

"भारतीय प्रौद्योगिकी संस्थान (का.हि.वि.) वाराणसी के इलेक्ट्रॉनिक्स इंजीनियरिंग विभाग में टर्नकी आधारित एडवांस्ड सेमीकंडक्टर प्रोसेसिंग क्लीनरूम सुविधा, जिसमें डिज़ाइन, इंजीनियरिंग, सप्लाय, इंस्टॉलेशन, इंटीग्रेशन और कमीशनिंग शामिल हैं, की स्थापना के लिए"

(सीपीपीपी के ई-प्रोक्योरमेंट पोर्टल के माध्यम से
ऑनलाइन बोली आमंत्रित है)

निविदा संख्या: IIT(BHU)/ECE/2026-27/176, दिनांक: 19.08.2026

निविदा जमा करने की अंतिम तिथि: 16.09.2026, (04:00 PM)

निविदा खुलने की तिथि: 17.09.2026, (04:00 PM)



इलेक्ट्रॉनिक्स इंजीनियरिंग विभाग
भारतीय प्रौद्योगिकी संस्थान
(काशी हिंदू विश्वविद्यालय) वाराणसी
वाराणसी - 221005, उत्तर प्रदेश, भारत

ई-मेल: head.ece@itbhu.ac.in

Online Bids

(Through E-Procurement Portal of CPPP)

are invited
for

**“Establishment of Advanced Semiconductor Processing
Cleanroom Facility on Turnkey Basis including Design,
Engineering, Supply, Installation, Integration and
Commissioning”**

in the

Department of Electronics Engineering, IIT(BHU), Varanasi

Tender No.: IIT(BHU)/ECE/2026-27/176, Dated: 19.08.2026

Last Date of Bid Submission: 16.09.2026, (04:00 PM)

Bid Opening Date: 17.09.2026, (04:00 PM)



**Department of Electronics Engineering
Indian Institute of Technology (BHU) Varanasi
Varanasi - 221005, Uttar Pradesh, India
E-mail: head.ece@itbhu.ac.in**

विभाग/केंद्र: इलेक्ट्रॉनिक्स इंजीनियरिंग विभाग, भारतीय प्रौद्योगिकी संस्थान (बीएचयू) वाराणसी,
वाराणसी- 221005, उत्तर प्रदेश, भारत

विज्ञापित निविदा जांच दस्तावेज
(निविदा आमंत्रण सूचना)

आईआईटी (बीएचयू) वाराणसी निम्नलिखित वस्तुओं के लिए निर्माताओं (या उनके 'अधिकृत' डीलरों जिन्हें इस निविदा आमंत्रण सूचना के प्रत्युत्तर में कोटेशन देने के लिए अधिकृत किया गया है) से ऑनलाइन निविदाएं आमंत्रित करता है।

क्रम संख्या	निविदा संख्या एवं अंतिम तिथि	वस्तु का विशिष्टता एवं मात्रा	जमा की जाने वाली अग्रिम धनराशि
1.	निविदा संख्या: IIT(BHU)/ECE/2026-27/176, दिनांक: 19.08.2026 निविदा जमा करने की अंतिम तिथि: 16.09.2026, (04:00 PM)	भारतीय प्रौद्योगिकी संस्थान (का.हि.वि.) वाराणसी के इलेक्ट्रॉनिक्स इंजीनियरिंग विभाग में टर्नकी आधारित एडवांस्ड सेमीकंडक्टर प्रोसेसिंग क्लीनरूम सुविधा, जिसमें डिज़ाइन, इंजीनियरिंग, सप्लाय, इंस्टॉलेशन, इंटीग्रेशन और कमीशनिंग शामिल हैं, की स्थापना मात्रा: 01 अनुलग्नक-I के अनुसार विशिष्टताएँ	रु. 20,00,000/-

निविदा दस्तावेज़ केंद्रीय सार्वजनिक खरीद पोर्टल (Central Public Procurement Portal) <http://eprocure.gov.in/eprocure/app> से डाउनलोड किए जा सकते हैं।

निविदाकर्ता सीपीपी पोर्टल (CPP Portal) पर निविदा दस्तावेज़ों को एक्सेस कर सकते हैं। उपयुक्त निविदा का चयन करें, सभी आवश्यक जानकारी भरें और पूर्ण रूप से भरे हुए निविदा दस्तावेज़ को निर्धारित कार्यक्रमानुसार उक्त वेबसाइट <http://eprocure.gov.in/eprocure/app> पर ऑनलाइन जमा करें।

वे इच्छुक निविदाकर्ता जो ई-प्रोक्योरमेंट पोर्टल पर अभी तक पंजीकृत / नामांकित नहीं हैं, उन्हें वेबसाइट <http://eprocure.gov.in/eprocure/app> के माध्यम से भाग लेने से पूर्व पंजीकरण / नामांकन कर लेना चाहिए। पोर्टल पर नामांकन निःशुल्क है।

निविदाकर्ताओं को सलाह दी जाती है कि वे "ऑनलाइन निविदा जमा करने के लिए दिशा-निर्देश" अनुभाग में दिए गए निर्देशों को ध्यानपूर्वक पढ़ें।

कोई भी मैनुअल (हस्तलिखित या ऑफ़लाइन) निविदा स्वीकार नहीं की जाएगी। सभी कोटेशन (तकनीकी एवं वित्तीय दोनों) ई-प्रोक्योरमेंट पोर्टल के माध्यम से ही जमा की जानी चाहिए।

निविदा विभागाध्यक्ष, इलेक्ट्रॉनिक्स इंजीनियरिंग विभाग, भारतीय प्रौद्योगिकी संस्थान (बीएचयू), वाराणसी - 221005, उत्तर प्रदेश, भारत के नाम संबोधित होनी चाहिए और इसे महत्वपूर्ण तिथियों की तालिका (Critical Date Sheet) में उल्लिखित अंतिम तिथि से पहले या अंतिम तिथि तक ऑनलाइन जमा किया जाना चाहिए।

संस्थान ऑनलाइन निविदाएं जमा करने में होने वाली किसी भी देरी के लिए उत्तरदायी नहीं होगा। संस्थान को किसी भी निविदा को स्वीकार या अस्वीकार करने तथा बिना कोई कारण बताए निविदा को रद्द करने का पूर्ण अधिकार प्राप्त है। इस संबंध में किसी भी प्रकार का पत्राचार स्वीकार नहीं किया जाएगा।

विभागाध्यक्ष,
इलेक्ट्रॉनिक्स इंजीनियरिंग विभाग,
भा.प्रौ.सं. (का.हि.वि.) वाराणसी
वाराणसी - 221005, उत्तर प्रदेश, भारत

INDIAN INSTITUTE OF TECHNOLOGY (BHU), VARANASI

Varanasi - 221005, Uttar Pradesh, India

DEPARTMENT/ CENTRE: Department of Electronics Engineering, Indian Institute of Technology (BHU) Varanasi, Varanasi - 221005, Uttar Pradesh, India

Advertised Tender Enquiry Documents

(NOTICE INVITING TENDER)

IIT(BHU), Varanasi invites online tender from manufacturers (or their 'authorized' dealers that they have been authorized to quote in response to this NIT) of the following items are invited:

S. No.	Tender No. and Last Date	Specifications & Quantity of the item	Earnest Money Deposit to be submitted
1.	Tender No.: IIT(BHU)/ECE/2026-27/176, Dated: 19.08.2026 Last Date of Bid Submission: 16.09.2026, 04:00 PM	Establishment of Advanced Semiconductor Processing Cleanroom Facility on Turnkey Basis including Design, Engineering, Supply, Installation, Integration and Commissioning in the Department of Electronics Engineering, IIT(BHU), Varanasi Quantity: 01 Specifications as per Annexure-I	Rs. 20,00, 000/-

Tender Documents may be downloaded from Central Public Procurement Portal <https://eprocure.gov.in/eprocure/app>. Tenderers can access tender documents on the CPPP Portal. Select the appropriate tender and fill them with all relevant information and submit the completed tender document online on the website <https://eprocure.gov.in/eprocure/app> as per the schedule given in the next page.

Aspiring Bidders who have not enrolled/ registered in e-procurement should enroll/ register before participating through the website <https://eprocure.gov.in/eprocure/app>. The portal enrolment is free of cost. Bidders are advised to go through instructions provided at 'Instructions for online Bid Submission'.

No manual bids will be accepted. All quotations (both Technical and Financial should be submitted in the e-procurement portal).

The tender should be addressed to **Head, Department of Electronics Engineering, Indian Institute of Technology (BHU) Varanasi, Varanasi - 221005, Uttar Pradesh, India** and should be submitted online one or before the last Date of Submission as mentioned in critical date sheet.

The Institute shall not be responsible for any delay in submitting online Bids. The Institute reserves the right to accept or reject any bid, cancel the Tender without assigning any reason thereof. No correspondence in this regard will be entertained.

**Head of the Department
Department of Electronics Engineering,
IIT(BHU), Varanasi
Varanasi - 221005, Uttar Pradesh, India**

विभाग/केंद्र: इलेक्ट्रॉनिक्स इंजीनियरिंग विभाग, भारतीय प्रौद्योगिकी संस्थान (बीएचयू) वाराणसी,
वाराणसी- 221005, उत्तर प्रदेश, भारत

भारतीय प्रौद्योगिकी संस्थान (का.हि.वि.) वाराणसी के इलेक्ट्रॉनिक्स इंजीनियरिंग विभाग में क्लीनरूम सुविधा हेतु आपूर्ति,
स्थापना, परीक्षण और कमीशनिंग के लिए निविदा दस्तावेज

महत्वपूर्ण डाटा शीट

संगठन का नाम	भारतीय प्रौद्योगिकी संस्थान, (बीएचयू), वाराणसी
टेंडर	खुला
निविदा प्रकार / अनुबंध का प्रकार (कार्य / आपूर्ति / नीलामी / सेवा / क्रय / पैनल गठन / विक्रय)	कार्य
मूल निविदा जारी / प्रकाशित करने की तिथि	19.08.2026 (05:00 PM)
दस्तावेज डाउनलोड प्रारंभ तिथि	19.08.2026 (05:00 PM)
पूर्व-बोली बैठक की तिथि (यदि कोई प्रश्न हों तो उन्हें विचारार्थ पूर्व-बोली बैठक की तिथि से पहले head.ece@itbhu.ac.in पर ईमेल द्वारा भेजना अनिवार्य है।)	31.08.2026 (11:00 AM)
संशोधन (यदि कोई हो)	---
निविदा अपलोड करने की अंतिम तिथि और समय	16.09.2026, (04:00 PM)
तकनीकी निविदा खोलने की तिथि और समय	17.09.2026, (04:00 PM)
निविदा प्रसंस्करण शुल्क (जीएसटी सहित, यदि लागू हो)	रु. 10000/- + रु. 1800/- (जीएसटी@18%) = रु. 11800/- (निविदा प्रसंस्करण शुल्क के लिए) (निविदा प्रसंस्करण शुल्क और ईएमडी, निम्नलिखित विवरण के अनुसार आरटीजीएस/एनईएफटी के माध्यम से भुगतान किया जाना है:) खाते का नाम: रजिस्ट्रार, आईआईटी (बीएचयू) बैंक का नाम: भारतीय स्टेट बैंक शाखा का नाम: आईटी, बी.एच.यू., वाराणसी खाता संख्या: 32778803937 आईएफएससी: SBIN0011445 भुगतान का प्रमाण तकनीकी बोली के साथ संलग्न होना चाहिए।
जमानत राशि (ईएमडी)	रु. 20,00,000/- (ईएमडी के लिए एमएसएमई को छूट दी गई है)
कवर की संख्या (1/2/3/4)	02
बोली की वैधता अवधि (दिनों में)	365 दिन (निविदा खुलने की अंतिम तिथि से)
पत्राचार हेतु पता	विभागाध्यक्ष, इलेक्ट्रॉनिक्स इंजीनियरिंग विभाग, भा.प्रौ.सं. (का.हि.वि.), वाराणसी वाराणसी - 221005, उत्तर प्रदेश, भारत
ई-मेल पता	head.ece@itbhu.ac.in

INDIAN INSTITUTE OF TECHNOLOGY (BHU), VARANASI**Varanasi - 221005, Uttar Pradesh, India****DEPARTMENT/ CENTRE: Department of Electronics Engineering, Indian Institute of Technology (BHU) Varanasi, Varanasi - 221005, Uttar Pradesh, India*****TENDER DOCUMENT FOR***

Establishment of Advanced Semiconductor Processing Cleanroom Facility on Turnkey Basis including Design, Engineering, Supply, Installation, Integration and Commissioning in the Department of Electronics Engineering, IIT(BHU), Varanasi

CRITICAL DATA SHEET

Name of Organization	Indian Institute of Technology (BHU), Varanasi
Tender	Open
Type/ Form of Contract (Work/ Supply/ Auction/ Service/ Buy/ Empanelment/ Sell)	Work
Date of Issue/Publishing Original Tender	19.08.2026 (05:00 PM)
Document Download Start Date	19.08.2026 (05:00 PM)
Pre-Bid Meeting Date* (*Queries, if any, to be discussed, must be emailed to head.ece@itbhu.ac.in, before the date of Pre-Bid meeting for consideration.)	31.08.2026, (11:00 AM)
Corrigendum, if any	---
Last Date and Time for Uploading of Bids	16.09.2026, (04:00 PM)
Date and Time of Opening of Technical Bids	17.09.2026, (04:00 PM)
Tender Processing Fee (including GST as applicable)	Rs. 10000/- + Rs. 1800/- (GST @ 18%) = Rs. 11800/- (For Tender Processing Fee) (Tender Processing Fee and EMD, To be paid through RTGS/NEFT, as per the following details:) Name of Account: Registrar, IIT(BHU) Name of the Bank: State Bank of India Name of Branch: IT, BHU, Varanasi Account No.: 32778803937 IFSC: SBIN0011445 The proof of payment must be enclosed with Technical Bid.
EMD (Earnest Money Deposit)	Rs. 20,00,000/- (For EMD, MSMEs are exempted)
No. of Covers (1/2/3/4)	02
Bid Validity Days	365 Days (From last date of opening of the tender)
Address for Communication	Head of the Department, Department of Electronics Engineering, IIT(BHU), Varanasi Varanasi-221005, Uttar Pradesh, India
E-mail Address	head.ece@itbhu.ac.in

INDIAN INSTITUTE OF TECHNOLOGY (BHU) VARANASI

Varanasi - 221005, Uttar Pradesh, India

DEPARTMENT/ CENTRE: Department of Electronics Engineering, Indian Institute of Technology (BHU) Varanasi, Varanasi - 221005, Uttar Pradesh, India

TENDER DOCUMENT FOR

Establishment of Advanced Semiconductor Processing Cleanroom Facility on Turnkey Basis including Design, Engineering, Supply, Installation, Integration and Commissioning in the Department of Electronics Engineering, IIT (BHU) Varanasi

INVITATION FOR BIDS

Online bids are invited from eligible bidders for the following:

S. No.	Tender No. and Last Date	Specifications & Quantity of the item	Earnest Money Deposit to be submitted
1.	Tender No.: IIT(BHU)/ECE/2026-27/176, Dated: 19.08.2026 Last Date of Bid Submission: 16.09.2026, 04:00 PM	Establishment of Advanced Semiconductor Processing Cleanroom Facility on Turnkey Basis including Design, Engineering, Supply, Installation, Integration and Commissioning in the Department of Electronics Engineering, IIT(BHU), Varanasi Quantity: 01 Tech. Specifications as per Annexure-I	Rs. 20,00,000/-

- Interested eligible Bidders may obtain further information from IIT(BHU), Varanasi website: www.iitbhu.ac.in/iitnotifications/purchase_enquiries/ or from Central Public Procurement Portal (CPPP) <https://eprocure.gov.in/eprocure/app> .
- Intending bidders are advised to visit IIT(BHU), website www.iitbhu.ac.in/iitnotifications/purchase_enquiries/ and CPPP website <https://eprocure.gov.in/eprocure/app> regularly till closing date of BID submission of tender for any corrigendum/ addendum/ amendment.
- Tender Processing Fee is to be deposited electronically by RTGS/NEFT in the account of Registrar, IIT (BHU) in the Bank details mentioned above. Bidders are required to submit the scan copy of payment receipt details of Tender processing fees payment at the time of Bid Preparation.
- This Tender Document contains the following:
 - Instructions for Online Bid Submission
 - Instruction to Bidders
 - General conditions of contract (GCC)
 - Special Condition of Contracts
 - Checklist for Bid/Tender submission
 - Declaration Certificate
 - Technical specifications for the complete project (Annexure 1)
 - Compliance Sheet

SECTION 1: INSTRUCTION FOR ONLINE BID SUBMISSION

As per the directives of Department of Expenditure, this tender document has been published on the Central Public Procurement Portal (<https://eprocure.gov.in/eprocure/app>). The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.

More information useful for submitting online bids on the CPP Portal may be obtained at: <https://eprocure.gov.in/eprocure/app>.

1. Registration

1. Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (<https://eprocure.gov.in/eprocure/app>) by clicking on the link “Click here to Enroll”. Enrolment on the CPP Portal is free of charge.
2. As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.
3. 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.
4. 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/ n-Code/ e-Mudhra, etc.), with their profile.
5. 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.
6. Bidder then logs in to the site through the secured log-in by entering their user ID/ password and the password of the DSC/ e-Token.

2. Searching for Tender Documents

1. 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.
2. 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 Tenders’ folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.
3. 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.

3. Preparation of Bids

1. Bidder should take into account any corrigendum published on the tender document before submitting their bids.
2. 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.

3. Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF formats. Bid documents may be scanned with 100 dpi with black and white option.
4. 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, annual reports, auditor certificates, etc.) has been provided to the bidders. Bidders can use “My Space” area available to them to upload such documents. These documents may be directly submitted from the “My Space” 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.

4. Submission of Bids

1. Bidder should log into the site well in advance for bid submission so that he/she upload the bid in time i.e., on or before the bid submission time. Bidder will be responsible for any delay due to other issues.
2. The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
3. Bidder has to select the payment option as “on-line” to pay the tender processing fee as applicable and enter details of the instrument. Whenever, Tender processing fees is sought, bidders need to pay the tender processing fee on-line through RTGS.
4. 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 white colored (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BoQ file is found to be modified by the bidder, the bid will be rejected.
5. 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.
6. All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128-bit encryption technology. Data storage encryption of sensitive fields is done.
7. The uploaded tender documents become readable only after the tender opening by the authorized bid openers.
8. 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.
9. Kindly add scanned PDF of all relevant documents in a single PDF file of compliance sheet.

5. Assistance to Bidders

1. 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.
2. 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.

6. General Instructions to the Bidders

1. The tenders will be received online through portal <https://eprocure.gov.in/eprocure/app>. In the Technical Bids, the bidders are required to upload all the documents in **.pdf format**.
2. 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://eprocure.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://eprocure.gov.in/eprocure/app> under the link “Information about DSC”.
3. Tenderer are advised to follow the instructions provided in the ‘Instructions to the Tenderer for the e-submission of the bids online through the Central Public Procurement Portal for e Procurement at <https://eprocure.gov.in/eprocure/app>.

SECTION 2: INSTRUCTIONS TO BIDDERS

A. Introduction

1. Scope of Work

IIT (BHU) invites online bids from the vendors on behalf of The Director, IIT (BHU) for **Establishment of Advanced Semiconductor Processing Cleanroom Facility on Turnkey Basis including Design, Engineering, Supply, Installation, Integration and Commissioning in Department of Electronics Engineering, IIT (BHU) Varanasi** as per the technical specifications given in Annexure- I and as per terms and conditions of this tender document.

2. Cost of Bidding

The Bidder shall bear all costs associated with the preparation and submission of its bid, and "the Purchaser", will in no case be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.

B. The Bidding Documents

3. Tender Processing Fees

The Tender Processing fees (**Rs. 11,800/-**) should be submitted ONLINE as per the details mentioned above. Further, the proof of payment must be uploaded with Technical Bid. The exemption will be applicable as per Govt. of India norms.

4. Content of Bidding Documents

4.1 The goods required, bidding procedures and contract terms are prescribed in the bidding documents. In addition to Invitation of Bids, the bidding documents include:

- (a) Instructions for Online Bid Submission
- (b) Instructions to Bidders (ITB)
- (c) General Conditions of Contract (GCC)
- (d) Special Conditions of Contract (SCC)
- (e) Schedule of Requirements
- (f) Tender Form (Technical Bid)
- (g) Tender Form (Financial Bid)

4.2 The Bidder is expected to examine all instructions, forms, terms, and specifications in the bidding documents. Failure to furnish all information required by the bidding documents or submission of a bid not substantially responsive to the bidding documents in every respect will be at the Bidder's risk and may result in rejection of its bid.

5. Amendment of Bidding Documents

5.1 At any time prior to the deadline for submission of bids, the Purchaser may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the bidding documents by amendment.

5.2 All prospective bidders who have received the bidding documents will be notified of the amendment in writing, which will be binding on them.

5.3 In order to allow prospective bidders reasonable time within which to take the amendment into account in preparing their bids, the Purchaser, at its discretion, may extend the deadline for the submission of bids.

C. Preparation of Bids

6. Language of Bid

The bid prepared by the Bidder, as well as all correspondence and documents relating to the bid exchanged by the Bidder and the Purchaser shall be written in English language.

7. Documents Comprising the Bid

7.1 Techno commercial unpriced bid and priced bid: The bids are to be submitted in two parts i.e.

Techno commercial un-priced bid and priced bid.

- (a) Techno commercial unpriced bid along with Bid Securing Declaration Form (EMD) as shown in invitation to bids shall be submitted through CPP Portal. If the proof of Bid Securing Declaration Form as EMD is not received along with the technical bid, such bid will not be considered. The samples (if required) of all the items shown in the schedule of requirements of each tender should also accompany the techno commercial un-priced bid in a separate cover.

- (b) Priced bid.

7.2 Techno commercial un-priced bid: The techno commercial un-priced bid prepared by the bidder shall be provided in the following Model Response Format:

Model Response Format

- (a) Standing of each Bidder Manufacturer/Dealer and past experience in supply of the material (certificates to be enclosed), proof of manufacturing Unit/Dealership along with all the documents required for proving the credentials regarding the fulfilment of essential pre-bid criteria.
- (b) List of other Govt. Departments, Public Sector units and Central Autonomous Bodies for which the bidder is supplying material or having the similar type of contracts and a certificate regarding the satisfactory performance of the contract (In the Annexure III format).
- (c) Copy of the audited balance sheet of the vendor for the previous financial year indicating the turnover in supply of the relevant materials/service.
- (d) Details of Permanent Account Number and latest income tax clearance certificate.
- (e) Details of GST No. along with a copy of certificate to be attached.
- (f) Submission of samples if required, for all items indicated in the schedule of requirements. The make of items proposed to be supplied should be indicated in the format of the schedule of requirements and submitted along with the techno commercial un-priced bid without indicating the pricing components.
- (g) Willingness to execute all orders which are placed to meet emergency requirement on priority basis. The Bidder shall note that standards for workmanship, material and equipment, and references to brand names designated by the Purchaser in the schedule of requirements are intended to be descriptive only and not restrictive. The Bidder may substitute alternative standards, brand names and/or catalogue numbers in his bid, provided that it demonstrates to the Purchaser's satisfaction that the substitutions ensure substantial equivalence to those designated in the Technical Specifications.

7.3 Price Bid: The price bid shall comprise the techno commercial bid along with the price component indicating the Unit prices for each and every item indicated in schedule of requirements (Refer Annexure I).

- (i) The prices quoted must be net per unit as shown in the Schedule and must include all charges for delivery at the designated stores i.e., F.O.R. IIT (BHU) Varanasi and should be mentioned clearly.
- (ii) The rate must be stated for each item separately both in words and figures. If there is a discrepancy between the price quoted in word and figures the higher price quoted will be treated as final.
- (iii) Quoted prices should be firm and inclusive of taxes/duties, freight and forwarding charges, handling charges, loading and unloading charges, and insurance charges etc. However, the prices must be reflected clearly in BoQ format by mentioning basic rate, GST, Freight charges, Any other Taxes/Duties/Levies and exemptions thereon as applicable to IITs.
- (iv) The prices once accepted by the Institute shall remain valid till the successful execution of the order and till supplies is fully effected and accepted or 12 months from the date of acceptance of tender whichever is later. The Institute shall not entertain any increase in the rates during the period. However, in the event there is a reduction or increase in Government levy/duties/taxes.
- (v) during the period of execution of the order, the rates shall be suitably adjusted with effect from the date notifying the said reduction or increase in the Government levy/taxes/duty, if any.

8. Bid Prices

8.1 The Bidder shall indicate on the Schedule of requirements (BoQ), the unit prices of the goods it proposes to supply under the Contract and enclose it with the priced bid.

8.2 Prices indicated on the Price Schedule shall be entered separately in the following manner:

- (i) The prices quoted must be net per unit as shown in the schedule of requirements and must include all charges for delivery at the designated stores.
- (ii) Any Indian duties, GST and other taxes which will be payable on the goods, if this Contract is awarded.

8.3 Prices quoted by the Bidder shall be fixed during the Bidder's performance of the Contract and not subject to variation on any account.

9. Bid Currencies

Prices shall be quoted in Indian Rupees only.

10. Period of Validity of Bids

10.1 Bids shall remain valid for **365** days after the date of bid opening prescribed by the Purchaser. A bid valid for a shorter period shall be rejected by the Purchaser as non-responsive.

10.2 In exceptional circumstances, the Purchaser may solicit the Bidder's consent to an extension of the period of validity. The request and the responses thereto shall be made in writing. A Bidder granting the request will not be required nor permitted to modify the bid.

10.3 Bid evaluation will be based on the bid prices without taking into consideration the above modifications.

D. Submission of Bids

11. The tender has to be submitted **ONLINE** before the due date. The offers received after the due date and time will not be considered. **No manual bids will be considered.**

12. Deadline for Submission of Bids

12.1 Bids must be received by the Purchaser **ONLINE** not later than the time and date specified in the Invitation for Bids.

12.2 The Purchaser may, at his discretion, extend this deadline for submission of bids by amending the bid documents in which case all rights and obligations of the Purchaser and Bidders previously subject to the deadline will thereafter be subject to the deadline as extended.

13. Late/Delayed Bids

The offers received after the due date and time will not be considered.

14. Modifications and Withdrawal of Bids

14.1 The Bidder may modify or withdraw its bid after the ONLINE bid's submission, as per the provision of CPP Portal.

14.2 No bid may be modified subsequent to the deadline for submission of bids. No documents will be accepted in support of essential pre-bid criteria after the last date of submission of bids.

14.3 No bid may be withdrawn in the interval between the deadline for submission of bids and the expiry of the period of bid validity specified by the Bidder on the bid form.

E. Bid Opening and Evaluation of Bids

15. Opening of Techno commercial un-priced Bids

The purchaser will open all techno commercial un-priced bids in the first instance.

16. Clarification of Bids

16.1 During evaluation of the bids, the purchaser may, at its discretion, ask the Bidder for clarification of its bid. The request for clarification and the response shall be in writing and no change in price or substance of the bid shall be sought, offered or permitted.

16.2No Bidder shall contact the purchaser on any matter relating to its bid from the time of the bid opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Institute, it should be done in writing.

16.3Any effort by a Bidder to influence the purchaser in its decisions on bid evaluation, bid comparison or contract award decisions may result in rejection of the Bidder's bid.

17. Evaluation of Techno commercial un-priced Bid

17.1Prior to the detailed technical evaluation, the purchaser will determine the substantial responsiveness of each bid. A substantially responsive bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviations and meets all the essential pre-bid criteria. If any bidder does not meet the essential pre-bid criteria as laid down in the Instruction to Bidders, then his bid will be summarily rejected. No documents will be accepted in support of essential pre-bid criteria after the last date of submission of bids.

17.2 The purchaser will reject a bid determined as not substantially responsive.

17.3The bidders may be called for discussion and may be allowed to modify their technical bids to suit the organization's requirement. The idea is to arrive at a threshold level of acceptability above which all the bidders shall be treated on par. Those whose technical specifications do not reach the threshold level of acceptability shall be rejected as technically unsuitable. The price bids of the bidders who finally emerge as technically acceptable shall be opened, evaluated and the contract awarded to the lowest evaluated bidder.

17.4The bidders short-listed by the purchaser based on meeting the essential pre-bid criteria and detailed evaluation regarding satisfying the technical criteria laid down in this tender document may be called for detailed discussions with a team selected for the purpose, at a specified date, time and venue, if needed.

18. Opening of Priced Bids

18.1The Purchaser will open the Priced Bids of only those bidders who meet the essential pre-bid criteria and whose techno commercial un-priced bids have been found to be substantially responsive.

18.2 The priced Bids of the technically qualified bidders shall be opened by the tender committee.

19. Evaluation and Comparison of priced Bids

19.1Arithmetical errors will be rectified on the following basis: If there is a discrepancy between words and figures, whichever is the higher of the two shall be taken as bid price. If the Vendor does not accept the correction of errors, its bid will be rejected

19.2Bidders shall state their bid price for the payment schedule outlined in the Clause 14 of General Conditions of Contract. Bids will be evaluated on the basis of this base price. Bidders are, however, permitted to state an alternative payment schedule and indicate the reduction in bid price they wish to offer for such alternative payment schedule. The purchaser may consider the alternative payment schedule offered by the selected Bidder but it may not be binding on the purchaser.

19.3The purchaser, at its option may ask some more bidders to match the rates of the lowest bidder for creating parallel suppliers.

19.4The currency that shall be used for bid evaluation and comparison purposes to convert all bid prices expressed in various currencies into a single currency is: Indian Rupees

19.5 The source of exchange rate shall be: Reserve Bank of India/Any other authentic source.

19.6 The date for the exchange rate shall be: **Date of opening of Financial Bids.**

20. Purchasers right to accept any bid and to reject any bid or all bids

The Purchaser reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to award of Contract, without thereby incurring any liability to the affected Bidder or bidders or any obligation to inform the affected Bidder or bidders of the grounds for the Purchaser's action.

21. Award Criteria

- a. IIT (BHU) shall award the contract to the technically qualified eligible BIDDER whose bid has been determined as the lowest evaluated commercial bid.
- b. If more than one BIDDER happens to quote the same lowest price, IIT(BHU) Varanasi reserves the right to award the contract to more than one BIDDER or any BIDDER.

22. Notification of Award

Prior to the expiration of the period validity, the purchaser will notify the successful Bidder in writing by letter or by fax, to be confirmed in writing by speed post or hand delivered letter, that its bid has been accepted.

23. Factors Affecting the Award of Supply

23.1 The bidder should have its own Contract support facilities. The support facilities should be fully owned and managed by the bidder.

23.2 Conformity with the Request for Bid/Tender required and conditions.

23.3 The assessment based on the response to Model Response Outline.

23.4 The assessment of the capability of the bidder to meet the terms and conditions.

23.5 The bidders must have executed similar orders, for which the bidder is quoting, for Govt./Semi-Govt./Autonomous Organizations.

23.6 The cost and the discount offered, if any.

24. Fall clause

24.1 The price quoted by the supplier should not be higher than the maximum retail price, if any, for the stores and the same shall not be higher than the price usually charged by the supplier for stores of the same nature, class or description to any other purchaser.

24.2 The price charged for the stores supplied under the contract by the supplier shall in no event exceed the lowest price at which the supplier sells the stores of identical description to any other person during the period till performance of all supply orders placed during the currency of the contract is completed. If at any time during the period the supplier reduces the sale price of such stores or sells such stores to any other person including his dealers at a price lower than the price chargeable under the contract, he shall forthwith notify such reduction or sale to the purchaser and the price payable under the contract for these items of stores supplied after the date of coming into force of such reduction or sale shall stand correspondingly reduced.

24.3 If it is discovered that the supplier has contravened the above conditions, then without prejudice to any other action which might be taken against him, it shall be lawful for the purchaser to (a) revise the price at any stage so as to bring it in conformity with sub-clause(i) above, or (b) to terminate the contract and purchase the items of stores at the risk and cost of the supplier and in that event the provisions of Clause 28 of General Conditions of Contract shall, as far as possible, be applicable or recover the loss.

SECTION 3: GENERAL CONDITION OF CONTRACTS

1. Definitions

In this Contract, the following terms shall be interpreted as indicated:

- (a) "The order" means the agreement entered between the Purchaser and the Supplier including all the attachments and appendices and all documents incorporated as per notification of award.
- (b) "The Contract Price" means the price payable to the Supplier under the Contract for the full and proper performance of its contractual obligations.
- (c) "The Goods" means all the items, which the Supplier is required to supply to the Purchaser under the Contract.
- (d) "Services" means services ancillary to the supply of the Goods, such as transportation and insurance, and any other incidental services training and other obligations of the Supplier covered under the Contract.
- (e) "GCC" means the General Conditions of Contract contained in this section.
- (f) "The Purchaser" means the organization purchasing the Goods i.e., IIT (BHU) VARANASI.
- (g) "The Purchaser's country" is India.
- (h) "The Supplier" means the individual or firm supplying the Goods and Services under this Contract.
- (i) "Day" means calendar day.

2. Application

These General Conditions shall apply to the extent that they are not superseded by provisions in other parts of the Contract.

