INDIAN INSTITUTE OF TECHNOLOGY MADRAS
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The Senior Manager (Project Purchase) Date: 22.01.2024

Open Tender Reference No: PY/MSRO/094/2024/CLEANROOM

GEM NAR ID: GEM/GARPTS/12012024/RC57HD2QEESH Due Date/Time: 05.02.2024@ 3:00 PM

Dear Sir/Madam,

On behalf of the Indian Institute of Technology Madras, digitally signed online bids are invited in two bid system from Class-I local suppliers and Class II local suppliers, for the supply of: "**DESIGN, SUPPLY, INSTALLATION AND COMMISSIONING OF A CLEANROOM : CLASS - 1000 (ISO-6) AND CLASS-100 (ISO-5)**" Conforming to the specifications given in **Annexure -A.**

Tender Documents may be downloaded from Central Public Procurement Portal https://etenders.gov.in/eprocure/app. Aspiring Bidders who have not enrolled / registered in e-procurement should enroll / register before participating through the website https://etenders.gov.in/eprocure/app. The portal enrolment is free of cost. Bidders are advised to go through instructions provided at **"Help for Vendors".** [Special Instructions to the Vendors / Bidders for the e-submission of the bids online through this eProcurement Portal"]

Bidders can access tender documents on the website (For searching in the NIC site, kindly go to Tender Search option and type 'IIT'. Thereafter, click on "GO" button to view all IIT Madras tenders). Select the appropriate tender and fill them with all relevant information and submit the completed tender document online on the website https://etenders.gov.in/eprocure/app as per the schedule attached.

1)	**Pre-bid Meeting Details**	**:**	If required will be intimated
2)	**ICSR Vendor Registration**	**:**	**Vendor registration:** Vendor registration with IC&SR (IITM) is mandatory for bidders to participate in tenders. ** **For Vendor Registration & Guidelines, Please follow the website :** https://icandsr.iitm.ac.in/vendorportal; Helpdesk: vendorhelpdesk@icsrpis.iitm.ac.in

No manual bids will be accepted. All tender documents including Technical and Financial bids should be submitted in the E-procurement portal.

Last date for receipt of tender	**:**	**05.02.2024 @ 3:00 PM**
Date & time of opening of tender	**:**	**06.02.2024 @ 3:00 PM**

3. Instructions to the Bidder:

A)	**Searching for tender documents**	**:**	• There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal. • Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective **"My Tender"** folder. This would enable the CPP Portal to intimate the bidders through SMS / email in case there is any corrigendum issued to the tender document. • The bidder should make a note of the **unique Tender ID** assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.
B)	**Assistance to bidders**	**:**	• Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender. • Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is [0120-4200462, 0120-4001002, 0120-4001005]
C)	**Enrollment Process to Bidders**	**:**	**REGISTRATION** • Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal URL:https://etenders.gov.in/eprocure/app by clicking on "Online Bidder Enrollment". Enrollment on the CPP Portal is free of charge. • As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts. • Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal. • Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / TCS / nCode / eMudhra etc.) • Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse. • Bidder then may log in to the site through the secured log-in by entering their user ID / password and the password of the DSC / eToken.

			• Possession of a Valid Class II/III Digital Signature Certificate (DSC) in the form of smart card/e-token in the company's name is a prerequisite for registration and participating in the bid submission activities through https://etenders.gov.in/eprocure/app • Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available in the web site https://etenders.gov.in/eprocure/app under the "Information about DSC".
D)	**Preparation of bids**	**:**	• Bidder should take into account any corrigendum published on the tender document before submitting their bids. • Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid. • Bidder, in advance, should prepare the bid documents to be submitted as indicated in the tender document / schedule and generally shall be in PDF / XLS formats as the case may be. Bid documents may be scanned with 100 dpi with black and white option. • To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, GSTIN Details, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use **"My Documents"** area available to them to upload such documents. These documents may be directly submitted from the **"My Documents"** area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.
E)	**Submission of bids**	**:**	• Bidder should log into the site well in advance for bid submission so that he/she can upload the bid in time i.e. on or before the bid submission date and time. Bidder will be responsible for any delay due to other issues. • The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document. • Bidder has to select the bid security declaration. Otherwise, the tender will be summarily rejected. • A standard BOQ format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Bidders are required to download the BOQ file, open it and complete the detail with their respective financial quotes and other details (such as name of the bidder). If the BOQ file is found to be modified by the bidder, the bid will be rejected. • The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for

			submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission. • The Tender Inviting Authority (TIA) will not be held responsible for any sort of delay or the difficulties faced during the submission of bids online by the bidders due to local issues. • The uploaded tender documents become readable only after the tender opening by the authorized bid openers. • Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details. • Kindly add scanned PDF of all relevant documents in a single PDF file of compliance sheet. • More information useful for submitting online bids on the CPP Portal may be obtained at: https://etenders.gov.in/eprocure/app. • All tender documents including pre-qualification bid, Technical Bid &Financial Bid should be submitted separately in online CPP portal as per the specified format only. Right is reserved to ignore any tender which fails to comply with the above instructions. **No manual bid submission will be entertained.**
F)	**Marking on Technical Bid**		• The bidder eligibility criteria, technical specification and supply of item for this tender is given in Annexure A. • The Bidders shall go through the specification and submit the technical bid. • The Technical bid should be submitted in the proforma as per Annexure-B in pdf format only through online (e-tender). No manual submission of bid will be entertained. • The technical bid should have a page-wise heading as "Technical Bid" and page no. in all pages with seal and signature of authorized signatory. The total no. of pages should be mentioned at the last page of the documents. • The technical bid should consist of bidder eligibility criteria details and all technical details along with catalogue/ pamphlet which will give a detailed description of product with technical data sheet so that technical compliance can be verified.
G)	**Marking on Price Bid**		• Financial bid (BoQ) should be submitted in the prescribed proforma format as per Annexure-C in xls format through e-tender only. No manual or other form of submission of Financial Bid will be entertained

4)	**Preparation of Tender**: The bidders should submit the bids in two bid system as detailed below. **Bid I _Technical Bid** The technical bid should consist of bidder eligibility criteria and technical specification compliance sheet as per Annexure-B. **Bid II _Price Bid** The price bid should be submitted in excel format (BoQ) as per the proforma (Annexure C) uploaded in the e-Tender web site. The Quoted price should be for supply and installation of the item and inclusive of all cost and statutory levies at IIT Madras.
5)	**Price:** a) The price should be quoted only in INR net per unit (after breakup) and must include all packing, transit insurance and delivery charges to **The India Centre for Lab-Grown Diamond, Material Science Research Centre, IIT Madras** b) The rate quoted shall be all inclusive of all taxes and no extra payment will be made other than statutory revisions as per the terms and conditions stipulated in this contract document. c) The percentage of tax & duties should be clearly indicated separately. IIT Madras is eligible for custom duty (5.5%). Relevant certificates will be issued wherever necessary. d) The offer/bids should be submitted through online only in two bid system i.e. Technical Bid and Financial Bid separately.
6)	**Tenderer shall submit along with this tender:** **(**i) Proof of having ISO or other equivalent certification given by appropriate authorities. (ii) Name and full address of the Banker and their swift code and PAN No. and GSTIN number. (iii) GST registration proof showing registration number, area of registration etc. (iv) All of your future correspondences including Invoices should bear the GST No. and Area Code.
7)	**Terms of Delivery:** Supplier will be fully responsible for the safe carriage, Installation/Commissioning of goods up to **The India Centre for Lab-Grown Diamond, Material Science Research Centre, IIT Madras**, or named place as per PO, Insurance coverage will be in the scope of the supplier. The tenderer should indicate clearly the time required for delivery of the item (subject to the approval of the Executive Committee-IIT-Madras). In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied. In the event of delay or non-supply of materials/execution of Contract beyond the date of delivery/completion of job. The penalty will be levied @1% per week of delay subject to a max of 10% of the value of purchase order and if the delay is more than accepted time frame by IIT M, the PO would be partially or fully cancelled and liquidated damages will be enforced accordingly.
8)	**Period for which the offer will remain open:** The Tender shall remain open for acceptance/validity till: 120 days from the date of opening of the tender. However, the day up to which the offer is to remain open being declared closed holiday for the Indian Institute of Technology Madras, the offer shall remain open for acceptance till the next working day.
9)	**EMD:** The EMD of **Rs.6,00,000** to be transferred to the account details mentioned in Annexure G and proof should be enclosed in the Technical Bid. Any offer not accompanied with the EMD shall be rejected summarily as non-responsive.

	The EMD of the unsuccessful bidders shall be returned within 30 days of the end of the bid validity period. The same shall be forfeited, if the tenderers withdraw their offer after the opening during the bid validity period. The Institute shall not be liable for payment of any interest on EMD. EMD is exempted for Micro and Small Enterprises (MSE) as defined in MSE Procurement Policy issued by Department of Micro, Small and Medium Enterprises (MSME) and Startups as recognized by Department of Industrial Policy & Promotion (DIPP). (MSE/MSME/DIPP PROOF should be enclosed in the cover containing technical bid)
10)	**Performance Security: -** The successful bidder should submit Performance Security for an amount of **5%** of the basic invoice value of the contract/supply. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt in the name of "The Registrar, IIT Madras" from any scheduled commercial bank or Bank Guarantee from any scheduled commercial bank in India. The performance security should be furnished within 14 days from the date of the purchase order. Performance Security in the form of Bank Guarantee: - In case the successful bidder wishes to submit Performance Security in the form of Bank Guarantee, the Bank Guarantee should be routed directly to IIT Madras from the Bank. The Bank Guarantee should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations.
11)	For the same tender, either the OEM or the authorized dealer/service provider can only quote. But both of them cannot quote separately for the same tender.
12)	The offers/bids should be sent only for a item/Equipments of latest version that is available in the market and supplied to a number of customers. A list of customers in India with details must accompany the quotations. Quotations for a prototype machine will not be accepted
13)	Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid.
14)	Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal/OEM.
15)	**Risk Purchase Clause** In the event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from other sources on the total risk of the supplier under risk purchase clause.
16)	**Payment:** (i) No Advance payment will be made. However, 90% Payment after supply and 10% after installation are agreed to wherever the installation is involved. (ii) Advance Payment: No advance payment is generally admissible. In case a specific percentage of advance payment is required, the Vendor has to submit a Bank Guarantee from a scheduled commercial bank in India equivalent to the amount of advance payment.
17)	**On-site Installation:** The equipment/item or Machinery has to be installed or commissioned by the successful bidder within the number of days (as prescribed by PI) from the date of receipt of the item at the site of IIT Madras.
18)	**Warranty/Guarantee:** The offer should clearly specify the warranty or guarantee period for the machinery/equipment. Any extended warranty offered for the same has to be mentioned separately (For more details please refer our Technical Specifications).

	**** Note: PO which involves installation, warranty/guarantee shall be applicable from date of installation.**
19)	**Acceptance and Rejection:** Failure to comply with any of the instructions stated in this document or offering unsatisfactory explanations for non-compliance will likely to lead to rejection of offers. I.I.T. Madras has the right to accept the whole or any part of the Tender or portion of the quantity offered or reject it in full without assigning any reason.
20)	**Debarment from Bidding:** In case of breach of Terms & Conditions, Bidder may be suspended from being eligible for bidding in any contract with the IIT Madras up to 2 Years [as per Rule 151(iii) of GFR] from the date of Tender.
21)	**Disputes and Jurisdiction:** **Settlement of Disputes:** Any dispute, controversy or claim arising out of or in connection with this PO including any question regarding its existence, validity, breach or termination, shall in the first instance be attempted to be resolved amicably by both the Parties. If attempts for such amicable resolution fails or no decision is reached within 30 days whichever is earlier, then such disputes shall be settled by arbitration in accordance with the Arbitration and Conciliation Act, 1996. Unless the Parties agree on a sole arbitrator, within 30 days from the receipt of a written request by one Party from the other Party to so agree, the arbitral panel shall comprise of three arbitrators. In that event, the supplier will nominate one arbitrator and the Project Coordinator of IITM shall nominate on arbitrator. The Dean IC&SR will nominate the Presiding Arbitrator of the arbitral tribunal. The arbitration proceeding shall be carried out in English language. The cost of arbitration and fees of the arbitrator(s) shall be shared equally by the Parties. The seat of arbitration shall be at IC&SR IIT Madras, Chennai. a. **The Applicable Law:** The Purchase Order shall be construed, interpreted and governed by the Laws of India. Court at Chennai shall have exclusive jurisdiction subject to the arbitration clause. b. Any legal disputes arising out of any breach of contact pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.
22)	**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, it's delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure. For purposes of this Clause, "Force Majeure" means an event beyond the control of the Supplier and not involving the Supplier's fault or negligence and not foreseeable. Such events may include, but are not limited to, acts of the Purchaser either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes. 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.
23)	**Eligibility Criteria:** ➢ **As per the Government of India Order, only "Class - I Local Suppliers" and "Class - II Local Suppliers" <u>can participate in this tender.</u>** ➢ **<u>Bidder should confirm their acceptance that they comply with the provisions with report to "Guidelines for eligibility of a bidder from a country which shares a land border with India as detailed at Annexure-E. The bidder should submit Certificate for "Bidder from/ Not from Country sharing Land border with India & Registration of Bidder with Competent Authority" as per Order of DoE F.No.6/18/2019-PPD dated 23.07.2020 and No.F.7/10/2021-PPD(1) dated 23.02.2023.</u>**

24)	**Preference to "class I Local Suppliers"**: preference will be given to "**class 1 local suppliers**" (subject to class -I local supplier's quoted price falling within the margin of purchase preference) as per public procurement (preference to make in India) order 2017 .O.M No P- 45021/2/2017 – pp(BE - 11) dt 04/06/2020 subject to the conditions that the "class 1 Local Supplier" should agree to supply goods / provide service at L1 rate and furnish a certificate with the technical bid document that the goods/service provided by them consists local content equal to or more than 50%.(certificate from Chartered Accountant in case value of contract exceeds Rs 10 crore). ➢ **'Class - I local supplier'** means a supplier or service provider whose goods, services or works offered for procurement consists of local content equal to or more than 50% as defined under the above said order. **Declaration to be provided as per Annexure-D per item/service/work.** ➢ **'Class - II local supplier'** means a supplier or service provider whose goods, services or works offered for procurement consists of local content equal to 20% but less than 50% as defined under the above said order. **Declaration to be provided as per Annexure-D per item/service/work.** ➢ **'Margin of purchase preference'**: - The margin of purchase preference shall be 20%. The Definition of the margin of purchase preference is defined in the Govt. of India Order No: **P-45021/12/2017-PP (BE-II) Dt.4th June, 2020) Order 2017. As per the Government of India Order – "Margin of Purchase Preference" means the maximum extent to which the price quoted by a "Class-I local supplier" may be above the L1 for the purpose of purchase preference.** ****Note: Local content percentage to be calculated in accordance with the definition provided at clause 2 of revised public procurement preference to Make in India Policy vide GoI Order no. P-45021/2/2017-PP (B.E.-II) dated 15.06.2017 (subsequently revised vide orders dated 28.05.2018, 29.05.2019and 04.06.2020) MOCI order No. 45021/2/2017-PP (BE II) Dt.16th September 2020 & P-45021/102/2019-BE-II-Part(1) (E-50310) Dt.4th March 2021**
25)	**Evaluation of Bids** Bid evaluation will take place in two stages. **Stage I Technical Bid evaluation** All bidders who have fully complied with bidder eligibility criteria I, II and technical evaluation (Annexure A) will only be considered for opening of price bid. **Stage II: Price Bid Evaluation** The price bid evaluation will be based on price quoted by the bidder. The rate quoted for **DESIGN, SUPPLY, INSTALLATION AND COMMISSIONING OF A CLEANROOM : CLASS - 1000 (ISO-6) AND CLASS-100 (ISO-5)** unit will alone be taken up for arrival of Lowest Bid (L1) value.
26)	In accordance to the Rule 173 of GFR,2017 and relevant provisions thereof in Procurement Manuals, 2022, IC&SR, IITM reserves the right to carry out the negotiation process through its purchase/technical committee with L1/H1 (as applicable) vendor to ensure price reasonability before final recommendation to the Competent Authority. The negotiation details, if any, on case to case basis shall be recorded in minutes of meetings suitably for records.
27)	**Selection of successful bidder and Award of Order** The order will be directly awarded to the technically qualified bidder as per the condition in para 3A of DIPP, MoCI Order No. 45021/2/2017-PP (BE II) dated 16th September 2020.
28)	All information including selection and rejection of technical or financial bids of the prospective bidders will be communicated through e-Tender portal. In terms of Rule 173(iv) of General Financial Rule 2017, the bidder shall be at liberty to question the bidding conditions, bidding process and/or rejection of bids.
29)	The tenderer shall certify that the tender document submitted by him / her are of the same replica of the tender document as published by IIT Madras and no corrections, additions and alterations made to the same. If any deviation found in the same at any stage and date, the bid / contract will be rejected / terminated and actions will be initiated as per the terms and conditions of the contract.

30)	Clarification to the queries and doubts raised by the bidders will be issued as a corrigendum/addendum in the e-tenders portal.
31)	In the e-tender process, participation of bidders after the due date is not possible. The eligible bidders can login to the e-Procurement portal to ascertain the tender status.

ACKNOWLEDGEMENT

It is hereby acknowledged that I/We have gone through all the points listed under "Specification, Guidelines, Terms and Conditions" of tender document. I/We totally understand the terms and conditions and agree to abide by the same.

SIGNATURE OF TENDERER ALONG WITH SEAL OF THE COMPANY WITH DATE

Bidder Eligibility Criteria and Technical Specification for DESIGN, SUPPLY, INSTALLATION AND COMMISSIONING OF A CLEANROOM: CLASS - 1000 (ISO-6) AND CLASS-100 (ISO-5)
Tender No. PY/MSRO/094/2024/CLEANROOM

Bidder Eligibility Criteria – I (Public Procurement – Preference to Make in India)

Only 'Class-I local suppliers' and 'Class-II local suppliers', as defined under DIPP, MoCI Order No. P-45021/2/2017-PP (BE-II) dated 16th September 2020 and other subsequent orders issued therein (**ANNEXURE – D**)

Bidder Eligibility Criteria – II

1. Vendor Registration ID/Proof.
2. Land Border Certificate (**ANNEXURE – E**)
3. **OEM Certificate Form**-The Participating Bidder's firm shall be the Original Equipment Manufacturer (OEM) or OEM Certified authorized firm (**ANNEXURE – F**)
4. Non- Debarment Declaration **(ANNEXURE – H**)
5. Mandate Form **(ANNEXURE – J)**
6. EMD as per Tender, to be remitted in the account number as given in the **(Annexure – I)** or EMD is exempted for Micro and Small Enterprises (MSE) as defined in MSE Procurement Policy issued by Department of Micro, Small and Medium Enterprises (MSME) and Startups as recognized by Department of Industrial Policy & Promotion (DIPP). (MSE/MSME/DIPP PROOF should be enclosed in the cover containing technical bid).

7. The parties/firms participating in the tender should be technically competent and experienced in having undertaken Cleanroom projects for semiconductor/ MEMS/nano/ IC fabrication facility with the following eligibility criteria (points a to f).

a) Parties/ firms should have successfully completed at least two (2) "similar works" during the last two (2) years. "Similar Work" shall mean "Design, detailed engineering, supply, installation, testing, commissioning and validation of Cleanroom facility (Class 100/ISO 5 or better, as per FED Std. 209E/ISO14644) and associated utilities comprising of HVAC works, Electricals, Fire Detection etc. for semiconductor/Microelectronic/Nano fabrication facilities".

b) Copies of Purchase Orders/ work orders in respect of "similar work" executed by the party/firm with Documents evidencing issued by the respective clients/organizations shall be submitted along with the bid. In case the firm/party associates with other firm/party, copies of the POs/work orders executed by the other firm with Documents evidencing satisfactory completion issued by the respective clients/organizations shall also be submitted along with the bid

c) The parties / firms should have installed / commissioned high purity and toxic gas lines in semiconductor/Microelectronic/Nano fabrication facilities. Necessary copies of POs/ work orders shall also be submitted along with the bid.

d) The parties/ firms should have experience in maintenance of cleanroom facilities (Class 100/ 1000). Necessary copies of POs/ work orders shall also be submitted along with the bid.

e) Annual financial turnover should not be less than Rs. 50 million (fifty million rupees) during the last 3 years. The prospective firm/party shall provide Chartered Accountant's certificate for the annual financial turnover.

f) Should not have incurred any loss in more than 2 years during the last (five) 5 financial years. The prospective firm/party shall provide the copy of audited Annual Accounts by a chartered accountant for the previous 3 financial years.

III. Technical Specification for DESIGN, SUPPLY, INSTALLATION AND COMMISSIONING OF A CLEANROOM : CLASS - 1000 (ISO-6) AND CLASS-100 (ISO-5)

Cleanroom Application: Fabrication of high power and high frequency solid state devices

Department of Physics, IITM intends to build a Cleanroom facility for its India Centre for Lab Grown Diamonds (InCent-LGD) over a floor area of about 900 sq. feet in an already semi-finished lab-space located at Ground Floor on turnkey basis.

Tender is invited from the bonafide firms who are willing in setting up Cleanroom on turnkey basis at InCent-LGD. The criteria for evaluation will be mentioned in the tender document.

- Deviations from the technical specifications requested are allowed. Such deviations must be highlighted and justified. Their acceptance or rejection will be left to the discretion of the technical committee.
- Detailed technical specifications of the equipment being offered should be included.
- Any additional capabilities or technical details, that you would like to bring to the attention of the purchase committee, can be listed at the end of the technical table.

The overview of cleanroom, required specifications along with the tool list and it's utility requirement are given below:

Facility Overview:

The Cleanroom area will comprise a suite of Class 100, Class 1000 Cleanrooms and Utility Support Areas

1) Class 1000 Area
2) Class 100 Area
3) Change Room
4) Visitor Corridor
5) Utility Rooms for Electrical and Gases
6) Cleanroom HVAC
7) Cleanroom utilities:
    i) Process Cooling System
    ii) DI Water System
    iii) Compressed Air System
    iv) Bulk Gas Distribution
    v) Process Exhaust System
8) Ultra-High Purity Gas Lines
9) Cleanroom and HVAC Electrical
10) Building Management System (BMS)
11) Scrubbing Systems
12) Life safety and Security System
13) Testing Commissioning and Validation

Cleanroom Parameter Control Philosophy

The cleanroom parameters will be controlled automatically by BMS. The output from all the sensors will be taken to the BMS. Based on the sensor inputs, BMS will give command to different systems (VFD, Modulating Valves and Heater) to modulate and control the cleanroom parameters.

