 for Standby Drive) - DI: Min. 10 Nos.; DO: Min. 8 Nos. per VVVF drive	
		2. Hoist Drive for FPS: ZCU with DTC suited for ACS880 (preferable) shall be supplied with 2 Nos. (1 for Main Drive; 1 for Standby Drive) - DI: Min. 10 Nos.; DO: Min. 8 Nos. per VVVF drive	
		3. CT and Rotation Drives for LHS: ZCU with DTC suited for ACS880 (preferable) shall be supplied with 3 Nos. (2 for working Drive; 1 for common Standby Drive) - DI: Min. 10 Nos.; DO: Min. 8 Nos. per VVVF drive	
		4. LT Drives: ZCU with DTC suited for ACS880 (preferable) shall be supplied with 2 Nos. (1 for Main Drive; 1 for Standby Drive) - DI: Min. 10 Nos.; DO: Min. 8 Nos. per VVVF drive	
f)	DI & DOs	10 % additional DI / DOs in control unit with respect to the used/assigned terminals for future usage. The same will be counted after completing the commissioning of the LHS and FPS at site. If not able to configure, suitable nos. of spare DI / DO modules need to be supplied as additional.	
g)	Operator Panel	**For M/s SIEMENS Drives(Substantial equivalent)**	
		1. Operator Panel with display: IOP shall be supplied with suitable CU250S-2 (to match with VVVF drive selection) with required mounting kit.	
		2. IOP shall be supplied along with Door mounting kit.	

		3. Provided with fault history read and logging facility.	
		4. It needs to be mounted on the panel door.	
		For M/s ABB Drives(Substantial equivalent)	
		1. Operator Panel with display: Intuitive Human Machine Interface (Assistant control panel) shall be supplied with suitable ZCU (to match with VVVF drive selection) with required mounting kit.	
		2. Provided with fault history read and logging facility.	
		3. It needs to be mounted on the panel door.	
h)	Drive Software	1. Suitable software need to be supplied along with drive.	
		2. Supplied software shall have a valid license for its operation and the same shall be accessible for entire program structure of the drive.	
		3. This software to be loaded on the programming device (supply of programming device is in the scope of supplier) with valid license as per specification: 19	
		4. Drive communication cable suitable for support either USB or RJ45 of the laptop need to be supplied. Qty: Equals to no. of VVVF Drives.	
i)	Make & Model of VVVF Drives	1. M/s SIEMENS: S-120 or latest suitable to selected control unit(Substantial equivalent)	
		2. M/s ABB: ACS 880 or latest suitable to selected control unit. (Substantial equivalent)	
j)	Location of Panel	Identified in the safe area in ground level or as decided by the department.	
12.5.	**Input and Output Choke**	Suitable input choke for controlling the harmonics and output choke for reducing dv/dt and terminal peak voltages at MOTOR.	
12.6.	**Dynamic Braking Resistor**	1. DBR of suitable capacity/rating shall be provided to all VVVF drives including standby VVVF Drives (in feed re-generative model shall not be selected).	
		2. For Hoist motions DBRs shall be sized for a minimum of 150% of motor full load torque and it shall not be less than the torque limit setting of the VFD in the hoisting direction.	
		3. Necessary forced cooling needs to be planned. Controlling of the cooling fans needs to be linked with control supply ON as per the design requirement.	
12.7.	**Dynamic Braking Unit**	Suitable rated Dynamic Braking Unit (DBU) need to be provided for individual drives including standby VVVF drives.	
12.8.	**Encoder for MH Motors**	1. Flame proof hollow shaft incremental encoder - To be used to achieve vector control mode of operation for Hoist application with appropriate module in the VVVF Drive.	
		2. All Encoders signals shall be suitable for VVVF drive input.	
		3. Screened cable as per manufacturer (Encoder) recommendations shall be used for all encoders. Preferred make of Encoder Cable pl. refer clause 27.	
		4. Encoder shall have a terminal strip termination for connecting the cables.	

12.9.	**Absolute Encoder for Hoist & CT of LHS & FPS, LT, Rotation of LHS system**	1. Flame proof hollow shaft absolute encoder - To be used to indicate and control the position of the system.	
		2. All Encoders signals shall be suitable for PLC input.	
		3. Screened cable as per manufacturer (Encoder) recommendations shall be used for all encoders. Preferred make of Encoder Cable pl. refer clause 27	
		4. Encoder shall have a terminal strip termination for connecting the cables	
12.10.	**Brakes Control**	1. All the brakes shall be supplied with OPEN and CLOSE limit switches.	
		2. These status to be wired using Intrinsic Safe relay. The same to be located inside the VVVF Panel.	
		3. The same shall be wired individually up to panel to enable for the interlocks. Nowhere it shall be combined till intrinsic safe isolator at panel.	
		4. All the brakes need to be powered with suitable rated Motor Protection Circuit Breaker (MPCB)	
12.11.	**Scheme to be followed for powering the Brakes**		
a)	All Brakes	1. Logic for operation:	
		a. Opening: Monitoring min. of 20% of current built in the motor, Brake MPCB not in trip condition, all Brake contactors not in energized condition and all the Brakes are in closed condition till given a command from VVVF Drive.	
		b. Closing: Monitoring min. of 0% speed of the motor.	
		2. No. of power contactor: 2 Nos. per brake (only for Hoist Motion Motor)	
		3. Controlling of power contactor:	
		a. One no. of digital output per contactor from the control unit.	
		b. One no. of intrinsic safe relay per contactor with proper interposing relay.	
		4. All the brake contactor status needs to be monitored.	
		5. In case of any one power contactor got welded / fused, the system has to operate with flashing indication.	
		6. If both the power contactors got welded/fused, main (line) contactor need to be switched OFF.	
		7. Similarly, all the Brake MPCB trip status needs to be wired as one digital input to control unit for logic evaluation.	
12.12.	**Limit Switches**	1. Gravity Limit switch: Should control the Entire power supply of the LHS and FPS. (Qty: 2 Nos. 1 No. Each for LHS and FPS Hoist)	
		2. Rotary Limit switch: Should control the Hoist motion independently for the LHS and FPS. It shall have a 4 NC points. (Qty: 2 Nos. 1 No. Each for LHS and FPS Hoist)) 2 NC for Hoist and 2 NC for Down. 1 NC shall be act as pre-limit and 1 NC for the final limit. (Both LHS and FPS)	

		3. 2-Way Lever Limit switch: Should control the Cross Travel of the LHS and FPS. (Qty: 4 Nos. – 2 Nos. for each CT)	
		4. 2-Way Lever Limit switch: Should control the Long Travel of the LHS and FPS. (Qty: 4 Nos. – 2 Nos. for each LT)	
		5. Individual limit status need to be wired individually and it shall not be looped in series till intrinsic safe isolator point at panel.	
12.13.	**Junction Boxes**		
a)	Flame Proof Junction Boxes	1. FLP junction boxes need to be planned for inter facing of all the equipment which are powered **not through intrinsic safe** supply (i.e., > 8.9 V)	
		2. All the terminal inside this box shall have a provision for connecting ring type lugs only.	
		3. The probable locations of the JBs are	
		a. LHS LT Girder.	
		b. LHS Platform.	
		c. LHS and FPS Trolley / platform.	
		4. Preferred make of FLP JB pl. refer clause 27.	
b)	Non-Flame Proof Junction Boxes	1. Non-FLP junction boxes need to be planned for inter facing of all the equipment which are powered **through intrinsic safe** supply (i.e., pendant control, limit switches, etc)	
		2. The probable locations of the JBs are	
		a. LHS LT Girder.	
		b. LHS Platform.	
		c. LHS and FPS Trolley / platform.	
		3. Preferred make of FLP JB pl. refer clause 27.	
12.14.	**Power Socket**	1. On the LHS and FPS: Each side of the LT platform 1 No. of 1 phase, 230 Volts AC FLP switch cum socket with plug top with necessary isolating switch / MCB inside the panel.	
		2. Inside the Panel: 1 No. of 230 V AC power sockets with ON / OFF switch for all the panels.	
12.15.	**Light Fittings & Bell**	1. On the LHS and FPS:	
		a. Under slung FLP, 150 Watts LED light fitting need to be planned. Qty: 4 Nos.	
		b. FLP bell need to be planned. Qty: 1 No.	
		2. Preferred make of FLP JB pl. refer clause 27.	
12.16.	**Pendant**	Push button station supported by the movabletrolley to be considered	
		One number of Push button station shall beprovided which are mounted on of movable typetrolleys, and should have connecting socket (1 No.as indicated in the drawing) - of required no. ofpins with control cable of flexible type of	

		lengthmin. 20m. Trolley wheels shall be of adequate sizeof reputed make : M/s.Rexello	
		The respective connection / plugin terminals withrequired cabling / plugin junction box, accessoriesfor the above portable pendent control station shallbe provided on the wall for satisfactory operation as indicated indetailed specifications as required & complete / asdirected by department.	
		Push Button Station (PBS):	
		1. Shall be provided with Key way switch Lockable at OFF, Mush room head Emergency OFF.	
		2. Push button for control On and Off	
		3. Control ON/OFF indication lamp powered through Intrinsic Safe circuit.	
		4. Shall be provided with push buttons for controlling main and creep of all motions.	
		5. i.e., Hoist for LHS and FPS: UP/down; CT for LHS and FPS: right/left; LT for LHS: forward/reverse, Rotation for LHS: CW / CCW	
		6. Push button for Bell	
		7. All the push buttons materials shall be of stainless steel.	
		8. All the push button commands to be routed through 1NO 3 NC auxiliary contactor.	
		9. Shall also provide with 2-way Switch for Under Bridge Lights.	
		10. Minimum 30 % Spare Core shall be provided in PBS with respect to the used cores.	
		11. All push buttons are to be powered through intrinsic safe module only apart from other control elements like limit switch, etc.,	
		12. Enclosure for the pendant shall be Stainless-steel.	
		13. Plug in type – Suitable plug in box along with socket to be provided in all the above-mentioned location.	
		14. Pendent control cable securing provision shall be planned i.e, cable drum is to be provided with winding and re-winding the control cable and plug.	
		15. The pendant control cables are to be routed properly in suitable cable trays along the building structure.	
12.17.	**Cables**	All the necessary cables to be supplied & need tobe laid and end-terminated as per the site requirement.	
		The following cables need to be supplied:	
a)	Encoder Cable	1. All the Encoder cables shall be minimum of 8 cores only.	
		2. The cable shall be of screened cables and it should have the provision of connecting the shield to earth.	
		3. There is 'NO' joint of cable is allowed between the panel end to the encoder end. Hence, cable shall be of flexible cable only.	

		4. Qty of cable with full length: 2 Nos. To be connected to both the signals of the proposed encoder till panel and end equipment.	
		5. Preferred make of Encoder Cable pl. refer clause 27.	
b)	Power Cables	The following area cables need to be supplied:	
		1. All the power cables shall be of 4 core only.	
		2. Minimum size shall be of 4 sq.mm.	
		3. The cable running between panel to field equipment, other than the cable running in Drag Chain are of 1.1 kV Grade, XLPE insulated, copper conductor, G.I. armoured cables only.	
		4. From power supply source at SLC Complex to Protective Panel Incomer. Refer Drawings	
		5. From Protective panel to all the other panels, field equipments like motor, brakes, lights, bell, etc.	
		Power cables towards the motors are to be selected as follows:	
		1. Selected / approved motor electrical kW and rated current to be selected for the voltage drop calculation.	
		2. Maximum 3% of Voltage drop only will be accepted in the selected cables.	
		3. Incomer cables rating to be considered for maximum of three different motions along with EOT LHS and FPS lights and other transformers loads.	
c)	Control Cables	The following area cables need to be supplied:	
		1. All the control cables shall be minimum of 12 core which are running between junction box to junction box and panel.	
		2. The cable running between panel to field equipment, other than the cable running in Drag Chain are of 1.1 kV Grade, XLPE insulated, copper conductor, G.I. armoured cables only.	
		3. From Protective panel to all the other panels, field equipment like brake limit switches, various limit switches, pendant, etc.	
		4. Out of used cores, 30% of core shall be kept as spare with respect to each size of the cables from panel to junction boxes.	
d)	Cable Identification	1. Cable tags indicating the source and destination to be provided for all the cables.	
		2. The ferrules shall be of ring type and of non-deteriorating material.	
e)	Inside the panel	The following cable management to the planned:	
		1. Power circuit – Minimum size: 4 Sq.mm	
		2. Control circuit – Minimum size: 2.5 Sq.mm	
		3. Signal wire (for Control Unit and Encoder module) - Maximum size: 0.5 Sq.mm	
		4. Colour coding should be followed as:	

		a. 110 V AC Phase – Grey without sleeve.	
		b. 240 V AC Phase – Grey with RED sleeve.	
		c. 110 V &240 V AC Neutral– Grey with BLACK sleeve.	
		d. 415 V AC – Black with RED, YELLOW, BLUE and / BLACK.	
		e. 24 V DC Positive– Red.	
		f. 24 V DC Negative– Blue.	
		g. 8.9 V DC – Orange.	
		h. Signal cable – As per the standard of LAPP/IGUS cable.	
		i. Earth cable – Green & Yellow.	
		5. All the limit switch terminals (Hoist, CT, LT Rotation of LHS, Hoist, CT and LT of FPS and all Brakes, etc) need to be wired up to the terminal block of the VVVF panel.	
		6. Interconnecting / looping of above terminals need to be carried out in the VVVF panel intrinsic safe module terminals only.	
		7. Interconnecting of above terminals in the equipment's and bringing the common terminals to the VVVF panel is not acceptable.	
f)	Earthing	The following area cables/strips need to be supplied:	
		1. Earth strip (min. 25 x 6 mm) need to be supplied.	
		2. LT Rail at both the sides of the LHS and FPS needs to be earthed.	
		3. All the equipment including the mechanical structure needs to be grounded effectively with double earthing.	
		4. Suitable bridge clamp need to be positioned on the LHS and FPS for tapping of earth points.	
		5. Panel shall be provided with earthing provision at both the ends. Same shall be connected with plant earth by the LHS and FPS contractor.	
g)	Drag Chain	1. Drag chain need to be planned for LT ,CT, Rotation and Hoist motions	
		2. Necessary supports (like beam / angles, guided cable tray, etc) for running the drag chain along the LT and CT motions need to be supplied.	
		3. Maintenance cage (LT) shall be provided for attending the drag chain maintenance.	
		4. All the cables running inside the drag chain are of same make as that of the drag chain.	
		5. All the signal cables are to be routed with the clearance of minimum 300 to 400 mm from the proposed and existing power cables.	
		6. Preferred make of Drag Chain pl. refer clause 27.	
12.18.	**MCCB**	1. Protective Panel - MCCB with adjustable overload, adjustable short circuit protection, adjustable ground fault and Instantaneous protection to be provided.	

		2. Protective Panel - MCCB handle (door operated) shall have an illumination kit for indicating ON / OFF / TRIP	
		3. Suitable rated Incomer MCCB switch (FLP) equal to protective panel to be supplied and positioned in the exposure hall. Power cable termination to be completed in all aspects as directed by department.	
12.19.	**MCB**	1. Voltage input to the Multifunction meter shall be routed through 4-pole MCB	
		2. Individual components control shall be planned by a dedicated MCB control.	
		3. All the MCBs (wherever used for controlling the motion) shall have the provision for ON, OFF and Alarm contact provisions. The same shall be wired for the control logics (to meet the logical operation).	
12.20.	**Switch Dis-connector Fuse (SDF) unit**	1. All motion Panel - Switch Dis-connector Fuse unit shall be provided.	
		2. All SDF to be provided with semi-conductor fuse with fuse indication cum monitoring device.	
		3. All SDF to be provided with auxiliary switch to ensure the ON / OFF status of SDF Unit. Same to be wired up to drive input to enable the drive for operation.	
		4. All the semi-conductor fusing indication to be wired as the drive input in series with the above point to enable the drive for operation.	
		5. All the isolating switches are not to be provided on the door.	
		6. All the isolating switches (either MCCB / SDF) are to be located uniformly in the height of from FFL.	
12.21.	**Fuses**	Hoist, CT, LT and Rotation of LHS and Hoist, CT and LT of FPS power supply to VVVF drives to be routed through Semiconductor fast acting Fuses or as per the Drive manufacturer's recommendation of adequate rating. Fuses shall have an indicator for fusing by providing Fuse Monitoring MPCB.	
12.22.	**Cable Tray**	1. Perforated G.I. cable trays need to be planned for routing the cables from the panel to top of the LHS and FPS.	
		2. Necessary supports (like beam / angles, etc) for running the cable tray inside the trench (bottom of the panel), on the wall, structure, on the LHS and FPS, etc need to be supplied.	
		3. Entire length of the cable trays need to be covered with G.I. sheet cover with bolts and nuts and all bolts and nuts shall be of G.I coated.	
		4. No cables are routed without cable trays and cover anywhere from panel room to top of the LHS and FPS.	
		5. The cable trays are also to be earthed with respect to the common ground.	
		6. Aluminium strip shall not be used for earthing the cable tray. Only G.I strip alone shall be used.	
		7. All the signal cables are to be routed with the clearance of minimum 300 to 400 mm from the proposed and existing power cables.	

		8. The separate cable tray shall be arranged for LINAC machine cables from control room to X-ray head (LHS). In addition to LHS and FPS cables.	
12.23.	**Motor Protection Circuit Breaker (MPCB)**	1. Rating shall be selected as per the type-2 co-ordination chart with respect to fuse-less feeder.	
		2. All the brakes need to be powered with suitable rated motor protection circuit breaker.	
		3. To be provided for each motor where the output of single VVVF drive is driving two or more nos. of motors.	
		4. Trip status to be wired as one no. of Digital Input to control unit to create logic as per the user requirement.	
		5. ON/OFF status also to be wired as one no. of Digital Input to control unit to create logic as per the user requirement.	
		6. More than 1 motor including Brake shall not be powered through single MPCB.	
12.24.	**Contactor**		
a)	Auxiliary Contactor	1. Shall be used as intermediate contactors to the power contactors.	
		2. All the field interlocks need to be wired to the auxiliary contactor level.	
		3. Suitable surge suppressor need to be supplied along with auxiliary contactor.	
		4. It shall be utilized for contact multiplication instead of add-on NO, NC contacts for power and auxiliary contactor.	
b)	Power Contactors	1. Duty: AC-3	
		2. The contactors shall be able to withstand their rated current for one second without welding / fusing of the contacts	
		3. Individual Power Contactors are to be provided for each motion for controlling.	
		4. All the power contactors need to be powered viz. auxiliary or interposing contactors / relays with suitable rating along with surge suppressor.	
		5. Any multiplication of NO, NC points – auxiliary contactor need to utilize.	
		6. NO add-on blocks will be allowed for power contactors.	
		7. Suitable power isolation (both input and output side) using this power contactors need to be planned for the selection of spare / standby drives as applicable.	
12.25.	**Intrinsic Safe Relay**	Input Relay:	
		1. All the field signals like pendant push button, limit switches (motion & status) to be wired to this relay.	
		2. This relay shall be located in safe area (inside the panel) only. Make: M/s P&F	
		3. All this relay shall be selected to suitable for operating with 110V AC supply.	
		Output Relay:	
		1. These relay shall be used for powering indication lamps in the hazardous location.	

