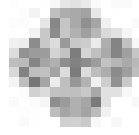


বসু বিদ্যালয়

BOSE INSTITUTE

P-1/12, C.I.T. Scheme VII-M, Kolkata 700 054, West Bengal, India

Ref : BI-K/E-TEND/19/2019-20



বসু বিদ্যালয়

BOSE INSTITUTE

P-1/12, C.I.T. Scheme VII-M, Kolkata 700 054

BIDDING DOCUMENTS

For Tender Notice No.

BI-K/E-TEND/19/2019-20

To be addressed to:

Registrar (Officiating)

Bose Institute, Centenary Building,

P-1/12, CIT Scheme - VII -M

Kolkata - 700054 (INDIA)

INVITATION TO BIDS

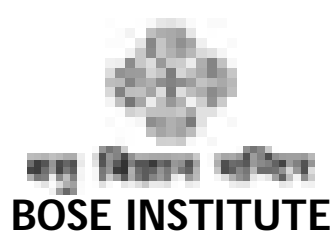
Bose Institute, Kolkata, West Bengal, India invites **online** offers from **Indian manufacturers** or their Authorized Dealers for supply, installation and commissioning of the following item :

Sl. No.	Name of the items	Qty.	Bid security (EMD)
1.	100K CLEAN ROOM	16	INR 7,00,000.00

- **Details of Prequalification criteria are enclosed in Annexure - I**
- **Details of specifications are enclosed in Annexure - II**

Sl. No.	Particulars	Date & Time
1.	Date of uploading of NIT & other documents (Online) (Publishing date)	28.9.2020
2.	Documents download start date (Online)	28.9.2020 at 14:00 hrs.
3.	Clarification Start date Queries to be sent to the mail id bipurchase@jcbose.ac.in)	28.9.2020 at 15:00 hrs.
4.	Clarification End date	02.10.2020 at 17:00 hrs.
5.	Amendment (if any) (On line)	09.10.2020 at 18:00 hrs.
6.	Bid submission start date (On line)	10.10.2020 at 17:00 hrs.
7.	Documents download end date (Online)	16.10.2020 upto 17:00 hrs.
8.	Bid Submission closing (On line)	16.10.2020 upto 17:00 hrs.
9.	Last Date of submission of Earnest Money Deposit Including the technical brochure, if any (Off line)	19.10.2020 upto 17:00 hrs.
10.	Bid opening date for Technical Proposals (Online)	20.10.2020 at 12:00 hrs.
11.	Date of uploading list for Technically Qualified Bidder (online)	To be notified later
12.	Date for opening of Financial Proposal (Online)	To be notified later

Director, Bose Institute reserves the right to accept or reject any or all tenders either in part or in full. The reasons for rejecting the tender of a prospective bidder will be disclosed only when enquiries are made.

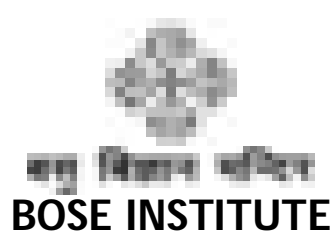


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SECTION - A
INSTRUCTION TO BIDDERS

- A. General guidance for e-Tendering :** Instructions / Guidelines for electronic submission of the tenders have been annexed for assisting the vendors to participate in e-Tendering.
1. **Registration of Vendors :** Any vendor willing to take part in the process of e-Tendering will have to enrol and get registered in the Central Public Procurement (CPP) Portal, NIC, GOI through logging on to <http://eprocure.gov.in/eprocure/app> and the vendor is to click on the link for e-Tendering site as given on the above.
 2. **Digital Signature certificate (DSC) :** Each vendor is required to obtain a Class-II or Class-III Digital Signature Certificate (DSC) for submission of tenders as applicable from the approved service provider of the National Informatics Centre (NIC) on payment of requisite amount. Details are available at the Web Site stated in Clause A.1. above. DSC is given as a USB e-Token.
 3. The vendor can search & download N.I.T. & Tender Document(s) electronically from computer once they log on to the website mentioned in Clause A.1. using the Digital Signature Certificate. This is the only mode of collection of Tender Documents.
 4. **Submission of Tenders:** Tenders are to be submitted through online as stated in Clause A.1. in two folders at a time for each bid, one in Technical Proposal & the other is Financial Proposal before the prescribed date & time using the Digital Signature Certificate (DSC). The uploaded documents are to be virus scanned and duly Digitally Signed. The documents will get encrypted (transformed into non readable formats).
 5. A. **Technical Proposal:** The Technical proposal should contain scanned copies of the following in two covers (folders).
 - (a) **Statutory Cover** containing the following documents :
 - (i) **NIT (upload the published NIT accepted using digital signature)**
 - (ii) Bidders' Information Form
 - (iii) Bid Form
 - (iv) Techno-Commercial Bid Form
 - (v) Manufacturer's Authorization Form
 - (vi) Bidder's Performance Statement Form
 - (vii) Service Support Details Form
 - (viii) Technical Compliance Statement Form
 - (ix) **Fall Clause Certificate**
 - (x) **Integrity Pact**



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- (b) **Non-statutory Cover** containing the following documents :
For indigenous quotes the bidder has to upload requisite registration / tax certificate like TAN, PAN, GST etc.

CONTENT OF TENDER DOCUMENTS:

Online open tender has been invited from the reputed manufacturer of Class 100K Clean Rooms and other allied services for Supply and Installation in the Unified Academic Campus of Bose Institute, Kolkata in Block-EN, Sector V, Salt Lake City, Kolkata - 700091.

The tender document consists of two parts:

PART-I: TECHNICAL BID:

- A. PRE-QUALIFICATION CRITERIA
- B. TERMS & CONDITIONS
- C. TECHNICAL BID

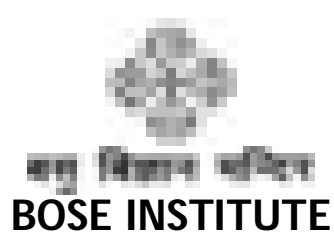
PART-II: FINANCIAL BID:

A. QUOTED MULTISHEET BOQ CONTAINING DETAILED BREAK-UP OF PRICES.

Intending bidders are hereby requested to upload the technical bid and financial bid separately in two separate covers as mentioned in the tender detail through CPP Portal using digital signature certificate of the authorized signatory. Proof of document that indicate the price should not be uploaded in the technical cover. If such document is found in the technical cover, the entire bid shall be liable to be cancelled without any prior intimation to the bidder. Proper documentation with clear visibility of scanned documents are to be ensured before uploading the bid document. The interested **bidders are expected to visit the proposed site** before submitting the tender at their own cost. **Please see the BOQ filling instruction sheet to ensure proper bid submission in the financial cover.**

The Institute may provide the following Documents to the Successful Bidder, if required:

- 1) Custom Duty Exemption Certificate, as applicable
- 2) The institute would provide way bill as per requirement
- 3) GST Exemption Certificate, as applicable



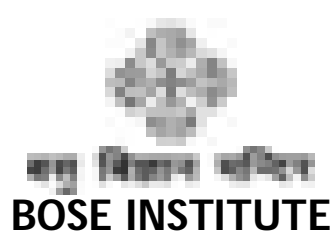
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6. Earnest Money Deposit :

- (a). Demand Draft / Bankers Cheque / Bank Guarantee towards Earnest Money (EMD) as prescribed in the N.I.T. should in favour of "Bose Institute" payable at Kolkata.
- (b). Demand Draft / Bankers Cheque / Bank Guarantee towards Earnest Money (EMD) as prescribed in the N.I.T. against each of the instruments **in favour of "Bose Institute" payable at Kolkata** (original hard copy) **along with a covering letter stating the bank details for releasing the said EMD online by the Institute, as per norms** to be submitted to the Purchase Section (Import) at the Centenary Building, P-1/12, CIT Scheme VII-M, Kolkata 700054.
- (c). **Bidder must upload copy of valid registration certificate (i.e. MSME, NSIC) for EMD exemption.**

<u>GENERAL INSTRUCTIONS</u>
<ul style="list-style-type: none"> The bids would be opened in the presence of the bidders who wish to attend the Bid-opening. However, the representative should bring with them a letter of authority from the corresponding bidders, without which, they are not permitted to attend the bid opening.
<ul style="list-style-type: none"> The acceptance of the quotation will rest with the competent authority of Bose Institute, Kolkata who does not bind himself to accept the lowest quotation and reserves the right to Himself to reject, or partially accept any or all the quotations.
<ul style="list-style-type: none"> The offer shall be valid for hundred twenty days (120 days) from the date of opening of the technical bid. No revision in price will be allowed after opening the quotation.
<ul style="list-style-type: none"> Unsolicited / conditional / in complete / unsigned digitally tenders shall not be considered.
<ul style="list-style-type: none"> <u>Offers that have been blindly copied from the tender specifications are not acceptable and shall be rejected.</u>
<ul style="list-style-type: none"> The Bidder / Company should not be in the list of black listed firms by any Govt. Dept. / agencies.
<ul style="list-style-type: none"> The price comparison will be decided as per BOQ comparative chart on the date of opening of financial bid.
<ul style="list-style-type: none"> Prices are required to be quoted in units. When quotations are given in terms of other units, relationship between two sets of units should be furnished. Quantity discounts, if any should also be indicated. The items should be quoted indicating the serial nos.
<ul style="list-style-type: none"> To assess in the examination / evaluation, comparison and post qualification of the bids, purchaser may at its discretion, ask the bidder for a clarification of its bid. The request for clarification and the response shall be in writing and no change in the prices or substance of the bids shall be sought, offered or permitted. Any clarification submitted by the bidder in respect of its bid which is not in response to a request by the purchaser shall not be considered.
<ul style="list-style-type: none"> Two or more vendors cannot submit bid quoting the rates on behalf of same OEM.
<ul style="list-style-type: none"> The Institute is registered with Department of Scientific & Industrial Research, Govt. of India and thus is exempted from Customs/Central Excise duty vide notification no. 10/97 dated 01.3.1997 and 16/2007 dated 01.03.2007. The present details of registration are no. 11/106/1988-TU-V dt. 31.3.2018.
<ul style="list-style-type: none"> The mode of dispatch of the items must be mentioned clearly in the quotation.
<ul style="list-style-type: none"> Samples, if called for, shall be submitted free of charge and on no obligation basis.
<ul style="list-style-type: none"> The offered delivery period shall have to be strictly adhered to in case an order is placed.



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SECTION-B

GENERAL TERMS & CONDITIONS

1. The procurement will be made by Bose Institute in compliance to the Govt. of India Rules framed for public procurement.
2. ***The procurement will be made by Bose Institute in compliance with the Govt. of India rules framed for public procurement from time to time Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the competent authority.***

In this regard the clause and conditions issued as per Ministry of Finance, Department of Expenditure, Public Procurement Division order no F.No.6/18/2019-PPD dated 23 July 2020, must be strictly adhered to and necessary certification as mentioned in the subject order must be submitted alongwith the tender.

3. The Tender document can only be downloaded from the website: <https://eprocure.gov.in/eprocure/app> only after the time of "Document Download / Sale Start Date till Document Download / Sale End Date as shown in the schedule of tender.
4. The Institute reserves the right to reject any or all the bidders at any stage or accept them in part or reject the lowest tender without assigning any reason thereof. The Institute reserves the right to relax or tighten the Terms and Conditions given in the tender documents as per norms.
5. The Institute will initially issue Letter of Intent to the awarded vendor, who have actually participated in the tender, found eligible in all respects and have fully complied both in Technical as well as financial evaluation, and upon consequent acceptance and approval of the competent authority of the Institute. The bidder is then expected to prepare the GFC drawings and the final SOQ. The purchase order(s) shall be subsequently issued after the receipt and due approval of GFC drawings and finalized BOQ.
6. **Preparation and Submission of Bid:**
 - a. Bid is to be submitted on-line through the website stated above. All the documents uploaded by the Tender Inviting Authority forms an integral part of the contract. The bidder is required to upload entire set of tender documents along with other related documents as asked for in the tender document through the above stated website within the stipulated date and time mentioned in the **schedule of the tender**.
 - b. Bid is to be submitted in two folders namely "Technical Cover" and "Financial Cover" (as mentioned in the **cover details**) within due date and time. The bidder shall carefully go through the documents and prepare to upload the scanned documents in Portable Document Format (PDF) files in the designated locations in the portal as Technical Bid. The bidder is required to fill up the rates of items in the provided BOQ in the designated cells (SOQ_supply and SOQ-Installation) and upload the same in the designated location in the portal as Financial Bid. Please follow the INSTRUCTION FOR FILLING UP THE PRICE-BID (BOQ/SOQ)

to ensure full compliance. If price is disclosed in the technical cover, the entire bid shall be rejected without any prior intimation to the respective bidder.

- c. Documents uploaded are to be digitally signed using the Digital Signature Certificate (DSC).[Class -II or Class III with organization name]
- d. Documents once uploaded can only be changed / replaced till the last date of submission of bid and after this date and time no changes are allowed.
- e. **Multiple bids on behalf of the same manufacturer are not allowed. In such a circumstance, bids shall be rejected.**
- f. The Institute is registered to the Department of Scientific & Industrial Research, Govt. of India and is thus exempted from customs duty vide notification no. 51/96 dated 23.7.1996 and GST exemption as per Govt. of India notification 45/2017 and 47/2017 dated 14.11.2017. The present details of registration are no. 11/106/1988-TU-V dt. 23.4.2018 valid upto 31.3.2021.

7. Cover Details:

a) Technical Cover:

• **Statutory Cover:**

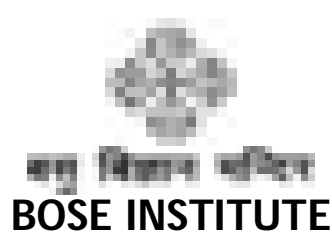
- Fees:** Scanned copy of EMD **to be uploaded**

PQC / Technical: Duly filled-up and signed **Annexure- I to X**, NIT should be uploaded in this cover. A point-to-point technical compliance is to be ensured and such a document must also be prepared and uploaded. All the scanned documents in support of the eligibility criterion should also be uploaded in this cover. Bidders may upload any other relevant documents or their technical/financial credibility in this section as per the tender details.

b) Financial Cover:

- Only the commercial/financial bid in the downloaded BOQ should be uploaded in this folder without tampering the BOQ Template.
- Any other information regarding the Price Bid should be uploaded (in **pdf format**) in the additional folder only in financial cover as mentioned in the tender details.
- Please refer to BOQ filling up instruction sheet for preparation and submission of the financial quote.
- The bids submitted by the vendors should be valid for a minimum period of 120 days from the date of the opening of the technical bid and the quoted price should be valid throughout the currency of contract and no price variation would be allowed under any circumstances.

- 8. Two Bid Systems:** - The two bid systems should be followed for this tender. In this system the bidder must upload the technical and financial bid documents to the respective folder correctly. Scanned copy of bid documents with clear visibility to be uploaded by the bidders as per eligibility criteria.



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9. Each page of the tender document submitted by the company must be digitally signed.
10. **Validity of Bid:** 120 days from the date of opening of Technical Bid.
11. The selected vendor will be initially issued a letter of intent for execution of the work. The bidder is then required to visit the Institute site and meet the end-users for finalizing the exact GFC drawing and requirement and submit the same to the Institute authority for issuance of the formal purchase order. The same must be completed within a maximum time span of 30 days from the date of issue of the letter of intent. The purchase order may be segregated for supply items, if required.
12. **Period of Completion:** The supply, installation & commissioning of the items in the tender should be executed within 6 months from the date of issuance of Work Order.
13. **Liquidated damage:** If the installation of the all items are not made within stipulated period, a compensation will be payable for non- adherence to the committed installation schedules by the vendor to Bose Institute Kolkata as follows:

1% of the total order value per week or part thereof of delay in installation, subject to maximum of 10% of total order value or the difference in rate if Bose Institute Kolkata decides to purchase the items from open market whichever is higher.
14. All the items to be supplied should be new, good quality, standard and conform to the technical specifications mentioned in technical bid document. Factory certification in this regard should be submitted. The Institute reserves the right to get any of the supplied products tested by the approved testing centres or any other agency decided by the Institute. Expenditures in this regard, if any, shall be borne by the vendor/supplier. Institute reserves the right to reject the supplies in case such tests fail to give satisfactory results.
15. **Force Majeure:** The Supplier shall not be liable for forfeiture of its performance security, liquidated damages or termination for default, if and to the extent that, its delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure. If a Force Majeure situation arises, the Supplier shall promptly notify the Purchaser in writing of such conditions and the cause thereof. Unless otherwise directed by the Purchaser in writing, the Supplier shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.
16. The installation of above items will be at the new laboratories in the Bose Institute, Unified Academic Campus, Kolkata, Salt Lake, Sector-V, Block-EN, Kolkata-700091.
17. The party has to make their own arrangements for boarding & lodging for their manpower deployed during installation. During installation party has to abide by all statutory requirements, safety norms and government rules applicable to them without creating any damage to the Institute premises and properties. For any such damage, the vendor shall be responsible for fixing the same at their own cost. Alternatively, they may be allowed to pay a compensation decided by the Institute authority.