Cleanroom Specifications

Parameter	Class 1000	Class 100	Change Room: Class 10000	Visitor Room: Class 10000
Room Area in m^2	49.26	23.36	7.19	5.49
Room Height in m	2.5	2.5	2.5	2.5
Temperature in ^oC	22±2	22±2	24±2	24±2
RH in %	50±5	45±5	50±5	50±5
Room Positive Pressure	15-20 Pa	25-30 Pa	5-10 Pa	5-10 Pa
Air Flow pattern	Vertical	Vertical	Vertical	Vertical
Sound level	55±5 db	55±5 db	55±5 db	55±5 db
Light Intensity	500 Lux normal Light	400-450 Lux UV Light	500 Lux normal Light	500 Lux normal Light
Process Exhaust	1.2 m^3/s	0.5 m^3/s	NA	NA

Summary of Cleanroom Equipment's with Utility Requirements

		Electrical data			Utilities							
S. No	**Equipment's**	**No. of Dual Connections**	**Phase**	**Appx Kw**	**N_2**	**Ar**	**O_2**	**CDA**	**DI Water**	**RO Water**	**PCW**	**Exhaust**
Class 1000												
1	Plasma Cleaner	1	1Ø	2.3	Yes	Yes	Yes	Yes				
2	Profile Oven	1	1Ø	2.3								
3	Pull Tester	4	1Ø	4.6								
4	Optical Microscope	3	1Ø	3.45								
5	Wire Bonder	4	1Ø	4.6								
6	Sputter Coater	4	1Ø- 3 no 3Ø- 1 no	14	Yes	Yes	Yes	Yes			Yes	Yes
7	E-Beam Evaporator	4	1Ø- 3 no 3Ø- 1 no	19	Yes	Yes	Yes	Yes			Yes	Yes
8	Chemical Fume Hoods (2 No.s)	8	1Ø	18.4	Yes			Yes	Yes	Yes		Yes
9	Hot Plates	2	1Ø	2.3								
10	Work Stations	8	1Ø	9.2								
Class 100												
1	Direct Writer (CEE Type male Connector)	3	1Ø	11.04	Yes			Yes				Yes
2	Solvent Fume Hood	4	1Ø	14.72	Yes				Yes	Yes		Yes
3	Optical Microscope	1	1Ø	1.15								
4	Work Stations	4	1Ø	4.6								

Note: Process Gases (Ar, O_2, N_2) will be of UHP grade

Additional requirements:

- **Electrical Points: 3 Ø - 7 No.s and 1 Ø - 15 No.s**
- **Utility Lines (Ar, O_2, N_2, CDA, PCW, Exhaust, RO water and DI Water): 5 points each**

Note: Refer to the attachments for the layout and HVAC schematic

Cleanroom Specifications

S. No	Specification
1.	**CLEANROOM CONSTRUCTION**
1.1	**Cleanroom Solid Wall Panel for Class 100 and 1000** Supplying & Fixing of Progressive type Solid Double skin modular 100mm thick Solid wall panel for partitions and wall panelling, made of 0.8 mm thick Powder coated sheets on both sides with PUF as infill of density 40 ± 2 kg /m3, GI Profiles for reinforcement along the periphery with bottom track, and necessary arrangements, All Joints shall be sealed with cleanroom compatible Neutral Grade Silicon Sealant.
1.2	**Cleanroom Return Air Riser Wall Panel for Class 100 and 1000** Cleanroom Return Air Riser wall panel with inbuilt Return Air Risers of not less than 0.8 mm thick Powder coated GI sheet (hot dipped with zinc coating of 120 gsm), Return air risers shall be minimum 800x70mm to be provided with a minimum of 15mm puff insulation on both side of riser, within the wall panel. Risers with adjacent ceiling heights to extend minimum 200mm high above the top of the false ceiling with minimum 25mm flange.
1.3	**Cleanroom Ceiling Panel for Class 1000** Cleanroom Ceiling panels shall be Progressive type Double skin modular 75 mm thick Ceiling wall panel made of 0.8 mm thick Powder coated sheets on both sides with PUF as infill of density 40 ± 2 kg /m3, GI Profiles for reinforcement along the periphery with bottom Aluminium track, and necessary arrangements, All Joints shall be sealed with cleanroom compatible Neutral Grade Silicon Sealant. Ceiling panels are suspended by threaded tension bars with adjustable turnbuckles fastened to the overhead support at fixed intervals to withstand 150-200 Kg per sq. mtr.
1.4	**Aluminium Grid Ceiling System for Class 100 Cleanroom** The Cleanroom ceiling shall be formed from a HEAVY DUTY ALUMINIUM WALKABLE extruded T-Grid ceiling Systems for all areas. Ceiling grid colour should match wall panel colour (Designer white shade). The ceiling grid shall be heavy duty walkable inverted T-grid ceiling system of approx. 50 mm width (gasket type ceiling) to be provided on 600mm X 1200mm hanging configuration, the system shall include aluminium (approx. 50 mm wide) extrusions, aluminum extruded cross connector with hammer head bolts and nuts, M8 bolt and matching square hanger and other standard accessories. The grid should be suspended from the parent building roof with adequate size fasteners etc. for ensuring structural stability of the ceiling. Blank Ceiling Panels: Supply & Installation of 50mm thick HEAVY DUTY WALKABLE Al. Honeycomb Ceiling Blank Panel of dimension 1200 mm x 600mm x 45 mm/50 mm thick, using 45/50mm thick aluminum honeycomb core laminated with 0.8 mm thick Aluminum skin on both sides, static dissipative finished of designer white shade all complete.

1.5	**Cutout in Wall & Ceiling Panels** Suitable factory-made cut-outs wherever required shall be provided in the wall panel and ceiling panel as applicable for fixing HEPA filters with Modules, light fixture, return air grills, power sockets, communication outlets, LAN outlets, cables, pipes, exhaust ducts, Magnehelic gauge, smoke sensors, pendants, utilities etc., are also to be included in the quotation after conducting an inspection to the proposed cleanroom and utility. Factory made wall cut-outs for switches and sockets and includes one conduit per cut-out. Quantity and size as per requirement. Quantity will be as per the Electrical design and will be finalized on drawing approval. Factory made ceiling cut-out for HEPA Modules (with lip as per HVAC design). Quantity and size as per requirement. Quantity will be as per the HVAC design and will be finalized on drawing approval. Each 0.74 SQM (1200 mm X 600 mm). Factory made ceiling cut-out for Light Fixtures (with lip as per electrical design). Quantity and size as per requirement. Quantity will be as per the Electrical design and will be finalized on drawing approval. Each 0.36 SQM (600 mm X 600 mm)
1.6	**Cleanroom Window Modules** Windows and door vision panels should be formed from double glazed toughened glass composite modules. View panels of size 900 x 900 mm shall be provided in wall panels - View panels glass shall be at least 5 mm thick toughened Glass with Ceramic border of 20mm width. View panels shall be fixed flush to both faces of wall panels. - No crevices / joints/sloped profiles should be used for fixing the glass to avoid particle contamination and dust accumulation.
1.7	**Cleanroom Doors** Cleanroom Doors shall be 44 mm thick doors flush on one side made of static-dissipative type powder coated door frames 1.2mm thk totally flushed with the wall panels - Concealed hardware for fixing the door frames. - In fill of PUF/ Honeycomb is used to give the effective acoustic and thermal insulation. Stainless steel double bearing butt hinges as per BS 7352 CLASS 9 - Mortise dead locks with all ancillaries like door closer, lock & key, hinges, d-handle, push plate, drop seal & tower bolt with view glass of size 0.4m x 0.6m. Door-sets should match the partition modules.
1.8	**Coving** All the Covings (Inner and Outer Coving) are Extruded Aluminium Powder Coated /Anodized clip-on type covings of R-50mm. Coving shall be used at wall-wall and wall-ceiling joints and Wall to Floor. Coving Corner Pieces: All the Inner and Outer 3D & 2D corner pieces are Aluminium powder coated finish.
1.9	**ESD Flooring** The electrostatic dissipative flooring should be provided for Cleanroom Class 100 & 1000 areas with the specification below: - • The anti-static floor material shall have a Resistance level of 1 x 10^6 to 1 x 10^9 ohms suitable for Cleanroom. • Load carrying capacity of the material shall be 750PSI (min.) conforming to BS 2050. • The joints shall be welded by thermo chord weld. • The flooring shall Include providing and laying (P/L) suitable copper strip (foil) grid of size 3' x 3' (approx.) as recommended by manufacturer and connecting to the dedicated earthing Work includes preparation of existing surface with suitable (compatible for cleanroom application) floor levelling material so as to make the surface free from any undulations

1.10	**Dedicated Earthing for ESD Flooring** ESD Flooring includes, dedicated earth pit accessories and Interconnecting Copper strip 30x5 mm thick. Vendor has to ensure 0.1 ohm resistance can be achieved at the cleanroom point.
1.11	**Lights**
1.11.1	**Class 1000 Lights** Cleanroom compatible LED lights. The envisaged Lighting level in cleanrooms is 500 Lux, at 90 cm above the floor. Lights must be openable towards inside the room. Dimensions: 600 x 600 mm Power: 42 W
1.11.2	**Class 100 Lights** Cleanroom teardrop light fittings for ISO 5 (class 100) and surface mounted fittings to be provided throughout the facility to achieve the 400-450 Lux lighting levels. The teardrop & surface mounted light fittings shall comprise of a powder coated extruded aluminum body and clear acrylic diffusers. UV filtration film having 350-400 nm thickness to be applied on lights or UV Tube sleeves shall be used
1.12	**HEPA Filter Modules** The Cleanroom ceiling system shall include HEPA filter ceiling modules as indicated on the drawing. • The filters will be used as terminal air distribution device. The air supply plenum shall be connected directly to a connecting collar on the filter top with individual damper in the plenum and flexible ducts. • The filters shall H13 class filters as per EN1822 with an efficiency of 99.95%. • The design Air velocity through filter shall be 0.45m/s with IPD of 100±5% Pa or better. • The frame of the filter shall be of Extruded Anodized Aluminium construction. • The filter media shall be Glass Fibre with hot melt separator. • The filter shall have expanded sheet metal face guard. The face guard shall be powder coated in off-white colour. • The filter shall be having endless polyurethane D-profile, Liquid pour to solid in extrusion profile seal at the outlet. • All the filters shall be individually tested according to EN1822 and computerized scan test report should accompany each filter. • The filter shall be held in place utilizing 'hold down' devices with the Ceiling grid using channel on the filter top and T-bolts in the ceiling grid pressing the filter against ceiling grid. • All filter modules shall be complete with air inlet collar of 12" diameter (approx.). • Top sheet should be of G.I./Aluminium single piece drawn with seamless neck. In case, neck is not seamless, neck joint to the top sheet be a proper leak proof joint and with the capability of supporting a person standing on the top surface. • Filter media shall be bonded to extruded aluminium cell sides. Dimensions :1210 L x 600 D x 60 mm H

1.13	**Fan Filter Units** Fan Filter module with HEPA filters. These FFM's are self-powered grid module with modular design, to fitting in standard T grid ceiling. Total height is 320mm. The Fan Filter Module is U.L listed and CE certified. FFU speed can vary from 0.2 to 0.5m/s and air flow rate vary from 460-760 CFM. The sound level will be 55dB's when measured from 760mm below from filter face. The vibration level is 0.9mils. The Fan motor drive will be direct drive, forward curve centrifugal type with sealed bearing. The motor will have permanent split capacitor type, rated for continuous operation with thermal overload protection with two speed switches. The power requirement is 230V, 50Hz single phase with maximum current of 1.9A with 280watts power input. The fan/motor assembly is capable of delivering air at filter pressure of 9mm to 23mm final state. These FFM will have a speed controller for increasing the speed of the motor/blower from low, medium and high. Dimensions :1215 Lx 600 D x 350 mm H FFU Material of construction: Al Zinc Alloy ULPA filter: Ulpa Filters U15 are rated 99.9995% efficiency in removing 0.3µ or larger particles. IPD of 120±5% Pa or better. Leak free in accordance with latest I.E.S recommended particle. The filter media is micro glass fibre with poly-string separator, sealed to casing. The filter guard is provided with diamond pattern expanded sheet for protection. Dimensions :1210 L x 600 D x 60 mm H Pre Filter are rated 90% efficiency in removing 10 to 15 micron particles. Pre filters are made from non-woven materials. Dimensions :550 L x 600 D x 50 mm H
1.14	**Air Shower** **Supply of Single-entry air shower** *****Material of Construction: Powder Coated SS304 *Dimensions:1500mm L x 1500mm D x 2300mm H *Class 100 Compatible *****Door interlocking arrangement should permit opening of only one door at a time. During operation, neither entrance nor exit door should be operated. A lock switch for overriding the electronic control system ensuring manual operation should also be provided. *The air shower shall be provided with per filter of HDPE, Washable type with efficiency 90% down to 10 micron and HEPA filter with efficiency of 99.97% down to 0.3 microns etc., *****Air Shower shall include: Differential Pressure Gauge, ON/OFF Switches, PAO Test Port, Timer for setting Air Shower operation time (settable for 30 seconds to 5 minutes), Emergency STOP button, Automatic as well as Manual Working.
1.15	**Sterile Garment Storage Cabinet** *****Material of Construction: Powder Coated SS304 Flow: Vertical type Filters: Pre, HEPA Filter Dimensions: 1200x 600 x 2100 in mm. Features: Sterile garment Storage Cabinet shall be having features like 20 w fluorescent tube, IR Light, Normal Light, SS grill for HEPA filter, Feather touch type HMI, Caster wheel with stopper. UV light will be OFF once door opens, and will be switched ON once the door closed for pre-defined time. Hinged type double skin door with view glass window.

1.16	**Static Pass Box** Material of Construction: Powder Coated SS304 Dimensions: 600 x 600 x 600 in mm Features: Static Pass box shall have the features like Hinged doors, UV Light, Normal Light and Door Interlock.
1.17	**Cross Over Bench** Supply of 1.2 mm SS304 construction cross over benches size-2400 L X 300 W X 500 H mm
2	**AIR HANDLING UNIT (AHU) (Quantity – 2 No.s)** Scope of work included design, supply, installation and commissioning of 1 Nos. 4.382m3/s capacity AHU for class 1000 cleanroom facility and 1 Nos. 4.853 capacity AHU for class 100 cleanroom facility. 1) Specification of the AHU for class 1000 cleanroom is given below: a. Total Supply air = 4.382 M3/sec b. Return air =2.733 m3/sec c. Fresh air =1.649 m3/sec d. Total fan Static =150 mm WG e. Cooling Coil Capacity =40 Tr f. Heater capacity= 57 Kw 2) Specification of the AHU for class 100 cleanroom is given below: a. Total Supply air = 4.853 m3/sec b. Return air =4.1 m3/sec c. Fresh air =0.735 m3/sec. d. Total fan Static =150 mm WG e. Cooling Coil Capacity =40 Tr f. Heater Capacity= 76 Kw
2.1	**AHU CASING** 1) AHU shall be of modular construction and of draw through type comprising of pre filter section, fine filter section, cooling coil section and fan section. The framework shall be of extruded Al sections joined by molded high tensile reinforced plastic and shall be assembled to provide a sturdy, strong and self-supporting framework for various sections. Each section shall be complete with its own independent base and mounted on 14G galvanised sheet steel and aluminium die cast channels. Zinc deposition on the GI sheets shall be minimum 120 gsm. 2) AHU shall be of double skin, with 45+5 mm thick PUF insulation sand-witched panel, 0.8 mm thick percolated GSS outer skin and 0.8 mm thick plain GSS sheet inside. The density of PUF insulation shall be minimum 38±1 Kg/m3. 3) The framework for each section shall be joined together with soft rubber gasket in between to make joints air tight. 4) Suitable air tight access doors with Aluminium die cast heavy duty hinges and locks shall be provided for various sections. 5) The casing shall incorporate thermal break profile and all other necessary design. Features to ensure that condensation does not occur during all seasons. 6) The AHUs shall be having Sound attenuators at Suction and delivery of AHUs to reduce the sound to 70±2 dB

2.2	**CIRCULATION FAN** 1) Fan Type: Direct driven, Plug type high efficiency centrifugal fan 2) Desired noise level should be reduced to 70±5 dB or less by suitable sound attenuators on supply and return air path. 3) Required Total static pressure: 150 ± 2 mm WG. 4) Fans should have backward curved blades to improve efficiency. 5) Fan blades should be made of Aluminium alloy for stability. 6) Motor and fan assembly should be floor mounted and to be placed on extruded aluminium sections and on the vibration isolators to reduce amplitude to less than 25-50 microns. 7) Motor Requirement: Adequately sized, TEFC Squirrel cage induction motor with VFD drive and suitable for 415V ± 10%, 3 phase, 50 Hz± 5% AC power supply. 8) The motor should be of high efficiency IE3 class as per IS 12615 – 2011- Non FLP. 9) Motor should be compatible for VFD operation. 10) Flexible connection should be fabricated of neoprene coated flame proof fabric attached by screws or bolts at 6" interval should be provided. Flexible connection should be provided with the sufficient material width to prevent interference with the free operation of the fan vibration system. 11) Fan should be factory statically and dynamically balanced as required to achieve field balance levels. 12) Epoxy based coating shall be provided on all the surfaces of ferrous fan housing. 13) Vibration measurement should be made in three orthogonal areas at each bearing location. Where equipment configuration precludes measurement at bearing, measurement should be made on adjacent routine structure. 14) Peak to peak displacement at the rotational frequency should be measured. Governing displacement should be at the rotational frequency of fan. Controlling displacements at frequencies other that the rotational frequencies are not in compliance with the balance requirements.
2.3	**COOLING COILS** 1) Cooling medium requirement: Chilled water at a temperature of 8 ± 1 Deg C 2) The velocity across the cooling coils should not exceed 2.25 m/s. accordingly, cooling coil area should be selected. 3) Coils should be of seamless copper tubes with Al fins, 8 rows deep, with 12-13 fins/inch, with copper header, flange connection and SS 304 enclosure. 4) Copper tubes should be 25±5% SWG and hydrostatically tested for 21 kg per sq. cm. 5) Cooling coil condensate tray should be of 14±5% SWG SS 304 material. 6) Vertically stacked Cooling coils should have SS 304 drip trays between them and SS pipe drain connection left at the drain tray and finally should be connected to drain point with suitable trap to check ingress of outside air. 7) Fouling factor requirement: 0.0002 hr. m2 Deg C/K cal. 8) Accessories requirement: Frame, support, inlet and outlet header, vent connection and drain connection with valves, pressure gauges with valves at inlet and outlet and their associated fittings.
2.4	**HEATERS** The AHUs should have Electrical heaters section to maintain the cleanroom temperature in the winter season. 1) Strip/Tubular heaters of sufficient capacity should be selected in each AHU to maintain the area temperature. 2) The heaters should be complete with mounting frame, Thermostat, humidistat, air stat in redundant arrangement along with all control devices which will be controlled by thyristors.
2.5	**HUMIDIFIER** 1) Type: Pan type, Electrical heating 2) Humidification capacity: Sufficient capacity to maintain the required RH levels inside the cleanrooms in dry season.

	3) For calculating humidification by the above humidifier so as to maintain dew point temperature of the treated fresh air at 12.5 ± 0.5 Deg C, an outside peak winter temperature as per the outdoor conditions to be considered.
2.6	**FILTERS** There should be 3 stages of filtration in the AHU. Specifications: • Filters face velocity should not exceed 2.25 m/sec. • Filter mounting frame should be made out of extruded aluminium material. The frame should be strong enough to withstand the weight of two persons for climbing the frame during the filters replacement. • Between filter sections, minimum spacing of 600 mm should be maintained. • Filters should have a quick release mechanism and sealing gasket. • All the filters should have Al frame (flange type) with a module size of 600 mm x 600 mm (preferably): 1) 1st Stage Pre-filters should be of G4 grade as per EN 779, non-woven synthetic material sandwiched between HDPE mesh on both sides with minimum thickness of 150 mm flange type with an initial pressure drop of 5 mm WG or less, suitable for cleaning with dry air or water jet. 2) 2nd stage bag filters should be of F7 grade as per EN779, non-woven synthetic material sandwiched between HDPE mesh on both sides and suitable for minimum thickness of 300mm initial pressure drop of 6-8 mm WG or less, suitable for cleaning with dry air or water jet. 3) 3rd HEPA Filters should be of H14 grade, suitable for AHU capacity. Filter media should be of micro fibre glass, Efficiency required: 99.995% down to 0.3 micron. The filters should have Anodized Al frame with a module size of 600mm x 600mm (preferably). The filter media should be epoxy/PU bonded to the filter casing, Pressure drop < 15 mm of WG. Accessories Requirement: Frame, supports, sealing gasket (Neoprene gasket pasted on the back side of the flange), quick release mechanism.
3	**Chillers (Quantity: 3 No.s : 2W+1 S)** **Air cooled Scroll Chiller:** Supply, loading, unloading, lifting, shifting, installation, testing and commissioning of factory assembled, microprocessor controlled air-cooled, single/multiple screw/rotary chiller packages of minimum capacity of 40 TR at 39-41 Deg C ambient conditions prevailing at Chennai. The leaving water temperature from the chiller shall not exceed 7 Deg C when entering water temperature is 12 Deg C. The compressor (s) operating on eco-friendly refrigerants such as R134a/407c/410a complete with controls and accessories, crankcase heaters, automatic modulating capacity control, forced feed lubrication system with oil separator etc. Air-cooled condenser(s) made of copper tubes mechanically expanded into aluminum fins, statically and dynamically balanced low noise condenser fans and motors. Shell and tube DX type/ Flodded type chiller with steel shell and copper tube and complete with drain points. Microprocessor based control center unit in fully enclosed steel cabinet (IP 55 Protection) with power and safety operating controls in separate compartments and complete with monitoring facilities for suction/Discharge pressure, oil pressure, suction line super heat etc. Power supply panel (IP 55 protection) housing all main power connection(s), starters for compressor(s) and condenser(s), factory wiring for compressor(s), condenser(s).

3.1	**Chiller Water Pumps** 1) Quantity – 2 Nos. (1 W+ 1S) 2) Pump flow rate: 900 LPM @ 3 Kg/cm2 3) Pump type: Horizontal centrifugal pumps. 4) Heavy duty for continuous operation 5) MOC: CI 6) Impellor: SS304 7) Motor: Adequately sized TEFC, squirrel cage induction motor having high efficiency rating IE3 Class and suitable for 415V + 10%, 3 Phase, 50 Hz + 5%. 8) Pump shall be horizontal, closed coupled, single stage, centrifugal, end suction with back pull-out design. Hence, the rotating unit can be removed and serviced without disconnecting the suction and discharge pipe. 9) The noise level shall not exceed 75dbA at 1m from the source. 10) Accessories: Pressure gauges at suction and discharge, isolating butterfly valves at suction and discharge, check valve, strainer, integral piping, base frame, foundation bolts, nuts, vibration isolator/rubber pads etc. Pumps should be Horizontal end suction Type.
3.2	**Chiller Water Pipe Lines**
3.2.1	**Piping** 1) All the pipes shall be SS304 SCH10, PN 10 rated, all pipe lines should be joined with tig welded. 2) Square cut plain ends should be welded for pipes upto and including 100 MM Dia. 3) All pipes 125 MM Dia. or larger should be bevelled by 35 DEG. before welding
3.2.2	**Pipe supports/ hangers** 1) Pipe supports should be provided and installed for all piping wherever indicated, required or otherwise specified. Wherever necessary, additional hangers and supports shall be provided to prevent vibration or excessive deflection of piping and tubing. 2) All vertical pipe support should be made of 12mm M.S. rods and the horizontal support should be of M.S. angles of 50x50x4 mm thick. 3) Pipe supports should be adjustable for height and prime coated with rust preventive paint & finish coated with black paint using approved grade of paint.
3.2.3	**Joining's** 1) All pipe lines should be joined with tig welded. 2) All pipes 125 MM Dia. or larger should be bevelled by 35 DEG. before welding
3.2.4	**Dual Plate Check valves** 1) The body of the check valve should be made from SS304 PN 16 rated, single piece casting in cylindrical shape 2) There should be two plates, which should be hinged in the centre of the circle. 3) Both plates should have springs attached to them for assisting in closing action of the valve. 4) There should be properly/designed metal to metal seal between the plates and the outer body, to ensure non leaking sealing. 5) The valve design should confirm to API 594 or equivalent specifications.