		2. This relay shall be located in safe area (inside the panel) only.Make: M/s P&F	
		3. All this relay shall be selected to suitable for operating with 110V AC supply.	
		Interlock:	
		1. All the output commands from VVVF Drive control unit shall be directly given as the input of this relay.	
		2. All the interlock wiring (If required) as per the logic need to be carried out in this relay itself.	
		3. No relay board shall be used for creating any interlock inside the panel.	
		Make: P&F only (both input and output relays)	
12.26.	**Panel**		
a)	Individual panels shall be designed for effective utilization of inbuilt ventilation system. Preferred make of panel pl. refer clause 27.		
b)	Protective panel shall be provided with mushroom head emergency switch to disable power supply during maintenance		
c)	Painting	1. Paint shade – RAL 7032 / 7035.	
		2. Base frame – Matt black.	
		3. Mounting plate – Orange.	
d)	Indication Lamps	1. It shall be of cluster LED provided with translucent lamp covers	
		2. Cluster LED module shall be suitable for direct operation on 230 V / 110 V, 50 Hz AC or 24 V DC.	
		3. Panel shall have the 3-phase indication lamps in the metering cubicle controlled by 3-pole MCB.	
e)	Design & Construction	1. Enclosure – Indoor, Floor mounting, Front operated free standing	
		2. Frame, Mounting plates, Doors & Covers – 2.0 mm Thickness CRCA	
		3. Lifting arrangements - Suitable Lifting Arrangement shall be provided for each panel on the Top on all four sides	
		4. Base frame – ISMC 100 x 50 with Matt black	
		5. Glass door – shall be provided in the overall control panel (where control unit, communicating systems, IS barriers, aux. contactors, etc is arranged)	
		6. Degree of protection – IP 42.	
		7. Shrouding – As per standard (to be provided inside the panel, in front of power components and power terminals).	
		8. Cable entry (power and control) – bottom	
		9. The panels to be provided with inbuilt ventilation system.	
		10. The panels need to be provided with panel lamps (LED) along with door limit switches.	

f)	Name Plate (Panel and components)	1. Material – Transparent acrylic.	
		2. Colour of letter – white letter in black background.	
g)	Earth busbar	1. Size – Minimum 30 X 10mm Copper with nuts, bolts & washers at each end is to be provided per panel	
		2. Necessary earth strip need to be supplied for the following	
		a. To link panel to rail at the gantry girder.	
		b. To link rail and all the electrical elements on the EOT LHS and FPS.	
		c. To link the panel to the earth strip.	
h)	SMPS	1. 24 V DC power supply to be provided - 4 Nos. (2 Nos. inside the panel & 2 Nos. as spare)	
		2. Shall be used as common supply to all the motion including protective panel.	
		3. ORing diode needs to be supplied.	
		4. The DC power supply failure shall be noticed via. Digital inputs.	
		5. If either the SMPS or ORing diode fails a 24 V DC missing indication lamp need to be provided.	
		6. Qty: 4 Nos.	
i)	Multifunction meter	1. Panel shall be provided with Multifunction meter	
		2. Along with Add-on DI / DO modules – 1 No.	
		3. Communication: As applicable modules	
		4. Make: M/s SIEMENS; Model: PAC 4200(Substantial equivalent)	
j)	Terminal blocks	1. Terminal blocks shall be of 750 Volts grade of the stud type and shrouded.	
		2. Insulating barriers shall be provided between adjacent terminals.	
		3. All the terminal blocks are grouped with respect to the following:	
		a. 24 V Power distribution (separately for positive and negative).	
		b. 110 V Power distribution (separately for phase and neutral).	
		c. 230 V Power distribution (separately for phase and neutral).	
		d. 415 V Power distribution if any	
		e. Motor and brake power distribution	
		4. Short linked Terminal blocks are to be used for terminal multiplication. More than one wires need to be avoided in one terminal block.	
		5. VVVF Drive Control unit wires multiplication also shall be carrying out in a separate and identified terminal blocks only.	
		6. No wires multiplication is allowed inside the Drive control unit also.	

		7. All future interlocks to be provided with permanent shorting link	
		8. Interlocking between the panels is to be routed through respective panel terminal blocks only. Direct wiring between the components of two different panels to be avoided.	
		9. Power & Control circuit (used for field cables) – Ring type end termination of suitable size	
		10. All the terminals needs to be provided with group markers	
		11. 25% Spare Terminals Shall be provided for both Power and Control in each Panel	
		12. Make: Connectwell / Wago / Elmex	
k)	Panel Space Heater	1. Panel Space heater is to be mounted in such a way that, Power & Control Cables must not run in close vicinity of it.	
		2. All the Panels shall be provided with space heaters to avoid moisture condensation.	
		3. Necessary thermostat need to be supplied along with the space heaters.	
		4. ON / OFF Control of space heaters shall be interlocked with main contactor. i.e., whenever main contactor is in OFF condition, power shall be available at space heater terminals.	
l)	Rubber mats	1. Rubber mats to be supplied and provided in-front of all the panels as per the designed length of panels including Transformer and DBR panels.	
		2. Class 'A', 3.3 kV ac (rms), 2.0mm ± 10% thickness as per IS 15652/2006	
		3. Width: 1 mtrs. (maximum)	
m)	Layout details	1. The bottom most row of equipment mounted inside the panel excepting terminal strip shall be at least 350mm above the panel bottom cover to facilitate inspection and repairs	
		2. Selector switches, indication lamps and operator panel needs to be provided on the panel door	
		3. Routing of Signal & Power/Control cables is to be done separately wherever possible	
		4. All Communication cables shall be routed through wire channel	
		5. Shield of all Signal Cables is to be properly clamped to Body of the Device/structure.	
12.27.	**To be considered during Detailed Engineering:**		
a)	Panel	1. All the panels are to be maintained the uniform height. Height of the panel shall be not less than 2000 mm excluding the base frame of 100 mm. Overall height of the panel not less than 2100 mm.	
		2. Width of all the panels is to be maintained uniformly. Door opening and rear access will be decided based on the requirement during detailed engineering.	
		3. All the panel line up to be taken care like a bureau opening type.	

		4. Enamel Danger plates shall be provided on the Panel inscribed in Hindi, Tamil and English languages as directed by department.	
		5. Drawing pocket needs to be considered.	
		6. Comfort handles with key to be considered.	
		7. The cable entry areas, a suitable cable gland shall be provided. This is applicable for junction boxes also.	
b)	Interlock Scheme	1. Auxiliary Contactor level:	
		a. Hard wired interlocks for the push button command are to be provided at auxiliary contactor.	
		b. When Aux. contactor operates with respect to the motion selected, remaining Aux. contactors with respect to other motions should not be operated. Aux. contactor shall be operated only when main power contactor is in ON condition.	
		2. In VVVF Drive Logic control:	
		a. It is to be programmed such a way only one motion has to be selected for operation at a time in the VVVF drive.	
c)	ON Interlock for Hoist motion	1. Selection of Drive	
		2. Rotary limit switches i.e hoist and lower, Gravity limit switch.	
		3. Thruster Brakes' MPCB condition.	
		4. Brake Close limit switch condition.	
		5. Encoder for motor.	
		6. Off status of de-stabilisation system	
		7. Provision shall be made for two extra interlocks for future usage.	
d)	ON Interlock for Cross Travel motion	1. Right and Left limit switches for respective motion of the drive.	
		2. Thruster Brakes' MPCB condition.	
		3. Brake Close limit switch condition.	
		4. Off status of de-stabilisation system	
		5. Provision shall be made for two extra interlocks for future usage.	
e)	ON Interlock for Long Travel motion	1. Forward / Reverse limit switches for respective motion of the drive.	
		2. Thruster Brakes' MPCB condition.	
		3. Brake Close limit switch condition.	
		4. Off status of de-stabilisation system	
		5. Provision shall be made for two extra interlocks for future usage.	
f)	ON interlock for Rotation motion	1. CW / ACW limit switches for respective motion of the drive.	

		2. Thruster Brakes' MPCB condition.	
		3. Brake Close limit switch condition.	
		4. Off status of de-stabilization system	
		5. Provision shall be made for two extra interlocks for future usage.	
13.	**CONTROLS**		
a)	Mode of operation: LHS shall be operated both in local and remote mode(through PLC). Local operation is through local pendant and remote operation is through PLC based SCADA system		
b)	SCADA system to be provided in control room.		
c)	All functions shall be controlled by pendant controls as described below.		
d)	Each pushbutton shall be operated with intrinsic safety barrier as follows: 1. "Power ON" red pilot light with intrinsically safe cluster LED 2. "Stop" red mushroom pushbutton, which will de-energize the main power 3. "Start" which will energize the main power 4. "Safety Key" for On/ Off 5. Reset button 6. Intrinsically safe display unit for monitoring all the critical parameters in pendant 7. "LHS Hoist Up" – Main & Creep 8. "LHS Hoist Down" – Main & Creep 9. "LHS LTFWD" – Main & Creep 10. "LHS LTREV" – Main & Creep 11. "LHS CTFWD" – Main & Creep 12. "LHS CTREV" – Main & Creep 13. "LHS Rotate CW" – Main & Creep 14. "LHS Rotate CCW" – Main & Creep 15. "FPS Hoist Up" – Main & Creep 16. "FPS Hoist Down" – Main & Creep 17. "FPS CT FWD" – Main & Creep 18. "FPS CT REV" – Main & Creep 19. "FPS Minor LT FWD" (Separate motion) – Main & Creep 20. "FPS Minor LT REV" – Main & Creep 21. "Sound Horn" 22. "LINAC LaserOn/Off" selector switch 23. Crane light On /Off selector switch 24. Local / remote selection with selector switch 25. LHS Stabilization 26. LHS Destabilization (Please refer Section)		
e)	Provision shall be incorporated to avoid simultaneous operation of HOIST UP and DOWN motions • Pendant level interlocking • Auxiliary contactor level interlocking • Drive logic level interlocking		
14.	**Cable Management System**		
a)	For arriving at cable management system, following details of LINAC cables including water cooling hoses etc may be considered. The dimension of hoses/cables, Ø 150mm(2Nos.) Ø15mm (8Nos.), Ø 25-30mm (7Nos.). The		

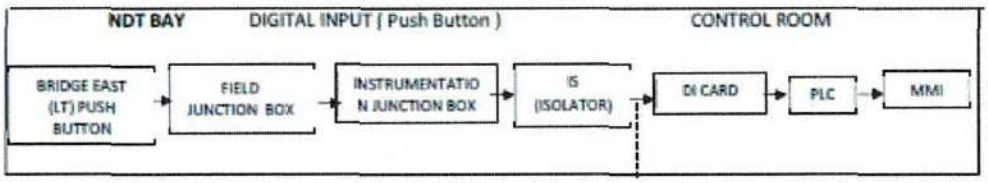
	minimum bending radius for LINAC cable is 305mm and water hoses is 255mm	
b)	Following shall be noted by the contractor, • All LINAC cables/hoses will be provided by Department at the time of LINAC interface with LHS at Department site. • All LHS and FPS cables shall be in the scope of supplier.	
15.	**SPECIFICATION OF CONTROL SYSTEMS (PLC)**	
a)	CPU- The PLC shall be latest model with micro memory card of minimum capacity 8GB	
b)	I/O cards - Minimum 20% Extra spare channels should be available Software	
c)	Latest software with license to be supplied with a programming device as per Clause 19. This device shall have a provision to access all the VVVF Drive and PLC through suitable communication.	
d)	Full time licensed software shall be provided for PLC and SCADA. The original license / key to be handed over to department PLC drive control unit power shall be drawn from UPS and wiring shall be made from PLC panel room to UPS room by the Contractor	
15.2.	**PLC Programming**	
a)	Programming shall be carried out by the contractor by incorporating necessary interlocks as required by Department.	
b)	Software- Licensed SCADA software with latest version with 2048 tags.	
c)	PC - 32" Desk top PC type console with i7 processor,8GB RAM,1TB HDD, with embedded cards/external adopter for connecting to PLC.	
d)	SCADA/MMI screen and programming shall be developed and supplied by party	
15.3.	**Digital Input Isolator: (with 1-input, 2- output)**	
	Brief Specification • 1-channel isolated barrier • 24 V DC supply (Power Rail) • Dry contact or NAMUR inputs • Usable as signal splitter (1 input and 2 outputs) • Relay contact output • Fault relay contact output • Line fault detection (LFD) • Reversible mode of operation • Up to SIL 2 acc. To IEC 61508/IEC 61511 Signal type - Digital Input Safety Integrity Level (SIL) - SIL 2 Rated voltage - 19 to 30 V DC Ripple - ≤ 10 % Rated current - ≤ 45 mA Power dissipation - ≤ 0.9 W Rated values - acc. To EN 60947-5-6 (NAMUR) Switching point/switching hysteresis - 1.2 ... 2.1 mA / 36pprox.. 0.2 mA Line fault detection breakage – I ≤ 0.1 mA , short-circuit I > 6 mA Connection Output I: -signal; relay Output II: signal or fault message ; relay Minimum switch current - 2 mA / 24 V DC Mechanical life - 107 switching cycles Switching frequency - ≤ 10 Hz Galvanic isolation - according to IEC/EN 61010-1, rated insulation voltage 300 Veff Display elements - LEDs Control elements - DIP switch	

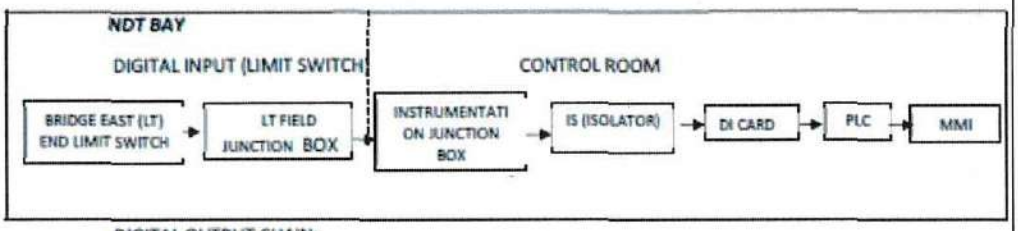
	Ambient temperature -20 to 70 °C	
15.4.	**Digital output Isolator**	
	Brief Specification • 1-channel isolated barrier • 24 V DC supply (loop powered) • Current limit 45 mA at 10 V DC • Up to SIL 3 acc. To IEC/EN 61508 Signal type - Digital Output Rated voltage - loop powered Input Connection side - control side Rated voltage- 20 to 35 V DC Current- 72 mA at 20 V input voltage, load = 220 Ω 50 mA at 35 V input voltage, load = 220 Ω Output Connection Side - field side Connection - terminals 1+, 2- Internal resistor - max. 282 Ω Current - ≤ 45 mA Voltage - ≥ 10 V Open loop voltage – min. 22.7 V Output rated operating current - 45 mA Display elements - LED Degree of protection - IP20 Examination certificate - BASEEFA 06 ATEX 0252 Maximum safe voltage - 250 V Galvanic isolation - safe electrical isolation acc. To IEC/EN 60079-11, voltage peak value 375 V IECEx certificate - IECEx BAS 06.0058 IECEx CML 19.0093X	
16.	**INSTRUMENTATION & CONTROL SYSTEMS**	
16.1.	**PENDANT PUSH BUTTONS / INDICATION LAMPS COMMON TO ALL SUB-SYSTEMS OF LHS &FPS (CT, LT, Hoist, Yoke and Rotate) controlled through PLC**	
a)	Pendant power ON, OFF and system emergency push buttons – 03 potential free contacts	
b)	Feedback from main contactor – 01 Potential free contact	
c)	Pendant power ON status – Indication lamp (Intrinsic safe output for status)	
d)	Selector switch for local / remote selection – 02 potential free contacts	
e)	Pendant Reset button - 1 number Digital Input	
f)	For Pendant display, preferably x-ray radiation hardened or suitable shielding shall be provided	
16.2.	**Incremental Encoder**	
a)	The encoder for dynamic performance provided in motor shaft shall be incremental type and it shall be flame proof	
b)	Details of Incremental Encoder: (a) Encoder type: Incremental (b) Resolution: 1024 PPR or higher (c) Hazardous area requirement: zone I, IIA IIB, T4. (Ex d only)	
16.3.	**Absolute Encoder**	
	Brief Specification • Up to 30 Bit multiturn • ATEX approval	

	• IECEx approval • Flameproof enclosure • Removable connection cap Detection type - Photoelectric sampling Device type - Multi-turn absolute encoder Operating voltage - 10 to 30 V DC No-load supply current - max. 230 mA at 10 V DC max. 100 mA at 24 V DC Time delay before availability - < 1000 ms Linearity - ± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit Output code - Binary code Code course (counting direction) Programmable, CW ascending (clockwise rotation, code course ascending) CW descending (clockwise rotation, code course descending) Interface type - PROFIBUS Resolution - Single turn: up to 16 Bit Multi-turn: up to 14 Bit Overall resolution: - up to 30 Bit Transfer rate - 0.0096 ... 12 MBit/s Standard conformity - PNO profile 3.062, RS-485 Degree of protection - DIN EN 60529, IP66 Operating temperature - -40 to 70 °C Examination certificate - ITS 15 ATEX 18372X; IECEx ITS 15.0061X
17.	**LT and CT SYSTEM**
	The following configuration is for each system
a)	It shall have push buttons for forward & reverse (Push button: 4 numbers including main and creep operations- Digital Input)
b)	It shall have provision to monitor the system linear position with 2 Nos. (each one for CT and LT) Ex-proof absolute encoder
c)	Absolute encoders (2 Nos.) with intrinsic safe PROFINET / Ethernet / PROFIBUS Communication shall be mounted on suitable location to facilitate positional display
d)	Since the area of operation (NDT hall) is hazardous (Zone 1, gas group IIA, IIB, T4 class), all push buttons, LED lamps, etc. shall be intrinsically safe, Encoders (flame proof) with relevant standards and certificates
e)	Appropriate number of junction boxes (Flame proof type) with terminal blocks for control cables shall be provided
f)	All controls / push buttons/ signals shall be powered through intrinsic safe circuits with IS isolators
g)	IS isolator with one input/ two outputs shall be provided for all intrinsic safe circuits
h)	Supplier shall provide flame proof junction box for encoders and related control cables
i)	Suitable Control cables for all motions interfacing with VFDs & PLC and analog cables for encoders shall be provided by the contractor
18.	**SIGNAL MEASUREMENT & COMMAND CHAIN**
18.1.	**Scope of Control unit** The control unit shall control the LHS and FPS as per the user input during

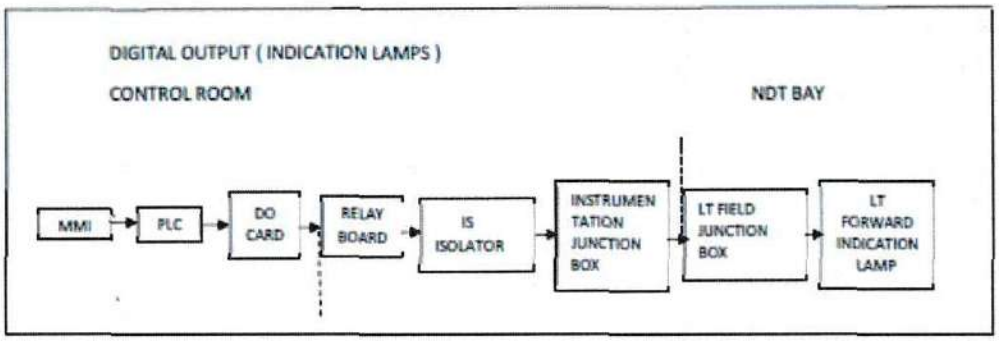
the operation. The conceptual operation for LT of LHS alone is given below.