18. PRICE:

- a. Unit price in foreign currency means delivered price up to Bose Institute, Kolkata including insurance, packing & forwarding, freight & transportation (up to Bose Institute, Unified Academic Campus, Salt Lake City, Sector-V, Kolkata-700054), loading, unloading & warranty charges on **DDP basis**.
- b. Unit price in INR means delivered price up to Bose Institute Kolkata, including insurance, packing & forwarding, transportation (up to Bose Institute, Unified Academic Campus, Salt Lake City, Sector-V, Kolkata-700054), loading, unloading & warranty charges.
- c. Though the BOQ uploaded is the multicurrency BOQ. However, the Institute prefers the prices to be quoted in INR.
- d. As per Govt. Notification # 45/2017 dt.14th November, 2017, Scientific Research Institute funded by the Govt. of India, GST will be applicable @5% for the items used for research purpose, for the bids where GST will be applicable, against Certificates to be provided by the Institute.

19. PAYMENT TERMS:

Payment for the items to be supplied by the vendor against the purchase order shall be made by Bose Institute, Kolkata as follows -

- **For supply Items Quoted in INR:** 60% payment will be made by the Institute against delivery, receipt and inspection FOR destination/delivery at site. Remaining 40% will be paid after successful installation, commissioning and final acceptance of the items at Bose Institute in good condition and to the entire satisfaction of the end-user along with submission of warranty certificate by the vendor. The Institute reserves the right to deduct any amount from the bill(s) as deemed fit if the supplier(s) fails to supply and install as per this tender and satisfaction to the end-user.
- **Payment for installation charges** will be released only after complete supply of the items and satisfactory installation and commissioning of the items, and submission of the completion certificate approved by the Institute.

NOTE: The Institute reserves the right to increase or reduce the quantity of items as mentioned in the SOQ without any change in the rate per unit quoted by the bidder in its Financial Bid.

20. Performance Security:

The successful Bidder is required to furnish a Performance Security, within equal to 10% of Purchase Order (P.O.) in the form of an account payee Demand draft, Fixed deposit receipt, Bank Guarantee etc from any Commercial Bank in favour of "Bose Institute" payable at "Kolkata". Performance Security should remain valid for a period of sixty (60) days beyond the date of completion of all contractual obligations of the successful Bidder including warranty obligation/completion of comprehensive maintenance period. The performance security has to be submitted within 10 days of signing of the agreement, after issuance of formal purchase order.

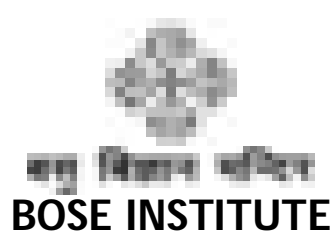
21. Supplier Integrity

The Supplier is responsible for and obliged to conduct all contracted activities in accordance with the Contract using state of the art methods and economic principles and exercising all means available to achieve the performance specified in the contract.

a. As per directive of the CVC and/or DST, Bose Institute, Kolkata have to adopt an Integrity Pact (IP) to ensure transparency, equity and competitiveness in major Public procurement activities. The integrity pact envisages and agreement between the prospective bidders/vendors with the buyer committing the persons/officials of both the parties with the aim not to exercise any corrupt influence on any aspect of the contract. Only those bidders/vendors who have entered in to such an integrity pact with the buyer i.e. Bose Institute, Kolkata, would be competent to participate in the bidding. It is, therefore, mandatory to make it a condition for qualification in the bidding process in the tender document.

b. IP envisages Panel of Independent External Monitors (IEMs) which shall be provided/recommended by Bose Institute Kolkata and approved by CVC and/or DST. The model format of Integrity Pact is attached in ANNEXURE-III.

22. Warranty: All the clean-rooms and components thereof, except the consumables such as filters, must be supplied with a warranty of two years from the date of installation and additional three years of maintenance service. The epoxy flooring should be warranted for a minimum of three years against chipping.



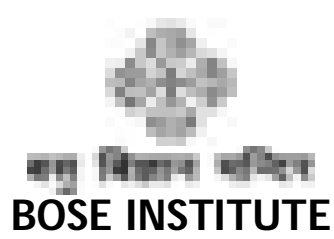
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23. The tender must be submitted in the prescribed tender document issued by the Bose Institute, Kolkata. Any other technical details required to supplement the information quoted in the prescribed tender document may please be attached separately. The information asked in the tender document should be given at the place provided for it in the tender document. The tender in which information is not given at the place provided for it or not in the similar format given in the tender document may be rejected.
24. Conditional bid submitted by the bidders will not be accepted by Bose Institute, Kolkata.
25. The documents containing bids shall be free from cutting and erasures. However, alterations, if any, in the tender should be attested properly by the bidder, failing which the tender is liable to be rejected.
26. The tenders submitted by telex/fax/email or any other mode other online process through CPP Portal, will not be considered. No further correspondence will be entertained on this matter.
27. Tender will be rejected, if technical specifications offered by the firm in the technical bid differ from that of the financial bid.
28. Bose Institute, Kolkata requires that the bidders who wish to bid for this project have highest standards of ethics. Bose Institute, Kolkata will reject a bid if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices while competing for this contract. Bose Institute, Kolkata may declare a vendor ineligible, either indefinitely or for a stated duration, to be awarded a contract if it at any time determines that the vendor has engaged in corrupt and fraudulent practices during the execution of contract.
29. Any conditional offer will lead to disqualification of tender.
30. AWARD OF CONTRACT:
Bose Institute, Kolkata shall award the Contract to the bidder whose evaluated bid has been determined to be technically suitable and financially lowest and is substantially responsive to the bidding document, provided further that the bidder is determined to be qualified to execute the contract satisfactorily.
 - Purchaser's Right to Vary the Quantities: Bose Institute, Kolkata reserves the right at the time of award or during execution of Contract to increase or decrease the quantity of items specified in the Schedule of Quantities without any change in price or other terms and conditions.
 - The selected vendor has to give their acceptance on the letter of intent within 3 days of it's issue.
 - If formal purchase order is issued to the vendor, then they have to give their acceptance on the PO within 7 days of it's issue. They also have to enter into an agreement with the Institute within 10 days of issue of the formal PO, in applicable format to be provided by the Institute, incorporating the tender terms and conditions.

- 30 The decision of Director, Bose Institute, Kolkata is final and binding in case of any dispute arising out of this contract.
- 31 The committee designated by Director Bose Institute, Kolkata may inspect, if required, those organization to assess the quality of work, infrastructure & obtain feedback from the users only after technical evaluation.
The committee will submit their report on the basis of their visit or otherwise, after due evaluation based on the documents and/or physical inspection of the site of the parties.
32. All the documents to be uploaded on CPP Portal should be digitally signed by the authorized representative of the bidder. Hardcopies of any technical brochure and leaflets, in support of the technical bids, may be submitted to Purchase Section, Bose Institute, P-1/12 CIT Scheme VIIM, Kolkata - 700054 along with the EMD and Tender fees.
33. **Applicable Law and arbitration:** All dispute arising out of this contract shall be referred to the sole arbitration of a person selected out of the panel of three persons nominated by the Director, Bose Institute, and his decision /award shall be final and binding on both parties. The Arbitration shall be governed under the Indian Arbitration Act 1996 or any statutory modifications or re-enactment thereof and rules made there under and for the time being in force shall apply to the arbitration proceeding under this contract. The Contract shall be interpreted in accordance with the laws of the Union of India and all disputes shall be subject to place of jurisdiction at Kolkata.
34. **SCOPE OF CONTRACT:** The contract comprises the supply, installation, commissioning of items and necessary civil modification work as per the site condition mentioned in the contract, and the provision of all labour, materials, constructional plant, equipment and transportation, temporary works and everything, whether of a temporary or permanent nature required in and for such installation & commissioning so far as the necessity for providing the same is specified in or reasonably to be inferred from the contract. The supplier shall make his own arrangements for the safe storage of materials; accommodation for his staff etc. and no claim for the temporary accommodation from the supplier shall be entertained. After the tender process, the successful bidder needs to submit the lab wise drawing and updated BOQ for the issuance of the purchase order.



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35. The successful bidder shall be required to enter into an agreement with the Institute within 10 days of issue of P.O. on non-judicial stamp paper of appropriate value. The Schedule of quantities & rates filled in by the successful bidder, the general terms & conditions of the tender, Specifications for Civil & Electrical Works, the Special conditions, additional specifications, and the award letter etc. shall form part of the agreement to be signed by the successful bidder. The cost of stamp paper required for the agreement shall be borne by the vendor and the same shall also be arranged by the vendor

Registrar (Officiating)
Bose Institute, Kolkata

Pre-qualification Criteria

1	Company Profile: The bidders should be registered as per company norms in India having a place of business in India. Clear supporting documents in this regard should be uploaded.
2	Financial Turnover: Should have had an average annual financial turnover of Rs.3.5 Crore in respect of clean room & similar facility during the last three years ending 31st March 2020. Latest audited financial statement with CA Certificate to this effect may be submitted
3	Considering the size of the Project, the Bidder should have Solvency of minimum Rs. 1.5 Crore as on 31st July, 2020. The Bidder shall produce the Solvency Certificate for Rs. 1.5 Crore from the Bank, with the technical Bid
4	Bidder must upload the scanned copy of PAN Card, Incorporation Certificate, Income tax Return of the last Three Financial years (16-17, 17-18, and 18-19). Professional Tax Registration along with the updated challan, GST Registration Certificate and Certificate of Registration with EPF and ESI.
5	The bidder should have demonstrated capability of building 100K clean-rooms in reputed govt./private research organizations during the last five years. The bidder must provide PO copies and satisfactory completion certificate in support of the same.
6	Bidder should be ISO 9001:2015 certified. The valid certificate in this regard must be uploaded.
7	The bidder should not be blacklisted by any other Govt. agencies or organizations. A certification in this regard must be provided by the vendor on non-judicial stamp paper.

Bidders who qualify the pre-qualification criteria will only be considered for Technical evaluation.

(Annexure-II)

GENERAL SPECIFICATIONS

Name of the Project:

**Supply and Installation of Class 100K Clean Rooms and other allied services in the Unified Academic Campus of Bose Institute, Kolkata in Block-EN,
Sector V, Salt Lake City, Kolkata – 700091.**

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INTRODUCTION

BOSE INSTITUTE wishes to set up sixteen Class 100K clean rooms –

Sl. No.	ITEMS	DESCRIPTION	BASIC REQUIREMENTS
1	Class 100K Clean Room Enclosures containing – A) Class 100K Clean Room B) Ante-Room (Air-Lock)	Dimension (each room) ~20 ft x ~10 ft (area) x ~8 ft (height) - Dimension ~14 ft x ~10 ft - Dimension ~6 ft x ~10 ft	Clean Room shall be class 100K, ISO-8 certified - Air Pressure – 55 Pa - Air Pressure – 40 Pa Detailed Specification given on Page Nos. 5-10
2	Two doors	Ante-Room shall be equipped with two doors with a minimum opening of 6.5 ft x 3.5 ft	Detailed Specification given on Page Nos. 7-8. Doors shall be equipped with electro-magnetic controllers and hard inter-lock facility
3	Air Handling Unit (AHU)/HVAC	Each Class 100K Clean shall be equipped with separate AHU of 6 tr capacity	Detailed Specification given on Page Nos.11-20.
4	Propeller based, and Twin nozzle system Air Curtain	The first door leading into the Ante-Room shall be equipped with an Air curtain	Detailed Specification given on Page No.21.
5	Flooring, False Ceiling and Electrical	Epoxy Flooring, Hermetic suspended false ceiling and electrical fittings and installation shall be included	Detailed Specification given on Page No.9-10.

The above Class 100K Clean Room Facilities will be used for carrying out mammalian cell culture and other research activities including single photon experiments within the research laboratories in the Unified Academic Campus building located in sector V, Salt lake City, Kolkata.

The unified academic campus consists of a 16 storied building out of which first 8 floors have been completed with HVAC system, GI exhaust ducts, false ceilings, vitrified tiles flooring, electrical connections, and fresh air units. Out of these eight floors the proposed Class 100K Clean Rooms will be distributed across 2nd to 8th floors. Each floor will have one or multiple Class 100K Clean Room (with separate AHU for each Clean Room) within existing laboratories of two predominant layouts -

- A. Laboratories with two entry doors
- B. Laboratories with single entry doors

The Scope of works shall include preparation of –

1. Preparation of GFC drawing as per the site condition,
2. Supply, installation, Commissioning and handing over of the fully functioning Class 100K Clean Room having 65±5% relative humidity and 22±3°C temperature.
3. Certification of the Class 100K Clean Room

Typical Suggested Layouts*



Room Type-1



Room Type-2

* All dimensions shown here are approximate and shall be finalized in the GFC drawing

CHAPTER-01

CLEAN ROOM WALL, FALSE CEILING AND FLOORING SPECIFICATIONS

1. SUMMARY AND SCOPE

- A. Supply, install, and commission of Clean room partitioning, false ceiling and flooring including all necessary electrical cabling, looping, lighting and electrical accessories such as clean-room plugs and switches.
- B. The structure shall be of modern design and shall be constructed in accordance with the best practices of the Scientific Laboratory Equipment Industry. First class quality infrastructural work shall be insured by the use of proper machinery, tools, dies, fixtures and skilled workmanship to meet the intended quality and quantity for the project.
- C. Necessary civil modifications required for installation as per the approved GFC drawing.
- D. Removal of all debris, dirt and rubbish accumulated as a result of the installation of the Cleanroom infrastructure, leaving the premises broom clean and orderly.

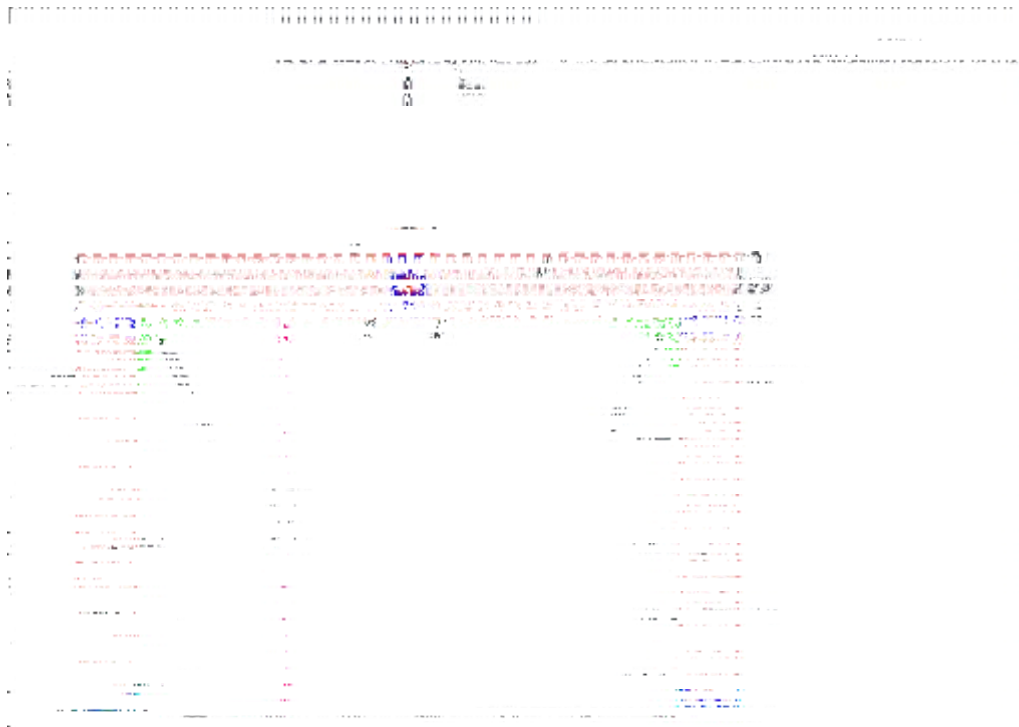
2. MODULAR CLEANROOM WALLS :

- A. **Standard walls** shall have a composite construction of two 0.8 mm thick skins of Pre-Coated Galvanized Iron (PCGI/PCGI over Welded rectangular aluminum framework) with a sealed and insulated interior with an overall thickness of 50 mm (see drawings in the next page). PCGI skin is chosen to provide high mechanical strength and impact resistance.
- B. **Standard panel dimensions** should be no less than 1200 mm (wide) and length (height) of 2400mm unless required otherwise as per the approved GFC. The semi-monocoque construction should be self-supporting. Additional wall heights, if required, may be achieved by using a stacking technique.
- C. **All panels should be prefabricated in the factory** as per the GFC and no modification of the panels on-site such as cutting, edge modifications shall be allowed. The panels must be fire-resistant for a minimum of 30 minutes.
- D. The self-supporting, insulated, walls shall be constructed with an interior aluminum framework.
- E. A 70 mm Aluminum torsion box / U Profile shall be used to level and support the wall system.
- F. Panel to panel connections shall be maintained with precision by Aluminum H- profiles that create uniform minimum gap seams.
- G. The panel seams shall be sealed by silicone with a perfectly flush finishing after installation on-site.
- H. Insulation materials shall be sandwiched between the two skin layers and sealed from the exterior by the aluminum framework.
- I. The standard insulation material for the wall system is 48.4mm fire-retardant High-Density Poly-Urethane Foam (HDP/PUF) with a nominal density of $40 \pm 2 \text{ kg/m}^3$.
- J. The PCGI panels should allow flush mounting of all covings and accessories to guarantee compliance with cGMP rules for room cleaning.
- K. The wall system shall be flexible, easy to assemble, able to accept changes to design in the field and can be removed or reconfigured for use in other locations.
- L. The panels must be shipped with a protective film of GSM 80 micron over the PCGI skins to prevent surface damage during shipping and installation.