3.2.5	**Stainers** 1) Strainers should either be pot type or 'Y' type SS304 body PN 16 rated, tested upto pressure applicable for the valves as per design. 2) The strainers should have a perforated bronze sheet screen with 3 mm perforation and with a permanent magnet, to catch iron fillings.
3.2.6	**Al Cladding Insulation** All the chilled water lines shall be Chilled water line shall be insulated with Puff 50mm thick insulation and cladded with Aluminium sheet.
3.2.7	**TESTING** 1) In general, tests should be applied to piping before connection of equipment and appliances. In no case should the piping, equipment or appliances be subjected to pressures exceeding their test ratings 2) The tests should be completed and approved before any insulation is applied. Testing of segments of pipe work should be permitted, provided all open ends are first closed, by blank offs or flanges. 3) After tests have been completed the system should be drained and flushed 3 to 4 times and cleaned of all dust and foreign matter. All strainers, valves and fittings should be cleaned of all dirt, fillings and debris. 4) All piping should be tested to hydraulic test pressure of at least one and half times the maximum operating pressure but not less than 10 kg/cm2 for a period of not less than 12 hours. All leaks and defects in the joints revealed during the testing should be rectified to the satisfaction.
3.3	**AIR DISTRIBUTION SYSTEM: DUCTS, GRILLS & DIFFUSERS DUCTS AND INSULATION**
3.3.1	**Duct Specifications:** Complete supply air ducting including the flexible ducting connecting the solid duct work with filters collar and return air ducting is covered under scope of work. • Dusts shall be made from GI sheet of lock forming quality having Zinc Coating as per ASTM A-525 G90. • The ducts shall be constructed as per SMACNA standard. • The ducts shall be designed for 100 mm of WC pressure. • The ducts will be used for cleanroom class 100 environments. To meet this requirement, the GI sheet for manufacturing the ducts shall be totally oil free**.** • Velocity for Supply Air shall not exceed 1500 fpm and return air shall not exceed 1000 fpm, ducting shall be complete with dampers, vanes, anchor fasteners, supports, access doors, neoprene rubber gaskets etc. • All the ducts shall be supported with the building structure with GI threaded rods of 10mm dia and spring isolators of GI or coated suitable for cleanrooms. • Ducting shall include dampers, supports, Isolators etc. • All duct supports, re-enforcement shall be galvanised. • All the dampers shall be Al anodised. • The duct sections shall be joined with Angle iron flange joints. • All the edges with minor leaks should be sealed with silicon sealant. • Duct inspection window to be provided in the main ducts and plenum boxes. The inspection windows shall be leak proof, easy to open/close. • The ducts fabrication work shall be carried out in dust free environment. **Sheet Specifications:** All duct work, sheet metal thickness and fabrication unless otherwise directed, shall strictly meet requirements, as described in IS:655-1963 with amendment-I (1971 edition). **The thickness of the sheet shall be as follows: -**

Size of Duct	Sheet Thickness	Type of Joints	Bracing if any
Up to 750 mm	0.63 mm / 24Ga	G.I. Flange	
751 mm to 1000 mm	0.80 mm /22 Ga	25x25x3 mm Angle iron frame with 8 mm dia from joints, nuts & bolts	25x25x3 mm at the rate of 1.2 M from Joints
1001 mm to 1500 mm	0.80 mm/ 22 Ga	40x40x5 mm Angle iron frame with 8 mm dia from joints, nuts & bolts	40x40x5 mm at the rate Of 1.2 M
1501 mm to 2250 mm	1.00 mm 20 Ga Angle iron frame	50x50x5 mm with 10mm dia to be Braced with nuts & bolts	40x40x3 mm at the rate Of 1.2 M at Diagonally 125 mm centre.
2251 mm and above	1.25 mm 18 Ga	50x50x6 mm Angle iron frame with 10 mm dia from joints, nuts & bolts at 125 mm	40x40x3 mm at the rate of 1.6 M centre.

Duct supports and hangers for supporting the ducts including threaded rod, fittings, slotted angles, nuts, bolts gaskets and fasteners etc.

3.3.2 Flexible Duct Work

- Insulated, flexible ductwork shall be installed from Al supply duct work to each HEPA filter ceiling module.
- The flexible duct work shall be sealed and secured at each filter module and sheet metal collar utilizing stainless steel flexible duct bands and duct band locks.
- The diameter of flexible duct shall be 12" (approx.) matching with the air inlet collar size.
- Flexible ducting shall be heavy duty suitable for +2500 Pa of air pressure and 30m/s air velocity.
- Material of duct: Multiple layers of Al - polyester laminated with spring steel wire helix.

3.3.3 Volume Control Damper

• At the junction of each branch duct with main duct and split of main duct, volume dampers must be provided. Dampers shall be two gauges heavier than the gauge of the large duct and shall be rigid in construction.
• The volume dampers shall be of an approved type, lever operated and completed with locking devices which will permit the dampers to be adjusted and locked in any positions and clearly indicating the damper position.
• The dampers shall be of splitter, butterfly or louver type. The damper blade shall not be less than 1.25 MM (18) Gauge, reinforced with 25 MM angles 3 MM thick along any unsupported side longer than 250 MM. Angles shall not interfere with the operation of dampers, nor cause any turbulence.

3.3.4 Duct Insulation

Supply & Return Air Duct Thermal Insulation with Aluminium foil faced self-adhesive, Closed cell, Nitrile Rubber Insulation with proper sealing of joints filled with silicon sealant. Insulation of duct exposed to atmospheric/ambient conditions using Aluminium faced Closed cell Nitrile rubber, Class 'O' fire rating, density not less than 50 Kg/m3 all the joints shall be sealed with 75mm thick Al tape.
Supply Air Duct: 19mm thick
Return Air Duct: 16mm thick.
Al- Cladding: HVAC ducts exposed UV light shall be cladded with Al. Sheets of suitable gauge.

3.3.5	**Standard Grills** • The supply and return air grills shall be fabricated from extruded aluminum sections. The supply air grills shall have single/double louvers. The front horizontal louvers shall be of extruded section, fixed/adjustable type. The rear vertical louvers where required shall of aluminum extruded sections and adjustable type. The return air grill shall have single horizontal extruded section fixed louvers. The grills may or may not be with an outer frame. • The damper blades shall also be of extruded aluminum sections. The grill flange shall be fabricated out of aluminum extruded section. Grills longer than 450 mm shall have intermediate supports for the horizontal louvers.
3.3.6	**Return Air Grills** The linear diffusers/grilles shall be fabricated from Aluminum extruded sections. The diffusion blades shall be extruded, flush mounted type with single or double direction air flow. The frame shall be of aluminum extruded section and shall hold the louvers tightly in fixed position. The dampers as described under grilles shall be provided wherever specified.
3.3.7	**Fire Dampers** • Automatic fire dampers to be provided wherever required as per the safety standards. The damper shall be multi blade louvre type. The blades should remain in the air stream in open position and shall be constructed with minimum 1.8 mm thick galvanised sheets. The frame shall be of 1.6 mm thickness. Other materials shall include locking device, motorised actuator, control panel to trip AHU motor etc. • The fire dampers shall be capable of operating automatically on receiving signal from a fire alarm panel. All control wiring shall be provided between fire damper and electric panel. • A hinged and gasketed access panel measuring at least 450 mm x 450 mm shall be provided on duct work before each reheat coil and at each control device that may be located inside the duct work.
4	**Electrical Panels and Cabling**
4.1	1) **HVAC Electrical Panel :** General Design Consideration a) System configuration i. Voltage Supply: 415V± 10% ii. Frequency : 50Hz± 5% iii. No of Phase and grounding: 3 Phase & Solidly ground earth iv. Power Distribution: A.C., 3 Phase 4 wire for 3 Phase system, 1 Phase 3 wire system b) Code & Standards All electrical equipment and accessories to be furnished, installed and commissioned shall be designed, manufactured, tested and installed in accordance with relevant Indian Standard Specifications (ISS), Indian electricity rules and any other applicable regulations. 2) Cabling for electrical supply from wall mounted electrical panel to respective AHUs/Chillers/Pumps/Humidifier shall be armoured copper cables. 3) Copper lugs should be used for cable termination. 4) Bus bar for incoming should be of Copper. 5) Cabling for all the equipment shall be laid through GI ladder or conduit. 6) AHU blower should operate on VFDs 7) Heaters control should be through Thyristors 8) Star-delta starter for chilled water pumps 9) Electrical Panel with bypass arrangement DOL/SD type electrical control panel and provision Microprocessor controller with display for Temperature, RH controlling, monitoring with status (AHU) interlocking with 3 way modulating valve & Strip heater system and SCR for Heater controllers. Provision for : a) AHU (Heaters, Blower, Humidifier) b) Pumps c) Chillers d) Compressor e) Process Cooling Water system 10) AHU panel Interlocks a. Flow Switch- 1nos b. AHU Door interlock- 1 nos c. Smoke and Fire interlock - 1nos d. Thermal Interlock- 1nos e. Access control Emergency interlock- 1nos. **2) Sub-Distribution Boards:** Switchboards and Switch/Sockets: The scope includes the Supply and installation of different sizes of Switchboards and switch/socket for Lighting, Power Distribution and Trunking.

	Vendor shall consider suitable rated distribution boards with individual isolators for Cleanroom equipment, lights, fan filter units, power points. Based on the availability of power at site, UPS/Raw Power will be selected for equipment's.
4.2	**Electrical Cabling and Accessories (Cables, wire, conduit, earthing, Switchboards, Switches/Sockets etc)**
4.2.1	**Trunking & Raceway** The scope includes Supply of UPVC cable management (Trunking System) and metal raceways, its accessories, installing the same on wall/surface and floor as per the specification and quantities specified in the BOQ. The PVC Trunking shall be fire retardant, low smoke and the contractor shall provide the necessary test certificates in support of this requirement. Cutting of the floor for installing the Raceway shall form part of the installation of the Raceway by the Contractor.
4.2.2	**Cables** The scope includes the Supply and installation of ISI marked PVC/XLPE insulated, Extruded PVC inner sheath, GI strip armoured overall FRLS PVC outer sheathed, on wall/surface/existing cable tray as required as per the detailed specification and quantity in the BOQ. Control cables shall be copper conductor PVC insulated and power cables shall be XLPE insulated. The necessary hardware for installation of cable like cable tie, clamps, tags etc. will be in the scope of contractor. Make of power/control cable shall be Polycab/ Havells/ KEI/ NICCO/CCI/National/gloster/Ecko. Instrumentation cables shall be conforming to BS 5308, type II, 300/500 V grade with stranded 0.75sq mm copper conductor, PVC insulated, colour coded, twisted to form a pair/pairs, twisted to form a unit, units laid up, myler taped binding, overall screened with aluminium myler tape with tinned copper drain wire, extruded inner sheathed, galvanised steel round wire /strip armoured, overall FRLS PVC sheathed.
4.2.3	**Wire** The scope includes the Supply and installation of stranded Copper conductor wire, 1100-volt grade, FR PVC insulated single core conforming to IS 694 as per the detailed specification, quantity in the BOQ. **Conduit:** The scope includes the Supply and installation of ISI make rigid steel, hot dip galvanised conduits of different size, quantity & Specification as per BOQ. The conduit shall be installed on wall/surface/ metal truss/existing cable tray, as required. Flexible conduit shall be made with bright cold rolled annealed and electro-galvanised mild steel. Installation of conduits shall include all necessary hardware, metal strip, welding, clamps etc.
4.2.4	**Earthing** The scope includes the Supply and providing earth pits and earth strips for earthing of Panels, DBs, Process Tools as per established norms/Indian codes and quantities as per the BOQ.
4.2.5	**VFD Panels** All the blowers must operate through VFD's(AHU Blower, Wet Exhaust Blower & Dry exhaust Blower
4.3	**PLC Panel With HMI** Dedicated HVAC BMS system with HMI panel shall be with the following I/O's.

			(DO)						(AO)				(DI)								(AI)																
	M & E SYSTEM EQUIPMENT	Quantity	Remote Start/Stop Command	Humidifier	Heater	3 way modulating valve	Motorised Damper	Heater	Control Valve	3 way modulating valve	VFD	On/Off Status	Trip Alarm	Motorised Valve Open/Close	Fault Alarm	Hi-Lo Level	Filter Dirty Alarm	Motorised Damper	Supply Air Temperature	Return Air Temperature	Water Supply Temperature	Water Return Temperature	Room Temperature	Room Humidity	3 way modulating valve	Air Flow	Differential Pressure	Voltage	Ampere	PH Reading	Pressure Reading	Flow	Resistivity	PPM Fluoride	HF&Acid Alkaline level
S/N	***System***																																			
CONTROL PANEL		0																																		
1.0	CHILLER	3	3																																	
2.0	CHILLER PUMP	2	2								0	2	2																	2					
3.0	AHU	2	2		2	2	2	2	2	2	2	2	2	2				2	2	0	0	0	0	0	2										
4.0	Exhaust Blower	1	1								1	1	1												1										
5.0	Duct temp and RH Sensors room	2																					1	1												
6.0	Air Flow sensor(AHU)	3																					0	0		3										
7.0	Room RH Sensors	3																						0												
8.0	Fire alaram system	1										1																								
9.0	Wet Scrubber(Blower)	1	1								1	1	1													1			0						
10.0	Dry Scrubber(Blower)	0	0								0	0	0													0									
	Sub Total :		9	0	2	2	2	2	2	2	4	7	6	2	0	0	0	2	2	0	0	0	1	1	0	7	0	0	0	0	2	0	0	0	0
	I/O Used:	53	15						8			17							13																
	Total Spare:	26	8						6			6							6																
	Total	79																																		

5 Process Utilities

5.1 DI Water Plant

The System should meet the daily requirement of Type-I and Type-II water : 150 – 200 Liters per day with storage and distribution system with the following specifications:

- Type-II water Conductivity: < 0.2µS/cm @ 25 Deg C with a flow rate of 2 lpm at 1.5-2 Bar
- Type-I water Conductivity: < 0.05µS/cm @ 25 Deg C with a flow rate of 1-2 lpm at 1.5-2 Bar

The DI water plant along with the storage tank is to be installed in the utility area behind the lab space housing the cleanroom. The plumbing of Type-I water and Type-II water system to the respective distribution lines inside the cleanroom is to be included in the scope of the work. The piping set required to cover a distance of between the DI generator and the cleanroom is included in the scope of this work.

The Type-II water distribution system is to be connected to the POU - Gooseneck in wet chemical stations-1, 2 & 3 and must provide water at the specified flow rate 40 LPH. Type-I water distribution system is to be connected to POU spray gun installed in wet chemical station-1, 2 and 3 and must provide water at 1-2 liters per minute at the spray gun outlet. The Type-I water system must continuously recirculate the water to provide constant fluid flow and eliminate dead legs to POU. Water quality monitors must be provided for live monitoring of the Type-I and Type-II water quality from the system. Resistivity sensors and display of measured resistivity value must be included.

The feed water is municipal supply water/borewell water or a mixture of the two. The feed water quality and pressure may vary. De-ionized water system able to use tap water as feed with quality parameters up to below given limits: Conductivity < 500µS/cm, Hardness < 100 ppm, Chlorine < 1.5 ppm, SDI <7. Type-II system should be provided with UV lamp along with Electro De-ionization (EDI) module. The vendor must provide appropriate pre-treatment/filter systems. Wastewater, if any, from the Type-I and Type-II systems should be connected to the building drain. The vendor must label all water supply lines with fade-proof easily readable labels at appropriate locations and must provide drawings and documentation of the final water plumbing layout. All electrical wiring and power points required for powering the DI plant is to be included in the scope of this work and must be done according to standards specified.

DI Water Pipe lines and Tap-off points:
DI Water pipelines shall be SCH 80 PP and Tap off point should have Isolation Valve, Regulator and Gauge.

5.2	**Process Cooling water System** Independent air-cooled water chiller of suitable capacity to be designed to generate 50-60 LPM process cooling water at 17-19 Deg C @4-5 bar capacity • Buffer tank 400 Liters • Duty/standby pump set. • Primary chilled water heat exchanger. • SS304 Valves and distribution pipework. Process cooling water pipework shall be SS304, should be thermally insulated where ever appropriate. And 10 tap-off points shall be considered. Tap off point should have the accessories like pressure regulator, Isolation Valve, Pressure gauge and flow meter. **Process Cooling water Distribution:** MOC of Distribution Lines: 1" UPVC SCH 80 No. of Tap off Points- 10 nos. (Tap off Points: Tap off Points should have Ball Valve, Gauge, Flow meter, PRV)
5.3	**Utility Drain Piping** Utility drain pipe shall be PP SCH 80, DN 50. 4 Tap off points to be provided. All the fume hoods drain will be connected to the drain lines. Main header drain line to be connected to the nearest existing drain line.
5.4	**Air Compressor and Pipe Lines** Screw Air Compressor**,** air cooled model of latest design Screw Air compressor for supply of oil free, clean and dust free dry air to process labs. • Unit performance should be according to ISO 1217 • Max. working pressure – 10 Bar @ 9 cfm • Air receiver- 150 L Capacity • Integrated refrigerant dryer, with purification system • Noise level should not be more than 55dBs • Pressure gauges/drains/ isolation valves **Compressed Air Line:** Compressed air line MOC shall be SS316L ¾" in size with 10 tap off points, tap off point should have Isolation Valve, Pressure regulator, Gauge and Accessories.
5.5	**Supply and Installation of Gas Panels and Pipe Line Distribution**
5.5.1	**Supply of Auto Changeover Panel for Gases:** Supply, Installation, Testing and commissioning of Auto Cylinder Changeover gas panels for N2, Ar, O2 to safely regulate the pressure of gas present in cylinder to the pressure required at point of use. The gas supply panel consists of the following components: 1) Isolation valve 2) Vent arrangement 3) Pressure Regulator 4) Safety relief valve 5) inlet Filter - 0.5 um and outlet filters- 0.003um 6) Pressure gauges All these components are to be assembled on an SS plate inside a class 100 cleanroom environment. The panels will be undergoing 5 step testing and validation process for pressure test, Helium leak test, Trace moisture test, Trace oxygen & particle count. **Panels for UHP Gasses:** N2- 4 Cylinder auto changeover panel Ar- 2 Cylinder auto changeover panel O2- 2 Cylinder auto changeover panel

5.5.2	**Gas Tubing** SS316L EP Tube Supply, installation, testing and validation of SS316L, 10 Ra electropolished Tubes of 1/4", all the joints shall be orbitally welded. Upon completion of installation, the tubes shall undergo 5 step testing and validation. The steps are : - Pressure hold test (0 psi drop over 24 hours) - Helium leak check (10^-9 mbar l/sec) - Trace oxygen (<10ppm) - Trace moisture (<10ppm) - Trace Particle (<0.1 micron)
5.5.3	**Gas Line Tap-off Points** All the gas line tap-off points must have UHP Valve, Regulator and Gauge
5.6	**Drain Lines** Drain lines shall be PP/UPVC of suitable sizes, all the POU requires U-Trap arrangement.
5.7	**Exhaust Ducting:**
5.7.1	**Wet Exhaust Ducting** All the Exhaust Ducting outside the cleanroom shall be PP+FRP 2+3mm thick and inside the cleanroom shall be PP 5 mm thick, with individual volume control damper. Ducting shall be laid with suitable supporting system.
5.7.2	**Dry Exhaust Ducting** All the Dry exhaust ducting shall be SS304 ducting with individual volume control damper. Ducting shall be laid with suitable supporting system.
5.8	**Wet Chemical Station (Quantity – 2 Nos)**
5.8.1	**Wet Chemical Station for acids** meant for wet chemical processing using acids, bases and majorly aqueous solutions. The overall dimensions of the fumehood are *1800x950x2300 mm (width x depth x height).* The fumehood must be constructed out of stress relieved, fire-retardant, high quality polypropylene sheets of thickness 10mm (data regarding residual stress in the sheets must be provided). Any material being quoted must meet all cleanroom materials specifications. **Construction:** The Wet Chemical Station must be provided with a flat worktop made of 10mm thick polypropylene sheet. A skirting of width 25 mm and 10 mm height must be provided at the front of the worktop to contain any spills on the worktop and prevent spilling on the floor. It must include a polypropylene sink, the worktop must be at standard fumehood worktop height from the cleanroom floor. The worktop height should be provided with the technical bid. A clear transparent height adjustable counter-weight balanced sash made of acid and solvent resistant material that is at least 10mm in thickness. The fumehood must have a standard value for face opening at full sash position. The sash opening at full sash position must be provided with the technical bid. At fumehood must have standard fumehood face opening at full sash position and must maintain a face velocity between ***90-110 fpm*** at half sash position. The fumehood exhaust blower must be suitable rated and all ducting must be fire-resistant polypropylene. Fire resistance rating should be clearly mentioned. The quote should include all necessary fittings for routing the exhaust duct and installation of the blower. **<u>Utilities</u>** <u>Gooseneck:</u> Gooseneck made of Polypropylene with control valve for sink shall be supplied for Acid usage Wet chemical Station. <u>Power Points</u>: 5/15A 4 no.s socket and switches provided on front of the station on either side.

	Lights: 2 Nos. normal light 36W Shall be will be provided for adequate illumination, material of construction will be PVC/polycarbonate. DI and N2 Guns: Two guns made of virgin PTFE with anti-static protection must be provided at each end of the fumehood worktop. The nitrogen blow guns must have a filter housing with disposable filters. DI water Gun will not have a filter. The piping for each of the guns must have enough length to reach the whole of the work area. When not extended, the extra piping must retract and be concealed inside the workstation body. The piping must be resistant to acids and common solvents and must not outgas or generate particulates (provide specifications/manufacturer data sheets with quote) A polypropylene sink with 250 x 200 mm must be provided inside the fumehood at back left corner. It must have a Polypropylene gooseneck with a tap and connected to the DI water supply line. The drain of the sink must be piped into the building drainage duct. Magnehelic gauge: Magnehelic gauge of 50mm of water column capacity to measure the differential pressure at the exhaust plenum box in fume hood of the workstation must be provided. Storage cabinet trolleys: Two storage cabinet trolleys of 900mm length each for chemicals/materials storage under fumehood. The trolleys must be made of high-quality polypropylene.
5.8.2	**Wet Chemical Station for solvents** meant for wet chemical processing using solvents and majorly aqueous solutions. The overall dimensions of the fumehood are *1200x950x2300 mm (width x depth x height).* The fumehood must be constructed out of stress relieved, fire-retardant, high quality polypropylene sheets of thickness 10mm (data regarding residual stress in the sheets must be provided). Any material being quoted must meet all cleanroom materials specifications. **Construction:** The Wet Chemical Station must be provided with a flat worktop made of 10mm thick polypropylene sheet. A skirting of width 25 mm and 10 mm height must be provided at the front of the worktop to contain any spills on the worktop and prevent spilling on the floor. It must include a polypropylene sink, the worktop must be at standard fumehood worktop height from the cleanroom floor. The worktop height should be provided with the technical bid. A clear transparent height adjustable counter-weight balanced sash made of acid and solvent resistant material that is at least 10mm in thickness. The worktop shall be SS 316, 1.6mm thick. The fumehood must have a standard value for face opening at full sash position. The sash opening at full sash position must be provided with the technical bid. At fumehood must have standard fumehood face opening at full sash position and must maintain a face velocity between ***90-110 fpm*** at half sash position. The fumehood exhaust blower must be suitable rated and all ducting must be fire-resistant polypropylene. Fire resistance rating should be clearly mentioned. The quote should include all necessary fittings for routing the exhaust duct and installation of the blower. **Utilities** Gooseneck: Gooseneck made of Polypropylene with control valve for sink shall be supplied for solvent usage Wet chemical Station. Power Points: 5/15A 4 no.s socket and switches provided on front of the station on either side. Lights: 2 Nos. UV light 36W shall be will be provided for adequate illumination, material of construction will be PVC/polycarbonate. DI and N2 Guns: Two guns made of virgin PTFE with anti-static protection must be provided at each end of the fumehood worktop. The nitrogen blow guns must have a filter housing with disposable filters. DI water Gun will not have a filter. The piping for each of the guns must have enough length to reach the whole of the work area. When not extended, the extra piping must retract and be concealed inside the workstation body. The piping must be resistant to acids and common solvents and must not outgas or generate particulates (provide specifications/manufacturer data sheets along with the quote) A polypropylene sink with 250 x 200 mm must be provided inside the fumehood at back left corner. It must have a Polypropylene gooseneck with a tap and connected to the DI water supply line. The drain of the sink must be piped into the building drainage duct. Magnehelic gauge: Magnehelic gauge of 50mm of water column capacity to measure the differential pressure at the exhaust plenum box in fume hood of the workstation must be provided. Storage cabinet trolleys: Two storage cabinet trolleys of 600mm length each for chemicals/materials storage under fumehood. The trolleys must be made of high-quality polypropylene.