LHS: (For Conceptual purpose, for LT alone)

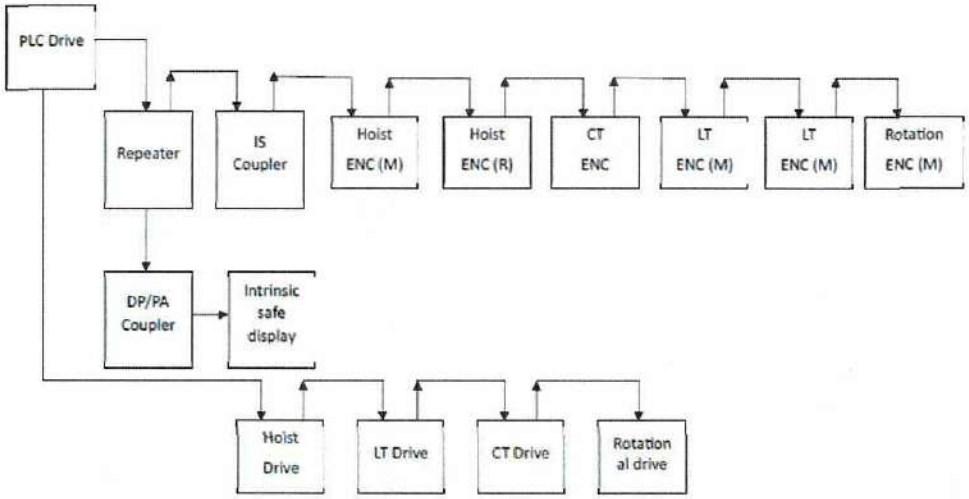




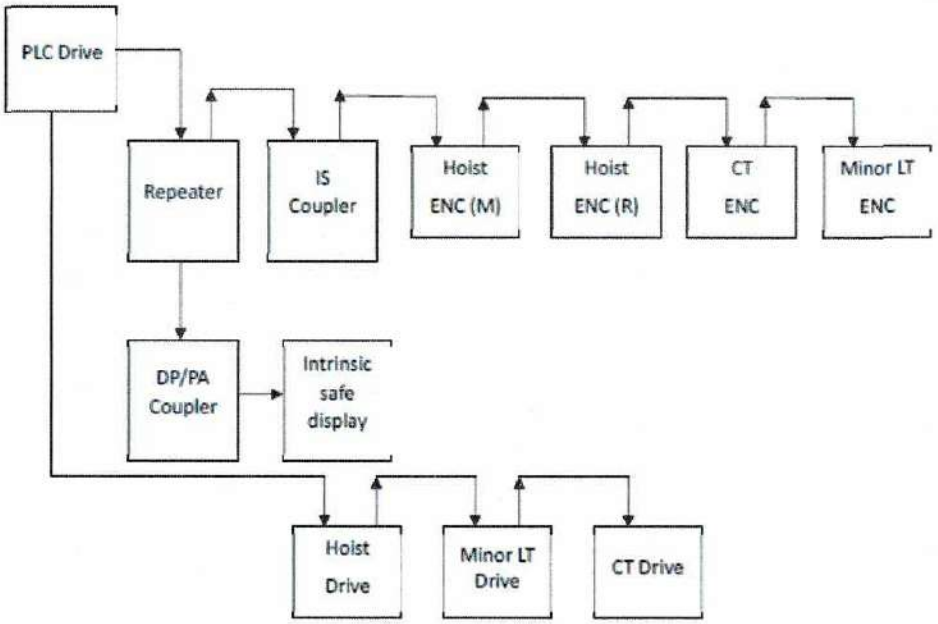
DIGITAL OUTPUT CHAIN:



18.2.	**PLC Configuration for LHS (It is referring PROFIBUS – make it suitable for PROFIBUS / PROFINET / Ethernet)**

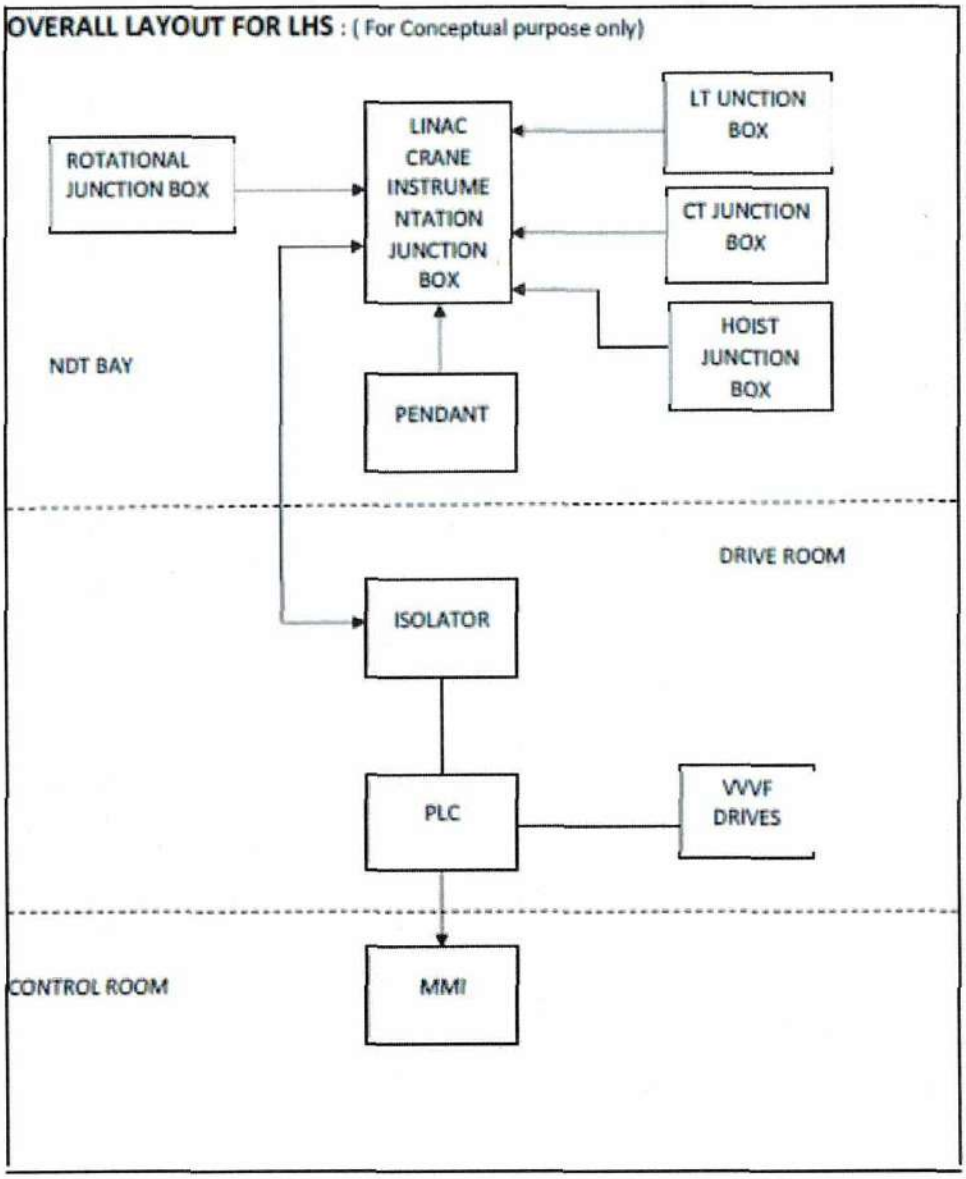


PLC Configuration for FPS

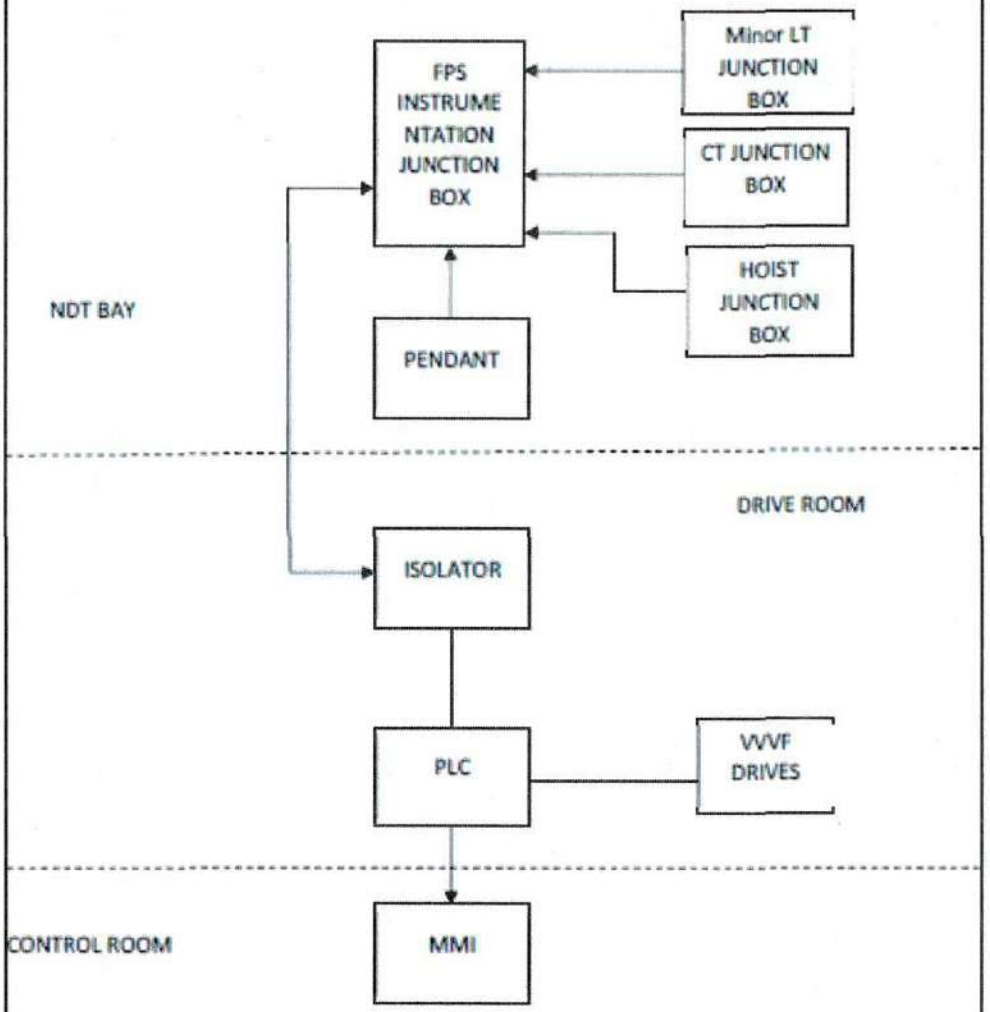


18.3.	**Overall Control System**	

OVERALL LAYOUT FOR LHS : (For Conceptual purpose only)



OVERALL LAYOUT FOR FPS : (For Conceptual purpose only)



19.	**Portable Programming device (Qty: one number)**		
19.1.	**Description**	**Essential Specification**	
19.2.	Specification	Make: Dell/Sony/HP, Processor: INTEL i7 processor or latest, Hard disk: 1TB (or above) Solid State Drive + 1TB HDD, Motherboard: INTEL original (Suitable for the configuration), DDR RAM (DDR4): 16GB, Graphics card: 2 GB, Network Cards: Ethernet card: 1 Nos. (100 Mbps / 1 Gpbs), With Standard USB Mouse with scroll & External DVD/CD Drive	
19.3.	Optical Drive	DVD RW (Multi Layer)	

19.4.	Operating System	Licensed version of Windows 11 (64 bit) ultimate or latest (Compatible with SCADA & PLC software versions).	
19.5.	Licensed Software to be supplied and loaded on system.	1. MS Visio Professional	
19.6.		2. MS Office Professional latest.	
19.7.		3. Latest version of Antivirus with 3 years validity	
19.8.	Monitor Screen	14" FHD, supported resolution 1920x1200 and above.	
20.	**PAINTING OF LHS AND FPS : Total painting thickness, DFT, shall be 200microns.***(DFT shall be measured at the time of final inspection)*		
20.1.	Surface Cleaning	The entire surface of fabricated materials, girders, frames, platforms, trolley, end carriage, wheels etc., are to be sand / grit / abrasive blasted to white metal finish (SA 2½ quality) and cleaned properly off rust, grease & dirt.	
20.2.	Painting with Epoxy Primer (Total thickness of 80 microns)	Two coat of epoxy primer (Apcodur CP 680 of M/s Asian Paints or equivalent) shall be applied to a Dry Film Thickness (DFT) of 80 microns.	
20.3.	Painting Epoxy Paint (Total thickness of 120 microns)	Two coats of epoxy paint of **Golden Yellow** color (Apcodur CF 693 of M/s Asian Paints or equivalent) shall be applied to a Dry Film Thickness (DFT) of 80 micron and 40 micron for first and second coats with **proper drying** in between coats. Final touching shall be done after erection & commissioning at site. Painting quality shall ensure aesthetic looking of LHS and FPS.	
20.4.	Total paint thickness including primer	Not less than 200 microns. This will be tested during stage inspections and final inspection at contractor works.	
20.5.	In addition, if any intermediate cleaning required between successive coats of paint are to be carried out as per the recommendation of paint manufacturers and as per the instruction of the Department.		
20.6.	Interior of all gear box housings shall be sand / grit / abrasive blasted and painted with two coats of oil resisting durable paint.		
21.	**INFORMATION/DOCUMENTS TO BE SUBMITTED ALONG WITH QUOTATION**		
21.1.	GA drawing showing full details of LHS and FPS, with dimensions, span, height of lift, end clearances, head room, overhead clearance, hook approach limits, weights, wheel loads, major components and general arrangement of Hoist Drive etc..		
22.	**DESIGN INPUTS**		
	GENERAL ARRANGEMENT OF LHS AND FPS: The mass of the dual energy LINAC Head (attached with an external Collimator) is the prime pay load for the handling system which will be around 5000kg. However, the interface/design and weight requirements shall be suitable to LINAC equipment. And another pay load is Detector will be around 5000Kg. Following components shall be designed by the Contractor and masses of all four items shall be considered for the design of LT Bridge /Girder system:		

	1. Yoke & its sub-systems 2. Hoist system components including Stabilization (for LHS alone) / Mast system / Linear guide, wire ropes and other machineries 3. Cross travel (CT) Trolley for LHS, FPS and connected components 4. The Contractor shall also consider for design of bridge girders system, the condition of both trolleys (LHS &FPS) being present side by side at the centre of the LT bridge without spatial separation. The LT drive system shall also be designed taking into account the masses of above two trolleys along with payloads. In the proposed facility, two overhead cranes, one at 9-meter elevation (LHS & FPS) and another at 13 m elevation (60T EOT) has been planned. In order to avoid simultaneous operation and collision of both cranes, a suitable interlock system shall be planned by the supplier. 5. **LINAC Stand/Table:** Contractor shall supply the MS stand/table for keeping the LINAC X-ray head for commissioning activities and future maintenance activities. The Stand must be withstanding 6.25 Ton weight of the X-ray head and dimension 2.7 X 1.25 (w) X 1 (h) m. 6. **LINAC X-ray Head Dummy Load :** The 5Ton weight of dummy load shall be supplied by contractor along with the system to qualify the LHS before interfacing the LINAC head with LHS. The dimension of the load shall be similar to M/S. VAREX make 9/ 15MeV LINAC X-ray head and compatible to interface with LHS. The interface requirements also shall be made by contractor and load test also shall be done by party at both locations (Party site as well as SLC site). The load shall have necessary handling brackets and good finishing shape includes painting. The dummy load shall be handed over to department after the load test at SLC site.. 7. **Steel Table for Testing the machine performance:** Supplier shall supply the MS Steel table for commissioning activities for keeping the SSD and MS plates. The table shall withstand load of 700Kgs weight and dimension may be 2.0mtrs x 1mtrs x 1.2 mtrs. (LxWxH). **8. Training:** Training of Department personnel (4 Persons) for PLC systems & programming, SCADA systems & Programming and VVVFD shall be provided. Alsothe purchaser's representatives shall be trained in the operation and maintenance of the LHS &FPS system including trouble shooting.	
b	**LT GIRDER SYSTEM (Same for LHS and FPS)** • The bridge of the LT system shall be of the top riding type/EOT with rotating axles. • The bridge wheels shall be of the double-flange type with rotating axles. • The wheels shall be finished in equal diameters and in pairs. • The wheel treads and flanges shall be flame hardened as per IS3177. The bridge shall run on LHS and FPS runway rails as indicated in the BOQ.	

	• The speed range for the bridge motion shall be from 0.3 to 3.0 m/min (or) as indicated in the BOQ and selectable through PLC/VFD. • LT span will be 25 meters (Hall length)	
c	**CROSS TRAVEL SYSTEM (Independent movement for LHS and FPS)** • The trolley for the cross-travel system shall be of the top riding type with rotating axles and shall run on CR rail on the bridge girders. • The Trolley wheels shall be of the double-flange type with rotating axles and wheels shall be finished in equal diameters and in pairs. • The speed range for the Trolley motion shall be from 0.3 to 3.0 m / min (or) as indicated in the BOQ and selectable through PLC/VFD. • CT span will be 20 meter (Hall width). Both trolley movement shall be maximum. However, between the trolley, minimum separation shall be maintained and interlock also shall be provided) • The interlock shall be incorporated, to enable anti-collision between LHS and FPSCT trolley	
d	**YOKE SYSTEM FOR LINAC HEAD** The design of yoke system shall take into account the total mass of the LINAC Head and the attached external collimator. The tilting and rotation sub-systems shall be part of the motorized yoke assembly. The specification parameters include the following: • The tilting speed shall be 180° per min manual mode of operation(The tilt angle shall be displayed in the manual system. • The rotation speed shall be 360° per min main and 36 deg./min micro with VVVFD. The rotation angle shall be displayed in the display module in pendant. • The angular positional accuracy of both Tilt and Rotation shall be ± 0.1° • The angular range of the tilting of LINAC head shall be as follows (Reference axis for angular measurement is y –axis in ZX-plane): ▪ Tilt up: 0° to 15° ▪ Tilt down: 0° to –15° • The tentative angular range of rotation of LINAC Head is as follows (Reference axis for angular measurement is Z-axis in XY plane): (Rotation about Hoist axis) ▪ Counter clockwise rotation (CCW)*: 0 to -45° ▪ Clockwise rotation (CW)*: 0 to 90° • Any change of range in the sense of rotation will be communicated to the contractor at the time of finalizing the configuration of LHS system and the same shall be implemented. • The design parameters from LINAC point of view will be submitted at the time of detailed design stage of the LHS. LINAC head size (l x b x h) = 2740 x 1250 x 1500mm approx. and weight:4800kg	

	• The design of Tilt shall consider a maximum unbalanced moment in any direction, details of which to be provided by the Department • Analog graduated scales for tilt and rotation shall be prepared and attached at appropriate location. • The brakes (flame-proof thruster brake) of Rotation motors shall have a torque rating of 150% of the full motor torque. There shall also be provision for manual release of brakes. • The suitable parking legs shall be provided for yoke system for parking the LINAC x-ray head.	
e	**HOIST SYSTEM (LHS)** • The hoist system for LINAC Head shall be integrated with the Yoke assembly which shall have Tilt (manually operated) and Rotation arrangement. • The hoist system shall have a true vertical lift with sufficient lifting design margin of safety and an equalizer bar. All wire ropes shall be as per this document with actual breaking strength certifications. • The equalizer bar shall have a load cell system (Intrinsic safe type) and it is preferred to have provision to stop hoisting motion if the system is overloaded. It shall be connected to PLC. It is preferable to have the over load indication identified by load cell in the control console. • The speed range for the hoist shall be of300 and 3000 mm / min., selectable through PLC/ VFD. • The positional accuracy of Hoist system shall be within ± 5 mm at 100 mm/min. The stroke of LINAC hook point shall be minimum of 7500 mm (±200mm). • The lowest point of the LINAC target shall be 650 mm (±50mm) from finished floor level (FFL) • It is desirable to rest the LINAC head on the floor when not in use. Accordingly, suitable arrangement shall be provided to the trunion frame, yoke. When trunion bottom frame attaining the bottom stroke height of 500mm from FFL during hoisting down, the speed shall automatically reduce to micro speed. • There shall be a display read out (DRO) of the same on the control console. • The hoist system shall have an upper limit switch mechanically actuated by the load block. • VVVF Drives (Non FLP) panels shall be located Drive Panel Room as indicated in the Department Drawings. • Appropriate number of junction boxes for power cables shall be provided. • Encoder for positional information shall be of absolute encoder with FLAME Proof having PROFINET / PROFIBUS / Ethernet / latest communication.	

f	**Hoist System for FPS (Film Positioning System)** • The system shall be provided with suitable hoist mechanism (telescopic preferably) to manipulate the FPS for the stoke of 7500mm • Positional accuracy: ± 5mm creep speed • It shall be provided with suitable limit switches for safe operation as per user inputs. • The movement speed shall be 300mm / min for micro and 3000mm / min for main speed with ±5mm in micro speed. • Considering the future scope of Digitization, the SWL is fixed for Hoist system. Presently, the supplier shall fabricate and interface the detector frame (cassette Holder) as per Purchaser requirements. The film holder/cassette frame size (full size) may be 1260mm x 320mm , approximately. The holder shall hold the load of around 25 kgs. Supplier shall interface the holder system with Detector hoist. (attach drawings) • Similarly, for SS2 & SS3 cassette frame size (half size). 840 mm (L) X 160 mm (w) (attach drawing) • Cassette frame grabber envelope shall not be more than dia 200mm. • In addition to above cassette frames, vendor shall supply one full size &one half size cassette frames as spare. •	
g	**Stabilization System for LHS (LINAC Head)** • The structure of the mast/stabilization system for LHS must be sufficiently stable so that no oscillation of LINAC Head shall be observable maximum 120 second after the bridge or hoist movement in micro speed. • Department approval of Design and Analysis of the stabilization system shall be obtained before commencing fabrication. • If Telescoping rigid mast is used, then it shall be made of structural steel members with multiple sections. All sections shall move smoothly using sealed bearings and hardened wheels. • Existing system in Departmental facility: Configuration of the existing stabilization system is attached with this document. It is a hydraulic stabilization system provided on the crab which consists of Hydraulic power pack with flame proof motor, flame proof pressure switches/pressure transmitters, DC valves, seamless telescopic cylinders etc. Hydraulic and electrical circuit drawings of the existing stabilization system are provided in this document. However, it is the responsibility of the contractor to build a LHS system as per the requirement mentioned above. • Stabilization System function: It is for dampening/suppression of the vibrations/oscillations that are developed on X-ray machine/pay load during Hoist, CT, LT movements. Hence while operation i.e., during Hoist/CT/LT movements, system will be de-stabilized by switching the de-stabilization selector switch on pendant/control console. After completion of the required movement of X-ray machine, stabilization switch will be selected from pendant/control console which will pressurize the hydraulic telescopic cylinders such that all oscillations will be damped within one minute.	