3. Standards

The Goods supplied under this Contract shall conform to the standards mentioned in the Technical Specifications, and, when no applicable standard is mentioned, to the authoritative standard appropriate to the Goods' country of origin and such standards shall be the latest issued by the concerned Institution.

4. Use of Contract Documents and Information

- 4.1** The Supplier shall not, without the Purchaser's prior written consent, disclose the Contract, or any provision thereof, or any specification, plan, drawing, pattern, sample or information furnished by or on behalf of the Purchaser in connection therewith, to any person other than a person employed by the Supplier in performance of the Contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purposes of such performance.
- 4.2** The Supplier shall not, without the Purchaser's prior written consent, make use of any document or information except for purposes of performing the Contract.
- 4.3** Any document, other than the Contract itself, shall remain the property of the Purchaser and shall be returned (in all copies) to the Purchaser on completion of the Supplier's performance under the Contract if so, required by the Purchaser.

5. Patent Rights

The Supplier shall indemnify the Purchaser against all third-party claims of infringement of patent, trademark or industrial design rights arising from use of the Goods or any part thereof in India.

6. Submission of the Bids

- 6.1** All bids complete in all respect must be submitted online on or before the Bid Closing date and time as mentioned on Critical Data Sheet. Tenders received without Bid Securing Declaration Form as earnest money etc. shall be rejected.
- 6.2** The Tender document for this supply is available on the website of IIT (BHU) Varanasi (www.iitbhu.ac.in/iitnotifications/purchase_enquiries/) or from Central Public Procurement Portal (CPPP) <https://eprocure.gov.in/eprocure/app>.

6.3 Interested bidders may submit their bid through the Central Public Procurement Portal (CPPP) <https://eprocure.gov.in/eprocure/app>.

7. Inspections and Tests

7.1 The Purchaser or its representative shall have the right to inspect and/or to test the Goods to confirm their conformity to the Contract specifications at no extra cost to the Purchaser.

7.2 The inspections and tests may be conducted on the premises of the Supplier or its subcontractor(s), at point of delivery and/or at the Goods destination. If conducted on the premises of the Supplier or its subcontractor(s), all reasonable facilities and assistance, including access to drawings and production data shall be furnished to the inspectors at no charge to the Purchaser.

7.3 Any inspected or tested Goods fail to conform to the specifications, the Purchaser may reject the goods and the Supplier shall either replace the rejected Goods or make alterations necessary to meet specification requirements free of cost to the Purchaser.

7.4 The Purchaser's right to inspect, test and, where necessary, reject the Goods after the Goods' arrival at Project Site shall in no way be limited or waived by reason of the Goods having previously been inspected, tested and passed by the Purchaser or its representative prior to the Goods shipment.

7.5 Nothing in GCC Clause 7 shall in any way release the Supplier from any warranty or other obligations under this Contract.

8. Consequences of rejection

If in the event the stores are rejected by the purchaser at the destination and the supplier fails to make satisfactory supplies within the stipulated period of delivery, the purchaser will be at liberty to:

- (a) Allow the supplier to resubmit the stores in replacement of those rejected, within a specified time without any extra cost to the purchaser.
- (b) Reject the material, which shall be final and binding on the contractor.
- (c) Procure the rejected materials of comparable quality from the open market/Govt. stores and the supplier shall be liable to pay the difference in price over the RC prices or get the amount adjusted from the outstanding bills of the supplier, if any.

9. Packing

9.1 The Supplier shall provide such packing of the Goods as is required to prevent their damage or deterioration during transit to their final destination as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit and open storage. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the Goods' final destination and the absence of heavy handling facilities at all points in transit.

9.2 The packing, marking and documentation within and outside the packages shall comply strictly with such special requirements as shall be provided for in the Contract including additional requirements, in any subsequent instructions ordered by the Purchaser.

10. Delivery and Documents

10.1 The Supplier shall make delivery of the 90 percent of the material should be delivered within **7 months** of time with a project completion time of **10 months** in pursuance of the notification of award. The purchase order would be placed after assessing the requirements on quarterly basis. However, the supplier shall also arrange to execute all orders on priority basis which would be placed to meet any emergent requirements.

10.2 In case the purchaser decides to conclude parallel rate contracts, then the requirements would be split on different firms on equitable basis as per the discretion of the purchaser.

10.3 The delivery of Stores shall be affected at the premises of the Institute free of all delivery charges and within the stipulated time and as may be elucidated in the confirmed order, accompanied by a delivery challan. No extension of time for delivery of Stores shall normally be accorded.

The supplier shall mail the following documents to the purchaser with a copy to the insurance company:

1. 3 Copies of the Supplier Invoice showing contract number, goods' description, quantity, unit price, total amount, etc.
2. Installation Certificate.
3. Insurance Certificate if applicable.
4. Manufacturer's/Supplier's Warranty Certificate.
5. Inspection Certificate issued by the nominated inspection agency, if any.
6. Supplier's Factory Inspection Report.
7. Certificate of Origin (if possible, by the beneficiary).

The above documents should be received by the Purchaser before arrival of the Goods (except where the Goods have been delivered directly to the Consignee with all documents) and, if not received, the Supplier will be responsible for any consequent expenses.

Time and Date of Delivery - Essence of the Contract: The time for and the date of delivery of the stores stipulated shall be deemed to be of the essence of the contract and delivery must be completed not later than the date(s) specified.

11. Insurance

The Goods supplied under the Contract shall be fully insured in Indian Rupees against loss or damage incidental to manufacture or acquisition, transportation, storage and delivery. The insurance shall be obtained by the suppliers in an amount equal to 110% of the value of the goods from "warehouse to warehouse" (final destinations) on "all risks" basis including war risks and strikes.

12. Transportation

Where the Supplier is required under the Contract to transport the Goods within India defined as Project site, transport to such place of destination in India including insurance, as shall be specified in the Contract, shall be arranged by the Supplier, and the related cost shall be included in the contract Price.

13. Warranty

13.1 The Supplier warrants that the Goods supplied under this Contract are new, unused, of the most recent or current models and that they incorporate all recent improvements in design and materials unless provided otherwise in the Contract. The Supplier further warrants that all Goods supplied under this Contract shall have no defect arising from design, materials or workmanship or from any act or omission of the Supplier that may develop under normal use of the supplied Goods in the conditions prevailing in India.

13.2 This warranty shall remain valid for at least **24 months** (or as specified) after the Goods or any portion thereof as the case may be, have been delivered to and accepted at the final destination indicated in the Contract, unless specified otherwise.

13.3 The Purchaser shall promptly notify the Supplier in writing of any claims arising under this warranty.

13.4 Upon receipt of such notice, the Supplier shall with all reasonable speed, repair or replace the defective Goods or parts thereof, without any extra cost to the Purchaser.

13.5 If the Supplier, having been notified, fails to remedy the defect(s) within a reasonable period, the Purchaser may proceed to take such remedial action as may be necessary, at the Supplier's risk and expense and without prejudice to any other rights which the Purchaser may have against the Supplier under the Contract.

14. Payment

14.1 The payment can be made in staggered payment mode against Supply, Installation and Commissioning and submission of satisfactory PBG@5 % if required.

14.2 The Supplier's request(s) for payment shall be made to the Purchaser in writing, accompanied by an invoice describing, as appropriate, the Goods delivered and the Services performed, and by documents, submitted pursuant to GCC Clause 10, and upon fulfilment of other obligations stipulated in the contract.

15. Prices

Prices charged by the Supplier for Goods delivered and Services performed under the Contract shall not vary from the prices quoted by the Supplier in his bid. The bidder must mention the applicable taxes/duty and exemptions thereon, if any, as per the Government of India norms. The Institute will provide requisite certificate, if any, required by the bidder as per the applicable Govt. of India norms.

16. Change Orders

16.1 The Purchaser may at any time, by written order given to the Supplier, make changes within the general scope of the Contract in any one or more of the following:

- (a) Drawings, designs, or specifications, where Goods to be furnished under the Contract are to be specifically manufactured for the Purchaser;
- (b) The method of shipping or packing;
- (c) The place of delivery; and/or
- (d) The services to be provided by the Supplier.

16.2 If any such change causes an increase or decrease in the cost of, or the time required for, the Supplier's performance of any provisions under the Contract, an equitable adjustment shall be made in the Contract Price or delivery schedule, or both, and the Contract shall accordingly be amended. Any claims by the Supplier for adjustment under this clause must be asserted within thirty (30) days from the date of the Supplier's receipt of the Purchaser's change order.

17. Contract Amendments

Subject to GCC Clause 16, no variation in or modification of the terms of the Contract shall be made except by written amendment signed by the parties.

18. Assignment

The Supplier shall not assign, in whole or in part, its obligations to perform under the Contract, except with the Purchaser's prior written consent.

19. Subcontracts

The Supplier shall notify the Purchaser in writing of all subcontracts awarded under this Contract if not already specified in the bid. Such notification, in his original bid or later, shall not relieve the Supplier from any liability or obligation under the Contract.

20. Delays in the Supplier's Performance

20.1 Delivery of the Goods and performance of the Services shall be made by the Supplier in accordance with the time schedule specified by the Purchaser as per GCC clause 10.

20.2 If at any time during performance of the Contract, the Supplier or its sub-contractor(s) should encounter conditions impeding timely delivery of the Goods and performance of Services, the Supplier shall promptly notify the Purchaser in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the Supplier's notice, the Purchaser shall evaluate the situation and may, at its discretion, extend the Supplier's time for performance with or without liquidated damages, in which case the extension shall be ratified by the parties by amendment of the Contract.

20.3 Except as provided under GCC Clause 23, a delay by the Supplier in the performance of its delivery obligations shall render the Supplier liable to the imposition of penalty pursuant to GCC Clause 21, unless an extension of time is agreed upon pursuant to GCC Clause 20.2 without the application of liquidated damages.

21. Penalty

Subject to GCC Clause 23, if the Supplier fails to deliver any or all of the Goods or to perform the Services within the period(s) specified in the Contract, the Purchaser shall, without prejudice to its other remedies under the Contract, deduct from the Contract Price, as penalty, a sum equivalent to 1% per week and the maximum deduction is 10% of the contract price of the delivered price of the delayed Goods or unperformed Services for each week or part thereof of delay until actual delivery or performance. Once the maximum is reached, the Purchaser may consider termination of the Contract pursuant to GCC Clause 22.

22. Termination for Default

22.1 The Purchaser may, without prejudice to any other remedy for breach of contract, by written notice of default sent to the Supplier, terminate the Contract in whole or part:

- (a) If the Supplier fails to deliver any or all of the Goods within the period(s) specified in the purchase order, or within any extension thereof granted by the Purchaser pursuant to GCC Clause 20;
- (b) If the Supplier fails to perform any other obligation(s) under the Contract;
- (c) If the Supplier, in the judgment of the Purchaser has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

‘For the purpose of this Clause:

“Corrupt practice” means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution.

“Fraudulent practice: a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition;”

22.2 In the event the Purchaser terminates the Contract in whole or in part, pursuant to GCC Clause 22.1, the Purchaser may procure, upon such terms and in such manner as it deems appropriate, Goods or Services similar to those undelivered, and the Supplier shall be liable to the Purchaser for any excess costs for such similar Goods or Services. However, the Supplier shall continue the performance of the Contract to the extent not terminated.

23. Force Majeure

23.1 Notwithstanding the provisions of GCC Clauses 20 & 21, the Supplier shall not be liable for imposition of liquidated damages or termination for default, if and to the extent that, its delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.

23.2 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.

23.3 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.

24. Termination for Insolvency

The Purchaser may at any time terminate the Contract by giving written notice to the Supplier, if the Supplier becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the Supplier provided that such termination will not prejudice or affect any right of action or remedy, which has accrued or will accrue thereafter to the Purchaser.

25. Termination for Convenience

25.1 The Purchaser, by written notice sent to the Supplier, may terminate the Contract, in whole or in part, at any time for its convenience. The notice of termination shall specify that termination is for the Purchaser's convenience, the extent to which performance of the Supplier under the Contract is terminated, and the date upon which such termination becomes effective.

25.2 The Goods that are complete and ready for shipment within 30 days after the Supplier's receipt of notice of termination shall be accepted by the Purchaser at the Contract terms and prices.

26. Resolution of Disputes

26.1 The Purchaser and the supplier shall make every effort to resolve amicably by direct informal negotiation any disagreement or dispute arising between them under or in connection with the Contract.

26.2 If, after thirty (30) days from the commencement of such informal negotiations, the Purchaser and the Supplier have been unable to resolve amicably a Contract dispute, either party may require that the dispute be referred for resolution to the formal mechanisms as specified below. These mechanisms may include, but are not limited to, conciliation mediated by a third party, adjudication in an agreed national or international forum, and national or international arbitration.

26.3 In case of Dispute or difference arising between the Purchaser and a supplier relating to any matter arising out of or connected with this agreement, such disputes or difference shall be settled in accordance with the Arbitration and Conciliation Act, 1996 as amended from time to time.

27. Governing Language

The contract shall be written in English language. Subject to GCC Clause 28, English language version of the Contract shall govern its interpretation. All correspondence and other documents pertaining to the Contract which are exchanged by the parties shall be written in the same language.

28. Applicable Law

28.1 The contract shall be governed by the Law of Contract for the time being in force.

28.2 Irrespective of the place of delivery, the place of performance or place of payment under the contract, the contract shall be deemed to have been made at the place from which the acceptance of tender has been issued.

28.3 Jurisdiction of Courts: The court jurisdiction shall be Varanasi only.

28.4 One-month notice will be given by either party for termination of Contract during the tenure of Contract for breach of Clause or otherwise.

29. Taxes and Duties

Suppliers shall be entirely responsible for all taxes, duties, license fees, road permits, etc., incurred until delivery of the contracted Goods to the Purchaser.

30. Performance Security

Successful bidder has to furnish **05%** of the order value as a performance security in the shape of Fixed Deposit Receipt / Bank Guarantee in favour of the Registrar, Indian Institute of Technology (BHU) Varanasi valid for a period of 60 days beyond the end of all warranty period / obligations (i.e., must valid for minimum **26 months**). Fixed Deposit Receipt / Bank Guarantee should be issued from a schedule bank in India.

31. Supplier Integrity

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

The Institute Reserves the Right to:

1. Increase or decrease the quantity of the item(s) as per requirement and GOI Norms only, however, provided within the ceiling of the category in which the original order was placed i.e., if it is within 2.5 Lakh category than should not exceed the 2.5 lakh limit and so on.
2. Reject the quotation in absence of not furnishing the documentary evidence in respect of Trade Tax Registration (G.S.T), Income Tax and Trade Tax clearance certificates together with the performance of supplies in various branches/institutions.
3. Reject the quotation in the event of non-furnishing the authentic documentary evidence in respect of Testing reports / Performance report of the concerned Govt. Organization / Institutions about the products being manufactured and marketed. The performance test of the product can be conducted at Institute level also for which charge will have to be borne by the suppliers.
4. Reject the supplies already made, if not found up to the mark. Thorough checking may be adopted to test the correctness of the supply. In such an event, further action may call to conform or discard the supply.
5. To reject any addition/alteration in respect of local dealerships intimated by the Principals after consideration of the case by the committee appointed by the Institute for the purpose.
6. Cancel this Tender at any point of time without assigning any reason thereof.
7. The Institute also reserves the right to reject the bid of any participated bidder.
8. The Purchaser may, without prejudice to any other remedy for breach of contract, by written notice of default sent to the Supplier, terminate the Contract in whole or part:
 - a. If the Supplier fails to deliver any or all of the Goods within the period(s) specified in the purchase order, or within any extension thereof granted by the Purchaser.
 - b. If the Supplier fails to perform any other obligation(s) under the Contract.
 - c. If the Supplier, in the judgment of the Purchaser has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.
9. To reject any or all the offers without assigning any reasons thereof.
10. All disputes are subject to ***“Varanasi Jurisdiction”*** only.
11. The decisions of the Institute in all respect shall be final and binding on all.
12. The Institute reserves the right to ask the successful bidder to produce all the original documents submitted along with the bids for verification at any point of time. During the verification of the document, if it is found that the bidder has concealed/falsified/fabricated any information, the bid and/or purchase order will be cancelled and performance security will be forfeited and action including blacklisting will be taken against the bidder as per norms of the Institute.
13. Please ensure that your offer is complete in all respect as no further clarifications shall be sought from you and reaches us within the last date mentioned above. **The Institute shall not be responsible for any delay etc.**

**Head of the Department
Department of Electronics Engineering
IIT(BHU), Varanasi
Varanasi - 221005, Uttar Pradesh, India**

SECTION 4: SPECIAL CONDITIONS OF CONTRACT

1. Essential Pre-Bid Criteria

Only those bidders who fully satisfy all prescribed eligibility requirements and submit complete supporting documentary evidence shall be considered for Technical Evaluation. The eligibility criteria are intended to ensure participation only by technically competent, financially sound, and experienced turnkey cleanroom integrators possessing proven capability in the design, engineering, supply, installation, integration, testing, commissioning, validation, and long-term support of semiconductor-grade cleanroom facilities and associated utility infrastructure systems. Failure to comply with any eligibility requirement or submission of incomplete, misleading, or unsupported documents may result in rejection of the bid without further consideration.

1. **Blacklisting Declaration:** The bidder should give in writing on a NOTARIZED non-judicial stamp of Rs. 100, that the bidder has never been blacklisted by any IITs/NITs/Govt. Offices/PSUs/Govt. Funded Universities/Govt. Funded Autonomous Bodies/Govt. Bodies. This should be issued after the date of publication of this tender.
2. **OEM Authorization:** The bidder shall be duly authorized by the respective Original Equipment Manufacturers (OEMs) for supply, installation, integration, commissioning, and maintenance of the proposed systems and equipment. Valid OEM authorization certificates and proprietary certificates, wherever applicable, shall be submitted along with the technical bid.
3. **Financial Eligibility:** The bidder shall have an average annual financial turnover of not less than ₹5 Crores in each of the last three (3) financial years (2023–24, 2024–25, and 2025–26). The bidder shall submit Chartered Accountant certified turnover certificates along with audited balance sheets and profit and loss statements for the corresponding financial years. The bidder should not have incurred financial losses during the above-mentioned financial years.
4. **Technical Experience:** The bidder shall possess proven experience in execution of complete turnkey semiconductor cleanroom projects from concept design through commissioning, validation, and handover for Semiconductor Facilities. The bidder shall have successfully completed at least one (1) turnkey Class 100 (ISO-5) cleanroom projects having a minimum cleanroom area of 250 sq. ft. or Class 1000 (ISO-6) semiconductor cleanroom project with a minimum area of 1000 sq. ft. during the last five (5) financial years. However, experiences of ISO-5 will be preferred. Further, at least one qualifying project shall demonstrate expertise in design, execution, integration, testing, commissioning, and validation of multiple cleanroom classifications including either of Class 100,000 (ISO-8), Class 10,000 (ISO-7), or Class 1000 (ISO-6), with Class 100 (ISO-5) within a single integrated facility layout, in line with IIT (BHU), VARANASI cleanroom operational requirements. Documentary evidence including work orders, completion certificates, validation reports, and satisfactory performance certificates issued by IITs, IISc, Government Institutes of Eminence, ISRO, DRDO, BARC and CSIR Laboratories shall be submitted along with the bid, failing which the bid shall not be considered for technical evaluation.
5. **Local Service Support:** The bidder shall maintain an operational office/service support facility in Varanasi District for a minimum period of two (2) years covering warranty and operational support obligations from the date of award of contract. In case the bidder does not have an existing office in Varanasi at the time of bid submission, an undertaking shall be submitted confirming establishment of the office within one month from the date of award of contract.
6. **Scope of Qualifying Projects, Mandatory Design and Detailing Submissions:** The bidder shall possess capability for preparation and submission of complete conceptual design, detailed engineering, coordinated layouts, technical calculations, and execution drawings for semiconductor-grade cleanroom facilities including the following mandatory deliverables:

- Basic Civil Layout with Sectional Drawings

- Conceptual Cleanroom Design & Architectural Layout Drawings
- HVAC Heat Load Calculation Sheets for individual laboratories along with Room Data Summary Sheets
- Airflow Schematics indicating Supply Air, Return Air, Cooling TR, and Condensing Unit Schematics
- AHU Zoning Layouts
- Room Pressure Zoning Layouts
- Temperature & Relative Humidity (RH) Zoning Layouts
- Cleanroom Classification Zoning Layouts
- Single-Line Duct Routing Layouts with AHU Positioning
- GA Drawings of Cleanroom Equipment including Dynamic Pass Boxes, Air Showers, Garment Cabinets, and associated systems
- Electrical Single Line Diagrams (SLD), Electrical Load Calculations, and Cable Schedules
- High Purity Gas Distribution Layouts including Manifold Drawings
- Exhaust and Scrubber System Design Drawings
- Equipment GA Drawings and Utility Interfacing Layouts
- Utility and Ancillary Systems Conceptual Drawings/Layouts as applicable
- Unpriced BOQ with Technical Specifications and Package-wise Quantity Details
- Validation Planning, Testing, Balancing, Commissioning, and Qualification Methodology

The Institute may modify the final routing, utility locations, equipment positioning, or integration requirements during execution; however, the overall scope, intended functionality, and project quantities shall remain substantially as specified in the tender documents. The bidder shall be an independent turnkey cleanroom facilitator/integrator with direct responsibility for design, engineering, execution, integration, commissioning, and validation activities. Projects executed solely as subcontractor, trader, supplier, or limited-scope service provider without complete turnkey responsibility may not be considered for qualification purposes.

7. **Consortium or Joint Venture Restriction:** This tender is intended for selection of a single-point turnkey cleanroom integrator possessing independent technical, engineering, manufacturing, execution, commissioning, and validation capability. Accordingly:

- Consortium bids shall not be permitted
- Joint ventures formed for qualification purposes shall not be considered
- Experience of associate companies, subsidiaries, collaborators, partners, or consortium members shall not be combined for determining eligibility.

Only the direct experience, financial capability, technical credentials, and execution track record of the bidding entity itself shall be considered for qualification evaluation in order to ensure single-point accountability and minimized inter-vendor dependency throughout project execution, commissioning, validation, warranty, and post-installation support.

8. **Manufacturing Capability:** The bidder shall possess in-house manufacturing capability for major cleanroom components including:

- HVAC: Air Handling Units (AHU), Ducting Grills and Diffusers
- Modular Cleanroom Wall Panels, Ceiling panels, and Scientific Doors
- Cleanroom Air shower, Pass box, and Garment Cabinet

excluding standard OEM supplied components such as filters, motors, cooling coils, condensing units, compressors, and similar proprietary integration components. All bidder-manufactured items and supplied outdoor systems shall carry a minimum manufacturing warranty of two (2) years.

9. **Certifications:** The bidder shall possess valid certifications including ISO 9001:2015 Quality Management Certification and ISO 14644 Compliance Capability applicable to semiconductor-grade cleanroom engineering and manufacturing practices.
10. **Warranty and Documentation:** All supplied products, systems, and equipment shall be covered under comprehensive warranty for a minimum period of two (2) years from successful commissioning. The bidder shall provide the following for all materials and systems supplied under the project:
- OEM Test Certificates
 - Calibration Certificates
 - Warranty Certificates
 - Factory Inspection Reports
 - Product Data Sheets
 - Compliance Certificates
 - Validation/Satisfactory Reports
 - User manuals
 - Software(s) (if any) to be used should be covered under perpetual license
11. **Mandatory Submission Requirements:** Certificates/declarations as specified under Annexure-V, Annexure-VI, and Annexure-VII shall be submitted on the official letterhead of the bidder and uploaded along with the technical bid. Any tender in which the prescribed conditions are not fulfilled, incomplete information is furnished, mandatory documents are not submitted, false information is provided, or conditional deviations/rebates are introduced shall be summarily rejected without further consideration.
12. **Project Execution Methodology:** The successful bidder shall submit a detailed project execution methodology including following for the execution of the complete facility:
- PERT/CPM/GANTT Charts
 - Engineering Schedule
 - Manufacturing Timeline
 - Installation Sequence
 - Integration Methodology
 - Validation Procedures
 - Commissioning Plan
 - Manpower Deployment Schedule
 - Training to IIT (BHU) team
13. **Mandatory site visit:** The bidder shall mandatorily inspect the project site (Department of Electronics Engineering, IIT (BHU), Varanasi) during working days and working hours prior to pre-bi meeting and submission of bids in order to familiarize themselves with the actual site conditions, utility availability, access conditions, execution constraints, and project requirements. Participation/Site Visit Confirmation Form duly signed by the authorized representative of the bidder and certified by the concerned department representative shall be mandatorily submitted along with the technical bid while uploading the tender documents.
- Note:** Bidders failing to attend the mandatory site visit and/or failing to upload the duly signed Participation/Site Visit Confirmation Form along with the technical bid shall be treated as technically non-responsive, and such bids shall not be considered for technical evaluation.
14. **AMC Experience for Complete Cleanroom Projects:** The bidder shall have prior experience in executing Annual Maintenance Contracts (AMC) or Comprehensive Annual Maintenance Contracts (CAMC) for complete turnkey cleanroom projects, including associated HVAC, electrical, gas distribution, and utility systems, in semiconductor-grade or equivalent controlled environments. Such experience shall be supported by relevant Purchase Orders, Work Orders, or Contract Agreements clearly indicating execution of maintenance services for fully operational

cleanroom facilities. The scope shall demonstrate capability in maintaining integrated systems ensuring continuous environmental control, contamination management, and system reliability. **Note:** The bidder shall submit valid documentary evidence including client certificates, performance reports, and reference details. Non-submission of adequate and verifiable documentation shall render the claim of AMC experience invalid for technical evaluation.

NOTE: THE BID OF THOSE BIDDERS WHO FAILS TO COMPLY THE ABOVE ESSENTIAL CRITERIA WILL NOT BE CONSIDERED FOR TECHNICAL EVALUATION.

Technical Evaluation Criteria for Design–Build Turnkey Semiconductor Cleanroom Facility

A. Experience Concept in Design–Build Turnkey Cleanroom Projects for semiconductor Facilities

Maximum Marks: 30

The bidder shall demonstrate proven experience in execution of Design–Build Turnkey Semiconductor Cleanroom Facilities including associated utilities, process infrastructure, ancillary systems, testing, commissioning, and validation during the last five (5) years. The scope of executed projects shall include:

- Cleanroom architectural systems
- HVAC and air management systems
- Semiconductor utility integration
- Electrical and control systems
- BMS/EMS integration
- Process utility systems
- Cleanroom testing, balancing, commissioning, and validation

Mandatory Experience should be on semiconductor facilities:

- Semiconductor Cleanroom AMC experience
- Projects executed for IITs, IISc, Government Institutes of Eminence, ISRO, DRDO, BARC, CSIR Laboratories.

Preference shall be given to bidders possessing:

- In-house multidisciplinary design engineering capability
- Indigenous manufacturing capability for cleanroom systems
- Experience in Semiconductor/MEMS/Nanofabrication facilities
- Experience in Class 100 (ISO-5) or better controlled environments

The bidder shall submit:

- Work orders and completion certificates
- Client satisfactory/performance certificates
- Validation and testing reports
- Project descriptions highlighting design philosophy and execution methodology
- Equipment and systems make list
- AMC/work support experience certificates, wherever applicable

Marks Allocation

Criteria	Marks
One Design–Build Class 100 (ISO Class 5) Semiconductor Cleanroom Project with 250 sq.ft. area with Satisfactory /Performance certificate (Mandatory)	10

Two or More Design–Build Class 100 (ISO Class 5) Semiconductor Cleanroom Projects 250 sq.ft. area with Satisfactory /Performance certificate	10
AMC / Post-Commissioning Semiconductor Cleanroom Support Experience with Satisfactory /Performance certificate	10
Total	30

B. Financial Turnover and Organizational Capability

Maximum Marks: 20

The bidder shall demonstrate adequate financial strength, organizational capability, technical manpower availability, and multidisciplinary in-house execution capability suitable for execution of turnkey semiconductor-grade cleanroom facilities such as Cleanroom engineering design, Manufacturing capability suitable for customization, Project execution, System integration and Commissioning & documentation

Eligibility Requirements

- Minimum annual turnover of ₹5 Crores in each of the last three (3) financial years (2023–24, 2024–25, and 2025–26)

Documents Required

Audited financial statements for last three (3) financial years (2023–24, 2024–25, and 2025–26)

- CA-certified turnover certificates for Compliance of Financial and Statutory Eligibility Criteria **(10 Marks)**
- Documents required for Organizational capability
- Project organizational chart **(2.5 Marks)**
- HR/manpower declaration on company letterhead **(2.5 Marks)**
- Capability statement **(2.5 Marks)**
- PERT/CPM/GANTT execution schedule **(2.5 Marks)**

Marks Allocation

Criteria	Marks
Compliance of Financial and Statutory Eligibility Criteria	10
Organizational capability	10
Total	20

Technically qualified bidders shall deliver a detailed technical presentation demonstrating their capability to design, engineer, execute, integrate, commission, validate, and hand over a turnkey semiconductor-grade cleanroom facility from conceptual design stage through final commissioning before a Technical Evaluation Committee.

Scope of Design, Engineering and Detailed Drawings for Turnkey Cleanroom Facility

1. General Layout and Facility Planning

The Vendor shall prepare and submit:

- Basic conceptual facility layout drawings indicating process flow, personnel flow, material flow, zoning, and room allocations.
- Necessary sectional drawings and elevations for complete understanding of the facility arrangement.
- Plant room layout drawings showing HVAC equipment, utility equipment, service corridors, and maintenance access provisions.
- Sectional drawings of plant rooms indicating equipment positioning, service clearances, and utility routing.
- Coordinated master layout drawings integrating architectural, HVAC, electrical, and utility requirements.

2. Modular Cleanroom Architectural Systems

The Vendor shall provide:

- Detailed cleanroom architectural layout drawings including room dimensions, classifications, and construction details.
- Reflected Ceiling Plan (RCP) showing supply air terminals, return air locations, lighting fixtures, HEPA filters, and ceiling accessories.
- Detailed wall panel layout drawings indicating panel types, joints, openings, and construction details.
- Ceiling panel, return air riser panel, and cleanroom envelope construction drawings.
- Scientific door, emergency exit door, vision panel, and hardware details including General Arrangement (GA) and construction drawings.

3. HVAC and Environmental Control Systems

The Vendor shall provide:

- Room Data Sheets indicating room classification, temperature, humidity, pressure differentials, air changes, and room-wise heat load calculations.
- Airflow schematic diagrams showing supply air, return air, fresh air, exhaust air, infiltration, and exfiltration calculations.
- AHU distribution schematics indicating airflow quantities, TR capacities, filtration stages, and system configuration.
- Zoning drawings showing AHU zoning, temperature zoning, humidity zoning, pressure cascade, and cleanroom classification zoning.
- Single-line ducting layouts for supply air and return air systems.
- AHU General Arrangement (GA) drawings with technical specifications, capacities, filtration arrangements, and approved makes.

4. Cleanroom Equipment Systems

The Vendor shall provide:

- Detailed fabrication and GA drawings for stainless steel shoe racks, crossover benches, tables, chairs, and other cleanroom furniture.
- General Arrangement drawings for 2-way Dynamic Pass Boxes.
- General Arrangement drawings for 3-way Dynamic Pass Boxes.
- General Arrangement drawings for 3-way Air Showers.
- General Arrangement drawings for Dynamic Garment Cabinets including dimensions, construction details, and proposed makes.

5. Electrical Systems

The Vendor shall provide:

- Room-wise electrical design data sheets showing single-phase power, three-phase power, raw power, UPS power, lighting, and socket requirements.
- Electrical load summary indicating room-wise equipment loads and utility loads.
- Electrical distribution block diagrams showing complete power distribution philosophy.
- Single-Line Diagrams (SLD) for Main MVP Panel, UPS Panel, HVAC Panel, and associated distribution boards.
- General Arrangement drawings of all electrical panels including ratings, components, and installation details.
- Cable schedules, cable sizing calculations, protection schemes, and distribution board details.
- Lighting and switch socket positioning layouts for all rooms and service areas.

6. Utility, ELV & Safety Systems

The contractor shall prepare:

- Utility distribution layouts for process gases, compressed air, vacuum, exhaust, and other services as specified.
- Access Control System layout drawings and system architecture.
- Fire Alarm System layout drawings and device positioning plans.
- CCTV System layout drawings including camera locations and monitoring architecture.
- Utility General Arrangement drawings and detailed routing plans.
- Earthing and grounding system construction drawings including earthing pits, conductors, and connection details.

7. Technical Documentation and Unpriced BOQ

Unpriced Bill of Quantities (BOQ)

- Package-wise detailed BOQ including technical specifications, quantities, capacities, material descriptions, and scope of supply for all systems.

Technical Datasheets and Product Catalogues

- Manufacturer catalogues, technical datasheets, proposed makes, model numbers, performance data, and compliance certificates for all major equipment and materials.
- Validation Documentation and Project Execution Methodology.
- Sample formats for DQ, IQ, OQ, PQ, FAT, SAT, commissioning protocols, validation reports, project execution methodology, quality assurance plan, installation procedures, and project implementation schedule.