3. COVINGS AND WALL CONNECTIONS

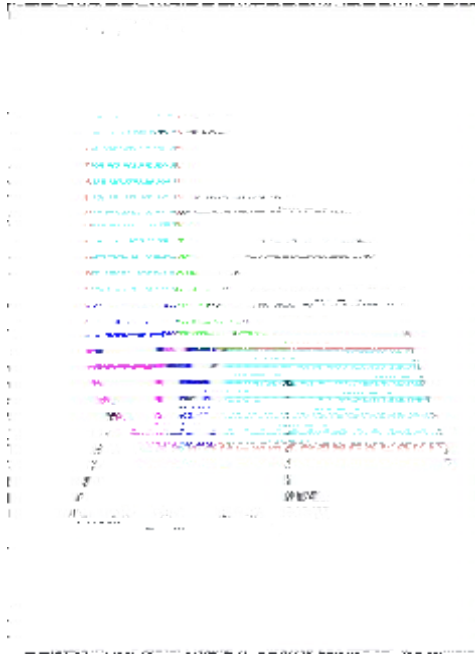
- A. In compliance with cGMP rules, for perfect cleaning in all corners of the room, the installation of flush wall connections should be done with round covings to allow complete removal of all particle accumulations.
- B. A two-piece coving shall be used at the floor and ceiling. The 90 angle under –coving will act as an anchor and seal for the wall. The radiused (R 70mm) over –coving is “clicked” in place to create the flush connectivity with the wall.
- C. A rough over-coving shall be used at the floor and a finished coving shall be used at the ceiling. Vertical connections for wall panels at 90° corners and T Intersections shall be completely flushed with all wall surfaces.
- D. All covings and corners are to be made of powder-coated aluminum.

TYPICAL DRAWING of 50 mm PCGI Panels with U-profile

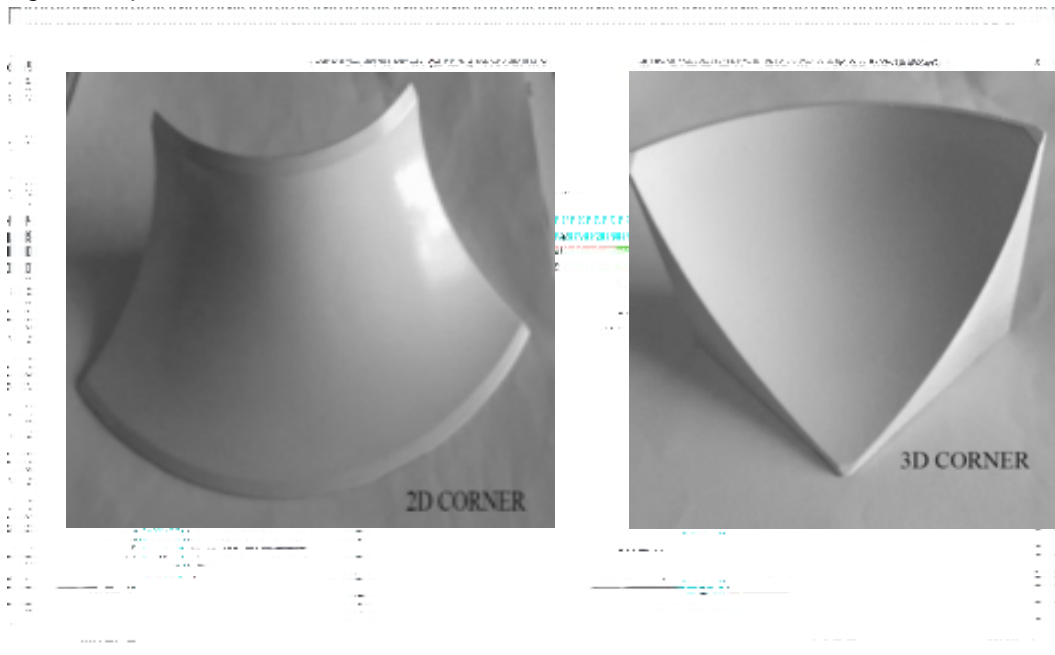


TYPICAL DRAWING of 50 mm PCGI Panels with 70 mm bottom profile

- E. FLUSH VERTICAL COVINGS - (Wall to ceiling and wall to floor):** Flush 90-degree corner shall be used for connecting the two walls (see drawing below).



- F. FITTINGS FOR LINKING COVING PROFILES:** Outside corners (1/4th sphere on 90 degree corner) and inside corners (1/8th sphere on Covings at Corners) shall be used to link vertical and horizontal covings between the wall and the ceilings. Different levels of finishing are required as given in pt. 3C.

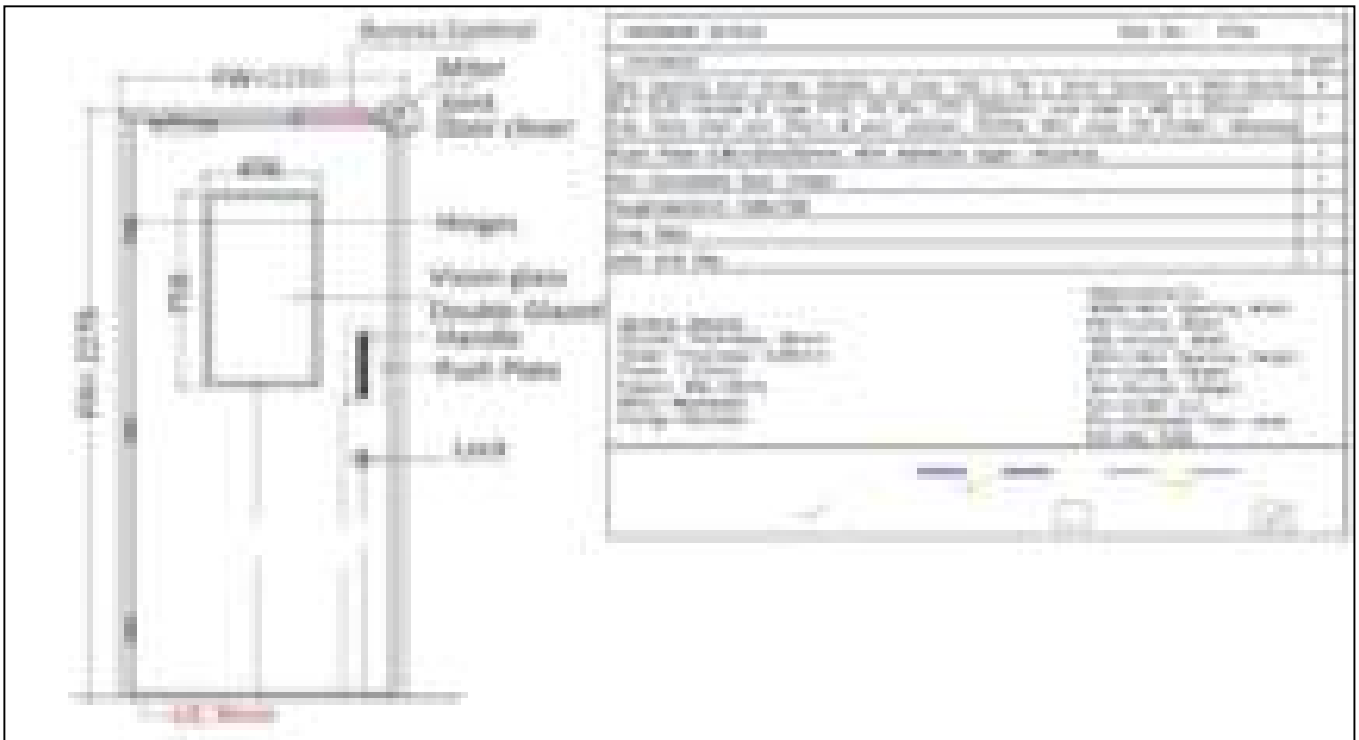


4. DOORS:

- A.** Doors shall be configured as Single Swing-Out (see drawing below).
- B.** Allow an open space of at least 3.5 feet when fully opened unless required otherwise as per approved GFC.
- C.** Standard door height shall be of 6.5 feet.
- D.** Standard door panels shall have a similar composite construction of two skins of PCGI with a sealed and insulated interior as that of the wall.

- E. Swing-out doors shall be designed to fit flush with both sides of the wall panel system.
- F. The internal frame work shall be constructed by welding extruded aluminum profiles.
- G. The external frames shall be manufactured with aluminum profiles with air tight dual gaskets.
- H. All fasteners for the hinges and latches shall be made of stainless-steel (Grade 304) and recessed in to the door frame. Standard hinges shall allow doors to swing 180° degrees from full open to full closed position.
- I. Door panels should have a View Panel of approximate dimension 1.3ft x 2.5ft, constructed using Double Glazed Vision Glass, flush fitted with the door panels. All dimensions have to be considered as "space available inside the door frame."

TYPICAL DRAWING OF A DOOR WITH VIEW PANEL*



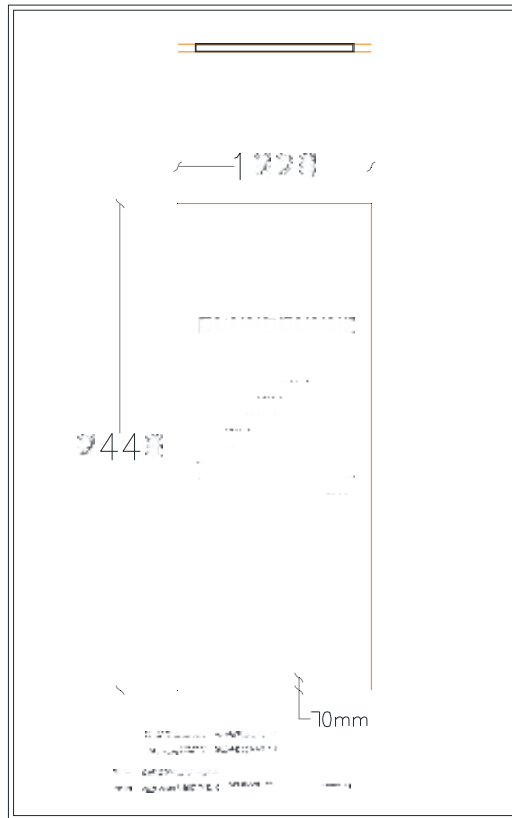
* All dimensions are approximate and for the purpose of understanding only.

- J. **DOOR INTER-LOCK CAPABILITY AND MECHANISM:** Both doors shall be equipped with electro-magnetic controllers ("mag-locks") and shall have "hard inter-lock" functionality. In this system, both doors shall be normally unlocked at all times. When one door is opened, the position switch shall trigger an input signal to the interlock controller, which shall send a signal to activate the locking device of the other door. The second door shall remain locked until the first door is closed. Once the first door is closed, the locking signal to the second door shall drop, and both doors shall return to normally unlocked status until the next input is received at the controller.

5. WALL VIEW-PANEL

- A. All clean rooms shall have a view-panel made of double-glazed glasses fit flush with both surfaces of the wall panel system (50mm) (see drawing) to allow visibility of the clean room interior from the laboratory. Each view-panel unit shall be constructed of two panels of toughened glass of dimension 1000 x 1000 mm. The window system shall be completely Silicone sealed and includes a micro-perforation profile with an integral silica gel moisture adsorption system to eliminate fogging.

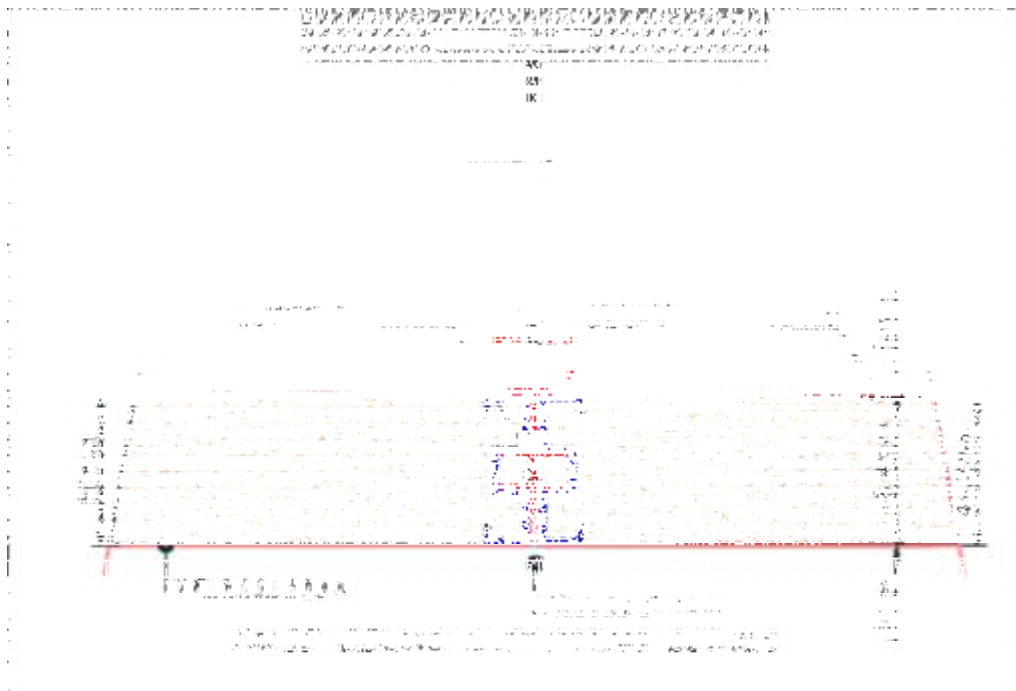
TYPICAL DRAWING OF A WALL VIEW PANEL



6. FALSE CEILING

- A. False ceiling of the clean room shall be a hermetic suspended walkable false ceiling, which is flexible and easy to assemble.
- B. The ceiling shall have a similar construction as the wall panels to provide proper sound and thermal insulation, as well as Resistance to humidity. False ceiling shall be made by means of PUF sandwiched between two layers of PCGI/PCGI. All sides closed by aluminium frame. The result shall be perfectly smooth and coplanar surface very easy to clean.
- C. False ceilings shall be designed according to the rooms lay-out. It can be installed before or after walls location.
- D. Bearing Aluminum Joining profile shall be housed by clicking-in between the two panels. A threaded tension bar shall be used to fasten the ceiling.
- E. **Panel dimensions:** at least 1200 mm x 2400 mm with a thickness of 50 mm unless required otherwise as per approved GFC.
- F. Filter, light and other accessories can be accessed from the top of the ceiling. Holes for filters, light and utilities shall be prepared with Numeric control Pantograph.
- G. The weight of standard false ceiling panel of dimension 1200 x2400 x 50 mm shall not exceed 48 kg.

TYPICAL DRAWING OF THE FALSE-CEILING WITH SUSPENSION MECHANISM



7. CLEAN ROOM FLOORING

- A. Flooring for the clean room and ante room should be constructed with epoxy material. Epoxy floor paint needs to be applied after removal of the tiles (if necessary) and proper leveling of the floor.
- B. The total thickness of the epoxy floor should be 3 ± 1 mm.

8. ANTE-ROOM (AIR-LOCK)

- A. An ante-room of dimension 10 ft x 6 ft shall be constructed within the Class 100K Clean Room with proper partitioning as depicted on the layout given in Page No. 3.
- B. The construction, materials of wall and partitioning, flooring as well as ceiling shall be exactly as described under the same for Class 100K Clean Room above.
- C. Additionally, the ante-room shall have two single-leaf doors of minimum dimension 6.5 ft x 3.5 ft of the described specification as above, one to allow the entry to the ante-room and the other at the entry to the Class 100K Clean Room as shown in the layout on Page No. 3. The two doors shall be equipped with inter-lock mechanism.
- D. The entry door to the ante-room shall also be equipped with an Air curtain, detailed specifications for which are given in chapter 4.

9. LIGHTING, GERMICIDAL UV LAMPS, AND ELECTRICAL FIXTURES

- A. The clean room and the anteroom should be provided with LED panel lights to achieve an intensity of 500 lux.
- B. The clean shall also be equipped with germicidal UV-lamps for decontamination to achieve an intensity of minimum 4.0 mJ/cm^2 .
- C. All electrical fixtures (5/15A universal sockets, 15 sockets and switches) must be of clean room grade.