	• **Note:** In case of any fault in hydraulic circuit, necessary bypass/isolation arrangement (bypass valve with limit switch interlocked through PLC) shall be incorporated in hydraulic power pack line such that hoist can be operated in passive mode (without stabilization operations). • All necessary interlocks shall be incorporated in the system. • Schematic of the hydraulic stabilization system circuit drawing is attached in this document. • Generally, the hoist operation shall be enabled during stabilization condition. Hoist shall be operable only on de-stabilization condition only. • All gearing shall be totally enclosed in oil tight gear cases. These cases shall be fully sealed to prevent any oil leak. A protected vent plug and an oil level sight plug may be used; however, these plugs must be designed to prevent leaks. Rotating shafts shall have seals. All machinery shall operate smoothly through the complete range of speeds. • All rotating members with projecting elements such as key, couplings, set screws, etc. as well as all other moving parts shall be guarded as per relevant standards. Refer Sketch:-5 for details.	
23.	**DESIGN APPROVALS:**	
	DRAWINGS /DOCUMENTS (EACH 3 COPIES) TO BE SUBMITTED AFTER PLACEMENT OF ORDER FOR APPROVALS.	
	[Note : It is the responsibility of the contractor to get the drawings / documents approved from Third Party Inspection Agency (TPIA)]	
23.1.	Contractor shall submit following list of Three sets (03 sets) of drawings/ calculations / documents (in 03 -three sets) for approval before manufacture of LHS and FPS. Note: It is the responsibility of the contractor to get the drawings/ documents approved from TPIA & Department.	
23.2.	At the same time, Contractor shall be responsible for proper submission of following drawings & calculations along with technical specifications to Third party Inspection Agency (TPIA) and obtain design Approvals from them.	
23.3.	If the drawings and other particulars are returned by the Department, because they are incomplete or faulty, the Contractor shall make the necessary correction / modifications and resubmit the drawings and calculations within a reasonable time, but in any case, should not exceed two weeks from the date of receipt of Department's / third party inspection agency's comments.	
23.4.	Design of load bearing structures shall be as per IS 807 and drive mechanisms &Hoist Gearboxes as per IS 3177 (as applicable) and also as per technical specifications in to consideration.	

23.5.	General Arrangement (GA) drawing of LHS and FPS to scale with dimensions, Bill of materials, Bought out items, makes, weight breakups and wheel loads.	
23.6.	GA Assembly Drawing of Trolley with all components.	
23.7.	GA Drawing of individual drive mechanisms for Hoist, CT(2No) and LT shall be submitted.	
23.8.	General Arrangement drawing of Single wire rope reeving with dimensions and rope equalizer assembly.	
23.9.	Design &Constructional Drawings of Gantry girder, Stabilisation System, Girder, end carriage, and trolley their connections with bill of materials.	
23.10.	Sub-assembly drawings for rope drum assembly, wheel assemblies, hook blocks etc.,	
23.11.	GA drawings, details and selection criteria, design calculations for gear boxes with manufacturer's data sheets as per this specifications and conditions.	
23.12.	LT rail arrangement (on Gantry Girders) drawing to scale with Bill of Materials (BOM).	
23.13.	Bridge Girder CT rail arrangement drawing to scale with BOM.	
23.14.	Sizing calculations for selection of Machine elements like wire rope, hook blocks, cross head, sheave pins, rope drum, couplings, wire rope pulleys, shafts, bearings etc.,	
23.15.	Calculation for bridge girder & gantry girder (with deflection & camber), trolley frame, end carriage, with weight breakup.	
23.16.	Calculations for selection of wheels &wheel bearings and Stabilisation system.	
23.17.	Calculations for selection of CT & LT rails.	
23.18.	Calculations for drive shafts and plummer block bearings.	
23.19.	Quality Assurance Plan for total LHS and FPS manufacture, erection & testing as given in Section-D	
23.20.	Delivery schedule of LHS and FPS in the form of Bar chart indicating different stages.	
23.21.	Selection of keys, key ways & couplings	
23.22.	Selection of bearings for Handling system LHS and FPS.	
23.23.	Selection of sheaves & sheave pin with calculations.	
23.24.	Calculations for selection of wheel bogie connecting pins.	
23.25.	All the components of LHS and FPS which are lifted for erection shall be design checked for erection / lifting loads and necessary Calculations shall be submitted.	

23.26.	Calculation for selection of motors, Hydraulic Stabilisationsystems, brakes, drives, cables and switch gear with manufacturer datasheets &Exproof certificates shall be submitted for approval. In addition, **all *Motors' torque and speed curves shall be submitted for approval.***		
23.27.	Electrical circuit diagrams and Control System of Handling SystemLHS and FPS with individual drive circuits, control circuit, and with interlocks' circuits.		
23.28.	GA drawings of Protective Panel, other panels including panel line up inside the room as indicated in the architectural drawing and inside components arrangements of each panel.		
23.29.	Lubrication arrangement of EOT LHS and FPS with points indicated in drawing.		
23.30.	**Contractor shall give the break-up weights of LHS and FPS as mentioned below during final design:**		
23.31.	Weight of each bridge girder as assembled and ready for erection, with and without mechanical and electrical components.		
23.32.	Weight of each end carriage as assembled and ready for erection.		
23.33.	Weight and name of individual heaviest mechanical components.		
23.34.	Total weight of structural, mechanical and electrical components separately		
23.35.	Total weight of LHS and FPS including electrical equipment.		
23.36.	Weight of trolley structure ready for erection shall be provided.		
23.37.	Total weight of trolley including electrical equipment.		
23.38.	For Electrical Systems:		
a)	Motors	1. No. of motors, Power of motor, Frame size, make, duty, no. of starts/hr, type and No. of poles, Insulation, Amb. temp, applicable IS for construction, bearing, accessories, terminal position from drive end, drawing nos. used for FLP certification, etc.	
		2. Torque and speed curves, thermal withstand time curve, efficiency and power factor with respect to loading of the motor, speed and time with respect to current and complete G.A of motor, terminal box / boxes by mentioning the approved drawing reference and nos.	
b) Test Reports		1. Flame proof electrical fittings / equipment test reports along with approved drawings (Either by CIMFR / ERTL (E)) with respect to all the annexure and amendment if available need to be submitted for review and acceptance of all FLP items.	
		2. Space heaters and its thermostat.	
		3. Transformers.	
		4. Dynamic Braking Resistor.	
		5. VVVF Drives and its components.	

		6. Certificate for obsolesce for all the major electrical items with not less than 15 years from the date of acceptance of the LHS and FPS.	
		7. Stabilisation System and its components.	
c)	Sizing Calculation	1. Control Transformer (with considering closed VA).	
		2. Lighting Transformer.	
		3. Dynamic Braking Resistor.	
		4. SMPS with and without loading.	
		5. Power Cables and its schedule.	
		6. Control Cables with respect to no. of cores.	
		7. Heat loss calculation towards panel AC selection.	
d)	Technical Catalogue / data sheets	1. VVVF Driveswith control unit	
		2. Switchgear components.	
		3. Power and Control Cables.	
		4. Encoder.	
		5. Cable Drag chain and its cables.	
		6. Limit switches.	
		7. Intrinsic safe relays&Proximity sensor	
		8. Panel.	
		9. Stabilisation system (Hydraulic)	
24.	**List of Manuals / drawings/ documents/ certificates to be submitted at the time of inspection of LHS and FPS at supplier's works and also at the time of commissioning at site.**		
24.1.	QAP/shop Inspection report document showing Third party design approvals, manufacturer test certificates., all stage & final inspection reports, load test reports as per QAP and TPIA report on final inspection at works & TPIA clearance report.		
24.2.	Test certificates of all items like raw materials, hooks, wire ropes, motors etc and for all LHS and FPSparts certified by "Competent person of third party agency" as per QAP & standards.		
24.3.	4 sets of LHS and FPS operation & maintenance manuals		
24.4.	2 sets of spare parts manuals		
24.5.	2 sets of spare parts manual and service manuals for the Gearbox shall be provided.		
24.6.	4 sets of all As Built Drawings of all systems of LHS and FPS as mentioned above & approval drawings that have been finally approved by TPIA / Department.		

24.7.	Manufacturer installation & maintenance manuals(including check list for maintenance), test certificates and Warranty / Guarantee Cards for all Bought-Out-Items.		
24.8.	Trouble Shooting Chart for Main and all Sub-Systems.		
24.9.	Lubrication schedule, diagram with details of lubrications.		
24.10.	Final test certificate of LHS and FPS from TPIA with inspection report		
24.11.	Final as built drawings of LHS and FPS and machinery, Maintenance & spare part Manuals, test certificates shall be supplied in soft form in the forms of DVDs and in the latest software format.		
25.	**Tolerances on LHS and FPS dimensions and manufacturing :**		
	Contractor shall ensure that the LHS and FPS shall be manufactured as per the tolerances specified below. Final inspection reports shall be submitted in drawing format.		
25.1.	Span over LT wheels	± 4mm maximum	
25.2.	Diagonal on wheels	± 5mm maximum	
25.3.	Parallelism of Girders	≤ 1/1000 of wheel gauge (measured at every 1m interval)	
25.4.	Verticality of Girders	≤ 2mm (measured at every 1m interval)	
25.5.	Verticality of End Carriages	≤ 1mm (measured at every 1m interval)	
25.6.	Trolley wheel gauge	± 2mm (measured at every 1m interval)	
25.7.	LT wheel alignment	± 1mm (maximum)	
25.8.	Difference in height between trolley rails	≤1/1000 of wheel gauge maximum at 1m interval	
25.9.	CT Rail alignment w.r.t Girder centre	±1 mm (measured at every 1m interval)	
25.10.	Tilt of wheels (both horizontal & vertical)	≤ D/ 1000mm where D = diameter Of wheels	
25.11.	CT/LT wheel displacement	≤2mm (measured at all wheels) Wheel alignment	
25.12.	CT / LT wheel diameter variation	less than 0.1 mm in diameter of wheel	
25.13.	Squareness of Girders to End carriages	within 1.60mm (for wheel base of ~4000mm)	
25.14.	Hoisting speed	+10% -5% of specified speed.	
25.15.	Lowering speed	+10% -5% of specified speed	

25.16.	Travelling speed	+10% -5% of specified speed.	
26.	**INSPECTION & TESTING DURING MANUFACTURE & SHOP TESTING OF LHS AND FPS**		
26.1.	DESIGN / DRAWINGS APPROVALS & CERTIFICATE from TPIA before LHS and FPS manufacture.	Contractor shall obtain all design/ drawings approvals from Third Party Inspection Agency (TPIA) and Department before starting LHS and FPS'sfabrication. LHS and FPS& components shall be manufactured & inspected as per the approved drawings only. All inspection/test reports shall be made with respect to approved drawing with reference numbers.	
26.2.	QAP &Third party agency	INSPECTION and testing shall be carried out **as per QAP** enclosed here with in **Section-D**. Supplier shall hold the manufacturing at specified "HOLD" places and call for inspection. The Schedule of Inspections shall be strictly adhered to and shall be witnessed by Third Party Inspection Agency (TPIA) and/or Department. All the critical inspections and load testing shall be done in the presence of Third Party and Department personnel.	
26.3.	Raw materials identification & stamping	Raw material identification for structures, wheels, hoist mechanisms, Gears, load pins etc., shall be done by Third party inspectorate and/or department. Raw material test certificates, traceability of materials with identification marks shall be made available during identification.	
26.4.	Welding inspection & Testing	All Butt Welded Joints (both compression & tension flanges / web joints) shall be subjected to 100% X-Ray Testing and X-Ray Films to be produced for TPIA and/or Department for evaluation and shall form part of the quality (QA) documentation submitted to purchaser.	
26.5.	Inspection major parts and records	Inspection of Bridges, End Carriages, trolley, rails gauge, Wheels and Measurement of Camber, mechanical assemblies checking as per QAP. Reports shall be made in drawing format.	
26.6.	Dimensional inspection & alignment checking & records	Inspection of Span & Diagonal Dimensions (Minimum ~10Kg pull should be applied while checking), Checking bridge & end carriages' squareness, Checking of Wheel Alignments, Mechanical drive Assemblies alignment and Pulley blocks alignment. Reports shall be made in drawing format.	
26.7.	The LHS and FPS hook should be tested and certified by the dock labor board / govt. Approved test house for twice its SWL and test certificate should be provided.		

26.8.	Load tests	No load test, Full load tests and Deflection measurement as per as per QAP and as per IS: 3177.	
26.9.	Load tests	Test at OVER-LOAD (125% SWL) capability Check and Permanent Set Measurement as per QAP and as per IS 3177.	
26.10.	Clearance for despatch	The equipment shall be despatched only after satisfactory performance testing/ inspection at supplier's works and on written clearance from Department & TPIA.	
27.	**ERECTION & COMMISSIONING OF LINAC HANDLING AND DEDECTOR POSITIONING SYSTEM**		
27.1.	At site works	Fully in the Contractor's scope. Inspection and testing during/after erection shall be as per QAP.	
27.2.	Erection Plan & Procedure	Before erection, contractor shall submit detailed erection plan and procedure along with erection loads on building & also on parts being lifted shall be submitted for approval.	
27.3.	Erection Supervision	Contractor shall depute adequate qualified personnel i.e., Two Engineers/supervisor/ foreman, (one for mechanical and one for electrical), fitters, riggers, and electricians and helpers for carrying out quality erection work at site within schedule.	
27.4.	Material (lifting equipment, lifting tackles, etc) required during erection.	Fully in the contractor's scope. All lifting machines / tackles used shall be tested & certified as per standards before their usage for lifting LHS and FPS.	
27.5.	Initial filling of lubricants and spare parts required for commissioning at site shall be provided by the Contractor.		
27.6.	Performance Proving & Smooth running of LHS and FPS	No Load test, Full load test and overload test (for 125%SWL) shall be done as per QAP and as per IS3177. Proving out for the LHS and FPS's Capacity and Smooth Functioning of the LHS and FPS at Full load (SWL) and Over load (125%SWL) shall be the responsibility of the Contractor.	
27.7.	Test/Clearance certificates for LHS and FPS	To be inspected and certified by "Competent Person of Third party Inspection Agency " as per Industrial Laws and shall provide Certification from Third Party Inspection Agency for final clearance & regular usage of LHS and FPS .	
28.	**MAKE OF THE BOUGHT-OUT ITEMS(makes are Substantial equivalent)**		
28.1.	GEAR BOXES and Geared Motors	M/s Elecon /Shanti /GREAVES(Premium transmission) /DB-Radicon/ Renold/ Sumitomo/ Flender.	

28.2.	Structural Steel Materials Plates, rolled sections	All the structural raw materials (plates, angles, beams) shall be NEW and of reputed make of M/s SAIL / M/s JINDAL/ M/s ESSAR/ M/s TATA STEEL / VIZAG-RINL	
28.3.	Forged steel materials wheels, shafts, keys, gears	M/s SAIL / JINDAL / TATA STEEL / ESSAR / VIZAG-RINL / SUNFLAG STEEL / TIMKEN / Mahindra Ugine Steel (MUSCO) / BHARTH FORGE	
28.4.	Wire Ropes	M/s Usha Martin only.	
28.5.	Bearings	M/s SKF / FAG / TIMKEN / INA	
28.6.	Flameproof Thruster Brakes (For Hoist motion)	M/s Pintsch BUBENZER /SIBRE / / GALVI / Sime GKN Stromag	
28.7.	Hooks	M/s EEK / Hercules/IRZAR/ Shilpa Udyog/ Crosby	
28.8.	Couplings	M/s FENNER / Elecon / Shanti / Renold	
28.9.	Rails	M/s SAIL / IISCO / JINDAL / ACCELOR / TATA STEEL / ESSAR	
28.10.	Push Buttons	M/s Werner with configurable tiles	
28.11.	Paints	M/s Asian Paints / Berger/ G.P	
28.12.	All Electrical Switch gear / SMPS	M/s Siemens	
28.13.	Flame Proof Motors	Bharat Bijilee / Crompton Greaves	
28.14.	VVVF Drives	M/s. Siemens / ABB	
28.15.	Limit switches	M/s. Sterling controls / Speed-O-Control / Electromag.	
28.16.	LT power & control cables	M/s. Lapp / Universal / Nicco / Finolex / RPG / Uniflex/Polycab/ Finolex/ Svam/ Apar.	
28.17.	Panels	M/s. Rittal / M/s President	
28.18.	Terminal Blocks	M/s. Elmex / Connectwell / Wago	
28.19.	Encoders	M/s. Hubner / P&F (Flame Proof) preferablyHollow shaft type Encoder can be planned.	
28.20.	Junction Boxes (FLP)	M/s. FCG / BALIGA / FEPL / P&F / STAHL	
28.21.	Junction Boxes (Non-FLP)	M/s. Rittal	
28.22.	Intrinsic Safe Relays	M/s P&F only	
28.23.	UB lights	M/s Baliga/ FCG/ FEPL/ P&F/ STAHL	
28.24.	Fasteners	M/s TVS / UNBRAKO	
28.25.	Flameproof Thruster Brakes (For LT / CT motions)	M/s Galvi / Sibre / Pethe / Speed-o-control / BCH / SEW/ Kateel	
28.26.	Flameproof LED Light Fittings	M/s Baliga/ FCG/ FEPL/ P&F/ STAHL	
28.27.	Drag Chain and Cables inside	M/s Lapp / M/s IGUS	

	Drag Chain		
28.28.	Other reputed and reliable makes of bought out items will be considered during detail engineering with submission of technical details, references and credentials. However, about other makes final decision is of the Department.		
29.	**General TERMS & CONDITIONS during Supply and Installation :**		
29.1.	In the design of LHS and FPS, all Indian standards, all safety regulations as applicable under provision of factory Act, Indian Electricity rules etc. as prevailing in the country / State (site of installation) shall be taken into consideration.		
29.2.	Arrangements shall be made by the supplier for the inspection and testing of the LHS and FPS during different stages of its manufacture starting from the raw materials till the completion of the LHS and FPS by the Department and/or Third Party Agency at the contractor's site as per the QAP schedule.		
29.3.	Dimensions of all parts used on LHS and FPS shall conform to metric standards.		
29.4.	No cast iron part should be used on the LHS and FPS except for electrical equipment. Similarly wood or combustible material and Bush bearing should not be used in any part of the LHS and FPS. Open gears should not be used in any drive / motion.		
29.5.	Assembly at site is to be kept as minimum as possible to enable early commissioning of the LHS and FPS. Welding of LHS and FPS at site is to be avoided as far as possible.		
29.6.	The contractor should satisfy himself about the site condition beforeand to avoid any difficulty during erection and commissioning of the LHS and FPS		
29.7.	Supplier shall submit complete erection plan with details of erection loads & pattern of wheel loads that will act on building civil structure, erection procedure, material handling procedure etc.		
29.8.	During the erection, testing and commissioning of the LHS and FPS at site, the contractor has to make his own arrangements for boarding, lodging, transportation of his men and materials.		
29.9.	Supplier shall make his own arrangements for welding and gas-cutting works if any, that are required for erection and commissioning of LHS and FPSs.		

29.10.	Department / Third Party Inspection Agency (TPIA) shall have the right of inspection and supervision of the manufacturing process adopted by the contractor for the manufacture of equipment at various stages through their authorized representatives. In case the manufacturing process adopted is not found suitable and commensurate with the desired quality of the equipment, the contractor will be advised to adopt the correct manufacturing process which will be binding on the contractor. Department's decision regarding the quality of work and its acceptability shall be final and binding on the contractor.	
29.11.	Arranging the test load / dead load, lifting equipments, tackles, men and materials are required for conducting above mentioned load tests at factory as well as purchaser site (both side) shall be in the scope of contractor. After load test, the dummy loads handed over to purchaser by the contractor. The testing and commissioning of LHS and FPSs shall be carried out as per IS / as directed by EIC.	