Marks Allocation

Criteria	Marks
Conceptual Design and Engineering Approach	20
Utilities Integration and System Detailing	10
IIT (BHU), VARANASI Project BOQ, Engineering Detailing and Technical Presentation	20
Total	50

Financial Bid Assessment

Financial Evaluation (Quality Protection Clause)

Considering the specialized nature of Design-Build Turnkey Semiconductor Cleanroom Facilities, the Institute reserves the right to ensure that the selected bidder possesses adequate technical capability, project understanding, execution capacity, and financial viability.

- Only bidders obtaining a minimum of 70 marks out of 100 in Technical Evaluation shall be considered technically qualified for opening of the Financial Bid.
- Financial bids shall be evaluated on Lowest Price (L1) basis among technically qualified bidders only.
- If the quoted price of the L1 bidder is found abnormally low compared with estimated project cost, engineering scope, BOQ quantities, or prevailing market benchmarks, the Institute may:
 1. Seek detailed technical and commercial justification from the bidder.
 2. Evaluate feasibility of execution against the proposed scope and technical specifications.
 3. Reject the financial bid if satisfactory justification is not provided.

The Institute may additionally consider the following while determining responsiveness of the financial bid:

- Technical depth of BOQ detailing
 - Proposed system makes and specifications
 - Engineering methodology
 - Project execution capability
 - Compliance with tender requirements
-
- If the L1 bidder is found incapable of executing the project satisfactorily, the Institute reserves the right to reject the bid and cancel the issued purchase order and or re-tender the work.
 - The decision of the Institute shall be final and binding on all bidders.

2. Documents Comprising the Bid

The tender/Bid shall be submitted online in two parts: Technical Bid and Commercial Bid.

I. Technical Bid

The following documents are to be scanned and uploaded as part of the Technical Bid as per the tender document:

- (a) Scanned copy of Tender Forms (Techno Commercial Un-Priced Bid), Declaration, Bidder's Information Form, and Tender Acceptance Letter.
- (b) Scanned copy of proof for submission of Tender Document Fee/ Earnest Money Deposit/Exemption Certificate, if any etc.
- (c) Scanned copy of written confirmation authorizing the signatory of the Bid to commit the Bidder.
- (d) Scanned copy of Firm/Party/Bidder Business profile / presentation/ Boucher along with all technicalities should be attached.

- (e) Scanned copy of completely filled Annexure III with supporting documents
- (f) Scanned copy of Technical Bid and essential Pre-bid Details, if any.
 - i. Scanned copy of documentary evidence establishing Bidder's qualifications to perform the contract if its bid is accepted and the Bidder's eligibility to bid.
 - ii. Scanned copy of documentary evidence, that the Goods and Related Services to be supplied by the Bidder are of eligible origin and conform to the Bidding Documents.
- (g) Scanned copy of Checklist, compliance of Essential pre-bid criteria and Technical Compliance Sheet (Annexure II) and any other document required as per the tender.

II. Commercial Bid

The commercial bid comprises of:

- (a) Scanned copy of Tender Form (Price Bid)
- (b) Price bid in the form of .xls format and to be uploaded in .xls and signed .pdf format.

The Price bid format is provided as .xls format along with this Tender Document at <https://eprocure.gov.in/eprocure/app>. Bidders are advised to download this .xls format and quote their offer/rates in the prescribed column.

3. Installation & Demonstration

The supplier is required to complete the installation and demonstration of the equipment within 10 months after awarding the tender from IIT (BHU) site, otherwise the penalty clause will be the same as per the supply of materials

In case of any mis-happening/damage to any equipment and supplies during the carriage of supplies from the origin of equipment to the installation site, the supplier has to replace it with new equipment/supplies immediately at his own risk. Supplier will settle his claim with the insurance company as per his convenience. IIT (BHU) will not be liable to any type of losses in any form.

4. Application Specialist

The Tenderer should mention in the Techno-Commercial bid the availability and names of Application Specialist and Service Engineers in the nearest regional office.

5. Spares

The Supplier is required to provide state availability of spares for ten years, if required.

6. Training of Personnel

The supplier shall be required to undertake to provide the technical training to the personnel (s) involved in the use of the cleanroom facility at the Institute premises, immediately after completing the installation of the cleanroom project for a minimum period of one month at the supplier's cost.

7. User List

The bidder must provide the list of users where they have deployed similar work in last 05 financial years in prescribed format of Annexure III.

8. Manuals/Documents

One set of hard copy and one set of soft copy in English (preferred as following).

- a. Operating manual
- b. Servicing & Maintenance manual
- c. Spare parts list with source of supply and prices
- d. Pre-installation requirements.

9. Services

Vendor must submit Factory Acceptance Test procedure supported with relevant printed literature and certificates.

10. The Tender document should also indicate what kind of service/maintenance is required for the system.

Whether this service has to be carried out by a company engineer or it can be carried by trained service personnel within India. The frequency of visit and the charges should be mentioned.

11. The Tender should be enclosed with proper certifications like **Authorization Certificate** and **Proprietary Certificate** (in case of Proprietary items).
12. Pre-installation site preparation/inspection requirements to be indicated and specified along with the bid.
13. Bid should include FOR IIT(BHU) Varanasi prices. The Institute will provide requisite certificate, if any, required by the bidder as per the applicable Govt. of India norms.
14. The vendor to provide compliance statement with respect to each technical specification in the tender document duly supported by the manufacturer's literature. Any other claim will not be accepted and may lead to rejection of the bid.
15. Printed literature in support of compliance to the prescribed specifications is to be submitted.
16. Compliance report needs to be submitted as a part of the technical bid.
17. Exemption is allowed from payment of Tender processing fees as per Government of India norms against submission of currently valid certificate specifically for the item(s) proposed to be procured through this Tender.
18. It is mandatory for bidders to quote items having local content minimum 20%. Refer revised Public Procurement (Preference to Make in India), Order 2017, No. P-45021/2/2017-PP (B.EII) dated 16.09.2020 issued by DPIIT, Ministry of Commerce and Industry, Govt. of India. (Submit duly filled Annexure VII for the same). The Annexure VII once submitted in the Technical Bid will be final. Submission of Revised Annexure VII will NOT be accepted. As per OM of DPIIT, Ministry of Commerce and Industry, Govt. of India No. P-45021/102/2019- BE-II- Part (1) (E-50310) Dated 04.03.2021, Bidders offering Imported products will fall under the category of Non-Local Suppliers. They cannot claim themselves as Class-I or Class-II Local Suppliers by claiming the services such as Transportation, Insurance, Installation, Commissioning, Training and After Sale Service Support like AMC/ CMC etc. as Local Value Addition.
19. As per the Government of India Order, only "Class-I Local Suppliers" and "Class-II Local Suppliers" can participate in this tender.
20. 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 VI. 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 as mentioned. A certificate shall be submitted by bidders in the tender documents regarding their compliance with the said order. If the certificate submitted by a bidder whose bid is accepted is found to be false, this would be a ground for immediate termination and further legal action in accordance with law. Annexure VI.
21. Defective Equipment: If any of the equipment supplied by the Tenderer is found to be substandard, refurbished, un-merchantable or not in accordance with the description/specification or otherwise faulty, the committee will have the right to reject the equipment or its part. The prices of such equipment shall be refunded by the Tenderer with 18% interest if such payments for such equipment have already been made. All damaged or unapproved goods shall be returned at suppliers cost and risk and the incidental expenses incurred thereon shall be recovered from the supplier. Defective part in equipment, if found before installation and/or during warranty period, shall be replaced within 30 days on receipt of the intimation from this office at the cost and risk of supplier including all other charges. In case supplier fails to replace above item as per above terms & conditions, IIT (BHU) may consider "Banning" the supplier.
22. Since the requirement of this tender is very specific and critical, therefore, no relaxation shall be given

for previous experience, previous work execution, financial eligibility etc.

IMPORTANT NOTE

1. Non-compliance of tender terms, non-uploading of required documents, lack of clarity of the specifications, contradiction between bidder specifications and supporting literature etc. may lead to rejection of the bid.
2. In the tender, either the Indian agent on behalf of the Principal/OEM or Principal/OEM itself can bid but both cannot bid simultaneously for the same item/product in the same tender.
3. If an agent submits bid on behalf of the Principal/OEM, the same agent shall not submit a bid on behalf of another Principal/OEM in the same tender for the same item/product.

SECTION 5: CHECKLIST FOR BID/TENDER UPLOADING**(The following check-list must be filled in and uploaded with the bid documents)**

S. No.	Particulars Techno Commercial Unpriced Bid (Cover 1)	Yes/No
1	Have you uploaded the techno commercial unpriced bid form duly filled in appropriately?	
2	Have you uploaded a copy of the last three financial years audited balance sheet and P & L Account of your firm?	
3	Have you attached the details of the income tax clearance certificate, proof of manufacturing unit/ dealership letter/ general order suppliers and copy of GST registration certificate?	
4	Do you possess proven experience in execution of complete turnkey semiconductor cleanroom projects from concept design through commissioning, validation, and handover for Semiconductor Facilities. The bidder shall have successfully completed at least one (1) turnkey Class 100 (ISO-5) cleanroom projects having a minimum cleanroom area of 250 sq. ft. or Class 1000 (ISO-6) semiconductor cleanroom project with a minimum area of 1000 sq. ft. during the last five (5) financial years. However, experiences of ISO-5 will be preferred. Further, at least one qualifying project shall demonstrate expertise in design, execution, integration, testing, commissioning, and validation of multiple cleanroom classifications including either of Class 100,000 (ISO-8), Class 10,000 (ISO-7), or Class 1000 (ISO-6), with Class 100 (ISO-5) within a single integrated facility layout, in line with IIT (BHU), VARANASI cleanroom operational requirements. Documentary evidence including work orders, completion certificates, validation reports, and satisfactory performance certificates issued by IITs, IISc, Government Institutes of Eminence, ISRO, DRDO, BARC, and CSIR Laboratories shall be submitted along with the bid, failing which the bid shall not be considered for technical evaluation.	
5	Have you submitted DD/transferred online Tender Processing Fee asked for and Bid Securing Declaration Form as EMD separately and uploaded their proof of submission?	
6	Have you enclosed the schedule of requirement indicating the make offered without indicating the pricing components along with the techno commercial unpriced bid?	
7	Have you uploaded the bids both techno commercial unpriced and priced bid separately for the tender?	
8	Have you enclosed the statement of deviations from financial terms and conditions, if any?	
9	Have you submitted the Technical Compliance Sheet?	
10	Have you attached the compliance of Essential Pre-Bid criteria?	
11	Have you attached a notarized affidavit that bidder has never been black-listed along with the technical Bid under cover 1?	
12	Have you attached the Declaration on the letter pad of Bidder?	
13	Have you attached the signed Tender acceptance letter?	
Price Bid (Cover 2)		
1	Have you signed and uploaded the priced bid form?	
2	Have you uploaded the schedule of requirements duly priced i.e., BOQ and its pdf version?	

NOTE: While arranging the Tender Documents, check list should be placed on TOP.

COMPLIANCE SHEET OF ESSENTIAL PRE-BID CRITERIA (for details refer Page No. 23-25)

S.NO.	Terms and Conditions (as per Pre-Essential Criteria)	Complied (Yes/No)	Page No.
1.	Blacklisting Declaration		
2.	OEM Authorization		
3.	Financial Eligibility		
4.	Technical Experience		
5.	Local Service Support		
6.	Scope of Qualifying Projects, Mandatory Design & Detailing Submissions		
7.	Consortium or Joint Venture Restriction		
8.	Manufacturing Capability		
9.	Certifications		
10.	Warranty and Documentation		
11.	Mandatory Submission Requirements		
12.	Project Execution Methodology		
13.	Mandatory site visit		
14.	AMC Experience for Complete Cleanroom Projects		

All documents in support of above essential pre-bid criteria shall be scanned and uploaded under cover 1.

Signature of the Authorized Person

Date: -----

Full Name -----

Place: -----

Company Address with Seal

SECTION 6: DECLARATION
(On the letter head of the firm submitting the bid)

1. I, ----- Son /Daughter of Shri-----
----- Proprietor/ Partner/ CEO /MD/ Director/
Authorized Signatory of M/s----- am competent to sign this
declaration and execute this tender document.
2. I have carefully read and understood all the terms and conditions of the tender and hereby convey my
acceptance of the same.
3. The information/ documents furnished along with the above application are true and authentic to the
best of my knowledge and belief.
4. I/ we/ am are well aware of the fact that furnishing of any false information/ fabricated document would
lead to rejection of my tender at any stage besides liabilities towards prosecution under appropriate
law.
5. Each page of the tender document and papers submitted by my Company is authenticated, sealed and
signed, and I take full responsibility for the entire documents submitted.
6. This is certified that our organization has been authorized (Copy attached) by the OEM to participate
in Tender. We further certified that our organization meets all the conditions of eligibility criteria laid
down in this tender document. Moreover, OEM has agreed to support on regular basis with technology
/product updates and extend support for the warranty.
7. The prices quoted in the price bids are subsidized due to academic discount given to IIT (BHU)
Varanasi.
8. We, further specifically certify that our organization has not been Blacklisted/De Listed or put to any
Holiday by any Institutional Agency/Govt. Department/Public Sector Undertaking in the last three
years.

Signature of the Authorized Person

Date: -----

Full Name -----

Place: -----

Company Address with Seal

SECTION 7: TENDER FORM

(Techno commercial un-priced Bid)
(On the letter head of the firm submitting the bid)

Tender No.

To,
Head of the Department
Department of Electronics Engineering
IIT (BHU) Varanasi
Varanasi - 221005, Uttar Pradesh, India

Dear Sir,

1. I/We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders;
2. I/We meet the eligibility requirements and have no conflict of interest;
3. I/We have not been suspended nor declared ineligible in India;
4. I/We offer to supply in conformity with the Bidding Documents and in accordance with the Delivery Schedules specified in the Schedule of Requirements the following Goods: *[insert a brief description of the Goods and Related Services]*
5. I/We offer to supply the items as listed in the schedule to this tender hereto/portion thereof as you may specify in the acceptance of Tender at the price given in the said Schedule and agree to hold this offer open for a period of..... days from the date of opening of the tender.
6. I/we shall be bound by a communication of acceptance issued by you.
7. I/We have understood the Instruction to bidders and Conditions of Contract in the form as enclosed with the invitation to the tender and have thoroughly examined the specifications quoted in the Schedule hereto and am/are fully aware of the nature of the goods required and my/our offer is to supply the goods strictly in accordance with the specifications and requirements.
8. A proof of payment of Rs..... (Rupees.....only) as Tender Processing Fee in the aforementioned account of Registrar, IIT (BHU).
9. The following have been added to form part of this tender.
 - (a) Schedule of requirements, quoting the make only duly signed and stamped. (without indicating price)
 - (b) Income Tax clearance certificate.
 - (c) Copy of last audited balance sheet.
 - (d) Copy of Valid GST registration certificate.
 - (e) Copy of similar relevant major purchase orders executed during last three (3) financial years (2023–24, 2024–25, and 2025–26) in IITs, IISc, Government Institutes of Eminence, ISRO, DRDO, BARC, CSIR Laboratories
 - (f) Proof of manufacturing Unit, dealership certificate/general order suppliers.
 - (g) Statement of deviations from financial terms & conditions, if any.
 - (h) Any other enclosure. (Please give details)
10. We undertake to execute all orders which have been placed to meet emergent requirements on priority basis.

11. Certified that the bidder is:

(a) A sole proprietorship firm and the person signing the bid document is the sole proprietor/constituted attorney of the sole proprietor,

Or

(a) A partnership firm, and the person signing the bid document is a partner of the firm and he has authority to refer to arbitration disputes concerning the business of the partnership by virtue of the partnership agreement/by virtue of general power of attorney.

Or

(b) A company and the person signing the document is the constituted attorney.

(NOTE: Delete whatever is not applicable. All corrections/deletions should invariable be duly attested by the person authorized to sign the bid document).

12. We do hereby undertake that, until a formal notification of award, this bid, together with your written acceptance thereof shall constitute a binding contract between us.

13. If our bid is accepted, we commit to obtain performance security in accordance with the Bidding Documents.

14. We are not participating, as a Bidder or as a subcontractor, in more than one bid in this bidding process, other than alternative bids submitted.

15. We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in any type of fraud and corruption.

Name of the Bidder*

Name of the person duly authorized to sign the Bid on behalf of the Bidder**

Title of the person signing the Bid

Signature of the person named above

Date signed day of

* In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder

** Person signing the Bid shall have the power of attorney given by the Bidder to be attached with the Bid Schedules.

Yours faithfully,

(Signature of bidder)

Dated this day of

Address:

Telephone No.:

FAX

E-mail

Company seal

(Priced Bid)
(On the letter head of the firm submitting the bid)

Tender No.

To,
Head of the Department
Department of Electronics Engineering
IIT (BHU) Varanasi
Varanasi - 221005, Uttar Pradesh, India

Dear Sir,

Having examined the bidding documents and having submitted the techno commercial unpriced bid for the same, we, the undersigned, hereby submit the priced bid for supply of goods and services as per the schedule of requirements and in conformity with the said bidding documents.

1. We hereby offer to supply the Goods/Services at the prices and rates mentioned in the enclosed schedule of requirement.
2. We do hereby undertake that, in the event of acceptance of our bid, the supply of Goods/Services shall be made as stipulated in the schedule of requirement and that we shall perform all the incidental services.
3. The prices quoted are inclusive of all charges net F.O.R IIT (BHU) Varanasi. We enclose herewith the complete Price Bid as required by you. This includes:
 - (a) Price Schedule (Bill of Quantity - BOQ) in .pdf format and .xls format
 - (b) Statement of deviations from financial terms and conditions, if any.
4. We agree to abide by our offer for a period of 90 days from the date fixed for opening of the bid documents and that we shall remain bound by a communication of acceptance within that time.
5. We have carefully read and understood the terms and conditions of the bid document, and we do hereby undertake to supply as per these terms and conditions. The Financial Deviations are only those mentioned in the statement of deviations from financial terms and conditions.
6. We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract: **[insert complete name of each Recipient, its full address, the reason for which each commission or gratuity was paid and the amount and currency of each such commission or gratuity]**

Name of Recipient	Address	Reason	Amount

(If none has been paid or is to be paid, indicate “none.”)

7. We understand that this bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed; and
8. We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive.

Certified that the bidder is:

A sole proprietorship firm and the person signing the bid document is the sole proprietor/ constituted attorney of sole proprietor,

Or

A partnership firm, and the person signing the bid document is a partner of the firm and he has authority to refer to arbitration disputes concerning the business of the partnership by virtue of the partnership agreement/by virtue of general power of attorney,

Or

A company and the person signing the bid document is the constituted attorney.

(NOTE: Delete whatever is not applicable. All corrections/deletions should invariably be duly attested by the person authorized to sign the bid document.)

We do hereby undertake that, until a formal notification of award, this bid, together with your written acceptance thereof, shall constitute a binding contract between us.

Dated this day of

Signature of Bidder

Details of enclosures

Full Address:

.....

Telephone No.

Mobile No.

Fax No.

E-mail:

Company Seal

BIDDER INFORMATION FORM

Date:

ADVT. No.:

1. Bidder's Name:

2. In case of JV, legal name of each member: *[insert legal name of each member in JV]*

3. Bidder's actual or intended country of registration:

4. Bidder's year of registration:

5. Bidder's Address in country of registration:

6. Bidder's Authorized Representative Information

Name:

Address:

Telephone/Fax:

Email:

Address:

7. Attached are copies of original documents of *[check the box(es) of the attached original documents]*

☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of the legal entity named above.

☐ In case of JV, letter of intent to form JV or JV agreement.

☐ In case of Government-owned enterprise or institution, documents establishing:

- Legal and financial autonomy
- Operation under commercial law
- Establishing that the Bidder is not dependent agency of the Purchaser

Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

TENDER ACCEPTANCE LETTER

(To be given on Company Letter Head)

Date:

**To,
Head of the Department**

**Department of Electronics Engineering,
IIT(BHU), Varanasi
Varanasi - 221005, Uttar Pradesh, India**

Sub: Acceptance of Terms & Conditions of Tender.

Tender Reference No.

Name of Tender/ Work:

.....
.....

Dear Sir,

1. I/We have downloaded/ obtained the tender document(s) for the above mentioned 'Tender/Work' from the web site(s) namely:
.....
as per your advertisement, given in the above-mentioned website(s).
2. I/We hereby certify that I/We have read the entire terms and conditions of the tender documents from Page No. to (including all documents like section(s), schedules(s) etc.), which form part of the contract agreement and I/we shall abide hereby by the terms/conditions/ clauses contained therein.
3. The corrigendum(s) issued from time to time by your department/ organization too have also been taken into consideration, while submitting this acceptance letter.
4. I/We hereby unconditionally accept the tender conditions of above-mentioned tender document(s)/ corrigendum(s) in its totality/entirety.
5. In case any provisions of this tender are found violated, then your department/ organization shall without prejudice to any other right or remedy be at liberty to reject this tender.

Yours faithfully,

(Signature of the Bidder, with Official Seal)

FORMAT FOR PERFORMANCE BANK GUARANTEE (PBG)/
PERFORMANCE SECURITY

(To be typed on non-judicial stamp paper of the value of Indian Rupees of One Hundred)

[To Be Established Through Any of the Nationalized Commercial Banks (Whether situated at Varanasi or Outstation) with A Clause to Enforce the Same on Their Local Branch at Varanasi]

To,
The Registrar
Indian Institute of Technology (BHU) Varanasi
Varanasi – 221005, Uttar Pradesh, India

LETTER OF GUARANTEE

WHEREAS Indian Institute of Technology (BHU), Varanasi (Buyer) has invited tender vide Tender No..... dated..... for purchase of AND WHEREAS the said tender document requires that eligible successful bidder (seller) wishing to supply the equipment / machinery, etc. in response thereto shall establish an irrevocable Performance Bank Guarantee in favour of “The Registrar, Indian Institute of Technology (BHU) Varanasi” in the form of Bank Guarantee for Rs. (5 % of the contract value) and the Performance Bank Guarantee shall remain valid for a period of 60 (sixty) days beyond the date of completion of all contractual obligations of the seller, including warranty obligations from the date of issue of Performance Bank Guarantee and the eligible successful bidder (the seller) shall submit the same within 14 (Fourteen) days from the date of Award of Contract.

NOW THIS BANK HEREBY GUARANTEES that in the event of the said bidder (seller) fails to abide by any of the conditions referred to in tender document / Award of Contract / performance of the equipment / machinery, etc. this Bank shall pay to Indian Institute of Technology (BHU), Varanasi on demand and without protest or demur Rs. (Rupees.).

This Bank further agrees that the decision of Indian Institute of Technology (BHU) Varanasi (Buyer) as to whether the said bidder (Seller) has committed a breach of any of the conditions referred in tender document / Award of Contract shall be final and binding.

We,.....(Name of the Bank & branch) hereby further agree that the Guarantee herein contained shall not be affected by any change in the constitution of the bidder (Seller) and/ or Indian Institute of Technology (BHU), Varanasi (Buyer). **Notwithstanding anything contained herein:**

1. Our liability under this Bank Guarantee shall not exceed Rs. (Indian Rupees only).
2. This Bank Guarantee shall be valid up to..... (date) and
3. We are liable to pay the guaranteed amount or any part thereof under this bank guarantee only and only if IIT (BHU), Varanasi serve upon us a written claim or demand on or before (date). This Bank further agrees that the claims if any, against this Bank Guarantee shall be enforceable at our branch office at situated at (Address of local branch).

Yours truly,

Signature and seal of the guarantor:

Name of Bank:

Address:

Date:

SECTION 8

ANNEXURE I

TECHNICAL SPECIFICATIONS

Bidders are requested to refer Annexure I (a) (attached in the end of the tender document) for detailed technical specifications for Establishment of Advanced Semiconductor Processing Cleanroom Facility on Turnkey Basis including Design, Engineering, Supply, Installation, Integration & Commissioning at Department of Electronics Engineering, IIT (BHU), Varanasi. Bidders can also refer to Annexure I (b) as a reference for detailed technical specifications for electrical works.

TERMS AND CONDITIONS

- 1- Work should be completed **within 10 months** from the date issue of purchase order.
- 2- Tender Uploaded Details: The tender document includes conceptual drawing for the proposed cleanroom facility indicating room-wise layout and classification. The drawings provide details of cleanroom zoning, room-wise dimensions along with total area in square feet, and the required environmental parameters including differential room pressures, temperature, and relative humidity requirements for each designated area. The documentation further specifies room-wise electrical load distribution, including connected electrical capacities and power requirements for individual cleanroom zones and associated utility areas. In addition, the drawings include details of process and utility systems, including gas distribution requirements and associated interfacing with electrical and control systems, to ensure proper integration of cleanroom infrastructure in accordance with the specified design and operational requirements. The sole responsibility about efficiency of equipment rest with the contractor. If any defect is noticed during the guarantee/warranty period, the contractor shall rectify it within 15 days of receipt of intimation of defects in the work. If the defects pointed out are not attended to within the specified period, the same will be got done from another agency at the risk and cost of contractor.
- 3- Pre-Bid Meeting & Mandatory Site Visit: A Pre-Bid Meeting shall be conducted at IIT (BHU), Varanasi, as per timeline mentioned in the critical datasheet. Attendance at the Pre-Bid Meeting and physical site visit is MANDATORY for all prospective bidders. During the site visit, bidders shall assess and familiarize themselves with site conditions including but not limited to infrastructure availability, space constraints, access routes, utility provisions (power, water, drainage), environmental conditions, and structural limitations impacting design and execution. A signed declaration confirming complete understanding of site conditions and technical requirements shall be submitted along with the technical bid. Failure to submit the same shall render the bid non-responsive. No claims regarding additional cost or time extension due to site conditions shall be entertained after award of contract.

- 4- The executed projects shall pertain to applications such as:

- Semiconductor fabrication facilities
- MEMS facilities
- Nano-fabrication laboratories
- Microelectronics manufacturing facilities
- Advanced R&D cleanroom facilities
- Multinational Precision manufacturing environments

The bidder shall additionally possess minimum two (2) years of experience as an independent turnkey cleanroom facilitator/integrator with direct responsibility for Design, Engineering, Detailing, Manufacturing, Execution, Integration commissioning, and validation activities.

Note: Projects executed solely in the capacity of subcontractor, supplier, or limited-scope service provider without complete turnkey responsibility may not be considered for qualification purposes.

- 5- Submission of Work Orders & Supporting Documents: The bidder shall submit documentary evidence in support of the similar works claimed for eligibility and evaluation purposes. The supporting documents shall mandatorily include, but not be limited to:
 - Purchase Orders (POs)
 - Tender Documents/Technical Specification Documents
 - Contract Agreements
 - Completion Certificates
 - Performance Certificates
 - Validation Reports
 - SAT/FAT Reports, wherever applicable
 - Client reference details and contact information

The submitted documentation shall clearly establish the following:

- Complete project scope and nature of work executed
- Cleanroom classification achieved (ISO 14644 / Class 100 or equivalent)
- Utility and infrastructure integration scope
- Contract value and execution responsibility
- Date of commencement and completion
- Performance acceptance and operational status
- Turnkey execution responsibility of the bidder

The Employer reserves the right to independently verify the authenticity, correctness, and completeness of the submitted credentials from the respective clients or issuing authorities. **Note:** Any discrepancy, incomplete information, or unverifiable claim shall render the bid liable for rejection

- 6- Satisfactory / Performance Certificates: Completion Certificates issued by the respective client organizations shall be mandatorily enclosed along with the bid submission. The certificates shall preferably include, but not be limited to, the following particulars:

- Project name and location
- Detailed scope of work executed
- Cleanroom classification achieved (as per ISO 14644 / Class 100 or equivalent)
- Date of completion and commissioning
- Performance status of installed systems
- Confirmation of successful handover and client acceptance
- Client satisfaction / performance remarks, wherever applicable

Note: Non-submission of valid and verifiable completion and performance documentation shall render the bid liable for rejection and disqualification from technical evaluation.

- 7- In-House Design/Manufacturing Facility: The bidder shall possess an established in-house manufacturing facility capable of manufacturing following cleanroom materials/components required for the project, including:

- Modular cleanroom infrastructure
- Cleanroom Equipment Air shower, Pass boxes etc.
- Air handling Units
- Air distribution systems
- Doors & vision panels
- Cleanroom furniture
- Structural framing systems
- Utility raceways
- Fabricated cleanroom accessories

The bidder shall submit:

- Factory details
- Manufacturing infrastructure information
- Machinery list
- Production photographs
- GST/Udyam/Factory registration documents
- Quality assurance procedures

This requirement is intended to ensure better quality control, standardized fabrication quality, faster project execution, reduced dependency on external vendors, improved supply-chain stability, and better coordination during installation and maintenance activities. The Employer reserves the right to inspect the manufacturing facility prior to award of work.

Other Terms

1. **Performance Bank Guarantee (PBG):** The successful bidder shall furnish a Performance Bank Guarantee (PBG) equivalent to five percent (5%) of the total Purchase Order (PO) value upon issuance of the Purchase Order, in accordance with the tender conditions. The PBG shall remain valid for the period stipulated in the Purchase Order and tender documents.
2. **Payment Terms:** The payment shall be released in the staggered mode as per following stages:
 - (i) 40% of the Purchase Order value shall be released against supply subject to receipt, inspection, verification, and satisfactory acceptance of the supplied materials by IIT BHU.
 - (ii) 20% of the Purchase Order value shall be released upon successful completion of installation of the supplied equipment and systems.
 - (iii) 25% of the Purchase Order value shall be released upon successful commissioning and acceptance of the complete system by IIT BHU.
 - (iv) The remaining 15% of the Purchase Order value shall be released after the two (2) months from the date of successful commissioning, subject to satisfactory performance of the system during the observation period and certification by IIT BHU.
3. Price of the facility should be quoted in Indian currency.
4. Price should be quoted F.O.R to IIT (BHU) Varanasi.
5. Custom Clearance will be the responsibility of the supplier.
6. **Indian agency commission:** Should be clearly stated in the financial bid in Indian currency.
7. **Penalty:** A penalty of 1% of the order value will be applied for late delivery of the goods for each week thereof subject to a maximum of 10%.
8. Pre-installation site preparation/inspection requirements to be indicated and specified along with the bid.
9. Warranty period to be clearly mentioned and should begin from the date of installation. **2-years comprehensive warranty on applicable equipment is required.**
10. The vendor to provide compliance statement with respect to each technical specification in the tender document duly supported by the manufacturer's literature. Any other claim will not be accepted and may lead to rejection of the bid.
11. Compliance report needs to be submitted as a part of the technical bid.
12. **Payment terms for AMC:** The payment during the AMC period shall be made on quarterly basis against satisfactory service report from IIT (BHU), Varanasi on receipt of bill from the vender after the completion of each quarter.

**Head of the Department
Department of Electronics Engineering
IIT (BHU) Varanasi
Varanasi - 221005, Uttar Pradesh, India**

TECHNICAL COMPLIANCE STATEMENT FOR CLEANROOM
(To be submitted by bidder duly filled, Refer Annexure I(a))

S.NO.	Criteria Points	Complied (Yes/No)	Page No.
	PART A: HVAC TECHNICAL SPECIFICATIONS		
1.	Approach methodology for achieving the required Class of Cleanliness		
1.1	General arrangements for construction of Modular Clean Room		
1.2	Supply Air Scheme		
1.3	Return Air Scheme		
1.4	Fabricated Return Air Raisers		
1.5	Recirculating Air Handlers		
1.6	Details of the Dedicated Air Handlers		
1.7	Dehumidified Air Quantity		
1.8	Fresh Air		
1.9	Air Velocity Criteria for Clean Air Distribution		
2.	AHU Zoning		
2.1	Cleanroom Temperature and Relative Humidity Control		
2.2	HEPA Filters		
2.3	Factory-Made Air-Cooled Condensing Units		
3.	Air Handling Units (AHUs)		
3.1	AHU-Cum-Dehumidification System for ISO-5 Portion of Cleanroom		
4.	Duct Heaters, Humidifiers and Pre-Cooling Coils		
4.1	Cleanroom Compatible Ducting System		
4.2	Duct Insulation-Scope, Material, Properties and Installation		
4.3	Fire Dampers, Dampers, Return Air Raisers, Grilles, and Accessories		
	PART B: TECHNICAL SPECIFICATION FOR CLEANROOM FABRICS		
1.	Cleanroom Compatible Modular Wall Panels (ISO-5, ISO-6 & ISO-8)		
2.	Walkable False Ceiling Panels		
2.1	ISO-6 & ISO-8 Cleanroom Ceiling System		
2.2	ISO-5 (Class 100) Walkable Ceiling System		
3.	Modular Cleanroom Doors		
4.	Emergency Doors		
5.	Cleanroom Glazed View Panels		
6.	Covings for Clean Rooms		
7.	Cladding of Vertical Pillars Inside Cleanrooms		
8.	ESD Conductive Flooring System for Cleanroom Lab Areas		
8.1	Antistatic Vinyl Flooring		

8.2	Raised Floor System		
9.	Hooded HEPA Filters (H-14) For ISO-5, ISO-6 and ISO-8		
10.	Analog Magnehelic Gauges - Cleanroom Pressure monitoring		
11.	Temperature and RH Indicators		
12.	Cleanroom Lighting System		
13.	Special Cleanroom Lighting Requirements-RIE Labs and Lithography Room		
	PART C: CLEANROOM EQUIPMENT AND ACCESSORIES		
1.	Dynamic Garment Storage		
2.	Dynamic Pass Box (DPB)-Floor Mounted		
3.	Way Air Shower-Tunnel Type (Single/Two-Person Entry)		
4.	Exit Control Logic as Airlock (Special Requirement)		
5.	Cleanroom Furniture Schedule (SS304 Cleanroom Furniture)		
6.	Cleanroom Wet Bench System		
7.	Fume Hood System		
8.	Cleanroom Oven		
9.	Ancillary systems		
9.1	Lithography Equipment Vibration Isolation Platform		
9.2	CCTV Surveillance and Access Control System		
9.3	Fire Alarm, Smoke Detection, and Emergency Lighting System		
9.4	Access Control System		
9.5	Water Purification System		
9.6	Air Compressor System		
9.7	Vacuum Pump System - 100 mbar		
10	Semiconductor Process Gas Distribution System		

**Signature of the Authorized
Official with Seal**

SECTION 9

PREVIOUS SIMILAR ORDER EXECUTED

Please quote best minimum prices applicable for a premier Educational and Research Institution. The party must give details of purchase orders identical or similar work order supplied to IITs, IISc, Government Institutes of Eminence, ISRO, DRDO, BARC, CSIR Laboratories as per below Format in last FIVE (5) financial years (to be enclosed in Price Bid / Commercial Bid) along with the final price paid and details are mandatory.