CHAPTER-02

SPECIFICATION FOR THE HVAC/AHU SYSTEM FOR CLASS 100K CLEAN ROOM

1. SCOPE OF WORKS

- A. The bidder shall provide air handling units that shall be of state-of-the-art design, factory manufactured, brand new, complete in all respects and conforming to the Specifications and in accordance with the requirements given in schedule of quantities. AHUs shall be installed with vibration isolation rubber pads. All air handling units shall be provided with the following accessories:
 - i. Access door of minimum 600 mm width shall be provided in each section and in each Plenum housing with interlock limit switch. Limit switches along with wiring shall be provided in fan section doors and shall be interlocked with AHU fan motor(s) and inspection lamp. Minimum 4 nos. entries shall be provided for Power/Signal cable compression glands.
 - ii. Junction box shall be provided with all the internal wiring from limit switch and marine light laid in enclosures. Separate switch should be considered to ON/OFF the marine light from outside the unit.
- B. Bidder shall only terminate the cables in AHU junction box. The quoted price of the air handling units shall include the cost of all above accessories and no extra claim, whatsoever shall be admissible.
- C. AHU units shall be supplied with outdoor VRF/VRV units as specified below and in the SOQ.
- D. The bidder is expected to visit the site to understand the requirements for housing, installation, ducting and functioning of the HVAC/AHU system.
- E. Any humidifier necessary to maintain desire humidity level.

2. Type

- A. The air handling units shall be double skin construction (as indicated below), blow thru / draw-thru type (Horizontal floor mounted/Vertical) as specified with powder coated finish & shall include pre-filter section (for air handling units without TFA), Microvee Filter section, plug fan section, coil sections, return air mixing box section, cooling coil of copper tubes and Aluminum fins as mentioned below with copper headers, SS drain pan with insulation, U trap and accessories. DIDW backward curved plug fans to be supplied along with VFD compatible motor, drive package comprising of drive motor etc. as included in schedule of quantities. Unit should have marine fixture including adequately rated LED bulb.

3. Capacity

- A. The air handling unit capacities and static pressure shall be as identified in schedule of Quantities.
- B. AHU casing size shall be selected on the basis of following: Velocity across Coil / Filter Face \leq 500 FPM.
- C. AHU capacity: 6tr and as per ISO 8 standard equivalent for class 100K rooms and should be able to maintain the following air-pressure.
 - i. **Air pressure in clean room:** 55Pa
 - ii. **Air pressure in Ante-Room (Airlock):** 40Pa

4. Fan Section

- A. The fan shall be forward/backward inclined blades, plug type suitable for rated flow at static pressures as indicated in the schedule of Quantities. Fans shall be selected for minimum efficiency of 70 %. The fan wheel and housing shall be fabricated from heavy gauge galvanized steel. Fan impeller shall be grounded on C40 carbon steel shaft supported to housing with angle GI frame and Plummer block. Fan motor assembly shall be statically and dynamically balanced to meet AMCA standard 204-96, to meet or exceed G6.3 Residual balance. Computerized fan selection printouts shall be submitted along with the offer.
- B. Fan motors shall be mounted inside the AHU casing and be totally enclosed fan cooled, with class `F`

insulation. Both fan and motor assemblies shall be mounted on a common heavy steel base frame inside the fan section on anti-vibration springs for isolating the unit casing. The fan section shall be provided with bell mouth arrangement for air outlet. The sound levels shall not be more than 75 dB from one meter distance from the air handling unit.

5. AHU Enclosure / Casing (Double Skin)

- A. Double skin Air Handling Units are to be constructed with minimum 48±3 mm thick PUF of density 40±2 kg/m³ sandwiched insulation panels with 0.6 mm thick plain inner GI skin and 0.6 mm thick pre-coated outer G.I skin complete with thermal break profile.
- B. All sections/panels shall be bolted to each other with self-adhesive coated food grade Neoprene rubber gasket and fixed with stainless steel screws in between them for perfect alignment and airtight joints.
- C. The gaskets shall be held in place by inserting them in the integrated channels in the framework.
- D. All panels shall be detachable or hinged. Hinges shall be made of die cast aluminum with stainless steel pivots. Handles shall be made of hard nylon and be operational from both inside and outside of the unit.
- E. Condensate drain pan shall be provided with multiple slopes towards drain outlet. Condensate drain pan shall be fabricated from 18 gauge stainless steel grade 304 (including SS Nipple) with all corners welded. It shall be isolated from bottom floor panel through 25mm thick polyurethane foam or any suitable insulation.
- F. **The Vendor shall guarantee that no sweating will take place on the outer surface of AHU.**

6. Cooling Coils

- A. Cooling coils shall be made from seamless copper tubes with sine wave aluminum fins.
- B. The tubes shall be solid drawn copper of not less than 12 mm diameter and minimum 0.4 mm wall thickness.
- C. Aluminum fins shall be continuous and equi-spaced by collars forming integral part of the fins. The number of fins shall be 12 FPI and the thickness of fins shall be minimum 0.15 mm.
- D. The fins shall be uniformly bonded to copper tubes by mechanic/hydraulic expansion for minimum thermal contact resistance with fins. The fins shall be assembled in a stainless steel frame. Coils shall be sliding track mounted inside the AHU for easy replacement. Face area of the coil shall be such as to ensure rated capacity from each unit and such that the air velocity across the coil shall not exceed 500 FPM.
- E. Each section of the coil shall be fitted with supply & return header of Copper to feed all passes of coil equally. U bends shall be of forged copper and shall be joined to tubes by brazing and silver soldering. Each of supply and return headers shall have two connections at either end to facilitate the coil replacement in any direction at site. Headers shall be provided with flanged ends for pipe connections. The headers shall also be provided with vent plug at top and drain plug/valve at bottom.
- F. The coil shall be designed for a maximum working pressure of 7 Kg/Sq.cm. Each coil shall be factory-tested at 21 kg/Sq.cm air pressure under water. Coil rating shall be as per **ARI standard 410**.
- G. Cross section area of AHU other than coil surface should be properly sealed (Blank off) with at least 16G SS 304 sheet. Contractor should guarantee that their shall be zero leakage from the blank off sheet. SS ports to be provided to measure on and off coil temperature.

7. Dampers

- A. Dampers shall be opposed blade type.
- B. Blades shall be made of double skinned aero foil aluminum sections of minimum 1.25 mm thickness with integral gasket and assembled within a rigid extruded aluminum alloy frame and bronze bearings.
- C. Dampers shall be lever operated and with locking device to permit the dampers to be adjusted and locked in any position and clearly indicate the damper position.
- D. The damper shall be provided with graduated scale for % opening or closing. Linkages shall be extended for motorized operation. Air leakage through dampers when in the closed position shall not exceed 1.5% of the maximum design air volume flow rate at the maximum design air total pressure.

8. Motors

- A. VFD-compatible Fan motors of 2.2 kW (3HP) shall be energy efficient (IE2) and shall be operable at $415 \pm 10\%$ volts.
- B. Motor shall be specified for inverter duty which can be operated at sine wave 50Hz.
- C. The motor should be three phase, totally enclosed fan-cooled class 'F' with IP-55 protection. Motor HP shall be selected at least 20% more than the BHP of fan at the specified flow and static pressure.

9. Vibration Isolators

- A. All fans and motors must be mounted with anti-vibration isolators to isolate them from AHU casings. Vibration isolators shall be anti-vibration springs or cushy foot mountings. Minimum vibration isolation efficiency shall be 90%. Fan outlet should have fire retardant type flexible connection to prevent vibration transmission to the casing.

10. Testing

- A. Capacity of various air handling unit models shall be computed from the measurements of air flow, dry bulb and wet bulb temperatures of air entering and leaving the coil.
- B. Flow measurements shall be measured by an anemometer and temperature measurements by accurately calibrated mercury-in-glass thermometers.
- C. Computed results must conform to the specified capacities and quoted ratings.
- D. Power consumption shall be computed from measurements of incoming voltage and input current AHU.
- E. Leakage test must be performed at site.

11. Fans

- A. **Type:** Plug, in-line and propeller type fans shall be of the type as indicated and identified in the schedule of Quantities. All the fans shall be AMCA International certified.
- B. **Capacity:** The air-moving capacity of fans shall be as given in schedule of Quantities.
- C. Base of the fan motor and blower should be made of extruded aluminum section.
- D. **Plug Fan:** Plug fans should conform to the following specifications
 - i. **Plug fans** shall be backward-curved non-over loading type and shall be fabricated from cold rolled sheet steel with polyester powder coating finish.
 - ii. The fan shall be selected for maximum frequency at 52 Hz at 110%/120% capacity.
 - iii. All fans shall be statically and dynamically balanced to ISO11940 and AMCA 204- G1.0 standards. All fans after assembly should be trim-balanced to ISO11940 and AMCA 204-G1.0 standards.

- iv. Shaft shall be constructed of C-45 carbon steel or equivalent, using an automatic process for positioning and cutting of the keyways. All dimensional tolerances of the shaft are fully checked to ensure a precision fit and then coated with anti-corrosive varnish after assembly, sized adequately and shall be accurately turned, ground and polished to a close tolerance. Shafts sizes shall be carefully calculated and designed such that the maximum operating speed (RPM) shall not exceed 75% of the first critical speed.
- v. Bearings shall be of the heavy duty ball type with an adapter sleeve or tapered roller type mounted directly on the fan housing. Bearings shall be designed especially for quiet operation and shall be of the self-aligning, oil / grease pack pillow block type with integral dust and grease seals.
- vi. Fan motor shall be energy efficient (IE2) and suitable for 415±10% volts, 50 cycles, 3 phase AC power supply, squirrel-cage, totally enclosed fan-cooled motor, provided with class F insulation, and of approved make. Motor name plate horsepower shall exceed brake horsepower by a minimum of 20%. The fan and motor combination selected for the particular required performance shall be of the most efficient (smallest horse power), so that sound level is lowest.
- vii. A computer printout on fan performance rating corresponding to the tested data, with corrected rating for altitude and temperature, fan operating speed, bearing life, etc. shall be submitted for approval.
- viii. Plug Fans shall be supplied with a Calibrated Nozzle to facilitate the flow measurement with the help of Differential Pressure Transmitter.

E. Centrifugal Fan: The centrifugal fans shall conform to the following specifications:

- i. The fan shall be forward/backward inclined blades, SISW Centrifugal type suitable for rated flow at static pressures as indicated in schedule of Quantities. Fans shall be selected for minimum efficiency of 70%. The fan wheel and housing shall be fabricated from heavy gauge galvanized steel. Fan impeller shall be grounded on C40 carbon steel shaft supported to housing with angle GI frame and Plummer block. Fan motor assembly shall be statically and dynamically balanced to meet AMCA standard 204- 96, to meet or exceed G6.3 residual balance. The fan outlet velocity shall not exceed 2000 FPM. Computerized fan selection printouts shall be submitted along with the offer.
- ii. Fan motors shall be mounted inside the AHU casing on slide rails for easy belt tensioning, and be totally enclosed fan cooled, to be class `F' insulation.
- iii. Fan and motor assemblies shall be mounted on a common heavy steel base frame inside the fan section on anti-vibration springs or cushy foot mountings for isolating the unit casing. The fan outlet shall be connected to casing with the double, fire retardant, waterproof, lint free and fungal resistant flexible canvass connection.

F. Performance Data: All fans shall be selected for the lowest operating noise level. Capacity ratings, power consumption, with operating points clearly indicated, shall be submitted and verified at the time of testing and commissioning of the installation.

G. Testing: Capacity of all fans shall be measured by an anemometer. Measured air flow capacities shall conform to the specified capacities and quoted ratings. Power consumption shall be computed from measurements of incoming voltage and input current.

12. Magnehelic Gauge

- A. Magnehelic gauge shall be provided with suitable SS box, SS nozzles & SS face plates and SS 304 tubing as approved by the engineer-in-charge. Housing of magnehelic gauge shall be Die cast aluminum with 100 mm diameter dial face.
- B. Accuracy shall be ±2% of full scale. It shall withstand a temperature limit of 0°C to 80°C.
- C. Process Connections shall be for high- and low-pressure taps - one pair side and one pair back for connections as per requirement.
- D. Gauges should be on site calibrated or should be with valid calibration at the time of commissioning.

13. Filter section

- A.** The filter section in AHU shall include pre-filter (MERV -8) to remove particles down to 10 Micron, 30-35 % dust spot efficiency (Equivalent to Eurovent Grade F5) on ASHRAE STD. 52.2. 1999. The micro-vee filters (MERV-11) to remove particles down to 1 - 5 Micron, 60-65% dust spot efficiency (Equivalent to Eurovent Grade F7) on ASHRAE STD. 52.2. 1999. The face velocity across filters and coil shall not be more than 500 fpm. Magnehelic gauges to be provided across all filter sections.
- B. Pre filter [MERV-8 (Minimum Efficiency Reporting Value)]:**
 - i. Pre filters shall be made of non-woven synthetic media. The efficiency of pre filters shall be 90% down to 10 microns. The filter shall be washable type.
 - ii. The filter frame shall be anodized aluminum.
 - iii. On the leaving side of filters, no fibrous media shall be exposed. The filter media shall be supported by multiple HDPE wire mesh towards air outlet side. The filter area provided shall ensure that the velocity does not exceed 500 FPM across the filter cross-sectional area. The sealant shall be epoxy or polyurethane & gasket shall be neoprene.
- C. Second stage filter (MERV-11):**
 - i. MERV filter shall be flanged type having efficiency of 90% down to 5 micron.
 - ii. Filter media should be glass fiber.
 - iii. The filter frame shall be made of anodized aluminum.
 - iv. The sealing material shall be either epoxy or polyurethane & food-grade neoprene rubber gaskets.

14. HEPA (High Efficiency Particulate Air) FILTERS & LAMINAR DIFFUSERS

- A.** Powder-coated extruded aluminum laminar flow diffusers suitable for 600cfm shall be installed on the ceiling panel with HEPA filter and dampers with necessary accessories.
- B.** HEPA filters used in the clean room which shall have the efficiency to filter particles as small as 0.3 µm (microns) with a 99.97% minimum particle-collective efficiency.
- C.** Filter materials shall be glass fiber media based and shall be of thicknesses of 6". All HEPA air filters must meet a minimum efficiency of 99.97% at 0.3 microns through test procedures described on page no. 24.

15. Electric Duct Heaters

- A.** The air heating elements should be "Flange-in-type" Duct Mounted (suitable for fixing on GI ducts), finned tubular air heating element comprising stainless sheathed black heat operations, safety thermal cut-out (manual), air differential pressure switches, temp auto thermostat, terminal bar, factory internal wiring with copper conductor, insulated walls, gladding, earthing, contactors for ON/OFF control.
- B.** The heater should be capable of integrating into the BMS including cabling and interconnections.
- C.** The minimum capacity of strip heaters shall be as follows:
 - i. for heater banks up to 1.0 KW capacity - Single phase wiring
 - ii. for heater banks 1.5 KW capacity onward - Three phase wiring
- D.** G.I. fins (28 mm) housed in 16 SWG G.I Enclosure shall be placed in the main supply air duct at suitable location and complete as required.
- E.** Strip Heater capacity should cater for all seasonal variations and changes in equipment / product load from 0% - 100% through a Thyristor control.
- F.** The three-phase heaters shall be connected in equal capacity across each phase.

G. The heater shall be fired by the Thyristor, based on the input from RH sensor via commanded humidistat and thermostat in the lab.

H. It should also have the necessary provision to provide ON/OFF status to BMS.

16.ELECTRICAL PANEL FABRICATION DETAILS:

The electrical panel shall be 3 Phase, 4 wire, 415 V, 50 Hz. The fabrication shall be made with 14/16 SWG cold rolled sheet with M/C pressing. The surface shall be rigorously treated for de rusting in 7tank process with de phosphate and painting with at least 2 coats of approved paint. The panel shall be totally enclosed white painted inside and shall be having control directory pasted inside the panel. The panel shall be mounted on existing trench and shall have cable entry provision from the top or bottom (as per requirement) with suitable alley as the case may be. The panel shall be tested for the same KA rating of the relevant highest rating ACB / MCCB. All components shall be from ISO-9001 companies and shall have relevant IS/IEC approvals without fail. (Fabrication, drawing and list of components and panel detail shall be approved by Bose Institute before fabrication).The panel shall be fully interlocked as required. The panel shall include base frame channel support. (The Single Line Diagram shall be closely followed).

A. The Panel shall be fully as per the requirement of Electrical Inspectorate/ EB authorities.

B. Auxiliary contactor to be provided along with auto-manual switch where ever required.

C. All Breakers both Incoming & Outgoing shall have LED 'ON / OFF / TRIP' indications without fail.

D. CTs shall be with single or dual ratio (as per requirement) are cast resin type only.

E. Ventilators shall be provided for Panels with 1000 A & above rated bus bars.

F. All doors to have double rubber gasket with shutter assembly & door seating frame.

G. All breakers more than 250A will be microprocessor based only.

H. The current density for ALU bus bars shall be 0.8 only.

I. The Current density for CU bus bars shall be 1.0 only.

J. Bi-metallic tape / washers to be used where ever copper & Aluminum are joined.

K. DC power pack shall be provided where ever required & INSISTED in panels.

L. TP means three pole.

M. TPN means 4 pole breaker with 50 neutral.

N. 4P means Four Pole breaker with 100% neutral.

O. Unless specified as 3.5 pole breaker, 4 pole means 4 pole ONLY.

P. All breakers to have breaker manufacturer's factory made Spreaders.

Q. All breakers to have breaker manufacturer's factory made Separators.

R. In any case Aluminum bus bars should not be connected directly to the breaker without spreaders.

S. The control wiring has to be in Troughs of appropriate size.

T. Irrespective of the Opacity all breakers shall be connected to the breakers using Bus bars only. Cables of any make will never be accepted.