List of Spares to be supplied along with the LHS and FPS

Electrical Spares:

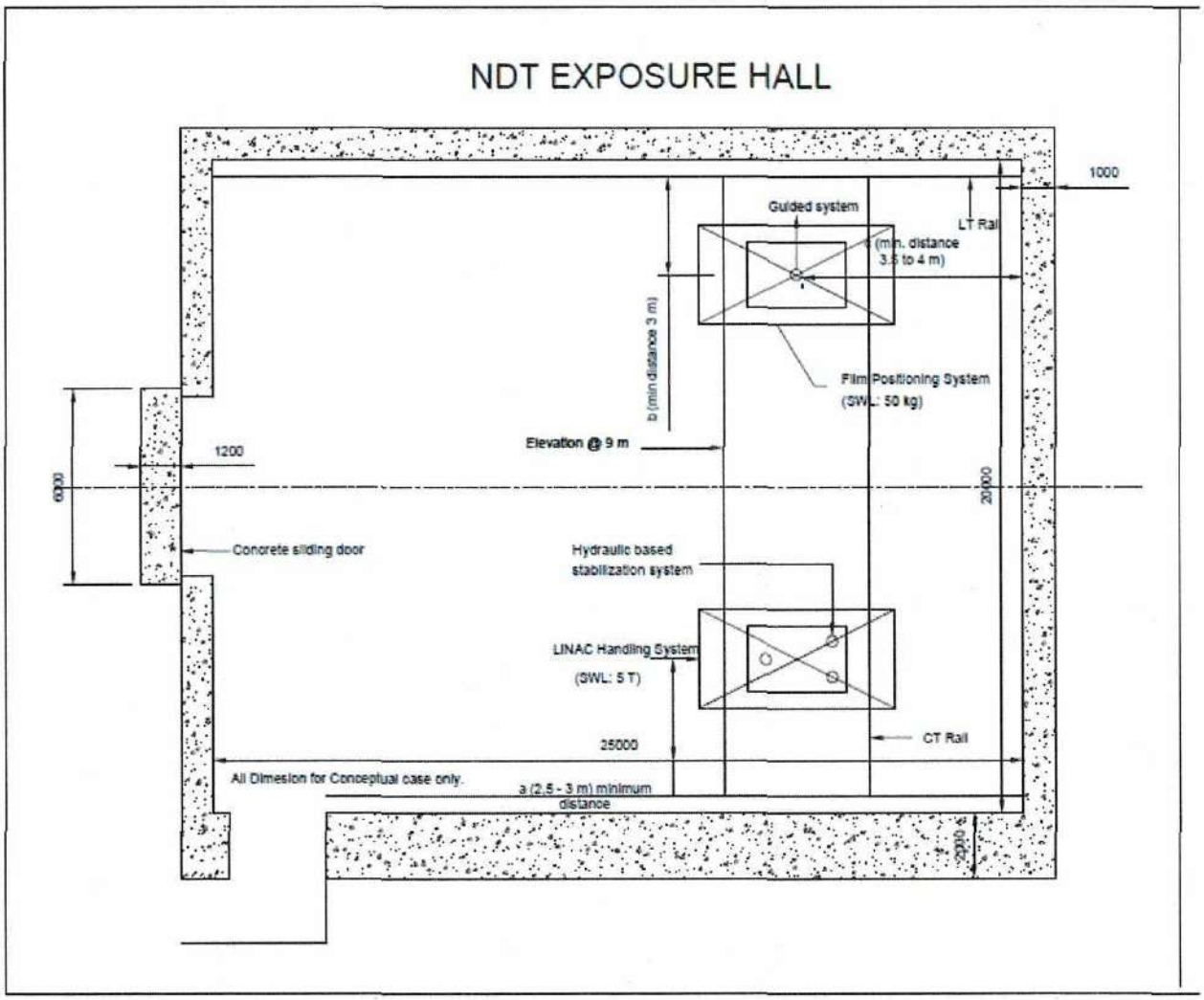
S.No	System Name	Qty
1.	Two level limit switches	4Nos.
2.	Selector Switch (Local/ remote selection)	3 Nos.
3.	Push buttons	10 Nos.
4.	Absolute Encoders	2Nos.
5.	Incremental Encoders	2Nos.
6.	DI isolators	8 Nos.
7.	DO isolators	6 Nos.
8.	DO Relays	8 Nos.
9.	LED Cluster lamps	2 Nos.
10.	Switch amplifier for display unit /lamp	1 No.
11.	All Contactors (one for each rating)	1 Set
12.	Push button, selector switch along with configurable tiles	6 Sets
13.	Intrinsic safe Pendant display unit	1 No.

14.	Siemens PLC 24V Power supply	1 No.
15.	Siemens drive 24V Power supply	1 No.
16.	Terminal blocks	20 Nos
17.	Panel Cooling fan	02 Nos
18.	AC / DC Clamp meter – Range 'mA' to 3 A; Make: Megger / Fluk	01 No.
19.	AC / DC Clamp meter – Range 'SWL with all three motion in operation'; Make: Megger / Fluke	01 No.
20.	Digital Insulation Tester – Range: Test Voltage as 1000 V; Make: Megge	01 No.

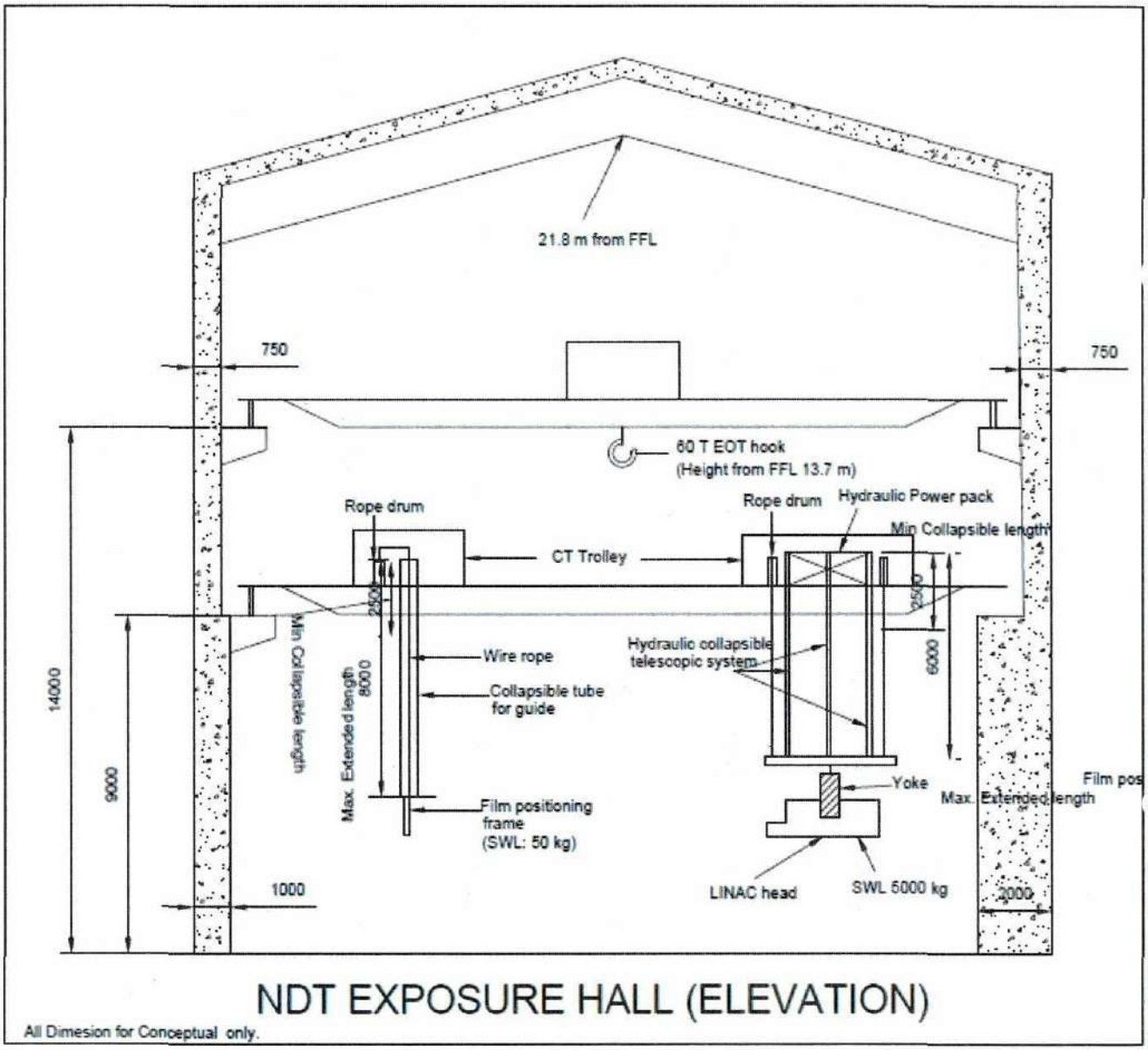
Mechanical Spares

Sl. No	Item Name	Qty
1.	Thruster for Hoist of LHS &FPS	Each 1No.
2.	Thruster for CT and LT for LHS &FPS	Each 1 No.
3.	Gearbox oil	30 litres
4.	Wire rope for Hoist of LHS & FPS	Each 1 Length
5.	Oil Seals for Gearboxes (Each type used in crane)	5 Sets
6.	Brake liners for brakes (Each type used in crane)	5 Sets
In Hydraulic power pack (Flame proof type)		
7.	DC valve	1No.
8.	Pressure switches	1 No
9.	Pressure transmitter	1No
10.	Load cell	1 No
11.	PRV	2 Nos.
12.	Pilot operated check valve	1 No.
13.	Wiper seals & Lip seals (one full set for telescopic cylinders). If seals are custom made, then spares set shall be same as used in cylinders.	1 full set for all cylinder sizes
14.	Pressure gauge	1 No.
15.	Oil filter	1 No.
16.	Strainer	1 No.

Reference Drawings and Photos
Sketch : 1



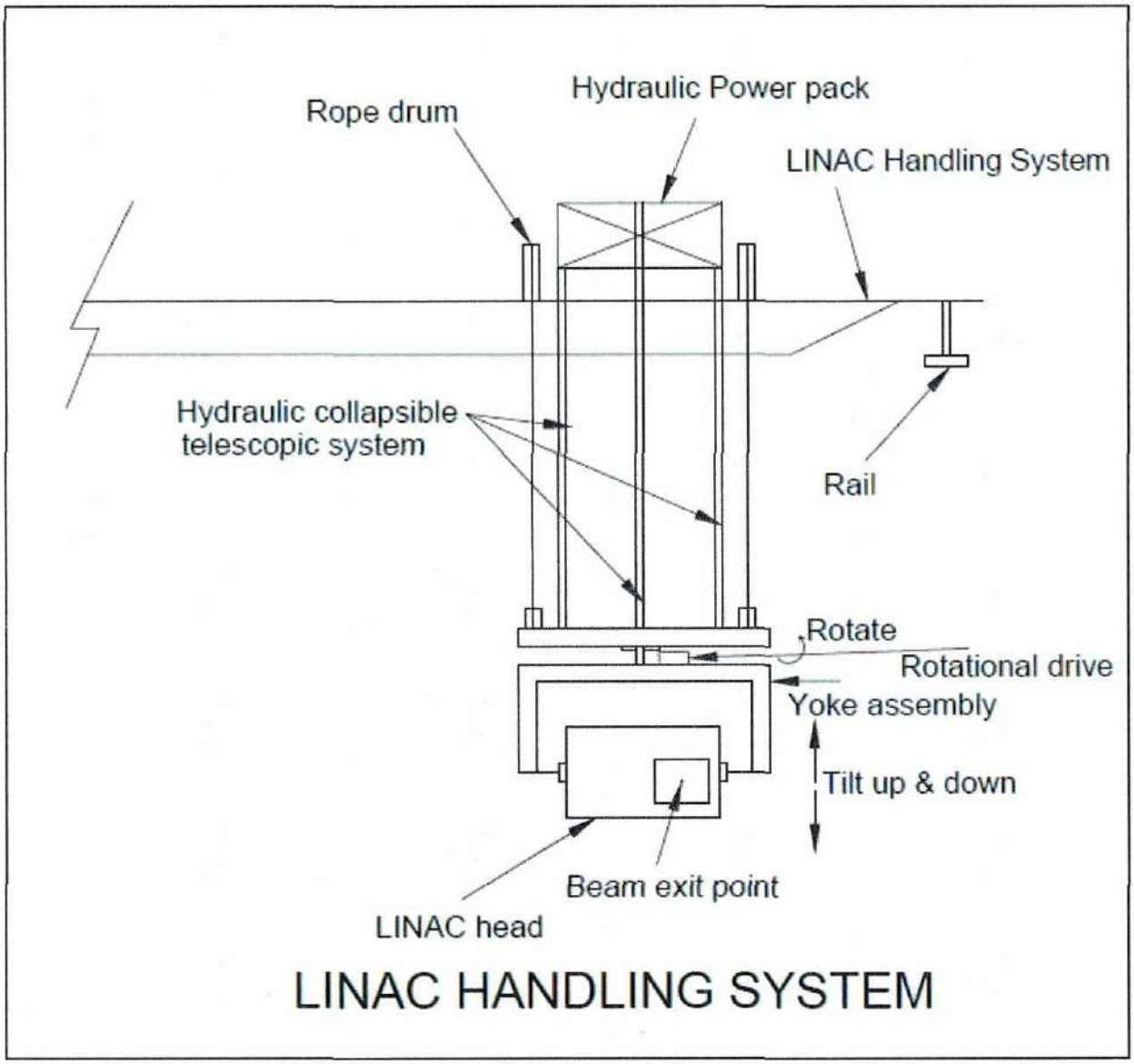
Sketch: 2 Details of NDT exposure Hall (Elevation)



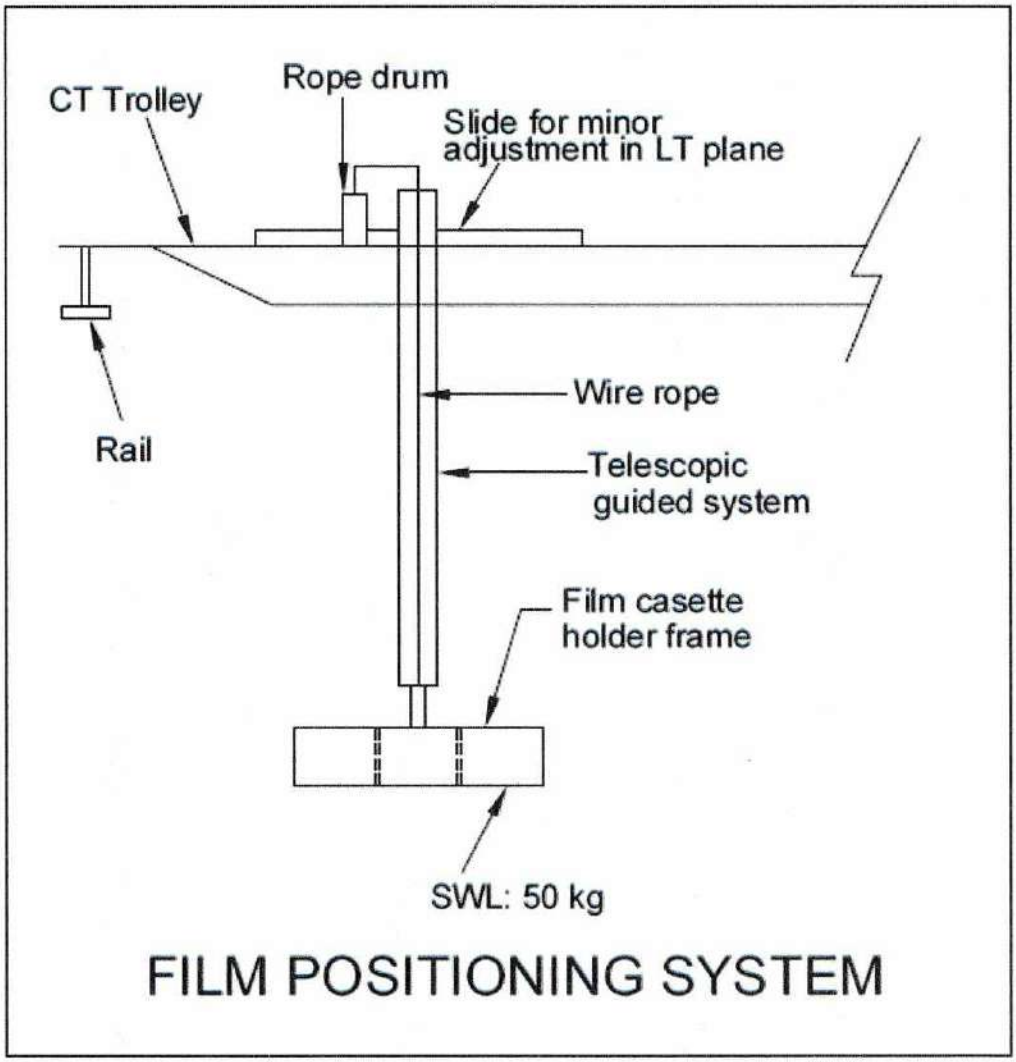
NDT EXPOSURE HALL (ELEVATION)

All Dimesion for Conceptual only.

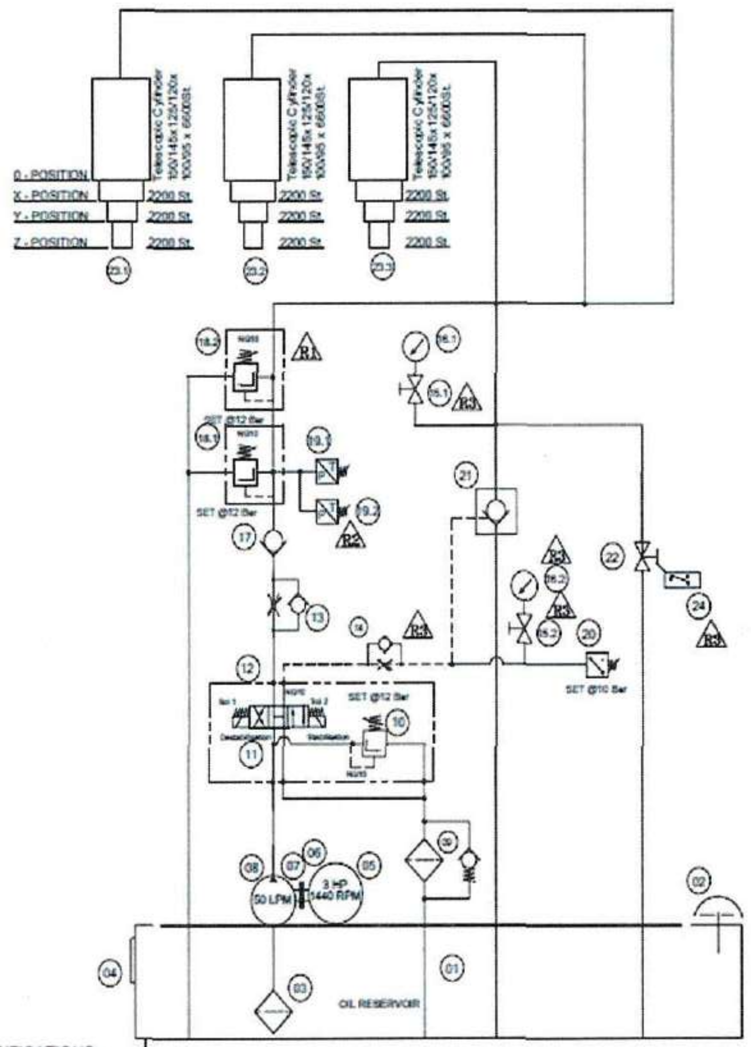
Sketch :3 : LINAC Handling system (Proposed)



Sketch :4: Film Positioning System.



Sketch: 5 -Hydraulic stabilisation system circuit drawing (for LHS alone)



SPECIFICATIONS:-

1. Reservoir Capacity	: 500 Lts.
2. Electrical Motor	: 3 HP,1440 RPM
3. Hydraulic Pump	: 50 LPM
4. Operating Pressure(max)	: 12 Bar
5. Hydraulic Oil	: Servo VG 68

NOTE:

1. All the three cylinders should move simultaneously at same pressure.
2. All switches & electrically actuated items should be of flameproof zone-I gas group IIA,IIB.
3. It should be ensured that there should not be any jerky movement & leakage of cylinders even at 3 bar pressure.
4. All items of reputed make and high quality are to be used.
5. Approved in principle subjected to satisfactory functioning during prove out at our works and customer works.
6. All electrical circuit items are to be provided in flame proof electrical cabinet.
7. Electrical motors make should be ' BBL / CROMPTON '.

SL. NO.	DESCRIPTION	MODEL CODE	MAKE	QTY.
24	Limit switch	-	SOC	1 No.
23	Telescopic Cylinder	-	REF. DRG. CR800-300	3 Nos.
22	Shut Off Valve	1" BSP	FLUTEC	1 No.
21	Pilot Operated Check Valve	CI 30 S-(Modiied)	Polyhydron&RC	1 No.
20	Pressure Switch	PS01F132B46FDAPC OT 2.5-16Bar(Flame Proof)	Switzer	1 No.
19	Pressure Transmitter	712 B 12 AV K E 0 0-20Bar(Flame Proof)	Switzer	2 Nos.
18	Pressure Relief Valve	DPRH10-S25-04	Polyhydron	2 Nos.
17	Check Valve	C20T1-03(1" BSP)	Polyhydron	1 No.
16	Pressure Gauge	2" Dial, 1/4"BSP, 0-40Bar	MASS	2 Nos.
15	Needle Valve	1/4" BSP	FLUTEC	2 Nos.
14	Throttle Cum Check Valve	3/8" BSP	FLUTEC	1 No.
13	Throttle Cum Check Valve	1" BSP	HYLOC	1 No.
12	Manifold Block	-	REF. DRG. CR800-314	1 No.
11	DC Valve	DL5BKD2-S2/10NR120 T01 /CM (Flame Proof) NG 10	DUPLOMATIC	1 No.
10	Pressure Relief Valve	DPRH10-K25-05	Polyhydron	1 No.
09	Return Line Filter	TIF2-08	Hydroline	1 No.
08	Hydraulic Pump	2P 3055	Dowty	1 No.
07	Coupling	-	Lovejoy	1 No.
06	Bell Housing	-	Polyhydron	1 No.
05	Electrical Motor	3 HP, 1440 RPM, 3-Ph Flame Proof, Flange mtg	Bharat Bhijlee	1 No.
04	Oil Level Indicator	LG2-10	Hydroline	1 No.
03	Suction Filter	SC3-30	Hydroline	1 No.
02	Filler Breather	FSB-25	Hydroline	1 No.
01	Oil Reservoir	500 Ltrs.	REF. DRG. CR800-313	1 No.