Name of the Firm _____

Order placed by (Full address of Purchaser)	Order No. and Date	Description and quantity of order	Value of Order	Date of completion of delivery as per contract	Remarks indicating reasons for late delivery, if any and justification for price difference of their supply order & those quoted to us	Has the Cleanroom facility being installed satisfactorily (Attach a Certificate from the Purchaser/ Consigner)	Contact Person along with Telephone No., Fax No. and e-mail address.

(Kindly enclose the scan copy of aforementioned purchase orders)

Details of Technical Expert

Name of application specialist / Service Engineer who have the technical competency to handle and support the quoted product during the warranty period.		
Name of the organization	Name of Contact Person	Contact No.

Place:

Date:

Signature and Seal of the Manufacturer/ Bidder

BID SUBMISSION**Online Bid Submission**

The Online bids (complete in all respect) must be uploaded online in **two covers** as explained below:

Cover - 1			
S. No.	Document	Content	File Type
1		Technical Compliance Sheet, Bidder information form	.pdf
2		Organization Declaration Sheet, Compliance sheets for Essential Pre-Bid Criteria	.pdf
3		Checklist, Tender Acceptance, Tender Form, Annexure I, etc.	.pdf
4	Technical Bid	List of organizations/clients where similar semiconductor cleanroom projects have been carried out (in last five financial years) along with their contact number(s). (Annexure III)	.pdf
5		Technical supporting documents in support of all claims made at Annexure I	.pdf
6		EMD and Tender fee submission proof	.pdf
7		Brochure of quoted product and other documents, if any	.pdf
8		Other Documents, if any which are not covered above	.pdf
Cover - 2			
S. No.	Document	Content	File Type
1		Duly filled and signed Tender Form (Price Bid)	.pdf
2	Price Bid	Duly signed BOQ	.pdf
3		BOQ in .xls Format	.xls/ .xlsx

ORIGINAL EQUIPMENT MANUFACTURER (OEM)
Manufacturing Authorization Form (MAF)
(On Letter Head of Manufacturer)

Tender No.:

To,
Head of the Department
Department of Electronics Engineering
IIT (BHU) Varanasi
Varanasi - 221005, Uttar Pradesh, India

Dear Sir,

We manufacturer of original equipment at (address of factory) do hereby authorize M/s..... (Name and address of Agent) to submit a bid, negotiate and receive the order format against your tender enquiry. M/s. is authorized to bid and conclude the contract in regard to this business. We hereby extend our full guarantee and warranty as per clause.....of the terms and conditions NIQ for the goods and services offered by the above firm.

Yours Faithfully,

(Name)

(Name & Seal of Manufactures)

Note:

1. Items of indigenous nature or quoted in INR, more than 1 authorized representative may participate in the same tender and submit their bids on behalf of their OEM/Principal/Manufacturer if the OEM permits more than one authorized bidder in such case as per their policy.
2. In cases of agents quoting in offshore procurements, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorize only one agent/dealer.
3. The letter of authority should be on the letterhead of the manufacturer and should be signed by a person competent and having the power of attorney to bind the manufacturer. The same should be included by the bidder in its techno-commercial unpriced bid.

DECLARATION

(To be submitted on the letterhead of Company)

**To,
Head of the Department
Department of Electronics Engineering
IIT (BHU) Varanasi
Varanasi - 221005, Uttar Pradesh, India**

We certify as under:

We have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries, and solemnly certify that we fulfill all requirements in this regard and are eligible to be considered.

We certify that:

- (a) We are not from such a country or, if from such a country, we are registered with the Competent Authority (copy enclosed);
- and**
- (b) We shall not subcontract any work to a contractor from such countries unless such contractor is registered with the Competent Authority.

Yours faithfully,

(Signature of the Bidder, with Official Seal)

DECLARATION OF LOCAL CONTENT

(To be given on Company Letter Head for Tender Value below Rs.10 Crores)/ (To be given by Statutory Auditor/ Cost Auditor/ Cost Accountant/ CA for tender value above Rs.10 Crores)

To,
Head of the Department
Department of Electronics Engineering
IIT (BHU) Varanasi
Varanasi - 221005, Uttar Pradesh, India

Subject: Declaration of Local Content

Tender Reference No:

Name of Tender/ Work:

1. Country of Origin of Goods being offered:

2. We hereby declare that items offered has % local content

3. Details of the Location at which the Local Value Addition is made

4. Details of Local Content

“Local Content” means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the item procured (excluding net domestic indirect taxes) minus the value of the imported content in the item (including all customs duties) as a proportion of the total value, in percent.

Bidders offering Imported products will fall under the category of Nonlocal Suppliers. They cannot claim themselves as Class-I or Class-II Local Suppliers by claiming the services such as Transportation, Insurance, Installation, Commissioning, Training and After Sale Service Support like AMC/ CMC etc. as Local Value Addition.

We are solely responsible for the abovementioned declaration. False declaration will be in breach of Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151(iii) of the General Financial Rules along with such other actions as may be permissible under law.

Yours faithfully,

(Signature of the bidder, with Official Seal)

Note: It is mandatory for bidders to quote items having local content minimum 20%. Refer revised Public Procurement (Preference to Make in India), Order 2017, No. P-45021/2/2017-PP (B.E-II) dated 16.09.2020 issued by DPIIT, Ministry of Commerce and Industry, Govt. of India.

PRE-CONTRACT INTEGRITY PACT**General**

This pre-bid pre-contract Agreement (hereinafter called the Integrity Pact) is made on _____ day of the month of _____ 2025, between, on one hand, the President of India, acting through Shri _____, designation of the officer, Ministry/Department, Government of India (hereinafter called the "BUYER", which expression shall mean and include, unless the context otherwise requires, his successors in office and assigns) of the First Part and M/S _____ represented by Shri _____, Chief Executive Officer (hereinafter called the "BIDDER/Seller" which expression shall mean and include, unless the context otherwise requires, his successors and permitted assigns) of the Second Part.

WHEREAS the BUYER proposes to procure (name of the Stores/ Equipment/ Item) and the BIDDER/Seller is willing to offer/has offered the stores and

WHEREAS the BIDDER is a private company/public company/Government undertaking/partnership/registered export agency, constituted in accordance with the relevant law in the matter and the BUYER is a Ministry/ Department of the Government of India/PSU performing its functions on behalf of the President of India.

NOW, THEREFORE,

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

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

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

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

Commitments of the BUYER

- 1.1. The BUYER undertakes that no official of the BUYER, connected directly or indirectly with the contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the BIDDER, either for themselves or for any person, organization or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.
- 1.2. The BUYER will, during the pre-contract stage, treat all BIDDERS alike, and will provide to all BIDDERS the same information and will not provide any such information to any particular BIDDER which could afford an advantage to that particular BIDDER in comparison to other BIDDERS.
- 1.3. All the officials of the BUYER will report to the appropriate Government office any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.
2. In case any such preceding misconduct on the part of such official(s) is reported by the BIDDER to the BUYER with full and verifiable facts and the same is prima facie found to be correct by the BUYER, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be

initiated by the BUYER and such a person shall be debarred from further dealings related to the contract process. In such a case while an enquiry is being conducted by the BUYER the proceedings under the contract would not be stalled.

Commitments of BIDDERS

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

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

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

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

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

* 3.5. The BIDDER further confirms and declares to the BUYER that the BIDDER is the original manufacturer/integrator/authorized government sponsored export entity of the stores and has not engaged any individual or firm or company whether Indian or foreign to intercede, facilitate or in any way to recommend to the BUYER or any of its functionaries, whether officially or unofficially to the award of the contract to the BIDDER, nor has any amount been paid, promised or intended to be paid to any such individual, firm or company in respect of any such intercession, facilitation or recommendation.

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

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

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

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

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

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

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

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

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

4. Previous Transgression

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

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

5. Earnest Money (Security Deposit)

5.1 While submitting commercial bid, the BIDDER shall deposit an amount _____ as specified in the RFP as Earnest Money/Security Deposit, with the BUYER through any of the following instruments:

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

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

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

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

6. Sanctions for Violations

6.1. Any breach of the aforesaid provisions by the BIDDER or any one employed by it or acting on its behalf

(whether with or without the knowledge of the BIDDER) shall entitle the BUYER to take all or any one of the following actions, wherever required:

- (i) To immediately call off the pre-contract negotiations without assigning any reason or giving any compensation to the BIDDER. However, the proceedings with the other BIDDER(s) would continue.
- (ii) The Earnest Money Deposit (in pre-contract stage) and/or Security Deposit/Performance Bond (after the contract is signed) shall stand forfeited either fully or partially, as decided by the BUYER and the BUYER shall not be required to assign any reason therefor.
- (iii) To immediately cancel the contract, if already signed, without giving any compensation to the BIDDER.
- (iv) To recover all sums already paid by the BUYER, and in case of an Indian BIDDER with interest thereon at 2% higher than the prevailing Prime Lending Rate of State Bank of India, while in case of a BIDDER from a country other than India with interest thereon at 2% higher than the LIBOR. If any outstanding payment is due to the BIDDER from the BUYER in connection with any other contract for any other stores, such outstanding payment could also be utilized to recover the aforesaid sum and interest.
- (v) To encash the advance bank guarantee and performance bond/warranty bond, if furnished by the BIDDER, in order to recover the payments, already made by the BUYER, along with interest.
- (vi) To cancel all or any other Contracts with the BIDDER. The BIDDER shall be liable to pay compensation for any loss or damage to the BUYER resulting from such cancellation/rescission and the BUYER shall be entitled to deduct the amount so payable from the money(s) due to the BIDDER.
- (vii) To debar the BIDDER from participating in future bidding processes of the Government of India for a minimum period of five years, which may be further extended at the discretion of the BUYER.
- (viii) To recover all sums paid in violation of this Pact by BIDDER(s) to any middleman or agent or broker with a view to securing the contract.
- (ix) In cases where irrevocable Letters of Credit have been received in respect of any contract signed by the BUYER with the BIDDER, the same shall not be opened.
- (x) Forfeiture of Performance Bond in case of a decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

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

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

7. Fall Clause

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

8. Independent Monitors

8.1. There shall be Independent Monitors (hereinafter referred to as Monitors) appointed by the BUYER for this Pact in consultation with the Central Vigilance Commission.

Shri Rajiv Kumar Srivastava, IFoS (Retd.)	Email: rksifs@gmail.com
Shri Rajiva Ranjan Verma, IPS (Retd.)	Email: rajivaranjanin@yahoo.co.in

- 8.2. The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.
- 8.3. The Monitors shall not be subject to instructions by the representatives of the parties and perform their functions neutrally and independently.
- 8.4. Both the parties accept that the Monitors have the right to access all the documents relating to the project/procurement, including minutes of meetings.
- 8.5 As soon as the Monitor notices, or has reason to believe, a violation of this Pact, he will so inform the Authority designated by the BUYER.
- 8.6. The BIDDER(s) accepts that the Monitor has the right to access without restriction to all Project documentation of the BUYER including that provided by the BIDDER. The BIDDER will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is applicable to Subcontractors. The Monitor shall be under contractual obligation to treat the information and documents of the BIDDER/Subcontractor(s) with confidentiality.
- 8.7. The BUYER will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the parties. The parties will offer to the Monitor the option to participate in such meetings.
- 8.8. The Monitor will submit a written report to the Foreign Secretary, Ministry of External Affairs, within 8 to 10 weeks from the date of reference or intimation to him by the BUYER / BIDDER and, should the occasion arise, submit proposals for correcting problematic situations.

9. Facilitation of Investigation

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

10. Law and Place of Jurisdiction

This Pact is subject to Indian Law. The place of performance and jurisdiction is the seat of the BUYER

11. Other Legal Actions

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

12. Validity

- 12.1. The validity of this Integrity Pact shall be from the date of its signing and extend up to 5 years or the complete execution of the contract to the satisfaction of both the BUYER and the BIDDER/Seller, including warranty period, whichever is later. In case BIDDER is unsuccessful, this Integrity Pact shall expire after six months from the date of the signing of the contract.
- 12.2. Should one or several provisions of this Pact turn out to be invalid, the remainder of this pact shall remain valid. In this case, the parties will strive to come to an agreement to their original intentions.

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

BUYER

Name of the Officer

Department/Ministry/PSU

BIDDER

CHIEF EXECUTIVE OFFICER Designation

Witness

1. _____

2. _____

Witness

1. _____

2. _____

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

-----END-----

ANNEXURE-I (a)

Technical specifications for Establishment of Advanced Semiconductor Processing Cleanroom Facility on Turnkey Basis including Design, Engineering, Supply, Installation, Integration & Commissioning at Department of Electronics Engineering, IIT (BHU), Varanasi.

Invitation for Tender Offers

IIT (BHU), VARANASI invites online Bids (Technical bid and Commercial bid) from eligible and experienced vendors for setting up a cleanroom facility about 1900 sq.ft. This includes Gowning Entry (Room No. A101, Approx. 65 sq. ft.), RIE LAB-1 (Room No. A102, Approx. 278 sq. ft.), RIE LAB-2 (Room No. A103, approx. 134 sq. ft.), LAB A (Room No. A104, Approx. 200 sq. ft.), LAB B (Room No. A105, Approx. 200 sq. ft.), LAB C (Room No. A106, Approx. 536 sq. ft.), Lithography (Room No. A107, Approx. 212 sq. ft.), Entrance Airlock (Approx. 31 sq. ft.) at Department of Electronics Engineering, IIT (BHU), Varanasi. It is proposed to house the Lithography system and its accessories for the fabrication. The total space is divided into three areas: Area 1: Gowning In & Out, RIE LAB 1 & 2, Area 2: LAB A, LAB B, LAB C, and Area 3: Lithography and its utility area.

Scope of Supply

The vendor shall undertake the design (as provided by the Committee) and detailed engineering, including the supply, installation, commissioning, validation, operation, and maintenance of the following systems:

- Cleanroom (1000 & 100) Wall & Ceiling & Scientific door Systems
- Cleanroom Equipment's Air shower, Garment Cabinet, Dynamic Pass box
- Heating, Ventilation, and Air Conditioning (HVAC) systems
- Electrical systems MCC panel to distribution system
- N₂ Bank, Air compressor, Water Purification System distribution systems
- Gas exhaust systems
- Acid and normal drain systems
- Fire detection, fire protection, and surveillance systems
- Process chiller units
- Any other required associated utilities or subsystems

The specifications in this document are broad in nature and, depending on the final requirements, may not include every minor detail. The vendor shall therefore be responsible for providing any additional components or minor items necessary to complete and fully realize the facility.

Layout and Detailed Engineering

IIT (BHU), VARANASI has prepared the broad conceptual layout of the cleanroom facility based on the functional requirements, process flow, equipment proposed to be installed, utility requirements, and available space constraints. The successful vendor shall further develop, optimize, refine, and prepare the complete detailed engineering layout for the entire facility, including cleanroom zoning, equipment placement, utility routing, maintenance accessibility, safety

clearances, pressure cascade arrangements, service integration, and operational workflow requirements.

Further, for the purpose of technical and financial evaluation, the bidder shall submit a comprehensive detailed engineering package comprising package-wise and line-item-wise bill of quantities (BOQ), technical specifications, material details, equipment sizing, utility calculations, load details, system capacities, and complete scope breakup for each subsystem. The submitted details shall be sufficiently comprehensive to enable the Committee to carry out transparent technical assessment, scope verification, comparative evaluation, and financial scrutiny of the proposed turnkey solution. The vendor shall submit detailed layouts, coordinated drawings, utility layouts, sectional drawings, shop drawings, and all associated engineering documents to IIT (BHU), VARANASI for review and approval prior to commencement of fabrication, procurement, or installation activities.

Salient Features of Cleanroom Facility

- All exposed surfaces of plastered cement concrete block or brick masonry walls, RCC beams, RCC columns, and soffits of RCC slabs within the cleanroom areas, service corridors, and associated controlled areas shall be clad with minimum 50 mm thick PUF insulated panels to achieve a smooth, seamless, non-shedding, and dust-free finish suitable for cleanroom applications.
- The cleanroom paneling system shall be designed to ensure proper sealing, easy maintenance, durability, and compatibility with the required cleanroom classification and operational conditions.
- A walkable false ceiling system with adequate structural strength and load-bearing capacity shall be provided. The ceiling system shall be designed to safely support HEPA filter modules, lighting fixtures, utility services, supply air ducts, return air ducts, and associated cleanroom service infrastructure.
- Class 100 cleanroom areas shall be designed with unidirectional (laminar) airflow systems to maintain the required cleanliness levels and airflow uniformity as specified in the technical requirements.
- To facilitate laminar airflow and return air management, a raised flooring system shall be provided in the Class 100 Lithography Room as indicated in the annexure drawings and layout details.
- The vendor shall provide a vibration-free isolation platform for installation of sensitive process equipment in the Class 100 Lithography area. The isolation platform shall be raised by approximately 300 mm or as specified in the approved drawings and shall be engineered to minimize vibration transmission to process equipment.
- The finished floor level of the equipment isolation platform shall be properly coordinated and aligned with the raised flooring level of the respective cleanroom area to maintain uniform operational access and process integration.
- To maintain a common finished working level across the fabrication facility, the structural floor level in the Class 100 cleanroom area shall be raised to the required elevation. The detailed dimensions, levels, and interfacing requirements of the raised structural floor shall be provided by IIT (BHU), VARANASI to the vendor during detailed engineering and execution stages.

- IIT (BHU), VARANASI shall provide only the incoming Raw Power or DG-backed electrical power up to the designated main electrical input point or main electrical panel location.
- Complete internal electrical distribution from the designated incoming point or main electrical panel onwards, including panels, cabling, wiring, earthing, lighting, isolation systems, clean power distribution, and all associated electrical infrastructure required for the cleanroom laboratories and utilities, shall be entirely within the vendor's scope.
- The vendor shall provide complete HVAC automation and control systems for maintaining specified cleanroom environmental conditions including temperature, relative humidity (RH), room differential pressure, airflow, monitoring, alarms, and associated control logic as specified in the technical requirements.
- The HVAC automation system shall include necessary sensors, actuators, controllers, monitoring systems, interlocks, communication systems, and centralized control arrangements required for stable and continuous operation of the cleanroom facility.
- All necessary SS cleanroom laboratory furniture, storage units, workstations, tables, sinks, racks, and associated laboratory utility furniture required for the laboratory areas shall be included within the vendor's scope of work.
- The detailed requirements, dimensions, utility provisions, configurations, and functional expectations for the SS laboratory furniture may be finalized during the execution stage in consultation with IIT (BHU), VARANASI representatives. The vendor shall coordinate with the end users and incorporate the necessary requirements accordingly without affecting the overall project schedule and functionality.

Design Considerations: HVAC System

Design Conditions of Varanasi for Heat Load Calculation

LAT: 25.2 deg N

Altitude: 76 M (249.3 FT)

DESCRIPTION	OUTSIDE DESIGN CONDITIONS to be Considered				
SEASON	DB deg F	WB deg F	RH %	DP deg F	Gr/lb
SUMMER	109	76.0	21	60	79.0
MONSOON	94.0	83.0	64	79	155.0
WINTER	50.0	47.0	80	44	43.0

CLEAN ROOM	71.6	60	55	54.6	63
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ROOM DATA: Specification functional areas. AHU-01

Room No 101: Gowning IN/OUT	
Area	65 sq.ft.
Class of Cleanliness	ISO 8 (Class 100000)
Particle Counts	$\leq 3,520,000$ Particles/m ³ of size 0.5 μ m as per ISO 14644 -1 Standard
Inside Room Temperature	21°C $\pm$ 1°C
Inside Room Relative humidity	55 $\pm$ 5 %
Inside Room Positive pressure (+ Pa) with ref to atmosphere	+ 25 $\pm$ 5 Pa (++)
Supply Air change rate per hour	Not less than 30 ACPH
Filter coverage	Minimum 30 %. The exact no. of filters for each area shall be worked by the vendor as per the design of HVAC systems being a part of the scope of the vendor.)
Supply Air Velocity	0.45 meters per second $\pm$ 20% (90 fpm +/- 20fpm)
Types & Quality of Filters	HEPA filter (H-14) with efficiency- 99.995% down to 0.3 μ m size particles@ MPPS acc. to EN1822
Supply Air PLENUM	Hooded HEPA filter (H-14) with efficiency-99.995% down to 0.3 μ m size particles.
Supply Airflow Pattern	Vertical
Sound pressure level	Around $\leq$ 60 dB
Lighting	600 lux
Height of False ceiling from FFL	10 feet (3.0 M)
Height of True Ceiling from FFL (from bottom of secondary ceiling)	18.4 feet (5.5 M)
Flooring	Antistatic vinyl flooring
Connected Equipment Load in kW	0 kW
Diversity factor for equipment load for Heat Load calculation	0.35
Max No of People at any point of time	01
Process Exhaust	0 CFM
Number of Fresh air Changes per hour	02

Outside design conditions to be considered	Data as per ISHRAE or relevant standard for Varanasi conditions with suitable Corrections
Treated Fresh air	Adequate to offset exhaust and to maintain specified RH and Pressure in the clean room.

Room No 102: RIE LAB -1	
Area	278 sq.ft.
Class of Cleanliness	ISO 6 (Class 1000) Mixed Flow
Particle Counts	$\leq 35,200$ Particles/m ³ of size 0.5 μ m as per ISO 14644-1 Standard
Inside Room Temperature	21°C $\pm$ 1°C
Inside Room Relative humidity	55 $\pm$ 5 %
Inside Room Positive pressure (+ Pa) with ref to atmosphere	+ 25 $\pm$ 5 Pa (++)
Supply Air change rate per hour	As per ISO 14644-4 standards (Not less than 90 ACPH)
Filter coverage	Minimum 40-60 %. The exact no. of filters for each area shall be worked by the vendor as per the design of HVAC systems being a part of the scope of the vendor.)
Supply Air Velocity	0.45 meters per second $\pm$ 20% (90 fpm $\pm$ 20fpm)
Types & Quality of Filters	HEPA filter (H-14) with efficiency- 99.995% down to 0.3 μ m size particles@ MPPS acc. to EN1822
Supply Air PLENUM	Hooded HEPA Concept with HEPA filter (H-14) with efficiency-99.995% down to 0.3 μ m size particles.
Supply Airflow Pattern	Vertical
Sound pressure level	Around $\leq$ 60 dB
Lighting	Yellow light 600 LUX
Height of False ceiling from FFL	10.0 feet (3.0M)

Height of True Ceiling from FFL (from bottom of secondary ceiling)	18.4 feet (5.5 M)
Flooring	Antistatic vinyl flooring
Connected Equipment Load in kW	3 kW
Diversity factor for equipment load for Heat Load calculation	0.35
Max No of People at any point of time	04
Process Exhaust	NIL
Number of Fresh air Changes per hour	02
Outside design conditions to be considered	Data as per ISHRAE or relevant standard for Hyderabad conditions with suitable Corrections
Treated Fresh air	Adequate to offset exhaust and to maintain specified RH and Pressure in the clean room.

Room No 103: RIE LAB -2	
Area	134 sq.ft.
Class of Cleanliness	ISO 6(Class 10,00) Mixed Flow
Particle Counts	$\leq 35,200$ Particles/m ³ of size 0.5 μ m as per ISO 14644-1 Standard
Inside Room Temperature	21°C $\pm$ 1°C
Inside Room Relative humidity	55 $\pm$ 5 %
Inside Room Positive pressure (+ Pa) with ref to atmosphere	+ 15 $\pm$ 5 Pa
Supply Air change rate per hour	As per ISO 14644-4 standards (Not less than 90 ACPH)
Filter coverage	Minimum 40-60%. The exact no. of filters for each area shall be worked by the vendor as per the design of HVAC systems being a part of the scope of the vendor.)
Supply Air Velocity	0.45 meters per second $\pm$ 20% (90 fpm $\pm$ 20fpm)
Types & Quality of Filters	HEPA filter (H-14) with efficiency- 99.995% down to 0.3 μ m size particles@ MPPS acc. to EN1822
Supply Air PLENUM	Hooded Concept with HEPA filter (H-14) with

	efficiency-99.995% down to 0.3 μ m size particles.
Supply Airflow Pattern	Downward Mixed Flow
Sound pressure level	Around ≤ 60 dB
Lighting	Yellow light 600 LUX Light Fixture
Height of False ceiling from FFL	10 ft (3M)
Height of True Ceiling from FFL (from bottom of secondary ceiling)	18 ft (5.5 M)
Flooring	Antistatic vinyl flooring
Connected Equipment Load in kW	3 kW
Diversity factor for equipment load for Heat Load calculation	0.35
Max No of People at any point of time	04
Process Exhaust	500 CFM
Number of Fresh air Changes per hour	15
Outside design conditions to be considered	Data as per ISHRAE or relevant standard for Hyderabad conditions with suitable Corrections
Treated Fresh air	Adequate to offset exhaust and to maintain specified RH and Pressure in the clean room.

Room No A104: LAB -A	
Area	200 sq.ft.
Class of Cleanliness	ISO 6(Class 10,00) Mixed Flow
Particle Counts	$\leq 35,200$ Particles/m ³ of size 0.5 μ m as per ISO 14644-1 Standard
Inside Room Temperature	21°C $\pm$ 1°C
Inside Room Relative humidity	55 $\pm$ 5 %
Inside Room Positive pressure (+ Pa) with ref to atmosphere	+ 35 $\pm$ 5 Pa
Supply Air change rate per hour	As per ISO 14644-4 standards (Not less than 90 ACPH)
Filter coverage	Minimum 40-60%. The exact no. of filters for each area shall be worked by the vendor as per the design of HVAC systems being a part of the scope of the vendor.)
Supply Air Velocity	0.45 meters per second $\pm$ 20% (90 fpm +/- 20fpm)
Types & Quality of Filters	HEPA filter (H-14) with efficiency- 99.995% down to 0.3 μ m size particles@ MPPS acc. to EN1822
Supply Air PLENUM	Hooded Concept with HEPA filter (H-14) with

	efficiency-99.995% down to 0.3 μ m size particles.
Supply Airflow Pattern	Downward Mixed Flow
Sound pressure level	Around ≤ 60 dB
Lighting	600 LUX Light Fixture
Height of False ceiling from FFL	10 ft (3M)
Height of True Ceiling from FFL (from bottom of secondary ceiling)	18 ft (5.5 M)
Flooring	Antistatic vinyl flooring
Connected Equipment Load in kW	3 kW
Diversity factor for equipment load for Heat Load calculation	0.35
Max No of People at any point of time	04
Process Exhaust	NIL
Number of Fresh air Changes per hour	02
Outside design conditions to be considered	Data as per ISHRAE or relevant standard for Hyderabad conditions with suitable Corrections
Treated Fresh air	Adequate to offset exhaust and to maintain specified RH and Pressure in the clean room.

ROOM DATA: Specification of functional areas. AHU-02

Room No A105: LAB -B	
Area	200 sq.ft.
Class of Cleanliness	ISO 6(Class 10,00) Mixed Flow
Particle Counts	$\leq 35,200$ Particles/m ³ of size 0.5 μ m as per ISO 14644-1 Standard
Inside Room Temperature	21°C $\pm$ 1°C
Inside Room Relative humidity	55 $\pm$ 5 %
Inside Room Positive pressure (+ Pa) with ref to atmosphere	+ 35 $\pm$ 5 Pa
Supply Air change rate per hour	As per ISO 14644-4 standards(Not less than 90 ACPH)
Filter coverage	Minimum 40-60%. The exact no. of filters for each area shall be worked by the vendor as per the design of HVAC systems being a part of the scope of the vendor.)
Supply Air Velocity	0.45 meters per second $\pm$ 20% (90 fpm $\pm$ 20fpm)
Types & Quality of Filters	HEPA filter (H-14) with efficiency- 99.995% down to 0.3 μ m size particles@ MPPS acc. to EN1822
Supply Air PLENUM	Hooded Concept with HEPA filter (H-14) with

	efficiency-99.995% down to 0.3 μ m size particles.
Supply Airflow Pattern	Downward Mixed Flow
Sound pressure level	Around ≤ 60 dB
Lighting	600 LUX Light Fixture
Height of False ceiling from FFL	10 ft (3M)
Height of True Ceiling from FFL (from bottom of secondary ceiling)	18 ft (5.5 M)
Flooring	Antistatic vinyl flooring
Connected Equipment Load in kW	3 kW
Diversity factor for equipment load for Heat Load calculation	0.35
Max No of People at any point of time	04
Process Exhaust	NIL
Number of Fresh air Changes per hour	02
Outside design conditions to be considered	Data as per ISHRAE/relevant standard for Hyderabad conditions with suitable Corrections
Treated Fresh air	Adequate to offset exhaust and to maintain specified RH and Pressure in the clean room.

Room No A106: LAB -C	
Area	536 sq.ft.
Class of Cleanliness	ISO 6(Class 10,00) Mixed Flow
Particle Counts	$\leq 35,200$ Particles/m ³ of size 0.5 μ m as per ISO 14644-1 Standard
Inside Room Temperature	21°C $\pm$ 1°C
Inside Room Relative humidity	55 $\pm$ 5 %
Inside Room Positive pressure (+ Pa) with ref to atmosphere	+ 30 $\pm$ 5 Pa
Supply Air change rate per hour	As per ISO 14644-4 standards(Not less than 90 ACPH)
Filter coverage	Minimum 40-60%. The exact no. of filters for each area shall be worked by the vendor as per the design of HVAC systems being a part of the scope of the vendor.)
Supply Air Velocity	0.45 meters per second $\pm$ 20% (90 fpm $\pm$ 20fpm)
Types & Quality of Filters	HEPA filter (H-14) with efficiency- 99.995% down to 0.3 μ m size particles@ MPPS acc. to EN1822
Supply Air PLENUM	Hooded Concept with HEPA filter (H-14) with efficiency-99.995% down to 0.3 μ m size particles.
Supply Airflow Pattern	Downward Mixed Flow

Sound pressure level	Around ≤ 60 dB
Lighting	600 LUX Light Fixture
Height of False ceiling from FFL	10 ft (3M)
Height of True Ceiling from FFL (from bottom of secondary ceiling)	18 ft (5.5 M)
Flooring	Antistatic vinyl flooring
Connected Equipment Load in kW	3 kW
Diversity factor for equipment load for Heat Load calculation	0.35
Max No of People at any point of time	03
Process Exhaust	500 CFM
Number of Fresh air Changes per hour	04
Outside design conditions to be considered	Data as per ISHRAE or relevant standard for Hyderabad conditions with suitable Corrections
Treated Fresh air	Adequate to offset exhaust and to maintain specified RH and Pressure in the clean room.

ROOM DATA: Specification of functional areas. AHU-03

Room No A107: LITHOGRAPHY AREA	
Area	212 sq.ft.
Class of Cleanliness	ISO 5(Class 10,00) laminar Unidirectional Flow
Particle Counts	$\leq 35,20$ Particles/m ³ of size 0.5 μ m as per ISO 14644-1 Standard
Inside Room Temperature	21°C $\pm$ 1°C
Inside Room Relative humidity	45 $\pm$ 2.5 %
Inside Room Positive pressure (+ Pa)with ref to atmosphere	+ 40 $\pm$ 5 Pa
Supply Air change rate per hour	As per ISO 14644-4 standards (≥ 400 ACPH)
Filter coverage	Minimum 90%. The exact no. of filters for each area shall be worked by the vendor as per the design of HVAC systems being a part of the scope of the vendor.)