5.8.3	**Wet Scrubber for acid wet chemical station** Supply and installation of Vertical type wet scrubber with liquid recirculation tank, recirculation pump dosing tank & dosing pump, pH sensor with the transmitter, exhaust sensor, differential pressure switch, exhaust blower of the static pressure of 250mm wg and stack. Material: PP-FRP, Pressure drop across the scrubber column should be below 50mm wg (approx.). The design velocity for the scrubber column shall be 1.5 m/s. Interconnection piping between the scrubber, Re-circulation tank, and Dosing tank shall be considered. complete with makeup water connection with control valve, water level indicator, drain with control valve, overflow pipe, scrubber recirculation pump without Mechanical seal, inlet flange connection with 'Y' Strainer, outlet flanged connections with nonreturn valve (NRV), Ball valve with gaskets & bolt nuts, single stage PP packing rings. Liquid spray nozzle system, Including Dosing Plug with Valve, Mounting Bolt & Nuts with Anti Vibration Pads, Including all pumps and motors cover, Ladders. Scrubber capacity : Scrubber capacity to handle 3500 cfm air. Blower: PPFRP Blower 3500 cfm Capacity @ 250 mm total Static
5.8.4	**Dry Scrubber** Dry Scrubber made of SS304 with activated carbon filter bed and all the duct work shall be SS304, tap off point should have volume control damper.
5.8.5	**Chemical Storage Cabinet** Chemical Storage Cabinet made of Stress Relieved, Fire-retardant Polypropylene, with adjustable type shelves. Dimensions: 900x550x2100 in mm
6	**Programmable Spin Coater** • Bowl-shaped process chamber which can hold size 6" (~150 mm) diameter wafers or 5" (~125 mm) square substrates • AC Brushless motor featuring bi-directional rotation / agitation, high acceleration, and a wide speed range • Digital process controller for easy programming • Speed : 1-12,000 rpm • Accuracy <+-0.5% of full speed • Time: 1 second to 99 minutes 59.9 seconds in 0.1 second increments • Programs: Twenty multi-step programs or manual mode • Real time display of RPM, time and program stamps • Input and control through soft touch keypad • Acceleration: up to 13K rpm/sec with standard chuck (programmable in 1 RPM increments) • PC Interface software to be included • Fluid-control lid directs materials towards rear drain — no drips should be encountered when opening chamber • Chemically-resistant lid with Ø3/4"; (Ø19 mm) center opening • NPP vacuum chuck for Ø50 mm through Ø150 mm substrates • NPP fragment chuck adapter — fits over above chuck for holding 10 mm through ~50 mm pieces Ø1.5"; (Ø38 mm) NPP Drain Port and Nitrogen purge • Polypropylene drain container to store exhausted drain reservoir • With necessary interlock, latch and lock for safety of the door • With oil-less vacuum pump (220 VAC, 50/60 Hz) and inlet port
7	**Cleanroom Safety and Security Systems**
7.1	**Fire detection system** The whole cleanroom area to be covered with a fire/smoke detection system with photo-electric type of fire & smoke detectors distributed to cover all areas of the labs and the change room. An Addressable fire panel shall be located near the BMS station. It shall also have an audible alert signal hooter of a good decibel value to attract attention of the staff for action. In the event of fire/smoke alert shall also

	trigger the release of the access control system on the doors as well as initiate the fire dampers in the supply air ducts to close. The penetrations in the proposed ceiling panels for the cabling of the fire/smoke detectors to be leak sealed and should be done in consultation with SPL/VSSC and should be compatible with the existing system. Scope of the work is to relocate the existing fire system.
7.2	**Door interlocks and access control for entry to cleanroom** Air Shower Door should have provision for installing biometric sensors. Air-shower Door should be able to open only after successful verification / validation of proximity type access control system validates the authorization for the person / proximity card. The access control system shall be controlled through software and it should be possible for logging the data of personnel movement in and out of the labs and to be stored in the PC as a record. Storage provision of at least 6 month's data is the minimum requirement and this should be able to copy and kept in another storage medium.
7.3	**CCTV Camera** HDMI type CCTV cameras (Megapixel level) to be provided by the vendor. The vendor has to install electrical power cable and suitable sockets for all the CCTV cameras; supply and installation of compatible signal cable to the CCTV control and monitoring system at service area (BMS control room). Electrical power supply for the CCTV cameras shall be brought on the UPS power for handling situations during power interruptions. The location of this CCTV cameras shall be as placed in the following areas: a) Class 100 – 2 No.s b) Class 1000 – 2 No.s c) Cleanroom Entrance – 2 No.s d) Gowning area, Visitor area, UPS room and utility room – 1 No each e) AHU area – 4 No.s All the camera outputs are to be stored in an HD compatible DVR with a minimum HDD capacity of 500GB and it should be able to display through the available display unit.
7.4	**LAN and Telephone & Intercom** Class 100 and Class 1000 will have 5 LAN points each. Class 100 and Class 1000 will have 2 Telephone point each.
7.5	**Local Fire Extinguishers** Local fire extinguishers suitable for A, B, C fire classifications 5 kg capacity suitable for Cleanroom Application
7.6	**Cleanroom Furniture** Supply of Cleanroom furniture Standard or customised type based on customer requirements All the cleanroom furniture supplied are suitable for Class 100, MOC shall be SS316L 1.6 mm thick and mirror finish.

8 Testing and Validation of Cleanroom

- Certification of Cleanrooms shall be done through an experienced Third party Agency
- Tests shall be performed in 'As- Built' condition in accordance with the testing Procedure specified in ISO 14644.
- The "independent" testing firm shall have experience of having conducted Clean Room testing for certification of minimum 2 (two) Class 100 Cleanrooms in the last 5 years.
- The Cleanroom Certification agency shall submit performance testing report for approval.
- In the event of non-conformance to the defined Cleanroom parameters, the Contractor shall take corrective action at his cost. The Cleanroom certification shall be re-done at Contractor's cost, to establish conformance to specifications.
- Performance Testing and Certification of Cleanrooms as per ISO 14644 through an 'Independent' Certification Agency, under "As Built", "At Rest" and " At Operation" conditions.

Validation: of the Cleanroom as per ISO14644 and following documents to be submitted along with the validation reports.

- o Temperature
- o Relative Humidity
- o Particle count
- o Filter Integrity test
- o Air velocity test
- o Differential room pressure test (pressure Zoning)
- o Recovery test
- o Air balancing
- o Pressure balancing

9 Installation and Training

Cleanrooms mechanical assembly shall be done by the Supplier. Electrical system installation shall be done by qualified and authorized electrician employed or subcontracted by the Supplier.
Supplier has to arrange for materials unloading and staging. The Supplier shall provide full training on the cleanroom' operations, equipment preventive maintenance and repair. Final documentation shall include the training manuals. Operation and maintenance manuals should be provided by the supplier

10 Documentation

In order to have Complete system documentation, the following documents have to be provided:

- System GA, Layout and PID drawings
- wiring diagrams
- lists of parameters to be monitored
- Installation, Commissioning reports
- SOP
- Recommended Spares List

For hand-over, all documents must be up-to-date and provided with the date.
Final documentation should contain both hard-copies & soft-copies

11 Recommended Makes

S.No.	Description	Recommended Makes
1	Cleanroom Wall panels, Ceiling, Doors, Window Modules	I Clean/Fabtech/GMP
2	Aluminium T- Grid System	Channel Systems/Terra Universal
3	Fan Filter Filters and HEPA Hoods	AAF / Camfil / Mayair**
4	Grills / Diffusers/Dampers	Carrier / Dynacraft / Cosmos/Dynamic / Konark / Equivalent**
5	Antistatic Flooring	Sigma, Wonderfloor
6	Cleanroom Lights	Wipro/ Philips
7	AHU	Zeco/Flakt wood/System Air/VTS

		8	Motors for AHU	Crompton Greaves/ ABB/ Siemens/ Schneider
		9	Starter	Siemens/ABB/L&T/Schneider
		10	Fire Dampers	Air Master/Caryaire/Ajanta/System Air/Cosmos
		11	Centrifugal Fan	Nicotra / Kruger / Comefri
		12	Strip Heaters	Dasspass / Escorts/ KEPL / Equivalent**
		13	Chillers	Daikin/ Trane / York
		14	Pump	Grundfos /Armstrong/WILO
		15	Motorised Actuator	Siemens/ Regin
		16	Ducting	Zeco/ Rolastar**
		17	Insulation	Armaflex/K-Flex**
		18	Chilled Water Valves	Aira/Audco/L&T
		19	Chilled water Pipelines	Rensa/Jindal
		20	Controls / Measurement Instrument	Baumer/Dwyer / Waaree /H-Guru/
		21	Gas Lines	Auto Changeover Panels: Swagelok/Rotarex/Parker/Tescom
		22	Gas Tubes	Valex/Dockweiler
		22	Valves, Regulator, Fittings	Swagelok, Rotarex, Parker, Tescom
		23	Gauges	Wika/Brooks
		24	Security camera	Bosch/Equivision/CP Plus
		25	Fire Panels	Notifier/Bosch
		26	Cables and wires	Polycab
		27	Switches/Sockets/MCB/MCCB	ABB /Legrand/Schneider
		28	BMS System Controller/Router:	Siemens /Regin/Sauter
		29	Polypropylene Fume Hood	Nano Clean Technologies/Kewanee/ESCO
		30	Polypropylene Chemical Storage Cabinet	Nano Clean Technologies/Kewanee/ESCO
		31	Air Shower	Esco/ Klenzaids /Terra Universal/Sam/Fabtech
		32	Static Pass Box	Klenzaids Thermadyne/Fabtech**
		33	Sterile Garment Storage	Esco/Klenzoids/Fabtech**
		34	Compressor	KAESER/Ingersoll Rand
		35	Process Cooling Chiller	Wernerfinly/Trane/Carrier
		36	DI Water Plant	MIlipore /Siemens
		37	Smoke & Fire Detection	Bosh/Notifier
		38	Door Interlock	Honeywell/Bosch
		39	Wet Scrubber	Alpha Projects/Driz Gas/ Nano Clean Technologies
		40	Dry Scrubber	Alpha Projects/Driz Gas/ Nano Clean Technologies
		41	VFD	Danfoss/ABB
		42	Cleanroom Furniture	Terrauniversal/ Nano Clean Technologies

Other Terms and Conditions (Mandatory):

1. The successful bidder should setup the cleanroom facility as per the cleanroom plan drawing and HVAC Schematic given as per the drawing.

2. The bidders are advised to make a site visit prior to bidding in order to ascertain the exact quantum of work to be undertaken and be able to quote their best for the specification and quantity as mentioned in BOQ.

3. The bidder should submit test certificates for major OEM components as required by user during the supply of materials.

4. Installation & Commissioning: Bidder should be responsible for installation / commissioning and for after-sales service during the warranty period and thereafter as mentioned in the order.

5. Any other item/work not specified above but required for completion of intended work shall be deemed to be part of the scope of work to be executed by the successful bidder.

6. Bidder should bring tools, consumables and manpower required for implementation of the work.

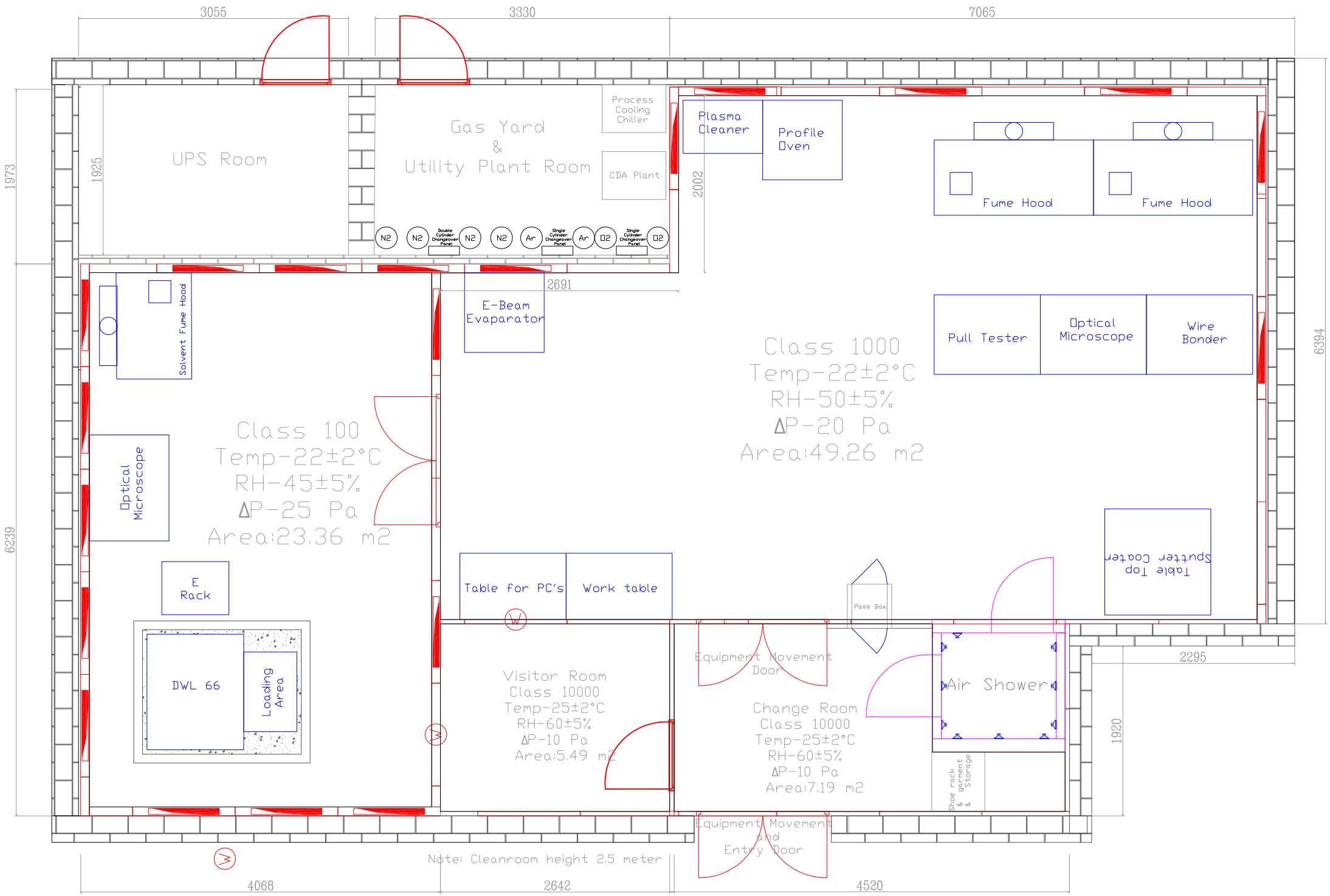
7. All the industrial safety practices must be followed during implementation of the project

8. Bidder should warranty entire facility including cleanroom and other installed service for a period of 1 year for all materials and machines. During warranty period bidder should monitor the complete facility and installed services and carry out necessary corrections, repair or replacements, if required, for smooth operation of the cleanroom facility & services as per laid down specifications.

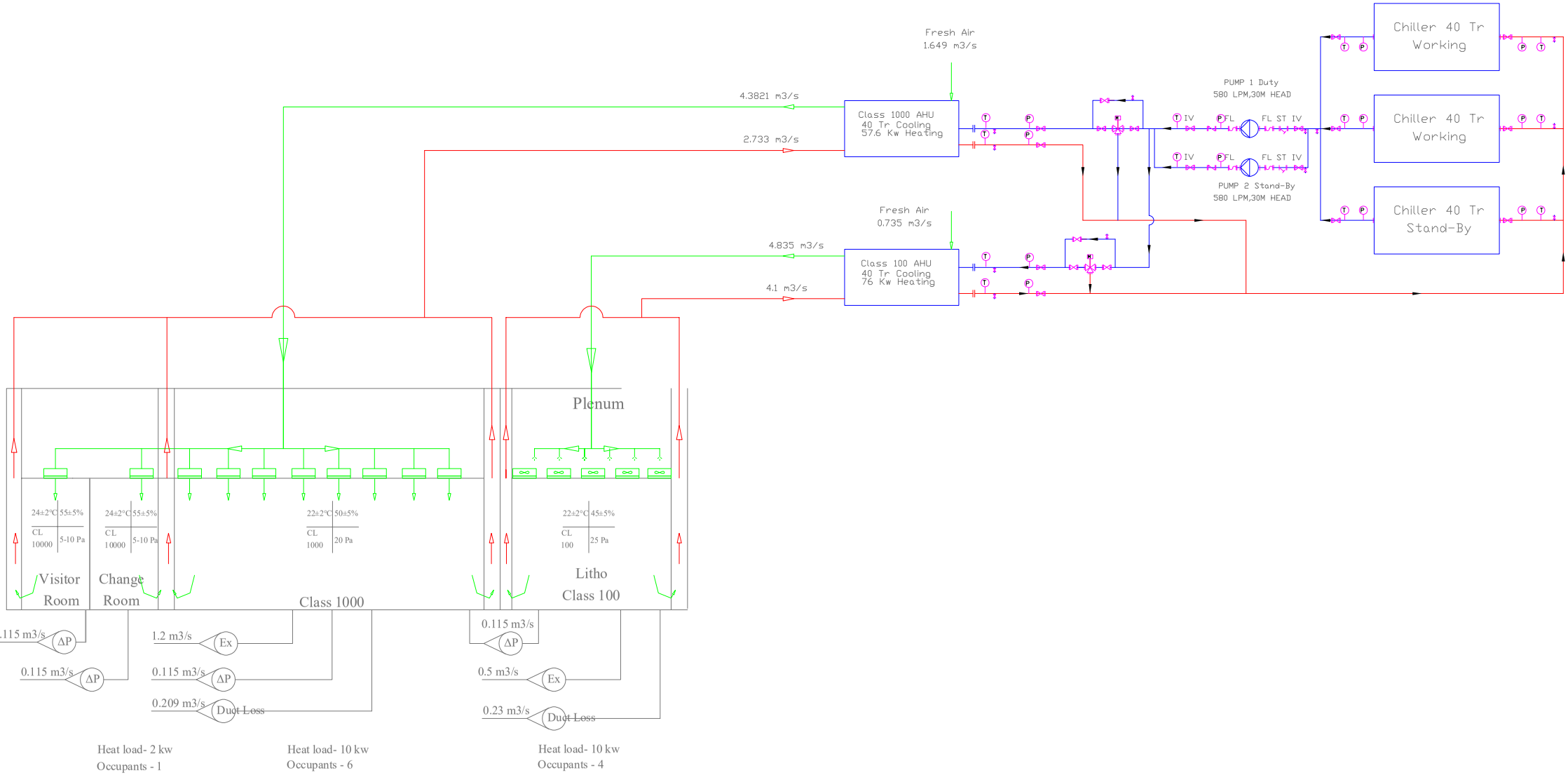
9. For HVAC work with HEPA filtration validation of particle count test, temperature & relative humidity, air velocity, AHU capacity & Air changes have to be confirmed after commissioning of work by the successful bidder.

10. Documentation for DQ-IQ-OQ has to be submitted with a set of as built drawing after completion of the work including OEM test reports of critical components.

Class 100 and 1000 Clean room Plan



Cleanroom Schematic



ANNEXURE - B

TECHNICAL BID PROFORMA

Tender No. PY/MSRO/094/2024/CLEANROOM

Item Name: DESIGN, SUPPLY, INSTALLATION AND COMMISSIONING OF A CLEANROOM:CLASS - 1000 (ISO-6) AND CLASS-100 (ISO-5)

1.0 Bidder Eligibility Criteria:

I	**Bidder Eligibility Criteria-I (Public Procurement – Preference to Make in India)**	**Class I / Class II**	**Local Content Percentage**	**Ref. Page No.**
1	Only 'Class-I local suppliers' and 'Class-II local suppliers', as defined under DIPP, MoCI Order No. P-45021/2/2017-PP (BE II) dated 16th September 2020 and other subsequent orders issued therein **(ANNEXURE – D)**			

II	**Bidder Eligibility Criteria-II**	**Complied/Not Complied**	**Ref Page No.**
1	Vendor Registration ID/Proof		
2	Land Border Certificate (**ANNEXURE – E**)		
3	**OEM Certificate Form**-The Participating Bidder's firm shall be the Original Equipment Manufacturer (OEM) or OEM Certified authorized firm (**ANNEXURE – F**)		
4	Non- Debarment Declaration **(ANNEXURE – H**).		
5	Mandate Form **(ANNEXURE – J)**		
6	EMD as per Tender, to be remitted in the account number as given in the **(Annexure – I)** or EMD is exempted for Micro and Small Enterprises (MSE) as defined in MSE Procurement Policy issued by Department of Micro, Small and Medium Enterprises (MSME) and Startups as recognized by Department of Industrial Policy & Promotion (DIPP). (MSE/MSME/DIPP PROOF should be enclosed in the cover containing technical bid).		
7	The parties/firms participating in the tender should be technically competent and experienced in having undertaken Cleanroom projects for semiconductor/ MEMS/nano/ IC fabrication facility with the following eligibility criteria (points a to f)		
	a) Parties/ firms should have successfully completed at least two (2) "similar works" during the last two (2) years. "Similar Work" shall mean "Design, detailed engineering, supply, installation, testing, commissioning and validation of Cleanroom facility (Class 100/ISO 5 or better, as per FED Std. 209E/ISO14644) and associated utilities comprising of HVAC works, Electricals, Fire Detection etc. for semiconductor/Microelectronic/Nano fabrication facilities".		
	b) Copies of Purchase Orders/ work orders in respect of "similar work" executed by the party/firm with Documents evidencing		

	issued by the respective clients/organizations shall be submitted along with the bid. In case the firm/party associates with other firm/party, copies of the POs/work orders executed by the other firm with Documents evidencing satisfactory completion issued by the respective clients/organizations shall also be submitted along with the bid.		
	c) The parties / firms should have installed / commissioned high purity and toxic gas lines in semiconductor/Microelectronic/Nano fabrication facilities. Necessary copies of POs/ workorders shall also be submitted along with the bid.		
	d) The parties/ firms should have experience in maintenance of cleanroom facilities (Class 100/ 1000). Necessary copies of POs/ workorders shall also be submitted along with the bid.		
	e) Annual financial turnover should not be less than Rs. 50 million (fifty million rupees) during the last 3 years. The prospective firm/party shall provide Chartered Accountant's certificate for the annual financial turnover.		
	f) Should not have incurred any loss in more than 2 years during the last (five) 5 financial years. The prospective firm/party shall provide the copy of audited Annual Accounts by a chartered accountant for the previous 3 financial years.		

3.0 Technical Compliance:

Cleanroom Specifications

Parameter	Class 1000	Class 100	Change Room: Class 10000	Visitor Room: Class 10000
Room Area in m^2	49.26	23.36	7.19	5.49
Room Height in m	2.5	2.5	2.5	2.5
Temperature in ^oC	22±2	22±2	24±2	24±2
RH in %	50±5	45±5	50±5	50±5
Room Positive Pressure	15-20 Pa	25-30 Pa	5-10 Pa	5-10 Pa
Air Flow pattern	Vertical	Vertical	Vertical	Vertical
Sound level	55±5 db	55±5 db	55±5 db	55±5 db
Light Intensity	500 Lux normal Light	400-450 Lux UV Light	500 Lux normal Light	500 Lux normal Light
Process Exhaust	1.2 m^3/s	0.5 m^3/s	NA	NA

Summary of Cleanroom Equipment's with Utility Requirements

		Electrical data			Utilities							
S. No	Equipment's	No. of Dual Connections	Phase	Appx Kw	N_2	Ar	O_2	CDA	DI Water	RO Water	PCW	Exhaust
Class 1000												
1	Plasma Cleaner	1	1Ø	2.3	Yes	Yes	Yes	Yes				
2	Profile Oven	1	1Ø	2.3								
3	Pull Tester	4	1Ø	4.6								
4	Optical Microscope	3	1Ø	3.45								
5	Wire Bonder	4	1Ø	4.6								

6	Sputter Coater	4	1Ø- 3 no 3Ø- 1 no	14	Yes	Yes	Yes	Yes			Yes	Yes
7	E-Beam Evaporator	4	1Ø- 3 no 3Ø- 1 no	19	Yes	Yes	Yes	Yes			Yes	Yes
8	Chemical Fume Hoods (2 No.s)	8	1Ø	18.4	Yes			Yes	Yes	Yes		Yes
9	Hot Plates	2	1Ø	2.3								
10	Work Stations	8	1Ø	9.2								
Class 100												
1	Direct Writer (CEE Type male Connector)	3	1Ø	11.04	Yes			Yes				Yes
2	Solvent Fume Hood	4	1Ø	14.72	Yes				Yes	Yes		Yes
3	Optical Microscope	1	1Ø	1.15								
4	Work Stations	4	1Ø	4.6								

Note: Process Gases (Ar, O_2, N_2) will be of UHP grade

Additional requirements:

- **Electrical Points: 3 Ø - 7 No.s and 1 Ø - 15 No.s**
- **Utility Lines (Ar, O_2, N_2, CDA, PCW, Exhaust, RO water and DI Water): 5 points each**

Note: Refer to the attachments for the layout and HVAC schematic

Cleanroom Specifications

S. No	Specification	Complied /Not Complied	Ref Page No.
1.	**CLEANROOM CONSTRUCTION**		
1.1	**Cleanroom Solid Wall Panel for Class 100 and 1000** Supplying & Fixing of Progressive type Solid Double skin modular 100mm thick Solid wall panel for partitions and wall panelling, made of 0.8 mm thick Powder coated sheets on both sides with PUF as infill of density 40 ± 2 kg /m3, GI Profiles for reinforcement along the periphery with bottom track, and necessary arrangements, All Joints shall be sealed with cleanroom compatible Neutral Grade Silicon Sealant.		
1.2	**Cleanroom Return Air Riser Wall Panel for Class 100 and 1000** Cleanroom Return Air Riser wall panel with inbuilt Return Air Risers of not less than 0.8 mm thick Powder coated GI sheet (hot dipped with zinc coating of 120 gsm), Return air risers shall be minimum 800x70mm to be provided with a minimum of 15mm puff insulation on both side of riser, within the wall panel. Risers with adjacent ceiling heights to extend minimum 200mm high above the top of the false ceiling with minimum 25mm flange.		
1.3	**Cleanroom Ceiling Panel for Class 1000** Cleanroom Ceiling panels shall be Progressive type Double skin modular 75 mm thick Ceiling wall panel made of 0.8 mm thick Powder coated sheets on both sides with PUF as infill of density 40 ± 2 kg /m3, GI Profiles for reinforcement along the periphery with bottom Aluminium track, and necessary arrangements, All Joints shall be sealed with cleanroom compatible Neutral Grade Silicon Sealant. Ceiling panels are suspended by threaded tension bars with adjustable turnbuckles fastened to the overhead support at fixed intervals to withstand 150-200 Kg per sq. mtr.		