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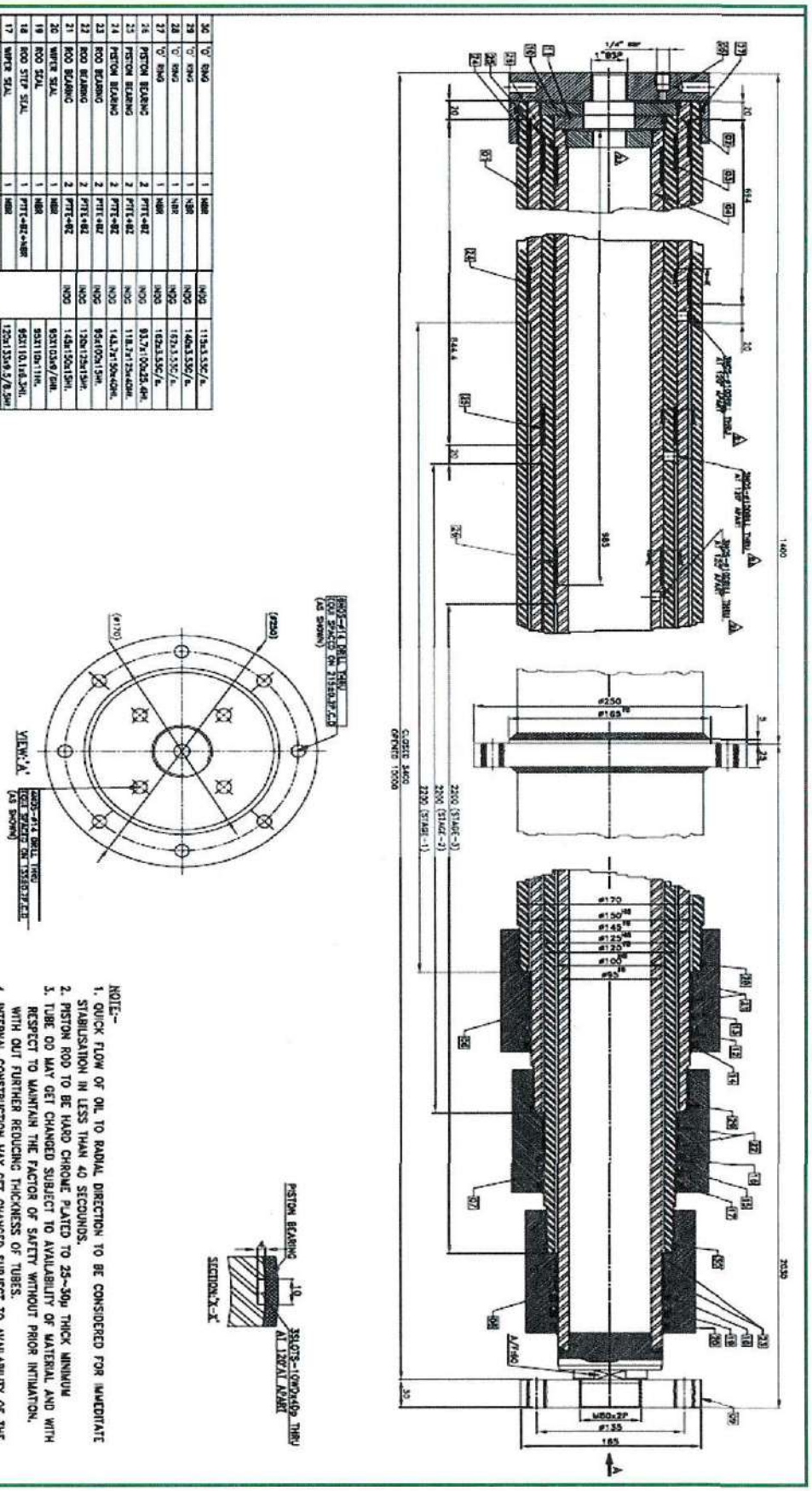
Sketch:6 -Configuration showing the telescopic Hydraulic cylinders



SL.NO	DESCRIPTION	QTY	MATERIAL	MAKE	SIZE/DRG.NO
30	'O' RING	1	NBR	INDO	115x3.5SC/a.
29	'O' RING	1	NBR	INDO	140x3.5SC/a.
28	'O' RING	1	NBR	INDO	152x3.5SC/a.
27	'O' RING	1	NBR	INDO	162x3.5SC/a.
26	PISTON BEARING	2	PTFE+BZ	INDO	93.7x100x25.4PL.
25	PISTON BEARING	2	PTFE+BZ	INDO	118.7x125x40PL.
24	PISTON BEARING	2	PTFE+BZ	INDO	143.7x150x40PL.
23	ROD BEARING	2	PTFE+BZ	INDO	95x100x15PL.
22	ROD BEARING	2	PTFE+BZ	INDO	120x125x15PL.
21	ROD BEARING	2	PTFE+BZ	INDO	145x150x15PL.
20	WIPER SEAL	1	NBR		95X105x6/BAR.
19	ROD SEAL	1	NBR		95X110x11PL.
18	ROD STEP SEAL	1	PTFE+BZ+NBR		95X110.1x6.3PL.
17	WIPER SEAL	1	NBR		125x135x6.5/8.5PL.
16	ROD STEP SEAL	1	PTFE+BZ+NBR	SPARE/AGE	125x135.1x6.3PL.
15	ROD SEAL	1	NBR		125x135x11PL.
14	WIPER SEAL	1	NBR		145x155x6.5/BAR.
13	ROD STEP SEAL	1	PTFE+BZ+NBR		145x160.1x6.3PL.
12	ROD SEAL	1	NBR		145x160x11PL.
11	LOCK NUT - 2	1	E250		CMDC-311
10	LOCK NUT - 1	1	E250		CMDC-310
09	ROD END FLANGE	1	C45		CMDC-309
08	PACKING BOX - 3	1	EN8/C45		CMDC-308
07	PACKING BOX - 2	1	EN8/C45		CMDC-307
06	PACKING BOX - 1	1	EN8/C45		CMDC-306
05	END COVER	1	EN8/C45		CMDC-305
04	PISTON TUBE-3	1	E355, DIN10305 C45, DIN10305		CMDC-304
03	PISTON TUBE-2	1	E355, DIN10305 C45, DIN10305		CMDC-303
02	PISTON TUBE-1	1	E355, DIN10305 C45, DIN10305		CMDC-302
01	CYLINDER TUBE ASSEMBLY	1	E355, DIN10305 C45, DIN10305		CMDC-301

SPECIFICATIONS

		STAGE-1	STAGE-2	STAGE-3
BORE		150 MM (tol: H8)	125 MM(tol: H8)	100 MM(tol: H8)
ROD		145 MM (tol: f8)	120 MM(tol: f8)	95 MM (tol: f8)
STROKE		2200 MM ±2.0	2200 MM ±2.0	2200 MM ±2.0
SL.NO	DESCRIPTION	PARAMETER & ACCEPTANCE CRITERIA		
01	TOTAL STROKE	6600 MM		
02	WORKING PRESSURE(MAX)	10 BAR (tol: ±2 BAR)		
	WORKING PRESSURE(MIN)	3 BAR (tol: ±2 BAR)		
03	DESIGN PRESSURE	10 BAR (tol: ±2 BAR)		
04	TEST PRESSURE	15 BAR (tol: ±2 BAR)		
05	TYPE	SINGLE ACTING		
06	MOUNTING	CIRCULAR FLANGE		
07	WORKING TEMPERATURE	-20°C ~ +80°C		
08	WORKING MEDIUM	MINERAL OIL		
09	INTERMEDIATE WORKING PRESSURE	50BAR (tol: ±2 BAR)		

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Sketch: 7- Details of LHS

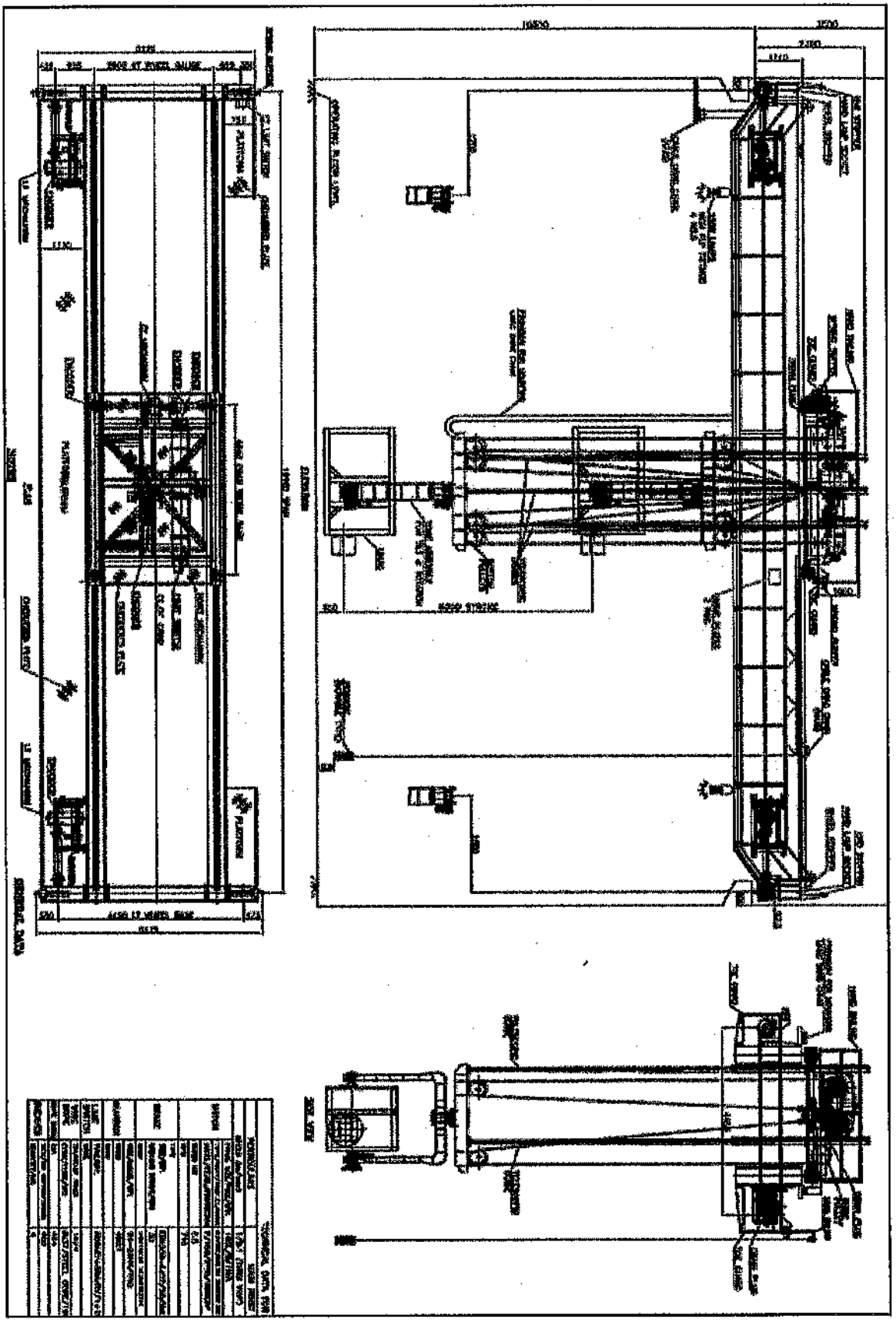
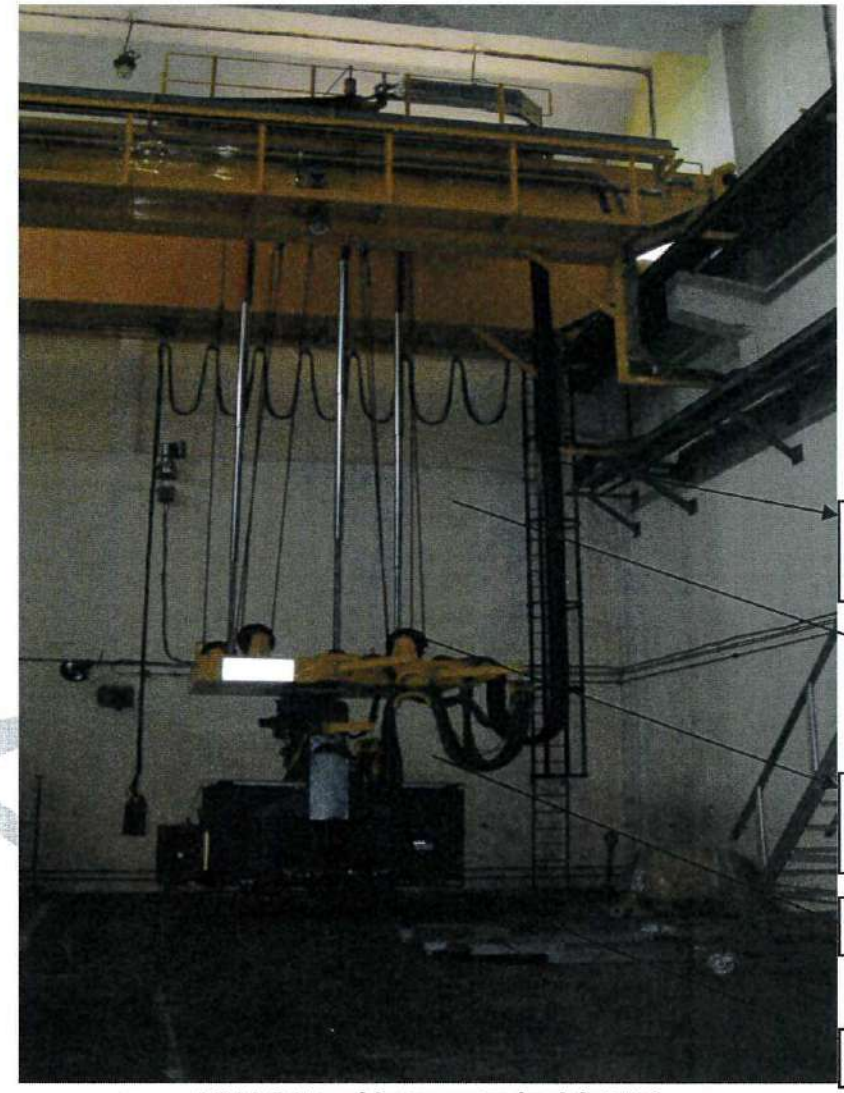


Image : 1 showing the present available LHS .



LINAC Head integrated with LHS

Image :2 Cable Management System

SECTION –D

QUALITY ASSURANCE PLAN

Sl. No	Components/ Operations	Characteristic to be checked	Category	Type / Method of check	Extent of check	Ref. Document	Acceptance Norm	Format of record	Agency			Remarks
									Performed	Witnessed	Verified	
A	B	C	D	E	F	G	H	I	J			K
i) H	Identification of Raw materials structural plates, forged steel material, Alloy steel etc.,	All raw materials shall be offered with test certificates for identification for Crane manufacture before start of fabrication. Stamping shall be done for verification at later date.					Component Specs./ IS 2062/ IS1570/ En steels	Stamping on parts & Identification record	1	-	–	All materials shall be Identified by Third Party Agency . (HOLD)
1	**STRUCTURAL WORKS : BRIDGE GIRDERS, END CARRIAGES, CRAB FRAME, DRIVE BASES & PLATFORMS ETC, Yoke & Telescopic Structure**											
1.1	Materials - Plates/rolled sections	Chemical composition/ Mechanical Properties	Major	T.C. Correlation (if not available then test)	One per heat	Approved drawings/ Specs./ IS 2062	Approved drawings / Tech. Specs./ IS 2062	Material T. C. / Supplier's Test Report	3,2	-	1	Reports / TC review by TPIA .
1.1.1		Lamination /Internal defects	Major	Ultrasonic Testing	100%	ASTM A-435	ASTM A-435	Supplier IR	3,2	-	1	For all plates of thickness ≥ 20mm, UT qualification (volumetric test)
.2	Welding	Welding procedure & Welders qualification.	Critical	Test piece visual & physical test.	One for each position	ASME Sec.IX	ASME Sec.IX	WPS/ PQR format	2	-	1	
1.2.1	Load Bearing Butt welds (both tensile and compression)	a) Welding quality & Surface defects	Critical	Visual & D.P. Test	100%	IS:3658 & AWS D14.1	IS:3658 & AWS D14.1	Supplier's IR	2	-	1	Visual inspection & Use weld gauges for measurement of weld
		b) Sub surface defects	Critical	Radiography	100 %	ASME Sec.VIII Div I	ASME Sec.VIII Div I	Supplier's IR	2	1	-	Review of radiography films by I.A.

Legend
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Sl. No	Components/ Operations	Characteristic to be checked	Category	Type / Method of check	Extent of check	Ref. Document	Acceptance Norm	Format of record	Agency			Remarks
									Performed	Witnessed	Verified	
A	B	C	D	E	F	G	H	I	J			K
1.2.2	Other than load Bearing Butt welds & fillet welds	Surface defects & Size	Major	Visual & DPT	100% Visual check & DP test 10% random	IS:3658	IS:3658	Supplier's IR	2	-	1	Use weld gauges for measurement of weld size
1.2.3 H	Bridge Girder & End Carriage Inspection before closing the box	Visual, & Welding Measurement	Major	Visual & welding quality	Visual 100% DPT-random of 10%	Component drawing AWS D14.1	Component drawing/ AWS D14.1	Supplier's IR	2	1	-	Use weld gauges for measurement of weld size (HOLD)
1.2.4	Final Welding Inspection	Visual Inspection	Major	Inspection of Welding quality	100%	Specification/ AWS D14.1	AWS D14.1	Supplier's IR	2	-	1	Visual final welding inspection by TPIA
1.2.5 H	Final Inspection of fabricated components Girders, End carriages, Trolley, LT drive frame, etc..,	Dimensional, Camber, straightness, level, Parallelism, verticality, etc.,	Major	Measurement tolerances as per specifications	100%	Tech. Specification/ Component drawing/IS 807	Tech. Specification/ Component drawing/IS 807	Supplier's IR	2	-	1	Measured Dimensions shall be marked on component drawing. Review of reports at next stage by TPIA. (HOLD)
2.0	ROPE DRUM Fabricated/ Heavy duty Seamless pipe/ Telescopic structure	Material composition/ Mechanical Properties UTS, YS, % elongation	Major	T.C. Correlation (if not available then test)	One per heat	Spec/drawing/ ASTSM A106/ IS 2062	Spec/drawing/ ASTSM A106/ IS 2062	Material T. C. / Supplier's Test Report	3,2	-	2, 1	Reports / TC / pressure test reports review by TPIA
2.1	ROPE DRUM joint Welding / Seamless pipe	Welding Joint quality & Weldment defects	Critical	Visual/DP Test/RT/ UT	100%	Component drawing	ASME Sec.VIII Div I	Supplier's IR	3/2	2`	1	Measured Dimensions shall be marked on component drawing.

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		Stress relieving	Major	Verification	100%	Mfg's std.	Stress relieving chart	Supplier's IR	3/2	2	1	

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									Performed	Witnessed	Verified	
A	B	C	D	E	F	G	H	I	J			K
3.0	**Gear box Housings Fabricated**	Material composition/ Mechanical Properties UTS, YS, % elongation	Major	T.C. Correlation (if not available then test)	One per heat	Spec/drawing/ IS 2062	Spec/drawing/ IS 2062	Material T. C. / Supplier's Test Report	3,2	-	2, 1	Reports / TC to be review by TPIA
3.1		Stress relieving	Major	Verification	100%	Mfg's std.	Stress relieving chart	Supplier's IR	2	-	1	SR chart will be reviewed by TPIA.
3.2		Surface defects & dimensional check	Major	Visual/DP Test/ Measurement	DPT 10% random & 100% visual	IS:3658/ Component drawing	IS:3658/AWS D14.1	Supplier's IR	2	-	1	Measured Dimensions shall be marked on component drawing
4.0	a) Platform b) LT Frame c) Hand Rails d) chequered Plates e) Telescopic structure	Dimensional Conformity/ Visual checking / Mfr's TC	Minor	Measurement	100% Critical dimensions / others at random	Component drawing/ Mfr's TC/ Industrial standards	Component drawing/ Mfr's TC/ Industrial standards	Supplier's IR	2	-	1	
5	**MECHANICAL COMPONENTS – GEAR BOXES (All movements including rotation Tilt and Minor LT)**											
5.1	MH, CT & LT Input shafts, Gears , Pinions, keys, spacers and all movements including rotation, tilt minor LT	Material composition/ Mechanical properties Hardness value / UT / MPT/ DPT of materials	Major	Correlation with Mfr's TC (if not test materials)	100%	Specification IS:1570 / BS 970 / IS:2048	Component drawing/ IS2048 Specification/ IS:1570 / BS 970	Mfr's TC/ Supplier's IR	3,2	-	1	1) UT volumetric test for wrought or forged materials as per ASTME 114 and A388. 2) DPT or MPT shall be performed as per ASTM A 275, E709

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5.1.1	Machined components for Gear boxes like input shafts, gears, pinions, keys, spacers etc.,	Dimensional conformity Hardness of gear teeth/ Bearing s/ Oil seals/ keys and key ways.	Major	Measurement/ Visual examination for finishing	100%	Component drawing/ IS4460/ AGMA/DIN IS:2048	Component drawing/ IS4460/ AGMA/DIN/ Heat treatment chart	Supplier's IR	2	-	1	Key ways shall be inspected by TPIA before assembly of gearboxes. Measured Dimensions shall be marked on component drawings.