Hvac System Design	The HVAC system for the Lithography Cleanroom shall be designed without the use of a common ceiling plenum arrangement. The air distribution system shall ensure controlled airflow integrity from AHU discharge up to the terminal filtration point, with all ductwork, terminal housings, and filter connections being fully gasketed, airtight, and suitable for maintaining uniform airflow and controlled pressure drop throughout the system.
Type of ceiling	The cleanroom ceiling shall be formed from a HEAVY-DUTY ALUMINIUM WALKABLE extruded T-Grid ceiling systems for all areas. The ceiling grid colour should match the wall panel (Designer white shade). The ceiling grid shall be a heavy-duty, walkable inverted T-grid ceiling system of approx. 50 mm T width (gasket type ceiling) to be provided on 600 mm x 1200 mm hanging configuration, the system shall include aluminum (approx. 50 mm wide) extrusions, aluminum extruded cross connector with hammerhead bolts and nuts, M8 bolt and matching square hanger and other standard accessories
Flooring	Raised floor Raised Floor System: Raised floor grill panel mounted on adjustable pedestals to provide an under-floor space to accommodate mechanical service line electrical conduits and serve as an air supply and return plenum
Supply Air Velocity	0.45 meters per second $\pm$ 20% (90 fpm $\pm$ 20fpm)
Types & Quality of Filters	HEPA filter (H-14) with efficiency- 99.995% down to 0.3 μ m size particles@ MPPS acc. to EN1822
Supply Air PLENUM	Hooded Concept with HEPA filter (H-14) with efficiency-99.995% down to 0.3 μ m size particles.
Supply Airflow Pattern	Unidirectional laminar flow
Sound pressure level	Around $\leq$ 60 dB
Lighting	Yellow light 600 LUX Light Fixture
Height of False ceiling from FFL	9 ft (2.7 M)
Height of True Ceiling from FFL (from bottom of secondary ceiling)	18 ft (5.5 M)
Connected Equipment Load in kW	4 kW
Diversity factor for equipment load for Heat Load calculation	0.35
Max No of People at any point of time	04
Process Exhaust	500 CFM
Number of Fresh air Changes per hour	02

Outside design conditions to be considered	Data as per ISHRAE or relevant standard for Hyderabad conditions with suitable Corrections
Treated Fresh air	Adequate to offset exhaust and to maintain specified RH and Pressure in the clean room.

PART A: HVAC TECHNICAL SPECIFICATIONS

Establishment of Advanced Semiconductor Processing Cleanroom Facility on Turnkey Basis including Design, Engineering, Supply, Installation, Integration, Testing, Commissioning and Validation at Indian Institute of Technology (BHU), Varanasi. Provisional Technical Specifications and Requirements for Design, Engineering, Manufacture, Supply, Installation, Testing, Commissioning and Validation of Advanced Semiconductor Processing Cleanroom Facility in accordance with ISO 14644 Standards.

1. Approach methodology for achieving the required Class of Cleanliness

1.1 General arrangements for construction of Modular Clean Room

The modular cleanroom shall be designed, manufactured, supplied, installed, tested, commissioned, and validated as a complete self-contained system suitable for semiconductor processing and advanced research applications. The construction shall comprise prefabricated modular wall and ceiling panel systems with smooth, non-shedding, non-particle generating, and easy-to-clean surfaces compatible with cleanroom environments. The cleanroom assembly shall include covings, cleanroom-compatible doors, double-glazed vision panels, cleanroom lighting fixtures, HEPA filter housing systems, flooring, support structures, and all associated accessories required for complete functionality and compliance with ISO 14644 standards. The cleanroom systems shall be designed to achieve the specified cleanliness classifications of ISO-5, ISO-6, ISO-7 and ISO-8 as defined in the design parameters.

The cleanroom layout and construction shall ensure proper airflow management, pressure differentials, contamination control, operational safety, accessibility for maintenance, and seamless integration with HVAC, electrical, utility, fire safety, monitoring, and process support systems. All joints, interfaces, penetrations, and service integration points shall be adequately sealed to maintain cleanroom integrity and prevent particle ingress. The entire facility shall be executed on a turnkey basis with coordinated engineering, testing, commissioning, validation, documentation, and complete operational readiness.

1.2 Supply Air Scheme

The cleanroom air distribution system shall be designed to provide uniform airflow, controlled air change rates, specified pressure differentials, and particulate contamination control in accordance with ISO 14644 standards and the required cleanroom classifications. Conditioned air shall be supplied from the Air Handling Units (AHUs) through insulated supply air ducts, branch ducts, volume control dampers (VCDs), and flexible duct connections terminating at terminal HEPA filter modules installed within the cleanroom false ceiling system.

The final filtration stage shall consist of hooded H-14 HEPA filters of suitable size and quantity to achieve the specified cleanliness levels of ISO-5, ISO-6, and ISO-8 areas. The air distribution arrangement shall ensure unidirectional airflow patterns as per process requirements, with proper air balancing and uniform clean air coverage throughout the cleanroom spaces. The system design shall minimize turbulence, dead zones, and particle accumulation while maintaining thermal comfort, process stability, and energy-efficient operation.

For ISO-5 areas, the ceiling system shall be designed with a dedicated HEPA filter grid arrangement providing more than 90% HEPA filter coverage to ensure uniform laminar airflow, enhanced particulate control, and stable cleanroom performance. Each HEPA filter module shall be connected through independent duct connections to avoid intermediate pressure drops, maintain uniform airflow distribution, and ensure sustainable cleanroom operating parameters under dynamic and static conditions. The airflow design shall ensure consistent laminarity, effective particle sweep, and minimal airflow variation across the entire critical clean space.

1.3 Return Air Scheme

The return air system shall be designed to ensure effective removal of airborne particles, maintenance of specified cleanliness classifications, pressure differentials, and uniform airflow patterns within the cleanroom facility. The return air arrangement shall be engineered considering controlled infiltration and exfiltration between pressure zones to minimize cross-contamination and maintain the required cleanliness hierarchy between adjoining clean spaces and surrounding areas. Return air shall be collected through suitably designed low-level and/or high-level return air risers, return air grilles, and dedicated return air ducts as per the cleanroom airflow strategy and process requirements. The system shall be designed to avoid stagnation zones, turbulence, particle accumulation, and uncontrolled air leakage while ensuring efficient recirculation of conditioned air back to the Air Handling Units (AHUs).

For ISO-5 (Class 100) cleanroom areas, the return air path shall be through the raised floor system with return air extraction provided from all corners/peripheral locations of the room to ensure uniform airflow distribution, effective particle sweep, and rapid contaminant removal. The conventional return air plenum concept above false ceiling or wall cavity plenum arrangements shall be strictly avoided in ISO-5 areas to maintain the required air change rates, minimize single-point pressure drop effects, and ensure stable airflow performance throughout the clean space. The return air system shall be adequately sized and balanced to maintain specified air change rates, room pressurization, environmental stability, and contamination control requirements for ISO-5, ISO-6, and ISO-8 areas. All return air components including grilles, dampers, ducts, risers, and raised floor return arrangements shall be fabricated from cleanroom-compatible materials with smooth internal finishes suitable for contamination-controlled environments.

1.4 Fabricated Return Air Raisers

Fabricated return air risers of suitable cleanroom-compatible construction shall be provided for effective return air circulation and maintenance of specified airflow patterns within the cleanroom facility. For ISO-6 and ISO-8 areas, return air risers of 100 mm / 80 mm size shall be provided as per the approved airflow design and room requirements. For ISO-5 areas, 200 mm return air risers shall be provided around the periphery of the cleanroom as indicated in the approved layout drawings to ensure uniform airflow distribution, effective particle sweep, and maintenance of laminar airflow conditions, and efficient return air collection. The return air arrangement shall be designed to maintain the required air change rates, pressure differentials, and contamination control performance in accordance with ISO 14644 standards and process requirements.

IMPORTANT NOTE:

Considering the high quantity of supply and return air required for the ISO-6 & 8 cleanroom, provision of sufficient return air risers is essential to maintain the specified air change rates, pressure differentials, airflow uniformity, and contamination control performance. To facilitate the required number of return air risers for efficient recirculation of clean air, For ISO 5 a double-wall cleanroom construction system is recommended comprising inner and outer modular cleanroom walls made of 50 mm thick PUF insulated panels with a 200 mm to 250 mm void/gap between the wall systems for accommodating return air risers and associated utilities without affecting cleanroom integrity and operational performance. This interstitial space shall be utilized for accommodating sufficient return air risers, utility routing, and associated service integration without affecting cleanroom integrity or usable clean space. The return air riser arrangement within the double-wall cavity shall be designed to ensure low-pressure drop, balanced airflow distribution, efficient return air collection, and sustainable cleanroom operating parameters in compliance with ISO 14644 standards and process requirements.

1.5 Recirculating Air Handlers

Suitable numbers of recirculating air handling units (RAHUs) shall be provided for the cleanroom facility and located outside the fabrication (fab) area envelope in the designated utility/service area adjacent to the parent building. The RAHUs shall be complete with cooling coils, filtration stages, blowers, mist eliminators, heaters, dampers, and associated control systems required to maintain specified temperature, relative humidity, pressure differentials, and cleanliness conditions within the proposed cleanrooms. The required quantity of conditioned and dehumidified air shall be delivered through suitably sized insulated supply air ducts routed into the building and horizontally distributed through the overhead interstitial/service space above the fab area, from where the air shall be supplied into the cleanrooms through hooded HEPA filter modules to achieve the specified ISO cleanliness classifications and airflow performance requirements.

1.6 Details of the Dedicated Air Handlers

- I) AHU-1: Dedicated Recirculating Air Handling Unit for ISO-8 Gowning In/Out areas and ISO-6 cleanroom areas including RIE-1, RIE-2, and other designated rooms as specified in the Room Data Matrix and approved layout drawings.
- ii) AHU-2: Dedicated Recirculating Air Handling Unit for ISO-6 cleanroom areas including LAB-A, LAB-B, and LAB-C as specified in the Room Data Matrix and approved layout drawings.
- iii) AHU-3: Dedicated Recirculating Air Handling Unit exclusively for the ISO-5 Lithography Room as specified in the Room Data Matrix and approved layout drawings.

Note: A common Treated Fresh air system is not required as individual Air handler shall be provided with fresh air as mentioned above

1.7 Dehumidified Air Quantity

The required quantity of dehumidified air necessary to maintain the specified temperature and relative humidity conditions within the cleanroom facility shall be determined based on detailed heat load calculations considering equipment loads, occupancy, lighting, process loads, fresh air requirements, and building envelope conditions. The calculated dehumidified air quantity (CFM) shall be processed through suitably designed cooling coils and strip heaters provided within the Recirculating Air Handling Units (RAHUs) to achieve and maintain the required environmental conditions, thermal stability, and cleanroom operating parameters within the proposed cleanroom areas.

1.8 Fresh Air

Treated fresh air shall be provided to compensate for process exhaust, exfiltration losses, and to maintain the required positive pressure hierarchy within the cleanroom facility. Each Air Handling Unit (AHU) shall be provided with an independent fresh air intake arrangement complete with pre-cooling coils, suitable pre-filters, volume control dampers (VCDs), mixing boxes, and associated accessories to ensure proper conditioning and controlled introduction of fresh air into the system.

1.9 Air Velocity Criteria for Clean Air Distribution

The supply air velocity from the main ducts of the Air Handling Units shall generally not exceed 1200 FPM in order to minimize vibration, turbulence, and noise levels, and the duct sizing shall be designed accordingly. The return air velocity for sizing return air risers shall generally not exceed 500 FPM, while the velocity through return air grilles shall not exceed 350 FPM. These velocity values are indicative in nature, and the vendor shall verify and optimize the same based on detailed engineering design and operating conditions.

2. AHU Zoning

Proper AHU zoning shall be designed based on process requirements and cleanroom classifications to ensure effective contamination control, operational flexibility, and optimized airflow management. Individual AHUs may cater to multiple cleanrooms of the same cleanliness classification, subject to process compatibility and engineering feasibility. Under no circumstances shall cleanroom AHUs be interconnected. A provisional zoning concept based on process requirements is provided in the Room Data /scheme for reference; however, the vendor shall finalize the AHU zoning during detailed engineering considering airflow requirements, available interstitial space, false ceiling height, beam clearances, duct routing limitations, pressure drop optimization, and maintainability. The AHU zoning design shall ensure that excessive supply air quantities do not result in impractically large duct sizes or installation constraints within the available service space.

2.1. Cleanroom Temperature and Relative Humidity Control

The cleanroom HVAC system shall be designed to maintain an internal temperature of $21^{\circ}\text{C} \pm 1^{\circ}\text{C}$ and relative humidity (RH) of NMT 60% continuously under static and dynamic operating conditions. Temperature and humidity control shall be achieved through suitably selected cooling coils, thyristor-controlled strip heaters, and pan humidifiers integrated within the **Recirculating Air Handling Units (RAHUs)** along with necessary sensors, controllers, and automation systems. The system shall ensure stable environmental conditions, process reliability, and cleanroom operational performance on a round-the-clock basis. Vendors may propose alternative or improved design concepts, control methodologies, or energy-efficient solutions based on their engineering expertise, provided the specified cleanroom environmental parameters and performance requirements are consistently achieved and maintained.

2.2 HEPA Filters

Standard hooded HEPA filter modules with H-14 grade filters shall be provided for the cleanroom facility. The HEPA filter modules shall be of approximate size (Sizes may vary)1210 mm $\times$ 600 mm $\times$ 152 mm depth and shall be capable of achieving a minimum filtration efficiency of 99.995% for particles down to 0.3 microns, equivalent to EN 1822 H-14 classification. The filter housing and module construction shall be fabricated from cleanroom-compatible Galvanized Al-Zn Alloy material suitable for contamination-controlled environments. Each HEPA filter module shall be designed for an airflow capacity in the range of approximately 650 CFM to 700 CFM with uniform airflow distribution, low pressure drops, and stable cleanroom performance suitable for ISO-5, ISO-6, and ISO-8 cleanroom applications.

2.3 Factory-Made Air-Cooled Condensing Units

The system shall comprise high-efficiency factory-made air-cooled direct expansion (DX) condensing units complete with scroll/rotary compressors, copper tube aluminium fin condenser coils, axial flow condenser fans with direct-driven motors, powder-coated weatherproof enclosure panels, and integral microprocessor-based control systems suitable for operation on 415V, 3 Phase, 50Hz power supply. The units shall be provided with HP/LP cut-outs, SPPR protection, overload protection, control cabling, and display facilities for monitoring operating parameters including suction/discharge pressure, temperature, load percentage, current, voltage, and system status. Refrigerant R407C shall be used.

The scope shall include insulated copper refrigerant piping along with all accessories such as filter driers, sight glasses, expansion valves, isolating valves, drain piping, thermostats, humidistats, control panels, electrical wiring (power and control), and associated components required for complete and satisfactory operation of the system. Refrigerant piping sizing shall be carried out by the contractor and approved prior to installation. Refrigerant pipes and control cabling shall be routed on adequately supported powder-coated MS covered cable trays.

The units shall include thermostatic expansion valves, compressor safety controls, temperature-based compressor cut-off arrangements, insulated suction lines, and air-cooled condenser assemblies complete with mounting frames and supports. Potential-free contacts for HP/LP status, compressor ON/OFF, and overload conditions shall be provided for PLC/BMS integration.

The condensing units shall be designed with redundancy configuration comprising one working unit and one standby unit. The manufacturer shall have certified rated products and an in-house

certified performance test facility for conducting factory acceptance tests (FAT). A minimum four-point FAT shall be conducted at design operating conditions prior to dispatch.

The supporting base frame shall be fabricated from heavy-duty hot-dip galvanized steel sections with polyester powder-coated finish suitable for outdoor installation and corrosion-resistant operation.

Note: Wherever the term “Air-Cooled Condensing Unit” appears in the tender specification, it shall be interpreted as “Factory-Made Air-Cooled Unit.” Similarly, wherever the unit capacity is specified as “-TR,” it shall be considered as “Capacity not less than - TR” at the specified operating/rating conditions.

3. Air Handling Units (AHUs)

- AHUs shall be of modular double-skin construction suitable for cleanroom applications with 24G (0.6 mm) plain Aluzinc inner skin and 22G (0.8 mm) Aluzinc powder-coated outer skin, comprising 45 ± 2 mm thick injected PUF insulation of density 38 ± 2 kg/m³ sandwiched between the panels, complete with internal aluminium coving and thermal break profiles to minimize thermal bridging and condensation.
- The AHU framework shall be fabricated from 1.5 mm thick extruded aluminium hollow sections integrated with polyamide thermal break profiles and assembled using aluminium die-cast 3-way corner sections and aluminium cast 2-way connectors for intermediate vertical profiles, complete with 1 mm thick aluminium internal coving profiles to ensure structural rigidity, thermal insulation efficiency, low air leakage, and cleanroom compatibility.
- The AHUs shall include cooling coil sections, blower sections, filter sections, mixing chambers, heater sections, fresh air intake arrangements, supply plenums, dampers, instrumentation provisions, and all accessories required for complete operation.
- The DX cooling coil section shall comprise minimum 6-row copper tube aluminium fin coils with copper headers, SS-304 insulated drain pans, PVC mist eliminators, and pressure-tested refrigerant connections. Coil face velocity shall not exceed 450 FPM.
- The blower section shall comprise belt-driven backward curved centrifugal fans complete with IE3 efficiency TEFC motors, VFD drives, anti-vibration mounts, inspection windows, marine lights, limit switches, and necessary safety arrangements suitable for continuous cleanroom operation.
- Fan and motor selection shall be based on minimum 10% additional capacity, and the sound level shall not exceed 70 dB at 1 meter distance.
- The AHUs shall include pre-filter sections with EU4/G4 filters and final filter sections comprising EU6/F6 and F7/EU7 filters complete with Magnehelic gauges for monitoring pressure drop across each filter stage.
- Supply plenums shall include low leakage aluminium aerofoil dampers suitable for manual/motorized operation with extended lockable shafts and flexible fire-retardant canvas connections.
- Provision For Electric tubular stainless steel strip heaters with thyristor controls, bypass arrangements, and instrumentation ports for temperature, velocity, and pressure measurements shall be provided.

- The AHUs shall include mixing chambers for fresh and return air mixing, fresh air intake louvers with bird mesh, washable pre-filters, rain protection louvers, bypass air arrangements, bleed dampers, and all associated controls and accessories.
- Provision shall be made for BMS integration including instrumentation pockets, pressure measuring ports, temperature measuring ports, DP switches, and sensor integration for monitoring temperature, humidity, airflow, filter differential pressure, fan status, and operating parameters.
- The AHUs shall be supplied in dismantled condition and installed complete with flexible canvas duct connections, vibration isolators, MS/PCC supports, marine lights, inspection doors, viewing glasses, safety grilles, and laminated airflow schematics mounted on each AHU.
- All AHUs shall be suitable for continuous duty operation on 415V, 3 Phase, 50Hz power supply.

3.1 AHU-Cum-Dehumidification System for ISO-5 Portion of Cleanroom

1. Scope of Supply: The bidder shall design, manufacture, supply, install, test, commission, and validate a complete AHU-cum-Dehumidification System capable of maintaining the specified environmental conditions within the laboratory areas on a continuous 24×7 basis. The system shall include all necessary equipment, accessories, controls, instrumentation, electrical components, ducting interfaces, supports, and interconnecting services required for complete and satisfactory operation.

2. Design Criteria: The AHU-cum-Dehumidification System shall be designed to maintain an indoor environmental condition of **21°C ± 1°C Dry Bulb Temperature and 45% ±2.5% Relative Humidity** under all operating and seasonal ambient conditions prevailing at Varanasi. The system shall be capable of handling both sensible and latent heat loads and shall maintain the specified conditions continuously without operational instability, moisture carryover, or degradation in performance.

3. AHU Construction: The Air Handling Unit shall be of robust, modular, double-skin construction comprising a minimum 43 mm thick injected polyurethane foam (PUF) insulated panel assembly with a minimum density of 40 kg/m³. The casing shall be thermally insulated and structurally reinforced to prevent thermal bridging, air leakage, vibration transmission, and panel deformation during operation. The AHU shall be provided with airtight access doors, inspection windows, internal lighting provisions, and a stainless-steel SS-304 drain pan with adequate slope for complete condensate removal.

4. Cooling Coil Section: The cooling coil shall be constructed from seamless copper tubes mechanically expanded into aluminium fins and selected for optimum heat transfer efficiency. The coil face velocity shall not exceed recommended industry limits to prevent moisture carryover. The coil shall be sized to meet the total cooling and dehumidification load under peak design conditions and shall be provided with adequate condensate management arrangements.

5. Desiccant Dehumidification Section: The dehumidification system shall incorporate an industrial-grade rotary desiccant wheel utilizing high-performance silica gel desiccant media. The rotor shall be non-toxic, non-corrosive, washable, and suitable for continuous industrial operation. The dehumidification wheel shall be designed to provide stable humidity control and efficient moisture removal throughout all seasons while maintaining long-term performance and structural integrity.

6. Regeneration System: The desiccant rotor shall be regenerated using a fully automatic electric regeneration heater assembly designed for continuous operation. The regeneration system shall be adequately sized to achieve the specified room humidity conditions under worst-case ambient conditions. Provision shall be incorporated for future integration of steam or hot water regeneration coils without major modification to the system. The regeneration process shall be controlled through PLC-based logic and shall automatically modulate or switch OFF when the desired room humidity is achieved and automatically restart when humidity rises above the set point. The operation of the regeneration system shall not adversely affect room temperature, humidity stability, or pressure differentials.

7. Fan Assembly: The supply air system shall be equipped with direct-driven plug fans or equivalent high-efficiency backward-curved centrifugal fans. Fans shall be selected for optimum efficiency and shall be capable of delivering the required airflow and external static pressure under all operating conditions. The fan assembly shall be dynamically balanced and mounted on vibration isolation supports. Variable frequency control shall be provided to facilitate airflow balancing, energy optimization, and pressure control.

8. Filtration System: The AHU shall be provided with a multi-stage air filtration arrangement consisting of G4 pre-filters, F7/F8 fine filters, and H13 HEPA filters where specified. Filters shall be selected in accordance with applicable ISO and EN standards. Suitable differential pressure monitoring devices shall be provided across each filtration stage for performance monitoring and maintenance indication.

9. Instrumentation and Controls: The AHU-cum-Dehumidification System shall be fully automated through a PLC-based control panel equipped with a color touchscreen HMI. The control system shall continuously monitor and regulate room temperature, relative humidity, airflow, static pressure, filter differential pressure, fan operation, regeneration temperature, and system status. All critical operating parameters shall be displayed locally and shall be available for remote monitoring through BMS integration using open communication protocols such as Modbus RTU/TCP or BACnet.

10. Electrical Control Panel: The control panel shall be factory-wired, tested, and suitable for industrial applications. The panel shall incorporate MCCBs, MCBs, contactors, overload relays, phase monitoring relays, surge protection devices, and all necessary safety components. The enclosure shall be of minimum IP54 protection class and suitable for indoor installation.

11. Safety Interlocks and Protection: The complete system shall be provided with comprehensive safety features including fan failure protection, regeneration heater high-temperature cut-out, motor overload protection, phase failure protection, emergency stop functionality, filter choking alarms,

smoke detector integration, and fire alarm interface. All safety interlocks shall be hardwired and integrated into the PLC control philosophy to ensure safe operation under all conditions.

12. Testing, Commissioning and Performance Verification: The bidder shall carry out complete testing, commissioning, balancing, calibration, and performance verification of the AHU-cum-Dehumidification System. Upon completion of installation, a continuous **72-hour performance test** shall be conducted. During the test period, the system shall maintain the specified room conditions of **21°C ± 1°C and 45% ± 2.5% RH** while maintaining the required room pressure differentials. The regeneration system shall automatically switch OFF when the desired humidity level is achieved and automatically restart as required without causing instability in room conditions. No unplanned shutdowns, excessive fluctuations, condensation formation, control hunting, or performance degradation shall be permitted during the test period.

13. Documentation and Validation: The bidder shall submit comprehensive documentation including equipment datasheets, selection calculations, psychrometric design reports, fan performance curves, electrical schematics, control philosophy documents, PLC software backup, calibration certificates, factory test reports, commissioning records, and operation and maintenance manuals. Detailed performance trend logs for temperature, humidity, pressure, airflow, and regeneration operation shall be submitted as part of the final validation dossier. Assistance for IQ, OQ, and performance qualification activities shall be provided wherever required.

14. Warranty and Service Support: The complete AHU-cum-Dehumidification System shall be warranted for a minimum period of twenty-four (24) months from the date of successful commissioning and acceptance. During the warranty period, the bidder shall provide preventive maintenance services, emergency breakdown support, calibration assistance, and replacement of defective components at no additional cost to the owner. The bidder shall maintain adequate service infrastructure and trained personnel to ensure prompt response and uninterrupted operation of the facility

4. Duct Heaters, Humidifiers and Pre-Cooling Coils

Electric duct heaters with thyristor control panels shall be provided for critical cleanroom areas wherever required to maintain the specified temperature conditions under varying ambient and process load conditions. The duct heater system shall comprise stainless steel tubular heaters, insulated heater assemblies, thyristor-based control panels, temperature sensors, safety thermostats, airflow interlocks, and automatic control arrangements for precise temperature modulation and stable cleanroom operation.

Pre-cooling coil systems shall be provided for fresh air handling wherever applicable. The pre-cooling modules shall comprise double-skin insulated modular housings with thermal break profiles, EU4 filters, DX cooling coils, PVC moisture eliminators, SS drain pans, VCDs, rough/fine filters, bird cowls, and associated accessories.

Pan humidifiers shall be provided to maintain RH not below 40% during low ambient humidity conditions. The humidifiers shall be fabricated from minimum 2 mm thick stainless steel with

immersion heaters, steam outlet nozzles, humidistats, safety controls, float valves, drain arrangements, and associated piping and controls.

4.1 Cleanroom Compatible Ducting System

- The cleanroom-compatible ducting system shall comprise factory-fabricated and site-fabricated GI sheet metal ducts conforming to SMACNA standards with minimum zinc coating of 120 GSM.
- The ducting system shall include all necessary accessories such as RTV sealants, gaskets, supports, MS flanges, threaded rods, nuts, bolts, vanes, splitters, dampers, and associated hardware required for complete installation.
- Duct sheet thickness/gauge shall be selected based on duct size and pressure class as per applicable standards and approved design criteria.
- Factory-fabricated ducts shall be manufactured using CNC profile cutting and lock-forming machines to ensure dimensional accuracy, rigidity, and low leakage performance.
- All duct joints, flanges, and connections shall be properly gasketed and sealed to minimize air leakage and maintain cleanroom integrity.
- Duct supports and hangers shall comprise MS slotted angles/channels with threaded rod supports and approved anchor fasteners suitable for the duct load and installation conditions.
- All bends, elbows, offsets, reducers, and branch connections shall be designed for smooth airflow, low turbulence, minimum pressure drop, and reduced noise generation. Turning vanes shall be provided wherever required.
- All branch take-offs from supply and return air ducts shall be provided with opposed blade volume control dampers for airflow balancing.
- Ducts shall be adequately supported, aligned, and labeled with airflow direction markings for easy identification and maintenance.
- All duct sections shall be connected using leak-proof galvanized flanged joints suitable for the specified pressure class and cleanroom application requirements.
- Duct transformations shall be used wherever required to change the shape or size of the duct and shall be designed to ensure smooth, noiseless airflow with minimum pressure drop. The maximum slope of duct transformation shall be limited to 1:4.
- All bends, offsets, reducers, and branch connections shall be fabricated and installed to ensure smooth airflow; minimum turbulence, low noise generation, and minimum pressure drop within the ducting system.
- In case of full-radius elbows, the optimum ratio of elbow centerline radius to duct dimension shall be considered as 1.25. However, where space constraints exist, short-radius elbows or square elbows with guide vanes may be provided.
- All curved elbows shall be provided with air turning vanes consisting of curved metal blades arranged to facilitate smooth directional airflow without appreciable turbulence.
- All right-angle elbows shall be provided with double-thickness aerofoil turning vanes extending over at least 50% of the elbow curvature. The turning vanes shall be complete with flanged mounting arrangement and riveted to the duct at intervals not exceeding 60 mm centers.

- Every duct take-off from supply air and return air ducts shall be provided with opposed blade volume control dampers for airflow balancing and system regulation.
- All main supply air and return air ducts entering the cleanroom areas from the external plant room/AHU locations through civil wall openings shall be installed with suitable outward slope towards the external side of the building to prevent ingress of rainwater or moisture into the cleanroom false ceiling/interstitial areas during monsoon or adverse weather conditions. Necessary weatherproof sealing, flashing, and waterproofing arrangements shall be provided at all duct wall penetration locations to maintain cleanroom integrity and prevent water leakage.

Supporting details for ducts:

Max Side of Duct (mm)	Supporting MS Angle - Minimum Size (mm)	Tie Rod Diameter (mm)	Max Spacing Between Supports (mm)
Up to 1000	35 × 35 × 3	10	3000
1001 to 2250	50 × 50 × 6	10	3000
2250 and above	65 × 65 × 6	12	2400

- The above-mentioned sizes of MS support angles and vertical rods are indicative minimum requirements. Higher sizes of MS angles and GI/MS support rods shall be provided wherever required based on duct size, load conditions, and site requirements. Double lock nuts shall be provided for all support rods to ensure rigid and vibration-free duct support arrangements.
- Steel anchor fasteners shall be provided by the vendor for duct hanging/supporting arrangements wherever required. The anchor fasteners shall be selected and installed such that the working load does not exceed 20% of the manufacturer's rated load capacity.

4.2 Duct Insulation-Scope, Material, Properties and Installation

- Supply air and return air ducts shall be thermally insulated using aluminum foil faced closed-cell nitrile rubber/electron beam cross-linked polyolefin foam insulation with proper sealing of all joints and edges. Airflow direction markings shall be clearly indicated on the respective ducts.
- Insulation thickness shall be 19 mm for supply air ducts and 13 mm for return air ducts unless otherwise specified based on system requirements and operating conditions.
- All duct surfaces exposed to the external atmosphere shall be insulated with minimum 19 mm thick insulation for supply air ducts and 13 mm thick insulation for return air ducts.

- The insulation material shall be electron beam (physically) cross-linked polyolefin foam/nitrile rubber type with factory-applied reinforced aluminium foil facing on one side. Insulation thickness shall be selected in accordance with manufacturer recommendations and operating conditions.
- The insulation material shall have minimum density of 25 kg/m³ and maximum thermal conductivity (K value) not exceeding 0.032 W/mK at 23°C mean temperature.
- The water vapors permeability of the insulation material shall be better than 0.8 gm/m²/24 hrs at 90% RH and 38°C conditions.
- The insulation material shall comply with minimum Class O fire rating requirements when tested as per BS 476 Part 6 & 7 standards.
- The insulation material shall comply with smoke toxicity requirements as per BS 6853 and ISO 5659 standards.
- The scope of work shall include supply and installation of all insulation materials, adhesives, reinforced aluminium foil tapes, accessories, weather protection arrangements, scaffolding, consumables, and associated items required for complete installation.
- The contractor/vendor shall supply all necessary skilled and unskilled manpower, supervision, tools, and equipment required for carrying out insulation work as per approved shop drawings, manufacturer recommendations, and good engineering practices.
- Insulation shall be installed strictly in accordance with the manufacturer's installation instructions and approved procedures.
- All insulation joints shall be tightly butted against each other and sealed using overlapping self-adhesive reinforced aluminium foil tape of minimum 75 mm width procured from the same manufacturer as the base insulation material.
- Each duct section including duct flanges shall be individually insulated. Flanges shall be insulated using minimum 120 mm wide insulation strips with all joints sealed using reinforced aluminium foil tape.
- All duct support hangers, clamps, and supports shall be lined with the same insulation material to avoid excessive compression, thermal bridging, and insulation damage.
- Proper care shall be taken during installation to ensure that no air gaps, voids, or pockets remain within the insulation system. Any cuts or damages on insulation surfaces shall be repaired and sealed using reinforced aluminium foil tape.
- For all insulated supply air and return air ducts exposed to the external atmosphere, 26G aluminium cladding shall be provided as protective covering against rain, sunlight, moisture, and extreme atmospheric conditions.

4.3 Fire Dampers, Dampers, Return Air Raisers, Grilles, and Accessories

4.3.1 Fire Dampers

- Fire dampers shall be of fusible link operated type in galvanized steel construction and shall be provided as required for proper air flow management and fire compartmentation.
- Fire dampers shall have minimum 90 minutes fire rating and shall consist of outer frame, damper blades, SS springs, plated steel linkage, twin micro switches, UL stamped fusible links, handles, and sleeves.
- The damper frame and blades shall be fabricated from minimum 1.6 mm thick galvanized steel sheet (GSS) as per applicable standards.

- Fire damper blades shall be one-piece folded high-strength galvanized steel construction designed to remain stacked in normal condition to provide maximum free air passage and minimum noise generation.
- In the event of fire, the fusible link shall actuate automatic closure of the damper utilizing intrinsic spring force/blade thrust mechanism.
- The closing action of the fire damper shall actuate one of the twin limit switches mounted within the damper assembly to automatically shut off power supply to the associated AHU and stop airflow instantaneously.
- The second limit switch provision shall provide signal to the DDC/BMS/main control panel for shutdown indication and interlocking of the AHU system.
- All fire dampers shall be complete with factory-fabricated duct sleeves, access doors, and mounting accessories as recommended by the manufacturer.
- Fire performance certification from CBRI/approved authority shall be submitted for all fire dampers.