1.4	**Aluminium Grid Ceiling System for Class 100 Cleanroom** The Cleanroom ceiling shall be formed from a HEAVY DUTY ALUMINIUM WALKABLE extruded T-Grid ceiling Systems for all areas. Ceiling grid colour should match wall panel colour (Designer white shade). The ceiling grid shall be heavy duty walkable inverted T-grid ceiling system of approx. 50 mm width (gasket type ceiling) to be provided on 600mm X 1200mm hanging configuration, the system shall include aluminium (approx. 50 mm wide) extrusions, aluminum extruded cross connector with hammer head bolts and nuts, M8 bolt and matching square hanger and other standard accessories. The grid should be suspended from the parent building roof with adequate size fasteners etc. for ensuring structural stability of the ceiling. Blank Ceiling Panels: Supply & Installation of 50mm thick HEAVY DUTY WALKABLE Al. Honeycomb Ceiling Blank Panel of dimension 1200 mm x 600mm x 45 mm/50 mm thick, using 45/50mm thick aluminum honeycomb core laminated with 0.8 mm thick Aluminum skin on both sides, static dissipative finished of designer white shade all complete.		
1.5	**Cutout in Wall & Ceiling Panels** Suitable factory-made cut-outs wherever required shall be provided in the wall panel and ceiling panel as applicable for fixing HEPA filters with Modules, light fixture, return air grills, power sockets, communication outlets, LAN outlets, cables, pipes, exhaust ducts, Magnehelic gauge, smoke sensors, pendants, utilities etc., are also to be included in the quotation after conducting an inspection to the proposed cleanroom and utility. Factory made wall cut-outs for switches and sockets and includes one conduit per cut-out. Quantity and size as per requirement. Quantity will be as per the Electrical design and will be finalized on drawing approval. Factory made ceiling cut-out for HEPA Modules (with lip as per HVAC design). Quantity and size as per requirement. Quantity will be as per the HVAC design and will be finalized on drawing approval. Each 0.74 SQM (1200 mm X 600 mm). Factory made ceiling cut-out for Light Fixtures (with lip as per electrical design). Quantity and size as per requirement. Quantity will be as per the Electrical design and will be finalized on drawing approval. Each 0.36 SQM (600 mm X 600 mm)		
1.6	**Cleanroom Window Modules** Windows and door vision panels should be formed from double glazed toughened glass composite modules. View panels of size 900 x 900 mm shall be provided in wall panels - View panels glass shall be at least 5 mm thick toughened Glass with Ceramic border of 20mm width. View panels shall be fixed flush to both faces of wall panels. - No crevices / joints/sloped profiles should be used for fixing the glass to avoid particle contamination and dust accumulation.		
1.7	**Cleanroom Doors** Cleanroom Doors shall be 44 mm thick doors flush on one side made of static-dissipative type powder coated door frames 1.2mm thk totally flushed with the wall panels - Concealed hardware for fixing the door frames. - In fill of PUF/ Honeycomb is used to give the effective acoustic and thermal insulation. Stainless steel double bearing butt hinges as per BS 7352 CLASS 9 - Mortise dead locks with all ancillaries like door closer, lock & key, hinges, d-handle, push plate, drop seal & tower bolt with view glass of size 0.4m x 0.6m. Door-sets should match the partition modules.		

1.8	**Coving** All the Covings (Inner and Outer Coving) are Extruded Aluminium Powder Coated /Anodized clip-on type covings of R-50mm. Coving shall be used at wall-wall and wall-ceiling joints and Wall to Floor. Coving Corner Pieces: All the Inner and Outer 3D & 2D corner pieces are Aluminium powder coated finish.		
1.9	**ESD Flooring** The electrostatic dissipative flooring should be provided for Cleanroom Class 100 & 1000 areas with the specification below: - • The anti-static floor material shall have a Resistance level of 1 x 10^6 to 1 x 10^9 ohms suitable for Cleanroom. • Load carrying capacity of the material shall be 750PSI (min.) conforming to BS 2050. • The joints shall be welded by thermo chord weld. • The flooring shall Include providing and laying (P/L) suitable copper strip (foil) grid of size 3' x 3' (approx.) as recommended by manufacturer and connecting to the dedicated earthing Work includes preparation of existing surface with suitable (compatible for cleanroom application) floor levelling material so as to make the surface free from any undulations		
1.10	**Dedicated Earthing for ESD Flooring** ESD Flooring includes, dedicated earth pit accessories and Interconnecting Copper strip 30x5 mm thick. Vendor has to ensure 0.1 ohm resistance can be achieved at the cleanroom point.		
1.11	**Lights**		
1.11.1	**Class 1000 Lights** Cleanroom compatible LED lights. The envisaged Lighting level in cleanrooms is 500 Lux, at 90 cm above the floor. Lights must be openable towards inside the room. Dimensions: 600 x 600 mm Power: 42 W		
1.11.2	**Class 100 Lights** Cleanroom teardrop light fittings for ISO 5 (class 100) and surface mounted fittings to be provided throughout the facility to achieve the 400-450 Lux lighting levels. The teardrop & surface mounted light fittings shall comprise of a powder coated extruded aluminum body and clear acrylic diffusers. UV filtration film having 350-400 nm thickness to be applied on lights or UV Tube sleeves shall be used		

1.12	**HEPA Filter Modules** The Cleanroom ceiling system shall include HEPA filter ceiling modules as indicated on the drawing. • The filters will be used as terminal air distribution device. The air supply plenum shall be connected directly to a connecting collar on the filter top with individual damper in the plenum and flexible ducts. • The filters shall H13 class filters as per EN1822 with an efficiency of 99.95%. • The design Air velocity through filter shall be 0.45m/s with IPD of 100±5% Pa or better. • The frame of the filter shall be of Extruded Anodized Aluminium construction. • The filter media shall be Glass Fibre with hot melt separator. • The filter shall have expanded sheet metal face guard. The face guard shall be powder coated in off-white colour. • The filter shall be having endless polyurethane D-profile, Liquid pour to solid in extrusion profile seal at the outlet. • All the filters shall be individually tested according to EN1822 and computerized scan test report should accompany each filter. • The filter shall be held in place utilizing 'hold down' devices with the Ceiling grid using channel on the filter top and T-bolts in the ceiling grid pressing the filter against ceiling grid. • All filter modules shall be complete with air inlet collar of 12" diameter (approx.). • Top sheet should be of G.I./Aluminium single piece drawn with seamless neck. In case, neck is not seamless, neck joint to the top sheet be a proper leak proof joint and with the capability of supporting a person standing on the top surface. • Filter media shall be bonded to extruded aluminium cell sides. Dimensions :1210 L x 600 D x 60 mm H		
1.13	**Fan Filter Units** Fan Filter module with HEPA filters. These FFM's are self-powered grid module with modular design, to fitting in standard T grid ceiling. Total height is 320mm. The Fan Filter Module is U.L listed and CE certified. FFU speed can vary from 0.2 to 0.5m/s and air flow rate vary from 460-760 CFM. The sound level will be 55dB's when measured from 760mm below from filter face. The vibration level is 0.9mils. The Fan motor drive will be direct drive, forward curve centrifugal type with sealed bearing. The motor will have permanent split capacitor type, rated for continuous operation with thermal overload protection with two speed switches. The power requirement is 230V, 50Hz single phase with maximum current of 1.9A with 280watts power input. The fan/motor assembly is capable of delivering air at filter pressure of 9mm to 23mm final state. These FFM will have a speed controller for increasing the speed of the motor/blower from low, medium and high. Dimensions :1215 Lx 600 D x 350 mm H FFU Material of construction: Al Zinc Alloy <u>ULPA filter</u>: Ulpa Filters U15 are rated 99.9995% efficiency in removing 0.3µ or larger particles. IPD of 120±5% Pa or better. Leak free in accordance with latest I.E.S recommended particle. The filter media is micro glass fibre with poly-string separator, sealed to casing. The filter guard is provided with diamond pattern expanded sheet for protection. Dimensions :1210 L x 600 D x 60 mm H <u>Pre Filter</u> are rated 90% efficiency in removing 10 to 15 micron particles. Pre filters are made from non-woven materials. Dimensions :550 L x 600 D x 50 mm H		

1.14	**Air Shower** **Supply of Single-entry air shower** *****Material of Construction: Powder Coated SS304 * Dimensions:1500mm L x 1500mm D x 2300mm H *Class 100 Compatible *Door interlocking arrangement should permit opening of only one door at a time. During operation, neither entrance nor exit door should be operated. A lock switch for overriding the electronic control system ensuring manual operation should also be provided. *The air shower shall be provided with per filter of HDPE, Washable type with efficiency 90% down to 10 micron and HEPA filter with efficiency of 99.97% down to 0.3 microns etc., *Air Shower shall include: Differential Pressure Gauge, ON/OFF Switches, PAO Test Port, Timer for setting Air Shower operation time (settable for 30 seconds to 5 minutes), Emergency STOP button, Automatic as well as Manual Working.		
1.15	**Sterile Garment Storage Cabinet** *****Material of Construction: Powder Coated SS304 Flow: Vertical type Filters: Pre, HEPA Filter Dimensions: 1200x 600 x 2100 in mm. Features: Sterile garment Storage Cabinet shall be having features like 20 w fluorescent tube, IR Light, Normal Light, SS grill for HEPA filter, Feather touch type HMI, Caster wheel with stopper. UV light will be OFF once door opens, and will be switched ON once the door closed for pre-defined time. Hinged type double skin door with view glass window.		
1.16	**Static Pass Box** Material of Construction: Powder Coated SS304 Dimensions: 600 x 600 x 600 in mm Features: Static Pass box shall have the features like Hinged doors, UV Light, Normal Light and Door Interlock.		
1.17	**Cross Over Bench** Supply of 1.2 mm SS304 construction cross over benches size-2400 L X 300 W X 500 H mm		
2	**AIR HANDLING UNIT (AHU) (Quantity – 2 No.s)** Scope of work included design, supply, installation and commissioning of 1 Nos. 4.382m3/s capacity AHU for class 1000 cleanroom facility and 1 Nos. 4.853 capacity AHU for class 100 clean room facility. 1) Specification of the AHU for class 1000 cleanroom is given below: a. Total Supply air = 4.382 M3/sec b. Return air =2.733 m3/sec c. Fresh air =1.649 m3/sec d. Total fan Static =150 mm WG e. Cooling Coil Capacity =40 Tr f. Heater capacity= 57 Kw 2) Specification of the AHU for class 100 cleanroom is given below: a. Total Supply air = 4.853 m3/sec b. Return air =4.1 m3/sec c. Fresh air =0.735 m3/sec. d. Total fan Static =150 mm WG e. Cooling Coil Capacity =40 Tr f. Heater Capacity= 76 Kw		

2.1	**AHU CASING** 1) AHU shall be of modular construction and of draw through type comprising of pre filter section, fine filter section, cooling coil section and fan section. The framework shall be of extruded Al sections joined by molded high tensile reinforced plastic and shall be assembled to provide a sturdy, strong and self-supporting framework for various sections. Each section shall be complete with its own independent base and mounted on 14G galvanised sheet steel and aluminium die cast channels. Zinc deposition on the GI sheets shall be minimum 120 gsm. 2) AHU shall be of double skin, with 45+5 mm thick PUF insulation sand-witched panel, 0.8 mm thick percolated GSS outer skin and 0.8 mm thick plain GSS sheet inside. The density of PUF insulation shall be minimum 38±1 Kg/m3. 3) The framework for each section shall be joined together with soft rubber gasket in between to make joints air tight. 4) Suitable air tight access doors with Aluminium die cast heavy duty hinges and locks shall be provided for various sections. 5) The casing shall incorporate thermal break profile and all other necessary design. Features to ensure that condensation does not occur during all seasons. 6) The AHUs shall be having Sound attenuators at Suction and delivery of AHUs to reduce the sound to 70±2 dB		
2.2	**CIRCULATION FAN** 1) Fan Type: Direct driven, Plug type high efficiency centrifugal fan 2) Desired noise level should be reduced to 70±5 dB or less by suitable sound attenuators on supply and return air path. 3) Required Total static pressure: 150 ± 2 mm WG. 4) Fans should have backward curved blades to improve efficiency. 5) Fan blades should be made of Aluminium alloy for stability. 6) Motor and fan assembly should be floor mounted and to be placed on extruded aluminium sections and on the vibration isolators to reduce amplitude to less than 25-50 microns. 7) Motor Requirement: Adequately sized, TEFC Squirrel cage induction motor with VFD drive and suitable for 415V ± 10%, 3 phase, 50 Hz± 5% AC power supply. 8) The motor should be of high efficiency IE3 class as per IS 12615 – 2011- Non FLP. 9) Motor should be compatible for VFD operation. 10) Flexible connection should be fabricated of neoprene coated flame proof fabric attached by screws or bolts at 6” interval should be provided. Flexible connection should be provided with the sufficient material width to prevent interference with the free operation of the fan vibration system. 11) Fan should be factory statically and dynamically balanced as required to achieve field balance levels. 12) Epoxy based coating shall be provided on all the surfaces of ferrous fan housing. 13) Vibration measurement should be made in three orthogonal areas at each bearing location. Where equipment configuration precludes measurement at bearing, measurement should be made on adjacent routine structure. 14) Peak to peak displacement at the rotational frequency should be measured. Governing displacement should be at the rotational frequency of fan. Controlling displacements at frequencies other that the rotational frequencies are not in compliance with the balance requirements.		

2.3	**COOLING COILS** 1) Cooling medium requirement: Chilled water at a temperature of 8 ± 1 Deg C 2) The velocity across the cooling coils should not exceed 2.25 m/s. accordingly, cooling coil area should be selected. 3) Coils should be of seamless copper tubes with Al fins, 8 rows deep, with 12-13 fins/inch, with copper header, flange connection and SS 304 enclosure. 4) Copper tubes should be 25±5% SWG and hydrostatically tested for 21 kg per sq. cm. 5) Cooling coil condensate tray should be of 14±5% SWG SS 304 material. 6) Vertically stacked Cooling coils should have SS 304 drip trays between them and SS pipe drain connection left at the drain tray and finally should be connected to drain point with suitable trap to check ingress of outside air. 7) Fouling factor requirement: 0.0002 hr. m2 Deg C/K cal. 8) Accessories requirement: Frame, support, inlet and outlet header, vent connection and drain connection with valves, pressure gauges with valves at inlet and outlet and their associated fittings.		
2.4	**HEATERS** The AHUs should have Electrical heaters section to maintain the cleanroom temperature in the winter season. 1) Strip/Tubular heaters of sufficient capacity should be selected in each AHU to maintain the area temperature. 2) The heaters should be complete with mounting frame, Thermostat, humidistat, airstat in redundant arrangement along with all control devices which will be controlled by thyristors.		
2.5	**HUMIDIFIER** 1) Type: Pan type, Electrical heating 2) Humidification capacity: Sufficient capacity to maintain the required RH levels inside the cleanrooms in dry season. 3) For calculating humidification by the above humidifier so as to maintain dew point temperature of the treated fresh air at 12.5 ± 0.5 Deg C, an outside peak winter temperature as per the outdoor conditions to be considered.		
2.6	**FILTERS** There should be 3 stages of filtration in the AHU. Specifications: • Filters face velocity should not exceed 2.25 m/sec. • Filter mounting frame should be made out of extruded aluminium material. The frame should be strong enough to withstand the weight of two persons for climbing the frame during the filters replacement. • Between filter sections, minimum spacing of 600 mm should be maintained. • Filters should have a quick release mechanism and sealing gasket. • All the filters should have Al frame (flange type) with a module size of 600 mm x 600 mm (preferably): 1) 1st Stage Pre-filters should be of G4 grade as per EN 779, non-woven synthetic material sandwiched between HDPE mesh on both sides with minimum thickness of 150 mm flange type with an initial pressure drop of 5 mm WG or less, suitable for cleaning with dry air or water jet. 2) 2nd stage bag filters should be of F7 grade as per EN779, non-woven synthetic material sandwiched between HDPE mesh on both sides and suitable for minimum thickness of 300mm initial pressure drop of 6-8 mm WG or less, suitable for cleaning with dry air or water jet. 3) 3rd HEPA Filters should be of H14 grade, suitable for AHU capacity. Filter media should be of micro fibre glass, Efficiency required: 99.995% down to 0.3 micron. The filters should have Anodized Al frame with a module size of 600mm x 600mm (preferably). The filter media should be epoxy/PU bonded to the filter casing, Pressure drop < 15 mm of WG. Accessories Requirement: Frame, supports, sealing gasket (Neoprene gasket pasted on the back side of the flange), quick release mechanism.		

3	**Chillers (Quantity: 3 No.s : 2W+1 S)** **Air cooled Scroll Chiller:** Supply, loading, unloading, lifting, shifting, installation, testing and commissioning of factory assembled, microprocessor controlled air-cooled, single/multiple screw/rotary chiller packages of minimum capacity of 40 TR at 39-41 Deg C ambient conditions prevailing at Chennai. The leaving water temperature from the chiller shall not exceed 7 Deg C when entering water temperature is 12 Deg C. The compressor (s) operating on eco-friendly refrigerants such as R134a/407c/410a complete with controls and accessories, crankcase heaters, automatic modulating capacity control, forced feed lubrication system with oil separator etc. Air-cooled condenser(s) made of copper tubes mechanically expanded into aluminum fins, statically and dynamically balanced low noise condenser fans and motors. Shell and tube DX type/ Flodded type chiller with steel shell and copper tube and complete with drain points. Microprocessor based control center unit in fully enclosed steel cabinet (IP 55 Protection) with power and safety operating controls in separate compartments and complete with monitoring facilities for suction/Discharge pressure, oil pressure, suction line super heat etc. Power supply panel (IP 55 protection) housing all main power connection(s), starters for compressor(s) and condenser(s), factory wiring for compressor(s), condenser(s).		
3.1	**Chiller Water Pumps** 1) Quantity – 2 Nos. (1 W+ 1S) 2) Pump flow rate: 900 LPM @ 3 Kg/cm2 3) Pump type: Horizontal centrifugal pumps. 4) Heavy duty for continuous operation 5) MOC: CI 6) Impellor: SS304 7) Motor: Adequately sized TEFC, squirrel cage induction motor having high efficiency rating IE3 Class and suitable for 415V + 10%, 3 Phase, 50 Hz + 5%. 8) Pump shall be horizontal, closed coupled, single stage, centrifugal, end suction with back pull-out design. Hence, the rotating unit can be removed and serviced without disconnecting the suction and discharge pipe. 9) The noise level shall not exceed 75dbA at 1m from the source. 10) Accessories: Pressure gauges at suction and discharge, isolating butterfly valves at suction and discharge, check valve, strainer, integral piping, base frame, foundation bolts, nuts, vibration isolator/rubber pads etc. Pumps should be Horizontal end suction Type.		
3.2	**Chiller Water Pipe Lines**		
3.2.1	**Piping** 1) All the pipes shall be SS304 SCH10, PN 10 rated, all pipe lines should be joined with tig welded. 2) Square cut plain ends should be welded for pipes upto and including 100 MM Dia. 3) All pipes 125 MM Dia. or larger should be bevelled by 35 DEG. before welding		
3.2.2	**Pipe supports/ hangers** 1) Pipe supports should be provided and installed for all piping wherever indicated, required or otherwise specified. Wherever necessary, additional hangers and supports shall be provided to prevent vibration or excessive deflection of piping and tubing. 2) All vertical pipe support should be made of 12mm M.S. rods and the horizontal support should be of M.S. angles of 50x50x4 mm thick. 3) Pipe supports should be adjustable for height and prime coated with rust preventive paint & finish coated with black paint using approved grade of paint.		

3.2.3	**Joining's** 1) All pipe lines should be joined with tig welded. 2) All pipes 125 MM Dia. or larger should be bevelled by 35 DEG. before welding		
3.2.4	**Dual Plate Check valves** 1) The body of the check valve should be made from SS304 PN 16 rated, single piece casting in cylindrical shape 2) There should be two plates, which should be hinged in the centre of the circle. 3) Both plates should have springs attached to them for assisting in closing action of the valve. 4) There should be properly/designed metal to metal seal between the plates and the outer body, to ensure non leaking sealing. 5) The valve design should confirm to API 594 or equivalent specifications.		
3.2.5	**Stainers** 1) Strainers should either be pot type or 'Y' type SS304 body PN 16 rated, tested upto pressure applicable for the valves as per design. 2) The strainers should have a perforated bronze sheet screen with 3 mm perforation and with a permanent magnet, to catch iron fillings.		
3.2.6	**Al Cladding Insulation** All the chilled water lines shall be Chilled water line shall be insulated with Puff 50mm thick insulation and cladded with Aluminium sheet.		
3.2.7	**TESTING** 1) In general, tests should be applied to piping before connection of equipment and appliances. In no case should the piping, equipment or appliances be subjected to pressures exceeding their test ratings 2) The tests should be completed and approved before any insulation is applied. Testing of segments of pipe work should be permitted, provided all open ends are first closed, by blank offs or flanges. 3) After tests have been completed the system should be drained and flushed 3 to 4 times and cleaned of all dust and foreign matter. All strainers, valves and fittings should be cleaned of all dirt, fillings and debris. 4) All piping should be tested to hydraulic test pressure of at least one and half times the maximum operating pressure but not less than 10 kg/cm2 for a period of not less than 12 hours. All leaks and defects in the joints revealed during the testing should be rectified to the satisfaction.		
3.3	**AIR DISTRIBUTION SYSTEM: DUCTS, GRILLS & DIFFUSERS DUCTS AND INSULATION**		
3.3.1	**Duct Specifications:** Complete supply air ducting including the flexible ducting connecting the solid duct work with filters collar and return air ducting is covered under scope of work. • Dusts shall be made from GI sheet of lock forming quality having Zinc Coating as per ASTM A-525 G90. • The ducts shall be constructed as per SMACNA standard. • The ducts shall be designed for 100 mm of WC pressure. • The ducts will be used for cleanroom class 100 environments. To meet this requirement, the GI sheet for manufacturing the ducts shall be totally oil free**.** • Velocity for Supply Air shall not exceed 1500 fpm and return air shall not exceed 1000 fpm, ducting shall be complete with dampers, vanes, anchor fasteners, supports, access doors, neoprene rubber gaskets etc. • All the ducts shall be supported with the building structure with GI threaded rods of 10mm dia and spring isolators of GI or coated suitable for clea rooms.		