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									Performed	Witnessed	Verified	
A	B	C	D	E	F	G	H	I	J			K
5.1.2 H	Gear box Assembly	Dimensional conformity/ Inspection of machined surfaces like gearbox base, bearing mounts etc.,.	Major	Measurement/ Visual check of Internal painting	100%	Gearbox GA drawing	Gearbox GA Drawing.	Supplier's IR	2	-	1	Measured Dimensions shall be marked on Gearbox GA drawings with allowed dimensional variations. **(HOLD)**
5.1.3	Gear box assembly testing (No load run test for minimum of 4 hours)	Contact ratio of surfaces/ Backlash/ Noise level & Bearing temperature/ Breather/ Oil level gauge	Major	Measurement & no load running	100%	Gearbox GA drawing / IS4460/ AGMA / Specification	Gearbox GA drawing / IS4460/ Specification / Noise level of gear box ≤ 80dBA	Supplier's IR	2	1	-	No Load Test shall be witnessed by TPIA. Noise level of gearboxes shall be ≤ 80dBA. Temperature rise shall be as per gearbox manufacture standards.
5.2	**MECHANICAL COMPONENTS – LT AND CT DRIVE SHAFTS**											
5.2.1	Materials of LT & CT Shafts, and Keyways & Keys	Material composition/ Mechanical properties Hardness of material / UT / DPT	Major	Correlation with Mfr's TC (if not test materials)	100%	Approved drawing/ IS2048/ Specification IS:1570/BS970/	Approved drawing/ IS2048 Specification/ IS:1570 / BS 970	Mfr's TC/ Test reports/ Supplier's IR	3, 2	-	1	UT of wrought and forged materials as per ASTM

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5.2.2	Machining of LT & CT Shafts, and Keyways & Keys (Dimensional measurement)	Straightness & Dimensional conformity Checks & Inspection of Key way milling	Major	Dimensional Measurement/ Visual examination	100%	Approved drawing/ Specification IS:1570 / BS 970/IS2048	Approved drawing/ IS2048 Specification/ IS:1570 / BS 970 /IS 2048	Supplier's IR	2	-	1	Keys & keyways shall be inspected by TPIA before assembly.
5.3	**COUPLINGS** **a) Materials** **b) Torque capacity** **c) Key ways**	Coupling s Size/ Material composition/ Mechanical properties / Hardness value / UT / DPT	Major	Correlation with Mfr's TC	100%	Approved drawing/ Specification IS:1570 / BS 970	Approved drawing/ IS2048 Specification/ IS:1570 / BS 970	Mfr's TC/ Supplier's IR	3, 2	-	1	Keys & keyways shall be inspected by TPIA before assembly. UT of wrought and forged materials as per ASTM

Sl. No	Components/ Operations	Characteristic to be checked	Category	Type / Method of check	Extentof check	Ref. Document	Acceptance Norm	Format of record	Agency			Remarks
									Performed	Witnessed	Verified	
A	B	C	D	E	F	G	H	I	J			K
5.4	**Plummer blocks & bases**	PB & bearing sizes/ Material composition/ Mechanical properties	Major	Correlation with Mfr's TC	100%	Approved drawing/ Specification	Approved drawing/ Specification/	Mfr's TC/ Supplier's IR	2	-	1	Review of Test certificates by TPIA and issue Compliance certificate. Measured Dimensions shall be marked on Component drawings with allowed dimensional variations.
5.5	**LT & CT Wheels**											
5.5.1	a) Material Forged steel C55Mn75	Material composition/ Mechanical properties Hardness of material /	Major	Correlation with Mfr's TC	100%	Approved drawing / Tech. Specification IS:1570/BS970	Approved drawing / Tech. Specification IS:1570/BS970	Mfr's TC/ Test reports/ Supplier's IR	3, 2	-	1	Review of Test certificates by TPIA and issue Compliance certificate.
		UT of forged blanks	Major	UT checking	100%	ASTM A-388	ASM A-388	Mfr's TC Supplier's IR	3, 2	-	1	Review of Test certificates by TPIA and issue Compliance certificate.

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5.5.2	b) Wheels after machining with Keys & key ways	Dimensional Conformity for Bore, wheel tread, taper of flange / Hardness/depth	Major	Measurement	100%	Approved Component drawing	Approved Component drawing	Supplier's IR	2	-	1	Measured Dimensions shall be marked on each Component drawings with allowed dimensional variations.
5.6	**WHEEL AXLES with key ways & keys**	Material composition/ Mechanical properties Dimensional inspection UT & DPT /MPT	Major	Correlation with Mfr's TC / Measurement	100%	Approved drawing / Tech. Specification IS:1570/BS970	Approved drawing / Tech. Specification IS:1570/BS970	Mfr's TC/ Test reports/ Supplier's IR	3,2	-	1	Measured Dimensions shall be marked on each Component drawings with allowed dimensional variations.
5.7	**Pulleys with Roller Bearings**											
5.7.1	a) Material (Forged Steel)	Material composition/ Mechanical properties Hardness of material / UT & DPT / MPT	Major	Correlation with Mfr's TC	100%	Approved drawing / Tech. Specification IS:1570/BS970	Approved drawing / Tech. Specification IS:1570/BS970	Mfr's TC/ Test reports/ Supplier's IR	3, 2	-	1	Review of Test certificates by TPIA and issue Compliance certificate.

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									Performed	Witnessed	Verified	
A	B	C	D	E	F	G	H	I	J			K
5.7.2	b) Visual Inspection c) Dimensional Inspection	Overall visual inspection / All dimensions as per drawing like bore, width, groove, etc.,/hardness of	Major	Measurement with vernier / Micrometer	100%	Component drawing / Specification	Component drawing / Specification Noise level of gear box < 80db	Mfr's TC	3	-	1,2	Measured Dimensions shall be marked on each Component drawings with allowed dimensional variations.
5.8	**Snatch block Cross head (if applicable)**	Material composition/ Mechanical properties Dimensional Inspection, 100% UT & MPT	Major	Correlation with Mfr's TC / Measurement	100%	Approved drawing / Tech. Specification IS:1570/BS970	Approved drawing / Tech. Specification IS:1570/BS970	Mfr's TC/ Test reports/ Supplier's IR	3, 2	-	1	Measured Dimensions shall be marked on each Component drawings with allowed dimensional variations.
5.9	**Snatch block assembly (if applicable)**	Dimensional Conformity	Major	Measurement	100%	Approved Assembly dwg.	Assembly Drawing	Supplier's IR	2	-	1	Review of reports by TPIA

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5.10	**Hook (if Applicable)**	Material composition/ Mechanical properties/ and 100% UT& DPT / MPT	Major	Correlation with TC.	100%	Component drawing / IS1875	Component drawing /IS 1875	Mfr's TC	3	-	2, 1	Proof load test from Govt. approved test house.
		Proof Load Test	Major	Testing	100%	IS5749/IS3815	IS5749/IS3815	Mfr's TC	3	-	2, 1	
		Stress relieving	Major	Verification	100%	Component drawing/ IS3815	Component drawing /IS3815	Vendor TC	3	-	2,1	
5.11	**Brake Drums with key and Key ways**	Material composition/ Mechanical properties	Major	Correlation with Mfr's TC /	100%	Approved comp. drawing / Tech. Specification IS:1570/IS1030	Approved comp. drawing / Tech. Specification IS:1570/IS1030	Mfr's TC/ Test reports/ Supplier's IR	3, 2	-	1	Measured Dimensions shall be marked on each Component drawings with allowed dimensional variations.
5.12		Dimensions/ Dynamic balancing/ Key way and key inspection.	Major	Balancing test/ Measurement with	100%	Component drawing / Specification	Component drawing / Specification	Mfr's TC	2	-	1	1. Dynamic balance report shall be reviewed by TPIA. 2. Measured Dimensions shall be marked on each Component drawings with allowed dimensional variations.

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									Performed	Witnessed	Verified	
A	B	C	D	E	F	G	H	I	J			K
6	**BOUGHT-OUT & Other items**											
6.1	**Wire Rope**	Dimensional, Genuine of make, Lay, core and stands, Tensile grade	Major	Mfr's TC	100%	Component drawing/ BOOM	Component drawing / BOOM	Mfr's TC	3,2	-	1	Review of Mfr's TC by TPIA. Visual examination of wire rope for any defects by 2 & 1.
		Breaking Load test	Major	Mfr's TC	100%	IS2266	IS2266	Mfr's TC	3	-	1	
6.2	**Bearings**	Bearing No./ Genuine make conformity	Major	Mfr's TC/ Invoice	100%	Approved make and type	SKF/FAG/TIMKEN	Mfg TC/ Supplier IR	2	-	1	
6.3	**Machined Fit Bolts & Nuts, Telescopic structure , yoke**	Material composition/ Mechanical properties / Measure dimensions	Major	Correlation with Mfr's TC / Measurement	100%	Approved comp. drawing / Tech. Specification /IS	Approved comp. drawing / Tech. Specification	Mfr's TC/ Test reports/ Supplier's IR	3, 2	-	1	Measured Dimensions shall be marked on each Component drawings with allowed dimensional variations.

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							IS:1570/IS1030					
6.4	**FASTENERS (Bolts, nuts, washers, lock nuts)**	Type / Genuine make conformity	Major	Mfr's TC/ Invoice	100%	Approved make and type	TVS/UNBRAKO	Mfg TC/ Supplier IR	2	-	1	
7	**ELECTRICAL EQUIPMENT (for all specified movements)**											
7.1	Electrical Control Panels (VVVF drive panels)	Dimensional, Visual Sequence / Functional and high voltage Test	Major	Electrical test	100%	Electrical Circuit diagram/ Approved drawing/ Specifications	Approved drawing/ Specification.	Supplier's IR	3	1, 4		Review of test certificates of all bought out items by IA
7.2	Motor (for all specified movements)	Visual/ Name Plate	Major	Name Plate	100%	IS 325/ Spec	IS 325/spec	Mfr's TC	2	1	-	
7.2.1		Routine / No load test	Major	Elec. test	100%	IS 325	IS 325	Mfr's TC	3	2, 1	-	Review of TC & Flameproof certificates by TPIA
7.2.2		Flameproof test cert.	Major	Gap measure	100%	IS2148/ CMRI	IS2148/ CMRI	Type test cert.	3	2,1	-	

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									Performed	Witnessed	Verified	
A	B	C	D	E	F	G	H	I	J			K
7.3	Brakes and Thrusters, Brake Coil	Visual/ Name plate/ Make Torque & Thrust / Material TC verify / Test certificate/ Ex proof certificate Accessibility of parts.	Major	Name plate details, make Verification of TC Verification of Ex-proof TC	100%	Approved Drawing/ Make/ BOM/Spec	Approved Drawing/ Make/ BOM/Spec/ ATEX- PTB/ IS2148 -CMRI	Mfr's TC/ Type test cert for Flameproof / Supplier IR	3	-	1	Review of TC & Ex-proof certificates by TPIA
7.4	Resistance box	Megger test, Resistance value	Major	Electrical test	100%	BOM/ drawing / Specifications.	BOM/ drawing / Specifications.	Mfr's TC	3	-	1	Review by TPIA.

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7.5	Limit switches / Switch Gear/ Proximity Sensors/Encoders	Sequence, Number of cams, Idle operational test	Major	Visual	100%	BOM/ drawing / Specifications.	BOM/ drawing / Specifications.	Mfr's TC	3	-	1	Review of TC by I.A.
7.6	Cables	Routine test	Major	Test	One per	BOM/spec.	BOM/spec.	Mfr's TC	3	-	1	Review of TC by I.A.
8 H	**ASSEMBLY OF LHS and FPS (Before assembly of crane all parts shall be inspected by TPIA/Purchaser. Supplier shall inform readiness of all parts)**											**(HOLD)**
8.1	Bridge Girder & End carriage assembly.	Overall Dimension s Structural Alignment & LT Wheel alignment. Span measurement Diagonal Checks	Major	Measurement/ visual inspection	100%	Approved General Arrangeme ntdrawing / Specificatio ns	Approved General Arrangement drawing / Specifications	Supplier's IR	2	1	-	Measured Dimensions / alignment values shall be marked on GA /component drawings with allowed dimensional variations.
8.2	Crab assembly with Main Hoist & CT machinery	Dimensional & CT Wheel alignment Couplings' alignment	Major	Measurement	100%	Approved drawing / Specificatio ns	Approved drawing / Specifications	Supplier's IR	2	1	-	Measured Dimensions / alignment values shall be marked on GA /component drawings with allowed dimensional variations.

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									Performed	Witnessed	Verified	
A	B	C	D	E	F	G	H	I	J			K
9 H	**LOAD TESTING AT WORKS**	**(HOLD)**										
9.1	NO LOAD TEST (MH, CT & LT mechanisms)	NO Load test/ Performance & Safety systems verification speed, Current etc.,	Major	NO Load test/ Measurement of parameters	100%	Approved dwg / IS807/ IS 3177 /Specification	Approved dwg / IS807/ IS 3177 /Specification	Supplier's IR & Load test Format	2	1, 4	-	Measure Gear Box Noise. (Noise Level should be<85dBA).
9.2	**FULL LOAD (SWL) TEST AT WORKS FOR HOIST & CT MOTIONS**											

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9.2.1	DEFLECTION TEST With Safe Working Load	Deflection	Major	Measurement as per approved procedure.	100%	Specifications/ IS807/ IS 3177	Specifications/ IS807/ IS 3177	Supplier's IR & Load test Format	2	1, 4	-	Deflection < **Span/1000** . Record procedure of test & measurement with sketch.
9.2.2	Main Hoist With Safe WorkingLoad	Performance, duty cycle, Speeds, Current, , Safety systems etc.,	Major	Full Load test/ Measurement of parameters	100%	Approved dwg / IS807/ IS 3177 /Specification	Approved dwg / IS807/ IS 3177 /Specification	Load test report /Supplier's IR	2	1, 4	-	Measure Gear Box Noise. (Noise Level should be <85dBA) .
9.2.3	CT Mechanism With Safe Working Load	Performance, duty cycle, Speeds, Current, , Safety systems etc.,	Major	Full Load test/ Measurement of parameters	100%	Approved dwg / IS807/ IS 3177 /Specification	Approved dwg / IS807/ IS 3177 /Specification	Load test report /Supplier's IR	2	1, 4	-	Measure Gear Box Noise. (Noise Level should be <85dBA) .
9.2.4	OVER LOAD (125% SWL) TEST (MH & CT)	Static test/ Capability of all motions/ Permanent set	Major	Capability of CT &Hoist motion/ Measurement	100%	Approved dwg / IS807/ IS 3177 /Specification	Approved dwg / IS807/ IS 3177 /Specification	Supplier's IR & Load test report	2	1, 4	-	Record procedure followed for test& measurement with sketch. After testing check for any damage, cracks/paint flaking in load bearing
10	PAINTING											
10.1	Sand/ Grit Blasting & Surface Cleaning	Surface Cleanliness/ texture visual inspection	Major	Visual	Random	Specification /SSPC SA2 1/2	Specification / SSPC SA2 1/2	Supplier's IR	2	-	1	
10.2	Primer Coat Painting	DFT Thickness/ visual inspection	Major	Measurement in µm / Visual	Random	Specification /DFT ≥75µm	Specification / DFT ≥75 µm	Supplier's IR	2	-	1	Paint thickness shall be measured with paint thickness gauge/ elcometer.

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									Performed	Witnessed	Verified	
A	B	C	D	E	F	G	H	I	J			K
10.3	Epoxy paint Painting (Two coats of 80 µm & 40 µm)	DFT Thickness/ visual inspection	Major	Measurement/ Visual	Random	Specification / DFT ≥195 µm	Specification / DFT ≥195 µm	Supplier's IR	2	-	1	Paint thickness shall be measured with paint thickness gauge/ elcometer . Final DFT measured in presence of TPIA.
11	ERECTION AT SITE											

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11.1	**GANTRY GIRDER RAIL ALIGNMENT**	Gantry rail Span, Level, straightness, rail Joints and Rail clamp distance.	Major	Measurement of parameters	100%	Approved drawing / IS 807 Specification / IS3177	Approved drawing / IS 807 Specification / IS3177	Supplier's IR	2	-	1	**Tolerances:** Rail span : ±5mm; Slope of rail : 1/1000 at 2m interval; Height diff : ±10mm between LH & RH rails; Rail Gap :2mm; Straightness of rails: ±5mm
12	**LOAD TESTING AFTER ERECTION AT SLC SITE. (applicable for all movements)**											
12.1	NO LOAD TEST (MH, CT & LT mechanisms)	NO Load test/ Performance & Safety systems verification speed, Current etc.,	Major	NO Load test/ Measurement of parameters	100%	Approved dwg /IS807/ IS 3177 /Specification	Approved dwg / IS807/ IS 3177 /Specification	Supplier's IR & Load test Format	2	1, 4	-	Measure Gear Box Noise. (Noise Level should be <85dBA).
12.2	DEFLECTION TEST With Safe Working Load	Deflection	Major	Measurement as per approved procedure.	100%	Specifications/IS807/ IS 3177	Specifications/ IS807/ IS 3177	Supplier's IR & Load test Format	2	1, 4	-	**Deflection < Span/1000** . Record procedure of test & measurement with sketch.
12.3	Hoist With Safe Working Load	Performance, duty cycle, Speeds, Current, , Safety systems etc.,	Major	Full Load test/ Measurement of parameters	100%	Approved dwg /IS807/ IS 3177 /Specification	Approved dwg / IS807/ IS 3177 /Specification	Load test report /Supplier's IR	2	1, 4	-	Measure Gear Box Noise. (Noise Level should be <85dBA) .
12.4	CT Mechanism With Safe Working Load	Performance, duty cycle, Speeds, Current, , Safety systems etc.,	Major	Full Load test/ Measurement of parameters	100%	Approved dwg /IS807/ IS 3177 /Specification	Approved dwg / IS807/ IS 3177 /Specification	Load test report /Supplier's IR	2	1, 4	-	Measure Gear Box Noise. (Noise Level should be <85dBA) .

Sl. No	Components/ Operations	Characteristic to be checked	Category	Type / Method of check	Extent of check	Ref. Document	Acceptance Norm	Format of record	Agency			Remarks
									Performed	Witnessed	Verified	
A	B	C	D	E	F	G	H	I	J			K
12.5	LT Mechanism With Safe Working Load	Performance, duty cycle, Speeds, Current, , Safety systems etc.,	Major	Full Load test/ Measurement of parameters	100%	Approved dwg / IS807/ IS 3177 /Specification	Approved dwg / IS807/ IS 3177 /Specification	Load test report /Supplier's IR	2	1, 4	-	Measure Gear Box Noise. (Noise Level should be <85dBA) .