U. All vertical bus bars in bus bar alley shall have bottom supports.

V. All indoor panels shall have top entry & out door panels shall be bottom entry only.

W. Panel earthing strip should come out vertically on top of the panel.

- X. ICS should be 100% ICU for service voltage. Any other percentage shall not be accepted.
- Y. All bus bars should be fully tightened before calling the consultant for inspection.
- Z. Door earthlings shall be provided for all doors.
- AA. Base frame shall be with each panel. The size will be equal to each section.
- BB. All test certificates must be provided immediately after commissioning.

Air Distribution

17. Factory Fabricated Ducting Duct Material

- A. All Ducting shall be fabricated of LFQ (Lock Forming Quality) grade prime GI raw material. Galvanizing shall be Class VIII – light coating of zinc, nominal 120 gm/Sq. surface area coating on both sides conforming to IS 277 coating grade. GI raw material shall be used in coil form (instead of sheets) so as to limit the longitudinal joints irrespective of cross-section dimensions.

18. Fabrication Standards

All ductwork including straight sections, tapers, elbows, branches, show pieces, collars and other transformation pieces shall be factory fabricated. In addition ducts shall be factory fabricated utilizing the following machines to provide the requisite quality of ducts.

- A. Coil (Sheet metal in Roll Form) lines to facilitate location of longitudinal seams at corners/folded edges only, to obtain the required duct rigidity and leakage free characteristics. No longitudinal seams permitted along any face side of the duct.
- B. All ducts, transformation pieces and fittings to be made on CNC profile cutter for requisite accuracy of dimensions, location and dimensions of notches at the folding lines.
- C. All edges to be machine treated using lock formers, flanges and rollers for turning up edges.
- D. Sealant dispensing equipment for applying built-in sealant in Pittsburgh lock where sealing of longitudinal joints are specified.

19. Gauge & Transverse Connectors

- A. All ducts shall be with MS/GI angle Flanges system with built-in sealant. Bracing distance should not be more than 600mm as per IS standard. All ducts shall be fabricated from galvanized steel / aluminum of the following thickness, as indicated as below:

B. Rectangular Ducts:

Longest Size of Duct	Minimum Sheet Thickness		Type of Joints / Flange	Bracing / If any
	GI	Aluminium		
1 – 750 mm	0.63 mm (24G)	0.80 mm	25x25x3mm MS epoxy painted / Hot dip galvanized angle iron flange with 6mm diameter GI nut & bolts at 125mm pitch	25x25x3mm MS epoxy painted
751 –1500 mm	0.80 mm (22G)	1.00 mm	40x40x3mm MS epoxy painted / Hot dip galvanized angle iron flange with 6mm diameter GI nut & bolts at 125mm pitch	25x25x3 mm MS epoxy painted
1501 –2250 mm	1.00 mm (20G)	1.25 mm	50x50x5 mm MS epoxy painted / Hot dip galvanized angle iron flange with 6mm diameter GI nut & bolts at 125mm pitch	40x40x3 mm MS epoxy painted

2251 mm & above	1.25 mm (18G)	1.80 mm	50x50x6 mm MS epoxy painted / Hot dip galvanized angle iron flange with 10mm diameter GI nut & bolts at 125mm pitch	40x40x3 mm MS epoxy painted
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C. Round Ducts:

Longest Size of Duct	Minimum Sheet Thickness	
	GI	Aluminium
1 – 500 mm	0.63 mm (24G)	0.80 mm
501 –1000 mm	0.80 mm (22G)	1.00 mm
1001 –1250 mm	1.00 mm (20G)	1.25 mm
1251mm & above	1.25 mm (18G)	1.80 mm

D. Duct hanging supports:

Larger Side of Duct (mm)	Hanger Diameter (mm)	Rod Supporting Angle (mm)	Maximum Spacing between Supports (mm)
Up to 750	08	25x 25 x 3	2000
751 – 1500	10	40 x 40 x 5	2000
1501 – 2250	10	50 x 50 x 5	2000
2251 & above	12	50 x 50 x 6	2000

20. Duct Construction

- A.** All ducts shall be fabricated and installed in workmanlike manner, conforming to relevant SMACNA codes. Duct dimensions shown on drawings, shall be overall sheet metal dimensions inclusive of the acoustic lining where required and indicated in schedule of quantities. The fabricated duct dimensions shall be as per approved drawings and care should be taken to ensure that all connecting sections are dimensionally matched to avoid any gaps.
- B.** All fabricated dimensional tolerances shall be within ± 1.0 mm of specified dimension. To obtain required perpendicularity, permissible diagonal tolerance shall be ± 1.0 mm per meter.
- C.** Each and every duct piece shall be identified by the color coded sticker which shows specific part numbers, job name, drawing number, duct sizes and gauge etc. Ducts shall be straight and smooth on the inside. Longitudinal seams shall be airtight and at corners only, which shall be either Pittsburgh or snap button punch as per SMACNA practice, to ensure air tightness.
- D.** Air-turning vanes shall be installed in all bends and duct collars designed to permit the air to make the turn without appreciable turbulence. All ducts shall be rigid and shall be adequately supported and braced where required with standing seams, tees, or angles, of ample size to keep the ducts true to shape and to prevent buckling, vibration or breathing. Reinforcement of the ducts shall be achieved by either cross breaking or straight beading depending on length of ducts. Plenums shall be shop/factory fabricated panel type and assembled at site. Fixing of galvanized angle flanges on duct pieces shall be with rivets heads inside i.e. towards GS sheet and riveting shall be done from outside. Self-adhesive, non-toxic Neoprene rubber / PVC gasket of 5 mm thickness shall be used between duct flanges and between duct supports in all ducting installation. Ducts and accessories within ceiling spaces, visible from air-conditioned areas shall be provided with two coats of mat black finish paint. Flexible Duct of maximum 3 diameter length made with core constructed from 12-15 micron aluminum film (Outer) bonded to 25 mm thick polyester blanket encapsulating helically wound spring steel wire bounded with 12-15 micron aluminum film (Inner side) with water based glue / adhesive (insulation shall be jacketed) and fastened with set of round clamps 8mm wide cable tie on both the ends of ducts & HEPA / Diffuser housing / Jet Nozzle and tightly sealed with self-adhesive aluminum tape. And factory fabricated square to round connection made from 20G GI sheet.

21. Support System

- A. A complete system consisting of fully threaded GI rods, double L bottom brackets (MS epoxy painted angles) / Slotted angles, nuts, washers and anchor bolts shall conform to relevant IS standards. To provide the required thermal brake effect, Neoprene of 6 mm thickness shall be used between duct profiles to avoid heat transfer losses.

AIR-COOLED CONDENSING OUTDOOR VRF/VRV Units

22. General Specification

- A. The Air cooled VRV/VRF condensing outdoor units shall comprise high efficiency inverter type scroll compressors of minimum capacity and performance as indicated in the SOQ, starter for compressors, condenser fans, Insulated cooler, air cooled condenser with microprocessor control panel.
- B. Each unit shall be completely factory assembled, piped, wired and tested. Great importance is attached to good pipe work arrangement and installation to enable maintenance and repair works to be carried out properly and efficiently.
- C. VRF/VRV units shall be complete in all respect with necessary accessories, pipes, connections, wiring, thermometers, gauges, protective devices, and other apparatus that may be necessary for the complete operation.
- D. The VRF/VRV unit shall utilize a non-chlorofluorocarbon (CFC) refrigerant of type R-134A/R410a/R407c.

23. CASINGS

- A. The casing for the VRF/VRV unit shall consist of galvanized steel, rust proofed and finished with a scratched-resistant and wear resistant baked on enamel so as to resist environment corrosion mounted on a frame.
- B. Removable panels shall be provided to enable all maintenance and repairs to be carried out without removal of the unit or structural alteration to prevent rattles and looseness after prolonged period of operation.
- C. The inside of the cabinet (where the compressor is located) shall be insulated with 2" (50 mm) thick high-density fiberglass or rock wool.
- D. The nuts and bolts shall be treated with anti-rust and coat with rust proof paint. Mild Steel Bolts and Nuts are NOT ACCEPTABLE.

24. COMPRESSORS

- A. The air-cooled outdoor unit shall be fitted with two or more scroll compressors of the semi-hermetic type. In either case, the availability of spare parts shall be assured.
- B. The compressors shall be driven by electric motors designed for operation on $400 \pm 10\%$ volts, 50 cycle, and three-phase. Compressors motors shall be cooled with suction gas or other approved means.
- C. The compressors and motors shall be fully protected against abnormal operating conditions by high- and low-pressure switches, thermal relays, overload relays and safety controls and Phase Failure fuses.
- D. The compressors shall be fitted with gauge connections for reading oil, suction and Discharge pressures and shall be fitted with a sight glass, crankcase heater, muffler, Discharge manifold and internal motor protection.
- E. The capacity Control shall be step less control by use of a slide valve or step control by use of solenoid valves.
- F. The compressors shall be mounted on spring vibration isolators.

- G. Compressors should be provided with acoustic jacket for sound attenuation from the factory.

25. CONDENSERS

- A. The air-cooled condenser shall be of the cross-finned type (aluminium) with copper tube to suit the capacity of the unit. Bonding of the fins to the tubes shall be by mechanical means to ensure a positive lasting bond.
- B. The condenser fan shall be the propeller type Low noise fans and will not hold water. Please state noise criteria. The fan shall be statically and dynamically balanced and mounted on a solid steel shaft running in self-aligning ball bearings, amply sized for quiet operation and long life. The condenser fan shall be driven directly by an induction motor with adequate horsepower for the duty.
- C. Condenser Coil fins to be coated against corrosion.

26. VIBRATION ISOLATION MOUNTING

- A. The unit shall be supplied with adequate number of levels adjusting spring type isolation provided by the manufacturer.

27. COPPER PIPING AND STRAINER

- A. Interconnecting refrigerant pipe work should consist of copper pipes (Hard drawn) with 19mm/13mm thick closed cell elastomeric nitrile rubber tubular insulation between each set of indoor and outdoor units.
- B. Three pipe sizes shall be selected according to the equipment's capacities.
- C. The refrigerant path must have an on-line strainer for the refrigerant.
- D. All piping shall be properly supported with suitable Zinc coated MS hanger & clamps with rubber sleeves.
- E. The support hanger shall be grouted to the wall and roof structure using Anchor fasteners.
- F. The maximum spacing between the supports shall not exceed 1200-mm and provide support at each bend additionally.

28. STANDS

- A. Outdoor units must be installed using GI stands painted with two coats of primer and two coats of synthetic enamel paint.
- B. Vibration isolators (rubber pads) are to be provided between the VRF units and the stands and stand base and floor.

29. STANDARDS AND CODES

- A. ASHRAE Standards for System and Equipment
- B. UL Underwriters Laboratories.
- C. Eurovent - Air Handling Units
- D. ARI - Cooling Coil ratings
- E. AMC – Fans
- F. NEMA Enclosures for Electrical Equipment
- G. BSRIA AG 1 / 2001.1- Pre – Commission Cleaning of Pipe Works Systems (2nd EDITION)
- H. SMACNA – Sheet Metal and Air Conditioning Contractors National Association or Equivalent Indian Standards –1982 Edition or IS277/655 Standards

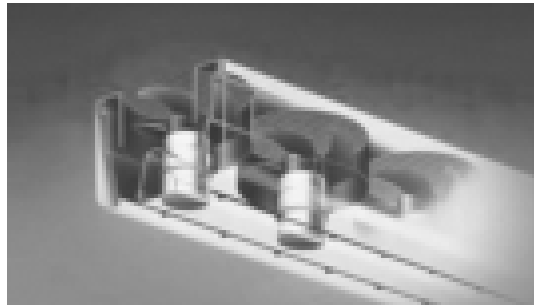
CHAPTER - 03

AUTOMATIC AIR CURTAIN

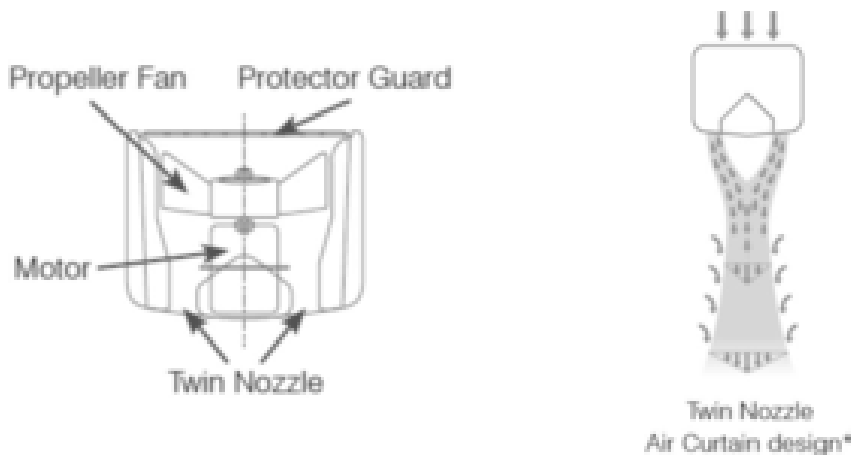
1. Propeller Fan Less-Noise Airflow system

- A. The air curtain should have the Propeller Fan driven by an energy efficient motor, as opposed to the Line Flow Fan for decreased operating costs.
- B. The Axial Fan (Propeller Fan) should allow easier maintenance of the air curtain unit and ensure its optimal performance over a longer time period.

TYPICAL DRAWING SHOWING THE AIR-CURTAIN MECHANISM



2. Twin Nozzle System



The twin nozzle design allows the Air Curtain to generate larger air-velocity distribution with less air intake. Resistance to the influence of external airflow has been strengthened, greatly improving insulation against heat and cold.

3. Detailed specification

Fan Speed	Single-phase 50Hz 220–240V					Starting Current (A)	Weight (kg)
	Air Volume (m ³ /h)	Running Current (A)	Input Power (W)	Air Velocity Max. (m/sec)	Noise (dB)		
High	1420-1440	0.35-0.37	76-83	9.5	46-47	0.62	13.3±1.5
Low	1150-1170	0.31-0.33	67-78	7	40.5-44		

CHAPTER - 04

Installation

Following tools and tackles shall be used to give the required duct quality and speed of installation including:

- Electric Pittsburgh Steamer – used for closing Pittsburgh joints.
- Electric Slitting Shear – to make cut-outs.
- Drilling machine with drill bits – for drilling holes in the sheet metal work.
- Hammer drill machine with drill bits – for drilling holes in the building structure for anchors.
- Hoisting system – for lifting the duct assembly up to mounting heights.

All ducts shall be installed generally as per tender drawings, and in strict accordance with approved shop drawings to be prepared by the Contractor.

The Contractor shall provide and neatly erect all sheet metal work as may be required to carry out the intent of these Specifications and Drawings. The work shall meet with the approval of Owner's site representative in all its parts and details.

All necessary allowances and provisions shall be made by the Contractor for beams, pipes, or other obstructions in the building, whether or not the same are shown on the drawings. Where there is interference / fouling with structural work, plumbing or other pipes, and conduits, the ducts shall be transformed or modified as per actual site conditions.

After the end of the day working, the contractor shall temporarily close all duct openings with PVC foil / polyethylene sheets with tapes to prevent debris / dust entering into ducts and maintain them clean. Opening for grilles shall also be closed in the same manner.

Ducting over false ceilings shall be supported from the slab above, or from beams. In no case shall any duct be supported from false ceiling hangers or be permitted to rest on false ceiling. All metal work in dead or furred down spaces shall be erected in time to occasion no delay to other contractor's work in the building.

Where ducts pass through masonry openings, it shall be provided with thick TF quality expanded polystyrene around the duct. An MS angle of ISA 50 x 50 x 6 shall be riveted to the duct portion passing through wall / opening. The corners of MS frame shall be extended on both sides to serve as fasteners, which shall be grouted in the wall to prevent any leakage between rooms / infiltration of air. The gap between duct surface and MS surface shall be thoroughly sealed with fire barrier mortar for complete sealing.

All ducts shall be totally free from vibration under all conditions of operation. Whenever ductwork is connected to fans, air handling units or blower coil units that may cause vibration in the ducts, ducts shall be provided with a flexible connection, located at the unit discharge.

Duct shall not rest on false ceiling and shall be in level from bottom. Taper pieces shall taper from top.

Access Doors and Windows

Bolted hinged insulated access doors shall be provided in ducting for fire dampers for servicing. Access doors shall be rigid and shall be provided with food grade silicon sealant to render them air tight.

Minimum size of access doors / windows provided in the ducting shall be as follows:

- 300 mm x 300 mm for attending volume control dampers provided in the bottom horizontal face of Ducts.
- 600 mm x 600 mm for attending fire dampers and/or motorized dampers.

Dampers

Dampers shall be provided in ducts at every branch supply or return air connection, whether or not indicated on the Drawings, for the proper volume control and balancing of the air distribution system.

All duct dampers shall be of 16 G GI construction and tight fitting. The design, method of handling and control shall be suitable for the location and service required.

Dampers shall be of splitter or butterfly type. Damper blade thickness shall not be less than 1.25 mm and not more than 2.25 mm wide. Dampers shall be lever operated and with locking device which will permit the dampers to be adjusted and locked in any position and clearly indicating the damper position. The damper shall be provided with graduated scale for % opening or closing. Linkages shall be extended for motorized operation

damper.