4.3.2 Volume Control Dampers (VCD)

- Volume control dampers shall be provided at all suitable locations in supply air and return air ducts for airflow balancing and proportional volume control.
- Dampers shall be lockable opposed blade type with low leakage construction, aerofoil aluminium blades, extended operating lever, and suitable locking arrangement.
- Dampers shall be provided at all branch take-offs, terminal HEPA filter connections, fabricated return air raisers, and wherever required for balancing of airflow.
- Dampers shall be fabricated from anodized/powder-coated aluminium with aerofoil blade design for minimum pressure drop and low noise operation.
- Dampers shall comply with DIN 1946 Part 4 requirements and shall have distortion-free hollow profile aluminium blades with special rubber sealing lips for near zero leakage performance.
- Damper frame shall be fabricated from galvanized steel sheet with minimum 60-micron powder coating and suitable bearing arrangements using polyamide bushes.
- Gear wheels and operating mechanisms shall be located outside the air stream to avoid contamination and dust accumulation.
- Manual dampers shall be complete with graduation markings, locking arrangements, open/close indication, operating handle, and protective gear cover.

4.3.3 Fabricated Return Air Raisers & Return Air Grilles

- The required return air quantity for maintaining temperature and RH shall be drawn through dedicated fabricated return air raisers installed at low level along the periphery of cleanroom wall panels.
- Return air raisers for ISO-6 and ISO-8 areas shall generally be 100 mm/80 mm depth, while return air raisers for ISO-5 areas shall be minimum 200 mm depth or as required by airflow design.

- In ISO-5 cleanroom areas, return air path shall be taken from raised floor/peripheral low-level return arrangement from all corners of the room and plenum return concept shall be avoided to maintain uniform air change rate and minimize pressure drop.
- Return air raisers shall be fabricated from minimum 22G galvanized steel sheet with suitable supports and insulation wherever required.
- Return air raisers shall include linear type Stainless steel SS 304 return air grilles complete with GI powder-coated collars and opposed blade volume control dampers along with 10 mm thick 20-micron filter
- Return air grilles shall be selected for maximum NC-35 aerodynamic noise criteria and return air velocity through grilles shall not exceed 350-400 FPM.
- Return air riser sizing velocity shall not exceed 500 FPM.
- Return air grille construction shall comprise high-quality SS304 with standard 30 mm flange width and 15° one-way/two-way throw blades.
- Grille bar spacing shall generally be 6 mm/12 mm as required.
- Vertical aero foil blades at rear side shall be mounted using nylon bushes for airflow adjustment.
- Return air volume control shall be manually operable from room side through suitable operating lever arrangement.
- Adequate thermal insulation shall be provided for fabricated return air raisers located outside conditioned cleanroom envelope.
- Insulation for external return air raisers shall comprise minimum 9 mm thick Class 'O' closed-cell nitrile rubber insulation with aluminium foil facing and sealed joints.

4.3.4 Velocity Criteria

- Main supply air duct velocity from AHUs shall not exceed 1200 FPM.
- Return air riser velocity shall not exceed 500 FPM.
- Return air grille face velocity shall not exceed 350-400 FPM.
- Final velocity selection shall be verified by vendor based on actual design conditions; pressure drop calculations, noise criteria, and cleanroom performance requirements.

4.3.5 Magnehelic Gauges & Temperature/RH Indicators

- Magnehelic gauges shall be cleanroom compatible dial type, minimum 100 mm diameter with pressure range of 0-10 mm WG complete with SS mounting box and PVC tubing.
- Digital temperature and RH indicators shall be cleanroom compatible type with display range of 0-50°C temperature and 0-90% RH complete with digital display unit.

4.3.6 Validation & Commissioning of Cleanroom

- The contractor/vendor shall carry out complete validation and commissioning of the cleanroom facility in accordance with ISO 14644 standards.
- Validation scope shall include DQ (Design Qualification), IQ (Installation Qualification), and OQ (Operational Qualification).
- The contractor shall submit complete validation reports, equipment test certificates, material test certificates, and detailed engineering drawings.

- **Validation and testing of the semiconductor cleanroom facility** shall be carried out sequentially in accordance with ISO 14644 standards, NEBB/IENT guidelines, and approved cleanroom validation protocols. The validation sequence shall include, but not be limited to, the following tests:
 - **Visual Inspection & System Verification:** Visual inspection and system verification shall be carried out to confirm proper installation, sealing, workmanship, equipment integration, and overall compliance with approved cleanroom design specifications.
 - **Air Balancing & Air Velocity Test:** Air balancing and air velocity testing shall be conducted to verify uniform airflow distribution, specified air change rates, and design air velocities across all cleanroom areas.
 - **Air Change Rate (ACPH) Verification:** Air change rate testing shall be performed to confirm that the required air changes per hour are achieved as per the specified cleanroom classification.
 - **HEPA Filter Integrity Test (PAO Test):** HEPA filter integrity testing shall be conducted using PAO/DOP aerosol challenge to verify absence of leakage through filters, filter seals, and housing assemblies.
 - **Differential Pressure & Pressure Zoning Test:** Differential pressure testing shall be carried out to verify proper pressure cascade, pressure zoning, and contamination control between adjacent cleanroom areas.
 - **Temperature Uniformity Test:** Temperature uniformity testing shall be performed to confirm maintenance of specified temperature conditions uniformly throughout the cleanroom areas.
 - **Relative Humidity (RH) Test:** Relative humidity testing shall be conducted to verify that the specified RH conditions are maintained within the required operating limits.
 - **Airborne Particle Count Test (At-Static & Dynamic Condition):** Airborne particle count testing shall be carried out under both at-rest/static and operational/dynamic conditions to verify compliance with ISO cleanroom classification requirements.
 - **Recovery Test (Clean-Up Time Test):** Recovery testing shall be performed to determine the time required for the cleanroom to restore specified cleanliness levels after particle generation or operational disturbance.
 - **Airflow Pattern/Smoke Visualization Test:** Smoke visualization testing shall be conducted to verify airflow direction, laminarity, airflow uniformity, and absence of turbulence or stagnant zones.
 - **Noise Level & Lux Illumination & Vibration Test:** Noise level and illumination testing shall be conducted to verify compliance with specified acoustic and lighting requirements for cleanroom operation.
 - **Vibration Test:** Vibration testing shall be performed in critical semiconductor process areas to verify that vibration levels remain within acceptable operational limits.
 - **Validation of Return Air Path & Laminar Flow Verification in ISO-5 Areas:** Validation shall be conducted to confirm proper return air path arrangement and maintenance of unidirectional laminar airflow in ISO-5 areas.
- **Functional Performance Verification of HVAC, Controls, Interlocks & Monitoring Systems:** Functional testing shall be carried out to verify satisfactory operation of HVAC

systems, controls, alarms, interlocks, sensors, and monitoring systems under all operating conditions.

- Documentation Review including DQ, IQ & OQ Protocols and Final Validation Reports: Complete review and submission of DQ, IQ, OQ documents, calibration certificates, test reports, SOPs, and final validation reports shall be carried out for project acceptance and compliance documentation.

PART B: TECHNICAL SPECIFICATION FOR CLEANROOM FABRICS

Cleanroom Fabrication Works Scope

This specification covers the design, manufacture, supply, installation, testing, commissioning, and validation of cleanroom fabrication works for the Advanced Semiconductor Processing Cleanroom Facility at Indian Institute of Technology (BHU), Varanasi, in accordance with ISO-14644 standards and applicable international cleanroom engineering practices. The cleanroom fabrication scope shall include modular wall panels, ceiling systems, covings, doors, vision panels, cleanroom partitions, support structures, flooring interface arrangements, return air risers, equipment cut-outs, utility integration provisions, and all associated accessories required for complete cleanroom construction.

1. Cleanroom Compatible Modular Wall Panels (ISO-5, ISO-6 & ISO-8)

Design Specifications

- The modular wall panel system shall be designed for ISO-5, ISO-6, and ISO-8 cleanroom applications with airtight, smooth, non-particle shedding, and cleanable surfaces suitable for semiconductor and controlled environments.
- The wall panel system shall be modular and demountable in construction to facilitate future shifting, replacement, movement, or installation of semiconductor process tools and equipment without damaging adjacent panels.
- The system shall incorporate concealed provisions for electrical conduits, switchboards, LAN points, utility routing, and other service integrations within the panel cavity wherever required.
- The wall panel arrangement shall include suitable tracks, joining profiles, reinforcements, and airtight interlocking edge construction to ensure structural rigidity, insulation continuity, and contamination control.
- Fabricated return air risers shall be integrated within the modular wall panel system wherever required as per approved cleanroom layout and HVAC design.
- Flush cleanroom-compatible view panels/vision panels shall be incorporated within the wall panel system wherever indicated in the approved drawings.
- All wall-to-wall, wall-to-ceiling, and wall-to-floor junctions shall be designed with aluminium R-70 covings and R-90-degree corner profiles to ensure smooth finish and easy cleanability.

Construction Specifications

- Wall panels and related fabricated components shall be manufactured using high-quality PPGL (Pre-Painted Galvalume Steel) sheets with minimum 0.6 mm thick inner and outer skins having smooth polyester powder-coated finish in approved cleanroom-compatible colour.

- Panels shall be minimum 50/80/100 mm thick comprising self-extinguishing rigid PUF (Polyurethane Foam) insulation core of density not less than 48 kg/m³ sandwiched between two powder-coated metal skins.
- RCC/steel column cladding, fabricated return air risers, and exposed structural elements within the cleanroom shall also be finished using the same modular wall panel construction and finish.
- Panels shall be manufactured in continuous lengths without intermediate joints and shall have recessed male and roll-formed female interlocking edges for airtight panel jointing.
- All wall joints, panel intersections, and view panel interfaces shall be sealed using cleanroom-compatible food-grade/non-outgassing sealant to prevent air leakage and particle ingress.
- Aluminium R-70 covings and R-90-degree corner profiles matching the panel finish and colour shall be provided at all internal wall, ceiling, and floor junctions.
- Suitable internal reinforcements shall be provided at doors, view panels, utility openings, and high-load areas extending from floor to ceiling level.
- Panels shall be supplied with removable peel-off protective film to prevent scratches, dents, and surface damage during transportation, storage, and installation.

Note: Tongue-and-groove type joining systems are not acceptable, HPL finish panels, one-side GPSP and one-side HPL panels, or any wall panel construction other than the specified cleanroom-compatible double-skin GI modular panel system shall not be accepted and are liable for rejection.

2. Walkable False Ceiling Panels

2.1 ISO-6 & ISO-8 Cleanroom Ceiling System

Design Specifications

- The modular false ceiling system shall be designed for ISO-6, ISO-7, and ISO-8 cleanroom applications with airtight, flush, and cleanable construction suitable for semiconductor and controlled environments.
- The ceiling system shall be modular in design with provisions for integration of cleanroom lighting, HEPA terminals, sprinkler systems, and utility services.
- The ceiling layout shall incorporate maintenance access through suitably located trap doors/service access panels.
- The system shall be designed to provide thermal insulation, structural rigidity, contamination control, and long-term cleanroom performance.

Construction Specifications

- Ceiling panels shall be manufactured using high-quality PPGL sheets with minimum 0.6 mm thick inner and outer skins having smooth polyester powder-coated finish in approved cleanroom-compatible colour.
- Panels shall be minimum 50 mm thick with self-extinguishing rigid PUF insulation core of density not less than 48 kg/m³ sandwiched between metal skins.

- All joints shall be sealed using cleanroom-compatible food-grade/non-outgassing sealant, and all panel junctions shall be finished with matching aluminium coving/profile sections.
- The system shall include complete galvanized suspension/support framework comprising trusses, wall angles, suspenders, reinforcing members, anchor fasteners, and all fixing hardware required for installation below the parent structural roof.

2.2 ISO-5 (Class 100) Walkable Ceiling System

Design Specifications

- The ceiling system shall be designed as a heavy-duty walkable false ceiling suitable for ISO-5 (Class 100) cleanroom applications.
- The modular ceiling grid configuration shall be 1200 mm × 600 mm with gasket-type sealing arrangement for airtight cleanroom performance.
- The ceiling system shall be capable of accommodating hooded HEPA filters, cleanroom light fixtures, sprinklers, and other service utilities.
- The ceiling grid colour shall match the wall panel finish and shall provide smooth, cleanable, and contamination-resistant surfaces.

Construction Specifications

- The ceiling grid system shall consist of heavy-duty anodized aluminium extruded T-grid sections having 56 mm inverted T-width and 78 mm height.
- Walkable ceiling panels shall comprise GPSP/PPGL/PCGI double skin construction with minimum overall thickness of 50 mm insulated with self-extinguishing rigid PUF core of density not less than 48 kg/m³.
- The ceiling system shall include aluminium extruded cross connectors, hammer head bolts, M8 bolts, square hangers, suspension rods, turnbuckles, anchor fasteners, reinforcing members, and all necessary galvanized support hardware.
- All panel joints shall be sealed with cleanroom-compatible non-outgassing sealant, and necessary trap doors/service access panels shall be provided for maintenance access above the ceiling system

3. Modular Cleanroom Doors

Design Specifications

- Modular cleanroom doors shall be flush-mounted double skin doors designed for ISO-5, ISO-6, and ISO-8 cleanroom applications with smooth, airtight, and cleanable surfaces.
- Doors shall be designed to integrate seamlessly with the modular wall panel system on both sides and shall include view panels, concealed sealing systems, and cleanroom-compatible hardware.
- Door systems shall be suitable for integration with access control systems, electro-magnetic interlocks, and cleanroom automation requirements.
- Doors shall be designed to minimize air leakage, particle accumulation, and operational vibration during cleanroom operation.

Construction Specifications

- Door shutters shall be minimum 44 mm thick comprising self-extinguishing rigid PUF insulation core of density not less than 38 kg/m³ sandwiched between minimum 0.8 mm thick GPSP GI sheets on both sides.
- Door frames shall be minimum 50 mm thick fabricated from minimum 1.2 mm thick GPSP GI sheets on both sides with polyester powder-coated finish of minimum 60 microns DFT including primer.
- Doors shall include double glazed flush-type view panels with minimum 5 mm thick toughened glass fixed using self-adhesive tape and food-grade silicon sealant.
- Doors shall be complete with SS ball bearing butt hinges, SS “D” handles, SS push plates, SS304 kick plates (300 mm height), Dorma TS-71 door closer, concealed automatic drop seal, lock and key arrangement, and electro-magnet compatible door interlock provisions

4. Emergency Doors

Design Specifications

- Emergency exit doors shall be designed for safe emergency evacuation from cleanroom areas in compliance with fire and safety requirements.
- Emergency doors shall open outward in the direction of escape and shall be provided with panic bar arrangement.
- Door assemblies shall maintain cleanroom integrity while providing emergency access functionality.
- Door systems shall be compatible with cleanroom wall panel construction and airtight sealing arrangements.

Construction Specifications

- Emergency doors shall comprise single leaf GI powder-coated double skin fire-rated doors of 50 mm thickness with mentioned sizes in drawings suitable for cleanroom emergency exit applications.
- Door shutters shall be fabricated from minimum 0.8 mm thick GI sheets with minimum 1.2 mm thick GI frame and insulated with Rockwool infill of density not less than 96 kg/m³.
- Doors shall include fire-rated glazed vision panel of size 300 mm × 300 mm with minimum 5 mm thick fire-rated glass, smoke seal, and automatic bottom drop seals on both sides to prevent ingress of insects, dust, and contaminants from outside the cleanroom environment.
- Doors shall be complete with SS304 ball bearing hinges, SS304 kick plate, panic bar arrangement, locking system, and all necessary fire-rated hardware and accessories required for safe and compliant operation.

5. Cleanroom Glazed View Panels

Design Specifications

- Cleanroom view/vision panels shall be flush-mounted double-glazed units designed for airtight cleanroom wall integration.
- View panels shall provide clear visibility between cleanroom areas while maintaining contamination control and insulation performance.
- Vision panels shall be factory-sealed to prevent moisture ingress, fogging, and particle accumulation within the glazing cavity.
- View panel framing and sealing arrangement shall be compatible with modular cleanroom wall panel construction.

Construction Specifications

- View panels shall consist of double-glazed toughened glass units with minimum 6 mm thick glass on both sides and suitable air gap between the glass panes.
- Standard panel size shall be 1200 mm × 1200 mm or were are possible provisions shown by the vendors
- Frames shall be fabricated from powder-coated GPSP GI/aluminium sections finished in Designer White shade complete with gasket and silicone sealant.
- View panels shall include silica gel moisture absorption arrangement, sealed glazing assembly, double adhesive gasket fixing, and complete installation accessories.

6. Covings for Clean Rooms

Design Specifications

- R-70 coving systems shall be designed to provide smooth radius-type cleanroom junctions to eliminate dust accumulation and facilitate ease of cleaning and maintenance.
- R-70 covings shall be provided at all wall-to-wall, wall-to-ceiling, wall-to-floor, and cleanroom corner junctions to maintain hygienic and contamination-free surfaces.
- The aluminium male and female coving profile system shall maintain flush, seamless, and cleanroom-compatible surface finish throughout the cleanroom area.
- Internal and external corners suitable for R-70 coving arrangement shall be finished using 2D and 3D aluminium corner coving sections including R-90 corner profiles wherever required around columns and internal corner intersections.

Construction Specifications

- All male and female R-70 covings shall be manufactured from extruded aluminium powder-coated profiles in approved cleanroom-compatible finish and colour.
- Radius of coving shall be minimum R-70, and R-90 corner coving/profile sections shall be provided wherever required for columns, internal corners, and special junction conditions.
- The coving system shall include clip-on type aluminium covings, 2D corner covings, 3D corners covings, fixing clips, and all necessary installation accessories.
- Covings shall be installed continuously along wall joints, wall-to-ceiling junctions, wall-to-floor interfaces, column edges, and cleanroom corner locations to ensure smooth, airtight, and easily cleanable transitions.

7. Cladding of Vertical Pillars Inside Cleanrooms

Design Specifications

- All exposed RCC/steel pillars and structural projections within cleanroom areas shall be fully clad using modular cleanroom 50mm thick wall panel system.
- Pillar cladding shall maintain flush alignment with adjacent cleanroom 50 mm thick wall surfaces and preserve cleanroom integrity.
- Cladding system shall provide airtight, cleanable, and contamination-resistant finish matching the modular wall panel system.
- The cladding finish and colour shall match the adjacent cleanroom wall panel finish.

Construction Specifications

- Pillar cladding panels shall comprise minimum 50 mm thick modular double skin wall panels insulated with self-extinguishing rigid PUF (Polyurethane Foam) core of density not less than 38 kg/m³.
- GI powder-coated sheets or aluminium powder-coated sheets shall not be used separately for pillar cladding applications, and the cladding material shall be strictly identical to the approved modular cleanroom wall panel system.
- Pillar cladding construction, material specifications, panel finish, sealing arrangement, insulation properties, and installation methodology shall be fully matching and compatible with the approved modular cleanroom wall panel construction.
- The cladding system shall provide flush, airtight, smooth, and contamination-free finish integrated with adjacent cleanroom wall panels without visible gaps, offsets, or exposed joints.

8. Flooring System for Cleanroom Lab Areas

8.1 ESD or Antistatic Vinyl Flooring

Design Requirements

- ESD or Antistatic vinyl flooring shall be provided in all ISO-5, ISO-6 and ISO-8 cleanroom areas as indicated in the approved cleanroom layout and drawings.
- The flooring system shall be designed to provide a smooth, seamless, non-shedding, and easy-to-clean surface suitable for cleanroom applications and contamination-controlled environments.
- The flooring material shall be suitable for semiconductor/cleanroom applications and shall possess anti-static properties to minimize electrostatic charge buildup within the cleanroom areas.
- The flooring system shall comply with applicable ISO cleanroom standards, cleanroom operational requirements, and approved design specifications.

Construction Requirements

- The flooring shall consist of high-quality antistatic conductive vinyl flooring of approved make and suitable thickness for cleanroom applications.
- The flooring material shall be chemically resistant, abrasion-resistant, durable, non-combustible, and compatible with cleanroom cleaning agents and operational conditions.
- The finished flooring surface shall be smooth, level, and free from visible seams, joints, cracks, cavities, or surface irregularities that may trap particles, contaminants, or moisture.
- All joints, edges, corners, covings, and terminations shall be properly sealed and finished to maintain cleanroom integrity and ease of maintenance.
- The flooring system shall include all necessary adhesives, conductive layers, grounding arrangements, covings, trims, edge protection, and associated accessories required for complete installation and performance.

Installation and Performance Requirements

- The vendor shall prepare the existing floor surface properly prior to installation of the antistatic vinyl flooring system, including leveling, cleaning, moisture checks, and surface treatment as required.
- The complete flooring installation shall be carried out in accordance with manufacturer recommendations, approved cleanroom practices, and applicable standards.
- The installed flooring system shall ensure long-term durability, easy maintenance, cleanability, anti-static performance, and compatibility with cleanroom operational requirements.
- The vendor shall ensure proper conductivity/ESD performance and grounding continuity of the flooring system and shall submit relevant test certificates and validation reports during commissioning

8.2 Raised Floor System

Design Requirements

- The raised floor system shall be designed as a modular cleanroom flooring system consisting of floor grill/tile panels mounted on adjustable pedestal assemblies, providing an underfloor plenum for routing mechanical services, electrical conduits, instrumentation cabling, and utility services, and for use as supply/return air plenum wherever applicable.
- The system shall be suitable for Class 100 cleanroom applications and designed to meet cleanroom, anti-static, airflow, structural loading, and operational requirements of semiconductor/lithography facilities.
- The flooring system shall be fully integrated and coordinated with the Lithography Isolation Platform, Air Shower Entry, utility routing arrangements, and cleanroom access requirements as indicated in the annexure drawings and approved layouts.

- The raised floor system shall be designed to maintain electrostatic discharge (ESD) protection with system conductivity/resistivity maintained within the range of approximately $1.5 \times 10^5 \Omega$ to $2 \times 10^7 \Omega$ measured between the top tile surface and understructure.
- The pedestal and flooring assembly shall be designed to achieve an electrical resistance level within the range of $1 \times 10^6 \Omega$ to $1 \times 10^9 \Omega$ in compliance with cleanroom grounding and anti-static requirements.
- The flooring system shall include a copper strip/foil grounding grid arrangement approximately 10 ft $\times$ 10 ft spacing, or as recommended by the manufacturer, connected to the cleanroom earthing system as per approved grounding practices and applicable standards.

Construction Requirements

- Floor panels/tiles shall be manufactured from high-strength die-cast aluminum or mild steel (MS) structure with powder-coated finish and shall be of capsule type and/or perforated type construction suitable for airflow management and cleanroom operation.
- The top surface finish of the floor panels shall consist of minimum 2 mm thick anti-static conductive vinyl flooring which shall be non-combustible, abrasion-resistant, chemical-resistant, and suitable for cleanroom applications.
- Adjustable pedestal assemblies shall be of heavy-duty construction capable of supporting a minimum axial load of 2250 kg without permanent deformation or structural failure and shall have a minimum load-bearing capacity of ≥ 750 PSI or equivalent approved standard.
- Prior to installation of the pedestal-floor tile arrangement, the existing base floor surface shall be properly prepared and finished with anti-static vinyl flooring or equivalent approved anti-static treatment.
- The flooring system shall include all required pedestals, stringers, perforated/grill panels, solid panels, ramps, supports, cut-outs, grounding accessories, edge trims, sealing arrangements, access panels, and associated installation hardware necessary for complete installation and operation.
- All materials used in the raised flooring system shall be compatible with cleanroom environments and shall be non-shedding, corrosion-resistant, easy to clean, and suitable for semiconductor/lithography applications.

Installation and Performance Requirements

- The vendor shall carry out complete detailed engineering, load calculations, airflow coordination, grounding continuity arrangements, installation, leveling, alignment, testing, and commissioning of the raised flooring system.
- The installed flooring system shall provide stable, vibration-compatible, cleanroom-compliant, and operationally safe performance suitable for lithography and precision equipment applications.
- The complete raised flooring system shall be installed in proper coordination with HVAC airflow requirements, cleanroom zoning, utility layouts, equipment foundations, and isolation platform arrangements.

- The vendor shall ensure proper grounding continuity and ESD performance throughout the complete raised flooring system and shall submit relevant test reports during commissioning and validation.

9. Hooded HEPA Filters (H-14) For ISO-5, ISO-6 and ISO-8

Design Specifications

- The cleanroom HVAC system for ISO-5, ISO-6, and ISO-8 areas shall be provided with disposable type Hooded HEPA Filters (H-14) with ceiling module suitable for semiconductor, microelectronics, precision fabrication, and contamination-controlled cleanroom applications.
- HEPA filters shall be designed to achieve minimum filtration efficiency of 99.995% at MPPS (Most Penetrating Particle Size) in accordance with EN1822 standards to maintain the specified cleanroom particulate cleanliness classifications.
- The HEPA filter ceiling module shall be designed for uniform laminar airflow distribution with low turbulence and minimum pressure drop to ensure optimum cleanroom airflow performance and contamination control.
- The HEPA housing shall be designed with hermetically sealed construction, top-entry air inlet arrangement, airtight gasket sealing, and integrated DOP/PAO testing provision for leak integrity validation and operational reliability.
- The HEPA filter module shall be compatible with modular cleanroom ceiling systems and shall be suitable for integration with walkable ceiling grids, cleanroom lighting systems, sprinklers, and return air arrangements.
- The HEPA filter assembly shall be designed for easy replacement, servicing, validation, and maintenance access from the top side above the false ceiling without disturbing cleanroom operations or adjacent ceiling modules.

Construction Specifications

- Hooded HEPA filters shall be disposable type of nominal overall size approximately 1200 mm × 600 mm × 152 mm depth complete with anodized aluminium extruded housing and lightweight aluminium casing suitable for cleanroom ceiling mounting applications.
- The HEPA filter media shall comprise ultra-fine glass fiber media with minimum media depth of 48 mm and shall achieve H14 filtration efficiency of minimum 99.995% at MPPS as per EN1822 standards.
- The filter unit shall be designed for nominal airflow capacity of approximately 1200 CMH (650-700 CFM) at 0.45 m/sec face velocity with maximum initial pressure drop of approximately 125 Pa under standard operating conditions.

- The filter assembly shall include top-entry air inlet arrangement with factory-fitted inlet collar of 250/300 mm diameter complete with airtight sealing arrangement for leak-proof operation.
- The HEPA filter construction shall include thermoplastic separators, cold-cured resin bonding, neoprene gasket on air leaving side, epoxy-coated expanded steel face guard, DOP/PAO test port, and hermetically sealed housing construction.
- The HEPA filter modules shall be individually leak/scanning tested for functional reliability and compliance with cleanroom performance requirements prior to dispatch and installation.
- The complete HEPA module assembly shall include suspension/support arrangement, fixing accessories, sealing gaskets, mounting hardware, and all accessories required for complete installation within modular cleanroom ceiling systems.
- The HEPA filter housing and components shall be suitable for continuous cleanroom operation up to temperature limit of 70°C and shall provide corrosion-resistant, non-particle shedding, and cleanroom-compatible performance throughout service life

10. Analog Magnehelic Gauges - Cleanroom Pressure monitoring

Design Specifications

- Magnehelic gauges shall be provided for monitoring room differential pressure across cleanroom areas to ensure maintenance of specified pressure cascade and contamination control requirements.
- The gauges shall be cleanroom-compatible dial type instruments suitable for continuous monitoring of low Room-to-Room differential pressures and Ambient-to-Room pressure conditions in semiconductor and cleanroom applications.
- The pressure monitoring system shall be designed for clear visibility, stable operation, accurate indication, and easy maintenance with suitable wall-mounted arrangement.
- The Magnehelic gauges shall be suitable for monitoring both positive and negative pressure conditions between cleanroom areas, airlocks, return air risers, and adjacent service zones.

Construction Specifications

- Magnehelic gauges shall be dial type with minimum 100 mm diameter display and pressure range of 0 to 100 Pascal complete with cleanroom-compatible construction.
- The gauges shall be provided with stainless steel mounting box/enclosure suitable for flush/surface mounting within modular cleanroom wall panel systems.
- The system shall include PVC tubing, pressure sensing lines, connectors, pressure tapping points, fixing accessories, mounting hardware, and all necessary installation components required for complete operation.
- The gauges shall be factory calibrated and site tested for accuracy, stable differential pressure indication, and reliable operation under cleanroom environmental conditions.

11. Temperature and RH Indicators

Design Specifications

- Cleanroom areas shall be provided with digital Temperature and Relative Humidity (RH) indicators for continuous environmental monitoring and cleanroom condition verification.
- The indicators shall be cleanroom-compatible type suitable for semiconductor and controlled environment applications with clear digital display visibility.
- The monitoring system shall be designed to provide accurate indication of room temperature and humidity conditions for maintaining cleanroom operational requirements.
- The display units shall be suitable for wall mounting and integration within modular cleanroom panel systems.

Construction Specifications

- Digital temperature and RH indicators shall have operating range of 0°C to 50°C temperature and 0% to 90% RH measurement range.
- The display unit shall comprise minimum 100 mm diameter /flat digital display suitable for clear visibility from operating locations.
- The indicators shall be supplied complete with sensing elements, mounting accessories, power supply arrangement, and fixing hardware.
- The monitoring devices shall be calibrated and tested for accurate temperature and humidity indication suitable for cleanroom environmental monitoring applications.

12. Cleanroom Lighting System

Design Requirements

- Cleanroom-compatible LED lighting fixtures shall be provided for all ISO-6 LAB A, B, C and ISO-8 Gowning IN/OUT cleanroom areas as per the approved lighting layout and cleanroom design requirements.
- The lighting fixtures shall be specifically designed and manufactured for cleanroom applications and shall be suitable for maintaining the required cleanroom conditions without particle generation or contamination risk.
- The lighting system shall be designed to provide uniform illumination, minimum glare, ease of maintenance, energy efficiency, and compatibility with cleanroom ceiling systems and HVAC airflow arrangements.
- All lighting fixtures shall comply with approved cleanroom design specifications, applicable electrical standards, cleanroom requirements, and safety regulations.

Construction Requirements

- The LED lighting fixtures shall be complete with LED drivers, heat-dissipating elements, mounting arrangements, sealing gaskets, diffusers, frames, covers, and all accessories necessary for complete installation and operation.

- Fixtures shall be of cleanroom-compatible construction with smooth, non-shedding, corrosion-resistant, and easy-to-clean surfaces suitable for contamination-controlled environments.
- The fixture housing, diffuser, framework, and finishing materials shall be suitable for cleanroom operation and compatible with the cleanroom ceiling system.
- Fixtures shall have suitable IP protection rating as specified in the approved design and shall be suitable for cleanroom environmental conditions.
- All exposed surfaces, joints, edges, and interfaces shall be properly sealed to prevent dust accumulation and contamination ingress.

Submittals and Technical Documentation

- The vendor shall submit complete technical data sheets and product details for all proposed lighting fixtures for review and approval prior to procurement and installation.
- The submitted technical documents shall include, but not be limited to, the following details:
 - Make and model
 - General Arrangement (GA) drawing
 - Fixture dimensions and ceiling cut-out details
 - Wattage and illumination characteristics
 - Colour temperature and CRI
 - IP protection rating
 - Service accessibility type
 - Framework and housing details
 - Surface finishing details
 - Diffuser specifications
 - Frame and cover thickness
 - Mounting details and installation methodology
 - Only approved fixtures and accessories shall be used for the project.

Installation and Performance Requirements

- The vendor shall ensure proper installation, alignment, sealing, grounding, testing, and commissioning of all cleanroom lighting fixtures.
- All fixtures shall be installed in coordination with cleanroom ceiling systems, HEPA filters, ducting, sprinkler systems, and associated services to maintain cleanroom integrity and accessibility.
- The installed lighting system shall maintain the required cleanroom classification, illumination levels, reliability, safety, and operational performance as specified in the approved design documents and technical specifications

13. Special Cleanroom Lighting Requirements-RIE Labs and Lithography Room

Design Requirements

- RIE Lab 1 and RIE Lab 2 shall be provided with square-type yellow cleanroom lighting fixtures suitable for cleanroom applications and compatible with the approved laboratory layout and cleanroom design.
- The ISO-5 Lithography Room shall be provided with yellow Tear-Drop type LED lighting fixtures specifically designed for lithography and photo-sensitive process applications within cleanroom environments.
- The lighting fixtures for the Lithography Room shall have a colour temperature of approximately 3000 K or as approved during detailed engineering, suitable for cleanroom operational requirements and process compatibility.
- Where required for process protection, the lighting fixtures shall be provided with suitable optical filters capable of blocking wavelengths below 420 nm to prevent exposure of light-sensitive materials and lithography processes.
- All lighting fixtures shall be compatible with ISO-5 cleanroom requirements and shall be designed to minimize particle generation, heat buildup, glare, and contamination risks.