	• Ducting shall include dampers, supports, Isolators etc. • All duct supports, re-enforcement shall be galvanised. • All the dampers shall be Al anodised. • The duct sections shall be joined with Angle iron flange joints. • All the edges with minor leaks should be sealed with silicon sealant. • Duct inspection window to be provided in the main ducts and plenum boxes. The inspection windows shall be leak proof, easy to open/close. • The ducts fabrication work shall be carried out in dust free environment. **Sheet Specifications:** All duct work, sheet metal thickness and fabrication unless otherwise directed, shall strictly meet requirements, as described in IS:655-1963 with amendment-I (1971 edition). **The thickness of the sheet shall be as follows: -** **Duct supports** and hangers for supporting the ducts including threaded rod, fittings, slotted angles, nuts, bolts gaskets and fasteners etc.		

Size of Duct	Sheet Thickness	Type of Joints	Bracing if any
Up to 750 mm	0.63 mm / 24Ga	G.I. Flange	
751 mm to 1000 mm	0.80 mm /22 Ga	25x25x3 mm Angle iron frame with 8 mm dia from joints, nuts & bolts	25x25x3 mm at the rate of 1.2 M from Joints
1001 mm to 1500 mm	0.80 mm/ 22 Ga	40x40x5 mm Angle iron frame with 8 mm dia from joints, nuts & bolts	40x40x5 mm at the rate Of 1.2 M
1501 mm to 2250 mm	1.00 mm 20 Ga Angle iron frame	50x50x5 mm with 10mm dia to be Braced with nuts & bolts	40x40x3 mm at the rate Of 1.2 M at Diagonally 125 mm centre.
2251 mm and above	1.25 mm 18 Ga	50x50x6 mm Angle iron frame with 10 mm dia from joints, nuts & bolts at 125 mm	40x40x3 mm at the rate of 1.6 M centre.

3.3.2	**Flexible Duct Work** • Insulated, flexible ductwork shall be installed from Al supply duct work to each HEPA filter ceiling module. • The flexible duct work shall be sealed and secured at each filter module and sheet metal collar utilizing stainless steel flexible duct bands and duct band locks. • The diameter of flexible duct shall be 12" (approx.) matching with the air inlet collar size. • Flexible ducting shall be heavy duty suitable for +2500 Pa of air pressure and 30m/s air velocity. • Material of duct: Multiple layers of Al - polyester laminated with spring steel wire helix.		
3.3.3	**Volume Control Damper** • At the junction of each branch duct with main duct and split of main duct, volume dampers must be provided. Dampers shall be two gauges heavier than the gauge of the large duct and shall be rigid in construction. • The volume dampers shall be of an approved type, lever operated and completed with locking devices which will permit the dampers to be adjusted and locked in any positions and clearly indicating the damper position. • The dampers shall be of splitter, butterfly or louver type. The damper blade shall not be less than 1.25 MM (18) Gauge, reinforced with 25 MM angles 3 MM thick along any unsupported side longer than 250 MM. Angles shall not interfere with the operation of dampers, nor cause any turbulence.		

3.3.4	**Duct Insulation** Supply & Return Air Duct Thermal Insulation with Aluminium foil faced self-adhesive, Closed cell, Nitrile Rubber Insulation with proper sealing of joints filled with silicon sealant. Insulation of duct exposed to atmospheric/ambient conditions using Aluminium faced Closed cell Nitrile rubber, Class 'O' fire rating, density not less than 50 Kg/m3 all the joints shall be sealed with 75mm thick Al tape. Supply Air Duct: 19mm thick Return Air Duct: 16mm thick. **Al- Cladding:** HVAC ducts exposed UV light shall be cladded with Al. Sheets of suitable gauge.		
3.3.5	**Standard Grills** • The supply and return air grills shall be fabricated from extruded aluminum sections. The supply air grills shall have single/double louvers. The front horizontal louvers shall be of extruded section, fixed/adjustable type. The rear vertical louvers where required shall of aluminum extruded sections and adjustable type. The return air grill shall have single horizontal extruded section fixed louvers. The grills may or may not be with an outer frame. • The damper blades shall also be of extruded aluminum sections. The grill flange shall be fabricated out of aluminum extruded section. Grills longer than 450 mm shall have intermediate supports for the horizontal louvers.		
3.3.6	**Return Air Grills** The linear diffusers/grilles shall be fabricated from Aluminum extruded sections. The diffusion blades shall be extruded, flush mounted type with single or double direction air flow. The frame shall be of aluminum extruded section and shall hold the louvers tightly in fixed position. The dampers as described under grilles shall be provided wherever specified.		
3.3.7	**Fire Dampers** • Automatic fire dampers to be provided wherever required as per the safety standards. The damper shall be multi blade louvre type. The blades should remain in the air stream in open position and shall be constructed with minimum 1.8 mm thick galvanised sheets. The frame shall be of 1.6 mm thickness. Other materials shall include locking device, motorised actuator, control panel to trip AHU motor etc. • The fire dampers shall be capable of operating automatically on receiving signal from a fire alarm panel. All control wiring shall be provided between fire damper and electric panel. • A hinged and gasketed access panel measuring at least 450 mm x 450 mm shall be provided on duct work before each reheat coil and at each control device that may be located inside the duct work.		
4	**Electrical Panels and Cabling**		
4.1	**1) HVAC Electrical Panel :** General Design Consideration a) System configuration i. Voltage Supply: 415V± 10% ii. Frequency : 50Hz± 5% iii. No of Phase and grounding: 3 Phase & Solidly ground earth iv. Power Distribution: A.C., 3 Phase 4 wire for 3 Phase system, 1 Phase 3 wire system b) Code & Standards All electrical equipment and accessories to be furnished, installed and commissioned shall be designed, manufactured, tested and installed in accordance with relevant Indian Standard Specifications (ISS), Indian electricity rules and any other applicable regulations. 2) Cabling for electrical supply from wall mounted electrical panel to respective AHUs/Chillers/Pumps/Humidifier shall be armoured copper cables. 3) Copper lugs should be used for cable termination. 4) Bus bar for incoming should be of Copper. 5) Cabling for all the equipment shall be laid through GI ladder or conduit. 6) AHU blower should operate on VFDs 7) Heaters control should be through Thyristors 8) Star-delta starter for chilled water pumps 9) Electrical Panel with bypass arrangement DOL/SD type electrical control panel and provision Microprocessor controller with display for Temperature, RH controlling, monitoring with status		

	(AHU) interlocking with 3 way modulating valve & Strip heater system and SCR for Heater controllers. Provision for : a) AHU (Heaters, Blower, Humidifier) b) Pumps c) Chillers d) Compressor e) Process Cooling Water system 10) AHU panel Interlocks a. Flow Switch- 1nos b. AHU Door interlock- 1 nos c. Smoke and Fire interlock - 1nos d. Thermal Interlock- 1nos e. Access control Emergency interlock- 1nos. **2) Sub-Distribution Boards:** Switchboards and Switch/Sockets: The scope includes the Supply and installation of different sizes of Switchboards and switch/socket for Lighting, Power Distribution and Trunking. Vendor shall consider suitable rated distribution boards with individual isolators for Cleanroom equipment, lights, fan filter units, power points. Based on the availability of power at site, UPS/Raw Power will be selected for equipment's.		
4.2	**Electrical Cabling and Accessories (Cables, wire, conduit, earthing, Switchboards, Switches/Sockets etc)**		
4.2.1	**Trunking & Raceway** The scope includes Supply of UPVC cable management (Trunking System) and metal raceways, its accessories, installing the same on wall/surface and floor as per the specification and quantities specified in the BOQ. The PVC Trunking shall be fire retardant, low smoke and the contractor shall provide the necessary test certificates in support of this requirement. Cutting of the floor for installing the Raceway shall form part of the installation of the Raceway by the Contractor.		
4.2.2	**Cables** The scope includes the Supply and installation of ISI marked PVC/XLPE insulated, Extruded PVC inner sheath, GI strip armoured overall FRLS PVC outer sheathed, on wall/surface/existing cable tray as required as per the detailed specification and quantity in the BOQ. Control cables shall be copper conductor PVC insulated and power cables shall be XLPE insulated. The necessary hardware for installation of cable like cable tie, clamps, tags etc. will be in the scope of contractor. Make of power/control cable shall be Polycab/ Havells/ KEI/ NICCO/CCI/National/gloster/Ecko. Instrumentation cables shall be conforming to BS 5308, type II, 300/500 V grade with stranded 0.75sq mm copper conductor, PVC insulated, colour coded, twisted to form a pair/pairs, twisted to form a unit, units laid up, myler taped binding, overall screened with aluminium myler tape with tinned copper drain wire, extruded inner sheathed, galvanised steel round wire /strip armoured, overall FRLS PVC sheathed.		
4.2.3	**Wire** The scope includes the Supply and installation of stranded Copper conductor wire, 1100-volt grade, FR PVC insulated single core conforming to IS 694 as per the detailed specification, quantity in the BOQ. **Conduit:** The scope includes the Supply and installation of ISI make rigid steel, hot dip galvanised conduits of different size, quantity & Specification as per BOQ. The conduit shall be installed on wall/surface/ metal truss/existing cable tray, as required. Flexible conduit shall be made with bright cold rolled annealed and electro-galvanised mild steel. Installation of conduits shall include all necessary hardware, metal strip, welding, clamps etc.		
4.2.4	**Earthing** The scope includes the Supply and providing earth pits and earth strips for earthing of Panels, DBs, Process Tools as per established norms/Indian codes and quantities as per the BOQ.		
4.2.5	**VFD Panels** All the blowers must operate through VFD's(AHU Blower, Wet Exhaust Blower & Dry exhaust Blower		

4.3 **PLC Panel With HMI**

Dedicated HVAC BMS system with HMI panel shall be with the following I/O's.

			(DO)						(AO)				(DI)								(AI)																
	M & E SYSTEM EQUIPMENT	Quantity	Remote Start/Stop Command	Humidifier	Heater	3 way modulating valve	Motorised Damper	Heater	Control Valve	3 way modulating valve	VFD	On/Off Status	Trip Alarm	Motorised Valve Open/Close	Fault Alarm	Hi-Lo Level	Filter Dirty Alarm	Motorised Damper	Supply Air Temperature	Retuen Air Temperature	Water Supply Temperature	Water Return Temperature	Room Temperature	Room Humidity	3 way modulating valve	Air Flow	Differential Pressure	Voltage	Ampere	PH Reading	Pressure Reading	Flow	Resistivity	PPM Fluoride	HF&Acid Alkaline level
S/N	***System***																																			
CONTROL PANEL		0																																		
1.0	CHILLER	3	3																																	
2.0	CHILLER PUMP	2	2								0	2	2																	2					
3.0	AHU	2	2		2	2	2	2	2	2	2	2	2	2				2	2	0	0	0	0	0	2									
4.0	Exhaust Blower	1	1								1	1	1													1									
5.0	Duct temp and RH Sensors room	2																					1	1											
6.0	Air Flow sensor(AHU)	3																					0	0		3									
7.0	Room RH Sensors	3																						0											
8.0	Fire alaram system	1										1																							
9.0	Wet Scrubber(Blower)	1	1								1	1	1													1			0					
10.0	Dry Scrubber(Blower)	0	0								0	0	0													0								
	Sub Total :		9	0	2	2	2	2	2	2	4	7	6	2	0	0	0	2	2	0	0	0	1	1	0	7	0	0	0	0	2	0	0	0	0
	I/O Used:	53	15					8				17							13																
	Total Spare:	26	8					6				6							6																
	Total	79																																	

5 **Process Utilities**

5.1 **DI Water Plant**

The System should meet the daily requirement of Type-I and Type-II water : 150 – 200 Liters per day with storage and distribution system with the following specifications:

- Type-II water Conductivity: < 0.2µS/cm @ 25 Deg C with a flow rate of 2 lpm at 1.5-2 Bar
- Type-I water Conductivity: < 0.05µS/cm @ 25 Deg C with a flow rate of 1-2 lpm at 1.5-2 Bar

The DI water plant along with the storage tank is to be installed in the utility area behind the lab space housing the cleanroom. The plumbing of Type-I water and Type-II water system to the respective distribution lines inside the cleanroom is to be included in the scope of the work. The piping set required to cover a distance of between the DI generator and the cleanroom is included in the scope of this work.

The Type-II water distribution system is to be connected to the POU - Gooseneck in wet chemical stations-1, 2 & 3 and must provide water at the specified flow rate 40 LPH. Type-I water distribution system is to be connected to POU spray gun installed in wet chemical station-1, 2 and 3 and must provide water at 1-2 liters per minute at the spray gun outlet. The Type-I water system must continuously recirculate the water to provide constant fluid flow and eliminate dead legs to POU. Water quality monitors must be provided for live monitoring of the Type-I and Type-II water quality from the system. Resistivity sensors and display of measured resistivity value must be included.

The feed water is municipal supply water/borewell water or a mixture of the two. The feed water quality and pressure may vary. De-ionized water system able to use tap water as feed with quality parameters up to below given limits: Conductivity < 500µS/cm, Hardness < 100 ppm, Chlorine < 1.5 ppm, SDI <7. Type-II system should be provided with UV lamp along with Electro De-ionization (EDI) module. The vendor must provide appropriate pre-treatment/filter systems. Wastewater, if any, from the Type-I and Type-II systems should be connected to the building drain. The vendor must label all water supply lines with fade-proof easily readable labels at appropriate locations and must provide drawings and documentation of the final water plumbing layout. All electrical wiring and power points required for powering the DI plant is to be included in the scope of this work and must be done according to standards specified.

	DI Water Pipe lines and Tap off points: DI Water pipelines shall be SCH 80 PP and Tap off point should have Isolation Valve, Regulator and Gauge.		
5.2	**Process Cooling water System** Independent air-cooled water chiller of suitable capacity to be designed to generate 50-60 LPM process cooling water at 17-19 Deg C @4-5 bar capacity • Buffer tank 400 Liters • Duty/standby pump set. • Primary chilled water heat exchanger. • SS304 Valves and distribution pipework. Process cooling water pipework shall be SS304, should be thermally insulated where ever appropriate. And 10 tap off points shall be considered. Tap off point should have the accessories like pressure regulator, Isolation Valve, Pressure gauge and flow meter. **Process Cooling water Distribution:** MOC of Distribution Lines: 1" UPVC SCH 80 No. of Tap-off points- 10 nos. (Tap off points: Tap-off points should have Ball Valve, Gauge, Flow meter, PRV)		
5.3	**Utility Drain Piping** Utility drain pipe shall be PP SCH 80, DN 50. 4 Tap-off points to be provided. All the fume hoods drain will be connected to the drain lines. Main header drain line to be connected to the nearest existing drain line.		
5.4	**Air Compressor and Pipe Lines** Screw Air Compressor**,** air cooled model of latest design Screw Air compressor for supply of oil free, clean and dust free dry air to process labs. • Unit performance should be according to ISO 1217 • Max. working pressure – 10 Bar @ 9 cfm • Air receiver- 150 L Capacity • Integrated refrigerant dryer, with purification system • Noise level should not be more than 55dBs • Pressure gauges/drains/ isolation valves **Compressed Air Line:** Compressed air line MOC shall be SS316L ¾" in size with 10 tap off points, tap off point should have Isolation Valve, Pressure regulator, Gauge and Accessories.		
5.5	**Supply and Installation of Gas Panels and Pipe Line Distribution**		
5.5.1	**Supply of Auto Changeover Panel for Gases:** Supply, Installation, Testing and commissioning of Auto Cylinder Changeover gas panels for N2, Ar, O2 to safely regulate the pressure of gas present in cylinder to the pressure required at point of use. The gas supply panel consists of the following components: 1) Isolation valve 2) Vent arrangement 3) Pressure Regulator 4) Safety relief valve 5) inlet Filter - 0.5 um and outlet filters- 0.003um 6) Pressure gauges All these components are to be assembled on an SS plate inside a class 100 cleanroom environment. The panels will be undergoing 5 step testing and validation process for pressure test, Helium leak test, Trace moisture test, Trace oxygen & particle count. **Panels for UHP Gasses:** N2- 4 Cylinder auto changeover panel Ar- 2 Cylinder auto changeover panel O2- 2 Cylinder auto changeover panel		

5.5.2	**Gas Tubing** SS316L EP Tube Supply, installation, testing and validation of SS316L, 10 Ra electropolished Tubes of 1/4", all the joints shall be orbitally welded. Upon completion of installation, the tubes shall undergo 5 step testing and validation. The steps are : - Pressure hold test (0 psi drop over 24 hours) - Helium leak check (10^-9 mbar l/sec) - Trace oxygen (<10ppm) - Trace moisture (<10ppm) - Trace Particle (<0.1 micron)		
5.5.3	**Gas Line Tap off Points** All the gas line tap off points must have UHP Valve, Regulator and Gauge		
5.6	**Drain Lines** Drain lines shall be PP/UPVC of suitable sizes, all the POU requires U-Trap arrangement.		
5.7	**Exhaust Ducting:**		
5.7.1	**Wet Exhaust Ducting** All the Exhaust Ducting outside the cleanroom shall be PP+FRP 2+3mm thick and inside the cleanroom shall be PP 5 mm thick, with individual volume control damper. Ducting shall be laid with suitable supporting system.		
5.7.2	**Dry Exhaust Ducting** All the Dry exhaust ducting shall be SS304 ducting with individual volume control damper. Ducting shall be laid with suitable supporting system.		
5.8	**Wet Chemical Station (Quantity – 2 Nos)**		
5.8.1	**Wet Chemical Station for acids** meant for wet chemical processing using acids, bases and majorly aqueous solutions. The overall dimensions of the fumehood are *1800x950x2300 mm (width x depth x height).* The fumehood must be constructed out of stress relieved, fire-retardant, high quality polypropylene sheets of thickness 10mm (data regarding residual stress in the sheets must be provided). Any material being quoted must meet all cleanroom materials specifications. **Construction:** The Wet Chemical Station must be provided with a flat worktop made of 10mm thick polypropylene sheet. A skirting of width 25 mm and 10 mm height must be provided at the front of the worktop to contain any spills on the worktop and prevent spilling on the floor. It must include a polypropylene sink, the worktop must be at standard fumehood worktop height from the cleanroom floor. The worktop height should be provided with the technical bid. A clear transparent height adjustable counter-weight balanced sash made of acid and solvent resistant material that is at least 10mm in thickness. The fumehood must have a standard value for face opening at full sash position. The sash opening at full sash position must be provided with the technical bid. At fumehood must have standard fumehood face opening at full sash position and must maintain a face velocity between ***90-110 fpm*** at half sash position. The fumehood exhaust blower must be suitable rated and all ducting must be fire-resistant polypropylene. Fire resistance rating should be clearly mentioned. The quote should include all necessary fittings for routing the exhaust duct and installation of the blower. **<u>Utilities</u>** <u>Gooseneck:</u> Gooseneck made of Polypropylene with control valve for sink shall be supplied for Acid usage Wet chemical Station. <u>Power Points</u>: 5/15A 4 no.s socket and switches provided on front of the station on either side.		

	Lights: 2 Nos. normal light 36W Shall be will be provided for adequate illumination, material of construction will be PVC/polycarbonate. DI and N2 Guns: Two guns made of virgin PTFE with anti-static protection must be provided at each end of the fumehood worktop. The nitrogen blow guns must have a filter housing with disposable filters. DI water Gun will not have a filter. The piping for each of the guns must have enough length to reach the whole of the work area. When not extended, the extra piping must retract and be concealed inside the workstation body. The piping must be resistant to acids and common solvents and must not outgas or generate particulates (provide specifications/manufacturer data sheets with quote) A polypropylene sink with 250 x 200 mm must be provided inside the fumehood at back left corner. It must have a Polypropylene gooseneck with a tap and connected to the DI water supply line. The drain of the sink must be piped into the building drainage duct. Magnehelic gauge: Magnehelic gauge of 50mm of water column capacity to measure the differential pressure at the exhaust plenum box in fume hood of the workstation must be provided. Storage cabinet trolleys: Two storage cabinet trolleys of 900mm length each for chemicals/materials storage under fumehood. The trolleys must be made of high-quality polypropylene.		
5.8.2	**Wet Chemical Station for solvents** meant for wet chemical processing using solvents and majorly aqueous solutions. The overall dimensions of the fumehood are *1200x950x2300 mm (width x depth x height).* The fumehood must be constructed out of stress relieved, fire-retardant, high quality polypropylene sheets of thickness 10mm (data regarding residual stress in the sheets must be provided). Any material being quoted must meet all cleanroom materials specifications. **Construction:** The Wet Chemical Station must be provided with a flat worktop made of 10mm thick polypropylene sheet. A skirting of width 25 mm and 10 mm height must be provided at the front of the worktop to contain any spills on the worktop and prevent spilling on the floor. It must include a polypropylene sink, the worktop must be at standard fumehood worktop height from the cleanroom floor. The worktop height should be provided with the technical bid. A clear transparent height adjustable counter-weight balanced sash made of acid and solvent resistant material that is at least 10mm in thickness. The worktop shall be SS 316, 1.6mm thick. The fumehood must have a standard value for face opening at full sash position. The sash opening at full sash position must be provided with the technical bid. At fumehood must have standard fumehood face opening at full sash position and must maintain a face velocity between ***90-110 fpm*** at half sash position. The fumehood exhaust blower must be suitable rated and all ducting must be fire-resistant polypropylene. Fire resistance rating should be clearly mentioned. The quote should include all necessary fittings for routing the exhaust duct and installation of the blower. **Utilities** Gooseneck: Gooseneck made of Polypropylene with control valve for sink shall be supplied for solvent usage Wet chemical Station. Power Points: 5/15A 4 no.s socket and switches provided on front of the station on either side. Lights: 2 Nos. UV light 36W shall be will be provided for adequate illumination, material of construction will be PVC/polycarbonate. DI and N2 Guns: Two guns made of virgin PTFE with anti-static protection must be provided at each end of the fumehood worktop. The nitrogen blow guns must have a filter housing with disposable filters. DI water Gun will not have a filter. The piping for each of the guns must have enough length to reach the whole of the work area. When not extended, the extra piping must retract and be concealed inside the workstation body. The piping must be resistant to acids and common solvents and must not outgas or generate particulates (provide specifications/manufacturer data sheets along with the quote) A polypropylene sink with 250 x 200 mm must be provided inside the fumehood at back left corner. It must have a Polypropylene gooseneck with a tap and connected to the DI water supply line. The drain of the sink must be piped into the building drainage duct. Magnehelic gauge: Magnehelic gauge of 50mm of water column capacity to measure the differential pressure at the exhaust plenum box in fume hood of the workstation must be provided.		