Fire & Smoke Dampers

Dampers shall be of fusible link type as indicated in the schedule of Quantities. Fire damper shall be multi blade type. The blades and frame shall be of minimum 16 G thickness. Other materials shall include return spring, locking device, all supply and return

Air ducts at AHU room crossings and at all floor crossings shall be provided with Motor operated Fire damper of at least 1-1/2 or 2 hour rating as per UL555/1995 tested by CBRI/FM.

Fire damper blades shall be one piece folded high strength 16 gage galvanized steel construction. In normal position, these blades shall be gathered and stacked at the frame head providing maximum air passage and preventing passing air currents from creating noise or chatter. The blades shall be held in position through fusible link of temp 70o C

In case of fire, the intrinsic energy of the folded blades shall be utilized to close the opening. The thrust from the closing of the damper shall operate a limit switch mounted in the bottom frame of fire damper within the duct. Closing of this limit switch shall shut off the power supply to the air handling unit stopping all air flow instantaneously. No hinges or blade linkages shall be permitted which may give way under heat or pressure.

The thrust of suddenly released tension shall instantly drive the blades down without the use of springs, weights other devices subject to failure. Fire damper sleeves and access doors shall be provided within the duct in accordance with the manufacturer's recommendation and applicable codes & regulations.

The electric actuator shall be energized either upon receiving a signal from smoke detector installed in AHU room supply air duct / return air duct or temperature sensor. The fire damper shall also close upon sensing temperature rise in supply air ducts thru the electronic temperature sensor.

Each damper shall be provided with its own control panel, mounted on the wall and suitable for 240 VAC supply. This control panel shall be suitable for spring return actuator and shall have at least the following features:

- Potential free contacts for AHU fan on/ off and remote alarm indication.
- Accept signal from external smoke / fire detection system for tripping the electrical actuator.
- Test and reset facility.
- Indicating lights / contacts to indicate the following status:
- Power Supply On
- Alarm
- Damper open and close position.

Actuators shall be mounted on the sleeve by the damper supplier in his shop and shall furnish test certificate for satisfactory operation of each Motor Operated Damper in conjunction with its control panel. Control panel shall be wall mounted type.

It shall be Bidder's responsibility to co-ordinate with the Fire Alarm System Contractor for correctly hooking up the Motor Operated Damper to Fire Detection / Fire Management System. All necessary materials for hooking up shall be supplied and installed by HVAC Contractor under close co-ordination with the fire protection system contractor.

The bidder shall demonstrate the testing of all Dampers and its control panel after necessary hook up with the fire protection / fire management system is carried out by energizing all the smoke detectors with the help of smoke.

HVAC Contractor shall provide Fire retardant cables wherever required for satisfactory operation and control of the Damper.

HVAC Contractor shall strictly follow the instructions of the Damper Supplier or avail his services at site before carrying out testing at site.

supports, rubber strip 5mm thick between duct and support, vibration isolator suspension where specified or required, inspection chamber/access panel, splitter damper with quadrant and lever for position indication, turning vanes, straightening vanes, and all other accessories required to complete the duct installation as per the specifications. These accessories shall not be separately measured nor paid for.

Special Items for Air Distribution shall be measured by the cross-section area perpendicular to air flow, as identified herewith:

Diffusers - cross section area for air flow at discharge area, excluding flanges. Volume control dampers, wherever specified shall form part of unit rate and shall not be separately accounted.

Fire dampers - shall be measured by their cross sectional area perpendicular to the direction of air flow. Quoted rates shall include the necessary collars and flanges for mounting, inspection pieces with access door, electrical actuators and panel.

All frames, required for installation of grilles/diffusers irrespective of the location of grilles/diffusers shall be in scope of HVAC contractor. All these frames shall be fabricated out of anodized aluminum angle/channel etc. as required. The contractor shall include the cost of all such items in the quotes rates. No claims, whatsoever, shall be entertained on account of non-inclusion of the frames cost in the rates quoted.

Testing

The ducts, branches, elbows etc. shall be inspected and the joints and connection shall be checked before these are assembled in position. After assembly the system shall be checked for tightness, vibration and noise.

Ductwork shall be free from waves or buckles and the sheet metal is to be machine-bent to ensure neat and accurate fabrication.

All duct surfaces behind diffusers, registers and grilles shall be painted Matt black.

Duct joints and seams shall be made air tight by use of sealants acceptable to local authority.

Test points shall be provided at the discharge of each air handling unit and at each individual zone of the duct work system. Test points shall consist of minimum 25 mm diameter sockets fitted with sealing plugs which can be removed for the fitting of measuring devices. Test points shall be insulated as for the ductwork and shall be provided with identification labels.

Rectangular risers should be free supported by angles or channels secured to the sides of the duct flanges with bolts or sheet metal screws or blind rivets. The Supporting angle or channel should be freely resting over the slab cut-out.

To ensure the air tightness, all ducts shall be checked with Leak Test conforming to relevant standards after completion of installation but before applying insulation

Balancing

The air distribution system shall be tested and balanced so that the requisite temperature and air flow are maintained throughout the space to be air-conditioned or ventilated.

During start-up phase, Contractor shall make all arrangement for drilling or plugging of all test opening or holes, adjustment of volume control dampers, adjusting of fan speed to obtain specified flows, obtaining actual motor ampere readings, and all related functions to ensure the proper operation of all systems.

All instruments required for testing and balancing of air distribution system shall be provided by the Contractor.

Complete air balance report shall be submitted for scrutiny and approval. Four copies of the approved balance report shall be provided with completion documents.

Duct Insulation

Closed cell elastomeric nitrile (VOC free) with anti-bacterial properties shall be used. The product shall have temperature range of -40°C to 105°C. Thermal conductivity of the insulation material shall not exceed 0.0351 W/m²K at an average temperature of 30°C. The density of nitrile rubber shall be 65-70 Kg/Cum. The water vapour diffusion resistance shall be more than 7000. The material shall also be UV and Ozone resistant. The joints shall be sealed with self-adhesive tapes of similar specifications.

Ducting insulation thickness shall be following as under:

Supply air duct:	As per SOQ
Return / Exhaust air duct	: As per SOQ

Duct Insulation

External thermal insulation shall be provided as shown on drawing or identified in the schedule of quantities.

Following procedure shall be adhered to for the Duct Insulation application:

- ✓ Duct surfaces shall be cleaned to remove all grease, oil, dirt, etc. prior to carrying out insulation work.
- ✓ Measurement of surface dimension shall be taken properly to cut closed cell elastomeric rubber sheets to size with sufficient allowance in dimension. Cutting of insulation sheets shall be done with adjustable blade with straight cuts.
- ✓ Material shall be fitted under compression and no stretching of material shall be permitted. A thin coat of adhesive shall be applied on the back of the insulating material sheet and then on to the metal surface. When

adhesive is tack dry, insulating material sheet shall be placed in position and pressed firmly to achieve a good bond. All longitudinal and transverse joints shall be sealed by providing 6 mm thick 50 mm wide self-adhesive insulation tape. The adhesive shall be strictly as recommended by the manufacturer.

Measurement of Insulation

Unless otherwise specified measurement for duct and pipe insulation for the project shall be on the basis of center line measurements described herewith.

Duct Insulation and Acoustic Lining shall be measured on the basis of surface area along the center line of insulation thickness. Thus the surface area of externally thermally insulated or acoustically lined duct shall be based on the perimeter comprising center line (of thickness of insulation) width and depth of the cross section of insulated or lined duct, multiplied by the center-line length including tapered pieces, bends, tees, branches, etc. as measured for bare ducting.

Pipe Insulation shall be measured in units of length along the center line of the installed pipe, strictly on the same basis as the piping measurements described earlier. The linear measurements shall be taken before the application of the insulation. It may be noted that for piping measurement, all valves, orifice plates and strainers are separately measurable by their number and size. It is to be clearly understood that for the insulation measurements, all these accessories including cladding, valves, orifice plates and strainers shall be considered strictly by linear measurements along the center line of pipes and no special rate shall be applicable for insulation of any accessories, fixtures or

EVALUATION AND VALIDATION TESTING PROCEDURE

Below HVAC test to be done for Classification area as per ISO 14644.

1	Room Air Changes Per Hour (ACPH) Checks
2	Temperature and Relative Humidity Checks
3	HEPA Filter Integrity Tests
4	Air Flow Particulate Count Analysis
5	Light Intensity (LUX) Testing
6	Airflow Pattern Test (Video Recording)

WARRANTY AND MAINTENANCE

- **Page No. 25 of NIT 2, Chapter 4 (WARRANTY AND MAINTENANCE):**The warranty of two years means a comprehensive coverage for all components and labor from the date of installation and additional three years of maintenance service with spares/consumables billed as per actual.

All the clean-rooms and components thereof, except the consumables such as filters, must be supplied with a warranty of two years from the date of installation and additional three years of maintenance service.

The epoxy flooring should be warranted for a minimum of three years against chipping.

CHECKLIST TO BE SUBMITTED

Nos	Component name	Detailed Drawings & Layout (Yes/No/NA)	Brochure/Technical Literature from manufacturer (Yes/No)	Manufacturer website	Necessary certifications & Quality assurance (Yes/No)	User list (Yes/No)
1	Class 100K Clean Room					
2	Wall Panels	NA				NA
3	HVAC/AHU – Fans/motors	NA				
4	Doors					

5	Air Curtain	NA				
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Compliance Statement

SI. No.	ITEMS	BASIC REQUIREMENTS	DETAILED SPECS & DESCRIPTION GIVEN IN	COMPLIED / PARTIALLY COMPLIED / NOT COMPLIED
1	Scope of the work	2. Final layouts, 3. Supply, installation, Commissioning and handing over of the fully functioning Class 100K Clean Room having 65±5% relative humidity and 22±3°C temperature. 4. Certification of the Class 100K Clean Room	Introduction, Page No. 3	
2	Class 100K Clean Room Enclosure containing – Class 100K Clean Room Ante-Room (Air-Lock)	Total dimension 20 ft x 10 ft Clean Room shall be Class 100K, ISO 8 certified - Dimension 14 ft x 10 ft, Air Pressure – 55 Pa - Dimension 6 ft x 10 ft, Air Pressure – 40 Pa	Chapter – 01, Page Nos. 5 -10	
3	Drawing / Layout	For Two room types and as per GFC Drawing	Page No. 4	
4	Clean Room Walls	Modular wall shall include : <ul style="list-style-type: none"> • Standard panel dimensions should be no less than 1220 mm wide with an overall length of 2400mm. • High Density PolyUrethane (HDP) – 48.4mm for 50mm panels • Infill – HDP/PUF (Density - 40 + / - 2 kg/m³) • Welded rectangular aluminum framework • Aluminum rectangular profile between wall sections shall provide the precision minimum seal gap • A 70mm aluminum floor track for panel support & U profile floor track for panel support. 	Chapter – 01, Page Nos. 5 - 6	
5	Covings and Wall Connection	FLUSH VERTICAL COVINGS - (Wall to ceiling and wall to floor), Flush 90 degree corner shall be used for connecting the two walls. POWDER COATED FITTINGS FOR LINKING COVING PROFILES - Outside corners (1/4th sphere on 90 degree corner) and inside corners (1/8th sphere on Covings at Corners) shall be used to link vertical and horizontal covings between the wall and the ceilings. Different levels of finishing are proposed.	Chapter – 01, Page Nos. 7.	

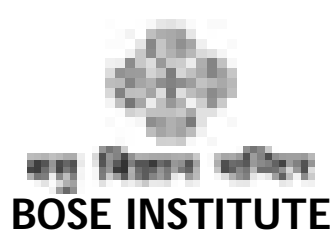
6	Doors	Doors shall be configured as Single Swing-Out, however, when fully opened should allow an open space of at least 3.5 feet. Standard door height shall be of 6.5 feet. Standard door panels shall have a composite construction of two skins of PCGI with a sealed and insulated interior. Swing out doors shall be designed to fit flush with both sides of the wall panel system and shall be supplied in several dimensions. The internal frame work shall be constructed by welding extruded aluminum profiles. The external frames shall be manufactured with aluminum profiles with air tight dual gaskets. All fasteners for the hinges and latches shall be recessed in to the door frame. Standard hinges shall allow doors to swing 180° degrees from full open to full closed position. Door panels should have a View Panel of approximate dimension 1.3ft x 2.5ft, constructed using Double Glazed Vision Glass, flush fitted with the door panels. All dimensions have to be considered as "space available inside the door frame."	Chapter – 01, Page Nos. 7 - 8	
7	Door Interlock Capability	Both doors shall be equipped with electro-magnetic controllers (“mag-locks”) and shall have “hard inter-lock” functionality – meaning, in this system, both doors shall be normally unlocked at all times. When one door is opened, the position switch shall trigger an input signal to the interlock controller, which shall send a signal to activate the locking device of the opposite door. The second door shall remain locked until the first door is closed. Once the first door is closed, the locking signal to the second door shall drop, and both doors shall return to normally unlocked status until the next input is received at the controller.	Chapter – 01, Page No. 8	
8	View Glasses in Wall Panel	All clean rooms shall have a view-panel made of double-glazed glasses fit flush with both surfaces of the wall panel system (50mm) (see drawing) to allow visibility of the clean room interior from the laboratory. Each view-panel unit shall be constructed of two panels of toughened glass of dimension 1000 x 1000 mm. The window system shall be completely Silicone sealed and includes a micro-perforation profile with an integral silica gel moisture adsorption system to eliminate fogging.	Chapter – 01, Page No. 8-9	
9	False Ceiling	False ceiling shall be a hermetic suspended false ceiling & shall be designed according to the rooms lay-out. False ceiling shall be made by means of PUF sandwiched between two layers of PCGI/PCGI. All sides closed by aluminium frame. The result shall be perfectly smooth and coplanar surface very easy to clean. Bearing Aluminum Joining profile shall be housed by clicking-in between the two panels. A threaded tension bar shall be used to fasten the existing ceiling. Panel dimensions: 1220 x 2440 x 50 mm thickness. Filter, light and other accessories can be accessed from the top of the ceiling. Holes for filters, light and utilities shall be prepared at company site with Numeric control Pantograph. The weight of standard false ceiling panel 1220x2440x 50mm shall not exceed 48Kgs.	Chapter – 01, Page No. 9-10	
10	Clean Room Flooring	Flooring should be of epoxy material. Epoxy floor paint needs to applied after removal of the tiles (if necessary) and proper leveling of the floor. The total thickness of the floor should be 3mm thick.	Chapter – 01, Page No. 10	
11	Ante-Room	An ante-room of dimension 10 ft x 6 ft shall be constructed within the Class 100K Clean Room with proper partitioning as depicted on the layout given in Page No. 3. The construction, materials of wall and partitioning, flooring as well as ceiling shall	Chapter – 01, Page No. 10	

		be exactly as described under the same for Class 100K Clean Room above. Additionally, the ante-room shall have two doors of dimension 6.5 ft x 4 ft (single swing or double swing), one at the entry to the ante-room and the other at the entry to the Class 100K Clean Room as shown in the layout on Page No. 3. The two doors shall be inter-locked. The entry door to the ante-room shall also be equipped with an Air curtain, detailed specifications for which are given below.		
12	Lighting, germicidal UV lamps, and electrical fixtures	The clean room and the anteroom should be provided with LED panel lights to achieve an intensity of 500 lux. The clean shall also be equipped with germicidal UV-lamps (UV-A or B) for decontamination. All electrical fixtures (13A universal sockets, 15 sockets and switches) must be of clean room grade.	Chapter – 01, Page No. 10	
13	Air Curtain	The first door leading into the Ante-Room shall be equipped with an Air curtain. Air Curtain shall be Propeller based, and Twin nozzle system Air curtain	Chapter – 03, Page Nos. 20	
14	HVAC & AHU System For Class 100K Clean Room	<p>The air handling units shall be state of the art design, factory manufactured, brand new, complete in all respects and conforming to the Specifications and in accordance with requirements in schedule of quantities. All air handling units shall be provided with following accessories:</p> <p>A) Access door of minimum 600 mm width shall be provided in each section and in each Plenum housing. Limit switches along with wiring shall be provided in fan section doors and shall be interlocked with AHU fan motor(s) and inspection lamp. Minimum 4 nos. entries shall be provided for Power/Signal cable compression glands.</p> <p>B) Junction box shall be provided with all the internal wiring from limit switch and marine light laid in enclosures. Separate switch should be considered to ON/OFF the marine light from outside the unit.</p> <p><u>Type</u> The air handling units shall be double skin construction (as indicated in SOQ), blow thru / draw-thru type (Horizontal floor mounted/Vertical) as specified with powder coated finish & shall include pre-filter section (for air handling units without TFA), Microvee Filter section, plug fan section, coil sections, return air mixing box section, chilled water cooling coil of copper tubes and Aluminum fins as mentioned below with copper headers, SS drain pan with insulation, U trap and accessories. DIDW backward curved plug fans to be supplied along with VFD compatible motor, drive package comprising of drive motor etc. as shown on drawings and included in schedule of quantities.</p> <p><u>Capacity</u> The air handling unit capacities and static pressure shall be as shown on Drawings and AHU identified in schedule of Quantities. AHU casing size shall be selected on the basis of following: Velocity across Coil / Filter Face ≤ 500 FPM AHU capacity : 6tr As per ISO the clean room : ISO 8. Air pressure in clean room : 55Pa Air pressure in Ante-Room (Airlock) : 40Pa</p> <p><u>Testing</u> Capacity of various air handling unit models shall be computed from the measurements of air flow, dry bulb and wet bulb temperatures of air entering and leaving the coil. Flow measurements shall be measured by an anemometer and temperature measurements by accurately calibrated mercury-in-glass thermometers. Computed results shall conform to the specified capacities and</p>	Chapter – 02, Page Nos. 11 – 18 and on, Chapter – 02, Page No. 11	