Construction Requirements

- The lighting fixtures shall be complete with LED drivers, optical filters (where applicable), diffusers, heat-dissipating arrangements, mounting systems, sealing gaskets, and all accessories necessary for complete installation and operation.
- Fixtures shall be of cleanroom-compatible construction with smooth, non-shedding, corrosion-resistant, and easy-to-clean surfaces suitable for semiconductor/lithography cleanroom environments.
- The fixture housing, diffuser, frame, and sealing arrangements shall be designed to maintain cleanroom integrity and prevent dust accumulation or contamination ingress.
- Fixtures shall have suitable IP protection rating and construction compatible with cleanroom ceiling systems and HVAC airflow arrangements.

Installation and Performance Requirements

- All lighting fixtures shall be installed in coordination with cleanroom ceiling systems, HEPA filters, ducting, utility services, and process equipment layouts to maintain cleanroom functionality and accessibility.
- The vendor shall ensure that the installed lighting system maintains the specified ISO-5 cleanroom environmental requirements and supports stable lithography and process operations.
- The complete lighting system shall be tested and verified for illumination performance, wavelength protection requirements, cleanroom compatibility, grounding, and operational reliability prior to commissioning and handover.

PART C: CLEANROOM EQUIPMENT AND ACCESSORIES

1. Dynamic Garment Storage

Working Area (750 mm X 600 X 1600) -1 nos

Dynamic Garment Storage Cabinet shall be a cleanroom-compatible vertical laminar airflow garment storage system designed for contamination-controlled storage of cleanroom garments used in semiconductor and fabrication cleanroom environments. The system shall maintain continuously HEPA-filtered downward airflow within the cabinet to minimize particulate contamination, moisture accumulation, and microbial ingress while ensuring clean garments are maintained under positive pressure clean conditions prior to use. The cabinet shall be fully constructed in SS304 stainless steel and shall include interlocking arrangement with normal lighting and UV light system for controlled operation and garment disinfection applications.

Design Requirements

- The Dynamic Garment Cabinet shall be a fully enclosed double-skin cleanroom-compatible unit designed for storage, dispensing, and contamination-controlled handling of cleanroom garments.
- The cabinet shall be suitable for installation in cleanroom gowning areas and designed to maintain garment cleanliness in accordance with applicable ISO cleanroom standards and approved cleanroom operational requirements.
- The cabinet shall be designed with smooth, non-porous, crevice-free internal and external surfaces to minimize particle accumulation and facilitate easy cleaning and maintenance.
- The unit shall include transparent viewing glass/panels for visual monitoring of stored garments without unnecessary door opening or contamination exposure.
- The cabinet shall be provided with UV sterilization and/or HEPA-filtered airflow arrangements as specified in the approved design requirements to maintain cleanliness and hygiene of stored garments.
- The cabinet shall include properly arranged individual storage compartments, hanging provisions, or garment organizers to ensure systematic storage and controlled dispensing of garments.
- Access to the cabinet shall be controlled through suitable interlocking arrangements, RFID system, card reader system, or equivalent approved access-control mechanism to ensure authorized usage and contamination control.
- The unit shall include necessary status indicators, alarms, monitoring arrangements, and operational indication systems for monitoring equipment status, airflow condition, UV operation, door status, and other critical operating parameters.

Construction Requirements

- The Dynamic Garment Cabinet shall be constructed from high-quality Stainless-Steel SS 304 grade with suitable finish for cleanroom applications.
- All exposed surfaces shall be smooth, corrosion-resistant, non-shedding, easy to clean, and compatible with cleanroom disinfectants and operational conditions.
- The cabinet shall be of double-skin insulated construction with proper internal reinforcement and structural rigidity suitable for continuous cleanroom operation.
- Viewing glass panels shall be made of toughened/safety glass with proper sealing arrangements compatible with cleanroom applications.
- HEPA filtration units, UV sterilization systems, blowers/fans, airflow arrangements, access-control devices, electrical wiring, control systems, and all associated accessories necessary for complete operation shall be included within the scope.
- All joints, edges, corners, and interfaces shall be properly sealed and finished to prevent dust accumulation and maintain cleanroom integrity.

Installation and Performance Requirements

- The vendor shall carry out complete installation, testing, commissioning, balancing, and performance verification of the Dynamic Garment Cabinet in accordance with approved drawings and cleanroom requirements.
- The unit shall be installed in proper coordination with cleanroom layouts, gowning room arrangements, electrical services, access-control systems, and HVAC airflow requirements.
- The installed cabinet shall maintain the required cleanliness levels, operational reliability, contamination control, and user safety during normal operation.
- The vendor shall submit complete technical datasheets, GA drawings, airflow details, filtration specifications, access-control details, electrical load details, and operation manuals for review and approval prior to procurement and installation

2. Dynamic Pass Box (DPB)-Floor Mounted

Dimensions: Working Area Length 600 mm X Width 600 mm X Height 600 MM

Type: Two-way 1 nos, **Location:** Airlock to RIE Lab -1

Type: Three-way 1 nos, **Location:** RIE Lab -1 to RIE Lab 2 To Lithography

Dynamic Pass Box (DPB) shall be a floor-mounted, GMP-compliant cleanroom material transfer unit designed to enable controlled transfer of materials between classified cleanroom areas without cross-contamination. The system shall ensure particulate and microbial control through HEPA-filtered unidirectional airflow, UV sterilization, and fully interlocked operation of doors. The DPB shall be suitable for semiconductor fabrication, microelectronics, and precision cleanroom environments where strict contamination control, validated airflow performance, and interlocked operation are mandatory.

Design Requirements

The Dynamic Pass Box shall be a cleanroom-compatible enclosed transfer unit designed for controlled transfer of materials between cleanroom areas of different classifications while minimizing contamination and maintaining cleanroom integrity.

- The pass box shall be designed to prevent direct cross-contamination between adjacent cleanroom zones and shall maintain the specified cleanroom environmental conditions during material transfer operations.
- The unit shall be provided with interlocked door arrangements such that only one door can be opened at a time to prevent simultaneous exposure of both cleanroom areas.
- The Dynamic Pass Box shall incorporate HEPA-filtered unidirectional/laminar airflow within the transfer chamber for continuous flushing and decontamination of the internal chamber during operation.
- The pass box shall be provided in suitable sizes and configurations based on material handling requirements, operational workflow, and approved cleanroom layouts.
- The unit shall include status indicators, alarms, and monitoring systems for operational parameters including airflow condition, HEPA filter status, door interlock status, UV operation (if applicable), and fault indication.
- The Dynamic Pass Box shall be fully compliant with applicable ISO cleanroom standards and approved cleanroom operational requirements.

Construction Requirements

- The Dynamic Pass Box shall be constructed from high-quality Stainless-Steel SS 304 grade with suitable finish for cleanroom applications.
- All internal and external surfaces shall be smooth, non-porous, corrosion-resistant, non-shedding, and easy to clean to minimize particle accumulation and contamination risk.
- The unit shall include HEPA filtration systems, blowers/fans, airflow balancing arrangements, interlocking systems, viewing glass panels, electrical controls, lighting (if required), and all accessories necessary for complete operation.
- Viewing panels shall be made of suitable toughened/safety glass with proper sealing arrangements compatible with cleanroom applications.
- All joints, corners, edges, and interfaces shall be properly sealed and finished to maintain cleanroom integrity and facilitate cleaning and maintenance.
- Door interlocking arrangements shall be electro-mechanical and designed for reliable and fail-safe operation.

Installation and Performance Requirements

- The vendor shall carry out complete installation, testing, commissioning, airflow balancing, and performance verification of the Dynamic Pass Box in accordance with approved drawings and cleanroom requirements.
- The pass box shall be installed in proper coordination with cleanroom wall systems, cleanroom zoning, HVAC airflow arrangements, and operational workflow requirements.

- The installed unit shall maintain required cleanliness levels, operational reliability, contamination control, and user safety during normal operation.
- The vendor shall submit complete technical datasheets, GA drawings, airflow details, HEPA filter specifications, interlock details, electrical load details, and operation manuals for review and approval prior to procurement and installation.

3. Way Air Shower-Tunnel Type (Single/Two-Person Entry)

The complete 3-way Air Shower system, including main body structure, internal panels, air plenum, nozzles, door frames, hinges, fasteners, support members, and all exposed internal components in contact with cleanroom airflow, shall be fabricated entirely from SS304 stainless steel of suitable thickness with No.4 matt finish. The use of SS304 construction shall ensure superior corrosion resistance, low particle shedding characteristics, ease of cleaning, and long-term durability in semiconductor cleanroom environments. All weld joints shall be smooth-ground, crevice-free, and passivated to maintain cleanroom compatibility and prevent microbial or particulate accumulation, ensuring compliance with high-grade ISO classified facility requirements.

Design Requirements

- The Air Shower shall be of tunnel-type cleanroom design intended for personnel decontamination prior to entry into controlled cleanroom areas.
- The unit shall be configured as a three-door air shower arrangement designed for controlled personnel movement from Gowning Room to Lithography Room and/or Gowning Room to Airlock areas only, as indicated in the approved layout drawings.
- The Air Shower shall be designed for single-person entry operation at a time unless otherwise specified for two-person configuration in approved drawings and operational requirements.
- The system shall incorporate high-efficiency HEPA filtration units of minimum H13/H14 grade capable of achieving approximately 99.99% particle removal efficiency or higher as per applicable standards.
- The unit shall be equipped with high-velocity laminar airflow nozzles strategically positioned to provide effective removal of particulate contaminants from personnel garments and exposed surfaces during the decontamination cycle.
- The airflow pattern, nozzle arrangement, air velocity, and recirculation system shall be designed to ensure uniform and efficient personnel decontamination while maintaining cleanroom integrity.
- The Air Shower shall be provided with interlocked door arrangements ensuring that only one door can be opened at a time during operation.
- The system shall be specifically configured to prevent unauthorized or reverse exit from the Lithography Room side in order to avoid cross-contamination and maintain cleanroom process integrity.
- The Air Shower shall operate automatically through a preset programmable cycle time with automatic door interlocking and airflow activation sequence.
- The control system shall include status indicators, airflow monitoring arrangements, operational displays, alarms, emergency stop/emergency release knobs, and associated

safety interlocks. Emergency knobs/switches shall be provided both inside the Air Shower chamber and at the Gowning Area side for emergency access and operational safety.

- The complete system shall comply with applicable ISO cleanroom standards, cleanroom operational requirements, electrical safety standards, and approved project specifications.

4. Exit Control Logic as Airlock (Special Requirement)

- The system shall incorporate PLC-based airlock sequencing logic for controlled movement between Gowning → Lithography → RIE → Entry, ensuring that only one door set is unlocked at any given time with enforced directional flow control.
- During Exit Lithography-and-RIE to Gowning area transfer mode, the blower shall remain OFF and the system shall function strictly as an airlock chamber, preventing airflow disturbance, pressure imbalance, and contamination backflow between clean zones.
- During Entry mode (Gowning to Cleanroom transition), the blower shall operate in full cycle mode for personnel decontamination with programmable shower duration, automatic start/stop sequence, and cycle completion interlock.
- The system shall include fail-safe logic ensuring that all door interlocks remain engaged during power failure or system fault conditions, thereby preventing unintended simultaneous door opening.

Construction Requirements

- The Air Shower unit shall be constructed from high-quality Stainless-Steel SS 304 grade with suitable cleanroom finish.
- All internal and external surfaces shall be smooth, non-porous, corrosion-resistant, non-shedding, and easy to clean to minimize particle accumulation and facilitate cleanroom maintenance.
- The unit shall include HEPA filters, blower assemblies, nozzle systems, door interlocking mechanisms, control panels, viewing windows, lighting systems, sensors, alarms, and all accessories necessary for complete operation.
- Viewing windows/panels shall be made of suitable toughened/safety glass with proper sealing arrangements compatible with cleanroom applications.
- The Air Shower chamber shall be properly sealed and structurally reinforced to prevent air leakage and ensure stable airflow performance.
- Door interlocking systems shall be electro-mechanical type with fail-safe operational features and emergency override provisions.

Installation and Performance Requirements

- The vendor shall carry out complete installation, testing, commissioning, airflow balancing, and performance verification of the Air Shower system in accordance with approved layouts and cleanroom requirements.

- The Air Shower shall be installed in coordination with cleanroom wall systems, HVAC airflow arrangements, access-control philosophy, and cleanroom zoning requirements.
- The installed system shall ensure effective personnel decontamination, operational reliability, contamination control, user safety, and stable cleanroom operation.
- The vendor shall submit complete technical datasheets, GA drawings, airflow details, HEPA filter specifications, interlock logic, electrical load details, cycle operation details, and operation manuals for review and approval prior to procurement and installation.

5. Cleanroom Furniture Schedule (SS304 Cleanroom Furniture)

Design Specifications

- The gowning room furniture package shall comprise integrated cleanroom-compatible utility systems including shoe racks, cross-over benches, stainless steel tables, stainless steel chairs, and stainless-steel almirahs (storage units) designed to support controlled personnel entry, gowning discipline, and contamination-controlled storage.
- The entire furniture system shall be designed for ISO classified cleanroom support areas, ensuring smooth non-shedding surfaces, ergonomic usability, corrosion resistance, and ease of cleaning in compliance with semiconductor cleanroom protocols.
- The layout shall ensure proper segregation of “dirty” and “clean” zones using cross-over benches, with organized storage systems for footwear, garments, and consumables to maintain contamination control integrity.
- All furniture elements shall be modular, relocatable, and designed for long service life under continuous cleanroom usage conditions with minimal particle generation.

Construction Specifications

Shoe Racks

- Fabricated from SS304 stainless steel with No.4 matt finish
- Pigeon-hole type modular construction suitable for approximately 30 pairs of cleanroom shoes per unit.
- Internal compartment size 450 mm (W) × 450 mm (D) × 300 mm (H).
- Overall dimensions approx.) 3650 mm × 3650 mm × 450 mm as per layout.

Cross-Over Benches

- Fabricated from SS304 stainless steel with No.4 matt finish.
- Designed for clean/dirty zone separation during gowning and de-gowning operations.
- Height approx. 500 mm with length and width as per approved layout.
- Rigid structural frame with smooth edges and crevice-free welded construction.

Stainless Steel Tables Chairs 20 sets

- Fabricated from SS304 stainless steel tables No.4 matt finish with 1200 length x600 mm width and standard height with suitable chairs dimensions.
- Smooth, polished top surface suitable for gowning accessories, documentation, and cleanroom utilities.
- Reinforced under-structure for load stability and long-term durability.
- Ergonomic design with smooth rounded edges and easy-clean construction.
- For Chairs Stable base structure with anti-slip feet and corrosion-resistant finish.
- For chairs Smooth joints and crevice-free design for cleanroom compatibility.

Stainless Steel Almira (Storage Units - 6 Nos.)

- Fabricated from SS304 stainless steel with No.4 matt finish.
- Fully enclosed dust-proof storage cabinets for cleanroom garments, consumables, and accessories.
- Internal adjustable shelving with reinforced structure for load-bearing capacity.
- Lockable double-door system with smooth hinges and ergonomic handles.
- Each unit designed for hygienic storage with easy-clean internal surfaces.

General Requirements (Applicable to All Items)

- All welds shall be continuous, smooth-ground, crevice-free, and passivated for cleanroom compliance.
- All exposed edges shall be rounded and polished to avoid particle generation and ensure operator safety.
- All items shall be factory fabricated and delivered in fully finished condition ready for installation.
- All furniture shall be suitable for semiconductor cleanroom gowning areas and shall comply with ISO cleanroom hygiene practices.

Drawing and Approval Requirement

- The Contractor/Supplier shall submit complete shop drawings, fabrication drawings, general arrangement (GA) drawings, installation drawings, and material specifications for all furniture items prior to fabrication and procurement.
- All drawings shall clearly indicate dimensions, material grades, construction details, load capacities, fixing methodology, and interface coordination with cleanroom layout.
- All drawings shall be submitted for Consultant/Client approval and written clearance shall be obtained prior to commencement of manufacturing or procurement.
- No fabrication or supply shall be initiated without approved drawings issued for construction (IFC) status from the Engineer-in-Charge/Consultant.

6. Cleanroom Wet Bench System

Wet benches are critical process equipment used in semiconductor fabrication facilities for Lithography, RIE (Reactive Ion Etching), wafer cleaning, and characterization-related applications involving precision wet chemical processing operations such as wafer cleaning, resist development,

oxide removal, chemical etching, rinsing, substrate preparation, and post-process cleaning. Since these semiconductor processes are highly sensitive to particulate, chemical, ionic, and molecular contamination, the wet bench system shall be specifically designed to maintain stringent cleanroom conditions, safe chemical handling, contamination control, process reliability, and operational safety while ensuring compatibility with semiconductor-grade chemicals, ISO cleanroom standards, and approved semiconductor fabrication practices.

Design Requirements

- The Wet Bench system shall be designed for semiconductor cleanroom applications including Lithography, RIE, wafer cleaning, resist development, chemical etching, rinsing, substrate preparation, and characterization-related wet processing operations while ensuring strict control of particulate, chemical, ionic, and molecular contamination in accordance with ISO cleanroom standards and semiconductor fabrication practices.
- The system shall be suitable for safe handling and processing of semiconductor-grade chemicals including HF, HCl, H₂SO₄, NH₄OH, IPA, and other approved acids, bases, and solvents, and shall be designed to prevent cross-contamination between chemical baths and process stations through proper segregation, exhaust management, drainage arrangements, and process flow design.
- The Wet Bench shall be compatible with DI water systems, exhaust systems, drain systems, compressed air systems, chemical distribution systems, electrical systems, and cleanroom utility infrastructure, and shall include suitable exhaust arrangements, HEPA filtration, airflow control, illumination system, monitoring systems, alarms, and safety provisions required for semiconductor cleanroom operation.
- The approximate details of the Wet Bench shall be as follows unless otherwise approved during detailed engineering: Location - RIE Lab-2; Quantity - 1 No.; Overall Size (Door Closed) - 1500 mm (L) × 980 mm (W) × 2000 mm (H); Overall Height with Front Door Open at 90° - Approximately 2800 mm; Working Area - 1476 mm (L) × 800 mm (W) × 950 mm (H); Exhaust Box Width - Approximately 365 mm; Power Supply - 220 VAC, 50 Hz; Illumination - Minimum 800 Lux with 3000 K colour temperature and optical filtering below 450 nm wherever required; Noise Level - Less than 60 dB.

Construction Requirements

- The Wet Bench structure shall be constructed from stress-relieved white polypropylene material of minimum 0.5 inch (13 mm) thickness or equivalent approved cleanroom-compatible, corrosion-resistant, and chemical-resistant material suitable for semiconductor wet processing applications.
- The system shall include process tanks, cassettes, quartzware supports, chemical-resistant work surfaces, exhaust plenums, utility connections, DI water connections, drainage systems, HEPA filtration system with minimum 99.99% efficiency, centrifugal blower assembly with lubricated bearings, and all associated accessories necessary for complete operation.
- The exhaust system shall be ducted through a standard 10-inch (254 mm) diameter exhaust flange positioned at the top rear side of the cabinet, and suitable drain outlet

arrangements shall be provided at the bottom of the sub-deck plenum for safe drainage and disposal of process liquids and chemical residues.

- All internal and external surfaces, joints, tanks, piping, fittings, and process-contact components shall be smooth, non-porous, non-shedding, easy to clean, chemically compatible, and designed to minimize particle accumulation and contamination risks, and the system shall include necessary safety provisions including splash protection, emergency shutoff arrangements, alarms, spill management provisions, and monitoring systems for process safety and operational reliability.

Installation and Performance Requirements

- The vendor shall carry out complete detailed engineering, fabrication, supply, installation, integration, testing, commissioning, airflow balancing, utility integration, and performance verification of the Wet Bench system in accordance with approved layouts and semiconductor cleanroom requirements.
- The Wet Bench shall be installed in proper coordination with cleanroom layouts, HVAC systems, exhaust systems, drain systems, electrical systems, process equipment arrangements, utility services, and safety systems to ensure proper operation and contamination control.
- The vendor shall ensure proper exhaust balancing, chemical compatibility, drainage performance, grounding continuity, ESD protection, utility integration, operational safety, and compliance with PPE requirements and cleanroom operational procedures during installation, testing, and commissioning activities.
- • The vendor shall submit complete technical datasheets, GA drawings, airflow calculations, exhaust details, utility requirements, material specifications, chemical compatibility details, electrical load details, validation documents, and operation & maintenance manuals for review and approval prior to fabrication, installation, and commissioning

7. Fume Hood System

General Description

Fume hoods are ventilated containment systems designed to protect personnel, cleanroom environments, and semiconductor processes by effectively capturing, containing, and exhausting hazardous chemical vapors, gases, fumes, and airborne particulates generated during laboratory and semiconductor fabrication operations. In semiconductor cleanroom facilities, fume hoods are used for chemical handling, wet processing, sample preparation, reagent mixing, wafer processing support activities, and characterization-related applications where safe exhaust and contamination control are critical. The fume hood system shall be designed to maintain proper airflow patterns and face velocity to ensure effective containment of hazardous emissions while preventing migration of contaminants into adjacent cleanroom areas. The system shall support safe handling of approved semiconductor-grade chemicals and shall include suitable exhaust arrangements, sash mechanisms, monitoring systems, alarms, and safety provisions compliant with ISO cleanroom standards, environmental health and safety regulations, and semiconductor fabrication practices

Design Requirements

- The Fume Hood shall be designed as a cleanroom-compatible ventilated enclosure suitable for semiconductor laboratory and cleanroom applications involving chemical handling and hazardous process operations.
- The approximate overall dimensions of the Fume Hood shall be:
Dimensions Length: 1500 mm: Depth: 1200 mm: Height: 2000 mm
Location: RIE Lab 2; Quantity = 1 nos
- The fume hood shall be designed to maintain proper containment of hazardous vapours, fumes, gases, and airborne contaminants generated during semiconductor process operations.
- The system shall maintain suitable face velocity and airflow distribution to ensure safe removal of hazardous emissions from the operator breathing zone while minimizing turbulence and contamination risks.
- The fume hood shall be suitable for handling semiconductor-grade chemicals including acids, solvents, reagents, and wet-process chemicals used in lithography, cleaning, etching, and characterization processes.
- The hood shall be integrated with the laboratory/cleanroom exhaust system and designed for continuous and safe exhaust of process fumes and chemical vapors.
- The unit shall include suitable sash arrangements with smooth operation and provision for maintaining approved working height during operation.
- The system shall include airflow monitoring devices, operational status indicators, alarms, and safety interlocks for monitoring exhaust performance and operational safety.
- The fume hood shall comply with ISO cleanroom standards, laboratory safety standards, electrical safety requirements, and applicable environmental health and safety regulations.

Construction Requirements

- The fume hood structure shall be constructed from cleanroom-compatible, corrosion-resistant, and chemical-resistant materials suitable for semiconductor process applications.
- All internal working surfaces shall be smooth, non-porous, non-shedding, easy to clean, and resistant to approved chemicals and cleaning agents.
- The work surface/countertop shall be chemical-resistant and suitable for wet chemical process operations.
- The hood shall include a chemically resistant exhaust plenum, baffle arrangement, sash assembly, lighting fixtures, utility provisions, and all accessories necessary for complete operation.
- The sash shall be constructed from suitable toughened safety glass or approved transparent chemical-resistant material with smooth counterbalance operation.
- All exposed edges, joints, corners, and interfaces shall be properly sealed and finished to prevent contamination accumulation and ensure easy cleaning.

- The hood shall include suitable provisions for utility services such as DI water, process water, compressed air, gas lines, drainage connections, and electrical outlets wherever specified in the approved design.
- The complete unit shall be compatible with cleanroom operational requirements and shall not generate particles, fibers, or contamination during operation.

Installation and Performance Requirements

- The vendor shall carry out complete detailed engineering, fabrication, supply, installation, testing, commissioning, and performance verification of the Fume Hood system.
- The Fume Hood shall be installed in proper coordination with cleanroom layouts, exhaust systems, utility services, process equipment arrangements, and laboratory operational requirements.
- The installed system shall ensure safe exhaust performance, containment efficiency, operational reliability, and protection of personnel and cleanroom environments.
- The vendor shall ensure proper balancing and commissioning of the exhaust airflow system and shall submit airflow test reports and performance validation documents during commissioning.
- The vendor shall submit complete technical datasheets, GA drawings, airflow calculations, material specifications, exhaust requirements, utility load details, safety features, and operation & maintenance manuals for review and approval prior to fabrication and installation

8. Cleanroom Oven

Cleanroom ovens are precision temperature-controlled systems used in semiconductor fabrication facilities for wafer baking, curing, drying, annealing, photoresist processing, moisture removal, and other thermal treatment applications associated with Lithography, RIE, MEMS, and characterization processes. Since semiconductor manufacturing processes are highly sensitive to particulate, molecular, and thermal contamination, the cleanroom oven shall be specifically designed to provide stable temperature performance, contamination-controlled operation, uniform heat distribution, and cleanroom compatibility while ensuring compliance with ISO cleanroom standards and semiconductor fabrication practices.

Design Requirements

- The Cleanroom Oven shall be designed for semiconductor cleanroom applications including wafer baking, curing, drying, annealing, resist processing, and other temperature-controlled processes associated with Lithography, RIE, MEMS, and characterization-related operations while ensuring compliance with ISO cleanroom operational requirements and contamination-control practices.
- The oven shall be suitable for installation and operation within ISO cleanroom environments and shall be designed to minimize particulate generation, fibre shedding, thermal instability, and contamination risks during continuous semiconductor processing operations.

- The Cleanroom Oven shall have minimum operating specifications as follows: Maximum Temperature - $\geq 400^{\circ}\text{C}$; Chamber Volume - ≥ 100 Litres; ISO Cleanroom Compatibility - ISO 14644 Class 5 certified or equivalent approved standard.
- The system shall include programmable temperature control, single-ramp set-point operation, process timer, over-temperature protection, LED display system, and all monitoring and safety features necessary for reliable semiconductor cleanroom operation.
- Location RIE lab -2, Dimensions: Chamber Volume - ≥ 100 Litres Quantity: 1nos

Construction Requirements

- The Cleanroom Oven shall be constructed with fully sealed low thermal-mass insulation designed to prevent fibre shedding and particulate contamination within cleanroom environments.
- The unit shall be provided with fully enclosed brushless fan motor assembly suitable for cleanroom-compatible airflow circulation and stable temperature distribution during operation.
- The oven interior shall consist of polished stainless steel sealed construction with perforated stainless-steel shelves, particle-free silicone rubber door seals, and smooth contamination-resistant surfaces suitable for semiconductor cleanroom applications.
- The exterior shall consist of smooth, easy-to-clean gloss epoxy finish with double-skin insulated construction to ensure safe outer surface temperature, structural stability, thermal efficiency, and cleanroom compatibility.

Installation and Performance Requirements

- The vendor shall carry out complete detailed engineering, supply, installation, testing, commissioning, calibration, and performance verification of the Cleanroom Oven system in accordance with approved semiconductor cleanroom requirements and applicable standards.
- The Cleanroom Oven shall be installed in proper coordination with cleanroom layouts, electrical systems, exhaust arrangements, process equipment layouts, and utility services to ensure safe and reliable operation.
- The vendor shall ensure proper temperature uniformity, airflow circulation, safety interlocks, operational reliability, contamination control, grounding continuity, and compliance with cleanroom operational requirements during installation and commissioning.
- The vendor shall submit complete technical datasheets, GA drawings, chamber details, temperature performance data, utility requirements, cleanroom certification details, electrical load details, calibration certificates, validation reports, and operation & maintenance manuals for review and approval prior to procurement and installation.

9. Ancillary systems

9.1 Lithography Equipment Vibration Isolation Platform

Lithography equipment used in semiconductor fabrication facilities is highly sensitive to floor-borne vibrations, structural disturbances, acoustic noise, and environmental instability that can directly affect alignment accuracy, overlay performance, critical dimension control, and overall process yield. The vibration isolation platform shall therefore be specifically designed to provide highly stable, low-vibration operating conditions suitable for precision semiconductor lithography applications within ISO-5/Class 100 cleanroom environments while ensuring long-term operational reliability, equipment protection, and process stability.

Design Requirements

- The vendor shall design, prepare, and install a dedicated vibration isolation platform for lithography equipment as per the approved layout drawings and dimensional requirements provided by IIT (BHU), VARANASI Committee.
- The vibration isolation platform shall be designed to achieve sub-nanometre positional stability and effective isolation of lithography equipment from floor-borne vibrations, structural disturbances, acoustic noise, and environmental vibration sources.
- The system shall incorporate suitable passive isolation elements such as pneumatic isolators, elastomeric mounts, damping pads, or equivalent approved isolation systems along with active vibration control systems incorporating sensors, actuators, and real-time vibration cancellation mechanisms wherever required to achieve specified vibration performance.
- The platform shall include levelling arrangements, vibration damping mechanisms, tilt-control provisions, anchoring/interface arrangements, and structural compatibility features required for stable, tilt-free, and reliable lithography equipment operation while meeting manufacturer-specified vibration tolerance criteria and semiconductor cleanroom operational requirements.
- Design & Drawings Attached in layout for your reference

Construction Requirements

- The vibration isolation platform shall be constructed from structurally stable, cleanroom-compatible, low outgassing, non-shedding, corrosion-resistant, and particle-free materials suitable for ISO-5/Class 100 semiconductor cleanroom environments.
- The structural platform, support members, isolation assemblies, damping systems, mounting arrangements, and interface components shall be designed to support the specified lithography equipment load, operational dynamics, and long-term stability requirements without deformation or performance degradation.
- The system shall include all required passive isolation components, active control modules, sensors, actuators, mounting frames, leveling devices, anchoring systems, monitoring systems, control panels, interconnections, and associated accessories necessary for complete and reliable operation.
- The complete platform system shall be fully compatible with lithography equipment requirements, cleanroom floor conditions, raised floor arrangements, utility routing, and cleanroom operational conditions as indicated in the approved layout and engineering drawings.

9.2 CCTV Surveillance and Access Control System

Design Requirements

- The vendor shall design, supply, install, test, and commission a comprehensive CCTV surveillance and access control system for the semiconductor cleanroom facility to ensure continuous monitoring, operational safety, security management, personnel traceability, and controlled access in compliance with approved layouts, cleanroom operational protocols, and semiconductor facility security requirements.
- The CCTV system shall provide high-resolution video recording, real-time monitoring, secure footage storage, remote accessibility, and network-based monitoring capability, and the access control system shall be integrated with designated entry and exit points using RFID/card readers, biometric systems wherever applicable, electromagnetic locks, and monitoring systems. CCTV camera locations and minimum quantities shall be as follows unless otherwise approved during detailed engineering: Entrance Opposite Door - 1 No.; Gowning Area - No CCTV Camera; RIE Lab-1 - 3 Nos.; RIE Lab-2 - 2 Nos.; Lithography Room - 2 Nos.; Lab-A - 2 Nos.; Lab-B - 2 Nos.; Lab-C - 3 Nos.; complete administrative access, recording access, passwords, software licenses, and monitoring rights shall be provided to IIT (BHU), VARANASI authorized personnel/admin.

Construction Requirements

- The CCTV system shall consist of high-resolution IP/network cameras, network video recorders (NVR), storage devices, monitoring stations, display units, structured cabling systems, network switches, conduits, power supplies, monitoring software, backup arrangements, and all associated hardware/software necessary for complete and reliable operation.
- The access control system shall include RFID/card readers, biometric devices wherever applicable, electromagnetic locks, emergency release arrangements, access controllers, interface panels, and all associated accessories, and all installed cameras, cabling systems, conduits, mounting supports, and access-control devices within cleanroom areas shall be cleanroom-compatible, corrosion-resistant, properly sealed, and suitable for contamination-controlled semiconductor environments.

Installation and Performance Requirements

- The vendor shall carry out complete detailed engineering, coordinated layout preparation, supply, installation, integration, testing, commissioning, and performance verification of the CCTV surveillance and access control system in coordination with cleanroom layouts, cleanroom doors, HVAC systems, electrical systems, IT/network infrastructure, utility services, and emergency systems.
- The vendor shall ensure proper camera coverage, recording quality, access-control functionality, network communication reliability, remote accessibility, secure data storage, grounding continuity, uninterrupted system operation, and compliance with electrical safety standards and cleanroom operational requirements, and shall submit

complete technical datasheets, layouts, software details, administrator credentials, testing reports, validation documents, operation manuals, and maintenance procedures prior to commissioning and handover.

9.3 Fire Alarm, Smoke Detection, and Emergency Lighting System

Design Requirements

- The vendor shall design, supply, install, test, and commission a complete fire alarm, smoke detection, and emergency lighting system for the semiconductor cleanroom facility in accordance with applicable fire safety standards, cleanroom operational requirements, and approved layouts to ensure early fire detection, emergency notification, and safe evacuation during emergency conditions.
- All cleanroom areas shall be provided with suitable smoke detectors installed both above and below the cleanroom ceiling systems and connected to centralized fire alarm control panels, and the system shall include audible alarm hooters throughout all cleanroom areas, manual call points in each laboratory area, and emergency lighting systems capable of maintaining minimum 100 Lux illumination during power failure or emergency conditions.