	Storage cabinet trolleys: Two storage cabinet trolleys of 600mm length each for chemicals/materials storage under fumehood. The trolleys must be made of high-quality polypropylene.		
5.8.3	**Wet Scrubber for acid wet chemical station** Supply and installation of Vertical type wet scrubber with liquid recirculation tank, recirculation pump dosing tank & dosing pump, pH sensor with the transmitter, exhaust sensor, differential pressure switch, exhaust blower of the static pressure of 250mm wg and stack. Material: PP-FRP, Pressure drop across the scrubber column should be below 50mm wg (approx.). The design velocity for the scrubber column shall be 1.5 m/s. Interconnection piping between the scrubber, Re-circulation tank, and Dosing tank shall be considered. complete with makeup water connection with control valve, water level indicator, drain with control valve, overflow pipe, scrubber recirculation pump without Mechanical seal, inlet flange connection with 'Y' Strainer, outlet flanged connections with nonreturn valve (NRV), Ball valve with gaskets & bolt nuts, single stage PP packing rings. Liquid spray nozzle system, Including Dosing Plug with Valve, Mounting Bolt & Nuts with Anti Vibration Pads, Including all pumps and motors cover, Ladders. Scrubber capacity : Scrubber capacity to handle 3500 cfm air. Blower: PPFRP Blower 3500 cfm Capacity @ 250 mm total Static		
5.8.4	**Dry Scrubber** Dry Scrubber made of SS304 with activated carbon filter bed and all the duct work shall be SS304, tap off point should have volume control damper.		
5.8.5	**Chemical Storage Cabinet** Chemical Storage Cabinet made of Stress Relieved, Fire-retardant Polypropylene, with adjustable type shelves. Dimensions: 900x550x2100 in mm		
6	**Programmable Spin Coater** • Bowl-shaped process chamber which can hold size 6" (~150 mm) diameter wafers or 5" (~125 mm) square substrates • AC Brushless motor featuring bi-directional rotation / agitation, high acceleration, and a wide speed range • Digital process controller for easy programming • Speed : 1-12,000 rpm • Accuracy <+-0.5% of full speed • Time: 1 second to 99 minutes 59.9 seconds in 0.1 second increments • Programs: Twenty multi-step programs or manual mode • Real time display of RPM, time and program stamps • Input and control through soft touch keypad • Acceleration: up to 13K rpm/sec with standard chuck (programmable in 1 RPM increments) • PC Interface software to be included • Fluid-control lid directs materials towards rear drain — no drips should be encountered when opening chamber • Chemically-resistant lid with Ø3/4"; (Ø19 mm) center opening • NPP vacuum chuck for Ø50 mm through Ø150 mm substrates • NPP fragment chuck adapter — fits over above chuck for holding 10 mm through ~50 mm pieces Ø1.5"; (Ø38 mm) NPP Drain Port and Nitrogen purge • Polypropylene drain container to store exhausted drain reservoir • With necessary interlock, latch and lock for safety of the door • With oil-less vacuum pump (220 VAC, 50/60 Hz) and inlet port		
7	**Cleanroom Safety and Security Systems**		
7.1	**Fire detection system** The whole cleanroom area to be covered with a fire/smoke detection system with photo-electric type of fire & smoke detectors distributed to cover all areas of the labs and the change room. An Addressable fire panel shall be located near the BMS station. It shall also have an audible alert signal		

	hooter of a good decibel value to attract attention of the staff for action. In the event of fire/smoke alert shall also trigger the release of the access control system on the doors as well as initiate the fire dampers in the supply air ducts to close. The penetrations in the proposed ceiling panels for the cabling of the fire/smoke detectors to be leak sealed and should be done in consultation with SPL/VSSC and should be compatible with the existing system. Scope of the work is to relocate the existing fire system.		
7.2	**Door interlocks and access control for entry to cleanroom** Air Shower Door should have provision for installing biometric sensors. Air-shower Door should be able to open only after successful verification / validation of proximity type access control system validates the authorization for the person / proximity card. The access control system shall be controlled through software and it should be possible for logging the data of personnel movement in and out of the labs and to be stored in the PC as a record. Storage provision of at least 6 month's data is the minimum requirement and this should be able to copy and kept in another storage medium.		
7.3	**CCTV Camera** HDMI type CCTV cameras (Megapixel level) to be provided by the vendor. The vendor has to install electrical power cable and suitable sockets for all the CCTV cameras; supply and installation of compatible signal cable to the CCTV control and monitoring system at service area (BMS control room). Electrical power supply for the CCTV cameras shall be brought on the UPS power for handling situations during power interruptions. The location of this CCTV cameras shall be as placed in the following areas: a) Class 100 – 2 No.s b) Class 1000 – 2 No.s c) Cleanroom Entrance – 2 No.s d) Gowning area, Visitor area, UPS room and utility room – 1 No each e) AHU area – 4 No.s All the camera outputs are to be stored in an HD compatible DVR with a minimum HDD capacity of 500GB and it should be able to display through the available display unit.		
7.4	**LAN and Telephone & Intercom** Class 100 and Class 1000 will have 5 LAN points each. Class 100 and Class 1000 will have 2 Telephone point each.		
7.5	**Local Fire Extinguishers** Local fire extinguishers suitable for A, B, C fire classifications 5 kg capacity suitable for Cleanroom Application		
7.6	**Cleanroom Furniture** Supply of Cleanroom furniture Standard or customised type based on customer requirements All the cleanroom furniture supplied are suitable for Class 100, MOC shall be SS316L 1.6 mm thick and mirror finish.		

8 **Testing and Validation of Cleanroom**

- Certification of Cleanrooms shall be done through an experienced Third party Agency
- Tests shall be performed in 'As- Built' condition in accordance with the testing Procedure specified in ISO 14644.
- The "independent" testing firm shall have experience of having conducted Cleanroom testing for certification of minimum 2 (two) Class 100 Clean Rooms in the last 5 years.
- The Cleanroom Certification agency shall submit performance testing report for approval.
- In the event of non-conformance to the defined Cleanroom parameters, the Contractor shall take corrective action at his cost. The Cleanroom certification shall be re-done at Contractor's cost, to establish conformance to specifications.
- Performance Testing and Certification of Cleanrooms as per ISO 14644 through an 'Independent' Certification Agency, under "As Built", "At Rest" and " At Operation" conditions.

Validation: of the Cleanroom as per ISO14644 and following documents to be submitted along with the validation reports.

- Temperature
- Relative Humidity
- Particle count
- Filter Integrity test
- Air velocity test
- Differential room pressure test (pressure Zoning)
- Recovery test
- Air balancing
- Pressure balancing

9 **Installation and Training**

Cleanrooms mechanical assembly shall be done by the Supplier. Electrical system installation shall be done by qualified and authorized electrician employed or subcontracted by the Supplier.
Supplier has to arrange for materials unloading and staging. The Supplier shall provide full training on the cleanroom' operations, equipment preventive maintenance and repair. Final documentation shall include the training manuals. Operation and maintenance manuals should be provided by the supplier

10 **Documentation**

In order to have Complete system documentation, the following documents have to be provided:

- System GA, Layout and PID drawings
- wiring diagrams
- lists of parameters to be monitored
- Installation, Commissioning reports
- SOP
- Recommended Spares List

For hand-over, all documents must be up-to-date and provided with the date.
Final documentation should contain both hard-copies & soft-copies

11 **Recommended Makes**

S. No.	Description	Recommended Makes
1	Cleanroom Wall panels, Ceiling, Doors, Window Modules	I Clean/Fabtech/GMP
2	Aluminium T- Grid System	Channel Systems/Terra Universal
3	Fan Filter Filters and HEPA Hoods	AAF / Camfil / Mayair**

	4	Grills / Diffusers/Dampers	Carrier / Dynacraft / Cosmos/Dynamic / Konark / Equivalent**			
	5	Antistatic Flooring	Sigma, Wonderfloor			
	6	Cleanroom Lights	Wipro/ Philips			
	7	AHU	Zeco/Flakt wood/System Air/VTS			
	8	Motors for AHU	Crompton Greaves/ ABB/ Siemens/ Schneider			
	9	Starter	Siemens/ABB/L&T/Schneider			
	10	Fire Dampers	Air Master/Caryaire/Ajanta/System Air/Cosmos			
	11	Centrifugal Fan	Nicotra / Kruger / Comefri			
	12	Strip Heaters	Dasspass / Escorts/ KEPL / Equivalent**			
	13	Chillers	Daikin/ Trane / York			
	14	Pump	Grundfos /Armstrong/WILO			
	15	Motorised Actuator	Siemens/ Regin			
	16	Ducting	Zeco/ Rolastar**			
	17	Insulation	Armaflex/K-Flex**			
	18	Chilled Water Valves	Aira/Audco/L&T			
	19	Chilled water Pipelines	Rensa/Jindal			
	20	Controls / Measurement Instrument	Baumer/Dwyer / Waaree /H-Guru/			
	21	Gas Lines	Auto Changeover Panels: Swagelok/Rotarex/Parker/Tescom			
	22	Gas Tubes	Valex/Dockweiler			
	22	Valves, Regulator, Fittings	Swagelok, Rotarex, Parker, Tescom			
	23	Gauges	Wika/Brooks			
	24	Security camera	Bosch/Equivision/CP Plus			
	25	Fire Panels	Notifier/Bosch			
	26	Cables and wires	Polycab			
	27	Switches/Sockets/MCB/MCCB	ABB /Legrand/Schneider			
	28	BMS System Controller/Router:	Siemens /Regin/Sauter			
	29	Polypropylene Fume Hood	Nano Clean Technologies/Kewanee/ESCO			
	30	Polypropylene Chemical Storage Cabinet	Nano Clean Technologies/Kewanee/ESCO			
	31	Air Shower	Esco/ Klenzaids /Terra Universal/Sam/Fabtech			
	32	Static Pass Box	Klenzaids Thermadyne/Fabtech**			
	33	Sterile Garment Storage	Esco/Klenzoids/Fabtech**			
	34	Compressor	KAESER/Ingersoll Rand			
	35	Process Cooling Chiller	Wernerfinly/Trane/Carrier			
	36	DI Water Plant	MIlipore /Siemens			
	37	Smoke & Fire Detection	Bosh/Notifier			
	38	Door Interlock	Honeywell/Bosch			
	39	Wet Scrubber	Alpha Projects/Driz Gas/ Nano Clean Technologies			
	40	Dry Scrubber	Alpha Projects/Driz Gas/ Nano Clean Technologies			
	41	VFD	Danfoss/ABB			
	42	Cleanroom Furniture	Terrauniversal/ Nano Clean Technologies			

Other Terms and Conditions (Mandatory):

S. No	Specification	Complied/Not Complied	Ref Page No.
1	The successful bidder should setup the cleanroom facility as per the cleanroom plan drawing and HVAC Schematic given as per the drawing.		
2	The bidders are advised to make a site visit prior to bidding in order to ascertain the exact quantum of work to be undertaken and be able to quote their best for the specification and quantity as mentioned in BOQ.		
3	The bidder should submit test certificates for major OEM components as required by user during the supply of materials.		
4	Installation & Commissioning: Bidder should be responsible for installation / commissioning and for after-sales service during the warranty period and thereafter as mentioned in the order.		

5	Any other item/work not specified above but required for completion of intended work shall be deemed to be part of the scope of work to be executed by the successful bidder.		
6	Bidder should bring tools, consumables and manpower required for implementation of the work		
7	All the industrial safety practices must be followed during implementation of the project		
8	Bidder should warranty entire facility including cleanroom and other installed service for a period of 1 year for all materials and machines. During warranty period bidder should monitor the complete facility and installed services and carry out necessary corrections, repair or replacements, if required, for smooth operation of the cleanroom facility & services as per laid down specifications.		
9	For HVAC work with HEPA filtration validation of particle count test, temperature & relative humidity, air velocity, AHU capacity & Air changes have to be confirmed after commissioning of work by the successful bidder.		
10	Documentation for DQ-IQ-OQ has to be submitted with a set of as built drawing after completion of the work including OEM test reports of critical components.		

(Note: It is mandatory for the bidders to provide the compliance statement (comply/not comply) for the above points with document proof as required). If the compliance statement (comply/Not comply) is not furnished for the evaluation. Bidders will be disqualified.

SIGNATURE OF BIDDER ALONG WITH SEAL OF THE COMPANY WITH DATE

FINANCIAL BID (PROFORMA) - BILL OF QUANTITIES (BOQ)

Item Name: DESIGN, SUPPLY, INSTALLATION AND COMMISSIONING OF A CLEANROOM:CLASS - 1000 (ISO-6) AND CLASS-100 (ISO-5)
Tender No. PY/MSRO/094/2024/CLEANROOM

It. No	Description of work	Quantity	Units	Basic Rate in INR	GST in Percentage	Total Amount with taxes in INR
1	**A) Cleanroom Construction** **1.0) Wall paneling and Ceiling** a) Progressive type Double skin modular 100 mm thick Solid wall panel made of 0.8 mm thick Powder coated sheets on both sides with PUF as infill of density 40 ± 2 kg /m3, GI Profiles for reinforcement along the periphery with bottom track, and necessary arrangements, All Joints shall be sealed with cleanroom compatible Neutral Grade Silicon Sealant. All the cut-outs should be covered with suitable channels.	101	M2			
2	b) Progressive type Double skin modular 100 mm thick wall panel with inbuilt riser for return air made of 0.8 mm thick Powder coated sheets on both sides with PUF as infill of density 40 ± 2 kg /m3, GI Profiles for reinforcement along the periphery with bottom track, and necessary arrangements, All Joints shall be sealed with cleanroom compatible Neutral Grade Silicon Sealant. All the cut-outs should be covered with suitable channels.	86	M2			
3	c) **Ceiling Wall panels** i) **Grid Type Ceiling system for Class 100** The Cleanroom ceiling shall be formed from a HEAVY DUTY ALUMINIUM WALKABLE extruded T-Grid ceiling systems for all areas. Ceiling grid colour should match wall panel colour (Designer white shade). The ceiling grid shall be heavy duty walkable inverted T-grid ceiling system of approx.. 50 mm Twidth (gasket type ceiling) to be provided on 600mm X 1200mm hanging configuration, the system shall include aluminum (approx. 50 mm wide) extrusions, aluminum extruded cross connector with hammer head bolts and nuts, M8 bolt and matching square hanger and other standard accessories. The grid should be suspended from the parent building roof with adequate size fasteners etc. for ensuring	37	M2			

	structural stability of the ceiling. Blank Ceiling Panels: 50mm thick HEAVY DUTY WALKABLE Al. Honeycomb Ceiling Blank Panel of dimension 1200 mm x 600mm x 45 mm/50 mm thick, using 45/50mm thick aluminum honeycomb core laminated with 0.8 mm thick Aluminum skin on both sides, static dissipative finished of designer white shade all complete.					
4	ii) **Progressive Type Ceiling for Class 1000** Progressive type Double skin modular 75 mm thick Ceiling wall panel made of 0.8 mm thick Powder coated sheets on both sides with PUF as infill of density 40 ± 2 kg /m3, GI Profiles for reinforcement along the periphery with bottom Aluminium track, and necessary arrangements, All Joints shall be sealed with cleanroom compatible Neutral Grade Silicon Sealant. All the cut-outs should be covered with suitable channels.	73	M2			
5	d) Coving: Coving radius 50 mm, MOC: Aluminium Coving shall be installed at : 1) Wall to wall 2) Wall to Ceiling 3) Wall to flooring	306	Rmt			
6	e) Coving 3D inner corner pieces	36	Nos.			
7	f) Outer Coving	6	Rmt			
8	g) 2D Outer Coving corner pieces	2	Nos.			
9	h) Wall panel Cutouts : All the necessary cutouts made on wall panels and ceiling will be flashed with GI/MS powder coated C-Channels	40	Nos.			
10	i) Suspended Ceiling Support and Wall Panel Accessories : All the suspended ceiling panels will be supported with 10/8 mm threaded rod and turnbuckle for easy level adjustment at suitable locations. Ancillaries like C-channel, L-angles, required for the installation of m2 wall & ceiling panels	73	M2			
11	j) **Window Modules** Viewing panels shall be of Double glazed 5mm thick clear toughened glass, finished with 20mm wide ceramic border Dimensions: 900x900 in mm	4	Nos.			
12	k) **Cleanroom Doors:** The Cleanroom wall systems shall include all doors complete with all associated hardware. The Cleanroom doors shall be of GI/MS Powder coated					

	construction of approximate size , flush configuration, swing type, double skin. Door frame powder coat color must match with clean room wall system, with door closer, handles, lock sets with option of one or both side access, view glaze shall be of double glazed 6mm clear toughened. i) Cleanroom Single Door-900x2100 in mm	1	Nos.			
13	ii) Cleanroom Single Emergency Door-900x2100 in mm	1	Nos.			
14	iii) Cleanroom Double Door -1400x2100 in mm	3	Nos.			
15	l) **Fan Filter Modules and Hooded HEPA Filter Modules** i) **Hooded HEPA Filter Modules for Class 1000** **HEPA Filter Modules:** The Cleanroom ceiling system shall include HEPA filter ceiling modules as indicated on the drawing. *The filters will be used as terminal air distribution device. The air supply plenum shall be connected directly to a connecting collar on the filter top with individual damper in the plenum and flexible ducts. * The filters shall have H14 class filters as per EN1822 with an efficiency of 99.95% *The design Air velocity through filter shall be 0.45m/s with IPD of 130±5% Pa or better. *The frame of the filter shall be of Extruded Anodized Aluminium construction. *The filter media shall be Glass Fibre with hot melt separator. *The filter shall have expanded sheet metal face guard. The face guard shall be powder coated in off-white colour. * The filter shall be having endless polyurethane D-profile, Liquid pour to solid in extrusion profile seal at the outlet. *All the filters shall be individually tested according to EN1822 and computerized scan test report should accompany each filter. *The filter shall be held in place utilizing 'hold down' devices with the Ceiling grid using channel on the filter top and T-bolts in the ceiling grid pressing the filter against ceiling grid. *All filter modules shall be complete with air inlet collar of 12" diameter (approx.). *Top sheet should be of G.I./Aluminium single piece drawn with seamless neck. In case, neck is not	14	Nos.			

	seamless, neck joint to the top sheet be a proper leak proof joint and with the capability of supporting a person standing on the top surface. *Filter media shall be bonded to extruded aluminium cell sides. Dimensions :1210 Lx 600 D x 60 mm HEPA filter are rated 99.97% efficiency in removing 0.3µ or larger particles. Leak free in accordance with latest I.E.S recommended particle. The filter media is micro glass fibre with poly-string separator, sealed to casing. The filter guard is provided with diamond pattern expanded sheet for protection.					
16	ii) **Fan Filter Modules with ULPA Filters for Class 100** : The fan filter units FFU's are self-powered grid module with modular design, to fitting in standard T grid ceiling. Total height is 320mm. The Fan Filter Module is U.L listed and CE certified. FFU speed can vary from 0.2 to .5m/s and air flow rate vary from 460-760 CFM. The sound level will be 55dB's when measured from 760mm below from filter face. The vibration level is 0.9mils. The Fan motor drive will be direct drive, forward curve centrifugal type with sealed bearing. The motor will have permanent split capacitor type, rated for continuous operation with thermal overload protection with two speed switch. The power requirement is 230V, 50Hz single phase with maximum current of 1.9A with 280watts power input. The fan/motor assembly is capable of delivering air at filter pressure of 9mm to 23mm final state. These FFM will have a speed controller for increasing the speed of the motor/blower from low, medium and high. Dimensions :1220 Lx 610 D x 350 mm H FFU Material of construction : Al Zinc Alloy HEPA filters are rated 99.997% efficiency in removing 0.12µ or larger particles. Leak free in accordance with latest I.E.S recommended particle. The filter media is micro glass fibre with poly-string separator, sealed to casing. The filter guard is provided with diamond pattern expanded sheet for protection. Dimensions :1210 Lx 600 D x 60 mm H	18	Nos.			
17	m) **Return Air Grille with Collar Damper** The linear diffusers/grilles shall be fabricated from Aluminum extruded sections. The diffusion blades shall be extruded, flush mounted type with single or double direction air flow. The frame shall be of aluminum extruded section and shall hold the louvers tightly in fixed position. The dampers as	26	Nos.			

	described under grilles shall be provided wherever specified. Return air grills with damper at room side 800x400.					
18	n) **Antistatic PVC Flooring** i) The cleanroom flooring shall be ESD - PVC 2mm thick and the electro static dissipative will be homogeneous constructed product sliced from a pressed vinyl block to assure a highly flexible tile of dense construction, dimensionally stable, extremely hard wearing, with a completely non-directional pattern.	102	M2			
19	ii) ESD Flooring includes, dedicated earth pit and Interconnecting Copper strip 30x5 mm thick- 48 Rmt	1	Lot			
20	o) **Cleanroom Lighting** i) **Class 100 Cleanroom Lights** Cleanroom teardrop light fittings for ISO 5 (class 100) and surface mounted fittings to be provided throughout the facility to achieve the 400-450 Lux lighting levels. The teardrop & surface mounted light fittings shall comprise of a powder coated extruded aluminum body and clear acrylic diffusers. UV filtration film having 350-400 nm thickness to be applied on lights or UV Tube sleeves shall be used	10	Nos.			
21	ii) **Class 1000 Cleanroom Lights**: Supply and Installation of Cleanroom compatible LED lights. The envisaged Lighting level in clean rooms is 500 Lux, at 90 cm above the floor. Lights must be openable towards inside the room. Dimensions: 600x600 mm Power: 42 W	24	Nos.			
22	p) **Air Shower** Supply of SS304 single entry Class 10,000 airshower 1500 Lx 1500 D x 2300 H in mm * Dimensions:1500 Lx 1500 D x 2300 H in mm * Material of Construction: SS304 1.6 mm thick * Class 100 Compatible * Two Stage filtration EU6-Prefilter (95% down to 5 micron) for return air & fresh air intake * Doors: SS304, 1,6 mm thick doors with double walled flush glass view panels & door closer * Statically & Dynamically balanced Motor-Blowers with suspension arrangement to reduce noise level for suction and booster * Differential Pressure Gauge: 1 No. * ON/OFF Switches * PAO Test Port * Door Interlock Systems – to ensure that both the doors cannot open at the same time & to ensure that both the doors will be locked during the time air flow is on.	1	Nos.			

	* Timer for setting Air Shower operation time (settable for 30 seconds to 5 minutes) * Emergency STOP button * Straight Entry – Straight Exit / 90° L type Door Opening * Automatic as well as Manual Working.					
23	q) **Static Pass Box** Dimensions 600x600x600 in mm MOC: SS304	1	Nos.			
24	r) **Sterile Garment Storage Cabinet** Supply and Installation of SS304, 1.6mm thick Sterile Garment Storage Cabinet 1200x600x2100 in mm	1	Nos.			
25	B) **Cleanroom HVAC** **a)** Air Handling Unit i) **Class -100-AHU**- AHU shall be of double skin, with 45+5 mm thick PUF insulation sand-witched panel, 0.8 mm thick percolated GSS outer skin and 0.8 mm thick plain GI sheet inside. The density of PUF insulation shall be minimum 38 Kg/m3.The casing shall incorporate thermal break profile aluminium and all other necessary design features to ensure that condensate does not occur during all seasons. Supply Air:4.853 m3/s, Return Air:4.1 m3/s ,Fresh Air:0.735 m3/s Total fan static:150 mm wg, Cooling Coil suitable for Chilled water/Refrigerant capacity:40 TR, Heating Coil Capacity:76 KW	1	Nos.			
26	ii) **Class -1000-AHU**- AHU shall be of double skin, with 45+5 mm thick PUF insulation sand-witched panel, 0.8 mm thick percolated GSS outer skin and 0.8 mm thick plain GI sheet inside. The density of PUF insulation shall be minimum 38 Kg/m3.The casing shall incorporate thermal break profile aluminium and all other necessary design features to ensure that condensate does not occur during all seasons. Supply Air:4.382 m3/s, Return Air:2.733 m3/s ,Fresh Air:1.649 m3/s Total fan static:150 mm wg, Cooling Coil suitable for Chilled water/Refrigerant capacity:40 TR, Heating Coil Capacity:57 KW	1	Nos.			
27	b) **Chiller Unit (2W+1 S)** Supplying, installing, testing and commissioning of AHRI Certified Air Cooled SCROLL WATER CHILLING UNITS of 40 TR capacity(actual) complete with twin screw design compressor with star-delta, squirrel cage induction motor, starter panel machine mounted, water cooled condenser, insulated chiller, flow switch at chiller and condenser, neoprene pads, integral refrigerant piping and wiring, BMS interface unit Modbus, counter	3	Nos.			