		quoted ratings. Power consumption shall be computed from measurements of incoming voltage and input current AHU Leakage test shall be performed at site.		
15	Fan Section	<p>The fan shall be forward/backward inclined blades, plug type suitable for rated flow at static pressures as indicated in schedule of Quantities. Fans shall be selected for minimum efficiency of 70 %. The fan wheel and housing shall be fabricated from heavy gauge galvanized steel. Fan impeller shall be grounded on C40 carbon steel shaft supported to housing with angle GI frame and Plummer block. Fan motor assembly shall be statically and dynamically balanced to meet AMCA standard 204-96, to meet or exceed G6.3 Residual balance. Computerized fan selection printouts shall be submitted along with the offer.</p> <p>Fan motors shall be mounted inside the AHU casing and be totally enclosed fan cooled, with class `F' insulation. Both fan and motor assemblies shall be mounted on a common heavy steel base frame inside the fan section on anti-vibration springs for isolating the unit casing. The fan section shall be provided with bell mouth arrangement for air outlet. The sound levels shall not be more than 75 dB from one meter distance from the air handling unit.</p>	Chapter – 02, Page Nos. 11 - 12	
16	AHU Enclosure / Casing (Double Skin)	<p>Double skin Air Handling Units constructed with minimum 48±3 mm thick PUF sandwiched insulation panel with 0.6 mm thick GI sheets as per specification complete with thermal break profile. All sections/panels shall be bolted to each other with Food grade Neoprene rubber gasket and fixed with stainless screws in between them for perfectly aligned and airtight joints. The gaskets shall be held in place by inserting them in the integrated channels in the framework. All panels shall be detachable or hinged. Hinges shall be made of die cast aluminum with stainless steel pivots. Handles shall be made of hard nylon and be operational from both inside and outside of the unit. Condensate drain pan shall be provided with multiple slopes towards drain outlet. Condensate drain pan shall be fabricated from 18 gauge stainless steel grade 304 (including SS Nipple) with all corners welded. It shall be isolated from bottom floor panel through 25mm thick polyurethane foam or any suitable insulation. The Vendor shall guarantee that no sweating will take place on the outer surface of AHU.</p>	Chapter – 02, Page No. 12	
17	Cooling Coils	<p>Cooling coils shall be made from seamless copper tubes with sine wave aluminum fins. The tubes shall be solid drawn copper of not less than 12 mm diameter and minimum 0.4 mm wall thickness. Aluminum fins shall be continuous and equispaced by collars forming integral part of the fins. The number of fins shall be 12 FPI and the thickness of fins shall be minimum 0.15 mm. The fins shall be uniformly bonded to copper tubes by mechanic/hydraulic expansion for minimum thermal contact resistance with fins. The fins shall be assembled in a stainless steel frame. Coils shall be sliding track mounted inside the AHU for easy replacement. Face area of the coil shall be such as to ensure rated capacity from each unit and such that the air velocity across the coil shall not exceed 500 FPM.</p> <p>Each section of the coil shall be fitted with supply & return header of Copper to feed all passes of coil equally. U bends shall be of forged copper and shall be joined to tubes by brazing and silver soldering. Each of supply and return headers shall have two connections at either end to facilitate the coil replacement in any direction at site. Headers shall be provided with flanged ends for pipe connections. The headers shall also be provided with vent plug at top and drain plug/valve at bottom.</p> <p>The coil shall be designed for a maximum working pressure of 7 Kg/Sq.cm. Each</p>	Chapter – 02, Page No. 12	

		coil shall be factory-tested at 21 kg/Sq.cm air pressure under water. Coil rating shall be as per ARI standard 410. Cross section area of AHU other than coil surface should be properly sealed (Blank off) with at least 16G SS 304 sheet. Contractor should guarantee that their shall be zero leakage from the blank off sheet. SS ports to be provided to measure on and off coil temperature.		
18	Dampers	Dampers shall be opposed blade type. Blades shall be made of double skinned aero foil aluminum sections of minimum 1.25 mm thickness with integral gasket and assembled within a rigid extruded aluminum alloy frame and bronze bearings. Dampers shall be lever operated and with locking device which will permit the dampers to be adjusted and locked in any position and clearly indicating the damper position. The damper shall be provided with graduated scale for % opening or closing. Linkages shall be extended for motorized operation. Air leakage through dampers when in the closed position shall not exceed 1.5% of the maximum design air volume flow rate at the maximum design air total pressure.	Chapter – 02, Page No. 13	
19	Motors	Fan motors shall be energy efficient (IE2) and shall be 415±10% volts, Motor shall be specified for inverter duty which can be operated at sine wave 50Hz. Three phase, totally enclosed fan-cooled class 'F' with IP-55 protection. Motor HP shall be selected at least 20% more than the BHP of fan at the specified flow and static pressure.	Chapter – 02, Page No. 13	
20	Vibration Isolators	Vibration isolators shall be provided with all air handling units. Vibration isolators shall be anti-vibration springs or cushy foot mountings. Minimum vibration isolation efficiency shall be 90%.	Chapter – 02, Page No. 13	
21	Fans	Plug, in-line and propeller type fans shall be of the type as indicated in schedule of Quantities. All the fans shall be AMCA International certified.	Chapter – 02, Page Nos. 13 - 14	
22	Magnehelic Gauge	Magnehelic gauge shall be provided with suitable SS box, SS nozzles & SS face plates and SS 304 tubing as approved by engineer-in-charge. Housing of magnehelic gauge shall be Die cast aluminum with 100 mm diameter dial face. Accuracy shall be ±2% of full scale. It shall withstand a temperature limit of 0oC to 80°C.	Chapter – 02, Page Nos. 14	
23	Filter Section & Filters	Both pre-filters (MERV-8), MERV 11 as well as HEPA Filters shall be included.	Chapter – 02, Page Nos. 15	
24	Electric Duct Heaters	As mentioned in description.	Chapter – 02, Page Nos. 15 - 16	
25	Electrical Panel fabrication	Panel shall be 3-Phase, 4-wire, 415V and 50Hz.	Chapter – 02, Page Nos. 16 - 17	
26	Ducting Material & Duct Construction	All ducting shall be Factory Fabricated of Lfq (Lock Forming Quality) grade, prime GI raw material. Galvanizing shall be Class VIII – light coating of zinc, nominal 120 gm/Sq. surface area coating on both sides conforming to IS 277 coating grade. GI raw material shall be used in coil form (instead of sheets) so as to limit the longitudinal joints irrespective of cross-section dimensions. All ducts must conform to SMACNA codes.	Chapter – 02, Page No. 17	
27	Gauge & Transverse Connectors	All ducts shall be with MS/GI angle Flanges system with built-in sealant. Bracing distance should not be more than 600mm as per IS standard. All ducts shall be fabricated from galvanized steel / aluminum of the following thickness, as indicated	Chapter – 02, Page Nos. 17 – 18	

		in Chapter – 02, Page Nos. 16 – 17.		
28	Support System	A complete system consisting of fully threaded GI rods, double L bottom brackets (epoxy painted MS angles) / Slotted angles, nuts, washers and anchor bolts shall conform to relevant IS standards. To provide the required thermal brake effect, Neoprene of 6 mm thickness shall be used between duct profiles to avoid heat transfer losses.	Chapter – 02, Page Nos. 19	
29	Air Cooled Condensing Outdoor VRF/VRV Units	The Air cooled VRV/VRF condensing outdoor units shall be fitted with two or more high efficiency inverter type scroll compressors of minimum capacity and performance as indicated in the SOQ, starter for compressors, condenser fans, Insulated cooler, air cooled condenser with microprocessor control panel. Each unit shall be completely factory assembled, piped, wired and tested. Great importance is attached to good pipe work arrangement and installation to enable maintenance and repair works to be carried out properly and efficiently. VRF/VRV units shall be complete in all respect with necessary accessories, pipes, connections, wiring, thermometers, gauges, protective devices, and other apparatus that may be necessary for the complete operation. The VRF/VRV unit shall utilize a non-chlorofluorocarbon (CFC) refrigerant of type R-134A/R410a/R407c.	Chapter – 02, Page Nos. 19 - 20	
30	Installations	Installations shall be done according to description and specifications mentioned in Chapter – 02, Page Nos. 18	Chapter – 04, Page Nos. 20 - 24	
31	Certifications	The following certifications are to be provided – 1. Clean Room ISO 8 certification must be provided before commissioning 2. For all electrical panels, all test certificates must be provided immediately after commissioning 3. For HVAC & AHU, necessary certificates have to be provided for proper functioning after installation		
32	Warranty and Maintenance	WARRANTY AND MAINTENANCE All the clean-rooms and components thereof, except the consumables such as filters, must be supplied with a warranty of two years from the date of installation and additional three years of maintenance service. The epoxy flooring should be warranted for a minimum of three years against chipping.	Chapter - 04, Page No. 24	
33	Testing & Validation	The following HVAC tests need to be performed : 1. Room Air Changes Per Hour (ACPH) Checks 2. Temperature and Relative Humidity Checks 3. HEPA Filter Integrity Tests 4. Air Flow Particulate Count Analysis 5. Light Intensity (LUX) Testing 6. Airflow Pattern Test (Video Recording)	Chapter – 04, Page No. 24	



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ANNEXURE-III

PRE CONTRACT INTEGRITY PACT

General

This pre-bid pre-contract Agreement (hereinafter called the Integrity Pact) is made on _____ day of the month of _____ 2019, between, on one hand, the Director, Bose Institute acting through Shri....., Designation of the officer, Bose Institute (hereinafter called the "BUYER", which expression shall mean and include, unless the context otherwise requires, his successors in office and assigns) of the First Part and M/s _____ represented by Shri _____, Chief Executive Officer (hereinafter called the "BIDDER/Seller" which expression shall mean and include, unless the context otherwise requires, his successors and permitted assigns) of the Second Part.

WHEREAS the BUYER proposes to procure (Name of the Stores/Equipment/Item) and the BIDDER/Seller is willing to offer/has offered the stores and WHEREAS the BIDDER is a private company/public company/Government undertaking/partnership/registered export agency, constituted in accordance with the relevant law in the matter and the BUYER is a Ministry/Department of the Government of India/PSU performing its functions on behalf of the President of India

NOW, THEREFORE, to avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to:-

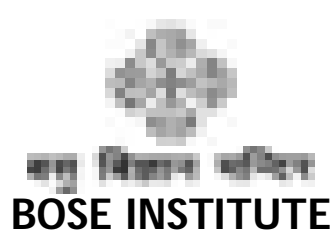
Enabling the BUYER to obtain the desired said stores/equipment at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement, and

Enabling BIDDERS to abstain from bribing or indulging in any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the BUYER will commit to prevent corruption, in any form, by its officials by following transparent procedures.

The parties hereto hereby agree to enter into this Integrity Pact and agree as follows:

Commitments of the BUYER

The BUYER undertakes that no official of the BUYER, connected directly or indirectly with contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the BIDDER, either for themselves or for any person, organization or their party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.



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The BUYER will, during pre-contract stage, treat all BIDDERS alike, and will provide to all BIDDERS the same information and will not provide any such information to any particular BIDDER which could afford an advantage to that particular BIDDER in comparison to other BIDDERS.

All the officials of the BUYER will report to the appropriate Government office any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.

2. In case any such preceding misconduct on the part of such official(s) is reported by the BIDDER to the BUYER with full and verifiable facts and the same is prima facie found to be correct by the BUYER, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the BUYER and such a person shall be debarred from further dealings related to the contract process. In such a case while an enquiry is being conducted by the BUYER the proceedings under the contract would not be stalled.

Commitments of BIDDERS

3. The BIDDER commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre-contract or post-contract stage in order to secure the contract or in furtherance to secure it and in particular commit itself to the following:-

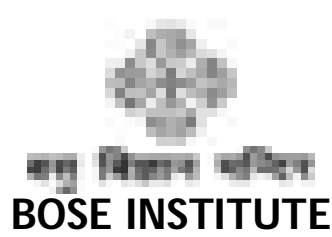
The BIDDER will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the BUYER, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the contract.

The BIDDER further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the BUYER or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the contract or any other contract with the Government for showing or forbearing to show favour or disfavour to any person in relation to the contract or any other contract with the Government.

BIDDERS shall disclose the name and address of agents and representatives and Indian BIDDERS shall disclose their foreign principals or associates.

BIDDERS shall disclose the payments to be made by them to agents/brokers or any other intermediary, in connection with this bid/contract.

The BIDDER further confirms and declares to the BUYER that the BIDDER is the original manufacturer/integrator/authorized government sponsored export entity of the defence stores and has not engaged any individual or firm or company whether Indian or foreign to intercede,



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facilitate or in any way to recommend to the BUYER or any of its functionaries, whether officially or unofficially to the award of the contract to the BIDDER, nor has any amount been paid, promised or intended to be paid to any such individual, firm or company in respect of any such intercession, facilitation or recommendation.

The BIDDER, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payments he has made, is committed to or intends to make to officials of the BUYER or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments.

The BIDDER will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.

The BIDDER will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.

The BIDDER shall not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the BUYER as part of the business relationship, regarding plans, technical proposals and business details, including information contained in any electronic data carrier. The BIDDER also undertakes to exercise due and adequate care lest any such information is divulged.

The BIDDER commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable facts.

The BIDDER shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.

If the BIDDER or any employee of the BIDDER or any person acting on behalf of the BIDDER, either directly or indirectly, is a relative of any of the officers of the BUYER, or alternatively, if any relative of an officer of the BUYER has financial interest/stake in the BIDDER's firm, the same shall be disclosed by the BIDDER at the time of filing of tender.

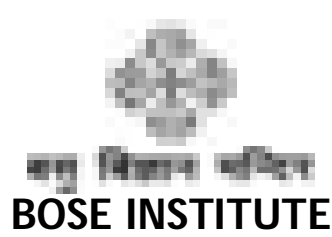
The term 'relative' for this purpose would be as defined in Section 6 of the Companies Act 1956.

The BIDDER shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of the BUYER.

4. Previous Transgression

The BIDDER declares that no previous transgression occurred in the last three years immediately before signing of this Integrity Pact, with any other company in any country in respect of any corrupt practices envisaged hereunder or with any Public Section Enterprise in India or any Government Department in India that could justify BIDDER's exclusion from the tender process.

The BIDDER agrees that if it makes incorrect statement on this subject, BIDDER can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.



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5. Earnest Money (Security Deposit)

While submitting commercial bid, the BIDDER shall deposit an amount of Rs. 7,00,000.00 as Earnest Money/Security Deposit, with the BUYER through any of the following instruments:

- (i) Bank Draft or a Pay Order in favour of Bose Institute, Kolkata.
- (ii) A confirmed guarantee by an Indian Nationalised Bank, promising payment of the guaranteed sum to the BUYER on demand within three working days without any demur whatsoever and without seeking any reasons whatsoever. The demand for payment by the BUYER shall be treated as conclusive proof of payment.
- (iii) Any other mode or through any other instrument such as NEFT/RTGS.

The Earnest Money/Security Deposit shall be valid upto a period of two years or the complete conclusion of the contractual obligations to the complete satisfaction of both the BIDDER and the BUYER, including warranty period, whichever is later.

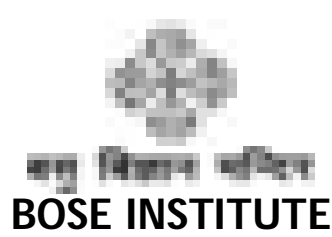
In case of the successful BIDDER a clause would also be incorporated in the Article pertaining to Performance Bond in the Purchase Contract that the provisions of Sanctions for Violation shall be applicable for forfeiture of Performance Bond in case of a decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

No interest shall be payable by the BUYER to the BIDDER on Earnest Money /Security Deposit for the period of its currency.

6. Sanctions for Violations

Any breach of the aforesaid provisions by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER) shall entitle the BUYER to take all or any one of the following actions, wherever required:-

- (i) To immediately call off the pre contract negotiations without assigning any reason or giving any compensation to the BIDDER. However, the proceedings with the other BIDDER(s) would continue.
- (ii) The Earnest Money Deposit (in pre-contract stage) and/or Security Deposit/Performance Bond (after the contract is signed) shall stand forfeited either fully or partially, as decided by the BUYER and the BUYER shall not be required to assign any reason therefore.
- (iii) To immediately cancel the contract, if already signed, without giving any compensation to the BIDDER.
- (iv) To recover all sums already paid by the BUYER, and in case of an Indian BIDDER with interest thereon at 2% higher than the prevailing Prime Lending Rate of State Bank of India, while in case of a BIDDER from a country other than India with interest thereon at 2% higher than the LIBOR. If any outstanding payment is due to the BIDDER from the BUYER in connection with any other contract for any other stores, such outstanding payment could also be utilized to recover the aforesaid sum and interest.