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12.6	Brake Path Test/ Brakes Effectiveness testing for all motions	Each Brake holding Brake path / Delay between two brakes	Major	Measurement of path & Brake currents	100%	Specifications/ Brake path ≤17mm for Hoist	Specifications/ Brake path ≤17mm for Hoist	Load test report /Supplier's IR	2	1, 4	-	
12.7	OVER LOAD (125% SWL) TEST applicable for all movements (MH, CT and LT motions)	Static test/ Capability of all motions/ Permanent set	Major	Capability of CT &Hoist motion/ Measurement	100%	Approved dwg / IS807/ IS 3177 /Specification	Approved dwg / IS807/ IS 3177 /Specification	Supplier's IR & Load test report	2	1, 4	-	Record procedure followed for test & measurement with sketch. After testing check for any damage, cracks/paint flaking in load bearing members.
13.	Final Painting & touch up	Aesthetic look of crane/ DFT measurement	Major	Thickness measurement	Random	Tech . Specifications.	Tech . Specifications.	Supplier's IR	2	1, 4	-	Final DFT measured in presence of TPIA.
14	Safety features like limit switches, overload relays, buffers, stoppers etc.,	Performance, interlocks	Minor	Performance	100%	Tech . Specifications./ IS3177	Tech . Specifications./ IS3177	Supplier's IR	2	1, 4	-	
15	Decoupling of main hoist output shaft coupling to rope drum	Ensuring the decoupling of drive system	Major	Ensuring the removal and fixing of drive system	100%	As per specifications	As per specifications	Load test report /Supplier's IR	2	1, 4	-	
16	Inspection of Hydraulic System and yoke assembly	Telescopic system Fabrication and testing and power pack system, verification of Text Certificates	Major	Testing and Visually verification of components	100%	As per Spec.	As Per Spec	Suppliers IR	2	1,4	-	
17	Brought out items	Visual checks and Test certificate if any verified	Minor	TC Verified	100%	As Per requirement	As Per requirement	Suppliers IR	2	-	-	

Legend
1 Third Party Inspection Agency (TPIA)
2 Vendor (Suppliers)
3 Sub Vendor / Item Supplier
4. ISRO

Place:
Date:

Signature of TPI
with Designation

Signature of Crane Vendor
with Designation

18	Checking of Instrumentation system in an integrated way	Full demo at site only	Major	Owner to be checked	100%	As per Spec.	As Per Spec	Load test report	2	1,4		

Legend
1 Third Party Inspection Agency (TPIA)
2 Vendor (Suppliers)
3 Sub Vendor / Item Supplier
4. ISRO

Place:
Date:

Signature of TPI
with Designation

Signature of Crane Vendor
with Designation

CODES AND STANDARDS FOR FLAME PROOF LINAC HANDLING AND FILM POSITIONING SYSTEM	
The design, manufacture and testing of the crane shall conform to the latest editions of the following codes and standards where ever applicable:	
IS:807	Code of Practice for Design, Manufacture, Erection and Testing (Structural Portion) of Cranes and Hoists.
IS:3177	Code of Practice for Design of Overhead Traveling Cranes and Gantry Cranes other than Steel Works Cranes.
IS:2062	Steel for general structural purpose.
ANSI/AWSD14.1	Code of welding practice for Industrial cranes, Mill cranes and other material handling equipment
IS:800	Code of practice for use of structural steel in general building construction.
IS:3681	Gears tooth form and modules.
IS7403:1974	Code of Practice for Selection of Standard Worm and Helical Gear Boxes
IS4460:Parts1to 3:1995	Gears-Spur and Helical Gears-Calculation of Load Capacity
IS:1835	Steel Wires for Ropes
IS:6594	Technical supply conditions for steel wire ropes and strands.
IS:2266	Steel Wire Ropes for General Engineering Purposes.
IS:2363	Glossary of terms relating to wire ropes.
IS:3973	Selection, installation, maintenance and technical supply conditions of wire ropes.
IS:3443	Crane Rail Sections
IS:15560	Point hooks with shank up to 160 ton (if applicable)
IS:816	Code of Practice for Use of Metal Arc Welding for general Construction in Mild Steel.
IS:823	Code of Practice for Use of Metal Arc Welding of Mild Steel.
IS:1181	Qualifying Tests for Metal Arc Welders (Engaged in Welding Structures other than pipes).
IS:1323	Code of Practice for Oxy-Acetylene Welding for Structural Work in Mild steel.
IS:325	Three Phase induction Motors.

IS:4029	Guide for Testing Three Phase induction Motor.
ANSI/ASMEB30.2	Safety Codes for overhead and Gantry Cranes.
IS:2147	Degrees of protection provided by enclosures for low voltage switchgear and control gear.
IS:5571	Guide for election of electrical equipment for hazardous areas
IS:5572	Classification of Hazardous Areas(Other than Mines) for electrical installations.
IS2148:1981	Flame proof enclosures for electrical apparatus
IS2206:	Specification for Flame proof Electric Lighting Fittings
IS5780:1980	Specification for Intrinsically Safe Electrical Apparatus and Circuits.
IS:8239	Classification of maximum surface temperature of electrical equipment for use in explosive atmosphere.
IS:2208	HRC cartridge fuse links upto 650V.
IS:2959	Contactors for voltage not exceeding 1000VAC or 1200VDC
IS:4064	Air-break switches, Air-break dis-connector, Air-break switch dis-connector and fuse combination for voltages not exceeding 1000VAC or 1200VDC.
IS:4237	General requirements of switch gears and control gears for voltages not exceeding 1000VAC.
IS8623:1993/IEC Pub439-1:1985	Specification for Low- Voltage Switch gear and Control gear Assemblies - Part1 to Part3
IS13947:Part4: Sec1:1993/IEC Pub947-4-1:1990	Specification for Low-Voltage Switchgear and Control gear - Part 1 to Part 5 : Suppliers and Motor-Starters - Section 1 : Electromechanical Contactors and Motor Starters
IS10118:1982	Code of Practice for Selection, installation and Maintenance of Switchgear and Control gear
	PartI:General
	PartII:Selection
	PartIII:Installation
	PartIV:Maintenance
IS1024:1999	Use of Welding in Bridges and Structures Subject to Dynamic Loading – Code of Practice

SCHEMATIC OF PENDANT PUSH BUTTON for LINAC HANDLING SYSTEM

Crane Motion / Requirement		Selector Switch	No. of push button	Indication lamps
Main / Creep speed Selector		1No. for each movement		
Hoist	UP	-	1	-
	DOWN		1	
Cross Travel	Right	-	1	-
	Left		1	
Long Travel	Forward	-	1	-
	Reverse		1	
Tilt	UP	-	1	-
	DOWN		1	
Rotation	Right	-	1	-
	Left		1	
Stabilisation		-	1	1
De Stablisation		-	1	1
Emergency Stop	Mushroom Switch		-	-
Power ON /OFF		1	-	1
Safety Key On/Off		-	-	1
LINAC Laser ON/OFF		1	-	-
Local /remote selector switch		1	-	-
Horn On/Off		1	-	-
Crane Light On / Off		1	-	-
Pendant Display	LED 1 No Properly X-ray shielded	-	-	-

SCHEMATIC OF PENDANT PUSH BUTTON for FILM POSITIONING SYSTEM (FPS)

Crane Motion / Requirement		Selector Switch	No. of push button	Indication lamps
Main / Creep speed Selector		1No.for each movement		
Hoist	UP	-	1	-
	DOWN		1	
Cross Travel	Right	-	1	-
	Left		1	
	Right		1	
	Left		1	
Minor Long Travel	Forward	-	1	-
	Reverse		1	
Emergency Stop	Mushroom Switch	-	-	-
Power ON /OFF		1	-	1
Safety Key On/Off		-	-	1
Local /remote selector switch		1	-	-
Pendant Display	LED 1 No Properly X-ray shielded	-	-	-

SCHEDULE OF PRICES & GENERAL PARTICULARS

1. Bidders shall not alter the contents of this schedule of prices. If the bidder wants any additions / alterations, these shall be brought out separately in the format as given in this schedule of prices.

2. Equipment and material to be supplied and erected shall be in accordance with section A, B, C, D, E & F of this specification.

3. The quoted price shall be price in Indian Rupees.

4. Total price towards Third Party Inspection (to be borne by the supplier) shall be indicated separately in the price bid.

5. SDSC SHAR reserves right to place order in full or part of the scope.

PRICE FORMAT FOR LINAC AND Film POSITIONING SYSTEM SUPPLY, ERECTION AND SPARES

Crane Sl No.1 **Capacity: 5t + 50 Kgs** **Span: 20m** **Facility: NDT**

Tender No. & Date:

Bidder's Quotation No. & Date:

Sl.No	Item/Description	Qty	Price	GST	cost
1.	Design, Manufacture & Supply of Double Girder, VVVF drive, Flame proof EOT crane-based LINAC Handling and Film Positioning System of capacity: 5t+50 Kgs including, Gantry Girder, CT trolleys (2Nos.), Stabilisation (for LINAC), Yoke system and including spares as per specifications given in enclosed document.	1No.			
2.	Erection & Commissioning of above Double Girder, VVVF drive, Flameproof LINAC and Film handling System of capacity: 5t+50 kgs including, Gantry Girder and CT trolleys (2Nos.) as per specifications given in enclosed document.	1No.			
3.	Charges for Third party Inspection services for LINA and Film handling design, manufacture, erection & commissioning of LINAC Handling and Film Positioning System	1 lot			
4.	Transportation charges for LINAC Handling and Film Positioning System with all parts including packing & forwarding charges.	1lot			
	Total Cost				

Note :

a. The tender is on two part bid basis. In this regard, in the technical bid the above format shall be filled and uploaded with mentioning QUOTED".
b. **If prices are disclosed in the technical bid, their bids will not be considered for evaluation.**
c. In the price bid only, the prices shall be mentioned and uploaded.

Date:

Signature & Office Seal of the bidder

BID QUALIFICATION CRITERIA FOR SUPPLY OF EOT CRANE

Bidders who are qualifying / meeting following Technical and financial criteria are eligible to participate in the bid for supply of LINAC Handling and Film Positioning System for NDT facility, SLC. Bidder shall furnish all the information mentioned in the criteria with documentary proof and submit along with quotation. Bidder who are not meeting the following criteria will not be considered for evaluation and will be rejected without seeking any further clarifications.

A. Technical Qualification Requirements:

1. The Bidder should be an organization with an experience in having executed contracts for design, engineering, manufacture, supply, erection, testing and commissioning of Double girder-based crane (Flame Proof) for precise handling of Yoke based Scientific Machine (Machine weight 2 to 5t) handling for last 10 Years in India, ending by 31-03-2025.
2. The firm should have successfully completed Design, Manufacture, Installation, Testing and Commissioning of at Least one number of double girder-based cranes (Flame Proof) for precise handling of Scientific equipment with VVVF drive control system of capacity 2 t or above and Span equal to 10m and above during last 10 years, ending by 31-03-2025. or
   Bidder shall have the experience in fabrication & delivery of telescopic hoisting systems with SWL more than 2t. Bidders have to provide performance certificates from the end user or shall submit the PO copy.
3. The firm should have facility to full load test at factory and full load and over load testing of 1.25 times of 5t of Handling system at site. (hoist, cross travel, Tilt. Rotation)
4. Bidder shall furnish the details of their factory like manpower, machinery, quality system etc, for department to assess their capability. Bidder shall submit above information in the format given in "Questionnaire "attached as Annexure (G3) to this BQR (this needs expansion)

B. Financial Qualification Requirements:

1. The Bidder should have annual turnover of not less than a value of Rs. 4.5 crores per year in the last three financial years ending with 31.03.2025
2. Bidder should have undertaken and successfully completed Single work order for cranes, used for specialized purpose (like Handling of Radiographic equipment, weighing above 4t or Handling of Radiographic Detector weighing above 2t (including shielding)), not less than: Rs.1.5 crore value of works at least in last 10 (Ten) years.
3. IT/ TDS certificate shall be submitted with Loss & Profit for last three years
4. Bidder shall submit audited statement of financial status for last three years.

C. The following documents shall be submitted along with the prequalification of Bid:

1. Firm establishment certificate and nature of work.
2. Details of work of similar type completed during the last 10 years ending 31.03.2025.
3. Satisfactory work Completion certificates or Client PO Copy
4. Copy of audited Balance sheets for last three years.
5. Current Solvency Certificate for a sum of Rs. 1.5 Cr
6. List value and work order copies of total projects under Execution with Purchaser name and address.
7. Structure and organization Chart.
8. List of personnel with qualification & experience in the firm in the areas of design production, quality safety administration etc.
9. List of Machinery & Equipment to be used for the work.
10. Any other relevant information which is related to above.

D. IMPORTANT NOTES:

1. Bidder shall furnish all the above details fully and explicitly
2. Please note that the "BID" without above mentioned the documents/information in support of the eligibility criteria will be summarily rejected.
3. No further clarification will be sought in this regard.

E. Bid Selection Procedure and Process of BID Qualification

Step-1 Short listing based on documents submitted, satisfying all the eligibility criteria given above by the firm or individual along with their Bid/application. (Non submission of any document as given in above list within stipulated time leads to rejection of Bid)

Step-2 Subsequently Bidder's competency, their technical achievements and financial status will be evaluated suitable for this project. Feedback from Bidder's clients will be verified.

Step-3 Visit to sites by technical team (ISRO or Third party) where Bidder has established above mentioned capacity of manufacturer.

Step-4 If required to visit will be made to their factory/ firm by technical team (ISRO or third party) for accessing the capacity of manufacturer.

Step-5 Mean while technical Bids will be opened and scrutinized for meeting all technical specification and supply conditions.

ISRO – SDSC SHAR reserves right to verify the information/data furnished by Bidder. If the
same is found as false or with any deviation the bid will be summarily rejected.

Only those Bidders who are found suitable & meeting all the above qualification Criteria/ requirements will be finally qualifying for opening of the price Bids evaluation

QUESTIONNAIRE FOR DESIGN, MANUFACTURE, TESTING AND ERECTION OF LINAC HANDLING AND FILM POSITIONING SYSTEM (INFORMATION TO BE PROVIDED BY BIDDERS)

Name & Address of Crane Supplier:
Phone:
Mobile
Email:

Sl. No	Items/Information	Specification/details of items
1	Type of Industry (SSI, Medium, Govt, etc.,)	
2	Year of Establishment	
3	Annual Turnover (In Rs.Lakhs) for last three years year ending up to 31.03.2025	
3.1	Turn over – 2022-2023 (Rs.)	
3.2	Turn over – 2023-2024 (Rs.)	
3.3	Turn over – 2024-2025 (Rs.)	
4	Orders executed during last 07 years capacity of EOT Crane based Handling system used for specialised handling, references are is to be mentioned. (Separate sheet can attached for this)	
5	Quality Certification of company (ISO,TUV,etc.,)	
6	No of Cranes, supplied for specialised application, with capacity, span and years of experience shall be as per the section A1,2 B2 and C2 of Sec. G2.	
7	Shop floor Area Covered	
8	No. of Employees (Supplier shall mention contract personnel separately) a. Engineers b. Supervisors c. Technicians d. Quality control engineers Administrative staff	
9	Raw Material Sourcing: a. Steel Plates b. Rolled sections, Flats c. Forged Rods, Blanks d. Round bars (for Axles) e. Seamless pipes	

	f. Hydraulic components	
10	Sources of Bought out components: a. Electric Motors b. Brakes Flameproof & Indigenous c. Gear Boxes d. Couplings e. Limit switches f. Wire ropes g. Electrical Panels h. VVF drives i. Cables j. FLP items k. PLC Software l. Hydraulic Components	
11	Details regarding out sourcing, if any, of manufacturing and fabrication works.	
12	Handling facility available: a. Over head/Grantry crane details (capacity, span, lift) b. Mobile cranes	
13	Load testing Facility Available: a. Maximum weight available. b. No.of weights c. Total test load available	
14	Welding/fabrication Workshop (Type/capacity/Quantity of machines shall be provided) a. MMAW machines b. GMAW machines c. Gas cutting m/cs d. Plasma cutting m/cs e. Welding Fixtures	
15	Fixtures available for Welding of Girders of span more than 10m	
16	Welding Professionals: a. No.of welders (MMAW) Qualification details Qualified by	

	Qualified by b. No.of Welders (GMAW) Qualification details Qualified by c. No.of welders (TIG) Qualification details Qualified by	
17	Details of Welding Inspection Equipment & welding inspector available with supplier (LPT, UT, MPT, X-ray, etc) Any out sourcing can be mentioned	
18	Forming Facilities available (with brief specification of each machine) a. Shearing Machine b. Cutting Machine c. Bending Machine	
19	Machining Facilities available (with brief specification of each machine) a. Turning Lath (Conventional/CNC) b. Milling Machine (Conventional CNC) c. Gear cutting/hobbing machines d. Gear Grinding machines e. Drilling Machine (Conventional/CNC) f. Cylindrical Grinding Machine(Conventional/CNC) g. Any other machines	
20	Details of Inspection facilities/ instruments available (Brief description & specifications shall be provided)	
21	If third party inspection services are taken for manufacturing of EOT Cranes give details.	
22	Range of Capacity of Specialised application Cranes manufactured till now (list with brief specs & customers shall be provided)	
23	Design facility available: a. Drafting & Modeling software packages b. FEM software	

	c. Other Software d. Design engineers (with qualification & experience)	
24	Painting facility available a. Sand/Abrasive blasting facility. b. Painting equipment c. Make of paints generally used.	
25	General stock level of Raw material/Brought out items in the factory: 1. Structural steel plates etc., 2. Alloy steel round bars 3. Bought out items 4. Paints, etc.,	
26	Any awards or recognitions obtained through product excellence	
27	Collaboration with other reputed manufactured and OEMs with product details and Name Principal supplier, country of origin etc.,	
28	Any other relevant information in design, manufacture and testing of Special purpose cranes to be disclosed.	
29	List of documents enclosed with this questionnaire	
30	Any other information would like to add (separate sheet can be attached)	

Signature:
Name:
Designation:
Company:

Date:

EXCEPTIONS AND DEVIATIONS

In line with Proposal Document, Bidder may stipulate Exceptions and deviations to the Proposed conditions if considered unavoidable.

Slno	Reference in Specification		Dept. Specification	Offered Specification	Deviation
	Page no	Clause no			

NOTE :

Only deviations are to be written in the above form.

Any deviations taken by the Bidder to the stipulations of the Proposal document shall be brought out strictly as per this format and enclosed along with the bid.

Any deviations not brought out in this Proforma and written elsewhere in the Proposal document shall not be recognized and the same is treated as null and void.

Any wilful attempt by the Bidders to camouflage the deviations by giving them in the covering letter or in any other documents that are enclosed may render the Bid itself non-responsive.

SIGNATURE : _____

NAME : _____

DESIGNATION: _____

SEAL OF THE COMPANY DATE : _____

SCHEDULE OF BIDDERS EXPERIENCE

The bidder shall furnish here under a list of Flame proof double girder based LINAC Handling and Film Positioning System (Specialized Purpose) works executed by him to whom a reference may be made by the PURCHASER in case the PURCHASER considers such a reference necessary.

SL. NO.	Name & address of Client / Name & address of project or plant (incl. tel.no., fax no., e-mail and name & designation of person who can be contacted.	Purchase Order / Contact no. and Date.	Brief details of equipment / system covered	Scope of services	Contract price (Rs)	Scheduled date of completion	Actual date of completion	Reasons for delay in completion, if applicable.	REMARKS

SIGNATURE: :
NAME :
DESIGNATION:
COMPANY :
DATE :

COMPANY SEAL

SCHEDULE OF BIDDERS PRESENT WORK (optional)

The bidder shall furnish here under a list of Flame proof double girder based LINAC Handling and Film Positioning System or similar kind of work (Specialised Purpose) being executed to whom a reference may be made by the PURCHASER in case the PURCHASER considers such a reference necessary.

SL. NO.	Name & address of Client / Name & address of project or plant (incl. tel.no., fax no., e-mail and name & designation of person who can be contacted.	Purchase Order / Contact no. and Date.	Brief details of equipment / system covered	Scope of services	Contract price (Rs)	Scheduled date of completion	Expected date of completion	REMARKS

SIGNATURE: :
NAME :
DESIGNATION:
COMPANY :
DATE :

Company Seal

SP PEC NO.: SLC- CRANE	**SSLV LAUNCH COMPLEX, SDSC-SHAR**	SECTION: G6
	LINAC Handling and Film Positioning System	SHEET : 1 OF 1

CHECK LIST

Sl no	Description	Response by supplier
1.	All documents related to Prequalification criteria mention in Section G2 have been met and all related documents are enclosed in technical Bid	Yes / No
2.	Are all the technical particulars as called for in the data sheets section A, B, C, D, E & F and commercial details as called for in schedule of prices filled up	Yes / No
3.	The detailed scope of work and technical specifications is understood and price was quoted accordingly.	Yes / No
4.	Supplier shall take proper care while storing the equipment and shall provide watch & ward at his own cost at SLC site	Yes / No
5.	Confirmation that the quoted prices are firm and fixed till the completion of scope of work.	Yes / No
6.	Validity of Offer is 4 months (minimum).	Yes / No
7.	Vendor Evaluation Format is attached	Yes / No
8.	Delivery Schedule with milestones	Yes / No
9.	Accepted the Department Payment Terms (As per Sec:B, 3.19)	Yes / No
10.	Are General terms and Conditions of Contract for Supply & Erection included in proposal acceptable?	Yes / No
11.	If not acceptable, are the deviations brought out in the "Schedule of Deviations"	Yes / No
12.	Are there any deviations from enquiry technical specifications?	Yes / No
13.	If there are technical deviations, are these filled in "Schedule of Deviations from Tech. Specifications"?	Yes / No
14.	Warranty for the fully commissioned and accepted system is 12 months	Yes / No
15.	3 % of the Order Value shall be submitted as Performance Bank Guarantee, which is valid till completion of the warranty period plus 02 months claim period.	Yes / No
16.	Liquidated Damages are acceptable	Yes / No
17.	Last three years audited financial results are enclosed	Yes / No
18.	Registration certificate of the company is enclosed	Yes / No
19.	All the forms in Section G1 to G6 are filled	Yes / No
20.	Are all data sheets duly filled in and submitted in offer	Yes / No
21.	Technical documents / drawings are attached along with technical bid	Yes / No

Signature of the tenderer.