	flanges along with flanged connection for condenser and cooler water in/out connections, complete charge of refrigerant and oil, accessories as required and called for, automatic and safety controls mounted in central micro-processor based console panel and all mounted on a steel frame complete as per specifications. Motor shall be suitable for 415±10% 50 cycles. 3phase AC supply and motor cable terminal box shall be suitable to connect copper Cabling. Refrigerant used shall be Ozone friendly HFC134a/R410a as detailed in specifications. First chiller shall be factory tested at design conditions at 100%, 75%, 50% and 25% load. Cooling Capacity: 40 Tr Water flow-900 lpm LPM Supply water temp. in Deg C- 5-7 deg C Return Water Temp in Deg C-12 deg C					
28	c) **Chilled water pumps for Chillers(1 W+1S)** i)Chilled water pumps horizontal & centrifugal type pumps. Supplying , installation, testing and commissioning of the pumps shall be horizontal, close coupled , single stage , centrifugal , end suction with backpull out design. Hence , the rotating unit can be removed and serviced without disconnecting the suction and discharge piping. The pump shall be balanced statically and dynamically. The pump are at constant speed and suitable for VFD drive. The noise level shall not exceed 75 dbA at 1m from the source. The Pumps shall be BMS compatible. Flow Rate:900 LPM, Total Head: 30 m, MOC: Body : CI, Impellor: SS304	2	Nos.			
29	ii) **Chilled water Piping with Al. Cladding Insulation**: Chilled water piping with Al Cladding shall be installed for: AHU and Pumps. MOC of Pipe Shall be SCH10 SS304 with all accessories	1	Lot			
30	d) **GI Ducting** Supply, installation, testing & commissioning of pre-fabricated GI sheet metal ducting (Prefabricating Ducting means duct fabrication on CNC machines) complete with GI / MS supports (complete supporting structure to install ducts at site) with fully threaded GI rods, GI nuts and bolts (With check nuts wherever applicable), vanes, splitters, thermal isolation blocks, etc. as per drawings and SMACNA standards for 4 inch and 2 inch pressure class. Ducting will have ductmate flanges with Food Grade Rubber Gasket between the flanges. All duct supports shall have minimum 3 mm thk. insulated tape between support and duct. All Ducting seam to be sealed with RTV Sealant. The zinc coating thickness should not be less than 120					

	grams/sq,mtr (GSM).All duct joints shall be inspected for leakage. i) 24G	170	M2			
31	ii) MS Supporting System	55	Kg			
32	e) **Insulation** Supply, installation of Nitrile rubber Insulation with one side Aluminum faced. The Insulation Material shall be FM Approved. The insulation shall have fire performance such that it passes Class 'O' as per BS 476 Part 6 for Fire Propagation and Class 1 as per BS 476 Part 7 for surface spread of flame. All insulation joints (including Flange joints) to be sealed with 3" width Self Adhesive tape. i) 19mm thick Insulation	110	Sqm			
33	ii) 16mm thick Insulation	110	Sqm			
34	**f)Dampers** Manual low leakage volume control damper of Class 4 as per BS EN 1751 (permissible leakage allowed -6.2 l/s/sq m, test certificate required) and shall be made out of 18G GI, opposed type multi Aerofoil shape blade with handle and wing nut, clearly marked with open/close, percentage open, locking in position and sealing arrangement for branches. The dampers should be suitable for manual & motorized operation and shall have the plain & rigid base plate to install actuator. Damper shaft rod shall be square. i) GI Round damper 250mm dia 18 G	16	Nos.			
35	ii) Flexible insulated duct 200 mm dia	32	RMT			
36	g) **Flexible Canvas Connection** Supply of 150 mm deep antivibration flexible joints made out of imported fire resistance flexible double canvas sleeve with extruded aluminium frame/ flanges on both sides	2	Nos.			
37	**C) Cleanroom and HVAC Electrical** a) **HVAC Electrical DB** Supply, Installation, Testing and commissioning of Floor mounted type VFD electrical control panel and provision for Microprocessor controller with HMI (refer to the I/O points mentioned in the Technical Specifications document under section 4.3: "PLC					

	panel with HMI") Provision for :Safety Interlock i) AHU Blower-VFD-6 Kw, 3 Ph	2	Nos			
38	ii) Chiller unit-41 Kw, 3 Ph-Contactor	3	Nos			
39	iii) Heater- SSR-60 & 80 Kw 3 Ph	2	Nos			
40	iv) Pumps-8 Kw, 3 Ph- Contactor with Star Delta Starter	2	Nos			
41	v) Exhaust Blower-8 Kw 3 Ph, -Contactor with Star Delta Starter	2	Nos			
42	vi) Process Cooling Chiller-8 Kw, 3Ph Contactor	1	Nos			
43	vii) Compressed Air Plant -8 Kw, 3 Ph Contactor	1	Nos			
44	viii) DI Water Plant- 3 Kw , 3 Ph Contactor	1	Nos			
45	**Interlocks** i) Flow Switch	2	Nos			
46	ii) AHU Door interlock	2	Nos			
47	iii) Chiller-Pump Interlock	2	Nos			
48	iv) Smoke and Fire	2	Nos			
49	v) Thermal Interlock	2	Nos			
50	vi) Access control Emergency interlock	2	Nos			
51	b) **Cleanroom Electrical SUB DB - UPS DB and Raw Power DB** Supply, Installation, Testing and commissioning of wall mounted/Floor mounted type Distribution board. **Provision at DB**: i) Cleanroom Sub DB - 2 nos (1 UPS, 1 Raw Power)	2	Nos			
52	ii) Cleanroom Lighting(40W) - 1 Ph	30	Nos			

53	iii) Cleanroom Power points(5/15A)	30	Nos			
54	iv) Fan Filter Units(2.5 A) - 1 Ph	14	Nos			
55	v) Air Shower (1.5KW)- 3 Ph	1	No			
56	vi) Sterile Garment Cabinet(6 A) - 1 Ph	1	No			
57	vii) Static Pass Box(6A) - 1 Ph	1	No			
58	viii) Access Control System(6A) -1Ph	1	No			
59	ix) CCTV - 1Ph	11	Nos.			
60	X) Clear Room Equipments: 3ph 32 A	10	Nos.			
61	xi) Cleanroom Power Points:1Ph 5/15 A Power Points	25	Nos.			
62	C) **Electrical cabling and Accessories** **HVAC Cabling: HVAC Cabling shall be laid in metal trunking (Electrical Incoming power to HVAC Panel, Sub DB will be provided by IITM)** i) Cabling for AHU Blower-6KW- 2nos.-4 mm2, 4 Core Armored Cable	180	Rmt			
63	ii) Cabling for AHU Blower Interlock and Emergency Light- 2nos.- 2.5mm 2, 3 Core Cable	180	Rmt			
64	iii) Cabling for modulating valve- 2nos.- 1.5mm 2 shielded 3 Core Cable	180	Rmt			
65	iv) Cabling for Heaters-3 Ph , 60 Kw & 80 Kw 2nos.6mm 2,3 Core Armored cable	540	Rmt			
66	V) Cabling for Chiller- 41 Kw-3nos.- 25mm2, 5 core Armored Cable	270	Rmt			
67	vi) Cabling for Pumps- 8 KW-2 nos.-4 mm2, 4 core Armored Cable	180	Rmt			
68	vii) Cabling for Process Cooling Chiller- 8 KW-1 nos.-4 mm2, 4 core Armored Cable	40	Rmt			
69	viii) Cabling for Compressed Air Plant- 8 KW-1 nos.-4 mm2, 4 core Armored Cable	40	Rmt			
70	ix) Cabling for Exhaust Blowers- 8 KW-2 nos.-4 mm2, 4 core Armored Cable	180	Rmt			

71	x) Cabling for DI Water Plant- 3 KW-1 nos.- 2.5 mm2, 4 core Armored Cable	40	Rmt			
72	xi) Cabling for - Flow sensor- 2 Nos.1.5mm2 shielded 3 Core Cable	180	Rmt			
73	xii) Cabling for - Room Temp and Rh- 2 Nos.1.5mm2 shielded 3 Core Cable	180	Rmt			
74	xiii) Cabling for - Thermal Sensor- 2 Nos.- 1.5mm2 shielded 3 Core Cable	180	Rmt			
75	d) **Cabling for Cleanroom Equipments** Cabling for Cleanroom Equipments Shall be layed through PVC Dado i) Cabling for Cleanroom Lights-30 nos- 2.5mm 2,3 Core Cable	240	Rmt			
76	ii) Cabling for Fan Filter Units-16 nos.- 1.5mm 2, 3 Core Cable	200	Rmt			
77	iii) Cabling for 1ph Power points-30 nos.- 2.5mm 2, 3 Core cable	375	Rmt			
78	iv) Cabling for 3Ph, 32 A, 5 wire ,Power Points - 10 nos- 4mm2,5 core Cable	500	Rmt			
79	v)Cabling for Air Shower- 1 nos-2.5mm 2, 5 core Cable	50	Rmt			
80	vi) Cabling for Garment cubicle- 1 nos,.- 2.5mm 2 , 3 Core Cable	50	Rmt			
81	vii) Cabling for Access Control System-2 nos.- 1.5mm 2, 3 Core Cable	80	Rmt			
82	viii) Cabling for CCTV- 11 nos-CAT 6 Cable	400	Rmt			
83	ix) Earthpits	6	Nos.			
84	**D) Process Utilities** **a) Gas Lines for N2, Ar and O2** Supply and Installation of UHP Gas lines Double Cylinder Auto Changeover Over Panel for N2,Ar & O2 i) Double Cylinder Auto Changeover Panel for N2- 1 nos.	1	Nos.			
85	ii)Single Cylinder Auto Changeover Panel for Ar- 1 nos.	1	Nos.			
86	iii)Single Cylinder Auto Changeover Panel for O2- 1 nos.	1	Nos.			

87	iv)1/4" SS316 L EP Pipes	230	Rmt			
88	v)Tap off points with Diaphragm Valve, Regulator and Gauge	8	Nos.			
89	vi)Supporting system and Clamps	1	Lot			
90	vii)Cylinder Mounting Accessories	6	Nos.			
91	b) **Compressed Air (CDA) System** i) **Supply of Compressor** Supply of Oil Free and Moisture Free Scroll Compressor 9 cfm Capacity, 10 Bar Pressure rating , with 150 L Storage Tank	1	No.			
92	ii) **Supply and Installation of Compressed air Line:** a)MOC: SS316L 3/4" -50 Rmt	50	Rmt			
93	b)Tap off points: Tap off points with Isolation Valve and Regulator	10	Nos.			
94	c) **Supply & Installation of Process Cooling water system** i) System must have working and Stand By Pumps of 50-60 LPM at 17-19 deg C at 4-5 bar pressure , Storage Tank of 400 L, all SS304 interconnecting pipes and Valves & Control Panel, MOC: MOC of the system SS304	1	No.			
95	ii)**Supply & Installation of Process Cooling water Distribution** a)MOC of Distribution Lines: 1" UPVC SCH 80	60	Rmt			
96	b)No. of Tap Off Points (Tap off Points should have Ball Valve, Gauge, Flow meter, PRV)	10	Nos.			
97	d) **Utility Drain Line** i) Utility drain line shall be PP SCH 80 DN 50mm	30	Rmt			
98	ii) Tap off Points	4	Nos.			
99	e) **Polypropylene Wet Chemical Bench** Polypropylene Wet Chemical Bench-1800 W x 950 D x 2300 H mm MOC: Polypropylene Fire Retardant Utilities:N2, DI water , RO water Connection, Drain, Power Points5/15A- 4 nos, Lights- 2 nos, Storage Trolley- 2 nos.	2	Nos.			
100	f) **Scrubber and Exhaust Ducting** **Wet Scrubber** i) PP+FRP Packed Bed Type Wet Scrubber for 3500 cfm Capacity	1	Nos.			

101	ii)PP+FRP 3+2 mm thick Ducting 300mm Dia.	30	Rmt			
102	iii)PPFRP Blower 2500 cfm Capacity @ 350 mm total Static	1	Nos.			
103	iv) Tap off points with VCD Dia. 200 mm	3	Nos.			
104	g) **Fume Hood for Solvents** MOC: Polypropylene Fire Retardant Dimensions: 1200 W x950 D x2300 H in mm Utilities:N2, DI water , RO water Connection, Drain, Power Points5/15A- 4 nos, UV-Lights- 2 nos, Storage Trolley- 2 nos.	1	Nos.			
105	h) **Blower and Exhaust Ducting** Blower MOC: SS304 i) Blower Capacity: 1000 cfm @ 75 mm Total static	1	Nos.			
106	ii) Duct MOC: SS304 200mm Dia with all Accessories-25Rmt	25	Rmt			
107	iii) BIBO box for Activated Carbon Filter	1	Nos.			
108	i) **DI Water Plant** A de-ionized water system consisting of a generation and storage system for generating and storing Type-I (resistivity ≥ 18 MΩ-cm) and Type-II water (resistivity ≥ 1 MΩ-cm) should be provided. In addition to the resistivity metrics, Plant shall be recirculatory type and Pressure depended type. DI/Type I water Flow rate:1-2 LPM @ 1.5-2 Bar RO/Type II water Flow rate:2 LPM @ 1.5-2 Bar	1	Nos.			
109	j) **DI water Piping** DI water piping MOC: PP PP DN 25mm pipe with all accessories- 70 RMT Tap off points- 3 nos. Tap off must have Isolation Valve- 3 nos.	1	Lot			
110	**E) Spin Coater** Programmable Spin Coater • Bowl-shaped process chamber which can hold size 6" (~150 mm) diameter wafers or 5" (~125 mm) square substrates • AC Brushless motor featuring bi-directional rotation / agitation, high acceleration, and a wide speed range • Digital process controller for easy programming • Speed : 1-12,000 rpm • Accuracy <+-0.5% of full speed • Time: 1 second to 99 minutes 59.9 seconds in 0.1 second increments • Programs: Twenty multi-step programs or manual mode • Real time display of RPM, time and program stamps • Input and control through soft touch keypad • Acceleration: up to 13K rpm/sec with standard chuck (programmable in 1 RPM increments) • PC Interface software to be included	1	No.			

	• Fluid-control lid directs materials towards rear drain — no drips should be encountered when opening chamber • Chemically-resistant lid with Ø3/4"; (Ø19 mm) center opening • NPP vacuum chuck for Ø50 mm through Ø150 mm substrates • NPP fragment chuck adapter — fits over above chuck for holding 10 mm through ~50 mm pieces Ø1.5"; (Ø38 mm) NPP Drain Port and Nitrogen purge • Polypropylene drain container to store exhausted drain reservoir • With necessary interlock, latch and lock for safety of the door • With oil-less vacuum pump (220 VAC, 50/60 Hz) and inlet port					
111	**F) Life Safety and Security System** a) CCTV - Cameras	11	Nos.			
112	b) Access Control System for 1 Door	1	Nos.			
113	c)Door Interlock System for Air Lock Room	1	Nos.			
114	d)Smoke and Fire detection system	1	Nos.			
115	e)Local Area Network	10	Nos.			
116	f)Telephone	4	Nos.			
117	g)Local Fire extinguishers : Suitable for A, B, C fire classifications 5 kg capacity suitable for Cleanroom Application	4	Nos.			
118	**G) Cleanroom Furniture** i) SS316L Cleanroom Cross Over Bench 2100x400x550mm	1	Nos.			
119	ii)SS316L Working Table 1500x900x750mm with 2 Power points	3	Nos.			
120	iii) SS316L Tables with Under table, Table Dimensions 1200x750x750,Under table Cubicles 500x700x700, 2 Drawers and 1 Door	2	Nos.			
121	iv)Class 100 Compatible Cleanroom Chairs	10	Nos.			
122	v)Class 100 Compatible Cleanroom Stools	2	Nos.			
123	vi) Polypropylene Chemical Storage Cabinet 900 W x550 Dx2100 H in mm	1	Nos.			

124	vii)SS316L Cleanroom Bins-Dia 350x650 H in mm	3	Nos.			
125	H)Room Differential Pressure Gauges	3	Nos.			
126	I)Temp and RH Indicator	1	Nos.			
127	J)Engineering, Design and drawings	1	Lot			
128	K)Documentation	1	Lot			
129	L)Commissioning and validation	1	Lot			
	Grand Total					

Total Amount Rupees in words _____

	Terms and Conditions	
1.0	Payment terms	
2.0	Packing	Included
3.0	Transportation	Included
4.0	Delivery at	IITM Chennai
5.0	GST	As mentioned above
6.0	Delivery period	_____weeks from the date of PO and approved drawings
7.0	Installation	_____ Weeks
8.0	Warranty	1 year from the date of installation
9.0	Validity	30 days

Note:

1) Price bid as per this format to be uploaded only at the financial document column in CPP Portal. Price disclosure at the technical bid will result in disqualification.

2) Technical Bid Should NOT Contain Price Bid/Financial Bid details (or) Indication. If the price Details are indicated, mentioned inside the Technical bid, then bid will be disqualified and neither the Technical Bid nor the Price Bid/Financial Bid will be considered.

I/We the bidder accept all the terms and conditions as per tender including all technical & commercial conditions.

Date:
Place:

Authorized Signatory
(_____)
Seal and signature

ANNEXURE – D

FORMAT FOR AFFIDAVIT OF SELF-CERTIFICATION UNDER PREFERENCE TO MAKE IN INDIA – PER ITEM

Tender Reference Number:

Name of the item / Service:

Date: _____
I/We_____S/o, D/o, W/o, _____
Resident of
_____

Hereby solemnly affirm and declare as under:

That I will agree to abide by the terms and conditions of the Public Procurement (Preference to Make in India) Policy vide GoI Order no. P-45021/2/2017-PP (B.E.-II) dated 15.06.2017 (subsequently revised vide orders dated 28.05.2018, 29.05.2019and 04.06.2020) MOCI order No. 45021/2/2017-PP (BE II) Dt.16th September 2020 & P- 45021/102/2019-BE-II-Part (1) (E-50310) Dt.4th March 2021 and any subsequent modifications/Amendments, if any and

That the local content for all inputs which constitute the said item/service/work has been verified by me and I am responsible for the correctness of the claims made therein.

Tick (✓) and Fill the Appropriate Category	
☐	I/We_____[name of the supplier] hereby confirm in respect of quoted items thatLocal Content is equal to or more than 50% and come under **"Class-I Local Supplier"** category.
☐	I/We_____[name of the supplier] hereby confirm in respect of quoted items that Local Content is equal to 20% but less than 50% and come under **"Class-II Local Supplier"** category.

- The details of the location (s) at which the local value addition is made and the proportionate value of local content in percentage

Address _____ _____ __ Percentage of Local content: _____%
_____

For and on behalf of ..... (Name of firm/entity)

Authorized signatory (To be duly authorized by the Board of Directors)
<Insert Name, Designation and Contact No.>

[Note: In case of procurement for a value in excess of Rs. 10 Crores, the bidders shall provide this certificate fromstatutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.]

This letter should be on the letterhead of the quoting firm and should be signed by a competent authority. Non-submission of this will lead to Disqualification of bids.

ANNEXURE – E

(To be given on the letter head of the bidder)

No._____ Dated: _____

CERTIFICATE

(Bidders from India)

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and hereby certify that I am not from such a country.

OR

(whichever is applicable)

(Bidders from Country which shares a land border with India)

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and hereby certify that I from _____ (Name of Country) and has been registered with the Competent Authority. I also certify that I fulfil all the requirements in this regard and is eligible to be considered. *(Copy/ evidence of valid registration by the Competent Authority is to be attached)*

Place: Signature of the Tenderer
Date: Name & Address of the
Tenderer with Office Stamp

ANNEXURE - F

OEM CERTIFICATION FORM
(In Original Letter Head of OEM)

Tender No: ..... Dated: .....

We are Original Equipment Manufacturers (OEM) of..... (Name of the company) Ms..... (Name of the vendor) is one of our Distributors/Dealers/Resellers/Partners (tick one) for the ……. and is participating in the above-mentioned tender by offering our product model.....(Name of the product with model number).

…….. is authorized to bid, sell and provide service support warranty for our product
as mentioned above.

Name and Signature of the authorized signatory of OEM along with
seal of the company with Date

TENDER CHECKLIST – Mandatory to be filled and sent (inside the Main Bid Cover) along with Bidding Document.

(1) I have registered as a Vendor with IC&SR. (Proof to be enclosed) ☐
To submit document proof pertaining to point.no: 6 of tender ISO certificate, Active GSTIN certificate, valid PAN details.

(2) Technical bid cover and Financial Bid cover to be submitted separated ☐

(3) Completed and **Signed Form of Tender**. The Form of Tender document shall be signed by a person legally authorized. ☐

(4) Completed Technical Compliance Statement ☐

(5) Certification of Class I / Class II (**As a part of technical bid) per item / service / work as per (Annexure – D)** ☐

(6) EMD ☐

(7) Land Border **(Annexure – E)** ☐

(8) Authorized agent certificate from OEM is mandatory if Indian agent/Indian office of OEM is participating in this tender on behalf of OEM. (**Annexure F)** ☐

The bid will be valid only if all the above documents are provided. Bidders are asked to supply and tick off the required information. Failure to provide any of the stated documents may result in the bid being considered as non-compliant and rejected.

Signature of the Bidder

ANNEXURE - H

FORM - A
NON- DEBARMENT DECLARATION

Date: XXXX

To,
The Indian Institute of Technology Madras,
Sardar Patel road,
Guindy, Chennai - 600036

Subject: Non-debarment declaration in connection with tender RFF No: XXXXXX for procurement of "XXXXXXXXXXXXXXXXXXXXXXXXXXX"

Dear Sir,

This is to notify you that our Firm/Company/Organization <*provide Name of the Firm/Company/Organization*> intends to submit a proposal in response to the invitation for procurement of "XXXXXXXXXXXXXXXXXXXXXXXXXXX" In accordance with the above we declare that:

a. We are not involved in any major litigation that may have an impact of affecting or compromising the delivery of services as required under this assignment.

b. We are not debarred by any Central/ State Government/ agency of Central/ State Government of India or any other country in the world/ Public Sector Undertaking/ any Regulatory Authorities in India or any other country in the world for any kind of fraudulent activities in last XX years.

Sincerely,

[BIDDERS NAME]
Name
Title Signature

CENTRE FOR INDUSTRIAL CONSULTANCY & SPONSORED RESEARCH (IC&SR)
INDIAN INSTITUTE OF TECHNOLOGY MADRAS
CHENNAI 600 036

ELECTRONIC CLEARING SERVICE (Credit Clearing)/ REAL TIME GROSS SETTLEMENT (RTGS) FACILITY FOR RECEIVING PAYMENTS

A. Details of Account Holder

Name of the Institution	Indian Institute of Technology - Madras
Complete Contact Address	Industrial Consultancy and Sponsored Research Indian Institute of Technology-Madras, IIT- Madras Campus Post Office, Sardar Patel Road, Guindy, CHENNAI - 600 036
Permanent Account Number (PAN)*	AAAAI3615G
GST REGISTERATION NO.	33AAAAI3615G1Z6
Telephone No./ Fax No.	Tel - 044-2257 8356
E- mail ID of the FO/AO/REG/DIR	dricsr@iitm.ac.in

B. Bank Account Details:

Institution Account Name (As per Bank Record)	The Registrar, Indian Institute of Technology - Madras
Account No.	2722101003872
IFSC CODE	CNRB0002722
SWIFT CODE	CNRBINBBIIT
Bank Name (in full)	Canara Bank
Branch Name	IIT-Madras Branch
Complete Branch Address	Canara Bank, IIT-Madras Branch, IIT- Madras Campus Post Office, Sardar Patel Road, Guindy, CHENNAI - 600 036
MICR No.	600015085
Account Type	Savings Account

Certified that the Institute's account is in an RTGS enabled branch.
I hereby declare that the particulars given above are correct and complete.

Date: 27/01/2023

Signature of the Competent Authority
of the Institution with seal.

उप कुलसचिव (आई.सी. एवं एस.आर.)
DEPUTY REGISTRAR (IC & SR)
आई.आइ.टी. मद्रास, चेन्नै
I.I.T. MADRAS, CHENNAI - 600 036.

27/01

Phone : +91 (0) 44 2257 8062 / 8061 / 8060 Fax : +91 (0) 44 2257 0545 / 2257 8366 email : deanicsr@iitm.ac.in website : http://www.iitm.ac.in

MANDATE FORM

ELECTRONICS CLEARING SERVICE (CREDIT CLEARING)/REAL TIME GROSS SETTLEMENT (RTGS) FACILITY FOR RECEIVING PAYMENTS.

*****

A. DETAILS OF ACCOUNT HOLDER:-

NAME OF ACCOUNT HOLDER	
COMPLETE CONTACT ADDRESS	
TELEPHONE NUMBER/FAX/E MAIL	

B. BANK ACCOUNT DETAILS:-

BANK NAME	
BRANCH NAME WITH COMPLETE ADDRESS, TELEPHONE NUMBER AND EMAIL	
WHETHER THE BRANCH IS COMPUTERISED?	
WHETHER THE NRANCH IS RTGS ENABLED? IF YES, THEN WHAT IS THE BRANCH **IFSC CODE**	
IS THE BRANCH ALSO NEFT ENABLED?	
TYPE OF BANK ACCOUNT(SB/CURRENT/CASH CREDIT)	
COMPLETE BANK ACCOUNT NUMBER(LATEST)	
MICR CODE OF BANK	

DATE OF EFFECT:

I hereby declare that the particulars given above are correct and complete. If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information I would not hold the user institution responsible. I have read the option invitation letter and agree to discharge responsibility expected of me as a participant under the Scheme.

(……)
Signature of Customer

Date:
Certified that the particulars furnished above are correct as per our records.
(Bank's Stamp)

(……)
Signature of Customer

Date :

1. **Please attach a photocopy of cheque along with the verification obtained from the bank.**
2. **In case your Bank Branch is presently not "RTGS enabled", then upon its up gradation to "RTGS Enabled" branch, please submit the information again in the above proforma to the Department at earliest.**