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- (v) To encash the advance bank guarantee and performance bond/warranty bond, if furnished by the BIDDER, in order to recover the payments, already made by the BUYER, along with interest.
- (vi) To cancel all or any other Contracts with the BIDDER. The BIDDER shall be liable to pay compensation for any loss or damage to the BUYER resulting from such cancellation/rescission and the BUYER shall be entitled to deduct the amount so payable from the money(s) due to the BIDDER.
- (vii) To debar the BIDDER from participating in future bidding processes of the Government of India for a minimum period of five years, which may be further extended at the discretion of the BUYER.
- (viii) To recover all sums paid in violation of this Pact by BIDDER(s) to any middleman or agent or broker with a view to securing the contract.
- (ix) In cases where irrevocable Letters of Credit have been received in respect of any contract signed by the BUYER with the BIDDER, the same shall not be opened.
- (x) Forfeiture of Performance Bond in case of a decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

The BUYER will be entitled to take all or any of the actions mentioned at Para 6.1(i) to (x) of this Pact also on the Commission by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER), of an offence as defined in Chapter IX of the Indian Penal Code, 1860 or Prevention of Corruption Act, 1988, or any other statute enacted for prevention of corruption.

The decision of the BUYER to the effect that a breach of the provisions of this Pact has been committed by the BIDDER shall be final and conclusive on the BIDDER. However, the BIDDER can approach the independent Monitor(s) appointed for the purposes of this Pact.

7. Fall Clause

The BIDDER undertakes that it has not supplied/is not supplying similar product/systems or subsystems at a price lower than that offered in the present bid in respect of any other Ministry/Department of the Government of India or PSU and if it is found at any stage that similar product/systems or sub systems was supplied by the BIDDER to any other Ministry/Department of the Government of India or a PSU at a lower price, then that very price, with due allowance for elapsed time, will be applicable to the present case and the difference in the cost would be refunded by the BIDDER to the BUYER, if the contract has already been concluded.

8. Independent Monitors

The BUYER has appointed independent Monitors (hereinafter referred to as Monitors) for this Pact in consultation with the Central Vigilance Commission (Independent External Monitors appointed by CVC for the tender -Dr. Sanjay Kumar Panda, IAS (Retd.) & Shri Amol Prabhakar Joshi, CES (Retd.)

The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.

The Monitors shall not be subject to instructions by the representatives of the parties and perform their functions neutrally and independently.

Both the parties accept that the Monitors have the right to access all the documents relating to the project/procurement, including minutes of meetings.

As soon as the Monitor notices, or has reason to believe, a violation of this Pact, he will so inform the Authority designated by the BUYER.

The BIDDER(s) accepts that the Monitor has the right to access without restriction to all Project documentation of the BUYER including that provided by the BIDDER. The BIDDER will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is applicable to Subcontractors. The Monitor shall be under contractual obligation to treat the information and documents of the BIDDER/Subcontractor(s) with confidentiality.

The BUYER will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the parties. The parties will offer to the Monitor the option to participate in such meetings.

The Monitor will submit a written report to the designated Authority or BUYER/Secretary in the Department/within 8 to 10 weeks from the date of reference or intimation to him by the BUYER / BIDDER and should the occasion arise, submit proposals for correcting problematic situations.

9. Facilitation of Investigation

In case of any allegation of violation of any provisions of this Pact or payment of commission, the BUYER or its agencies shall be entitled to examine all the documents including the Books of Accounts of the BIDDER and the BIDDER shall provide necessary information and documents in English and shall extend all possible help for the purpose of such examination.

10. Law and Place of Jurisdiction

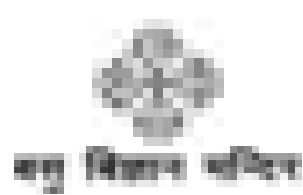
This Pact is subject to Indian Law. All disputes arising out of this Contract will be subjected to Kolkata jurisdiction.

11. Other Legal Actions

The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings.

12. Validity

The validity of this Integrity Pact shall be from date of its signing and extend up to 5 years or the complete execution of the contract to the satisfaction of both the BUYER and the BIDDER/Seller, including warranty period, whichever is later. In case BIDDER is unsuccessful, this Integrity Pact shall expire after six months from the date of the signing of the contract.



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Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact shall remain valid. In this case, the parties will strive to come to an agreement to their original intentions.

13. The parties hereby sign this Integrity Pact at _____ on _____

BUYER

Name of the Officer:

Designation

BOSE INSTITUTE

BIDDER

CHIEF EXECUTIVE OFFICER

Witness

1. _____

2. _____

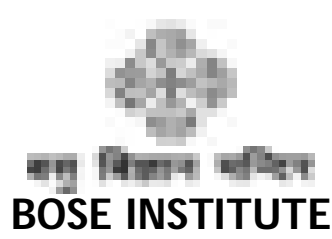
Witness

1. _____

2. _____

*Provisions of these clauses would need to be amended / deleted in line with the policy of the BUYER in regard to involvement of Indian agents of foreign suppliers.

**** The bidders may note that they must upload the Integrity Pact signed by both the bidder as well as the buyer (Institute) and upload the same alongwith the bidding document.**



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ANNEXURE-iv

UNDERTAKING

(To be printed on the letter-head of Bidder)

1. I/We undertake that I/we have carefully studied all the terms and conditions and understood the parameters of the proposed Work Order of laboratory furniture items and shall abide by them.
2. I/We also undertake that I/We have understood "All the terms and conditions and Annexure" mentioned in this Tender, and shall conduct the supply and installation of the furniture and equipment strictly as per the terms and conditions".
3. I/We further undertake that the information given in this Tender are true and correct in all respect and we hold the responsibility for the same.
4. I/we shall be responsible for rejection/cancellation of contract if the materials are not found up to the mark or for civil/criminal proceedings if the materials supplied is found substandard. We also undertake to incur the costs necessary for the tests or any other certification required by the Institute to confirm the compliance of the product with the specifications cited in the Notice for Tender.

Date

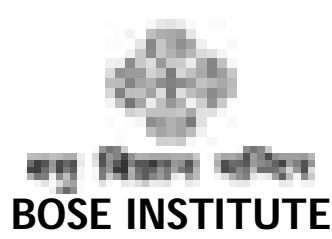
Name of the Authorized Signatory

Place

Designation:

Contact No.

Signature with seal



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ANNEXURE-V

BID FORM

(to be submitted on the official letterhead of the bidder)

**The Director,
Bose Institute,
P-1/12, CIT Scheme-VII/M,
Kolkata - 700054 (W.B.) India**

Sir,

Having examined the bidding documents the receipt of which is hereby duly acknowledged, I/We agree to furnish required supplies/services in conformity with the Techno-Commercial Bid or such portions thereof at the prices given in the Price Bid on receipt of order for the same.

I/We agree to hold this offer open until _____ and to supply, install and commission the equipment and complete the whole of the work and hand over to the purchaser within the period of _____ weeks, from the date of receipt of intimation from you regarding acceptance of this tender/receipt of supply order.

I/We agree to submit the bank guarantee as specified in the form prescribed by your goodself for the due performance of the contract, if our bid is accepted.

I/We understand that you are not bound to accept the lowest or any bid you may receive.

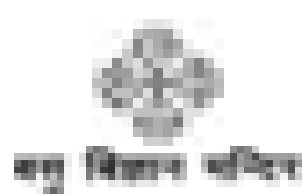
(_____)
Signature of Bidder
With Office Stamp
Name & Address

Telephone No.:

FAX No.:

E-mail address:

Name & Designation of the Contact Person:



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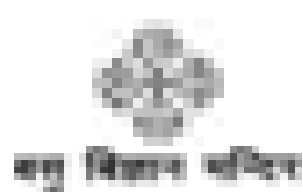
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ANNEXURE-VI

TECHNO-COMMERCIAL BID FORM

1.	Tender reference No	:	
2.	Due date of bid submission	:	
3.	Warranty Period (in years)	:	
4.	Details of Bank Guarantee enclosed as Bid Security :	:	
	Name of the Bank	:	
	Branch	:	
	Address with Phone, FAX & E-mail Nos.	:	
	Amount Rs.	:	
	Valid Upto	:	
5.	Bid currency	:	
6.	Schedule of Requirements :		
	Whether agreeing to all the terms and conditions including payment terms as mentioned in the bidding documents		
Note	::		
1.	Adhering to the format given above is a pre-requisite for considering your bid.		
2.	All columns must be filled up.		
3.	Separate list should be attached where required in the same format giving details of each item.		
4.	Please indicate applicability.		
I/We certify that I/We have completely read and understood and agree to all the terms & conditions given in NIT.			

(
Signature of Bidder
With Office Stamp
Name & Address
)



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ANNEXURE-VII

MANUFACTURERS' AUTHORIZATION FORM

No. _____

Dated _____

**The Director,
Bose Institute,
P-1/12, CIT Scheme-VII/M,
Kolkata - 700054 (W.B.) India**

Dear Sir:

I/We _____ who are established and reputable manufacturers of _____ having factories at _____ (address of factory) do hereby authorize M/s. _____ (Name and address of Agent) to submit a bid, negotiate and receive the order from you against your tender enquiry.

No company or firm or individual other than M/s. _____ is authorized to bid, and conclude the contract in regard to this business.

I/We hereby extend our full guarantee and warranty as per Clause 15 of the General Conditions of Contract and Clause of the Special Conditions of Contract for the goods and services offered by the above firm.

Yours faithfully,

(Name)

(Name of manufacturers)

Note: This letter of authority should be on the letterhead of the manufacturer and should be signed by a person competent and having the power of attorney to bind the manufacturer. It should be included by the Bidder in its techno-commercial unpriced bid.

বঙ্গ বিজ্ঞান ইনস্টিটিউট

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ANNEXURE-VIII

**BIDDER'S PERFORMANCE STATEMENT FORM
(For a Period of Last 3 Years)**

Name of the Firm.....

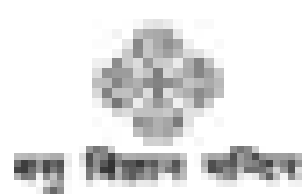
Order placed by (full address with Tel. No., Fax No. & e-mail address of purchaser)	Date	Description and quantity of ordered item	Date of completion of delivery as per Contract/ Actual	Remarks indicating reasons for late delivery, if any	Has the equipment been installed satisfactory? (Attach a certificate from the purchaser/ Consignee)

Place :

Signature :

Date :

Office stamp



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ANNEXURE-IX

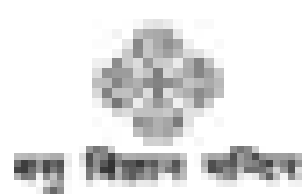
SERVICE SUPPORT DETAILS FORM

Sl. No.	Nature of training imparted	List of similar type items serviced in the past 3 years	Address, Telephone Nos., Fax and e mail address of the firm located in Kolkata, if any	Value of minimum stock of consumable spares held at all times.

Signature and Seal of the manufacturer/Bidder.....

Place :

Date :



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ANNEXURE-X

Quotation No.....

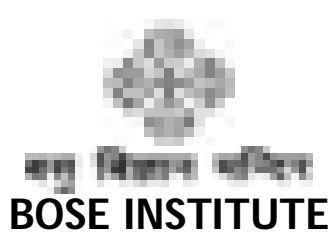
Date :

PROFORMA OF FALL CLAUSE CERTIFICATE

If on any subsequent date after submission of quotation or placing of supply order, the manufacturer (the term manufacturer will also include his authorized distributor / agent) reduces the sale price of such stores or sells such stores to any party at a price lower than the price charged / chargeable against supply order placed by Bose Institute, Kolkata, the manufacturer (including his authorized distributor / agent) as aforesaid in case the quotation is submitted by them and supply / service is also effected by them) will forth-with notify such reduction in sale price to Bose Institute, Kolkata and price payable for the stores to be supplied against the Supply Order after the date of such reduction in sale price coming into force shall reduced **correspondingly and will be reimbursed to the Institute.**

(Signature & Date of Bidders with Rubber Stamp)

*** This certificate should be uploaded on the letter head of the company / firm / agency*



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Ref : BI-K/E-TEND/19/2019-20

BID SECURITY FORM

(To be executed by a scheduled Bank in India on non-judicial stamp paper)

To
The Director,
Bose Institute,
P-1/12, CIT Scheme-VII/M,
Kolkata - 700054 (W.B.) India

Dear Sir,

Whereas (Name and address of Bidder) (hereinafter called "the Bidder") in response to your Tender Notification No. ----- dated ----- is submitting its bid for the supply of (Name and/or description of the goods) (Hereinafter called "the Bid").

KNOW ALL PEOPLE by these presents that WE (Name of bank) of (Name of country), having our registered office at (Address of bank) (Hereinafter called "the Bank"), are bound unto **Director, Bose Institute, Kolkata, INDIA** (Hereinafter called "the Purchaser") for the sum of (Amount of the Guarantee in Words and Figures) for which payment well and truly to be made to the said Purchaser, the Bank binds itself, its successors, and assigns by these presents. Sealed with the Common Seal of the said Bank this ____ day of _____ 20__.

THE CONDITIONS of this obligation are:

1. If the Bidder withdraws its Bid during the period of bid validity specified by the Bidder on the Bid Form; or
2. If the Bidder, having been notified of the acceptance of its bid by the Purchaser during the period of bid validity;
3. Fails or refuses to execute the Contract Form if required; or
4. Fails or refuses to furnish the performance security, in accordance with the Instruction to Bidders.
5. This guarantee is valid up to (six months from date).

We undertake to pay the Purchaser up to the above amount upon receipt of its first written demand, without the Purchaser having to substantiate its demand, provided that in its demand the Purchaser will note that the amount claimed by it is due to it, owing to the occurrence of one or both of the two conditions, specifying the occurred condition or conditions.

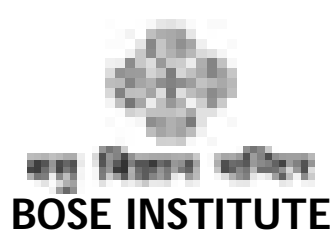
This guarantee will remain in force up to and including forty-five (45) days after the period of the bid validity, and any demand in respect thereof should reach the Bank not later than the above date.

Date: _____ Signature.....

Place: _____ Seal of Bankers

(Complete Address/Contact Details with Tel./Fax/email etc)

Witness: 1.
2.



BOSE INSTITUTE

P-1/12, C.I.T. Scheme VII-M, Kolkata 700 054, West Bengal, India

Ref : BI-K/E-TEND/19/2019-20

PERFORMANCE SECURITY FORM

(To be executed by a scheduled Bank in India on non-judicial stamp paper)

To
The Director,
Bose Institute,
P-1/12, CIT Scheme-VII/M,
Kolkata - 700054 (W.B.) India

Dear Sir,

Sub: Your Contract No. -----dated ----- for

2. You have entered into a contract with reference no as given above with _____(herein after referred to as the contractor) for the supply, installation, and commissioning of _____(herein after referred to as stores) for the price and on the terms and conditions contained in the said contract.
3. In accordance with the terms of said contract, the contractor has undertaken to produce a bank guarantee for Rs. _____ (Rupees _____ only) being 10 % of the total value of the said stores supplied to you, for the due fulfilment of its obligations to you for due performance as per the contract during warranty period.
4. In consideration thereof, we hereby expressly, irrevocably and unconditionally undertake and guarantee as principal obligator on behalf of the contractor that in the event you submit a written demand to us that the contractor has not performed according to the contractual obligations included in the said contract, we will pay you on written demand, without demur and without reference to the contractor any sum up to a maximum amount of Rs _____ (Rupees _____ only).Your demand shall be conclusive evidence to us that such payment is due under the terms of the said contract. Payment by us to you will be made within thirty (30) days from receipt of your request making reference to this guarantee and on demand.
5. This guarantee shall not be revoked without your express consent and shall not be affected by your granting any indulgence to the contractor, which shall include but not be limited to postponement from time to time of the exercise of any powers vested in you or any right which you may have against the contractor and to exercise the same in any manner at any time and either to forbear or to enforce any covenant contained or implied in the said contract or any other course or remedy or security available to you, and our Bank shall not be released from its obligations under this guarantee by your exercising any of your rights with reference to matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on your part or any other indulgence shown by you or by any other matter or thing whatsoever which under law would, but for this provision, have the effect of relieving our Bank from its obligation under this guarantee.
6. Notwithstanding anything herein contained, our liability under this guarantee is restricted to Rs _____(Rupees _____ only) and the guarantee shall remain in force up to and including the _____day of being reported to us by you and returned to us duly discharged.

7. Unless a demand or claim under this guarantee is made on us in writing on or before the aforesaid expiry date as provided above or unless this guarantee is extended by us all your rights under this guarantee shall be proscribed and we shall be discharged from the liabilities hereunder.

8. This guarantee shall not be affected by any change in the constitution of our Bank or of the contractor or for any other reason whatsoever.

Date:

Signature.....

Place:

Seal of Bankers

(Complete Address/Contact Details with Tel./Fax/email etc)

Witness:

1.

2.