Construction Requirements

- The system shall consist of smoke detectors, fire alarm control panels, hooters, manual call points, emergency lighting fixtures, batteries/backup systems, cabling systems, conduits, monitoring devices, interface modules, power supplies, and all associated hardware/software necessary for complete and reliable operation.
- All detectors, emergency lighting fixtures, alarm devices, conduits, cabling systems, mounting arrangements, and associated accessories installed within cleanroom areas shall be cleanroom-compatible, properly sealed, corrosion-resistant, and suitable for contamination-controlled semiconductor environments.

Installation and Performance Requirements

- The vendor shall carry out complete detailed engineering, coordinated layout preparation, supply, installation, integration, testing, commissioning, and performance verification of the fire alarm, smoke detection, and emergency lighting system in coordination with cleanroom layouts, HVAC systems, electrical systems, ceiling systems, emergency systems, and facility operational requirements.
- The vendor shall ensure proper detector coverage, alarm audibility, emergency lighting performance, battery backup operation, system integration, grounding continuity, and compliance with applicable fire safety standards and cleanroom operational requirements, and shall submit complete technical datasheets, layouts, testing reports, validation documents, operation manuals, and maintenance procedures prior to commissioning and handover.

9.4 Access Control System

Design Requirements

- The vendor shall design, supply, install, test, and commission a comprehensive access control system for all designated entry and exit points of the semiconductor cleanroom facility to ensure controlled personnel movement, operational safety, security management, and compliance with cleanroom operational protocols and approved layouts.
- The access control system shall include secure door locking and unlocking arrangements integrated with RFID/card-based access systems for all cleanroom and controlled-area doors to permit authorized personnel access while preventing unauthorized entry, and the complete system shall be compatible with the facility security, CCTV surveillance, monitoring infrastructure, and emergency systems for seamless operation and centralized management.

Construction Requirements

- The system shall consist of RFID/card readers, access cards, electromagnetic locks, emergency release arrangements, access controllers, interface panels, power supplies, monitoring software, structured cabling systems, conduits, and all associated hardware/software necessary for complete and reliable operation.
- All access-control devices, locking arrangements, cabling systems, conduits, mounting accessories, and associated components installed within cleanroom areas shall be cleanroom-compatible, properly sealed, corrosion-resistant, and suitable for contamination-controlled semiconductor environments.

Installation and Performance Requirements

- The vendor shall carry out complete detailed engineering, coordinated layout preparation, supply, installation, integration, testing, commissioning, and performance verification of the access control system in coordination with cleanroom doors, CCTV systems, electrical systems, emergency systems, and facility operational requirements.
- The vendor shall ensure proper functionality of access readers, door locking systems, emergency release mechanisms, network communication, administrator accessibility, system integration, and uninterrupted operation of the complete access-control system, and shall submit complete technical datasheets, layouts, software details, administrator credentials, testing reports, validation documents, operation manuals, and maintenance procedures prior to commissioning and handover

9.5 Water Purification System

Design Requirements

- The vendor shall design, supply, install, test, and commission a complete water purification system capable of producing Type III (RO Water), Type II (Pure Water), and Type I (Ultrapure Water) from potable tap water in accordance with ASTM D1193-

91 standards suitable for semiconductor cleanroom, laboratory, lithography, RIE, and characterization-related applications.

- The system shall include suitable pretreatment and purification arrangements comprising prefiltration module, booster pump, high-pressure pump, reverse osmosis (RO) membrane, UV lamp, electrode ionization module, ultra-purification cartridges, or equivalent approved purification technologies necessary to achieve reliable and continuous production of specified water quality for semiconductor process applications.

Construction Requirements

- The water purification system shall include all required modules, storage arrangements, circulation systems, piping, valves, pumps, filters, UV systems, purification cartridges, monitoring instruments, control systems, tanks, supports, electrical connections, and associated accessories necessary for complete and reliable operation.
- The system shall provide minimum water storage capacity of 60 litres either through integrated internal storage or external storage tank arrangements, and all wetted components, piping systems, tanks, and process-contact materials shall be corrosion-resistant, cleanroom-compatible, non-contaminating, and suitable for ultrapure water applications.

Installation and Performance Requirements

- The vendor shall carry out complete detailed engineering, supply, installation, integration, testing, commissioning, validation, and performance verification of the water purification system in coordination with laboratory utilities, drain systems, electrical systems, and cleanroom operational requirements.
- The system shall have minimum purification capacity of 2 litres per hour and shall ensure reliable, continuous, and stable production of Type I, Type II, and Type III water meeting specified ASTM standards, and the vendor shall submit complete technical datasheets, P&ID drawings, utility requirements, validation reports, water quality reports, operation manuals, and maintenance procedures prior to commissioning and handover

9.6 Air Compressor System

Design Requirements

- The vendor shall design, supply, install, test, and commission an oil-free scroll-type air compressor system suitable for semiconductor cleanroom, laboratory, lithography, RIE, and characterization-related applications requiring reliable, clean, and dry compressed air for continuous operation.
- The air compressor system shall include an oil-free scroll compressor, minimum 250-liter air storage receiver, CD absorption dryer, filtration arrangements, pressure regulation systems, monitoring instruments, and associated accessories necessary to

maintain constant working pressure of 6 bar and compressed air quality in accordance with ISO 8573-1 standards for particle, water, and oil content.

Construction Requirements

- The compressor system shall include compressor unit, air receiver tank, CD absorption dryer, moisture separators, pressure gauges, safety valves, filtration systems, automatic drain arrangements, piping connections, electrical controls, vibration isolation arrangements, and all associated hardware/accessories necessary for complete and reliable operation.
- The complete system shall be designed for continuous-duty operation, and all pressure vessels, piping systems, process-contact components, and associated accessories shall be corrosion-resistant, cleanroom-compatible, low-noise, and suitable for contamination-controlled semiconductor and laboratory environments.

Installation and Performance Requirements

- The vendor shall carry out complete detailed engineering, supply, installation, integration, testing, commissioning, airflow balancing, and performance verification of the air compressor system in coordination with cleanroom utility systems, electrical systems, compressed air distribution systems, and operational requirements.
- The compressor system shall provide minimum airflow capacity of 3 liters per second while maintaining stable 6 bar working pressure and specified ISO 8573-1 compressed air quality standards, and the vendor shall submit complete technical datasheets, GA drawings, utility requirements, air quality reports, testing certificates, operation manuals, and maintenance procedures prior to commissioning and handover

9.7 Vacuum Pump System - 100 mbar

Design Requirements

- The vendor shall design, supply, install, test, and commission a compact, lightweight, and mobile oil-free piston vacuum pump system suitable for semiconductor cleanroom, laboratory, lithography, RIE, and characterization-related applications requiring reliable, contamination-free, and continuous vacuum operation.
- The vacuum pump system shall include an oil-free piston-type vacuum pump, low-noise silencer arrangement, vacuum regulator with integrated pressure gauge, mobility provisions, monitoring accessories, CE certification, and all associated components necessary for safe, stable, and cleanroom-compatible operation, and the system shall be capable of achieving a vacuum level of 100 mbar.

Construction Requirements

- The vacuum pump shall be of oil-free construction suitable for cleanroom-compatible operation, and all wetted/process-contact components, piping systems, fittings, and

associated accessories shall be corrosion-resistant, low-noise, non-contaminating, and suitable for semiconductor and laboratory cleanroom environments.

- The system shall include silencer assembly, vacuum regulator, integrated pressure gauge, electrical controls, safety arrangements, mobility wheels/supports, vibration-isolation provisions, and all associated hardware/accessories necessary for complete and reliable operation.

Installation and Performance Requirements

- The vendor shall carry out complete supply, installation, integration, testing, commissioning, and performance verification of the vacuum pump system in coordination with laboratory utility systems, electrical systems, and cleanroom operational requirements.
- The vacuum pump system shall demonstrate stable, reliable, and low-noise performance while achieving minimum vacuum level of 100 mbar suitable for laboratory and cleanroom applications, and the vendor shall submit complete technical datasheets, certification documents, testing reports, operation manuals, and maintenance procedures prior to commissioning and handover.

10. Semiconductor Process Gas Distribution System

The Semiconductor Process Gas Distribution System forms a critical utility infrastructure for the safe, reliable, and contamination-free delivery of process gases required for semiconductor research, fabrication, lithography, etching, deposition, and associated cleanroom operations. The system shall be designed and executed on a turnkey basis to meet the specific room-wise process requirements of the facility, ensuring high purity gas delivery, operational safety, pressure stability, and compatibility with semiconductor cleanroom standards and process applications.

- Design, detailed engineering, supply, installation, testing, commissioning, validation, and handing over of complete Semiconductor Process Gas Distribution System on turnkey basis as per the room-wise process and utility requirements of the facility.
- Scope shall include gas storage systems, gas cabinets, valve manifold boxes (VMBs), pressure regulation and automatic changeover systems, SS 316L electropolished tubing network, valves, fittings, orbital welding, purging arrangements, and point-of-use distribution connections for respective cleanroom areas.
- The system shall be designed for contamination-free, leak-tight, and uninterrupted gas delivery with controlled pressure regulation, gas purity maintenance, flow stability, safety interlocks, emergency shut-off systems, and gas detection systems suitable for semiconductor process requirements.
- All gas lines and components shall be properly segregated, identified, pressure tested, helium leak tested, validated, and integrated with complete documentation, as-built drawings, testing certificates, and operational training in compliance with applicable cleanroom and semiconductor industry standards.

ANNEXURE-I (b)

TECHNICAL SPECIFICATION FOR ELECTRICAL WORKS FOR IIT (BHU) VARANASI SEMICONDUCTOR CLEANROOM PROJECT

1. INTRODUCTION

The Turnkey basis, the Contractor shall assume complete responsibility to verify and confirm all requirements with IIT (BHU), VARANASI for the design, detailed engineering, supply, installation, testing, commissioning, and performance validation of the entire electrical system for the IIT (BHU), VARANASI Semiconductor Cleanroom Project. The Contractor shall ensure full coordination, integration, and interface management with architectural, cleanroom, HVAC, process utilities, fire detection and fire protection, BMS, and all other associated systems as specified in the BOQ, to deliver a fully functional, compliant, and operational facility in accordance with the project specifications, approved drawings, applicable codes, and statutory requirements. Any omissions, discrepancies, or mismatches identified at any stage of the project shall be deemed to be within the Contractor's scope and shall be rectified by the Contractor without any additional cost or time implications to the Client.

2. SCOPE OF ELECTRICAL WORKS

The Contractor shall be responsible on a Turnkey basis for the complete design, detailed engineering, supply, installation, testing, commissioning, and performance validation of the electrical systems for the IIT (BHU), VARANASI Modular Cleanroom Project. The scope shall include, but not be limited to, LT power distribution, main and sub-distribution panels, UPS systems, normal and emergency lighting, power outlets, HVAC electrification, control wiring, earthing and equipotential bonding, special cleanroom electrical systems, and all associated controls, interlocks, protections, and interfaces with other services. All works shall be complete in all respects, including coordination with architectural, cleanroom, HVAC, fire detection & protection, BMS, process utilities, and statutory authorities. Any item or activity not explicitly mentioned but necessary for the safe, reliable, and intended operation of the facility shall be deemed to be included within the Contractor's scope, without additional cost or time implication to the Client. The entire electrical system shall comply with latest IS/IEC standards, CEA regulations, NBC, guidelines, and all applicable statutory and safety requirements. The Contractor shall obtain all mandatory inspections, test certificates, approvals, and clearances from competent authorities.

3. DESIGN BASIS AND CONSIDERATIONS

The electrical system shall be designed with due consideration to the cleanroom classification, operational reliability, maintenance accessibility, energy efficiency, future scalability, and overall safety of personnel and equipment. The design philosophy shall ensure uninterrupted and stable power supply to all critical systems essential for cleanroom operation. All critical and sensitive loads shall be backed by appropriately rated UPS systems to ensure continuity of operation during power interruptions, voltage fluctuations, or transition between power sources. The system design shall incorporate suitable redundancy, protection, and segregation of critical and non-critical loads in line with defence project reliability requirements.

4. APPLICABLE CODES AND STANDARDS

The design, engineering, supply, installation, testing, and commissioning of the electrical systems shall comply with the latest applicable editions (including amendments) of the following codes, standards, and regulations:

- IS 732 – Code of Practice for Electrical Wiring Installations
- IS 8623 – Low-Voltage Switchgear and Control gear Assemblies
- IS 3043 – Code of Practice for Earthing
- IEC 60364 – Low-Voltage Electrical Installations
- National Building Code (NBC) of India
- Central Electricity Authority (CEA) Regulations
- Local Electricity Supply Authority rules and statutory requirements

In case of any discrepancy between standards, the more stringent requirement shall prevail. Compliance with the above standards shall not relieve the Contractor of responsibility for safe, reliable, and compliant system performance under the SPR / Turnkey scope.

5. POWER DISTRIBUTION ARCHITECTURE

The incoming electrical supply shall be 415 V $\pm$ 10%, 3 Phase, 4 Wire, 50 Hz AC, received at the Main MV/LV Power (MVP) Panel. Power shall be distributed from the MVP Panel to various sub-distribution panels, UPS input panels, essential and non-essential load panels, AHU electrical panels, and other connected loads as per the approved single-line diagram (SLD). The distribution system shall be designed with adequate spare feeders and space provisions to cater for future load expansion without major system modification. Proper segregation of normal, essential, and UPS-backed loads shall be ensured to meet cleanroom and defence reliability requirements. All distribution equipment shall be suitably rated, protected, and coordinated to ensure selective tripping, operational safety, and ease of maintenance, in compliance with applicable codes and standards under the SPR or Turnkey scope.

SINGLE LINE DIAGRAM (SLD) DESIGN PHILOSOPHY

The Single Line Diagram (SLD) shall be developed to clearly depict the complete electrical power distribution architecture from the incoming power supply up to the final utilization points. The SLD shall indicate system voltage levels, equipment ratings, fault levels, protection devices, metering, load segregation, and interconnections in a clear and unambiguous manner. The SLD shall be designed to ensure high reliability, operational safety, ease of maintenance, and future expandability, in line with defence project requirements. Proper segregation of normal, essential, and UPS-backed critical loads shall be incorporated to prevent cross-interference and to ensure uninterrupted operation of critical cleanroom systems. All protective devices shall be selected and coordinated based on short-circuit calculations, load diversity factors, and protection coordination studies, ensuring selective tripping and minimization of outage impact. Provision for spare feeders, space, and capacity margins shall be included in the SLD to accommodate future expansion. The SLD shall also incorporate earthing philosophy, interlocking logic, emergency shutdown provisions, and interface requirements with HVAC, fire detection & protection, BMS, and process utility systems. The SLD shall be submitted for review and approval by the Client prior to execution, and any modifications during execution shall be updated in the as-built drawings.

6. ELECTRICAL PANELS

All electrical panels shall be factory-built, modular construction, designed, manufactured, tested, supplied, installed, tested, and commissioned on a Turnkey basis.

6.1 Construction & Enclosure

Panels shall be fabricated from minimum 2.0 mm thick CRCA sheet steel, properly treated with 7-tank pretreatment process and powder coated (RAL 7035 or approved shade). Enclosure protection shall be IP 52 minimum, suitable for indoor cleanroom utility areas. Panels shall be front-operated, floor-mounted / wall-mounted as applicable. Panels shall be vermin-proof, dust-proof, and provided with removable gland plates.

6.2 Busbars & Internal Wiring

Busbars shall be high-conductivity aluminium or tinned electrolytic copper, adequately sized for rated current and short-circuit withstand capacity. Busbars shall be color-coded, sleeved, and supported on heat-resistant, non-hygroscopic insulators. Internal control wiring shall be FRLS copper conductors, neatly routed through PVC wiring ducts. All wires shall be ferruled at both ends with permanent identification matching approved drawings.

6.3 Protection & Switching

Incoming and outgoing feeders shall be protected using MCCBs/ACBs with adjustable thermal and magnetic protection. Short-circuit ratings shall be coordinated based on fault level calculations. Proper interlocking, shrouding, and safety barriers shall be provided to ensure personnel safety.

6.4 Metering & Indications

Panels shall be equipped with digital multifunction meters for voltage, current, frequency, power, energy, and power factor monitoring. Necessary indication lamps, selector switches, and alarms shall be provided as per panel function. Provision for future integration with BMS / EMS shall be included where specified.

6.5 Compliance

Panels shall comply with IS 8623 / IEC 61439, IS 732, NBC, CEA regulations, and applicable CPWD standards. Routine and type tests shall be conducted, and test certificates shall be submitted for approval.

6.6 Typical Panel Load Summary (Indicative)

<i>Panel Name</i>	<i>Connected Load (kW)</i>	<i>Demand Load (kW)</i>	<i>Remarks</i>
<i>MVP Panel</i>	<i>360.87</i>	<i>229.41</i>	<i>Including future spare</i>
<i>UPS Output Panel</i>	<i>185.47</i>	<i>129.83</i>	<i>Critical loads</i>
<i>HVAC MCC Panel</i>	<i>168.9</i>	<i>118.23</i>	<i>AHU units + electric heaters</i>

Note: The above loads are indicative. The Contractor shall verify actual loads during detailed engineering and size all panels, feeders, protection devices, and busbars accordingly, without additional cost to the Client.

7. LIGHTING SYSTEM

The lighting system for the cleanroom and associated areas shall be designed, supplied, installed, tested, and commissioned on a Turnkey basis, ensuring compliance with cleanroom classification, illumination requirements, and defence reliability standards.

7.1 Cleanroom Lighting Fixtures

Cleanroom luminaires shall be LED type, flush-mounted with ceiling panels, suitable for cleanroom applications. Fixtures shall have IP 65 protection from the room side, with sealed construction to prevent particle ingress. Diffusers shall be made of PMEA / PMMA (high-transmittance, anti-yellowing) material, flush with the ceiling surface. LEDs shall be Bridgelux make or equivalent approved international make, with high luminous efficacy and low heat dissipation. Wattage options shall include 45 W and 60 W, selected based on illumination calculations. Minimum rated life of LED modules shall be 50,000 hours (L70) under normal operating conditions.

7.2 Performance Requirements

Lighting design shall meet or exceed the specified lux levels as per cleanroom standards and task requirements. Uniform illumination with low glare and minimal shadowing shall be ensured. Color temperature shall typically be 4000 K – 6500 K, and CRI ≥ 80 , unless otherwise specified.

7.3 Electrical & Safety Features

Fixtures shall be compatible with cleanroom ceiling systems and suitable for continuous operation. All luminaires shall be wired with FRLS copper conductors and suitable connectors. Provision for earthing of luminaires shall be included. Emergency lighting / UPS-backed lighting shall be provided in critical areas as specified.

7.4 Compliance & Testing

Lighting fixtures shall comply with IS/IEC standards, cleanroom lighting norms, and applicable NBC / Defence specifications. Samples and technical datasheets shall be submitted for approval prior to procurement. Functional testing and illumination level verification shall be carried out during SAT.

8. SMALL POWER & UTILITY OUTLETS

Small power and utility outlets for the cleanroom and associated areas shall be designed, supplied, installed, tested, and commissioned on a Turnkey basis. Flush-mounted industrial-grade socket outlets shall be provided, suitable for cleanroom applications and continuous operation. Normal power and UPS-backed power circuits shall be strictly segregated, with separate wiring, protection, and identification to prevent inadvertent interconnection. All sockets shall be:

- Rated for the specified voltage and current
- Provided with proper earthing and shutter protection
- Clearly color-coded and labelled to distinguish between normal and UPS supply

Sockets, wiring, and accessories shall comply with IS/IEC standards, NBC, CEA regulations, and applicable Defence / CPWD specifications. Functional testing and polarity checks shall be carried out during Site Acceptance Testing (SAT).

8.1 CLEANROOM WALL MODULE INTEGRATION

- All small power outlets, utility sockets, and associated accessories within the cleanroom shall be flush-mounted and fully integrated with the cleanroom wall panel modules, maintaining cleanroom integrity.
- Wall modules shall be factory-fabricated or site-integrated cleanroom-compatible modules, coordinated with cleanroom panel layouts.
- Socket outlets shall be mounted in flush-type, sealed stainless steel or powder-coated frames, ensuring smooth, crevice-free surfaces.
- All cut-outs in wall panels shall be properly sealed using cleanroom-approved gaskets and sealants to prevent air leakage and particle generation.
- Conduits and junction boxes shall be concealed within the wall cavity wherever possible.
- Wiring entry into wall modules shall be through sealed glands to maintain pressure and cleanliness.
- All electrical accessories shall be accessible from the cleanroom side for operation, with maintenance access from the service side where applicable.

The Contractor shall coordinate with cleanroom, HVAC, and architectural vendors to ensure correct placement, alignment, and sealing of wall modules under the SPR / Turnkey scope.

8.2 SOCKET RATING MATRIX (INDICATIVE)

The Contractor shall provide industrial-grade socket outlets as per the following indicative rating matrix. Final quantities and ratings shall be confirmed during detailed engineering based on equipment loads.

Socket Type	Voltage	Phase	Current Rating	Typical Application	Power Source
Light-duty socket	230 AC	V Single phase	5 A	Instruments, laptops, small devices	Normal / UPS
General-purpose socket	230 AC	V Single phase	16 A	Equipment, benches, tools	Normal / UPS
Heavy-duty socket	230 AC	V Single phase	32 A	Process equipment	Normal
Industrial socket	415 AC	V Three phase	16 A / 32 A	Large equipment, utilities	Normal

9. HVAC and AHU ELECTRIFICATION

The electrification of HVAC systems, including Air Handling Units (AHUs), shall be designed, engineered, supplied, installed, tested, and commissioned on a Turnkey basis, fully coordinated with the HVAC and cleanroom systems.

9.1 AHU Control Panels

AHU control panels shall be factory-built, modular type, suitable for continuous operation and indoor installation. Each AHU panel shall include, but not be limited to: Variable Frequency Drives (VFDs) for supply and return/exhaust fans, as applicable DOL / Star-Delta starters for motors where VFDs are not provided Electric heater control and protection, including contactors, overloads, and safety interlocks Control and power interlocks with HVAC

equipment, BMS, fire alarm, and emergency shutdown systems

VFD Technical Specification

VFDs shall be heavy-duty, industrial-grade, suitable for continuous HVAC duty. Input supply: 415 V $\pm$ 10%, 3-phase, 50 Hz. VFDs shall be PWM type with IGBT technology. Minimum overload capacity: 110% for 60 seconds. Enclosure rating: IP 20 minimum (IP 54 for field-mounted panels). Built-in protections shall include Over-current, over-voltage, under-voltage, Phase loss and phase imbalance, Over-temperature and ground fault, VFDs shall support local and remote operation with keypad and BMS interface. Communication protocols: Modbus RTU / TCP or equivalent, as required for BMS integration. Suitable for fan and pump applications with energy-saving control algorithms.

9.4.2 Harmonic Mitigation

VFDs shall be provided with built-in DC chokes or line reactors to limit current harmonics. Total Harmonic Distortion (THDi) at PCC shall be maintained within IEEE-519 / IEC limits. Where required by system studies, external harmonic filters (passive or active) shall be provided. The Contractor shall carry out harmonic analysis during detailed engineering and submit calculations for approval. Harmonic mitigation measures shall ensure no adverse impact on UPS systems, sensitive cleanroom equipment, or instrumentation.

9.5 HEATER SAFETY & AIRFLOW INTERLOCK PHILOSOPHY

Electric heaters associated with AHUs shall be provided with comprehensive safety and interlocking to prevent overheating, equipment damage, or unsafe operation.

9.5.1 Heater Safety Provisions

Heaters shall be provided with: Automatic reset thermostat for operational control, Manual reset high-temperature cut-out for safety, Over-current and short-circuit protection, Heater contactors shall be suitably rated for continuous duty. Heaters shall be energized only when all safety conditions are satisfied.

9.5.2 Airflow & Safety Interlocks

Heater operation shall be interlocked with: AHU fan running status, Airflow switch / differential pressure switch proving minimum airflow, VFD healthy status. In the event of: Fan trip or stop, Loss of airflow, Fire alarm / smoke detection signal, Emergency shutdown activation the heater shall trip immediately and remain locked out until manual reset, where applicable.

9.5.3 Integration & Testing

Heater interlocks shall be integrated with AHU control panels, BMS, and fire alarm systems. All interlocks and safety functions shall be tested during SAT and demonstrated to the Client. Fail-safe logic shall be adopted to ensure heaters default to OFF condition under any fault scenario.

10. EARTHING & CLEAN EARTH SYSTEM

The earthing system for the IIT (BHU), VARANASI Modular Cleanroom Project shall be designed, supplied, installed, tested, and commissioned on a Turnkey basis, ensuring compliance with cleanroom standards, electrical safety codes, and defence reliability requirements.

10.1 Earthing Philosophy

Separate earthing systems shall be provided for:

- Normal power distribution
- UPS-backed critical loads
- Clean earth for sensitive equipment and instrumentation
- ESD (Electrostatic Discharge) flooring and workstations

All electrical equipment, panels, luminaires, motors, and metallic enclosures shall be double-earthed (main + auxiliary/clean earth) to ensure personnel safety and equipment protection. Earthing systems shall be independent yet coordinated, preventing interference between power, UPS, and sensitive equipment, while maintaining proper potential difference and minimizing earth loops.

10.2 Design & Materials

- Earthing electrodes shall be copper-clad or GI rods, properly sized and installed in accordance with IS 3043 / IEC 60364.
- Earthing conductors shall be FRLS copper of adequate cross-section, terminated with exothermic welding or approved compression lugs.
- Separate earthing grids shall be provided for ESD flooring and critical instrumentation, with low resistance to earth ($<1\ \Omega$ for power / UPS earth, $<0.5\ \Omega$ for clean earth, subject to measurement).

Earth connections shall be mechanically robust, corrosion-resistant, and accessible for inspection.

10.3 Integration & Verification

Earth systems shall be segregated yet bonded at a single reference point to prevent potential differences and ground loops.

- ESD flooring shall be tested for resistance to ensure compliance with cleanroom ESD requirements.
- All earth connections shall be tested and certified during SAT using earth resistance testers / megger, and documented in the as-built drawings and test reports.
- Coordination with UPS, cleanroom panels, and sensitive equipment vendors shall be carried out to ensure optimal performance and safety.

11. ELECTRICAL LOAD DETAILS

11.1 Load Calculation Principles

Calculations shall be based on connected load of all equipment, panels, lighting, small power outlets, HVAC systems, UPS-backed loads, and special cleanroom systems. Diversity factors shall be applied in accordance with IS/IEC standards and best engineering practices, while ensuring reliable operation of all critical systems. Future expansion provisions shall be included to accommodate additional loads without major modification to the electrical distribution system.

11.2 Voltage Drop & Thermal Considerations

Voltage drop along feeders, cables, and busbars shall be calculated to ensure that all equipment operates within acceptable voltage tolerances. Thermal limits of conductors, busbars, and protective devices shall be verified to prevent overheating and insulation degradation. Cable

sizing shall account for load growth, grouping effects, ambient temperature, and installation conditions.

11.3 Documentation & Verification

Contractor shall prepare and submit detailed load schedules, single-line diagrams, feeder schedules, and cable sizing calculations for approval by the Client. All load calculations shall be coordinated with UPS, HVAC, cleanroom panels, lighting, and small power systems to ensure balanced distribution, redundancy, and operational reliability. Verification of loads shall be conducted during FAT /SAT and any discrepancies shall be rectified by the Contractor under the SPR / Turnkey scope at no additional cost.

CABLE SIZING AND ROUTING PHILOSOPHY

Cable Sizing

- All power and control cables shall be sized based on calculated connected loads, diversity factors, voltage drop limits, and thermal rating of conductors.
- Voltage drop shall not exceed 3% for feeders supplying critical loads and 5% for non-critical loads under full load conditions.
- Cable sizing shall consider short-circuit withstand capability, ambient temperature, grouping effects, and installation method in accordance with IS 1554 / IEC 60502 standards.

Conductors shall be copper, FRLS, and low-smoke zero-halogen (LSZH) type for all cleanroom and indoor applications.

Cable Routing

- Cables shall be routed through concealed trays, ladders, or conduits, maintaining minimum bending radius, segregation, and support spacing.
- Power, UPS, and control cables shall be physically segregated to avoid electromagnetic interference (EMI) with sensitive equipment.
- Routing shall minimize exposure to heat, moisture, and mechanical damage, and comply with cleanroom architectural and ceiling module constraints.

Cable entry into panels shall be through glands with proper sealing to maintain cleanroom integrity. Adequate spare conduits or trays shall be provided for future expansion.

FEEDER SEGREGATION, LABELING AND IDENTIFICATION

All feeders shall be clearly segregated into the following categories:

- Normal Power - for general and non-critical loads
- UPS-backed / Essential Power - for critical cleanroom equipment, instruments, and safety systems
- HVAC / AHU feeders - separately identified
- Lighting feeders - normal and emergency
- Special utilities - process gases, DI water, vacuum, etc.

Each feeder shall be uniquely labeled at panel terminations, cable entry points, and distribution boards.

- Color-coding shall be implemented for phase identification and supply type, in accordance with IS / IEC standards.

Cable tags shall be durable, cleanroom-compatible, and legible, with references matching the Single Line Diagram (SLD) and panel schedules.

Sample Load Details Table

Equipment	Qty.	Unit Load (kW)	Total Load (kW)
Cleanroom Lights	40	0.06	2.4
Air Shower	1	6.0	6.0
AHU	1	65.0	65.0

12. INSTALLATION METHODOLOGY

All electrical works for the IIT (BHU), VARANASI Modular Cleanroom Project shall be carried out under a Turnkey scope, ensuring compliance with cleanroom standards, safety requirements, and Defence tender specifications.

12.1 General Principles

All installations shall be performed in a contamination-controlled manner, maintaining cleanroom integrity during and after installation. The Contractor shall coordinate with cleanroom, HVAC, and architectural vendors to prevent damage or contamination of cleanroom modules. Installation shall comply with applicable IS/IEC standards, NBC, and Defence/CPWD requirements.

12.2 Wiring & Conduit Requirements

Concealed conduits shall be used for all electrical cables inside cleanrooms. Surface wiring is strictly prohibited within cleanroom areas. Cables shall be routed through properly sized conduits, trays, or ladders, ensuring minimal bending, secure support, and segregation of power, UPS, control, and instrumentation cables. Conduit entries into panels and wall modules shall be sealed with cleanroom-compatible gaskets to maintain air tightness and prevent particle ingress.

12.3 Equipment & Panel Installation

Panels, distribution boards, and UPS units shall be installed level, plumb, and securely anchored, with adequate clearances for maintenance. All metallic enclosures shall be properly earthed and bonded, in accordance with the earthing philosophy. Cable terminations, ferruling, and labeling shall be completed before energization.

12.4 Safety & Cleanroom Integrity

Installation teams shall wear cleanroom-compatible clothing, gloves, and other PPE when working inside controlled areas. Dust, debris, and contaminants shall be immediately removed, and protective coverings shall be maintained until final commissioning. All penetrations, junction boxes, and conduits shall be sealed and smooth-finished to prevent particle accumulation.

12.5 Verification

Installation quality, alignment, labeling, and cleanliness shall be verified during inspections, before energization or SAT. Any deficiencies observed shall be rectified immediately by the Contractor under the SPR / Turnkey responsibility, without additional cost or schedule extension.

13. TESTING & COMMISSIONING

Testing and commissioning shall be carried out for all supplied and installed systems to ensure safe, reliable, and compliant operation. The scope of testing shall include, but not be limited to, the following:

- Insulation resistance testing
- Earth continuity testing
- Functional testing of all equipment and controls
- Verification of interlocks and safety protections
- Simulation and verification of emergency power / power failure conditions

All tests shall be conducted as per relevant IS/IEC standards, approved drawings, and manufacturer recommendations. Test results shall be documented and submitted for review and acceptance prior to final handover.

14. COMPLIANCE & DEVIATION STATEMENT

The bidder shall submit a detailed, clause-wise compliance statement against all technical and commercial requirements of this tender document. Any deviations, exceptions, or clarifications shall be clearly highlighted and listed separately in the deviation statement. Deviations not explicitly stated in the submitted deviation statement shall be deemed as **fully compliant**, and no subsequent claims or variations on such grounds shall be entertained. Bidder shall submit a clause-wise compliance statement. Any deviation not listed shall be considered non-compliant.

15. GENERAL ARRANGEMENT & DATA SHEETS-PANELS (REFERENCE)

Total connected load details, including complete power distribution details, shall be provided along with General Arrangement (GA) drawings and data sheets for all line items. These documents are intended to indicate overall layout, space allocation, interface requirements, and compliance with the specified technical parameters. The bidder shall verify all dimensions, clearances, and site conditions prior to detailed engineering and fabrication. Any discrepancies, omissions, or ambiguities observed shall be brought to the notice of the Client during the bidding stage. Final detailed GA drawings, schematic diagrams, load calculations, data sheets, and fabrication drawings shall be prepared by the successful bidder and submitted for review and approval prior to manufacture, supply, and installation.

16. FINAL ACCEPTANCE AND HANDOVER

Final acceptance and handover shall be carried out after successful testing and commissioning of the complete system and approval by the Client. The handover package shall include, but not be limited to, the following: As-built drawings

- Approved test and commissioning reports
- Operation & Maintenance (O&M) manuals
- Warranty and guarantee documents, wherever applicable

Final handover shall be deemed complete only after submission, review, and acceptance of the above documents by the Client.